

ABSTRACTS OF THESES

Accepted for the award of post-graduate degrees in the University of Agricultural Sciences, Dharwad

DOCTOR OF PHILOSOPHY

AGRICULTURAL ECONOMICS

Impact of WTO on the production and export of Indian cotton – An econometric analysis

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2011

MAJOR ADVISOR: Dr. H. BASAVARAJA

The present study aims at analyzing impact of WTO on cotton production and export in India. The study estimated the growth rates and instability in area, production and productivity of cotton. The impact of WTO on the direction of exports, factors affecting the export and constraints involved in the exports were also examined. The time series data on production, area yield and exports were collected for a period from 1985-86 to 2008-09. The study period was divided into pre-WTO period (1985-86 to 1994-95) and post-WTO period (1995-96 to 2008-09). The study revealed that during the post-WTO period there was positive growth in the area, production of cotton. The districtwise analysis in Karnataka showed that only Gulbarga district recorded positive growth in area, production and productivity of cotton. The change in the mean yield was the main contributor to the change in the average production of cotton in the country and Maharashtra was the highest contributor. The yield variance was the major source of change. In case of Karnataka, the

change in mean area was the major contributor wherein Bellary and Raichur contributed significantly. The exports of cotton showed significant increase in all staple wise exports during the post-WTO period. Among the different staple lengths of cotton exported the major share was from the long and extra long staple (49%). The destination wise exports revealed that during the pre-WTO period the highest share of exports from India was to Japan. But during the post-WTO period Japan, UK and Germany showed negative growth in quantity of cotton exports from India. The quantity of exports witnessed higher instability of 133.62 per cent. During the post-WTO period China was the major importer (45.86%) followed by Pakistan (13.50%) and Japan, China, Pakistan Thailand were the stable markets of Indian cotton. The export demand for cotton was found to increase with domestic production. Poor awareness among the farmers especially with respect to packing material and the presence of high trash/contamination in cotton were the major constraints identified.

AGRICULTURAL MICROBIOLOGY

Studies on plant growth promoting fluorescent pseudomonads of Uttara Kannada district of Karnataka state

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2010

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Of the 133 fluorescent pseudomonads from Uttara Kannada district, 86 were identified as *Pseudomonas fluorescens*, 45 as *P. aeruginosa* and two as *P. aureofaciens*. Seventy isolates released 11.85 to 60.60 % Pi at 14 days. The IAA and GA production ranged from 30-984 mg/l and 55-342 mg/l of broth respectively and 22 isolates produced cytokinins (4.07-58.44 mg/l). While 67 produced alkaline protease, 28 had high chitinolytic activity. Sixty-seven isolates antagonized one or other plant pathogens; 49 were inhibitory to *A. carthami*, 39 to *F. oxysporum* f. sp. *carthami* (*Foc*), 32 to *S. rolfisii*, 23 to *R. bataticola*, 42 to *X. axonopodis* pv. *punicae* (*Xap*), 59 to *X. axonopodis* pv. *malvacearum*, 42 to *R. solanacearum* and 41 to *X. axonopodis* pv. *citri*. Of these, 41 produced HCN and all of them produced siderophores. Out of 28 potential antagonists, 26 produced antimicrobials. Five antagonists against each of the 4 fungal pathogens produced volatile metabolites which inhibited

S. rolfisii, *A. carthami* and *Foc*. Fifteen isolates with multifunctional properties were evaluated in pot cultures. In safflower, DF 75 was the best for growth promotion. When safflower was challenged with *Foc*, MDF 449(1) recorded best growth promotion coupled with the least wilt incidence and highest ISR activity. In pomegranate, MDF 449(1) was best for growth promotion. When pomegranate was challenge inoculated with *Xap*, DDF 347(1) showed maximum growth promotion coupled with the least bacterial blight intensity and highest ISR activity in leaves. The RAPD analysis of 25 isolates indicated tremendous diversity. The dendrogram for pooled data showed nine clusters. The Shannon's index of pooled data was 0.71 indicating high diversity the maximum being in dry deciduous forest (0.79). The richness index was 0.65 indicating that fluorescent pseudomonads are not distributed equally. Low evenness index of 0.26 indicated dominance of *P. fluorescens* over the others.

Molecular characterization and insecticidal activity of *Bacillus thuringiensis* isolates, cloning and expression of *cry*, *vip* gene variants and mutagenesis of codon optimized *cry1ac*

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The present work involved isolation of *B. thuringiensis* from different ecological niches, followed by their molecular characterization, cloning and expression of variants of *cry* and *vip* and mutagenesis of *cry*. From a total of 1745 soil samples collected, 977 isolates were identified as *B. thuringiensis*. The most predominant crystalline inclusion was the spherical crystals. The presence of *cry/vip* genes was determined and the most abundant gene was *cry10* and *cry20*. Several isolates had more than one *cry* gene in them. Only ten of the isolates harboured *vip3A*. Four isolates showed 100 per cent mortality at 48h of exposure against third instar larvae of *Plutella xylostella*. Twenty two native isolates exhibited 100 per cent mortality at 72h. The per cent mortality of third instar larvae of *Crociodolomia binotalis* ranged from 0 to 100 per cent. The

reference strain HD1 exhibited 96.6 per cent mortality, whereas the isolate DBT 763 exhibited 100 per cent mortality. The analysis of rep PCR fingerprints showed 18 to 20 bands with size ranging from 0.2 to 5kb with ERIC2 primer alone. One of the isolates DBT1881 showed 100 per cent similarity to *B. thuringiensis* subsp. *andalousiensis* whe DBT381 and DBT84 based on ARLP patterns was cloned and expressed in *E. coli*. The nucleotide sequence showed 99 per cent homology with the reference *cry1Ac22* (EU282379.1). The *vip3A* variant was cloned from 4L3 and 4C2 and was expressed in *E. coli*. The codon optimized *cry1Ac* from the truncated version (1.85kb) of a native *cry1Ac* was subjected to random mutagenesis and one mutant RM2G was observed to possess 20 per cent more toxicity than the *cry1AcM* to *P. xylostella*.

Isolation, characterization and development of *Bacillus thuringiensis* formulations against diamond back moth (*Plutella xylostella* L.)

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Total of 80 *B. thuringiensis* isolates were obtained from 396 samples collected from the Western Ghats of Karnataka, out of which 44, 27 and 9 isolates were obtained from the samples collected in Uttara Kannada, Dakshina Kannada and Udupi districts respectively. All the isolates were subjected for morphological, biochemical and molecular characterization. Sixty five per cent of the isolates showed spherical type of crystals and only 3.75 per cent of the isolates had bipyramidal type of crystals. All the 80 isolates showed positive reaction for nitrate reduction, catalase production, Voges-Proskauer reaction and oxidase test, but all were negative for acid and gas production from glucose, arginine hydrolysis, chitinase activity and esterase activity. Rep-PCR fingerprinting of 80 isolates indicated that, the isolates grouped into two major clusters having seven sub-clusters. Bioassay against third instar larvae of *Plutella xylostella* showed 100 per cent mortality by the isolates UK-13C and UK-762D.

Efficacy of six different concentrations of crude protein of selected Bt isolates against DBM showed the mortality ranged from zero to one hundred per cent. The isolate UK-13C having LC_{50} value close to that of the reference strain HD1 and least LC_{99} was recorded by UK-762D. Thirteen efficient isolates showed good growth in presence of chemical pesticides Indoxacarb, Novaluron, Chlorofenapyr and Spinosad and no growth in the presence of Thiodicarb, Profenofos, Captan and Mancozeb. Three isolates and reference strain HD1 with least LC_{99} value were selected for preparation of wettable powder (WP) and water based flowable (WBF) formulations and were tested for their efficacy against DBM under shade house and field condition using cabbage as a test crop. In both shade house and field condition, Dipel recorded the highest mortality of insect larvae followed by HD1 WBF @ double the LC_{99} and UK-762D WBF @ double the LC_{99} .

Studies on bioethanol production from selected agro-residues

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The present study was conducted on bioethanol production from selected agro-residues with the objectives of achieving higher recovery of fermentable sugars through delignification and saccharification followed by fermentation of the derived sugars to bioethanol. Five agro-residues namely sugarcane bagasse, sugarcane tops, sugarcane trash, corn husk and corn stover of particle sizes 0.5, 1.0 and 10.0 mm were delignified by various pre-treatment methods such as alkali, autohydrolysis and lignolytic fungi. The treatment combination of 3.0% NaOH with 121°C temperature for one h on particle size 0.5 mm resulted in the highest recovery of cellulose and hemicelluloses in sugarcane bagasse (0.813 g/g), sugarcane tops (0.786 g/g), sugarcane trash (0.806 g/g), corn husk (0.806 g/g) and corn stover (0.806 g/g). The delignified substrates were further saccharified using cellulolytic fungi and their crude enzymes and commercial cellulase enzymes. Among these, the commercial cellulase enzyme with 15 U/g along with b-glucosidase (10 U/g) and Xylanase (5 U/g) enzymes at 5%

substrate produced significantly highest reducing sugars with per cent saccharification in sugarcane bagasse (93.17%), sugarcane tops (90.33%), sugarcane trash (84.61%), corn husk (80.61%) and in corn stover (80.80%) in 12 h of incubation period. The pre-treated substrates were fermented to bioethanol by using six microorganisms. The combined inoculation of *Saccharomyces cerevisiae* and *Candida shihatae* on pre-treated substrates resulted in the highest ethanol yield in all the substrates, sugarcane bagasse (278.40 mg/g) followed by sugarcane tops (262.75 mg/g), sugarcane trash (241.42 mg/g), corn stover (239.82 mg/g) and corn husk (232.36 mg/g). The scaled up study on bioethanol production with sugarcane bagasse under optimized conditions produced 223 g bioethanol from one kg pre-treated substrate. Thus, it can be concluded that the substrates need to be alkali pretreated followed by treatment with commercial enzymes and further conversion to ethanol. The combined inoculation of the yeast cultures yields maximum ethanol.

AGRONOMY

Studies on performance of Bt cotton genotypes in different soils of northern transition zone of Karnataka under rainfed situation through farmers participatory approach

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The field experiments were conducted to evaluate the performance of Bt cotton genotypes in different soils under rainfed situation through farmers participatory approach in Govankoppa (black soil) and Budarkatti (red soil) villages of Bailhongal taluk of Belgaum district with mother and baby trial design during kharif 2008-09 and 2009-10. The experiments were laid out in a randomized complete block design with three replications. The treatment consisted of the Bt cotton genotypes RCH-2 Bt, RCH-2 BG-II Bt, Bunny BG-II Bt, JK-99 Bt, Mallika Bt, MRC-6918 Bt, Brahma Bt, RCH-708 Bt, Bunny Bt and DHH-11. Bunny BG-II Bt recorded significantly higher seed cotton yield (2385 kg/ha), while MRC-6918 Bt recorded higher benefit:cost ratio (4.02) in mother trial black soil. The seed cotton yield of RCH-708 Bt, RCH-2 Bt, JK-99 Bt and Brahma Bt in baby

trial was found on par with those in mother trial black soil. MRC-6918 Bt recorded significantly higher seed cotton yield (2257 kg/ha) and benefit:cost ratio of 3.68 and significantly higher over other cotton genotypes in mother trial red soil. The seed cotton of RCH-2 Bt, JK-99 Bt, DHH-11 and Brahma Bt in baby trial was found on par with those in mother trial red soil. The soil fertility status of major cotton growing areas of Bailhongal taluk in different soil types revealed that mean pH of the black soil was 7.5, whereas in red soil was 7.26. The soils were found to be deficit in N, P, Fe and Zn in both black and red soils. The survey on documentation of cultivation practices on cotton indicated that Bunny Bt was the dominant Bt hybrid cultivated in both black and red soil with a spacing of 120cm x 60 cm.

Agronomic investigations on management of abiotic and biotic stress in rainfed chickpea (*Cicer arietinum* L.)

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Investigations on "Abiotic and biotic stress management in rainfed chickpea" were carried out during *rabi* season of 2005-06 and 2006-07 at Agricultural Research Station, Gangavathi, UAS, Dharwad, Karnataka. Interaction of FYM cured DAP and seed priming with 2% SSP (P^2S_3) recorded highest grain yield of 1705 kg/ha which was significantly superior and was on par with interactions $P1S2$, $P1S3$, $P1S5$, $P1S6$, $P2S2$, $P2S3$, P_5S_1 , P_5S_3 , P_5S_4 , P_5S_5 and P_5S_6 . While, lowest grain yield of 1096 kg/ha was obtained from combination involving P application in the form of FYM and without seed treatment. Similarly, increased number of pods per plant at 60 DAS (29.7) and at harvest (37.7), grain weight

per plant (16.09g) and test weight (9.02g) was recorded with application of recommended dose of phosphorus through FYM cured DAP and seed priming with 2% SSP. Higher uptake of total nitrogen (102.8 kg/ha), phosphorus (9.0 kg/ha) and potash (102.7 kg/ha) was recorded with interaction of FYM cured DAP and seed priming with 2% SSP compared to other interactions except $P1S2$, $P1S3$, $P1S6$, $P2S2$ and $P2S6$. Interaction of FYM cured DAP and seed priming with 2% SSP recorded higher gross income (37517 `/ha), net income (29588 `/ha) and B:C ratio (3.73) over other interactions. Significantly higher chickpea equivalent yield (CEY) was recorded in chickpea + sunflower

intercropping (T_2 , 1436 kg/ha). While, lowest CEY was observed in chickpea + wheat intercropping (T_7). Higher number of pods per plant at 60 DAS (T_2 , 24.6) and at harvest (T_2 , 34.1) was recorded in sole chickpea. While, lowest number of pods per plant was recorded in chickpea + wheat (T_7) intercropping. Similarly, grain weight (T_2 , 7.56 g/plant) and test weight (T_2 , 15.4 g) were also significantly superior in sole chickpea than other intercropping systems. The population of *Helicoverpa* larvae was reduced as the stage of crop advanced. Significantly

lower number of larvae was observed in chickpea + sunflower intercropping system. Similarly, the population of spiders and coccinellids were higher in chickpea + sunflower intercropping system compared to sole chickpea. Higher gross return (₹ 30458 per ha), net returns (₹ 23117 per ha) and B:C ratio (4.14) were recorded in chickpea + sunflower intercropping system. While, the lowest gross return of ₹ 15452 per ha, net income of ₹ 8111 per ha and B:C ratio of 2.1 were recorded in chickpea + wheat intercropping system.

Effect of organic and integrated nutrient management practices on growth, yield and quality of sugarcane and jaggery in Cauvery command area

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MAJOR ADVISOR: Dr. Y. B. PALLED

Field experiments were conducted at Zonal Agricultural Research Station, V.C. Farm, Mandya on the effect of organic and integrated nutrient management practices on yield and quality of sugarcane and jaggery during 2007-08 and 2008-09. The treatments consisted of two varieties Co 62175 and Co 86032 as main plot and eight nutrient management practices. The results of the plant crop of sugarcane reveal that Co 62175 variety recorded significantly higher cane height (2.45 m), cane weight (1.79 kg), girth (3.13 cm), population of millable canes (115340 ha⁻¹), cane volume (0.185 m³) and sugarcane yield (149.04 t ha⁻¹) compared to Co 86032 variety. The juice quality parameters like brix (20.82%), pol per cent (19.13%), CCS (13.61%) were significantly higher with Co 86032 variety of sugarcane. Among the nutrient management practices, significantly higher cane length (2.80 m), cane weight (2.05 kg), girth (3.58 cm), millable cane number (1,30,470 ha⁻¹), cane volume (0.191 m³) and sugarcane yield (170.33 t ha⁻¹) were recorded with 50 per cent N

equivalent through pressmud and 50 per cent NPK through chemical fertilizers (N_6) over all the other nutrient management practices (N_7) except recommended package of practices with which it was on par. Sugar yield was significantly higher with N_6 over other nutrient management practices but it was on par with N_7 . The jaggery quality was higher with more of A1 quality jaggery with organic nutrient management practices. The nutrient management practice with 50 per cent N equivalent through pressmud and 50 per cent NPK through chemical fertilizers recorded significantly higher net income (₹ 105543 ha⁻¹) and B:C ratio (2.28) over all the other nutrient management practices. The experiment on ratoon crop produced similar results as that of plant crop. Co 62175 variety of sugarcane produced higher yield attributing parameters and yield over Co 86032. Among the nutrient management practices, higher yield attributing parameters and yield were recorded with N_6 over all others except N_7 .

Response of chickpea (*Cicer arietinum* L.) to various organics in vertisols of northern dry zone of Karnataka

SANGAPPA V. PATIL

2011

MAJOR ADVISOR: Dr. S. I. HALIKATTI

Field experiments were conducted at Agricultural Research Station, Annigeri, UAS, Dharwad during *rabi* seasons of 2009-10 and 2010-11 in a fixed site to explore the nutrient management options in organic cultivation of chickpea. In the experiment on nutrient management studies, application of nitrogen equivalent to 100 per cent recommended dose with enriched compost + vermicompost + glyricidia green leaf manure in equal proportions (OM_2) recorded significantly higher grain yield (2147 kg/ha) over other organic manures. Spraying of panchagavya @ 3 per cent (LM_1) at flower initiation and 15 days after flowering recorded significantly higher grain yield (2189 kg/ha) over other liquid organic manures except 10 per cent cow urine spray (2114 kg/ha). The combined application of 100 per cent recommended dose of N with OM_2 and foliar spray of panchagavya @ 3 per cent at flower initiation and 15 days after flowering recorded significantly higher grain yield (2400 kg/ha) over control (water spray) and recommended dose of fertilizers. Significantly higher B:C ratio

was recorded with OM_2 (3.34), panchagavya spray of 3 per cent (3.31) among liquid organic manures while the combined effect of OM_2LM_1 (3.69). The growth and yield attributing parameters, number of root nodules, and dry matter production and its partitioning followed similar trend as that of grain yield. In the experiment on phosphorus management, significantly higher grain yield (2140 kg/ha) was recorded with application of 200 kg rock phosphate per hectare over other lower levels except 150 kg RP_3 (2069 kg/ha). Interaction of compost @ 5 tons per hectare with 200 kg per ha rock phosphate recorded significantly higher grain yield (2130 kg/ha). Higher B:C ratio was recorded with application of 200 kg per ha rock phosphate (3.32) as well as interaction of compost @ 5 tons/ha with 200 kg per ha rock phosphate (3.36) over control. The integrated use of various sources of organic manures with rock phosphate in chickpea improved soil physical, chemical and biological properties and available NPK status.

Response of stevia (*Stevia rebaudiana* Bertoni.) to irrigation schedule, planting geometry and nutrient levels

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Field experiments were conducted at Water Management Research Center, Belavatagi, in black clayey soil under irrigated conditions to assess the response of stevia to irrigation schedules, planting geometry and nutrient levels during 2004 - 2006. The first experiment consisted irrigation schedules at 0.8, 1.0 and 1.2 IW/CPE as main plots and planting geometries of 30 x 20 cm, 30 x 30 cm, 45 x 30 cm and 60 x 20 cm as sub plots. The treatments were laid out in split plot design with three replications. The second experiment consisted three N and P_2O_5 levels as I factor and II factor respectively and two K_2O levels as III factor. The experiment was laid out in Randomised Block Design with factorial concept in three replications and one absolute control as check. Highest dry leaf yield of stevia was obtained with irrigation scheduled at 1.2 IW/CPE (10.54 t ha⁻¹) which was on par irrigation scheduled at 1.0 IW/CPE

(10.32 t ha⁻¹) and significantly lower dry leaf yield was with irrigation scheduled at 0.8 IW/CPE (9.36 t ha⁻¹). Planting geometry of 30 x 20 cm recorded the highest cumulative total dry leaf yield (11.12 t ha⁻¹) which was comparable with the dry leaf yield obtained with the planting geometry of 30 cm x 30 cm (10.89 t ha⁻¹). Significantly higher dry leaf yield was obtained with nitrogen level of 400 kg ha⁻¹ (11.42 t ha⁻¹) which was on par with 300 kg ha⁻¹ (10.94 t ha⁻¹). Phosphorus level of 200 kg ha⁻¹ recorded significantly highest dry leaf yield (11.14 t ha⁻¹) which was on par with 150 kg ha⁻¹ (10.85 t ha⁻¹). Higher potassium level of 200 kg ha⁻¹ recorded the dry leaf yield of 10.78 t ha⁻¹ which was comparable with potassium level of 100 kg ha⁻¹ (10.46 t ha⁻¹). Nutrient level of 300:150:100 NPK kg ha⁻¹ has been considered as an economically optimum level of nutrients for stevia.

Effect of intercrops on the performance of chilli + cotton system under conventional and organic cultivation

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Field experiments were conducted at Agricultural Research Station, Devihosur in black clayey soil under rainfed condition during 2004-06. The experiments were laid out in split plot design. The treatments comprised of two chilli genotypes (cv. Byadagi kaddi and Hy. 9646) with Jayadhar cotton as mixed crop (main plot) and six intercrops viz., soybean, french bean, coriander (vegetable), coriander (seeds), garlic and onion (sub-plot). Significantly higher dry chilli yield was recorded with genotype Hy. 9646 (1013 and 355 kg/ha) compared to cv. Byadagi (737 and 293 kg/ha) under both conventional and organic system of cultivation, respectively. Intercropping coriander (vegetable) with chilli + cotton recorded significantly higher dry chilli yield (1122 and 504 kg/ha) in conventional and organic cultivation systems, respectively. Intercropping coriander (vegetable) with chilli + cotton recorded significantly higher kapas yield (580 and 629 kg/ha) in conventional and organic cultivation, respectively. Chilli equivalent yield was highest with chilli cv. Byadagi (2189 and 1400 kg/ha) compared to chilli genotype Hy. 9646 (2096 and

1327 kg/ha) due to inclusion of chilli genotypes in intercropping with chilli + cotton in both conventional and organic system of cultivations, respectively. Intercropping garlic with chilli + cotton based cropping system recorded significantly higher chilli equivalent yield (3216 and 2443 kg/ha) compared to rest of the treatments in both conventional and organic system of cultivation. Inclusion of chilli cv. Byadagi with intercropping chilli + cotton mixed cropping system recorded significantly higher B:C ratio (2.6 and 0.69) compared to chilli genotype Hy. 9646 (2.16 and 0.44) under both conventional and organic form of cultivation. Intercropping onion with chilli + cotton accounted for significantly higher B:C ratio (3.41) in conventional cultivation while intercropping garlic with chilli + cotton recorded highest B:C ratio (1.22) under organic form of cultivation. Intercropping onion with chilli (cv. Byadagi) + cotton recorded significantly higher B:C ratio in conventional cultivation and intercropping garlic with chilli (cv. Byadagi) + cotton under organic form of cultivation.

Evaluation of Bt cotton genotypes and nutrient management to control leaf reddening

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2011

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Two field experiments on "Assessing leaf reddening malady in Bt cotton genotypes" and "Studies on nutrient management to overcome leaf reddening in Bt cotton" were conducted on vertisols at MARS, University of Agricultural Sciences, Dharwad during kharif 2007 and 2008. Mean of two years data from the first experiment indicated that cv. Neeraja-BG-II-Bt recorded significantly higher seed cotton yield (2483 kg/ha) and net monetary return (₹ 28,832/ha) compared to other cultivars (1131 to 2071 kg/ha and ₹ 1950 to 20,669, respectively). At 120 DAS, cv. Neeraja-Non-Bt recorded significantly higher total chlorophyll (1.66 mg/g fresh weight) and lower anthocyanin (0.137 mg/g fresh weight) while cv. Sahana-Non-Bt recorded significantly higher red leaf index (2.12). Seed cotton yield was positively correlated with total chlorophyll ($r=0.34$) while negative correlation with anthocyanin ($r=-0.09$) and red leaf index ($r=-0.03$) was observed among the genotypes studied at 120 DAS. Results from the second experiment revealed that

foliar application of KNO_3 @ 2% produced significantly higher seed cotton yield (2543 kg/ha) and net monetary return (₹ 27807/ha) compared to other treatments (1383 to 2522 kg/ha and ₹ 145985 to 27722, respectively). At 120 DAS, significantly increased total chlorophyll, decreased anthocyanin and lower red leaf index were recorded with soil and foliar application of MgSO_4 @ 25 kg/ha and 1%, respectively (1.77, 0.08 mg/g fresh weight and 1.05, respectively) which were on par with treatments of KNO_3 @ 2% foliar application (1.70, 0.10 mg/g fresh weight and 1.05, respectively) and soil application of MgSO_4 @ 25 kg/ha (1.70, 0.11 mg/g fresh weight and 1.05, respectively). Significant positive correlation between seed cotton yield and total chlorophyll ($r=0.95$) was observed while negative correlation with anthocyanin ($r=-0.86$) and red leaf index ($r=-0.97$) was noted at 120 DAS. Polyethylene mulching in between two Bt cotton rows did not influence significantly in overcoming leaf reddening.

Nitrogen management through leaf colour chart in bread wheat (*Triticum aestivum* L.) and emmer wheat [*Triticum dicoccum* (Schrack.) Schulb.] under irrigated condition

DINESHKUMAR S. P.

2011

MAJOR ADVISOR: Dr. B. N. PATIL

Field experiments were conducted to study the "Nitrogen management through leaf colour chart in bread wheat [*Triticum aestivum* L.] and emmer wheat [*Triticum dicoccum* (Schrack.) Schulb.] under irrigated condition" at All India Coordinated Wheat Improvement Project, UAS, Dharwad during rabi seasons of 2008-09 and 2009-10. The treatment consisted of three levels of leaf colour chart (LCC) (≤ 3 , ≤ 4 and ≤ 5), three levels of nitrogen (10, 20 and 30 kg/ha per topdressing), two method of application (with basal and without basal) and two controls (Recommended dose of nitrogen and zero nitrogen). The experiments were laid out in Randomized Complete Block Design with factorial concept with three replications. LCC ≤ 5 based nitrogen management with top dressing @ 30 kg/ha and basal application ($\text{L}_3\text{N}_3\text{M}_1$) (50.41 and 51.55 q/ha) and LCC ≤ 5 with top dressing of nitrogen @ 20 kg/ha and basal application ($\text{L}_3\text{N}_2\text{M}_1$) (47.17 and 48.62 q/ha) recorded significantly higher yield in both the types of

wheat as compared to other treatment combinations including two controls (RDN and Zero nitrogen). Data on straw yield also varied similarly as that of grain yield. Growth parameters, yield attributes and quality traits were significantly higher under $\text{L}_3\text{N}_3\text{M}_1$ and $\text{L}_3\text{N}_2\text{M}_1$ in both types of wheat. LCC ≤ 4 recorded significantly higher nitrogen use efficiency (NUE) in both types of wheat. Significantly higher gross income (₹ 64883/ha, ₹ 61319/ha in bread and ₹ 92781/ha, ₹ 87510/ha in emmer wheat), net income (₹ 41745/ha, ₹ 38728/ha in bread and ₹ 70008/ha, ₹ 65040/ha in emmer wheat) and B:C ratio (2.83, 2.72 in bread and 4.09, 3.90 in emmer wheat) were accounted with $\text{L}_3\text{N}_3\text{M}_1$ and $\text{L}_3\text{N}_2\text{M}_1$, respectively. LCC levels showed significant and positive correlation with SPAD values at all the growth stages. Among different spectral indices, RVI at 60 and 75 DAS were found to be the best indicator for yield prediction using linear regression model in bread and emmer wheat, respectively.

Precision nutrient management in sugarcane (*Saccharum officinarum* L.)

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2011

MAJOR ADVISOR: Dr. S. M. HIREMATH

Field experiments were conducted to study the precision nutrients management in sugarcane during 2005-2008 at Research and Development Farm, Krishna Nagar. Initial nutrients status of soil varied in farmers field from 149 kg N/ha to 325 kg N/ha and in grids of 10 m x 10 m it ranged from 140 kg N/ha to 245 kg N/ha. Yield variations in grids of uniformity trial was 82.7 t/ha - 128.2 t/ha. Nutrients uptake by the crop ranged between 148.9 - 547.4 kg N/ha, 2.48 - 15.61 kg P/ha and 124.8 - 434.2 kg K/ha. Drip irrigated plant cane crop and fertigated plots recorded significantly superior yield (146.7 t/ha) over furrow irrigated plots (124.0 t/ha) (check).

Fertigation interval or for fertilizer doses did not exhibit marked variations in yield under drip of irrigation. Significantly higher values of quality traits were observed in furrow irrigated plots over the drip plots. Sugarcane yield in drip irrigated ratoon crop was also significantly (84.62 t/ha) more over furrow irrigated check plot (63.60 t/ha). In farmers fields, the crop recorded significantly higher yield (139.7 t/ha) in relatively high nitrogen containing soils over the low soil nitrogen containing groups (119.0 t/ha). Relatively high soil nitrogen containing group recorded high ratoon yield (126.2 t/ha) than soils with throw nitrogen (109.4 t/ha). Drip irrigation with fertigation

at monthly intervals of nitrogen (urea) and potassium (MOP) from 90 days after planting/ratooning to 240 days in 6 equal splits and basal application of phosphorus (SSP) and vermicompost or FYM recorded higher net returns. The B:C ratio of drip irrigated plots were lower than those of the furrow

irrigated split applied nutrients plots due to higher cost of drip irrigation system. The economic returns are much higher either in drip or split applied nutrients in furrow irrigated crop compared to the general practices followed by the farmers particularly in ratoon crop.

FOOD SCIENCE AND NUTRITION

Little millet (*Panicum miliare*) flakes: Development, value addition, quality evaluation, consumer acceptability and commercialization

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2011

MAJOR ADVISOR: Dr. BHARATI CHIMMAD

An investigation was undertaken to develop ready to eat (RTE) and ready to cook (RTC) little millet (*Panicum miliare*) flakes; explore value addition; evaluate physical and chemical parameters; assess nutritional, sensory and storage quality; study consumer acceptability and commercialization potentials. The RTE and RTC flakes standardized by batch processing were highly acceptable, recorded zero trans fats and possessed shelf life of more than six months. RTE flakes contained 7.45 g protein, 0.72 g ash, 0.14 g fat, 24.10 g dietary fiber, 61.42 mg iron and 2.00 mg linolenic acid. Pre process value addition with incorporation of garden cress seeds (*Lepidium sativum*), greengram dhal (*Phaseolus aureus* Roxb.) or linseed (*Linum usitatissimum*) increased iron, protein and omega-3 fatty acids to 65.83 mg, 9.63 g and 116 mg per 100g, respectively in the value added flakes. Post process value addition with butter, chocolate or spices resulted in

acceptable extended products. Excellent commercialization potentials were recorded for value added RTE choco flakes among various consumer groups from both urban and rural locations. The RTC flakes recorded 7.51 g protein, 0.44 g total minerals, 22.40 g total dietary fiber and 32.23 mg iron per 100 g and exhibited glycemic index of 52.11. The flakes possessed excellent food applications in traditional and novel preparations. Post process value addition to RTC millet (*kheer* mix) recorded higher β carotene (736 $\mu\text{g}/100\text{g}$) storability of more than six months and was highly acceptability. The IVPD ranging from 74.04 to 78.56, IVSD 74.00 to 92.80 per cent and iron bioavailability of 0.11 to 0.23 mg per 100 g were recorded. Community compliance for the RTC and RTE flakes indicated excellent utilization potentials. The cost of production of RTE and RTC flakes were ₹ 145 and ₹ 39 per kg, respectively.

Physico-chemical and functional properties of little millet (*Panicum miliare*), development and efficacy of little millet based sports food

ROOPA U.

2011

MAJOR ADVISOR: Dr. B. KASTURIBA

Millet is being recognized as potential future crops and little millet (*Panicum miliare*) is one of the minor millet. In the present investigation, the physico-chemical and functional properties of local genotype and *Sukshema*, an improved variety were studied for developing little millet based sports food. The *Sukshema* genotype with better physico-chemical and functional properties was selected for the purpose. Roasted flours of little millet, soybean, sugar powder, skimmed milk powder and cardamom powder were mixed such that the energy from protein in the mix was more than 15, as per the guidelines of ICMR. The porridge from the fabricated sports food mix was highly accepted by the consumers and 46.15 per cent of them revealed that they would eat the product at every given opportunity. The protein, fat and carbohydrate contents of the fabricated sports food were 14.29, 4.05 and 70.59 g/100g, respectively. It provided 262mg of calcium and 4.69mg

of iron per 100g. The sports food had a shelf life of more than 180 days at ambient conditions. The efficacy of the sports food on physical endurance capacity was tested at three phases in sports persons (i) carbohydrate loading (ii) as pre-event meal and (iii) long term supplementation. Carbohydrate loading with sports food improved the endurance capacity by 15.55 per cent under fasting condition. The improvement in endurance capacity with sports food as pre-event meal over routinely consumed pre-event meal was 1-5 per cent. The sports food supplementation for 90 days greatly improved the anthropometric parameters and haemoglobin level. All the physical fitness components improved after supplementation with sports food. The flexibility (0.86%), cardiac efficiency scores (4.69%), strength (7.27%) and endurance capacity (26.86%) of the supplemented group increased significantly compared to control group.

GENETICS AND PLANT BREEDING

Genetic studies on productivity and quality features in cotton (*Gossypium hirsutum* L.)

JAYAPRAKASH M. NIDAGUNDI

2010

MAJOR ADVISOR: Dr. S. S. PATIL

Gossypium hirsutum L. genotypes were carefully chosen based on consistent performance with respect to seed cotton yield, fibre strength and adaptability in the All India Co-ordinated Cotton Improvement Project (AICCP) trails and crossed in a diallel fashion (DL-1 involving six genotypes and DL-2 involving 11 genotypes). Among the fifteen crosses in DL-1, PUSA 9127 x Surabhi, GSHV 99/307 x PUSA 9127 and NDLH 761 x PUSA 9127 were found to be most potential crosses, with the lines GSHV 99/307 and PUSA 9127 contributing for higher seed cotton yield and GSHV 99/307 contributing for higher fibre strength. Among the fifty five crosses in DL-2, CPD 803 x Surabhi, CPD 803 x LRA 5166 and ARB 904 x LRA 5166 were found to be the most potential crosses, with the lines CPD 803, HAG 1055, LRA 5166 and H 1284 contributing positively to seed cotton yield. MCU 5VT contributed significantly for higher fibre strength but conversely none of the hybrids with MCU 5VT as male parent possessed higher seed cotton

yield. In certain crosses viz., PUSA 9127 x Surabhi and GSHV 99/307 x PUSA 9127 in DL-1, it was possible to blend productivity and fibre strength besides achieving the desirable SL ratio. The inheritance pattern of seed cotton yield, its component traits and fibre qualities were determined by involving two genotypes viz., GSHV 99/307 and Surabhi possessing contracting genetic features (as revealed by their *gca* status). Presence of epistasis was detected for all the characters studies except ginning outturn. Among the twenty four three-way cross hybrids evaluated to identify heterotic groups based on combining ability status of genotypes, YHH 846 (F1) was found to be a potential combiner for seed cotton yield. CPD 803 and H 1284 were the two best testers identified in this study that can be crossed to develop segregating lines and further used in harnessing the utility of reciprocal recurrent selection. Potential three way crosses were also identified to develop trait based populations.

Molecular mapping and tagging of fusarium wilt resistance in chickpea (*Cicer arietinum*)

CHANDRAKANT D. SOREGAON

2011

MAJOR ADVISOR: Dr. R. L. RAVIKUMAR

Chickpea (*Cicer arietinum* L. $2n=2x=16$), is the third most important cool season food legume in the world after dry beans and peas. Productivity of chickpea has not yet been significantly improved due to

Fusarium wilt caused by *Fusarium oxysporum* f.sp. *ciceri*. Eight races of pathogen have been reported and race 1A is more prevailed in India causing significant yield losses. The resistance genes to all identified

rices of fusarium wilt have been identified and mapped except H2 locus of race 1 A. Present study emphasizes on validation and mapping of molecular marker (A07C417) linked to H2 locus of fusarium wilt using F9:10 recombinant inbred lines (RILs) obtained from an intraspecific cross of JG62 x WR315 segregating for both H1 and H2 loci and K850 x WR315 segregating for H2 locus alone respectively. A partial linkage map was developed using 31 polymorphic markers with 5.72 cM marker density. Single marker analysis (SMA) based on linear regression, identified four markers viz. H4G11, SSR14, A07C417 and OPK9 which had substantial contribution to variance for fusarium wilt. SMA also identified markers associated with agronomic and productivity traits. QTL mapping using composite interval mapping (CIM) identified three

QTLs for fusarium wilt, out of which one major QTL (OPK9- A07C417, H4G11) for fusarium wilt was identified with the phenotypic variance ranging from 13.5 per cent to 17.4 per cent and tightly linked to A07C417 and H4G11 (72.4 cM) on LG3. H4G11 is an SSR markers and hence it will be very useful in MAS. Analysis of variance for productive traits and wilt reaction at two stages indicated significant variation for all traits except number of branches among the RILs of both crosses. High variability was observed for per cent wilt, whereas moderate to high variability was observed for number of pods per plant, test weight and seed yield per plant followed by plant height and number of branches per plant in both populations. The RILs 35, 84, 86, 99 and 147 recorded significantly higher yield with wilt resistance.

Identification of drought tolerant maize (*Zea mays* L.) Germplasm

PRAKASH H. KUCHANUR

2010

MAJOR ADVISOR: Dr. P. M. SALIMATH

An investigation was carried out to assess the drought tolerance of inbred lines, hybrids and populations besides studying combining ability and variance with respect to drought tolerance traits and effect of combining different sources of drought tolerance. Eighty two inbred lines, 10 commercial hybrids and seven populations were screened for drought tolerance during *rabi*/summer 2007-08 under stress and nonstress situations. From this study, six inbred lines, four hybrids and four populations tolerant to drought were identified based on grain yield, cobs per plant, anthesis to silking interval and drought susceptibility index. Sixty six hybrids produced by utilizing 12 inbred lines varying for drought tolerance were evaluated along with parents and check under stress and nonstress during *rabi*/summer 2008-09 and 2009-10. The combined data of two years under stress and nonstress was analyzed separately as per Griffing's (1956) model-1 and method-2 extended by Singh (1973).

Combining ability analysis indicated that variances due to GCA and SCA were significant for most of the traits under both the situations indicating the importance of both additive and non-additive gene action in controlling the traits. The gca status of parents revealed that CI4 and Hyd Sel 15 as good general combiners among 12 inbred lines under both nonstress and stress situations for morphological, yield and yield related and physiological traits. The hybrids viz., CM 111 x NEI 9202B, KDMI 15 x NEI 9202B and Hyd Sel 4 x NEI 9202B exhibited high sca status and highly significant positive heterosis over mid parent for grain yield (kg/ha) under both the environments. When derivatives obtained by crossing different sources of drought tolerance were evaluated, DT inbred x DT inbred recorded higher mean grain yield under stress and more number of crosses with positive scores as compared to DT hybrid x DT inbred, DT population x DT inbred and DT population x DT population crosses.

Conventional and molecular approaches in breeding for high yield and disease resistance in urdbean (*Vigna mungo* L.) Hepper

KUMARI BASAMMA

2011

MAJOR ADVISOR: Dr. P. M. SALIMATH

A study was conducted to understand the inheritance of resistance to powdery mildew and mungbean yellow mosaic virus (MYMV) in urdbean during 2008 to 2010. TAU-1, a high yielding but powdery mildew susceptible variety was crossed to LBG-17 which is resistant to powdery mildew. The F₁, F₂ and F₃ populations were evaluated along with parents for resistance to powdery mildew under artificial condition. The study indicated that two independent dominant genes together control the resistance reaction in the host plant. Further, attempts were made to identify SSR markers linked to powdery mildew disease following the bulk segregants analysis in F₂ population of this cross. Out of 469 SSR primers used for screening parental polymorphism, 32 primers could differentiate the two parents and two were found to be closely linked to powdery mildew disease resistance. Similarly inheritance of resistance to MYMV was studied by crossing TAU-1, (susceptible to MYMV disease)

with BDU-4, a resistant genotype. The evaluation of F₁, F₂ and F₃ and parental lines indicated the role of a dominant gene in governing the inheritance of resistance to MYMV. Attempts to identify the marker linked to MYMV did not give satisfactory result with 469 primers used for the study. Since TAU-1 is a high yielding cultivar, the F₂ and F₃ populations developed using this as one of the parents for inheritance study for diseases, were also evaluated for productivity and its component traits. F₂ evaluation revealed high variability and also transgressive segregation. Similarly, evaluation of F₃ families further based on selections made in F₂ confirmed the superiority of few families in both the populations. Twelve families showing resistance to powdery mildew and high yield and nine F₃ families showing resistance to MYMV and high yield were identified. It is suggested to carry forward these promising selections further to develop high yielding and disease resistant lines.

Genetic variability and mapping of nutritional and oil quality traits in groundnut (*Arachis hypogaea* L.)

GANPATI MUKRI

2011

MAJOR ADVISOR: Dr. H. L. NADAF

The present investigation was carried out to elucidate the information on genetic variability and correlation analysis for yield, yield components, nutritional and oil quality traits, diversity with respect to nutritional and oil quality parameters, stability of genotypes for nutritional and oil quality traits and marker identification for nutritional and oil quality parameters in groundnut. The experimental material consisted of 189 accessions of minicore collection, few advanced breeding lines, controls and 268 RILs (TAG24xGPBD4). They were evaluated in two distinct seasons (*kharif* 2008 and summer 2008-09) and at two locations (UAS Dharwad and ICRISAT Hyderabad). There was significant variation among the genotypes of minicore collection and RILs population for yield, yield components, nutritional and oil quality traits. The PCV and GCV indicated the presence of wide genotypic and phenotypic variation for all the traits studied. Correlations between protein and oil content, oil content and oleic acid, O/L ratio were negative. Oleic acid had negative

correlation with linoleic acid. Genetic divergence study revealed that oleic acid and protein content contributed more (59.53%) towards genetic diversity. Stability analysis indicated significant G x E interaction for nutritional and oil quality traits. This germplasm viz., ICG2381, ICG6913, ICG5286, ICG6766, ICG10185 (>65%) and RILs No.viz., 187, 191, 193, 234, 252 (>50%) found stable and had high oleic acid content compared to check GPBD4 (50%). Single marker analysis with CAPS, confirmed their potentiality to identify one mutant allele *ahFAD2A* of oleoyl-PC desaturase and found to associated with high oleic trait. Linkage analysis using 68 polymorphic markers in RILs population been able to map only 57 markers on 14 linkage group spanning 453.6 cM with average distance of 7.69 cM. The marker *ahFAD2A* (8.60-31.64% phenotypic variance) and TCIA01 (5.85-20.84% phenotypic variance) and QTL flanked by markers *ahFAD2A*-TC3H02 (4.95-21.42% phenotypic variance) were found to be associated with oil quality traits.

HORTICULTURE

Studies on integrated nutrient management and scheduling of drip irrigation in onion (*Allium cepa* L.) cv. Telgi red

ANNAPPA N. BAGALI

2010

MAJOR ADVISOR: Dr. H. B. PATIL

The investigations on integrated nutrient management and scheduling of drip irrigation in onion were carried out at Regional Agricultural Research Station, Bijapur, Karnataka on medium deep black soil during 2004-05 *rabi* and 2005 summer. In integrated nutrient management (INM) experiment, there were 20 treatments involving three inorganic fertilizer levels and six organic manure levels with two controls (RPP and absolute control). The experiment on scheduling of drip irrigation included three irrigation intervals and three irrigation levels with flood irrigation as control. The experiments were laid out in a split-plot design with three replications each. The results of INM experiment indicated that, higher levels of inorganics *i.e.* 162:32:148 kg NPK ha⁻¹ (41.55 t ha⁻¹) and 81:16:74 kg NPK ha⁻¹ (41.09 t ha⁻¹) as well as higher levels of organic manures *i.e.* FYM at 30 t (40.56 t/ha), vermicompost

at 6 t (41.65 t/ha) and poultry manure at 3 t (40.88 t/ha) per ha recorded higher bulb yield individually. The similar trend was observed in growth and yield parameters along with net returns and B:C ratio. The physiological loss in weight, sprout and rot per cent were significantly lower with no inorganics and higher levels of organics at different storage periods. In the experiment on scheduling of drip irrigation, one and two days intervals of irrigation with 100 per cent PE recorded significantly higher growth, yield parameters, bulb yield, net returns and B:C ratio over other interactions. Compared to flood irrigation, one or two days intervals with 100 per cent PE and two days interval with 80 per cent PE were significantly superior. All the irrigation intervals, levels and their combinations recorded significantly higher WUE compared to flood irrigation.

Studies on organic production technology in onion (*Allium cepa* L.) Cv. Bellary red

RAVEENDRA S. JAWADAGI

2011

MAJOR ADVISOR: Dr. N. BASAVARAJ

Investigation on organic production technology in onion Cv. Bellary Red was carried out at Agricultural Research Station, Hagari (UAS, Dharwad) during *rabi* 2006-07 and *kharif* 2007-08 to study the effect of organic and inorganic sources of nutrients and planting geometry on production and keeping quality of onion and influence of post-harvest treatment of different botanicals and bioagents to minimize the storage loss of onion. Among the different nutrient sources, application of RDF (125:50:125 NPK kg ha⁻¹) + FYM (30t ha⁻¹) recorded significantly higher bulb yield (44.5t ha⁻¹) followed by 50% FYM (12.5t ha⁻¹) + 50% vermicompost (2t ha⁻¹) + biofertilizers (Azospirillum and PSB @ 5kg ha⁻¹ each) during *rabi* season. However, both the treatments were at par with each other in *kharif*. The storage study indicated that loss of bulbs were significantly minimum and marketable bulbs were maximum (58.23 and 45.41% during *rabi* and *kharif* seasons

respectively) at the end of storage period (4 months) with application of 50% FYM (12.5t ha⁻¹) + 50% vermicompost (2t ha⁻¹) + biofertilizers (Azospirillum and PSB @ 5kg ha⁻¹ each). The planting geometry of 15 x 10 cm with FYM (12.5t ha⁻¹) + vermicompost (2t ha⁻¹) + biofertilizers recorded significantly maximum bulb yield (38.56 and 34.72t ha⁻¹, respectively during *rabi* and *kharif* seasons) and marketable bulbs (49.28 and 43.67% during *rabi* and *kharif* season, respectively) at the end of storage period. The post-harvest application of *Trichoderma harzianum* -0.5% with 50% FYM (12.5t ha⁻¹) + 50% vermicompost (2t ha⁻¹) + biofertilizers during crop growth period resulted in better accumulation of TSS (%) and dry matter content in the bulbs, maximum marketable bulbs and highest B:C ratio of 4.95 and 4.18 during *rabi* and *kharif* season, respectively with minimum spoilage of bulbs after storage period.

Integrated nutrient management studies in papaya (*Carica papaya* L.)

B. S. SHIVAKUMAR

2011

MAJOR ADVISOR: Dr. P. R. DHARMATTI

Field experiments were conducted at Department of Horticulture, University of Agricultural Sciences, Dharwad during 2006-08 to study the influence of organic manures and their combinations and integrated nutrient management practices mainly use of organic manures with varied levels of RDF on growaath, yield and yield components, quality, post-harvest parameters, major and micro-nutrient status of the soil after crop harvest in papaya (cv. Surya). In the organic manure experiment, all the growth parameters and yield components were improved with the organic manurial treatments comprising of FYM, agrigold, vermicompost, sheep manure either alone or in combination with FYM. Application of organic manures had an additive effect on the quality attributes and with respect to post-harvest traits, organic manure treatments registered least physiological loss of weight with higher fruit firmness and longer shelf life of papaya fruits. Fruit yield was maximum in FYM @ 100% RDN followed by FYM + agrigold each with 50% RDN and agrigold @ 100%

RDN (173.9, 172.9 and 170.6 t/ha, respectively). The ratio of benefit:cost was maximum (5.85) with pressmud and minimum with bhumilabh @ 100% RDN (2.25). In integrated nutrient management experiment, FYM, vermicompost, pressmud, sheep manure and agrigold applied @ 50% RDN in combination with varied levels of RDF (50, 100 and 150%) recorded higher values for growth, yield components, quality and post-harvest parameters. Significantly higher fruit yield of 197.3, 196.3 and 192.6 t/ha was recorded in FYM, agrigold and vermicompost @ 50% RDN with RDF @ 150%, respectively. While, control with RDF @ 50% recorded lower fruit yield of 120.5 t/ha. The B:C ratio was higher with pressmud @ 50% RDN + 50% RDF (6.03) and was lower in vermicompost @ 50% RDN + 150% RDF (3.37). In both the experiments, higher organic carbon content, available major nutrients and DTPA extractable micronutrients were noticed with the application of organic manures as compared to control.

Standardization of production technology in china aster [*Callistephus chinensis* (L.) Nees] under transitional tract of northern Karnataka.

MUNIKRISHNAPPA P. M.

2011

MAJOR ADVISOR: Dr. A. A. PATIL

China aster is a half hardy annual commercial and ornamental flower crop grown for its flowers. The flowers of aster are used for flower arrangement, interior decoration, garland making, worshipping etc. It can be grown in herbaceous borders, flower beds, garden decoration and also as potted plant. The present investigations were conducted during *rabi* season of 2006-07 and 2007-08 at Hi-tech Horticulture project, Saidapur Farm, University of Agricultural Sciences, Dharwad with the objective to evaluate suitable varieties, standardize the spacing, fertilizer levels and to assess the effect of growth regulators on growth, flowering and quality of flower production in china aster. Among the varieties, Phule Ganesh White produced bigger sized flowers (8.75 cm) having maximum weight of flowers with stalk (14.62 g) with highest flower yield (37.91 t/ha), seed yield (772.06 kg/ha) and maximum

vase life (13.44 days). Varieties *viz.*, Violet Cushion and Shashank produced more number of double flowers but their yield was comparatively lesser compared to Phule Ganesh series. The gross and net returns were highest in Phule Ganesh White followed by Phule Ganesh Purple. Studies on effect of different spacing and fertilizer levels revealed that growth, flower yield and quality was found highest with the application of higher dose of fertilizer (210:150:90 kg NPK/ha) and wider spacing (45 cm x 30 cm). This treatment combination was superior in terms of maximum gross returns, net returns and benefit-cost ratio. Among growth regulators/chemicals, foliar application of cycocel at 1500 ppm recorded the highest flower yield (13.45 t/ha) flower quality in terms of weight of flowers with stalk (10.28 g) and vase life (10.99 days), gross returns, net returns and benefit-cost ratio.

HUMAN DEVELOPMENT AND FAMILY STUDIES

Status of personality, psychosocial problems and coping mechanism among II PUC achievers and failures

SHWETA BIRADAR

2010

MAJOR ADVISOR: Dr. V. S. YADAV

The present study attempted to investigate the status of personality, psychosocial problems and coping mechanism among II PUC achievers and failures. The sample consisted of 998 II PUC students, selected from 14 colleges of Hubli - Dharwad city, Karnataka state. The researcher had developed 6 scales viz., personality scale, coping mechanism scale, scholastic difficulty scale, anxiety scale, depression scale and behavioural problem scale. The results revealed that 70 per cent, 100 percent, 92 percent, 49 per cent and 73 per cent of distinction students had developed high level of Big Five factors of personality respectively. And 47 percent, 84 percent, 80 percent, 39 per cent and 45 per cent of the failures had developed high level of Big Five factors of personality respectively. There was significant association between surgency, intellect, emotional stability, conscientiousness, coping mechanism, scholastic difficulty, anxiety, depression, behavioural problem and academic performance. Distinction students had developed low level of negative coping mechanism, scholastic difficulty, anxiety, depression and behavioural problem compared to failures. There was significant difference between

distinction students and failures on surgency, intellect, emotional stability, conscientiousness, negative coping mechanism, scholastic difficulty, anxiety, depression and behavioural problem. Number of siblings were significantly and negatively related with surgency emotional stability, anxiety, depression and behavioural problem. Qualification and occupation of parents was significantly and positively related with surgency. Qualification of parents, occupation of mother was significantly and positively related with intellect. Qualification of parents and agreeableness was significantly and positively related with agreeableness, emotional stability and conscientiousness. Negative coping mechanism was significantly and negatively related with qualification of father. Qualification of parents, occupation of mother and positive coping mechanism was significantly and positively related. Qualification of parents and occupation of father was significantly and negatively related with scholastic difficulty, depression and behavioural problem. Qualification and occupation of parents was significantly and negatively related with anxiety.

Emotional health of emerging adults

ARATI S. ANGADI

2011

MAJOR ADVISOR: Dr. V. S. YADAV

Emotional health of emerging adults is an exploratory research to develop the emotional health scale (EHS), identify the status of emotional health of emerging adults and to develop a module for the intervention to promote emotional health. The emotional health scale (EHS) consisted of five subscales namely self-awareness, emotional management, self-confidence, social relations and self-esteem with 16 items in each subscale. The reliabilities and validities of the scale were established. The sample comprised of 951 emerging adults of 16 years to 22 years. The emotional health scale (EHS) was administered in the class on a subgroup selected randomly from SSLC, PUC, B.Sc, B.Sc (Agri), and B.HSc classes. The data were subjected to frequency, chi-square, correlation, t-test and factor analysis. The results revealed that the emerging adults who were in SSLC, PUC, I-B.Sc and II-B.Sc and I-B.HSc and II-B.HSc were poor in self-awareness which ranged from 87 per cent to 96 per cent and male students were significantly higher on self-awareness. Emerging adults of SSLC, PUC, I-B.Sc, II-B.Sc and I-B.HSc and II-B.HSc were poor on emotional management, which ranged from 90 to 100 per cent. Around 80 to 87 per cent of the emerging adults studying in II-PUC, I-B.Sc and II-B.Sc (Agri) were found to be poor on self-confidence. Around 81 to 100 per cent of the emerging adults of SSLC,

PUC, I-B.Sc (Agri), II-B.Sc (Agri), III-B.Sc (Agri), I-B.HSc and II-B.HSc were poor in social relations. Around 98 per cent of the emerging adults studying in II-PUC, I-B.HSc and II-B.HSc were poor in self-esteem followed by other classes where it was around 90 to 96 per cent. On the basis of overall results of emotional health, it can be concluded that emerging adults studying in II-PUC, II-B.Sc (Agri) and II-B.HSc were poor on emotional health (i.e., around 100%). And around 78 to 98 per cent of the other classes were poor on emotional health. The findings indicate that as the students progressed to the higher classes, their emotional health became better. The results also confirmed that male students were higher on self-awareness and female students were higher on self-confidence. The emotional health module was developed to promote emotional health. It consisted of 3 lectures, 5 activities, and 10 worksheets. The module was administered on a separate, homogeneous sample of 11 agriculture undergraduates who were identified as having poor emotional health. The intervention results revealed that a quantum of positive change occurred in all the five subscales i.e., self-awareness (6.83%), emotional management (i.e., 6.60%), self-confidence (i.e., 5.87%), social relations (i.e., 2.57%), self-esteem (i.e., 2.54%) and emotional health (i.e., 1.97%).

PLANT BIOTECHNOLOGY

Genome-wide QTL mapping for post-flowering drought tolerance and validation of charcoal rot resistance QTLs in NILs of sorghum

SUVARNA PATIL

2011

MAJOR ADVISOR: Dr. B. FAKRUDIN

Two Recombinant Inbred Line Populations (RIP) derived from the cross IS9830 x E36-1 (RIP1) and N13 x E36-1 (RIP2) were field evaluated for stay-green and yield related traits during *rabi* season at two locations over three years. Parents IS9830 and N13 were non-stay-green and E36-1 was a stay-green donor. Analysis of variance revealed significance difference among the RILs and a positive, significant association between post-flowering drought tolerance traits with yield at both phenotypic and genotypic levels in both RIPs. A total of 530 genic and 270 nuclear SSR markers were screened to finally genotype 40 genic, 71 nuclear SSR markers for RIP1 and 68 genic and 70 nuclear SSR for RIP2 to construct genetic linkage maps together with 46 anchor markers. The genetic linkage maps spanned over 1661.1 cM and 2003.8 cM for RIP1 and RIP2, respectively distributed over ten linkage groups, same were used for mapping the stable QTLs for stay-green components: *stg1* (GLA15DAF) flanked by Xtxp34-Xtxp285 on LG-A, *stg2* (GLA30DAF) flanked by Xtxp205-Xtxp231 on LG-E, *stg3* (GLA45DAF) flanked by Xtxp298-Xtxp324 on LG-J and dC flanked by

Xtxp6-Xiabt73 on LG-I, together accounting for 40.91 and 48.76 per cent of phenotypic variance in RIP1 and RIP2, respectively; the positive additive effects at all the loci was contributed by E36-1. The stable QTLs for other yield related traits were also mapped. The stable QTLs for component traits of charcoal rot resistance viz., *cr1* (Xtxp176-Xiabt312) for lodging per cent on LG-I, *cr2* (Xtxp297-Xiabt173) for number of internodes crossed by the fungus on LG-B and *cr3* (Xiabt275-Xiabt241) for length of infection on LG-I were introgressed from E36-1 into M35-1 and SPV86 susceptible backgrounds with recurrent foreground and background screening across BC₁F₁, BC₂F₁, BC₃F₁ generations and the BC₃F₂ progenies with various QTLs combinations in homozygous condition pinned down. The BC₃G₃ near isogenic lines (NILs) were evaluated: NILs with all the 3 QTLs recorded lodging per cent of 0.9 and 1.2 against 41.46 and 53.38 per cent incidence in controls, respectively in M35-1 and SPV86 backgrounds. The next best NIL in both backgrounds carried *cr1* and *cr2*. These NILs have immediate practical utility as resistant versions.

PLANT PATHOLOGY

Epidemiology and management of corynespora leaf fall disease of rubber caused by *Corynespora cassiicola* (Berk & Curt.) Wei

MANJU M. J.

2011

MAJOR ADVISOR: Dr. V. I. BENAGI

Corynespora leaf fall disease of rubber caused by *Corynespora cassiicola* is one of the major leaf diseases. Disease survey in Karnataka and Kerala revealed that, the disease incidence and intensity was more at Sullia where as it found least in Sagar and Thirthahalli in Karnataka. In Kerala, the disease was more in Kanhangod and least at Sreekanthapuram. The growth phase of *C. cassiicola* revealed that, maximum mycelial weight at 15 days of inoculation. Solid media PDA, liquid media potato dextrose broth, temperature (25-30°C), humidity (80-90%), pH (6.5-7.0) and alternate light intensity (12 h light and 12 h darkness) supported good growth of pathogen. Genetic variability indicated four distinct groups. The aerobiological study in relation to weather factors indicated that, fungal spore catch was recorded initially during second fortnight of January. The spore load reached peak during first fortnight of April and decreased after the onset of monsoon. *C. cassiicola* survived throughout

the year in the infected rubber tree it self and serve as primary source of infection during the favorable conditions. It also persists on infected dried twigs as thick dark brown dormant mycelium. In host range study no host has showed positive infection to rubber. Clone evaluation under natural infection in the nursery and field showed that popular high yielding clone RR1105 was found highly susceptible and commercially cultivated clones, RRIM 600 and GT 1 were classified under resistant group. Average performance of clones varied across years and cluster analyses revealed five distinct groups. Performance of water-based fungicides revealed that, the SAAF (mancozeb+carbendazim) @ 2 g/l was found to be more effective in lab as well as in field for the CLF disease management. Among the botanicals tested, garlic bulb extract and among the bioagents *Trichoderma viride* inhibited the growth of fungus to the maximum extent.

Molecular characterization and serodiagnosis of vascular pathogens affecting tomato

SUMANGALA KOULAGI

2011

MAJOR ADVISOR: Dr. S. LINGARAJU

Soil borne pathogens affecting tomato (*Fusarium oxysporum* f. sp. *lycopersici*, *Ralstonia solanacearum* and *Meloidogyne incognita*) were collected from different tomato growing regions of Karnataka. *F. o. f. sp. lycopersici* isolates, viz. Fol-1, Fol-4, Fol-6 Fol-9, Fol-11, Fol-13, Fol-15 and Fol-21 showed abundant aerial mycelium and sporulation with maximum colony diameter (75 to 90.0 mm): These were highly virulent. Among twenty four isolates of *R. solanacearum*, Rs. 1, Rs. 4, Rs. 7, Rs. 8, Rs. 9, Rs. 12, Rs. 16, Rs. 19, Rs. 21, Rs. 22, Rs. 23 and Rs. 24 isolates were highly virulent. RAPD analysis of *F. o. f. sp. lycopersici* revealed five major clusters. Maximum genetic similarity (73 %) was between Gubbi (Fol-5) and Doddaballapur isolates (Fol-4), whereas least genetic similarity was observed between Chintamani (Fol-17) and Garag (Fol-2) isolates. The similarity co-efficient of *R. solanacearum* isolates ranged from 0.19 to 0.61. Maximum genetic diversity of 61 per cent was between Hosalli (Rs. 7) and Doddaballapur (Rs. 9) isolates whereas

least similarity (0.19 per cent) was observed between Kolar (Rs. 22) and Garag (Rs. 2) isolates. PCR performed with the primer combination of Forward primer (5'-ATGTATAAGTTTAATCGTTTAAACGA-3') and 18s reverse primer (5'-GTATGTACCAACTATTTAGTAGGT-3') produced only the single expected fragment of 1.3 kb for all isolates of *M. incognita*. DAS-ELISA was more sensitive: it was precise enough to detect the *F. o. f. sp. lycopersici* antigen up to 51200 dilutions. Purified antigen of *F. o. f. sp. lycopersici* concentrations of 3.2 µg and 50 conidia/well could be detected by DAC-ELISA technique: The technique was capable of detecting *R. solanacearum* at 10³ cells/ml; collected isolates of *R. solanacearum* showed positive reaction using DAC-ELISA technique. This technique was also able to detect *R. solanacearum* directly from soil and plant sample infected with the bacterium. Four isolates *M. incognita* collected from different regions showed positive reaction by DAC-ELISA assay.

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

Effect of nutrient management practices on soil health and crop response under different cropping systems in a vertisol of northern transition zone of Karnataka

VIDYAVATHI

2010

MAJOR ADVISOR: Dr. G. S. DASOG

A field experiment was conducted to study the "Effect of nutrient management practices on soil health and crop response under different cropping systems in a Vertisol of Northern transition zone of Karnataka" at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during 2007-08. The experiment was laid out in strip plot design with nutrient management practices as main plots and cropping systems as subplots with three replications. Among the nutrient management practices organic plots recorded significantly higher soybean (2790 kg/ha), groundnut (3709 kg/ha) and chilli (1001 kg/ha) equivalent yields where as integrated plots recorded significantly higher maize (4330 kg/ha) and potato (4723 kg/ha) equivalent yields and were found superior over inorganic plots. Both organic and inorganic fractions of nitrogen in soil increased over time under organic followed by integrated nutrient management practices during both kharif and rabi seasons. Nitrogen fractions under

inorganic nutrient management practice increased up to 60 DAS and later declined. The dehydrogenase, phosphatase and urease activity were found to be maximum under integrated followed by organic nutrient management practice and their activity increased up to 30 DAS and then sharply declined. After harvest of rabi crops the soil organic carbon in organic plots increased by 32.6 per cent. Similarly, in integrated plot it increased by 17.1 per cent whereas in inorganic plot soil organic carbon decreased by 11.0 per cent over the initial value. The available N, P₂O₅, K₂O and S content of soil increased by 19.1, 46.3, 9.6 and 54.0 per cent respectively, and DTPA extractable Zn, Fe, Mn and Cu increased by 18.6, 30.6, 36.5 and 30.0 per cent, respectively under integrated nutrient management practice over their initial values. Legume based cropping system at the end of their crop cycle improved the soil fertility status with respect to available N, P₂O₅, K₂O, S and micronutrients content of soil.

Potassium dynamics and response to applied potassium in paddy-paddy and sunflower- bengalgram cropping system under vertisols and TBP command area

K. NARAYANARAO

2011

MAJOR ADVISOR: Dr. N. A. YELEDHALLI

An investigation was carried out on one hundred and fifty surface and subsurface soil samples of dominant cropping system of TBP command area for physico-chemical and mineralogical properties of the soils, quality and distribution of different forms of potassium, potassium reserves in textural fractions and its fixation. Field experiments were also conducted

to study the response of applied potassium in paddy-paddy and sunflower-bengalgram sequence with farmer's participation. The soils are low in water soluble K, medium to high in exchangeable K, which ranged from 78 to 238 mg kg⁻¹ in surface and from 103 to 265 mg kg⁻¹ in subsurface layers. The non exchangeable K varied between 342 to 602 mg kg⁻¹ and 374 to 631

mg kg⁻¹ in surface and subsurface layers, respectively. The amount of lattice K content in surface horizons varied from 2.90 g kg⁻¹ to 9.88 g kg⁻¹ and 3.25 to 11.0 g kg⁻¹ in subsurface layers of both the cropping sequence. The total content ranged between 3.38 to 10.56 and 3.89 to 11.0 g kg⁻¹ in surface and subsurface horizons, respectively. The different forms of K were positively correlated with each other in soils of paddy-paddy sequence indicating its dynamic equilibrium compared to soils of sunflower-bengalgram sequence where no dynamic equilibrium exists between different

forms of K. The soils of paddy-paddy sequence had higher K fixation compared to soils of sunflower-bengalgram sequence. The mineralogy of soils revealed the dominance of smectite in the clay fraction in both cropping sequence. The paddy, sunflower and bengalgram crops have responded to potassium application in both *kharif* and *rabi* seasons in a cropping sequence involving paddy-paddy and sunflower-bengalgram. The potassium balance sheet was negative in soils of both the cropping sequences.

MASTER OF SCIENCE

AGRICULTURAL BUSINESS MANAGEMENT

Sanitary and phytosanitary (SPS) compliance of vegetable crops in north Karnataka

NAVEEN KUMAR M. S.

2011

MAJOR ADVISOR: Dr. C. MURTHY

India is the fruit and vegetable basket of the world. India is the second largest producer of vegetables that accounts about 16 per cent of the world production. India has been with wide range of climate and physio-geographical conditions and as such is most suitable for growing various kinds of horticulture crops such as fruits, vegetables, flowers, nuts, spices and plantation crops. There are four vegetable crops viz., cabbage, beans and carrot from Belgaum district and onion from Dharwad district were selected for the study area. A total random sample of 25 farmers of each vegetable crops, there total sample size is 100. The selection of the districts were based on the highest area under vegetable crops, among the eight districts of north Karnataka and also the study based on criteria of dominance and its possesses most congenial soil, climate and geographical condition necessary for better performance of vegetables. In order to analyze to pesticide residues of cabbage, beans, carrot and onion were

subject to laboratory analysis. The analysis was carried out in the laboratory of the Shriram Institute for Industrial Research at Bangalore. There are 91 pesticides were carried out by using standardized protocols for residues of unknown pesticides for selected vegetable crops, among these carbon disulfide pesticide residual content is found out above limit of quantification for onion (0.35 mg/kg), cabbage (0.13 mg/kg) and carrot (0.11 mg/kg) but actual limit of quantification for onion, cabbage and carrot is 0.1 mg/kg. Similarly for beans the residue unknown pesticides were found to be below detectable level for all 91 pesticides. It was found that the farmers used more dosage of pesticide that the recommended dosage. Farmers could be advised to go for non-cash inputs like increasing the pest and disease resistant varieties sanitary and phyto-sanitary measures. Proper packaging materials like corrugated fibre boxes should be used so as to reduce the extent of damage or contamination to the produce.

Production and marketing management of ginger in Uttara Kannada district

BHARATI S. BHAT

2011

MAJOR ADVISOR : Dr. C. MURTHY

The study on Production and Marketing management of ginger was conducted in Uttara Kannada district of Karnataka state. From Uttara Karnataka district, top three taluks namely, Sirsi, Siddapur and Mundgod were selected based on the highest area under ginger crop. The required data for the study were obtained from both primary and secondary sources. Primary data was collected from 90 farmers and 30 market functionaries spread over three taluks of Uttara Kannada district. To evaluate the objectives of the study, data were analysed using simple tabular analysis with averages, percentages and Garrett's ranking techniques were adopted. The per hectare cost of cultivation was higher in case of small (₹ 89435.17) farmers compared medium (₹ 89203.30) and large (₹ 87015.34) farmers. However, there were no substantial differences in the cost of cultivation between small, medium and large farmers. The average net returns on per

hectare basis was worked out to be about ₹ 3,38,064, ₹ 3,60,547 and ₹ 3,78,427 for small, medium and large farms respectively and on overall basis it was ₹ 3,76,535 per hectare. The benefit cost ratios were 4.78, 5.13, 5.34 and 4.92 in small, medium, large and pooled farms respectively. Supply of plant material at subsidized rates would reduce the cost of cultivation. Three marketing channel were identified in which the producer's share in consumer's rupee was highest in channel I. marketing efficiency in channel I was recorded highest (5.15) compared to other two channels. The major problems confronting the cultivators are incidence of pest and disease. Hence, extension agencies need to gear up their activities to train farmers for effective control of disease. In case of intermediaries lack of storage facilities has got first rank. So, cold storage facilities have to be created in the Ginger growing areas.

Management of agro-inputs distribution in Dharwad district

DILIPKUMAR G. R.

2011

MAJOR ADVISOR: Dr. S. B. MAHAJANASHETTI

In India, agriculture sector is vital for the food and nutritional security of a vast population. The sector remains the principal source of livelihood for more than 58 per cent of the population. Non-availability of required agro-inputs during sowing season coupled with the vagaries of monsoon could make agricultural production more vulnerable, with a resource poor farmers being worst hit economically. These agro- inputs namely seeds, fertilizers and pesticides collectively do the trick as a package in enhancing food production. The role of seeds and fertilizers in enhancing food production during green revolution is highly recognized. In the present study trends in demand for seeds and fertilizers were analysed using the data on sale of seeds and fertilizers in Dharwad district from 1998-99 to 2009-10. Also, estimation of demand was carried out using multiple linear

regression analysis with appropriate explanatory variables. Tabular analysis was used to study the logistic management aspects aspects of agro-inputs distribution, and costs and return structure. The estimated demand equations for seeds revealed that variables like seed price, rainfall and relative output price were significantly influencing the demand for various crop seeds in Dharwad district. Similarly, variables like total cropped area, total irrigated area and rainfall were significantly influencing the demand for fertilizer nutrients. Public channel accounts for larger share in seed market in the district. Thus, efforts by government in ensuring timely supply of seeds would go a long way in enhancing agricultural output in the district. The fertilizer distribution in Dharwad district is dominated by private sector compared to cooperative sector.

Economic efficiency of contract farming models in medicinal plants - An analysis

JAGADEESH N. P.

2011

MAJOR ADVISOR: Dr. J. S. SONNAD

Contract farming can be structured in a variety of ways depending on the crop, the resources of the sponsor and the intensity of the relationship between farmer and sponsor. Any crop can be contracted out using any of the models. Four models (centralised, multipartite, intermediary and informal models) were selected in Gadag and Bellary districts for the study. Ashwagandha and tulsi were important medicinal plants selected for the study and techniques of tabular analysis and Cobb-Douglas production function were used. The study revealed that majority of the farmers belonged to middle age in all the contract farming models. Written agreement was followed in centralised and multipartite models, whereas oral agreement was followed in intermediary and informal models. Buy-back system was the major factor for farmers to go for contract farming in all the models. The net returns per acre of ashwagandha and tulsi were highest under multipartite model (₹ 12,266.32 and ₹ 59,249.72) as

compared to centralised (₹ 10,608.85 and ₹ 52,093.41), informal (₹ 8,351.91 and ₹ 37,401.03) and intermediary models (₹ 7,359.76 and ₹ 30,187.69) respectively. The Benefit-Cost ratio of ashwagandha and tulsi was also highest in multipartite model (1.73 and 1.90), followed by centralised (1.64 and 1.84), informal (1.54 and 1.61) and intermediary models (1.49 and 1.50) respectively. Ratios of Marginal Value Product to Marginal Factor Cost indicated that organic manure has scope to increase gross returns of ashwagandha and fertilizers has scope to increase gross returns of tulsi. Multipartite model showed better performance in terms of income and availability of credit to the farmers. Therefore, all medicinal plant growing farmers would do well in coming together and forming co-operative organization of their own. Such an effort would benefit the farming community to protect their interest against exploitation by private firms.

Behaviour of silk cocoon prices in Karnataka-an econometric analysis

RAMESH K. B.

2011

MAJOR ADVISOR: Dr. BASAVARAJA BANAKAR

Silk is the queen of textiles, have endearing qualities such as natural sheen, light weight with high durability. Analysis of price and market arrivals over time is important for formulating a sound price policy. Fluctuation in arrivals largely contributes to price instability. Such an analysis also use full to farmers in order to rear silkworm and produce cocoon in the months in which they obtain best price advantages. The monthly prices and arrivals of bivoltine and multivoltine silk cocoon in three major Government silk cocoon markets (i.e Ramanagara, Shidlagatta and Chintamani) were collected for period 13 years (April 1998 to September 2010). A decreasing trend in arrivals and increasing trend in prices was observed in the selected markets, but the quantum of decrease in arrivals and increase prices varied from one market to another. The higher seasonal

indices of prices were observed during May, during which the arrivals were found to be low. In the case of Multivoltine and Bivoltine silk cocoon arrivals and prices, the average duration of cycle was found to be once in 2.33 to 4.00 years and 3.00 to 3.33 years respectively. Response of silk cocoon arrivals on prices in all the markets showed positive relationship, which implied that, as arrivals of silk cocoon increased the prices also to small extent. ARIMA analysis was employed to quantify the variation in prices and also forecast the prices for next 24 months. The forecasted prices in the markets showed an increasing value. Analysis of zero order correlation showed that there is an existence of a strong integration among the selected markets. Finally it was forecasted prices which serve as input in taking the marketing and production decisions.

Role of NCDEX spot exchange ltd. (NSPOT) in Tur marketing in Gulbarga district - An economic analysis

JYOTI L. NAIK

2011

MAJOR ADVISOR: Dr. S. B. MAHAJANASHETTI

Karnataka is one of the Indian states, which has experimented with the innovative concepts like raitha sante, flour price scheme etc. in the arena of agricultural marketing. It is also one of the few states, which have granted license for the establishment of electronic exchanges like NSEL and NSPOT. NSPOT has started spot trading in the state in respect of tur at Gulbarga. The present study was undertaken in Gulbarga district for analyzing the role of NCDEX spot exchange in tur marketing with the specific objectives of investigating the cost and return of tur marketing at NSPOT, APMC and Tur Board, examine the awareness among the respondents about spot exchange and investigating the constraints faced by farmers and the spot exchange. The study included both primary and secondary data. The primary data was collected from 180 respondents, 60 each from NSPOT, APMC and Tur Board. The secondary data on daily NSPOT prices, APMC prices and prices paid by

Tur Board were collected from various sources that included NSPOT and APMC Gulbarga, krishimaratavahini website etc for 2010-11. The analytical tools employed were tabular analysis and co integration technique for examining integration between NSPOT and regulated markets. The awareness among farmers about spot exchange was found to be high. With the help of NSPOT, tur growers were able to receive net price of ₹ 3562.02 per quintal, which was more by ₹ 350 and ₹ 360 in comparison with net price received from APMC sales and Tur Board sales respectively. The total marketing cost in NSPOT was less (₹ 139.44 per quintal) compared to the total marketing cost in APMC (₹ 264.75) and Tur Board (₹ 198.67). Lack of coordination among farmers, minimum quantity requirement in multiples of 100 quintals, poor quality of produce etc. were some of the major problems faced by the spot exchange officials and farmers.

The role of e-choupal in marketing management of soybean in vidarbha region of Maharashtra state

JAISWAL VINOD KISANLAL

2011

MAJOR ADVISOR : Dr. J. S. SONNAD

The Indian Tobacco Company (ITC) initiated an e-Choupal experiment to link directly with rural farmers through the internet. This began as an effort to re-engineer the procurement process of agricultural produce like soybean, wheat, coffee and prawns in rural areas. The programme involves the installation of computers with internet access in rural areas to offer farmers precise information about agricultural production and marketing activities. This study throws light on changing behaviour of farmers towards this latest technology in agriculture. The study has been undertaken in Amravati district of Maharashtra state. The study revealed that, cent per cent farmers had awareness regarding services provided by e-choupal, preferences under e-choupal, operating personnel (Sanchalak), quality tests before purchase, expenses incurred during marketing and sale proceeds. The total cost incurred in soybean cultivation was ₹ 11,821.88 per acre in

e-choupal beneficiary category as compared to ₹ 11,705.30 per acre in non-beneficiary category, which was slightly higher. The net returns per quintal obtained by beneficiary farmers were higher (₹ 895.36) as compared to non-beneficiary farmers (₹ 602.26). Information on market price ranked first and foremost among the factors responsible for farmers' participation in e-choupal whereas Fast Moving Consumer Goods (FMCGs) were given the last ranking by farmers. Inadequate transportation facilities was a major problem for around 90.67 per cent beneficiaries, followed by low price at the peak period (85.33 per cent) and high transportation cost (78.67 per cent). The most important problems faced by e-choupal were related to infrastructure, farmers related problems, maintenance and marketing. There is a need to strengthen the network of e-choupals to benefits farmers at large which will bring higher net returns.

Supply chain management in arecanut –A comparative study of co-operative and private processing units in Uttara Kannada district

ANAND S. KOLUR

2011

MAJOR ADVISOR: Dr. C. MURTHY

Arecanut (*Areca catechu* L.) is an important commercial crop in India and is popularly known as betel nut. It finds a place in all religious, social and cultural functions of Indian people. Its kernel is used mainly for chewing purpose in “pan supari”. Arecanut being a tropical palm, its distribution is mainly confined to South East Asian countries. The production of arecanut covers an area of 7.02 lakh hectares with a total production of 8.54 lakh tonnes. The area and production of arecanut in India during 2008-09 was 3.86 lakh hectares and 4.76 lakh tonnes respectively. To fulfill the objective of the study, both primary and secondary data was collected. The secondary data 2001-2002 to 2009-10 was collected to assess the procurement management in processing units in that is co-operative and private units. The primary data pertaining to 2010-11 was collected from the selected processing units, traders in order

to assess the value addition, marketing margins, cost of production of different products, pricing efficiency, marketing practices and marketing channels. One co-operative processing unit was selected for detailed study. Similarly 5 units were selected from private activities in arecanut. The 5 wholesalers, 5 retailers, and 5 big traders were consider for assessing the margins and price spread. It can be inferred that the co-operative unit as a whole experienced significant growth rate in procurement of quantity (56.06%), value (61.08%) and sales of quantity (51.93%) and value of sales (50.26%) for rashi type of arecanut in finished produce for the period the annual growth rate of 2001-02 to 2009-10. Whereas for the same period the annual growth rate in private units procurement of quantity, value and sales of quantity and value of sales were 53.04, 61.39, 53.30 and 59.50 per cent respectively in rashi type of arecanut.

Marketing management in farmers’ commodity interest groups - A case in Maharashtra

MUNDADA YASH JUGALKISHOR

2011

MAJOR ADVISOR: Dr. B. K. NAIK

A Farmers’ Commodity Interest Group (FCIG) is a self managed, independent group of farmers with shared goal and interest. The need of the hour is to explore the enterprising ability of the Indian farmers and their ways of working in team, utilization of available resources and effective management of the respective groups. The study was carried out in Vidarbha and Khandesh regions of Maharashtra and tabular analysis different business performance ratios were employed to analyse the data. The study revealed that, line type of organizational structure was seen in FCIG-Katol, Warud and Kalameshwar, while in FCIG-Rawer line and staff type of structure was observed. When cost involved in pooling of commodity is concerned, it was found that, FCIG-Katol incurred ₹ 2.50 lakhs, FCIG-Warud, Kalameshwar and Rawer incurred ₹ 2.21 lakhs, ₹ 63,200 and ₹ 47,500, respectively. The total cost of value addition in FCIG-Katol, Warud, Kalameshwar and Rawer was ₹ 8.33 lakhs,

₹ 9.13 lakhs, ₹ 3.41 lakhs and ₹ 5.50 lakhs, respectively. When it comes to marketing activities, farmers’ meeting and exhibitions were carried out in less number and the costs incurred in marketing of commodities were ₹ 4,472.50, ₹ 4,717.81, ₹ 4,615.10 and ₹ 3,715.70 per tonne, respectively for the FCIGs considered. The total cost of business in the above FCIGs was of the order of ₹ 19,975.20, ₹ 24,027.89, ₹ 23,394.84 and ₹ 38,217.37 per tonne. The net returns after deducting all the expenses found to be ₹ 50,849.80, ₹ 48,472.11, ₹ 52,440.16 and ₹ 46,781.63 per tonne respectively. Socioeconomic status of the farmer, high cost transportation and proximity to market were the major problems encountered by the farmer members of the FCIGs. As the FCIGs are free of tax, the farmers who are not part of any farmers’ association can involve themselves in such profitable organizations to improve their income level and standard of living.

Market dynamics of wheat in Karnataka –An economic approach

ANIL B. KOLUR

2011

MAJOR ADVISOR: Dr. R. A. YELADAHALLI

Analysis of price and market arrivals overtime is important for formulating a sound agricultural policy. Fluctuations in market arrivals largely contribute to price instability. Such an analysis is also useful to farmers in order to decide the optimum time of disposing their produce to their best advantage. In view of this the present study was undertaken by collecting monthly prices and arrivals of wheat in major wheat markets of Karnataka for a period of 20 years (1989-90 to 2008-09). An increasing trend in arrivals and prices was observed in all the markets. But the quantum of increase varied from one market to another. Price of wheat was found to be highest during off season and lowest during harvest season. Since wheat is a *rabi* crop, the arrivals were high during March to April. The higher seasonal indices of prices were observed during April and May during

which the arrivals were found to be low. Uneven cycles were observed both in arrivals and prices in all the markets. Response of wheat arrivals to prices in all the markets, both in long run and in short term, showed a positive relationship, which implied that as the price of wheat increased, the arrivals also increased. ARIMA analysis was employed to quantify the variation in prices and also to forecast wheat prices. The forecasted price in all the markets showed an increasing value. Analysis of zero order correlation showed that there existed a strong integration among all the wheat markets. The analysis revealed that, by selling wheat during off season would help the producer in getting better returns. Finally it was suggested to disseminate the forecasted information prices to farmers for their advantage.

Competitiveness of export of fruits and vegetables to middle east countries

PRAVEEN H. PATIL

2011

MAJOR ADVISOR: Dr. R. A. YELEDHALLI

India is the fruit and vegetable basket of the world. Over 90% of India’s exports in fresh products go to west Asia and East European markets. The study endeavours to estimate the growth in export trade of selected fruits and vegetables from India, to examine the instability in export of fruits and vegetables and to analyze the competitiveness and direction of trade of major fruits and vegetables. The study was undertaken on a macro framework based on secondary data. Major fruits and vegetables such as mango, grapes, pomegranate, sapota, onion, potato, peas and green chilli were purposively selected. The yearly data on export quantity and value were compiled from APEDA, Import Export Data Bank, etc. for the period 1993-94 to 2009-10. The analysis on the growth in export of fruits and vegetables has shown an increasing trend specially with respect to pomegranate and green chilli from India to middle east countries.

Oman and UAE markets have been found very promising in terms of export. However, Oman, Bahrain and Kuwait markets have been promising for onion and potato exports followed by peas to Saudi Arabia. Instability and direction of trade have shown that UAE was very loyal for import of Indian fruits and vegetables, appropriate export incentives need to be framed and implemented to meet the growing demand for fruits and vegetables in the view of high Indian population in Middle East countries. The results of Nominal Protection Coefficient (NPC) analysis have shown that the export of fruits and vegetables have found to be more competitive and promising. India should exploit and explore new market avenues to reap the advantages of current situations and improvement in the trade relations on the part of the government initiatives would bring about tremendous potential for export of other fruits and vegetables in future.

Price dynamics of jayadhar cotton (*Gossypium herbaceum* L.) in Karnataka

MANJUNATH V. BEELIGI

2011

MAJOR ADVISOR: Dr. BASAVARAJ BANAKAR

Agricultural marketing plays an important role not only in stimulating production and consumption, but in accelerating the pace of economic development. Analysis of price and market arrivals over time is important for formulating a sound agricultural price policy. Fluctuations in market arrivals largely contribute to the price instability of the produce. In order to devise appropriate ways and means for reducing price fluctuations of agricultural commodities, there is a need to have a thorough understanding of price behavior over time and over space. Such an analysis is also useful to farmers in order to decide the optimum time for disposing their produce to their best advantage. Therefore, the present study was undertaken by collecting monthly prices and arrivals of Jayadhar cotton for a period of 21 years (1989-90 to 2009-10), in major Jayadhar cotton markets of north Karnataka. An increasing trend in arrivals and prices was observed in all the markets. Seasonal indices of Price in Jayadhar cotton was found

to be highest during July and August in Ranebennur market as well as Kottur market, where as it was highest during February and March in Hubli and Gadag markets owing to the variations in the market structure in selected markets. The arrivals were found to be low in July and August in all the markets. Uneven cycles were observed both in arrivals and prices in all the markets. Response of Jayadhar cotton arrivals to prices in all the markets, both in long run and in short run, showed a negative relationship, except in Kottur market, which implied that as the price of Jayadhar cotton increased, when arrivals were low. ARIMA model is used to forecast Jayadhar cotton prices. The forecasted prices in all the markets showed higher price during February, March and August months which indicated to farmers to sell the Jayadhar cotton during these months for price advantage. Analysis of zero order correlation showed that their existence of a strong integration among all the Jayadhar cotton markets.

Dynamics of prices and arrivals of *rabi* sorghum in Karnataka – An econometric analysis

BASAVARAJ M. BANDIGANI

2011

MAJOR ADVISOR: Dr. VILAS S. KULKARNI

Fluctuations in market arrivals largely contribute to price instability. Analysis of price and market arrivals overtime is important for formulating a sound agricultural policy. Such an analysis is also useful to farmers in order to decide the optimum time for disposing their produce to their best advantage. In view of studying dynamics of market arrivals and prices, the present study was undertaken by collecting monthly prices and arrivals of *rabi* sorghum in major *rabi* sorghum markets of Karnataka for a period of 20 years (1989-90 to 2009-10). An increasing trend in arrivals and prices was observed in all the markets, but the quantum of increase varied from one market to another. It was observed that, in all the markets, the arrivals of *rabi* sorghum was negligible from May to November. Price of *rabi* sorghum was found to be highest during off season (December and April) and lowest during harvest season (January - March), the arrivals were high during March and April. The higher

seasonal indices of prices were observed during March and April during which the arrivals were found to be low. Uneven cycles were observed both in arrivals and prices in all the markets. Response of *rabi* sorghum arrivals to prices in all the markets, both in long run and in short run, showed a positive relationship, which implied that as the price of *rabi* sorghum increased, the arrivals also increased. ARIMA analysis was employed to quantify the variation in prices and also to forecast *rabi* sorghum prices. The forecasted prices in all the markets showed an increasing value. Analysis of zero order correlation showed that there existed a strong integration among all the *rabi* sorghum markets. The analysis revealed that, storing *rabi* sorghum and selling during off season (April onwards) would help the producer in getting higher returns. Finally it was recommended to disseminate the forecasted prices to farmers for their advantage.

Market dynamics and price forecasting of sunflower in north Karnataka – An application of Garch model

PRADEEPKUMAR M. HARARI

2011

MAJOR ADVISOR: Dr. BALACHANDRA K. NAIK

Analysis of price and market arrivals overtime is important for formulating a sound agricultural policy. Fluctuations in market arrivals largely contribute to price instability. Such an analysis is also useful to farmers in order to decide the optimum time for disposing their produce to their best advantage. In view of studying dynamics of market arrivals and prices, the present study was undertaken by collecting monthly prices and arrivals of sunflower in five major sunflower markets of North Karnataka for a period of 20 years (April-1989 to April-2009). An increasing trend in arrivals and prices was observed in all the markets, but the quantum of increase varied from one market to another. Price of sunflower was found to be highest during off season (April-September) and lowest during harvest season (September-March). Since sunflower can be grown during *Kharif* and *Rabi* seasons, the arrivals were high during September to March. The higher

seasonal indices of prices were observed during April to September during which the arrivals were found to be low. Uneven cycles were observed both in arrivals and prices in all the markets. Response of sunflower arrivals to prices in all the markets, both in long run and in short run, showed a positive relationship, which implied that as the price of sunflower increased, the arrivals also increased. ARIMA analysis was employed to quantify the variation in prices and also to forecast sunflower prices for the next 10 months. The forecasted prices in all the markets showed an increasing value. Analysis of zero order correlation showed that there existed a strong integration among all the sunflower markets. The analysis revealed that, storing sunflower and selling during off season would help the producer in getting higher returns. Finally it was recommended to disseminate the forecasted prices to farmers for their advantage.

AGRICULTURAL ECONOMICS

Crop diversification in Karnataka: An economic analysis

SARASWATI POUDEL ACHARYA

2011

MAJOR ADVISOR: Dr. H. BASAVARAJA

Crop diversification is an important strategy for overall agriculture development in the country. The study aimed at analyzing the nature and extent of crop diversification in Karnataka and finding the factors affecting crop diversification. The necessary secondary data were collected for a period of 26 years from 1982-83 to 2007-08 from the Directorate of Economics and Statistics Bangalore. Growth rate, Composite Entropy Index and Multiple linear regression analysis were employed to analyze the nature and extent of crop diversification in Karnataka. Growth rates estimated for changes in area under different crops showed a significant positive growth in area under pulses, vegetables and spices and fruits and nuts while cereals has shown significant negative growth. The growth in area under oilseeds and commercial crops was negative and insignificant.

Similarly, the production of cereals, pulses vegetables and fruits showed a significant positive growth rate. The production of oilseeds and commercial crops registered insignificant positive growth. The productivity of different crop registered significant growth in the case of cereals, pulses and fruits. Productivity of oilseeds recorded moderately significant positive growth. The productivity of commercial crop registered insignificant positive growth and for vegetables the growth in productivity was insignificant and negative. The Composite Entropy Indices for different crop groups showed that almost all the crop groups have higher crop diversification index after post WTO (1995-96 to 2007-08) period as compared to pre WTO (1982-83 to 1994-95) period except for oilseeds and vegetable crops. There was diversification of commercial crop after WTO. No

single crop group showed higher index in initial years, which in turn, resulted in more diversification in recent years. The cereals ranked first and pulses remained second in the overall level of crop diversification during the study period. The major factors responsible for the changes in crop diversification in the state were per capita GSDP, proportion of

urban population, proportion of area under HYV of cereals, proportion of gross irrigated area to gross cropped area, rainfall, average size of holding, market density and fertilizer consumption. The creation of basic infrastructural facilities is an essential prerequisite for crop diversification and fostering the process of agricultural development.

Land use dynamics in Karnataka - An economic analysis

SAMAYA GAIRHE

2011

MAJOR ADVISOR: Dr. G. N. KULKARNI

Study on land use dynamics in Karnataka was undertaken using 28 years data from 1980-81 to 2007-08. Tabular analysis, growth rate, Markov chain analysis, instability index, multiple linear regression and annual rate of change were employed to arrive at meaningful results. Area under forest showed a marginal increase and a considerable growth in land put to non-agricultural uses and area sown more than once were observed. Barren and uncultivated land, permanent pastures, cultivable wastes and miscellaneous tree crops showed significantly negative growth over study periods. Current fallows witnessed positive growth for the entire period (1.20 %). The other fallows declined (-1.76 %) in Period-I (1980-81 to 1994-95) and increased (1.87 %) in Period-II (1995-96 to 2007-08). Net sown area showed positive growth (0.37 %) in Period-I. Markov chain analysis showed that except land not available for cultivation, all other categories showed stability in the Period-I. But in

Period-II except fallow land, all other categories have shown stability in retaining their shares. The instability index was found highest for current fallows followed by other fallows in both the periods and for entire period too. The results revealed that the major factors responsible for the changes in land use pattern over years were net irrigated area, road length, population density, literacy rate, number of factories and number of land holdings. Land put to non-agricultural uses and other fallows were the land use categories to exert pressure on cropping intensity. Study noticed that land use shift has been occurring from desirable (14,552 ha) and undesirable (1,518 ha) ecological sectors towards agricultural (5,600 ha) as well as non-agricultural sector (10,447 ha) annually. The study suggested to increase forest cover by afforestation, stabilization of irrigated acreage and to check land shifts from ecological sector to other sectors.

Supply response of arecanut in Karnataka state - An econometric analysis

KIRAN KUMAR R. PATIL

2011

MAJOR ADVISOR: Dr. B. L. PATIL

The study was an attempt to explain the acreage allocation behaviour of arecanut growers in response to price and non price factors. For which six major areca growing districts of Karnataka State were selected. Secondary data pertaining to the study were collected from various published sources for the period of 10 years (1998-99 to 2007-2008). Compound growth rate and Nerlovian adjustment lag model were employed to analyse the data. It was further attempted to know the remunerativeness and constraints involved in arecanut cultivation, for which Shimoga district and a sample size of 60 respondents were selected by employing multistage random sampling. The results revealed a significant and positive growth rate for area and production, while growth rate for productivity was nil. Supply response study revealed that the expected price, lagged area and

rainfall factor had significance in influencing decision of farmer's regarding acreage allocation. Long run elasticities were found higher reflecting that area adjustment would be possible in long run. Coefficients of rigidity were observed to be lower in all the selected cases, signaled a very slow rate of adjustment. It was further reported that the cultivation of arecanut was remunerative and farmers opined that huge price fluctuation and non availability of labours were the major constraints in arecanut cultivation. Stable rate of growth in productivity need to be overcome by the release of location specific and promising varieties. While the remunerative prices may be given for areca growers to increase its production in an extensive way. Stable price mechanism and partial mechanization may be adopted to combat the major constraints involved in its cultivation.

Production and value addition in foxtail millet in Bellary district - An economic analysis

KUSUMA D. K.

2011

MAJOR ADVISOR: Dr. JAYASHREE A. HANDIGOL

The focus of the present study was on Production and value addition in foxtail millet in Bellary district- An economic analysis. A sample size of 90 farmers for production and 60 farmers for value addition of foxtail millet was selected using multiple stage random sampling method. Field level data were elicited for the agriculture year 2009-10 through personal interview method. For analyzing the data collected during the study, budgeting technique and tabular analysis were employed. The per hectare total cost of cultivation of foxtail millet worked out to be ₹ 11607.21. Farmers got about 12 quintals of main product and 4.5 quintals of by- product worth ₹ 17190 per hectare. In the preparation of papad, the total cost of production worked out to be ₹ 7000, gross returns realized were ₹ 11880 and net returns were ₹ 4880. In preparation of tambittu, gross returns were ₹ 14250 and net returns were ₹ 5960 after deducting total cost of ₹ 8290 from gross

returns. In the marketing of foxtail millet and its value added products most of the respondents preferred commission agents to dispose off their products. They used their own vehicles and at the most auto rikshaws as they couldn't afford for other means of transportation. The major problems faced by the farmers were lack of technical guidance, non-availability of quality seeds, lack of marketing information, standardization of value added products and tough competition with existing products. The study concluded that, farmers can better utilize their marginal lands by cultivating foxtail millet on them. Value added products of foxtail millet brought more returns to the farmers than the foxtail millet grains. Hence, the study suggested the farmers to involve in value addition of foxtail millet and get better returns rather than selling it in raw form.

Institutional credit to agriculture and its impact on the farm economy in Tumkur district, Karnataka- An economic analysis

SHALINI H.

2011

MAJOR ADVISOR: Dr. G. N. KULKARNI

The study focused on the flow and impact of institutional credit on the farm economy in Tumkur district in Karnataka. Both secondary (1998-99 to 2008-09) and primary (2008-09) data were used. A sample of 120 farmers comprising borrowers (60) and non-borrowers (60) were selected for study. Compound growth rate, Garret score technique and gini co-efficient were employed to analyze the data. The flow of institutional credit to agriculture increased in the district significantly over the years. Volume of short-term credit (64 per cent) advanced by credit institutions was more than term credit (36 per cent). While, recovery performance of co-operative banks over a period was very poor (50.64 per cent) compared

to commercial (71.60 per cent) and regional rural banks (74.14 per cent). The borrowing pattern showed with increase in holding size the amount borrowed also increased among borrowers. Similarly, magnitude of credit utilized and repaid also increased with increase in holding size. The per acre productivities of crops such as paddy, ragi, groundnut, pigeonpea, arecanut and coconut increased on beneficiary farms compared to non-beneficiaries revealed positive impact of credit. The net returns obtained for paddy, ragi and groundnut increased by 31, 52 and 41 per cent, respectively among borrowers over non-borrowers. Financial status as indicated by savings was better among borrowers. The use of production credit among borrowers

resulted into an increase in farm income (24.50 per cent). There was a greater inequality in the distribution of total family income among non-beneficiaries when compared to beneficiaries. The increased flow of institutional credit formed a vital input to enhance the productive capacity

of farm resources. The study recognized the need for expanding volume of credit to farm sector, simplified procedures in credit advance by institutions and also emphasized for a strong co-operative structure through greater professionalism in banking the business.

Impact of agricultural debt waiver and debt relief scheme-2008 in Dharwad taluk of Karnataka

PRAJNA B. S.

2011

MAJOR ADVISOR: Dr. JAYASHREE A. HANDIGOL

The focus of the study was to analyse the impact of Agricultural Debt Waiver and Debt Relief Scheme-2008 in Dharwad taluk. The purposive sampling technique was employed to select 120 sample respondents comprising equal number of debt waived, debt relieved and prompt paid borrowers across the study area. The study revealed that institution wise amount of overdue was high in case of regional rural banks with ₹ 7.31 crore covering 2,546 accounts of debt waived borrowers. Borrower wise overdue amount of debt relieved borrowers was higher than the debt waived borrowers. Overdue amount was highest in case of crop loans. Benefit extended for debt waived borrowers was 100 per cent and in the case of debt relieved borrowers only 25 per cent of the total overdue amount was relieved. The scheme helped farmers with fresh finance from the banks to the extent of ₹ 0.47 crore but prompt paid borrowers expressed negative impression on the scheme, since scheme was only

applicable to the defaulter borrowers. Majority (94%) of branch managers opined that scheme had helped in recovering the bad debts to the extent of ₹ 27.61 but up on implementation of the scheme there was a decline in the proportion of prompt repayment of credit as it motivated them to become willful defaulters. Hence study suggested that instead of debt waiver and debt relief scheme, Government should think of providing incentives in terms of interest subvention for regular repayers and reduction of interest rates on agricultural loans which inculcates the prompt repayment among the farming communities. As per bank officers' suggestion, legislation for recovery through legal proceedings is required. Writing off based on criterion of defaulters should be stopped which otherwise motivate non-defaulters to become defaulters and willful defaulters further with the expectation on that same kind of incentives from the government.

Economics of Bt Cotton cultivation – A comparative analysis across different farm sizes in northern transitional zone, Karnataka

PAVAN KUMAR GAMANAGATTI

2011

MAJOR ADVISOR: Dr. M. T. DODAMANI

Karnataka is one of the nine major Bt. cotton-growing states in the country. Northern transitional zone is the major Cotton growing Zone of Karnataka i.e. 40.19 Percent of the total cotton area of Karnataka. It focused on the socio-economic characteristics of Bt. cotton farmers, cost and return, efficiency of resource use and problems faced by the farmers in Bt. cotton production under different farm sizes. Two taluks having highest cotton area were selected from the zone for study. The present study was conducted with primary data collected entirely based on a multistage sampling technique from 180 Bt. Cotton growing farmers. The study pertained to the agricultural year 2010-11. The Total variable cost of Bt. cotton was ₹ 22192.15 where large farmers incurred high cost i.e. ₹ 23256.85. The total cost of Bt.

cotton was ₹ 30920.56 and it was high in large farmers ₹ 32723.9. The net return in Bt. cotton was ₹ 79456.36. The yield per ha was 24.98 qtls and medium farmers got high yields i.e. 25.54 qtls. The Cobb Douglas production function, revealed that the small farmers were underutilized all the inputs (land, seed, FYM and human labour, bullock labour, PPC, fertilizer), where as medium and large farmers were over utilized the resources bullock labour and PPC. Non availability of labour during peak season, uncertainty of rainfall, price fluctuation and credit inadequacy is the major problems. Bt. Cotton technology has positive impact on Socio- economic status of farmers by increase in yield and reducing cost on inputs thereby increase in income and also standard of living.

Production and value addition to groundnut in Chitradurga district of Karnataka – An economic analysis

DINESH V. K.

2011

MAJOR ADVISOR: Dr. B. L. PATIL

The present study was conducted in Chitradurga district of Karnataka during 2010-2011. The total cost incurred by different size groups of groundnut farmers was higher in case of large farmers (₹ 19937) as compared to medium (₹ 18799) and small farmers (₹ 18120). While the overall cost incurred on groundnut cultivation accounted to ₹ 18952. However the net returns per hectare obtained by large farmers was high (₹ 7400) compared to small and medium farmers (₹ 6531 and ₹ 7361), respectively. The obtained BC ratio was highest in case of medium farmer (1.45) as against small (1.42) and large farmers (1.43). Further, the ratio of MVP to MFC was positive and more than unity for seeds and FYM for all categories of farmers revealing that these resources were underutilized and there was further scope for maximising returns by increasing the use of seeds and FYM. The pattern of capital investment in groundnut

processing units revealed a direct relationship with size of the processing units. However, total cost per quintal of groundnut oil processing was relatively more in small units (₹ 2676/q) as compared to large (₹ 2673.5/q) and ghanis (₹ 2475/q). The net returns per quintal of groundnut processed was higher in case of large (₹ 498/q) processing units compared to small (₹ 438/q) and ghanis (₹ 358/q). The results of financial feasibility analysis revealed that at 12 per cent discount rate, all the three indicators (IRR, BCR and NPW) revealed the investment made on the groundnut processing was financially feasible in case of different size of processing units. Low yield, non availability of labours at right time and uneven rainfall were the severe problems of groundnut producers. High government taxes, poor power supply and lack of availability of sufficient raw material were the major problems faced by processors in groundnut oil processing.

An economic analysis of production and marketing of rubber in Tripura

SATYA RANJAN DEY

2011

MAJOR ADVISOR: Dr. S. M. MUNDINAMANI

An economic analysis of production and marketing of rubber was conducted in West and South Tripura districts. Primary data was collected from 120 farmers and 20 market intermediaries spread over these two districts. Secondary data was collected from rubber board. The data collected were subjected to tabular, CGR and financial analysis. The results revealed that a positive and significant growth in area and production was observed in both districts and state as a whole, while productivity was found to be increasing but non-significant. In West Tripura, per hectare total cost of establishment was ₹ 2,50,307.27 and ₹ 2,33,333.16 in small and large plantations, respectively whereas in South Tripura it was ₹ 2,41,010.49 and ₹ 2,27,429.86 in that order. In West Tripura, the per hectare maintenance cost was ₹ 80,392.48 and

₹ 81,204.66 in small and large plantations, respectively whereas in South Tripura it was ₹ 80,933.17 and ₹ 82,114.84 in that order. The per hectare average yield of rubber sheet was 1460.18 kg and 1415.44 kg in West and South Tripura, respectively whereas the yield of scrap rubber was 128.84 kg and 126.58 kg in that order. The financial analysis revealed that rubber enterprise has maximum NPV, IRR, BCR and PBP. Among the two channels for marketing of rubber sheet and one channel for marketing of scrap rubber, the producer's share in factory's rupee was almost same in all cases. Non-availability of skilled tapper, higher initial investment, non-availability and high cost of fertilizers, high fluctuation in prices and high cost of transportation were the main problems confronting the cultivators. As investment in rubber plantation

was found to be financially feasible, the farmers, who wish to establish rubber plantation, may do so even if they have to borrow for establishing

the plantations at the prevailing rate of interest from financial institutions.

Performance of cotton in traditional paddy fields of Uttara Kannada district, Karnataka – An economic analysis

ANAND S. MENASINAHAL

2011

MAJOR ADVISOR: Dr. L. B. KUNNAL

The present study was conducted in Uttara Kannada District, Karnataka during 2010-2011. From the district Mundgod and Haliyal taluks where paddy crop has largely been replaced by cotton were selected purposively and from each taluk 30 farmers growing paddy 30 farmers growing cotton were selected by using multistage sampling method. It was observed that annual growth rates in area, production and productivity of cotton in Uttara Kannada district were positive whereas the same registered a negative growth rate for paddy. The total cost incurred by sample farmers in cotton cultivation (₹ 34452.67/ha) was high compared to paddy (₹ 31616.24/ha). However the net returns realised per hectare of cotton cultivation was ₹ 5122.73 which was higher as compared to paddy (₹ 40530.76). The B:C ratio was

also higher in case of cotton (2.48) compared to paddy (2.28). Further, the ratio of MVP to MFC was positive and more than unity for chemical fertilizer, FYM and bullock labour in case of paddy and it was also more than unity for FYM and seed in case of cotton revealing that these resources were underutilized and there was further scope for maximising returns by increasing the use of these resources. Change in temperature, change in rainfall pattern and high gross income from cotton were the major reasons for shifting over from paddy to cotton cultivation. Low yields, high wage rates and incidence of pests and diseases were major problems in cultivation of paddy whereas, in case of cotton, high cost plant protection measures and uncertainty of rains were the severe problems.

Performance of primary agricultural Co-operative credit societies in Dharwad district of Karnataka

CHANDRAGOUDA MARIGOUDAR

2011

MAJOR ADVISOR: Dr. S. S. GULEDAGUDDA

Farm credit is a strategic input and demand for it steadily increased with the advent of modern technology. Among the various financial institutions, the co-operatives have emerged as a major source of agricultural credit. A three-tier system of co-operative credit structure came into existence to meet short term and medium term credit requirements of the farmers. An enquiry into the performance of PACS's in Dharwad district could reveal interesting facts about the society's performance according to geographical variations. Fifteen PACS's were selected for the study, which represented three different agro-climatic zones. The study was based on both primary and secondary data. The growth in the employees, membership and loan account was positive and significant in most of the societies. Growth in financial variables like overdues and loss showed positive for most of the

societies. This implied that most of the societies incurring losses. The liquidity and solvency position of the bank was found to be sound. However, the net profit to net worth ratio was found to be negative. The recovery percentage for the selected PACS's increased over the years. The principal component analysis revealed that almost all variables were closely associated with performance of the societies in first component. The variations explained by these variables were ranged from 67 per cent to 85 per cent in all selected societies during the study period. Agricultural loan dominated among the loan amount advanced for different purposes followed by non-agricultural loan for small and large farmers, whereas, for medium farmers non-agricultural loan dominated. Demand and collection of the societies showed an increasing over the years.

An economic analysis of black pepper (*Piper nigrum* L.) varietal diversity and its conservation in Kerala

RESMI P.

2011

MAJOR ADVISOR: Dr. L. B. KUNNAL

The role of traditional varieties as a contributor of genes to the modern varieties is well documented and hence carries an economic value. The present study was undertaken to economically analyse the black pepper varietal diversity and its conservation by collecting data regarding conservation of black pepper germplasm at institutional level and also from farmers of Kerala state through multi stage sampling process. Sample size was 300 farmers. Indian Institute of Spices Research(IISR), Kozhikode has the maximum share of germplasm collections in case of *Piper* species (70.64 per cent) followed by All India Coordinated Research Project(AICRP) centers for Spices (13.34 per cent). A total of 6810 accessions of eleven spice crops are maintained at IISR of which the black pepper accessions alone comes to 3097. Black pepper accessions accounts nearly half the share of germplasm collections maintained at the institute (45.47 per cent). ₹ 88.32 was spent on each black pepper accession for its conservation annually in filed and it was cost effective when compared to

in vitro conservation. The transformed Herfindhal Index computed to analyze the varietal diversity of black pepper in the state was less (0.2973) indicating low diversity. Sixty four varieties were reported to be in cultivation and now it has reduced to thirty four registering a loss of thirty varieties (46.88 per cent). The Cobb Douglas production analysis revealed that there was technological breakthrough in pepper cultivation in the state. The total difference in productivity levels of old and new technology farms was positive. In this, contribution of technology was invariably positive. Neutral technological change was positive and the non-neutral technological change component was always negative. Tobit analysis was used to find out the factors determining on-farm conservation of varietal diversity. The total land holding, age, education level of the farmer, type of farming and resistance of variety to the pest and disease attack was found to influence the farmer's opinion towards conservation of traditional varieties in a positive manner in all the five districts.

Comparative economics of pigeonpea production under transplanted and conventional methods in selected districts of northern Karnataka

SANGMESH R. PATIL

2011

MAJOR ADVISOR: Dr. S. B. HOSAMANI

Indian rural economy is basically considered to be a crop economy. Transplanted method is one of the recent developments contributing to the higher yields in pigeon pea cultivating areas of Northern Karnataka. The per hectare average yield of pigeonpea on transplanted farm (26.25 qtl/ha) was higher than that of conventional system of pigeonpea growers (15.25 qtl/ha). The cultivation of pigeon pea in transplanted method was found to be more profitable compared to conventional method. Total cost of cultivation in transplanted method and conventional method were ₹ 39,382.28 per hectare and ₹ 30,819.53 per hectare respectively. Net returns were found to be higher in the case of Transplanted system (₹ 54,103.25/ha) than in conventional method (₹ 25,562.78/ha). Resources were optimally used in transplanted system, whereas in the case of conventional system, resources were not used

optimally. The coefficient of multiple determination (R^2) was 0.72 and 0.69 for conventional and transplanted system of pigeonpea growers, respectively. Age, education, income level, area under pigeon pea, irrigation availability, extension contact and family labour availability were the factors influencing the adoption of transplanted system of pigeon pea. Among these, education of the farmer and his extension contact were found to be the major factors influencing the adoption of transplanted method of pigeonpea cultivation. Problems faced by the growers of pigeon pea were studied under bio-physical, socio-economic and other. Higher incidence of pests and diseases was a major bio-physical problem while fluctuation in the prices of commodity and non-availability of required labour were the worth noting socio-economic and other problems, respectively.

Economics of cropping systems under rainfed situations in Belgaum and Dharwad districts of Karnataka

KUMARA B. R.

2011

MAJOR ADVISOR: Dr. S. B. HOSAMANI

Focus of the present study was on economic evaluation of the major cropping systems in Belgaum and Dharwad districts of Karnataka. A sample size of 160 farmers was selected using multistage sampling technique and data were elicited for the agriculture year 2009-10 through survey method. The techniques of tabular and functional analysis were employed. CS-I (maize + redgram), CS-II (sorghum + redgram), CS-III (greengram + redgram) and CS-IV (soybean sole crop) were the four important cropping system followed in the study area. Under rainfed condition, it was found that, per hectare total variable cost was high in CS-I (₹ 20931.75/ha), followed by CS-III (₹ 20410.67/ha) and CS-IV (₹ 19969.04/ha). The hectare total fixed cost was high in CS-II (₹ 6151.04/ha), followed by

CS-IV (₹ 6039.04/ha) and CS-III (₹ 6019.20/ha). The maximum net returns were found under CS-II (₹ 24659.08/ha), followed by CS-I, CS-IV and CS-III (₹ 22512.80, ₹ 13719.30 and ₹ 12507.44/ha, respectively). B:C ratio was found to be highest in CS-II (2.01), followed by CS-I, CS-IV and CS-III with values of 1.84, 1.53 and 1.47, respectively. The results of the functional analysis revealed that the ratio of MVP to MFC was greater than one for human labour and seed under major cropping systems, indicating further scope for using additional units of these inputs to increase gross income. Majority of farmers faced the problems of exogenous factors, high wages, scarcity of own fund, price fluctuation and lack of market information, which lead to uncertainty of income to the farmers.

Economic analysis of surface and subsurface drainage system in canal commands of north Karnataka

M. R. MUKKANAWAR

2011

MAJOR ADVISOR: Dr. R. S. PODDAR

The problems of water logging and salinization in irrigated commands have led to low productivity, decline in crop production, increase in cost of production and farm income. Surface and subsurface drainage technologies have found to be suitable for ameliorating these problems. The present study was conducted in Malaprabha and Ghataprabha irrigation command areas of North Karnataka, with an objective of identifying and analyzing the cost and returns of surface and subsurface drainage system and to study the impact of on-farm socio-economic condition of farmers. The results revealed that, the per hectare cost of adoption of surface drainage was ₹ 11,214 and ₹ 62,557 in case of subsurface drainage (PVC) and ₹ 47,628 in case of subsurface drainage (tile). The financial feasibility analysis showed in the case of surface drainage, NPV, BCR, IRR and PBP

were ₹ 27,880, 2.97, 69 per cent and two years, respectively. Similarly in case the of subsurface drainage (PVC) NPV, BCR, IRR and PBP were ₹ 1,87,282, 4, 33 per cent and three years, respectively and in the case of subsurface drainage (tile) NPV, BCR, IRR and PBP were ₹ 1,66,387, 4.72, 46 per cent and two years, respectively. Major problems in adoption of surface drainage and subsurface drainage were lack of knowledge, lack of cooperation among neighboring farmers. As the investment in adoption of surface drainage and subsurface drainage were found financially feasible, the farmers who wish to adopt these technologies may do so. Hence, the policy makers should encourage adoption of surface drainage and subsurface drainage by the farmers. Throw light on the subsidized rate of interest and scale of finance from financial institutions.

An economic analysis of production and marketing of coffee in Chikmagalur district of Karnataka

AVINASH KUMAR H. S.

2011

MAJOR ADVISOR: Dr. S. M. MUNDINAMANI

The objective of the study was to analyse the production and marketing of coffee in Chikmagalur district of Karnataka. A multistage random sampling procedure was adopted in selection of the sample farmers. The results revealed that the Chikmagalur district was found to be having positive growth rate in area and production (2.5% and 0.21%) while the productivity was negative (-1.96%). On the contrary, a lower positive and significant growth rate was observed in coffee area and production for the state as a whole, whereas the productivity showed negative trend (-0.91%). Per hectare establishment cost of coffee was found to be ₹ 393371.00 and ₹ 361860.00 in small and large plantations respectively. Per hectare maintenance cost during bearing period worked out to be ₹ 110761.90 and ₹ 102968.20 in small and large plantations respectively. The average per ha yield from small plantation was 3143.80 Kg and from

large plantation it was 3125.96 Kg. Net returns were ₹ 201634.40 from small plantation and ₹ 215664.67 from large plantation. Financial analysis revealed that discount rate at 12 per cent, the coffee enterprises has maximum NPV (₹ 305992.41 & 396471.69), BCR (1.35 & 1.49), PBP (7.61 & 7.11 years) and IRR (17% & 19%) in small and large plantations respectively. Two marketing channels were identified in which the producer's share in consumer rupee was highest in channel-II (96.87%) and it was 94.20% in channel-I. High fluctuation in prices, non availability of labours, weather extremity, no disciplinary trading system and incidence of stem borer and coffee rust were the main problems confronting the cultivators. Adoption of recommended cultivation practices, provision of adequate credit would help in expanding the area and also in increasing the productivity of coffee.

Investment pattern in irrigation development in Karnataka - An economic prospective

MAHESH KATAGERI

2011

MAJOR ADVISOR: Dr. R. S. PODDAR

This study was conducted to know the investment pattern in irrigation development in Karnataka. Objectives of the investigation were investment, potential created, utilization and identifying the constraints in irrigation development in Karnataka. Total investment on irrigation grew at a rate of 11.4 per cent. It was 18.3 per cent in KNNL, 13.2 per cent in MI, 7.9 per cent in CNNL and KBJNL was declining at the rate of 0.3 per cent. Total irrigation potential created in KBJNL was to the tune of 10, 69,202 ha which only 5, 49,821 ha was utilized, CNNL was to the extent of 5, 97, 89 ha which was only 25,251 ha was utilized, KNNL was to the tune of 91,236 ha which was only 46,973 ha was utilized and MI was 6, 89,203 ha which was only 4, 25,483 ha was utilized. Leading to a gap of 57.8 per cent, 48.6 per cent, 48.5 per cent and 38.2 per cent in CNNL, KBJNL, KNNL and MI with respectively.

With regard to minor irrigation large gap was observed in north Karnataka (44.9%) compared to south (31.6%). With respect to changes in cropping pattern during *kharif* in Malaprabha command area. Large percentage change was noticed in hybrid maize (14.9%) whereas, cotton was declining at the rate of 10.1 per cent, during *rabi* large percentage change was noticed in hybrid maize (12.8%) whereas, hybrid wheat declining at the rate of 7.4 per cent. Majority of experts (97%) expressed that there are wide gaps in potential creation and utilization. About 63 per cent of respondents felt that financial support for development of irrigation was satisfactory. Encroachment and siltation of tank bed, poor maintenance, and inadequate power supply, inadequate funds and lack of institutional support were identified as major constraints for irrigation development in Karnataka.

AGRICULTURAL ENTOMOLOGY

Plant derivatives and organics in the management of chilli pests

H. G. JAGADEESHA

2011

MAJOR ADVISOR: Dr. R. S. GIRADDI

An investigation was carried out to study the effect of plant derivatives and fermented plant products against chilli pests viz., chilli thrips, *Scirtothrips dorsalis* Hood, yellow mite, *Polyphagotarsonemus latus* Banks and fruit borer, *Helicoverpa armigera* Hub. during Kharif, 2007 at College of Agriculture, University of Agricultural Sciences, Dharwad. Among the plant derivatives evaluated in-vitro against yellow mite, NSKE (5%) proved highly effective (73.10% mortality @ 96 h after treatment) followed by *Vitex negundo* L. biodynamic spray (68.10%). However, they were inferior to standard check, dicofol. Soil application of neemcake @ 250 kg/ha and vermicompost @ 2.5 t/ha with reduced RDF (50%) followed by four sprays of NSKE (5%) was found to be the best treatment in reducing chilli thrips, yellow mite, and fruit borer infesting chilli. It also recorded least leaf curl due to thrips and mite infestation and highest dry chilli yield

(3.14 q/ha) and net returns (₹ 7110/ha). Among fermented plant products evaluated in-vitro against yellow mite, Agniasthra (3%) was the best treatment (69.03% mortality at 96 h after treatment) which was next best to standard check dicofol and NSKE (5%). Among the fermented plant products, Agniasthra (3%) combined with soil application of neemcake @ 250 kg/ha and vermicompost @ 2.5 t/ha, Panchagavya 5% foliar spray with reduced RDF (50%) was found to be the best treatment in reducing thrips, yellow mite and fruit borer and thrips and mite induced leaf curling. All the plant derivatives and fermented plant products combined with soil application of neemcake and vermicompost with reduced RDF (50%) were found to be quite safe to natural enemies viz., *Amblyseius* sp. and coccinellids in chilli ecosystem as evidenced by the normal activity of the predators comparable to untreated control.

Effect of foliar spray of organic formulations on mulberry and its influence on silkworm, *Bombyx mori* L.

VIVEK UPPAR

2011

MAJOR ADVISOR: Dr. S. G. RAYAR

A study was carried out to know the effect of foliar spray of organic formulations on mulberry and its influence on cocoon production. The organic foliar spray formulations viz., Panchgavya, Biodigester and Vermiwash were sprayed on M-5 mulberry on 15th and 30th day of pruning at 1,3 and 5 percent and compared with Vipul spray (250 ml/ha). Results revealed that foliar spray of Vermiwash 5% has significantly increased the plant height (87.42 cm and 129.16 cm), Shoot length (86.14 cm and 127.15 cm), Number of leaves per shoot (16.40 and 22.19), Leaf area (138.59 dm² and 522.98 dm²), on 45th and 60th day of pruning. Vermiwash 3 per cent and Vipul spray were on par with Vermiwash 5 per cent for most of the growth traits. Highest leaf yield of 566.00 g/plant was recorded in Vermiwash 5 per cent spray. Vermiwash 3 per cent (553.00 g), Vipul spray (533.00 g), Biodigester 1 per cent (532.00 g), Vermiwash 1 per cent (530.00g), Biodigester 5 per cent (513.00g), Panchgavya 3 per cent (482.00g) and water spray (480.00g) were at par with Vermiwash 5 per cent. Vermiwash 5 per cent foliar spray recorded significantly high amount of chlorophyll 'a' (2.17 and 1.37 mg/g), 'b' (1.02 and 0.89 mg/g) and total chlorophyll (3.13 and 2.16 mg/g) on 45th and 60th day of pruning. Foliar spray of Vipul (1.98 mg/g) and Vermiwash 3 per cent (1.33 mg/g) were on par with Vermiwash 5 per cent at 45th and 60th day of pruning, respectively in chlorophyll 'a' content. Vermiwash 5 per cent (1.02 and 0.89 mg/g), 3 per cent (0.94 and 0.83 mg/g) and Vipul (0.94 and 0.84 mg/g) recorded significantly high chlorophyll 'b' content on 45 and 60th day of pruning and were at par. On 45th (3.13 mg/g) and 60th (2.16 mg/g) day of pruning, Vermiwash 5 per cent recorded high total chlorophyll followed by Vipul (2.88 mg/g) on 45th day and Vermiwash 3 per cent (2.06 mg/g) and Vipul (1.97 mg/g) on 60th day and were all on par with each other.

High total sugar of 15.59 and 18.81 per cent was recorded in Vermiwash 5 per cent on 45th and 60th day of pruning, respectively, followed by Vipul (7.10%) and Vermiwash 3 per cent (7.05%) on 45th day and Vermiwash 3 per cent (10.29%) and Vipul (10.01%) on 60th day and over all on par. Vermiwash 5 per cent spray enhanced the crude protein content on 45th (30.70%) and 60th (31.30%) of pruning followed by Vipul (25.26 and 26.25%) and were on par with each other. The larval duration did not vary statistically due to foliar spray of organic formulations and Vipul. While, the silkworm growth traits viz., chawki (3.12g) and mature larval weight (41.79g), silk productivity (5.78 cg/day), effective rate of rearing (99.43%) and pupal weight (17.03g/10cocoon) were significantly more in Vermiwash 5 per cent. Vermiwash 5 percent and 3 per cent spray significantly increased the cocoon weight (21.10 and 20.71g/10cocoon) and shell weight (4.06 and 4.02g/10shells). Vipul spray was on par with Vermiwash 5 per cent in chawki larval weight (2.95 g/10 larvae), effective rate of rearing (98.77%) and pupal weight (15.85 g/10 pupae). While, Vermiwash 3 per cent was on par with Vermiwash 5 per cent in chawki larval weight (3.08 g), effective rate of rearing (99.38%), silk productivity (5.71 g/day) and pupal weight (16.54g). Higher cocoon yield of 820g/df was obtained due to Vermiwash 5 per cent spray. Significantly longer silk filament length of 926.54 and 880.46 m was observed in Vermiwash 5 and 3 per cent as compared to Vipul (819.84 m) and untreated control (688.26 m). The fibroin content significantly increased due to foliar spray of Vermiwash 3 per cent (81.50%), Vermiwash 5 per cent (81.25%) and Vipul (80.37%) and were at par as compared to untreated control (70.48%). The B:C ratio of 3.29 was observed in Vermiwash 5 per cent followed by Vermiwash 3 per cent (3.25) and Vipul (2.98).

Crop loss estimation and mangement of earhead caterpillar, *Helicoverpa armigera* (Hubner) on kharif sorghum

KIRAN GANDHI B.

2011

MAJOR ADVISOR: Dr. SEKHARAPPA

Investigations on crop loss estimation, effect of different dates of sowing and management of sorghum earhead caterpillar, *Helicoverpa armigera* (Hubner) were undertaken at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during 2009-10 kharif season. Crop loss estimation studies under natural condition revealed that, CSH-14 recorded least number of larvae (0.33/earhead) and highest grain yield (44.1 q/ha). Whereas minimum per cent earhead damage (1.33%) was recorded on both CSH-14 and CSH-16 cultivars. Overall an extent of 17.42 per cent yield loss can be avoided when protection measures were taken. Under artificial condition as the number of larvae released per earhead increased simultaneously reflected in reduction of grain yield. Low grain yield per earhead was recorded when larvae were released at both stages i.e., flowering and milky stages as compared to larvae released

once at each stage. Studies on effect of different dates of sowing indicated that in early date of sowing (12th June 2010) CSH -14 recorded minimum larval load (2 larvae/earhead) and earhead damage (11.33%) with highest grain yield of 39.81 q/ha. Whereas late sowing (24th July 2010) recorded 4.77 larvae/earhead and 43.00 per cent earhead damage with grain yield of 12.90 q/ha. The similar trend was exhibited in CSH-16 under early and late sowing. Among different insecticides tested spinosad 45 SC(0.1 ml/l), novaluran 10 EC(1 ml/l) and azadirachtin 5 per cent (5 ml/l) emerged as superior by recording 72.0, 66.0 and 63.0 per cent population reduction of *H.armigera* and produced a grain yield of 43.46, 42.23 and 41.16 q/ha, respectively. Maximum gross and net returns were recorded with two sprays of spinosad 45 SC with ₹ 35637.2 and ₹ 22140.2 per ha, respectively.

Safety evaluation of newer molecules of insecticides against promising parasitoid and predators of crop pests

HALAPPA B.

2011

MAJOR ADVISOR: Dr. J. S. AWAKNAVAR

Investigations on Safety evaluation of newer molecules of insecticides against promising parasitoid and predators of crop pests were undertaken during 2009-10, under laboratory condition at University of Agricultural Sciences, Dharwad. In *Trichogramma chilonis*, results of the bioassay on the eggs revealed that highest emergence from the treated eggs noticed in *Btk* (94.85%) followed by *N. rileyi*, imidacloprid, difenthiuron and endosulfon all of which allowed more than 80 per cent emergence. Indoxacarb and azadirachtin were detrimental which allowed only 60 per cent of the adult emergence. In the dry film bioassay on adults of *T. chilonis*, endosulfon (LC₅₀ 0.0337%) proved to be safest followed by difenthiuron (0.0231%) and *Btk* (0.0032%). Imidacloprid, indoxacarb, flubendiamide and azadirachtin were highly detrimental with the LC₅₀ range of 0.0003 to 0.0006 per cent. Spraying on cocoons of *C. plutellae* revealed novaluron and emamectin benzoate to be the safest insecticides which allowed maximum emergence of adults (more than 90%). Least emergence was noticed in indoxacarb which was highly detrimental followed by

rynaxypyr (62.00%), flubendiamide (51.00%) which proved to be slightly better on adults of *C. plutellae*. In the dry film residue bioassay on high safety revealed with novaluron (LC₅₀ 0.0621 %) followed by spinosad, emamectin benzoate and azadirachtin (0.0405%). Indoxacarb, rynaxypyr and flubendiamide were highly detrimental with a LC₅₀ range of 0.0003 to 0.0006 per cent. Spraying on grubs of *C. montrouzeiri* revealed that even sub lethal dose of all the insecticides caused mortality ranging from 23.33 to 90.00 per cent. The data on the mean mortality of the three doses tested revealed buprofezin and azadirachtin to be safest causing about 34.00 per cent mortality. The most detrimental effect was noticed with imidacloprid, carbaryl and acetamiprid causing highest mortality in the range of 96.67 to 91.11 per cent. Acute toxicity studies on adults of *C. montrouzeiri* revealed dichlorvas and buprofezin to be the safest followed by imidacloprid, acetamiprid and azadirachtin (LC₅₀ range of 0.0589 to 0.0235%). Fipronil and carbaryl were highly detrimental with least LC₅₀ values.

Biology and management of rice gall midge, *Orseolia oryzae* (Wood-Mason)

ARCHANA D.

2011

MAJOR ADVISOR: Dr. JAVAREGOWDA

Biology of rice gall midge *Orseolia oryzae* (Wood-Mason) was studied in detail during August to October under laboratory conditions at ARS, Sirsi. Egg, maggot and pupal periods occupied 2.50±1.41, 9.00±0.71 and 4.00±0.71 days, respectively. Average fecundity was 96.5±14.85 eggs/female and total life cycle occupied 17.50±3.54 days. Among the rice varieties screened at ARS, Sirsi, forty three were moderately susceptible, nineteen were moderately resistant, ten were susceptible and remaining eight proved to be highly resistant. None of the tested varieties were neither resistant nor highly susceptible at 30 and 50 DAT compared to susceptible check Jaya (21.29% SS). Similarly, among the 48 hybrids screened, forty one were susceptible, two were highly susceptible and remaining five were highly resistant. None of the hybrids could be categorized under resistant, moderately resistant and moderately susceptible group. Among thirty five rice varieties screened at ZARS,

Brahmavara, four rice genotypes proved highly resistant (0% SS); thirty one genotypes reacted highly susceptible (>25% SS) but none of the genotypes were resistant (<1% SS); moderately resistant (1-5% SS); moderately susceptible (6-10% SS) and susceptible (11-25% SS) at 50 DAT. Fipronil 40 WG @ 1 g/l was on par with carbofuran 3G @ 10 kg/ha for incidence of silver shoot (8.06 and 8.81), grain (65.98 and 64.05) yield and straw (69.73 and 67.01 q/ha) yield followed by profenophs 50 EC @ 2 ml/l. Among the botanicals evaluated, soap nut extract + neem oil @ 2.5% recorded least per cent silver shoot (17.07) resulting in increased grain (51.19 q/ha) and straw yield (53.15 q/ha) followed by *Randia spinosa* @ 20 kg/ha, *Gnidia glauca* leaf extract @ 5% and nimbecidine @ 3 ml/l. Higher C:B ratio of 1:3.04 was obtained from carbofuran 3G @ 10 kg/ha followed by profenophos 50 EC @ 2 ml/l (1:2.77) and fipronil 40 WG @ 1.0 g/l (1:2.52).

Effect of imidacloprid and thiamethoxam seed treatment on storability and sucking pests in sunflower

ASHA V. KENCHARADDI

2011

MAJOR ADVISOR: Dr. R. A. BALIKAI

Both laboratory and field experiments were carried out at the Agriculture College, Dharwad during 2009-10 to study the effect of imidacloprid and thiamethoxam seed treatments on storability and incidence of early sucking pests in sunflower hybrid KBSH-41. Laboratory studies indicated that seeds treated with imidacloprid and thiamethoxam seeds could be stored in polythene bag of more than 700 gauges up to ten months without significant reduction in the seed quality. Field studies revealed that the reduction in thrips population was highest in treated check (imidacloprid 200 SL @ 0.25 ml/l) as compared to other treatments. The treated seeds could be stored for one month without losing any efficacy against thrips. Lowest leaf hopper and whitefly incidence was recorded in seeds treated with imidacloprid 600 FS @ 10 ml/kg seeds followed by imidacloprid 70 WS @ 5 g/kg seeds, thiamethoxam 70 WS @ 5 g/kg seeds and thiamethoxam

35 FS @ 10 ml/kg seeds. Both leaf hopper and whitefly were under control up to 45 days and treated seeds could be stored for two and three months, respectively without losing any efficacy. The honey bee visitation to sunflower field and head diameter were unaffected by seed treatment with insecticides and different storage periods. Significantly highest gross and net returns were obtained in imidacloprid 600 FS @ 10 ml/kg seeds followed by thiamethoxam 70 WS @ 5 g/kg of seeds and the latter treatment was on par with thiamethoxam 35 FS @ 10 ml/kg of seeds and imidacloprid 70 WS @ 5 g /kg seeds. Seeds stored for one month recorded significantly higher gross returns and net profit as compared to any of the other storage periods. Higher cost benefit ratio (2.63) was recorded from imidacloprid 600 FS @ 10 ml/kg seeds treatment followed by imidacloprid 70 WS @ 5 g/kg seeds.

Biophysical and biochemical basis of induced resistance against soybean pests nourished with organics

JINSA NAZEEM

2011

MAJOR ADVISOR: Dr. R. S. GIRADDI

The studies on the biophysical and biochemical basis of induced resistance as influenced by organic, inorganic, integrated nutrient management (INM) and natural farming practices in soybean against defoliators and pod borer were undertaken during *Kharif* 2010-11 at the Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad. The results indicated that least larval population of *Spodoptera litura* (Fab.) and *Thysanoplusia orichalcea* (Fab.) (0.08 and 2.50 l/m row, respectively at 6 WAS) and minimum per cent pod damage by *Cydia ptychota* (Meyk.) (3.32%) were recorded in the treatment that received 100 per cent organics followed by 75% organics (2.51, 0.00 l/m row, 3.37%, respectively). The RPP recorded higher larval population (0.17 and 3.28 l/m.row, respectively at 6 WAS) and

pod damage (5.86%) followed by fully inorganic, natural farming, INM which were on par with each other. The studies on biophysical factors at 45 DAS revealed lower leaf succulency (78.28%) and higher leaf thickness (5.69 mg/cm²) imparted induced resistance against pest infestation in plants receiving organic nourishment compared to inorganic (82.49% and 4.86 mg/cm² respectively). The biochemical constituent, phenol recorded higher amount (0.61 mg/g fr.wt⁻¹ at 60 DAS) in plants nourished with organics resulting into lower pest incidence owing to induced resistance. The lower amounts of sugars, free amino acids, soluble proteins and prolines also imparted resistance to the plants receiving organics whereas higher quantities recorded in inorganic treatments resulted in susceptibility to pests. Morphological characters like plant

height, number of leaves, leaf area index, number of pods, number of nodules etc. were enhanced in organically nourished plants. Also, plants under organic nutrition recorded higher nodule dry weight, 100-seed weight, seed weight/plant and grain yield (2994.25 kg/ha) which were

comparable to RPP (3375.75 kg/ha). Microbial activity especially of heterotrophs in soil receiving organics was higher which induced the resistance capacity of plants through the production of antibiotics, psederophores etc., than in other treatments.

Studies on insect pests and their predators in upland rice ecosystem

GIRISH V. P.

2011

MAJOR ADVISOR: Dr. M. G. HEGDE

A study was conducted on the insect pests and predators of upland rice ecosystem at ARS (Paddy), Mugad during *Kharif* 2010. The blue beetle, leafhopper and horned caterpillar appeared in the vegetative phase of the crop and their population was significantly high in drill sown rice, compared to transplanted and aerobic rice. Leaf folder incidence was recorded throughout the season under all the planting methods. Drill sown rice crop supported significantly higher population when compared to aerobic rice. A meager population of grasshopper and earhead bug was recorded across the method without any statistical difference. Yellow stem borer population was significantly high in aerobic method during reproductive phase of the crop. The coccinellids, predatory spiders, ground beetle and odonata population were recorded throughout the season in all the three rice planting methods. The predatory spiders population was significantly high in drill sown and transplanted rice, compared to aerobic crop. The

coccinellid, ground beetle and odonata were found throughout the season without any distinct population pattern across the planting methods. Among the newer insecticides and botanical evaluated against leaf folder, emamectin benzoate 5 SG @ 0.25 g/l, spinosad 45 SC @ 0.2ml/l and flubendiamide 480SC @ 0.2 ml/l recorded lowest per cent leaf damage. Similarly, emamectin benzoate, bifenthrin, profenophos, chlorfenpyr and thiodiazinon were more toxic to the predatory spiders. The highest grain yield, net profit and B:C ratio was recorded in emamectin benzoate treatment. Among the rice varieties screened against rice leaf folder, Dambarali, Ratansagar, Champakali, M-18, J-192, Kari Kantiga, Hybrid 258-1, Kannanur local, Chitiga, MGD-103, MGD-105, MTU-1010, Amrut, MAS-26, ARB-6, and Rajmani showed resistant reaction. All the resistant cultivars showed hairiness as against smooth surface in moderately susceptible and susceptible varieties.

Comparative performance of indigenous bee attractants in Bt and non-Bt cotton hybrids

VINAYAK PISE

2011

MAJOR ADVISOR: Dr. SHASHIDHAR VIRAKTAMATH

Comparative studies on pollinator fauna, foraging activity of honey bees and effect of indigenous bee attractants on bee visitation and yield parameters of Bt and non-Bt cotton were made during *Kharif* season of 2010 at Dharwad. Among 18 species of pollinators, *Apis dorsata* F., was the most dominant (29.83 %) followed by *A. cerana* F. (25.21 %) and *A. florea* F. (22.54 %). Activity of honey bees was observed throughout the day with a peak at 1200 h in both Bt and non-Bt cotton. No significant difference in the activity was observed between Bt and non-Bt cotton hybrids. Indigenous bee attractants (Citril E, Citral Z, *Fagara budrunga*, *Sweritia densifolia*) were equally effective in attracting significantly more number of bees (2.25 to 3.25 and 2.17 to 3.17 bees /10m²/5 min in Bt and non-Bt cotton, respectively) which was as good as the Fruit boost, a

commercial bee attractant. However, there was no significant difference among Bt and non-Bt cotton hybrids with respect to bee visitation. Bee attractants enhanced the yield parameters viz, good opened bolls (8.37 to 9.56 and 7.18 to 8.25 % in Bt and non-Bt cotton, respectively), seeds per boll (10.82 to 21.89 and 10.67 to 16.64%), lint yield (5.80 to 7.83% and 4.85 to 5.13), seed yield (11.60 to 14.02 and 7.63 to 11.84%) and kapas yield (10.39 to 15.05 and 8.56 to 12.65%). At the same time there was a decline in the bad opened bolls (30.82 to 28.53 and 22.22 to 16.66 %) both in Bt and non-Bt cotton hybrids. The extent of increase in the total yield due to spray of indigenous bee attractants was more or less similar both in Bt (10.39 to 15.05 %) and non-Bt cotton (8.56 to 12.65 %) hybrids.

Bioefficacy and molecular characterization of native *Bacillus thuringiensis* (Berliner) isolates against lepidopteran pests of cabbage

PRABHAKAR A.

2011

MAJOR ADVISOR: Dr. P. S. HUGAR

The bio-efficacy of one hundred native *Bacillus thuringiensis* isolates were assessed against five day old lepidopteran insects (*Spodoptera litura* Fab., *Crociodolomia binotalis* Z. and *Plutella xylostella* L.). Molecular characterization and crude protein assay of eleven efficient isolates was done to identify the presence of insecticidal genes and the efficacy to target insects respectively. Based on the bioefficacy and the presence of the *cry* genes, consortia were developed against *P. xylostella*. Out of the 100 isolates tested Tx-232 and 531/a recorded cent per cent mortality against *P. xylostella*, 90 per cent mortality was shown by Tx-379 and 86.67 per cent mortality by Tx-201, AIM-72(1) and AIM-72 (2). Among isolates, Tx-201, Tx-29, Tx-379, AIM-72(2) showed 86.67 per cent and AIM-72(1), Tx-202 showed 80 per cent mortality against *C. binotalis*.

Tx-232 registered 73.33 per cent and Tx-202 recorded 66.67 per cent mortality of *S. litura* larvae. Out of eleven native *Bt* isolates tested for lepidopteran specific *cry* genes, *cry1* gene was amplified in six isolates, *cry2* amplified in four isolates, *cry8* and *cry9* was amplified in two isolates. However, *cry20* was not present in any of the eleven isolates. All the selected eleven isolates performed well against *P. xylostella*, *C. binotalis* but not against *S. litura* in crude protein assay. The consortium of two [531/a + Tx 232 and 531/a + AIM-72(2)] isolates recorded cent per cent mortality, three isolates combinations [Tx 379 + 531/a + Tx 232 and 531/a + Tx 232 + AIM-72(2) and four isolates combination [531/a + Tx 232 + AIM-72(2) + Tx 379] showed cent per cent mortality with quicker knock down effect against *P. xylostella* compared to the reference.

AGRICULTURAL EXTENSION EDUCATION

Mahatma gandhi national rural employment guarantee scheme (MGNREGS) as perceived by gram panchayat members

KOTRESHA S. S.

2011

MAJOR ADVISOR: Dr. J. G. ANGADI

The present study was conducted during 2010-11 in Belgaum district of Karnataka state to measure the knowledge of gram panchayat members regarding MGNREGS, perception of gram panchayat members regarding functioning of MGNREGS as well as assets/infrastructural facilities created under the scheme. One hundred and twenty gram panchayat members formed the sample for study. The data was collected by personal interview with the help of structured schedule which was developed keeping in view the objectives and variables of the study. Minimum wages fixed by the central government was known to 88.30 per cent of the respondents. An equal proportion (87.50%) of the respondents were aware of

guaranteed employment days provided and mode of payment of wages. Considerable percentage (37.50%) of members belonged to medium knowledge level followed by 36.67 per cent and 25.83 per cent who belonged to high and low knowledge levels, respectively. Very high percentage (96.67%) of the members were of the view that women participation under the scheme was adequate. Duration of the employment provided by the scheme was not sufficient as it was expressed by 65.00 per cent of members. One third (37.50%) of the members responded that healthcare facilities were provided sometimes to the beneficiaries. Higher proportion (64.17%) of the members responded

that wages provided to beneficiaries were inadequate. Majority (60.00%) of the respondents felt that migration had reduced after implementation of the scheme. The achievement percentage with regard to farm ponds, check dams and drainages accounted for 48.02, 61.53 and 78.50 per cent, respectively. The major problems of the gram panchayat members

were delay in sanctioning of the fund (88.33%) and complex procedure of the scheme (85.00%). Sex, education, cosmopolitaness, mass media participation, extension contact and organization participation were found to be positively and significantly associated with knowledge of gram panchayat members.

Perceived usefulness of krishi community radio programmes by farm women

SNEHA M. TALWAR

2011

MAJOR ADVISOR: Dr. L. MANJUNATH

The present study on Perceived Usefulness of Krishi Community Radio Programmes by farm women was conducted in Dharwad district during 2010-11, involving 120 farm women using structured and pretested interview schedule. The results showed that 39.17 per cent of women had medium level of awareness about the programmes while 31.67 per cent of them had low level and 29.17 per cent of them had high level of awareness about krishi community radio programmes. Land holding, annual income, extension participation, social participation, material possession, media utilization, and media participation were positively and significantly correlated with listening behaviour of farm women. Only family occupation is negatively correlated with listening behaviour. Interview with scientist was the most preferred mode of presentation, followed by Interview with farmer, Dialogue, Skit, Drama, Question and answer, Songs and finally Quiz was the least preferred mode of

presentation. Mahileyarigagi Arogya Kendra programme has got the highest (50.00%) per cent of listeners among the given list of programmes. Respondents opined that krishi community radio programmes were useful as these programmes would educate for better living, Knowledge about agriculture, Increase knowledge, Information on home improvements, Education on health, knowledge on social issues, News and information, Entertains and gives happiness. Education for better living opinion was accorded the first rank among above mentioned opinions regarding usefulness, followed by Knowledge about agriculture. Almost 61.00 per cent (60.83%) of women suggested to give more number of radio sets on subsidized rates, 56.67 per cent suggested to change broadcasting time, 43.33 per cent suggested to conduct more awareness programmes on Krishi Community Radio, and 30.00 per cent of them asked for enhancing the network coverage.

Impact of BAIF promoted livestock production activities on women empowerment in Karnataka

RESHMA

2011

MAJOR ADVISOR: Dr. A. BHEEMAPPA

The study on impact of BAIF promoted livestock production activities on women empowerment in Karnataka was carried out during 2010-2011 in Tiptur taluk of Tumkur district wherein BAIF has implemented extensive livestock production activities for the women empowerment. Based on random sampling the selected 120 respondents from six villages were interviewed using pre-tested standardized interview schedule. The important findings of the study were majority of respondents (70.83%) were practicing livestock keeping. Whereas less percentage were noticed in the enterprise combination of dairy+sheep/goat rearing (16.66%), and dairy+poultry combination of enterprise (12.50%). More number of respondents were noticed to possess small herd size dairy of 1-2 animals (65.88%). More number of respondents were observed in medium level of achievement motivation (47.50%), risk orientation (76.66%) and economic motivation (64.16%). Women were found to dominate decision making in the activities like type of livestock produce to be sold (82.50%),

taking loans (75.00%), and medical care (59.16%). Men dominated decision making was reported in the activities like growing fodder (71.66%), and construction of sheds (68.33%). The joint decision making was pointed out in the activities like fixing the price of produce (69.16%), and place of marketing (68.33%). The distribution of farm women in various activities of livestock keeping reveals that a high percent of farm women were involved in the activities like milking (91.66%), cleaning the shed/living area (79.16%), preparation of concentrate (70.83%), selling livestock products (69.16%) and washing the animals (65.00%). Through livestock keeping more number of farm women (45.00%) were able to get low income of ₹ 24,862. More or less equal per cent of respondents were noticed in getting high employment of more than 183 man days. A high percentage of respondents had experienced the constraints of high wages demanded by labour (95.83%), non availability of labour (93.33%) and small land holdings (91.66%).

Impact of Sujala watershed development programme in Dharwad district of Karnataka

SHAMBULINGAPPA B. G

2011

MAJOR ADVISOR: Dr. S. V. HALAKATTI

The present study was conducted in Dharwad district of Karnataka state during 2010-11 to measure the adoption of watershed practices by the beneficiaries, impact of watershed development programme on productivity of major crops and to document benefits derived from the programme. One hundred and twenty beneficiaries and sixty non beneficiaries were selected as the sample for study. The data was collected by personal interview with the help of structured schedule which was developed keeping in view the objectives and variables of the study. Majority of the beneficiaries (60.83%) belonged to medium adoption category. On the other hand most of the non-beneficiaries (93.33%) belonged to low adoption category. Ploughing across the slope (77.50%), field bund (72.50%) and inter cropping (70.83%)

were the major watershed practices adopted by the beneficiary farmers. Nearly twenty five per cent increase in the yield level was noticed in paddy (23.93%) and soybean (23.65%). While, 10.00 per cent increase in the yield level was observed in groundnut, cotton, *rabi*-sorghum and chickpea. The major benefits derived by the beneficiaries were increase in the ground water recharge (36.67%) and reduction in soil and water erosion (35.00%). Obstruction for cultural operation (60.00%) and water stagnation near bunded area (57.50%) were the major constraints expressed by beneficiary farmers in adoption of improved watershed practices. Non availability of labour (80.83%) and heavy risk due to failure of monsoon (74.17%) were the major constraints expressed by beneficiaries in adoption of improved crop production practices.

Access and use of ICT tools by extension personnel for transfer of technology in north Karnataka

HAGE MANTY

2011

MAJOR ADVISOR: Dr. K. V. NATIKAR

The study was conducted in North Karnataka during 2010-11 on Access and Use of ICT tools by extension personnel for Transfer of Technology. Random sampling procedure was employed to select 40 extension personnel from University of Agricultural Science, Dharwad and 40 from Karnataka State Department of Agriculture, making a total sample of 80. The results revealed that, Cent per cent of UASD extension personnel had accessibility to Television, Telephone, mobile. Whereas, Cent per cent of KSDA extension personnel had accessibility to Television and Mobile. It was

found that, (62.5%) of UASD extension personnel and (47%) of KSDA extension personnel had high and low level of knowledge about ICT tools. Regarding individual ICT tools, Cent per cent of UASD extension personnel had knowledge about telephone, e-mail, video conferencing, e-newspaper and e-agricultural magazine. Whereas, KSDA extension personnel had knowledge about telephone (100%), radio, television and computer (75%). Majority of the KSDA extension personnel do not possessed the knowledge about different kinds of ICT tools viz;

e-newspaper and e-agricultural magazine (87.5%). Further, Forty five per cent of the UASD extension personnel and (40%) of KSDA extension personnel had high and medium utilization of ICT tools. For the purpose of gaining the knowledge or for getting the information, UASD extension personnel used web based search engine (100%).Whereas, KSDA extension personnel used television (92.5%). For transfer of technology, UASD extension personnel used internet (90%).Whereas, KSDA extension personnel used mobile (50%).For training and teaching UASD extension

personnel used internet (75%). For making/sending reports, UASD extension personnel used e-mail (97.5%), computer (90%).Whereas, KSDA extension personnel used computer (55%). For sharing information with concerned organization including input agencies, UASD extension personnel used e-mail (100%).Whereas, KSDA extension personnel used mobile (75%). For communication with other organization, UASD extension personnel used e-mail (100%).Whereas, KSDA extension personnel used mobile (90%).

Perspectives of farmers on effect of climate change on agriculture and livestock

GAJENDRA T. H.

2011

MAJOR ADVISOR: Dr. NAGARATNA BIRADAR

The study was conducted in Dharwad and Bijapur districts of Karnataka in 2011. Ex-post-Facto research design was followed. The total sample for the present study was 150. The objectives of the study were to document farmers views on climate change, elicit reasons for climate change and study the effect of climate change on agriculture and livestock as felt by farmers. Appropriate statistical tools were employed. High majority (81.33%) of the respondents belonged to medium economic motivation. All the respondents observed changes in quantity of rainfall and 98.67 per cent noticed changes in the distribution pattern of the rains over the past 20 years. Large majority (84.67%, 92.67%, and 94.00%) of the respondents expressed that the distribution is unpredictable to the extent of variation of 67.66, 73.39 and 79.84 per cent in *Kharif*, *rabi* and *summer* seasons, respectively. High majority (90.00%) of farmers replaced traditional varieties like white sorghum, javari redgram and jaidhar cotton

varieties with high yielding varieties having characteristics of short duration and resistance to pests and diseases. High majority (90.00%) of the respondents expressed negative impact with percent variation on hours of grazing (42.00%) and hours of stall feeding (22.32%), respectively. Nearly two third (65.33%) of the farmers changed their cropping pattern from mono cropping to diversified cropping pattern. High majority (86.00) of the farmers followed practices like more hours of grazing, growing green fodder during *Kharif* and protecting straw by covering polythene to avoid shortcoming of dry fodder. Nearly half of the farmers reduced number of livestock and reared high milk yielding and drought resistant breeds. Thirty per cent of the farmers replaced large ruminants (buffaloes and cows) with the small ruminants (sheep and goat). Farmers were observing negative impact both agriculture and livestock on direct and indirect way.

Evaluation of grain storage methods adopted by farmers

SHAILA S. HOSAKOTI

2011

MAJOR ADVISOR: Dr. S. S. DOLLI

A study on evaluation of grain storage methods adopted by farmers was carried out during the year 2010-2011. Sixty farmers adopting improved method and sixty farmers adopting traditional method of grain storage formed the sample for the study. The data was elicited through the personal interview method using pre-tested schedule. The study revealed that cereals were threshed by machines, while pulses manually. Grain loss was maximum when grains were transported by tractor (0.73%) than the bullock cart (0.63%). Over 50 per cent of maize (67.44%), bengalgram (58.33%) and greengram (52.00%) growers used gunny bags for storage. Higher per cent (44.17%) of jowar growers used *Pucca koti* for storage of grains. Highest loss (20.90%) was observed in case of underground storage of jowar crop, while in case of gunny bags and *Pucca koti*, the loss was about 6.63 and

6.07 per cent, respectively. Minimum loss of grains was observed in gunny bags lined with polythene sheet (3.24%). About 50 per cent of crop harvest of wheat and jowar was retained for domestic use, while over 90 per cent of maize was used for commercial sale by farmers. In case of groundnut and pulses, almost one - third of the produce was retained for domestic use. Farmers reported that pre-storage loss during drying and cleaning was higher (1.01%) than the loss during the storage (0.72%). The average storage cost per quintal per year was highest (₹ 30.00) in gunny bags lined with polythene sheet and lowest (₹ 1.16) in case of underground storage. *Pucca koti* was most preferred method by farmers adopting improved method with first rank. In case of farmers adopting traditional method, gunny bag was their first choice.

A study on entrepreneurial qualities and adoption behaviour of banana growers

ASHOK KUMAR BENNUR

2011

MAJOR ADVISOR: Dr. N. MANJULA

The study was conducted in Gulbarga district of North Karnataka during the year 2010-11. Gulbarga district was purposively selected because it has higher area under banana cultivation. From each of the four selected taluks of Gulbarga district, five villages and six farmers from each village were selected for the study. By following proportionate random sampling procedure 120 farmers were selected and data was collected by personal interview method. The study revealed that Majority (60.83%) of banana growing farmers belonged to middle age group. About 40.83 per cent of farmers were educated up to high school. More than half (56.67%) of farmers had more than 21 years of farming experience. About 45.00 per cent of banana growers belonged to medium category of scientific orientation. More number (62.50%) of banana growers belonged to high risk orientation category. About 40.00 per cent of banana growers had regular contact with Horticulture Department. In entrepreneurial qualities, 45.00 per cent of banana growers belonged to medium category of innovativeness and

47.50 per cent belonged to high category of decision making ability. Higher proportion (72.50%) of the respondents belonged to medium category of economic motivation and 55.00 per cent belonged to medium category of leadership ability. Considerable percentage (45.83%) of banana growers belonged to medium category of adoption. As high as 97.50 per cent of banana growers were aware of varieties and 79.17 per cent had knowledge regarding number of suckers per acre. Majority (93.33%) of banana growers were aware of spacing, while 94.17 and 92.50 per cent had knowledge regarding diseases and irrigation respectively. Cent per cent of the farmers adopted desuckering practice, whereas 94.17, 91.67 and 82.50 per cent of banana growers adopted varieties, spacing and sucker type practices, respectively. Labour problem (94.17%), electricity problem (90.83%) and storage facility problem were the major constraints expressed by the banana growers. An equal proportion (52.50%) of the banana growers expressed training needs regarding disease control and marketing as most needed.

Knowledge and adoption pattern of bio-fertilizers by the farmers of Tungabhadra command area

SIDDALINGAYYA HIREMATH

2011

MAJOR ADVISOR: Dr. R. B. BELL

The present study was conducted in Raichur, Bellary and Koppal districts of Karnataka state during 2010-11 to measure the knowledge level and adoption pattern of bio-fertilizers by the farmers, ascertain the factors influencing the use of bio-fertilizers and identify the constraints by the farmers in adoption of bio-fertilizers. One hundred and twenty farmers were selected as the sample for study. The data was collected by personal

interview with the help of structured schedule which was developed keeping in view the objectives and variables of the study. Nearly 39.00 per cent of the respondents had medium level of knowledge, while 32.00 per cent and 29.00 per cent of the respondents had low and high level of knowledge, respectively. More than half (52.50%) of the respondents belonged to low adoption category followed by medium (37.50%) and high (10.00%).

High yield (81.66%) and regular supply (78.33%) were the major factors which influences use of biofertilizers by the farmers. Lack of reinforcement efforts from the Department (85.00%) and inability to understand the details of biofertilizers (77.50%) were the major constraints encountered by the farmers in adoption of bio-fertilizers. About 45.00 per cent of the respondents belonged to semi-medium land holding followed by almost equal percentage of marginal (11.66%), small (19.16%), medium (14.16%) and big farmers (10.00%). In case of cosmopolitanness, 39.00 per cent of

farmers belonged to high cosmopolitanness followed by low (35.00%) and medium (25.83%). Among total number of respondents 42.00 per cent fall under medium social participation followed by low and high. More than 40.00 per cent of farmers belonged to medium extension contact followed by low (33.33%) and high (25.00%). Majority (74.16%) of farmers belonged to medium economic motivation followed by high (13.33%) and low (12.50%). In mass media utilization, (51.00%) of farmers fell under medium category followed by low and high.

Participation and decision making of rural youth in Agriculture

SAVITA B. NASHI

2008

MAJOR ADVISOR: Dr. K. A. JAHAGIRDAR

Youth are the most potent segment of the population of the country. The youth of today are the hopes of tomorrow. They are the backbone of the country. The Socioeconomic development and prosperity of rural areas depends to a considerable extent, on the type of youth living in rural areas, because the rural youth have abilities to orient themselves to go along the main stream of the development process. Hence, the study was conducted in Belgaum district during 2010-11. Three taluks were selected namely Belgaum, Gokak and Raibag. From which twelve villages were selected by random sampling method. From each village, five male and five female respondents were selected. Thus, total sample size was 120. Majority (80%) of the rural male youth participated in ploughing, cent per cent of rural female youth were self participated in all activities. Majority (68.33%) of the youth were needed training in 'identification of pests and diseases'. Majority

(65%) of the rural youth expressed lack of awareness as their major problem (latest technology, varieties etc.). One third (34.17%) of the rural youth had education upto middle school. Majority (56.67% & 58.33%) of the rural male and female youth belonged to nuclear family. Both rural male (53.33%) and female (43.33%) youth had family size of 5 to 8 members. Majority (65%) of the respondents belonged to forward caste, medium experience in farming (70%), nearly half of the respondents had high annual income (49.17%) and medium farm families (48.33%). Majority (94.17%) of the families of rural youth possessed television. Among them 75.22 per cent viewed commercial programmes daily, 35 per cent of the respondents had medium innovativeness, 34.17 per cent of the respondents had high level of aspiration. The rural male youths are having higher innovativeness and more aspiration level than rural female youths.

Impact of farmers field school (FFS) on cotton crop management practices in Dharwad district

SHABNAM M. ADHONI

2011

MAJOR ADVISOR: Dr. S. S. DOLLI

The research study was conducted on impact of Farmer's Field School on cotton crop management practices in Dharwad district of Karnataka during the year 2010-11. The FFS conducted in Dharwad district during 2008-09 by Department of Agriculture were considered for the study. Three taluks viz., Kalghatagi, Dharwad and Hubli were selected for the study. Four villages from each taluk, 10 FFS farmers and 5 non FFS farmers from each village were selected by simple random procedure. Thus constituting a sample of 120 FFS farmers and 60 non FFS farmers. Study revealed that, 65.00 per cent of FFS participants and 25.00 per cent of non FFS participants had 'high knowledge' about Integrated Crop Management (ICM) practices of cotton. Regarding adoption of overall ICM practices, over thirty per cent of FFS farmers belonged to 'high' and 'medium' adoption category. Whereas, higher percentage of non FFS farmers belonged to low adoption category (43.33%). FFS had an impact on participants knowledge regarding

germination test, application of $ZnSO_4$, use of botanical preparation and beneficial insects. These practices were adopted by them. It was observed that, FFS farmers obtained higher mean yield (7.85q/acre) of cotton than the non FFS farmers (6.25q/acre). Study identified that six important factors viz., participants selection method (sign & symptom), representativeness of plot, accessibility of plot, insect zoo, short studies and special topics positively influenced on improving the knowledge level as well adoption level of participant farmers about ICM practices in cotton. However, no associationship exist between nature of collaborator, nature of facilitators and long term experiments with respect to knowledge as well as adoption level of participants. Over twenty per cent of FFS farmers expressed the problem of 'fixed day of conducting sessions (other than Monday)' and the same proportion of farmers suggested that FFS sessions should be conducted on 'monday only'.

A profilistic study on awardee farmers in north Karnataka

SHILPASHREE B. S.

2008

MAJOR ADVISOR: Dr. K. V. NATIKAR

The present study was conducted in the year 2010-11 in North Karnataka with a sample size of 80 farmers, constituting 40 farmers awarded by KSDA and 40 non-awardee (other) farmers were randomly selected for comparison. The data was collected with the help of structured interview schedule. The profile analysis of respondents revealed that, majority of awardee farmers belonged to middle age category, educated upto PUC, medium land holding, high income category, high farming experience, high mass media utilization, high extension contact, high risk orientation, high achievement motivation, high economic motivation, high innovativeness and high management orientation category. Whereas, majority of non-awardee farmers were also middle aged, had education upto middle school, belonged to semi medium income category, low mass media utilization, medium extension contact, low economic motivation, low economic motivation and low management orientation

category. The results indicated that, the productivity level of awardee farmers in respect of sugarcane (220t/ha), paddy (98.68 qt/ha), maize (91.96 qt/ha), kharif jowar (47.01 qt/ha) and with respect to various crops in general was higher than the non-awardee farmers. The findings also revealed that, majority of awardee farmers adopted the crop enterprises like; agriculture-horticulture-forestry-forage crops-dairy-poultry-sheep/goat rearing-vermicompost. Further the awardee farmers adopted the mixed cropping patterns like redgram+blackgram, maize+bengalgram and greengram+jowar. The major constraints faced by awardee farmers were the problem of price fluctuation, lack of guidance in time by extension staff, non availability of labour. Whereas, cent per cent of non-awardee farmers facing the problems of non-availability and high cost of labour, high cost of inputs like seeds, fertilizers, pesticides, price fluctuation and transportation and marketing.

A study on knowledge and adoption of cardamom cultivation practices by the farmers of Chikmagalur district

CHETHAN. M. G.

2011

MAJOR ADVISOR: Dr. SYED SADAQATH

The study was carried out in Chikmagalur district of Karnataka during the year 2010-11. Following the simple random sampling 150 farmer respondents were selected from 15 villages of three taluks of the district. The data was elicited through personal interview method. Cardamom is the Queen of Spices. Cardamom *Elettaria cardamom* (L.) Maton, which

belongs to the family Zingiberaceae. It is one of the most exotic and highly prized spices. Indian cardamom has a history as old as human civilization. Southern India and Sri Lanka are regarded as origin of this spice. Cardamom is grown commercially in plantations under the shade of tall shadow forest trees. It is very labour-intensive crop to produce.

The fruits are pluck individually by hand before they are fully ripe, over a period of few weeks. The important findings of the study were; considerable per cent of the respondents possessed medium knowledge (44.00%) and adoption (48.66%) about recommended cultural practices of cardamom. Cent percent of the respondents cultivated recommended varieties. Most of the respondents had medium psychological attributes like innovative proneness and risk orientation (52.00%) and (44.00%), respectively. A considerable percentage of respondents educated upto graduated (32.00%). Very high percentage of the respondents (94.66%) possessed television sets. A positive significant relationship was observed

between level of knowledge, adoption and personal, psychological and social characteristics like age, education, risk orientation, innovative proneness, extension contact, and mass media participation. Majority of the respondents expressed the problem of animal damage (86.66%), erratic rainfall (80.66%), pests and diseases damage (75.33%) high labour cost (91.33%) and lack of organized market (84.66%) were the constraints expressed by cardamom growers. Majority of the respondents (69.33%) marketed their produce in farm itself. Considerable percentage of respondents (80.00%) collected the information on market price from others who visited the market.

AGRICULTURAL MICROBIOLOGY

Influence of enriched organic manures on microbiological and biochemical properties of soil, growth and yield of brinjal (*Solanum melongena* L.)

HEMA C. RAO

2011

MAJOR ADVISOR: Dr. M. N. SREENIVASA

An experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to study the influence of microbially enriched organic manures viz., compost, vermicompost and biogas slurry on microbial activity, growth and yield of brinjal during Kharif 2010. The microbial load and nutrient status of manures improved due to microbial enrichment. Among the manures enriched vermicompost showed highest microbial population, N, P, K and micronutrient content. The rhizosphere population of bacteria, fungi, actinomycetes, phosphate solubilizers and free living nitrogen fixers were significantly highest when enriched manures were applied with green manure as compared to RDF + FYM at 45, 75 and 105 days after transplantation. The enzymatic activities viz., dehydrogenase, urease and phosphatase were significantly highest when enriched manures were applied with green manure at all the stages of crop growth. Significantly highest mycorrhizal spores were noticed in the rhizosphere soils applied with enriched compost, enriched

vermicompost and green manure. The plant growth parameters like plant height, root length, number of branches and leaves, chlorophyll content and dry matter production were significantly highest with the application of enriched compost, enriched vermicompost and green manure and it was found to be significantly superior over individual manurial treatments. The N, P and K concentration of plants were also significantly highest in the same treatment. The yield of brinjal was significantly highest with the application of enriched manures with green manure as compared to unenriched manurial combination and it was on par with that of RDF + FYM. This study clearly brought out significant improvement in soil biological indicators such as microbial population and enzymatic activity due to combined application of enriched organic manures and green manure. There was significant improvement in the growth and yield of brinjal with the combined application of enriched organic manures and green manure.

Influence of botanicals on beneficial microflora, enzymatic activities, growth and yield of tomato (*Solanum lycopersicum* L.)

ASHARANI Y. N.

2011

MAJOR ADVISOR: Dr. M. N. SREENIVASA

Tomato is one of the important vegetables grown throughout the world because of its health improving constituents. Botanical pesticides have been recommended as an ecofriendly and sustainable strategy in the management of agricultural pests. To assess the influence of botanical pesticides, in vitro evaluation was carried out against beneficial inoculants viz., *Trichoderma viride*, *Pseudomonas striata*, *Pseudomonas fluorescens* and *Azospirillum* at 5 and 10 per cent of aqueous botanical solution. The results showed that all four organisms were compatible with all 15 botanicals at both the concentrations. Based on local availability six botanicals were selected for further studies. They were sprayed (10% concentration) to tomato crop

at 45, 60, 75 and 90 days after transplantation. Microbial load and enzymatic activities were estimated one day before and one day after spraying of the botanicals. The results indicated stimulation in the beneficial microbial population (both phyllosphere and rhizosphere) and enzymatic activity. The number of fruits and fruit weight were higher in plants sprayed with *Azadirachta indica* and while the lowest incidence of *Helicoverpa* was observed in the same treatment. The highest plant dry matter and lycopene content in fruits were observed in plants sprayed with bougainvillea. Considering the fruit yield and lowest incidence of *Helicoverpa*, spraying with *Azadirachta indica* was found beneficial.

AGRICULTURAL STATISTICS

Modeling of early growth of agro-forestry tree species in semi-arid region of Karnataka

NAVEEN KUMAR G. M.

2010

MAJOR ADVISOR: Dr. S. G. HEGDE

The study conducted at Regional Agricultural Research Station Bijapur farm of University of Agricultural Sciences, Dharwad, Karnataka. Twenty four tree species were considered for the study and each tree species was taken as a treatment with two replications, planted at 7 m x 7 m spacing. The observations were taken on diameter (cm) and height (m) at one year interval (1990-2000). The superior performance of height was observed in case of *Eucalyptus citridara* planted in RARS, Bijapur, height of 9.195 m, followed by *Leucana leucacachepala* and *Eucalyptus citridara*. Lower performance was observed in *Delonix regia*. In diameter maximum performance was noticed in *Prosopis juliflora* (9.13 cm), followed by *Albizia lebeck* and *Eucalyptus hybrid*. Lower performance was observed in *Syzygium cumini*. In case of CAI, T₁₄ showed Maximum increment with (53900 cm³), followed by T₄ (45700 cm³), T₁₅ (45200 cm³), and T₁₁

showed least increment (5750 cm³). In MAI T₁₄ showed maximum increment with (21000 cm³) followed by T₄ (17000 cm³), T₅ (16000 cm³), T₁₂ showed least increment with (1830 cm³). In case of volume estimation T₄ showed maximum Volume with (56784 cm³), followed by T₁₄ (52584 cm³), T₅ (41035 cm³), and T₁₂ showed volume least (5341 cm³). In height and age relationship different growth functions were tested in that different models were fitted for different tree species. Out of 24 species Gompertz model fitted well for 12 species, Weibull model better fitted for 8 species with highest R² and lesser standard error. In diameter and age relationship different growth functions were tested in that different models were fitted for different tree species. Out of 24 species Gompertz model fitted well for 18 species Exponential model showed better for 2 species with highest R² and lesser standard error.

Statistical evaluation of milk and milk products of Tumkur Milk Union Limited (TUMUL)

PUNEETH. V.

2011

MAJOR ADVISOR: Mr. Y. N. HAVALDAR

Dairy development is a major component strategy to expand agricultural output in India. Indian dairy industry has emerged as the largest dairy

industry in the world with milk production 112 million tonnes. Hence, in this context, it was undertaken to analyse in detail about Tumkur

milk union limited (TUMUL). The study was carried out based on secondary data. Data was collected from the union for fifteen years (1994-2009) with respect to milk procurement and milk products production, in order to analyse the milk procurement and production of milk products using polynomial functions, ARIMA, Exponential and Markov chain analysis. The different degree polynomials were tried in order to examine trends in milk procurement and milk products production. Best models were selected based on highest R^2 and lowest RMSE values. In case of milk procurement, curd and peda showed an increasing trend over the years. Whereas butter, ghee and cream showed

an increasing trend and trend with ups and downs over the years. ARIMA and Exponential models were used to forecast the milk procurement and milk products production of TUMUL. These models were showed an increasing trend in all the milk products production and procurement of milk except in peda production. Markov- chain analysis was used for changing pattern of milk products production in TUMUL was carried out using transition probabilities. Five products butter, ghee, cream, curd and peda were considered in the transitional model. Results showed that curd was one of the most stable products of TUMUL followed by cream, butter and ghee.

Statistical model for estimation of life time milk production in surti buffalo

PRABHAKARA C.

2011

MAJOR ADVISOR: Dr. S. N. MEGERI

Indian buffaloes represent 56 per cent of the world buffalo population and have the privilege of having the best breeds of buffaloes for milk production. Surti buffalo is one of the best breed which is originated from Kaira district of Gujarat. Milk production is being most predominant for any dairy farm hence in order to keep the dairy profitable manner, models were essential for growth performance of any given animal. The study was carried out based on secondary data. The data was collected from the Department of Animal Sciences, UAS, Dharwad from 1974-75 to 2004-05 for 31 years. The present study was carried on utilizing the information available on 310 Surti buffaloes. Cobb Douglas model was used for estimation of 305 days milk yield and total milk yield in Surti buffalo with high efficiency. In this study we have considered log y

(where y is total milk yield) for further analysis. Sixth degree polynomial was found to be more efficient in estimating individual 305 days milk yield and total milk yield followed by Richards model. These models will help the farm managers for early estimation of production. Multiple linear regression equation was used to estimate life time milk production of Surti buffalo, by considering the 305 days milk yield, lactation length, calving interval peak yield and peak day as independent variables and total milk yield as dependent variable. The backward regression method was applied and it was noticed that peak yield and peak day was eliminated and the 305 days milk yield, lactation length and calving interval were remained. Based on the estimated model the life time milk yield was estimated and they are coinciding with each other.

Use of statistical tools in organic farming practices in northern zones of Karnataka

MANJUNATHA G. R.

2011

MAJOR ADVISOR: Dr. K. V. ASHALATHA

The study was attempted to estimate the crop preferences under organic farming, to assess the effect of number of years of organic farming practices and to test the efficacy of organic farming on crop productivity. Multistage purposive random sampling was employed for the selection of sample respondents. Wherein three zones viz., Hilly zone, Northern Transitional zones and northern dry zones were selected from Northern Karnataka. From each zones one district viz., Uttar Kannada, Dharwad and Bijapur were selected based on the maximum area under organic farming. From each district one taluk and two villages were chosen. The total sample size of 150 comprising 75 each of organic and inorganic farmers was chosen. Organic soil sample of about 27 were collected

from respective zones. Optimal scaling technique, ANOVA technique and Regression models were employed for analysis of data. The results of correspondence analysis revealed a stronger association between crops and zones and organic farming practices and selected zones. While ANOVA technique signaled a significant influence of years of farming and zonal organic practices on various soil indicators viz., organic carbon, nitrogen, phosphorus and potassium. Exponential growth in productivity level was observed over the period of practicing organic farming in selected zones. The significant difference was noticed on yield levels of performing organic and inorganic farming for different crops in selected zones of Karnataka.

Application of small area estimation technique in estimating the number of households engaged in income generating farm activities

SANTHOSH N. SHANBHAG

2011

MAJOR ADVISOR: Dr. A. R. S. BHAT

In the present study the Coastal Area under Arabian Sea is considered as broad area and villages in the Coastal Area are considered as small area. The sampling units (non-farm households) are selected by the method of two stage samplings. Villages are considered as first stage units and farming households are considered as second stage units. The coastal area was separated into two parts namely Udupi and Dakshina Kannada. Small area estimates were obtained for the villages by fitting regression based models considering each of the above as broad area. Small area estimates were also obtained considering all these areas together as one broad area. The estimates were obtained by fitting Poisson regression model and Logistic regression models. For fitting Poisson and Logistic

regression models, the explanatory variables used are family size, education level of household (number of years of schooling), total land holding (in acres), total annual non-farm income (in thousand rupees). The fitted models are then used to estimate the number of households engaged in non-farm activities for non-sampled villages in the broad area. The present investigation indicates that Logistic estimator and Composite estimator are the best small area estimators. The information on household's farm activities at village level has a greater importance to the government and NGO's in policy formulation, fund allocation for socio-economic development of a region and for establishment of small scale industries at the village level.

AGRONOMY

Response of late sown wheat (*Triticum aestivum* L.) to organics under irrigation

TAMIM FAZILY

2011

MAJOR ADVISOR: Dr. C. S. HUNSHAL

A field experiment was conducted to study the response of late sown wheat (*Triticum aestivum* L.) to organics under irrigation at Main Agricultural Research Station, Dharwad during *rabi* season of 2010-2011. The experiment was laid out in randomized block design with three replications consisting of fourteen treatments. The basal application consisted of 50% nitrogen (N) through farm yard manure (FYM), compost, sheep manure and these combined with 50% N through vermicompost (VC) and poultry manure (PM). Another set of treatments consisted of 50% N as basal through FYM, compost and sheep manure and these

followed by 50% N as top dressing at 30 DAS with VC and PM. Another two treatments included RDF (100:75:50 kg NPK/ha) and RPP (100:75:50 kg NPK/ha+7.5 t/ha FYM). All other treatments (except RDF) received 7.5 t/ha FYM. Application of RPP recorded significantly taller plants (68.11 cm), higher dry matter production (204.90 g/m row length) and number of effective tillers (137/m row length) at 90 DAS and greater ear length (9.01 cm), higher number of grains (41/ear), grain weight (1.39 g/ear), (90.87 g/ m row length), 1000 grain weight (34.37 g), grain yield (2724 kg/ha), straw yield (4690 kg/ha), protein content (13.27%),

net returns (₹ 35104/ha) and B:C (2.62) compared to other treatments. Among the organic treatments, addition of 50% N through sheep manure (basal) + 50% N through PM (top dressing) recorded greater ear length (8.36 cm), higher number of grains (39/ear), 1000 grain weight (33.47 g),

grain yield (2610 kg/ha), straw yield (4491 kg/ha), protein content (12.83%) and net returns (₹ 32831/ha) compared to other treatments. The lowest growth and yield parameters were recorded by FYM 50% basal along with vermicompost (50%) top dressing.

Response of maize (*Zea mays* L.) hybrids to irrigation scheduling during rabi season in Malaprabha command area

CHIGIN ADAMU

2011

MAJOR ADVISOR: Dr. B. N. ARAVINDA KUMAR

A field experiment was conducted at Water Management Research Center (WMRC), Belvatagi, U.A.S, Dharwad during rabi 2010-11 to evaluate 'Response of Maize (*Zea mays* L.) Hybrids to Irrigation Scheduling During Rabi Season in Malaprabha Command Area'. The experiment was laid out in split plot design with three replications. The main plots consisted of four irrigation levels (0.4, 0.6, and 0.8 IW/CPE ratio and irrigation at critical growth stages of maize) and in subplots three maize hybrids [PEEHM-5 (extra early), PEHM-2 (early) and Cargill 900 M Gold (full season)] were used. The results of the experiment revealed that irrigation scheduled at 0.8 IW/CPE ratio recorded taller plants (198.77 cm), higher AGDM (259.56 g plant⁻¹), biological yield (197.05 q ha⁻¹), shelling percent (80.48 %), number of grains per row (22.40), cob length (14.97 cm), cob girth (45.10 mm) and 100-seed weight (28.20 g) over other irrigation treatments. The moisture stress due to 0.4 IW/CPE ratio resulted in more number of days to 50% tasseling (61.40), day to reach 50% silking (69.30) and tasseling – silking interval (8.44). Greater RWC was recorded in 0.8 IW/CPE ratio (82.53%) where as lower was recorded in irrigation at 0.4 IW/CPE ratio (75.24%). Significantly higher

photosynthetic rate was observed in maize genotype PEEHM-5 at critical growth stages irrigation (16.04 μmol dm⁻²s⁻¹). Irrigation at 0.8 IW/CPE ratio recorded maximum values of SPAD reading at 60 DAS (41.70) and 90 DAS (41.29). Higher grain yield (81.43 q ha⁻¹) was recorded in irrigation at 0.8 IW/CPE ratio followed by irrigation scheduled at critical growth stages of maize (71.68 q ha⁻¹). Among the genotypes tested, Cargill 900 M Gold recorded significantly higher grain yield (84.61 q ha⁻¹) over PEHM-2 (63.18 q) and PEEHM-5 (57.28 q). The interaction effect of irrigation levels and genotypes significantly influenced grain yield. The grain yield ranged from 35.27 q ha⁻¹ at 0.4 IW/CPE ratio x PEEHM-5 to 100.36 q ha⁻¹ at 0.8 IW/CPE ratio x Cargill 900 M Gold. WUE was higher (23.80 kg/ha-mm) in irrigation provided at critical growth stages of maize. Among the genotypes, Cargill 900 M Gold recorded significantly higher WUE (26.16 kg/ha-mm) over PEHM-2 (19.19 kg/ha-mm) and PEEHM-5 (17.25 kg/ha-mm). The result of genetic difference analysis revealed that the higher genetic diversity was observed between PEEHM-5 and PEHM-2 (0.74) followed by PEHM-2 and Cargill 900 M Gold (0.73) indicating moderate diversity in the hybrids.

Bioefficacy of pre-emergent herbicides on weed management in maize

SEEMANTINI NADIGER

2011

MAJOR ADVISOR: Dr. RAMESH BABU

Field investigations were carried out during kharif 2010 at UAS, Dharwad (Karnataka) to evaluate the bioefficacy of pre-emergent herbicides on weed management in maize. The experiment consisted of 10 treatments involving four pre-emergent herbicides viz., pretilachlor (1.00 and 1.5 kg/ha), oxyfluorfen (0.10 and 0.15 kg/ha), pendimethalin CS (0.675 and 1.00 kg/ha) and atrazine (1.25 kg/ha) in conjunction with one intercultivation (IC) at 30 DAS and one hand weeding at 45 DAS, farmers practice (2 HW + 2 IC), weed free check (3 IC + 3 HW) and weedy check. Results of the experiment revealed that pre-emergence application of oxyfluorfen either @ 0.10 or 0.15 kg per ha and atrazine @ 1.25 kg per ha significantly reduced the weed density (2.12, 1.47 and 1.47) and weed dry weight (1.74, 1.47 and 1.80 g) at 30 DAS. Weed control index was

significantly higher in these three treatments (84.09, 89.54 and 82.88) compared to rest of the treatments except weed free check at 30 DAS. Grain yield was significantly higher with the application of oxyfluorfen @ 0.10 (10523 kg/ha) and 0.15 kg per ha (10827 kg/ha) and atrazine @ 1.25 kg per ha (10436 kg/ha). Net returns and benefit:cost ratio were significantly higher with the application of oxyfluorfen @ 0.15 kg per ha (₹ 59572/ha and 2.72), which was on par with oxyfluorfen @ 0.10 kg per ha (₹ 57423/ha and 2.68) and atrazine @ 1.25 kg per ha (₹ 56845/ha and 2.68). The soil dehydrogenase activity was significantly reduced at 20 DAS in the treatments receiving higher doses of herbicides compared to their lower doses. But, it gradually increased after 40 DAS till 100 DAS indicating the increased microbial activity.

Response of multicut fodder sorghum (COFS-29) to row spacings and nitrogen levels under irrigated condition

MANJUNATH S. B.

2011

MAJOR ADVISOR: Dr. V. V. ANGADI

A field experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad in Northern Transition Zone (Zone 8) of Karnataka on clay soil to study the response of multicut fodder sorghum (CoFS-29) to row spacings and nitrogen levels under irrigated condition during 2010-11. The experiment was laid out in RCBD with factorial concept, there were 12 treatment combinations consisting of three row spacings (30, 45 and 60 cm) and four levels of nitrogen (120, 180, 240 and 300 kg ha⁻¹). Nitrogen at all levels is divided into six equal parts at sowing, 30 days after sowing and after each cutting four times. Phosphorus 40 and potassium 40 kg ha⁻¹ were applied at the time of sowing. The crop was harvested for green forage at 50 per cent flowering

in each treatment at all the cuttings. The row spacing of 45 and 60 cm recorded significantly higher total green fodder (153.9 and 149.2 t ha⁻¹, respectively) and total dry matter yield (36.28 and 35.18 t ha⁻¹, respectively) compared to 30 cm row spacing. Application of 300 kg N ha⁻¹ recorded significantly higher total green fodder yield (179.63 t ha⁻¹) and total dry matter yield (42.33 t ha⁻¹) compared to lower levels. Higher level of nitrogen improved the quality of fodder. Higher total green fodder yield (187.58 and 183.30 t ha⁻¹), total dry matter yield (44.2 and 43.2 t ha⁻¹), net returns (₹ 82763 and 80199 ha⁻¹), benefit cost ratio (3.78 and 3.69) and better quality parameters were observed with 45 and 60 cm row spacing, respectively with 300 kg N ha⁻¹.

Effect of herbicides on weed seed bank and productivity of maize (*Zea mays* L.)

SHANTVEERAYYA HAWALDAR

2011

MAJOR ADVISOR: Dr. C. A. AGASIMANI

A field experiment was conducted during Kharif season 2010 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to study the effect of herbicides on weed seed bank and productivity of maize. The results revealed that Atrazine (0.75 kg/ha pre-em) followed by 2,4-D (1.00 kg/ha post-em) at 30 DAS recorded significant reduction in weed seed bank and gave an excellent control of weeds followed by mechanical weeding. Significantly lower weed population, weed dry weight and higher weed control efficiency (WCE) was noticed in weed free check and Atrazine (0.75 kg/ha pre-em) followed by 2,4-D (1.00 kg/ha

post-em) during the different growth stages of crop. Significantly higher total weed dry weight was recorded in weedy check. Plant height, number of green leaves, LAI and total dry matter production was higher in Atrazine (0.75 kg/ha pre-em) followed by 2,4-D (1.00 kg/ha post-em). Significantly higher net returns (₹ 72992.50) and benefit : cost ratio (3.47) was recorded in Atrazine (0.75 kg/ha pre-em) followed by 2,4-D (1.00 kg/ha post-em). Application of Oxyfluorfen (0.25 kg/ha post-em) at 20 DAS showed phytotoxic effect on crop. The data on dehydrogenase activity and soil respiration revealed that at 60 and 90

DAS weed free check recorded highest dehydrogenase activity which was on par with sequential application of atrazine (0.75 kg ha⁻¹) followed by 2, 4-D (1.00 kg ha⁻¹) and post-emergent application of oxyfluorfen (0.25 kg ha⁻¹) but at harvest dehydrogenase activity was decreased. This

was mainly due to the lesser microbial activity at the harvest and lesser herbicidal residual activity at this stage. At recommended dose of herbicides initially stimulates but subsequently inhibits the dehydrogenase and soil respiration activity.

Sequential application of pre and post emergence herbicides in soybean (*Glycine max* L.)

VIJAYALAXMI G. S.

2011

MAJOR ADVISOR: Dr. S. M. HIREMATH

A field experiment to study the sequential application of pre and post emergence herbicides in soybean was carried out at Agricultural Research Station, Bailhongal during *Kharif* 2010. The experiment comprised of 15 treatments namely, Diclosulam 22 g/ha fb Imazethapyr 75 g/ha (T₁), Oxyfluorfen 0.1 kg/ha fb Imazethapyr 75 g/ha (T₂), Chlorimuron-p-ethyl 9 g/ha fb Imazethapyr 75 g/ha (T₃), Diclosulam 22 g/ha fb Quizalofop-p-ethyl 75 g/ha (T₄), Oxyfluorfen 0.1 kg/ha fb Quizalofop-p-ethyl 75 g/ha (T₅), Chlorimuron-p-ethyl 9 g/ha fb Quizalofop-p-ethyl 75 g/ha (T₆), Diclosulam 22 g/ha fb Fenoxypop-p-ethyl 75 g/ha (T₇), Oxyfluorfen 0.1 kg/ha fb Fenoxypop-p-ethyl 75 g/ha (T₈), Chlorimuron-p-ethyl 9 g/ha fb Fenoxypop-p-ethyl 75 g/ha (T₉), Imazethapyr 75 g/ha (T₁₀), Quizalofop-p-ethyl 75 g/ha (T₁₁), Fenoxypop-p-ethyl 75 g/ha (T₁₂), Chlorimuron-p-ethyl 9 g/ha fb Chlorimuron-p-ethyl 9 g/ha (T₁₃), Standard check (Alachlor 2kg+IC+HW) (T₁₄) and Weedy check (T₁₅). These treatments were laid out in RCBD with three replications. The weed control rating observed after pre and post emergence herbicides revealed good to excellent control of weeds except in Diclosulam (T₁, T₄ and T₇) and Quizalofop-p-ethyl (T₄, T₅, T₆ and T₁₁) treated plots. Diclosulam gave moderate control at 7 DAS but at 14 and 21 DAS it recorded good to

excellent control of weeds. The crop toxicity rating observed after pre and post emergence herbicides revealed none of the herbicides had any injury on the crop except Quizalofop-p-ethyl. Quizalofop-p-ethyl treated plots showed deficient to moderate control of weeds as well as slight discoloration of leaves at 7 and 14 days after post emergence spray. Weed count and dry weight was significantly lower in T₂, T₁₃, T₁, T₅, T₄, T₁₂, T₇, T₁₄ and T₁₁ when compared to weedy check at 30 and 60 DAS. Weed control index was significantly higher in the former treatments while nutrient removed by the weeds was least in these treatments. Seed yield was significantly higher in T₂, T₁₃, T₁, T₅, T₄, T₁₂, T₇, T₁₄ and T₁₁ than weedy check. The various growth (plant height, number of nodules per plant, leaf area index and total dry weight), yield (number of pods per plant, 100 seed weight and seed weight per plant) parameters followed the trend as recorded in seed yield. The nutrient uptake by crop was also higher in T₂, T₁₃, T₁, T₅, T₄, T₁₂, T₇, T₁₄ and T₁₁ than weedy check. The economics of the study revealed that Oxyfluorfen 0.1 kg/ha fb Imazethapyr 75 g/ha (T₂) recorded highest net income (₹ 41,030/ha) and benefit: cost ratio (3.18). The treatments namely T₁₃, T₁, T₅, T₄, T₁₂, T₇ and T₁₄ remained on par with T₂.

Performance of chickpea (*Cicer arietinum* L.) genotypes for green purpose to dates of sowing in northern transition zone of Karnataka

RAJSHEKHAR SARADAR

2011

MAJOR ADVISOR: Dr. C. P. MANSUR

A field experiment entitled Performance of chickpea (*Cicer arietinum* L.) genotypes for green purpose to dates of sowing in northern transition zone of Karnataka was conducted at Main Agricultural Research Station, Dharwad during late *kharif* season of 2004. Among the varieties, variety KAK-2 recorded significantly higher green seed yield (63.92 q/ha) and plant biomass yield (7,401.00 kg/ha). The significantly higher green seed yield of KAK-2 over the test varieties is contributed to higher values of yield component viz., higher test weight (56.47 g/100 seeds), seed yield per plant (19.19 g), number of seeds per pod (1.13) and higher pod biomass yield (21.69 g). Similarly higher plant biomass was due to significantly higher values of growth components viz., higher plant height (48.17 cm), more number of primary and secondary branches at harvest (18.30), higher dry matter accumulation in pods at harvest (9.68 g/plant) and higher total dry matter accumulation at harvest (18.16 g/plant). This increase in yield and yield attributing characters recorded in KAK-2 variety can be attributed towards higher leaf area

(5.47 dm²/plant) and higher leaf area index of 1.83 at harvest. Among the dates of sowing, chickpea sown on August 27th recorded significantly higher green seed yield (51.58 q/ha) and higher plant biomass (6,017.00 kg/ha) and was on par with August 13th sowing (49.54 q/ha, 5858.00 kg/ha respectively). This can be attributed to the significantly higher leaf area (4.13 dm²/plant) and leaf area index (1.37). For quality parameters, organoleptic evaluation is made. Among the different characters, taste and flavour recorded highest (4.4 and 4.4 respectively) for ICCV-2. The score for colour was recorded highest in BG-256 (4.5). Highest score for overall acceptability was recorded for ICCV-2 (4.4). Significantly highest protein content was recorded in variety ICCV-2 (24.33%) which was on par with variety KAK-2 (23.44%). The net returns and benefit cost ratio were recorded higher in variety KAK-2 (27,374 ₹/ha and 2.86 respectively). Among the dates of sowing, August 27th sowing recorded significantly higher net returns (20,648 ₹/ha) and benefit cost ratio (2.19).

Effect of pre and post emergence herbicides in groundnut (*Arachis hypogaea* L.)

ABDULRAJAK CHAPPARABAND

2011

MAJOR ADVISOR: Dr. U. K. HULIHALLI

A field experiment was conducted during *Kharif* season of 2010 at Agronomy experimental plot Main Agricultural Research Station, University of Agricultural Sciences Dharwad. To study the effect of pre and post emergence herbicides in groundnut. There were 11 treatments and laid out in randomized complete block design with three replications. Post emergence application of Imazethapyr @ 75, 100 and 125 g a.i. ha⁻¹ and Propaquizafop and Quizalofop-p-ethyl @ 100, 75 g a.i. ha⁻¹ respectively at 20 DAS recorded slight injury to the crop at 3 and 6 days after spraying and it was recovered at 9 days after spraying and there was no effect on crop growth and yield components of groundnut and the same result was followed in post emergence application of Imazethapyr @ 75, 100, and 125 g a.i. ha⁻¹ at 30 to 35 DAS. In groundnut weed control treatments differed significantly. Weed free check (T₁₀) recorded significantly higher pod yield, weed control efficiency and lower weed index and it was followed by integrated weed management

(IWM) i.e. pre emergence application of Alachlor @ 1.5 kg a.i. ha⁻¹ fb two intercultivation at 25 and 40 DAS fb one hand weeding at 40 to 45 DAS (T₉), pre emergence application of Alachlor @ 1.5 kg a.i. ha⁻¹ fb post emergence application of Imazethapyr @ 100 g a.i. ha⁻¹ at 30-35 DAS fb one intercultivation at 40 to 45 DAS (T₅) and Pre emergence application of Alachlor @ 1.5 kg a.i. ha⁻¹ fb post emergence application of Imazethapyr @ 125 g a.i. ha⁻¹ at 30 to 35 DAS fb one intercultivation at 40 to 45 DAS (T₆) and weedy check (T₁₁) recorded the significantly lower weed control efficiency, lower weed index and lower pod yield and lowest benefit cost ratio was recorded over all other treatments. Among the different weed control treatments pre emergence application of Alachlor @ 1.5 kg a.i. ha⁻¹ fb post emergence application Imazethapyr @ 100 g a.i. ha⁻¹ at 30 to 35 DAS fb one intercultivation at 40 to 45 DAS (T₅) recorded the significantly higher weed control efficiency and lower weed index and higher B:C ratio as compared to other treatments.

Response of wheat (*Triticum aestivum* L.) to organic nutrient management practices under irrigation

ABDUL WAHAB KHIRZAD

2011

MAJOR ADVISOR: Dr. H. B. BABALAD

A field experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad on a sandy clay loam soil under irrigation during *rabi* season of 2010-11 to study the response of wheat (*Triticum aestivum* L.) to organic nutrient management practices under irrigation. The experiment comprises of 12 treatment combinations which includes organic manures mainly enriched compost (EC), vermin compost (VC), and green leaf manure (GLM) applied recommended dose of nitrogen (RDN) and equivalent RDN+FYM in combination with liquid organic manures mainly cow urine, *jeevamrut*, bio digester, and *panchagavya*, were compared with RDF+FYM and RDF. The treatments were replicated thrice and laid-out in a Randomized Complete Block Design. Application of RDF + FYM and organics (EC + VC + GLM) equivalent to RDN + FYM + *panchagavya* @ 5% spray recorded significantly higher wheat yield. Similarly, these treatments showed significant superiority in growth and

yield components. Application of EC + VC + GLM equivalent to RDN without foliar spray of liquid organic manures recorded significantly lower yield. Nutrient uptake in wheat was significantly higher with the application of RDF+FYM and organics equivalent to RDN+FYM with *panchagavya* application. Soil properties mainly OC and available soil nutrients (N, P₂O₅ and K₂O) after harvest of wheat were significantly higher with the application of organic manures equivalent to RDN+FYM along with *jeevamrut* application. Significantly higher net returns were realized with organics (EC+ VC + GLM) equivalent to RDN + FYM with *Panchagavya* spray @ 5% in wheat. Benefit cost ratio was significantly higher with RDF alone. The study reveals that EC+VC+ GLM equivalent to RDN +FYM +*panchagavya* spray @ 5% significantly produced higher yield, net returns, nutrient uptake and available nutrient in soil after harvest and was comparable to RDF+ FYM in wheat.

Response of oat genotypes to seed rate and nitrogen levels on forage yield and quality under irrigation

ARAVIND NEELAR

2011

MAJOR ADVISOR: Dr. S. C. ALAGUNDAGI

Field experiment was conducted at University of Agricultural Sciences, Dharwad in Northern Transition Zone of Karnataka to study the effect of oat genotypes to seed rate and nitrogen levels on forage yield and quality under irrigation during *rabi* 2010-11. The experiment was laid out in randomized complete block design involving two genotypes (JHO-822 and OS-6), three seed rates (75, 100 and 125 kg ha⁻¹) and three nitrogen levels (90,120 and 150 kg ha⁻¹). FYM @ 7.5 t ha⁻¹ and nitrogen as per treatments along with 60:40 kg P₂O₅ and K₂O ha⁻¹ was applied and crop was harvested twice for green forage at 50 per cent flowering stage. Forage quality parameters were analysed on whole plant dry matter basis. The oat genotype JHO-822 produced significantly higher total green forage (57.21 t ha⁻¹) and total dry matter (10.87 t ha⁻¹)

compared to the genotype OS-6 (55.30 t ha⁻¹ and 10.51 t ha⁻¹, respectively). The seed rate of 125 kg ha⁻¹ produced significantly higher green forage (37.20 t ha⁻¹ during first harvest, 25.09 t ha⁻¹ during second harvest and 62.29 t ha⁻¹ total) compared to 75 and 100 kg ha⁻¹ seed rate. The nitrogen level of 150 kg ha⁻¹ produced significantly higher green forage (38.44 t ha⁻¹ during first harvest, 24.14 t ha⁻¹ during second harvest and 62.58 t ha⁻¹ for total) compared to 90 and 120 kg ha⁻¹ nitrogen. Significantly higher total green forage yield (73.83 t ha⁻¹), total dry matter yield (14.03 t ha⁻¹) with superior forage quality, net returns (₹ 28774 ha⁻¹) and benefit cost ratio (2.85) can be obtained with genotype JHO-822 with 125 kg ha⁻¹ seed rate at 150 kg ha⁻¹ nitrogen.

Integrated nutrient management in blackgram (*Vigna mungo* L.) in northern transition zone of Karnataka

RAJESHWARI H. J.

2011

MAJOR ADVISOR: Dr. G. B. SHASHIDHARA

Field experiment was conducted at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad in Northern Transition Zone of Karnataka on medium black clay soil to study the Integrated nutrient management in blackgram (*Vigna mungo* L.) in Northern Transition Zone of Karnataka. The experiment was laid out in split plot with three replications. The treatment comprised of four main plot (FYM @ 5 t/ha + RDF, vermicompost @ 1 t/ha + RDF, FYM @ 2.5 t/ha + RDF and RDF) and four sub plot treatments (DAP @ 2 per cent, 19; 19:19 @ 2 per cent, urea phos @ 2 per cent and water spray at 45 and 55 DAS). The soil was low to medium in fertility status. Application of vermicompost @ 1 t/ha / FYM 5 t/ha along with RDF recorded significantly higher grain yield (1117 ha⁻¹ and 1078 ha⁻¹, respectively) compared to RDF alone (778 ha⁻¹). The increase in the grain yield with vermicompost @ 1 t/ha / FYM 5 t/ha with RDF was to an extent of 43.57 and 37.70 over RDF treatment.

Foliar application of DAP @ 2 per cent at 45 and 55 DAS recorded significantly higher grain yield (1114 ha⁻¹) as compared to water spray (803 ha⁻¹). The increase in yield was up to 38.72 per cent as compared to control. The interactions between organics and foliar spray reveal that application of vermicompost @ 1 t/ha + RDF + DAP @ 2 per cent spray / FYM @ 5 t/ha + RDF + DAP @ 2 per cent recorded significantly higher (1300 ha⁻¹ and 1240 ha⁻¹ respectively) grain yield over RDF + water spray with a net returns of Rs.44711 and 43222 per ha, respectively. In similar way yield parameters viz., number of pods per plant and 1000-seed weight recorded significantly higher with vermicompost @ 1 t/ha / FYM 5 t/ha with RDF. The performance of all growth parameters, quality parameters and nutrient uptake was also significantly higher with vermicompost + RDF and FYM 5 t/ha + RDF with DAP @ 2 per cent foliar spray combinations.

Effect of secondary treated distillery spentwash as source of nutrient in Bt Cotton in northern transitional zone of Karnataka

SHYORAM

2011

MAJOR ADVISOR: Dr. S. S. ANGADI

A field experiment was conducted during *kharif* 2010-11 at the Main Agriculture Research Station, University of Agricultural Sciences, Dharwad to study the effect of secondary treated distillery spentwash as source of nutrient in Bt cotton in Northern Transitional Zone of Karnataka. Results revealed that application of 150 kg N ha⁻¹ through spentwash recorded significantly higher seed cotton yield (2566.1 kg ha⁻¹) than RDF, 150 kg N ha⁻¹ through fertilizers, RPP (RDF + FYM) and control. However former treatment was on par with the application of 100 kg N ha⁻¹ through spentwash. The yield components, growth parameters and nutrient uptake followed similar trend. Significantly, lower micronaire value (3.73) was recorded with the application of 25 kg N ha⁻¹ through spentwash + 75 kg N ha⁻¹ through fertilizers and RPP (RDF + FYM), but was on par with all spentwash treatments. Other quality parameters did not differ significantly. Similarly, highest chlorophyll content (1.23 mg g⁻¹ fresh weight) and lower Red Leaf

Index (1.21) was recorded on 1st December with the application of 150 kg N ha⁻¹ through spentwash than rest of the treatments followed by 100 kg N ha⁻¹ through spentwash. Significantly highest jassid (4.20), thrips (28.90) and aphids (5.21) population were recorded with the application of 150 kg N ha⁻¹ through fertilizers than the rest of the treatments. However, all application levels of spentwash was reduced the population of sucking insects. Similarly, significantly higher available soil nitrogen (272.7 kg ha⁻¹) and potassium (966.7 kg ha⁻¹) were recorded with the application of 150 kg N ha⁻¹ through spentwash. However it was on par with the application of 100 kg N ha⁻¹ through spentwash. Significantly highest EC (0.39 dS m⁻¹) was recorded with 150 kg N ha⁻¹ through spentwash. The study indicated that the application of 100 kg N ha⁻¹ through spentwash was found to be suitable with respect to soil properties, yield, fibre quality parameters and higher net return (₹ 94,343 ha⁻¹).

Response of fodder maize and cowpea mixed cropping to FYM, seed rate and nitrogen levels

DEEPAK V. KALEKAR

2011

MAJOR ADVISOR: Dr. Y. B. PALLED

A field experiment was conducted at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad in Northern Transition Zone of Karnataka on black clay soil to study the response of fodder maize and cowpea mixed cropping to FYM, seed rate and nitrogen levels during *kharif* 2010. The experiment was laid out in randomized complete block design with 16 treatment combinations consisting two FYM levels (10 and 20 t ha⁻¹), two seed rates (60 and 80 kg ha⁻¹) and four levels of nitrogen (100, 150, 200 and 250 kg ha⁻¹). The crop was sown in 30 cm rows. The common recommended dose of 75 kg P₂O₅ and 25 kg K₂O per ha was applied. Nitrogen, FYM and seeds were applied as per the treatment. The crop was harvested at milky stage. Biometric observations were recorded at harvest. The forage quality parameters were analyzed on dry

matter basis following the standard procedures. The FYM at 20 t ha⁻¹ recorded significantly higher total green forage and dry matter yield (67.22 and 18.01 t ha⁻¹ respectively) compared to 10 t ha⁻¹. The seed rate of 80 kg ha⁻¹ produced significantly higher green forage yield (69.88 t ha⁻¹) compared to 60 kg ha⁻¹. The nitrogen level of 250 kg ha⁻¹ produced significantly higher green forage and dry matter yield (69.78 and 19.94 t ha⁻¹) compared to 100, 150 and 200 kg ha⁻¹ nitrogen. Significantly higher total green forage yield (74.90 t ha⁻¹) and total dry matter yield (22.17 t ha⁻¹) were obtained at 20 t FYM ha⁻¹ with 80 kg ha⁻¹ seed rate and 250 kg N ha⁻¹. Whereas, maximum net returns (₹ 31300 ha⁻¹) and benefit cost ratio (2.68) were obtained at FYM 10 t ha⁻¹ with 80 kg seed rate ha⁻¹ and 250 kg N ha⁻¹.

Agrometeorological studies in maize and soybean intercropping system in northern transition zone of Karnataka

YOGESH SUBHASHRAO

2011

MAJOR ADVISOR: Dr. S. I. HALIKATTI

A field experiment was conducted to study the agrometeorological parameters in maize and soybean intercropping system in northern transition zone of Karnataka during *Kharif* 2010 at MARS, UAS, Dharwad. The experiment consisted seven treatments viz., T1: Maize+Soybean (1:1) at 60cm x 20cm, T2: Maize+Soybean (1:1) at 75cm x 20cm, T3: Maize+Soybean (1:1) at 90cm x 20cm, T4: Maize+Soybean (1:2) at 90cm x 20cm, T5: Maize+Soybean (2:6) at 90cm x 20cm, T6: Sole Maize crop 60cm x 20cm, T7: Sole soybean crop 30cm x 10cm was laid out in RCBD with three replications. Results revealed that throughout the crop growth period, the air temperature inside canopy was less than the top of canopy. The relative humidity showed reverse trend compared to air temperature in all the treatments throughout the cropping period. Sole maize and soybean recorded highest heat use efficiency (9.09 kg/ha 0C day and 3.03 kg/ha 0C day) than in their intercropping systems. At 30 DAS, the

highest NDVI was recorded in sole maize (0.65) which is on par with maize + soybean intercropped in 1:1 row ratio (0.64). But significantly lower NDVI (0.58) was found in maize + soybean intercropping in 1:1 and 1:2 row ratio with 90 cm x 20 cm geometry compared to other intercropping ratios. Maize under sole cropping recorded the highest grain yield (70.92 q/ha) which was significantly superior to all intercropping treatments but on par with intercropping of maize and soybean in 1:1 row ratio with 100 per cent population of maize and 50 per cent of soybean. Higher soybean yield (21.80 q/ha) was recorded in sole soybean. Among intercropping maize and soybean intercropping in 2:6 row ratio recorded the lowest LTR. Highest net return (₹ 57,926 ha⁻¹) B:C ratio (3.57) were obtained from two rows of maize intercropped with 6 rows of soybean. Also 2:6 row ratio recorded the higher LER (1.54), ATER (1.32) and maize equivalent yield 94.70 q/ha).

Effect of pre and post emergence herbicides on weed control in maize (*Zea mays* L.)

ISHRAT D. HAJI

2011

MAJOR ADVISOR: Dr. C. S. HUNSHAL

A field experiment was conducted to study the effect of pre and post emergence herbicides on weed control in maize (*Zea mays* L.) in clay loam soils on farmer's field in Hale Torgal village of Ramdurg taluk, Belgaum district during 2010-2011 under rainfed conditions. The experiment was laid out in randomized block design with three replications and ten treatments. Treatment combinations consisted of pre emergence application of atrazine 50 WP (1.25 kg ha⁻¹) followed by (fb) post emergence application of atrazine 50 WP (1.50 or 1.75 kg ha⁻¹), directed spray of paraquat 24 SL (1.0 or 1.5 kg ha⁻¹), glyphosate 41SL (2.5 or 3.0 kg ha⁻¹) and 2,4-D 80 WP (2.0 or 3.0 kg ha⁻¹) along with standard check (Atrazine 50 WP 1.25 kg ha⁻¹+2

intercultivation (at 30 and 45 DAS) + 1 hand weeding (between 30 and 45 DAS) and weedy check. Weedy check recorded the highest dry weight of the weeds whereas lowest was recorded in Atrazine 50 WP (1.25 kg ha⁻¹) fb glyphosate 41SL (2.5 kg ha⁻¹). Total number of weeds, weed control index followed the same trend. The higher maize yield was obtained with atrazine 50 WP 1.25 kg ha⁻¹ fb glyphosate 41SL 2.5 kg ha⁻¹ (5305 kg ha⁻¹) whereas weedy check recorded significantly lower maize yield (2342 kg ha⁻¹). The economics of weed management practices indicated that application of atrazine 50 WP (1.25 kg ha⁻¹) fb glyphosate 41SL (3.0 kg ha⁻¹) resulted in higher net returns (₹ 60702 ha⁻¹) and B: C (3.76) compared to rest of the treatments.

Studies on integrated weed management in maize (*zea mays* L.) under Ghataprabha command area

SHAILENDRA SINGH

2011

MAJOR ADVISOR: Dr. S. M. HIREMATH

A field experiment was conducted to study effect of pre-plant, pre-emergence and sequential application of various herbicides applied singly or as mixture along with two cover crops, weedy check and weed free check. In all there were 15 treatments replicated thrice. Crop-toxicity occurred in treatments with pre-emergence application of metribuzin 0.25 kg ha⁻¹, oxyfluorfen 0.15 kg ha⁻¹ and post-emergence application of oxyfluorfen 0.20 kg ha⁻¹ which recovered later. Significantly lower weed population, weed dry weight and weed index were noticed in weed free check, alachlor 1.00 kg ha⁻¹ followed by (fb) oxyfluorfen 0.20 kg ha⁻¹, oxyfluorfen 0.15 kg ha⁻¹, alachlor 0.50 kg ha⁻¹ + atrazine 1.0 kg ha⁻¹, metribuzin 0.25 kg ha⁻¹, atrazine 1.25 kg ha⁻¹ fb atrazine 1.50 kg ha⁻¹, atrazine 1.50 kg ha⁻¹, atrazine 1.00 kg ha⁻¹ fb 2, 4-D 2.00 kg ha⁻¹, atrazine

1.00 kg ha⁻¹ at all the crop growth stages. Cover crops smothered weeds at 60 DAS and onwards. Growth attributes, yield and yield attributes of maize were significantly higher in weed free check, atrazine 1.25 kg ha⁻¹ fb atrazine 1.50 kg ha⁻¹, alachlor 0.50 kg ha⁻¹ + atrazine 1.0 kg ha⁻¹, atrazine 1.00 kg ha⁻¹, atrazine 1.00 kg ha⁻¹ fb 2, 4-D 2.00 kg ha⁻¹, alachlor 1.00 kg ha⁻¹ fb oxyfluorfen 0.20 kg ha⁻¹ and atrazine 1.50 kg ha⁻¹. Significantly higher net returns and B:C ratio were recorded in atrazine 1.25 kg ha⁻¹ fb atrazine 1.50 kg ha⁻¹ (₹ 41514 ha⁻¹ and 2.88) glyphosate 1.00 kg fb 2, 4-D 2.00 kg ha⁻¹ (₹ 36139 ha⁻¹ and 3.15) and glyphosate 1.00 kg fb atrazine 375 g ha⁻¹ + alachlor 0.50 kg ha⁻¹ (₹ 31668 ha⁻¹ and 2.63) while they were lower in weedy check (₹ 13924 ha⁻¹ and 1.71) and weed free check (₹ 21354 ha⁻¹ and 1.48).

CROP PHYSIOLOGY

Influence of plant growth regulators and chemicals on physiology, yield and quality in chickpea (*Cicer arietinum* L.) genotypes.

NISHA N. S.

2011

MAJOR ADVISOR: Dr. C. M. NAWALGATTI

A field experiment was conducted during *rabi*, 2010-11 at College of Agriculture, University of Agricultural Sciences, Dharwad to study the effect of plant growth regulators and chemicals on physiology, yield and quality in chickpea genotypes. The experiment was laid out in split plot design with two genotypes *viz.*, BGD-103 and JG-11 and ten treatments in three replications. The treatments included three PG Rs and one chemical in two concentrations *i.e.* Progibb (20 and 40 ppm), CCC (500 and 1000 ppm), TIBA (100 and 200ppm) and salicylic acid (50 and 100 ppm) as foliar spray. Progibb increased the plant height significantly, whereas the growth retardants *viz.*, CCC and TIBA resulted in reduced plant height. The number of branches increased significantly with PGRs *viz.*, TIBA (100 and 200 ppm) and CCC (500 ppm). Progibb (40 ppm) hastened the days for flower initiation and 50% flowering. Significant

increase in the dry weight of leaf, stem, reproductive parts and total dry weight were observed with the application of PGRs. The growth parameters *viz.*, leaf area, LAI, LAD, SLW, BMD, CGR, AGR, RGR and NAR increased significantly with CCC (500 ppm). Application of CCC (500 ppm) enhanced the biochemical parameters *viz.*, chlorophyll 'a', chlorophyll 'b', total chlorophyll and NRA, while no significant differences were recorded in seed protein content. The results on various yield and yield attributes indicated that the entire yield contributing characters *viz.*, seed yield per plant, number of pods per plant, 100-seed weight and harvest index were significantly higher with CCC (500 ppm) followed by TIBA (100 ppm) in both genotypes. From the economic point of view, CCC (500 ppm) was more profitable in terms of net returns.

Effect of zinc application in *rabi* sorghum genotypes for early vigour and its relationship with zinc content and productivity

HAREESH MARIGOUDAR

2011

MAJOR ADVISOR: Dr. R. V. KOTI

In an attempt to study the relationship between seed zinc content and seedling vigour, thirty *rabi* sorghum genotypes were sown with additional zinc during *rabi* 2009-10. In high vigour genotypes the total dry matter at 30 DAS ranged from 11.32-12.35g plant⁻¹ and in low vigour types it ranged from 8.25-8.84g plant⁻¹. Among these high vigor genotypes like Kadabin jola, DSV-4, SEVS-24, M-35-1, EC-19, Byahatti local and 5-4-1 had seed zinc content >3.05 mg100g⁻¹ and low vigour types EC-32, Koppal-4, Kamalapur, AKGMR 36-36 and Nadad N-1 <2.65 mg100g⁻¹. Thus there was correlation between seedling vigour and seed zinc content. In another experiment, to enhance the seed zinc content in selected genotypes, the experiment comprised of three zinc levels as main plot treatments (T₁-control, T₂-zinc sulphate @ 10 kg/ha and T₃-zinc sulphate @ 10 kg/ha in combination with organic (1t/ha) at the time of sowing along with

recommended dose of NPK) and genotypes as sub plots. Results revealed that soil application of zinc and zinc with organic increased leaf area, TDM, SPAD values, chlorophyll content, grain yield and seed zinc content irrespective of both high and low vigour types. Leaf and root zinc content at 30 DAS and at flag leaf stage was higher in high vigour types than in low vigour types. Application of zinc with organic significantly increased the seed yield by 23.4% and seed zinc content by 23.64% as compared to zinc alone and control. High vigour genotypes were superior to low vigour genotypes for seed zinc content, seed yield and dry matter accumulation. Irrespective of zinc treatments, the high vigour types showed higher zinc uptake and accumulation in the grains compared to low types. The high vigour types *viz.*, Kadabin jola and DSV-4 had significantly higher yield and high seed zinc content as compared to other genotypes.

Evaluation of strobilurin on growth, physiology and productivity in soybean [*Glycine max* (L.) Merrill]

SHWETA BANAKAR

2011

MAJOR ADVISOR: Dr. D. I. JIRALI

A field experiment was conducted during *kharif* 2010 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad, to study the effect of strobilurin on growth, physiology and productivity in soybean using factorial randomized block design with three replications. The experiment consisted of four genotypes (JS-335, KHSb-2, DSb-1 and DSb-11) and three foliar applications of strobilurin (150 g/ac, 175 g/ac and 200 g/ac) and a control. In all there were 16 treatment combinations. Significant differences were observed in morphological, growth, physiological, biochemical, yield and yield parameters with application of Strobilurin. Among the treatments, strobilurin @ 200 g/ac exhibited superiority over rest of the treatments, while giving a better response to most of the yield contributing characters such as more number of branches, more number of nodes, more leaf area, more TDM, higher percentage of

drymatter partitioning into economically useful parts, higher AGR, CGR, SLW, LAI, LAD, BMD, higher photosynthetic rate, higher chlorophyll content, higher SOD activity, higher Ascorbic acid content, higher Phenol content, more NRA, and more protein, ultimately resulting into more number of pods per plant, more number of seeds per pod, 100 seed weight and thus resulting in higher seed yield. Among the genotypes, DSb-11 gave highest seed yield (37.14 q/ha), followed by JS-335 (35.22 q/ha) with application of strobilurin @ 200 g/ac compared to control (30.73 q/ha). The application of strobilurin improved the morphological, growth, physiological, biochemical and yield parameters. Irrespective of the treatments the yield increase was to the tune of 12.50 per cent. Thus, it is inferred from the above study that the foliar application of the fungicide strobilurin is quite effective and can be used in increasing the seed yield in soybean.

Influence of organics on growth, development and yield of clusterbean genotypes

MEENA L. K.

2011

MAJOR ADVISOR: Dr. B. B. CHANNAPPAGAUDAR

A field experiment was conducted at the Main Agricultural Research Station, College of Agriculture, University of Agricultural Sciences, Dharwad during *Kharif* 2009-10 to study the influence of organics on growth, biophysical, biochemical and yield and yield attributes in clusterbean genotypes. The experiment was laid out in a split plot design with 3 replications. Main plot treatments consisted three genotypes *viz.*, Local, Pusa Navbahar (Improved variety) and SARPAN-101 (Hybrid). Sub-plot treatments includes different organic sources of nutrients *i.e.* neem seed cake, poultry manure, vermicompost and FYM. The morphological characters *viz.*, leaf dry weight and stem dry weight were higher in Local genotypes at all the growth stages. Among the organic treatments leaf dry weight was higher in poultry manure while stem dry weight was higher in FYM treatment. The dry weight of edible part was highest with poultry manure treatment in SARPAN-101 at all the growth stages. Total dry matter

accumulation was highest in SARPAN-101 at 60 and 90 DAS. The LAI was found superior in Local genotype with poultry manure. The growth parameters like AGR, CGR and RGR were highest in SARPAN-101 with poultry manure treatment at 30 DAS, while at 60 DAS, these were highest in Local genotypes with FYM treatment. The NAR was highest in SARPAN-101 with FYM treatment. The photosynthetic rate and chlorophyll contents were higher in hybrid (SARPAN-101) in combination with poultry manure treatment compared to an improved variety and Local, while NRA was higher in Local genotype with poultry manure treatment. The compact, non-branching, erect plant with cluster of fruits on every node observed in SARPAN-101 was an indicative parameter to establish a strong genetic relation among all yield and yield components and physiological parameters. The yield and yield attributes like number of pod per plant, pod yield and harvest index were

found superior in SARPAN-101 with poultry manure treatment whereas, shelling percentage was higher in Local genotypes with FYM treatment.

The highest B:C was also recorded in SARPAN-101 with poultry manure treatment.

Influence of organics on growth, yield and quality of tomato (*Lycopersicum esculentum* L. Mill.)

ARAHUNASHI C. S.

2011

MAJOR ADVISOR: Dr. B. B. CHANNAPPAGAUDAR

A field experiment was conducted at the Main Agricultural Research Station, College of Agriculture, University of Agricultural Sciences, Dharwad during rabi 2009-10 to study the Influence of organics on growth, yield and quality of tomato (*Lycopersicum esculentum* L. Mill.). The investigation was carried in random block design with 14 treatments in 3 replications. Treatments include different organic sources of nutrients i.e. compost, FYM, green leaf manure, poultry manure, sheep manure and vermicompost alone and their combinations compared with RDF alone and RDF+FYM. The morphological characters mainly total dry matter accumulation, plant height, number of branches, canopy spread, leaf area and physiological parameters like leaf area index (LAI), leaf area duration (LAD) and biomass duration (BMD) were significantly higher with RDF+FYM, organics mainly FYM, compost, poultry manure and sheep manure applied equivalent to RDN as compared to only inorganic fertilizer, green leaf manure and control in all growth stages. The growth parameters

like AGR and CGR were highest with the application of RDF+FYM followed by poultry manure at 30 to 60 DAT, while at 60 to 90 DAT AGR and CGR were higher with the application of poultry manure combined with vermicompost. The net assimilation rate, photosynthetic rate and chlorophyll contents were higher with the application of RDF+FYM followed by poultry manure, which were on par with other organic manures except green leaf manure and its combination with vermicompost. The quality parameters like ascorbic acid content, lycopene content, protein content, reducing sugar content, TSS, pH and shelf life were significantly higher with the application of poultry manure. The fresh fruit yield of tomato was found superior with the application of RDF+FYM followed by poultry manure, all other organic manures shows on par results except green leaf manure and its combination with vermicompost, RDF only and control. Net returns were significantly higher with RDF+FYM, on par with rest of the treatments except green leaf manure, RDF and control.

The effect of distillery spent wash fertigation on growth, physiological traits and yield of groundnut

DARMALINGAIAH D.

2011

MAJOR ADVISOR: Dr. M. B. DODDAMANI

The treated distillery spentwash is a nutrient rich liquid organic waste generated as a by product after the distillation of molasses. It is also a very good source of readily available major and micronutrients. Recently, the presence of appreciable quantity of plant growth promoters viz., gibberellic acid and indole acetic acid have also been detected which further enhance the nutrient value of spentwash. Groundnut cultivation is often plagued by the non availability of soil nutrients during critical stages of its growth. In view of this, an experiment was conducted at main agricultural research station (MARS), University of Agricultural Sciences, Dharwad during Kharif 2010. Treated distillery spentwash was fertigated in three splits based on the nitrogen requirement of groundnut. Since treated spentwash contains 0.25-0.3, 0.03-0.06, 0.75-1.0 % of NPK, additional required amount of phosphorous was supplied through spentwash fertigation. Application of 1.5 times recommended dose of nitrogen (RDN) through spentwash significantly increased the plant

height, leaf area, leaf area duration, total dry matter, chlorophyll content and nitrate reductase activity. Yield and yield components like number of seeds per pod, number of pods per plant, test weight, harvest index were also favorably influenced with the application of spentwash. Higher seed yield (3100.9 kg ha⁻¹) was recorded with 1.5 N through spentwash which was on par with 1.5 N through fertilizer (3046.6 kg ha⁻¹), indicating the beneficial effect of treated distillery spentwash on crop growth and yield in groundnut. Presence of higher organic compounds in treated spentwash may also bring significant changes on the biological properties of soils. However, beneficial effect of spentwash was evident in the present study with respect to soil enzyme activities and post harvest nutrient status in soil. The activity of soil enzymes like phosphatase and urease increased as the amount of effluent applied from 0.25 N to 1.5 N indicating the beneficial effect of treated distillery spentwash on soil health also.

Evaluation of groundnut genotypes for drought tolerance using line-source sprinkler irrigation technique

VIDHYADAR S. HIREMATH

2011

MAJOR ADVISOR: Dr. B. T. NINGANUR

Fifteen groundnut genotypes (ICGI-0734, ICGV-07322, ICGV-07076, ICGV-07273, ICGV-07394, ICGV-91114, ICGV-00350, ICGV-07328, TMV-2, R-8808, JL-24, GPBD-4, GPBD-5, Dh-86 and ICGV-0035) were screened in five moisture levels (+11.70 to 43.69%) using line source sprinkler irrigation technique (LST) during post rainy season of 2010-2011. The growth, phenological, physiological, biochemical parameters were recorded at different stages of crop growth. All the parameters recorded lower values as the level of moisture stress increased. The correlation studies indicated that the yield showed significant positive relationship with days to maturity ($r = 0.87^{**}$) at 90 DAS, number of primary branches ($r = 0.63^{*}$) at 90 DAS, leaf area ($r = 0.74^{*}$) at 90 DAS, leaf area duration ($r = 0.73^{*}$) between 60-90 DAS, leaf area index ($r = 0.76^{*}$) between 30-60 DAS, crop growth rate ($r = 0.79^{*}$) between

30-60 DAS, absolute growth rate ($r = 0.92^{*}$) between 30-60 DAS and dry matter accumulation ($r = 0.69^{*}$) at harvest. Similarly the biophysical parameters like relative water content ($r = 0.62^{*}$) at 60 DAS, chlorophyll stability index ($r = 0.73^{*}$) at 120 DAS and the biochemical parameters like nitrate reductase activity ($r = 0.66^{*}$) at 90 DAS and reducing sugar ($r = 0.66^{*}$) at 90 DAS. The results revealed that the TMV-2 recorded the highest biomass, MDI, WUE, and yield followed by ICGV-91114, ICGV-07328, R-8808, GPBD-4, Dh-86 and ICGV-00351 were found to be drought tolerant based on biomass MDI, WUE and yield. These genotypes possessed lower LA, moderate plant height, higher levels of RWC, total sugars, nitrate reductase activity, water use efficiency and chlorophyll stability index. Hence, these indices may be used either to screen or to develop drought tolerant groundnut genotypes.

Refining INFOCROP model for drought severities in cotton

SOMASHEKHARGOUDA PATIL

2011

MAJOR ADVISOR: Dr. B. C. PATIL

About 66 per cent of the cotton grown in India is rainfed, as a result there will be water deficiency stress of varying level at one or other stages. Even in irrigated condition, there will be water deficiency at some stages. In recent times, several systems of integration of multiple factors to forecast the impact of certain agricultural inputs/factors controlling growth on yield are available. This system is called simulation model. INFOCROP model is a generic model that integrates variety, soil, environmental and management practices. The present study aimed at refining this model for moisture stress situation envisaged both analysis and use of historical data (from 1996-2010) of cotton as well as weather data of Dharwad

location apart from experiments in field and rain out shelter during 2010-11. The historical rainfall data of Dharwad showed bimodal distribution of rainfall, the peaks being observed during July and October. In cotton as water deficit stress increases the yield decreases in linear trend. The INFOCROP model overestimates the yield to an extent of 8.79 per cent. The INFOCROP model simulated more number of days for phenological observations viz., anthesis (80 days) and maturity (177 days). The simulated boll weight is less than observed. Similarly INFOCROP model showed 16 percent more leaf area index in irrigated and 5.6 per cent in rainfed condition. The boll weight deviated to an extent of 40 per

cent. During 2010-11 in the present study there was 16 per cent decrease in yield in rainfed condition as compared to irrigated condition. There was decrease in growth and yield parameters. Thus considering the overall

performance of the INFOCROP model, it predicts the yield to 91 per cent of accuracy and hence it can be used in the evaluation of inputs and factors controlling growth for yield prediction in cotton.

EXTENSION AND COMMUNICATION MANAGEMENT

Impact of national rural health mission on rural mothers and children

VEENA CHANDAVARI

2011

MAJOR ADVISOR: Dr. CHHAYA BADIGER

Health is a vital indicator of human development. The present study was conducted during the year 2010-2011 in Dharwad block of Karnataka state. Purposive random sampling technique was used for selection of four blocks in Dharwad taluk *i.e* Garag, Mugad, Alnavar and Hebballi where the Primary Health Centres are located. Random sampling procedure was used for selection of 210 respondents, which includes 150 mothers of below poverty line, 30 community leaders and 30 block level health official. Cent per cent of the village women were aware of the facts that all the village women preferred hospital delivery as it is very safe. The overall opinion index of rural mothers towards selected health programmes was quite high that is 77.32 per cent. Mothers had appreciable knowledge about safe delivery in the Government hospital. Cent per cent rural mothers have adopted immunization schedule for children. Majority of the mothers are facing problems in Prasooti Arai

Programme (96.66%) which are benefits are limited only to 2 deliveries, incentives and cheques are not given in time. While in Janani Suraksha Yojana mothers suggested to provide well equipped labour room, timely monitoring and supervision by the staff. Majority of the community leaders realised problems like untimely implementation of the programmes, not providing incentives at right time, no improvement in the infrastructure of PHC, neglecting the patients by the staff, staff coming late and going home early. Majority of the community leaders suggested to give the madilu kit in time (96.00%). Cent per cent of the officials faced the problem of lack of knowledge and awareness of rural people followed by beneficiaries who are not having essential documents to claim the incentives of the programmes. Majority of the health officials suggested (93.33%) to provide timely in-service trainings to update their knowledge.

Knowledge and attitude of rural people about the national rural employment guarantee scheme(NREGS)

SHWETA KYATANAGAODAR

2011

MAJOR ADVISOR: Dr. SHOBHA NAGNUR

The research study was conducted during 2010-11 in Dharwad district of Karnataka state. In Dharwad taluk five panchayats were selected. Data was collected from one village from each of the panchayats, with a sample of 270 beneficiaries and 135 non-beneficiaries. Knowledge and attitude of the rural people regarding NREGS was studied. The findings revealed that there was significant difference between NREGS beneficiaries and non-beneficiaries with regard to knowledge ($t=55.86$) and attitude ($t=97.50$) of the NREGS. Ninety seven per cent of the beneficiaries had high knowledge about NREGS while only 3.7 per cent of non-beneficiaries had high knowledge. About 94.00 per cent beneficiaries had favourable attitude towards NREGS while none of the non-beneficiaries had a positive attitude towards the programme. Most beneficiaries had favourable attitude because having registered for the work, they had high knowledge and better understanding of the social advantage of the programme. With regards to asset creation,

beneficiaries were satisfied with the works taken up, like rural connectivity, construction of school compounds and flood control and protection which have greatly benefited the community. Beneficiaries faced some problems like, lack of sufficient work-site facilities like drinking water and crèche for women with young children. Suggestion for improvement of the programme were sought from the beneficiaries. About 93 per cent suggested that there should be increased wages and 70 per cent beneficiaries said that the number of working days should be increased beyond 100 days per year. The findings would therefore call for educating rural people about NREGS so that more number of people become aware about the programme. This would motivate larger number of rural folk to take advantage of the beneficiaries of this programme. The government should also note the shortcomings as posed by beneficiaries so that the programme would be more meaningful to the indented rural families.

FOOD SCIENCE AND NUTRITION

Impact of nutrition education on management of hypertension

SHILPA GUDDAD

2011

MAJOR ADVISOR: Dr. USHA MALAGI

An investigation was undertaken with an objective to test the knowledge, develop nutrition education material and assess its impact on management of hypertension. About 100 hypertensive subjects were selected from out patient department of Spandana hospital and from various Mahila mandals of Dharwad city. Demographic profile, dietary habits, history of disorder, lifestyle factors, and knowledge level were assessed using pre tested questionnaire. The blood pressure and lipid profile of the hypertensives were assessed by using standard procedure. An educational material (booklet) on management of hypertension was developed both in English and Kannada consisting of different lesson plans related to hypertension and its

management. The education intervention was carried out for a period of 90 days. The interventions were given in the form of i) booklet alone ii) booklet with education and iii) with no intervention for control group with 15 subjects in each group. Nutrition education brought about improvement in knowledge (+43.52%), dietary habits and blood pressure (from 152/86 to 146/82 mm Hg) of hypertensive subjects. These changes were more prominent in intervention group II compared to intervention group I. It can be concluded that nutrition education to hypertensives in the form of booklet and education in a phase wise manner has a significant impact in the management of hypertension.

Feeding practices and nutritional status of infants and nursing mothers of muslim community from rural and urban areas of Dharwad

FARZANA A. SHAIKH

2011

MAJOR ADVISOR: Dr. B. KASTURIBA

A study entitled "Feeding practices and nutritional status of infants and nursing mothers of Muslim community from rural and urban areas of Dharwad" was carried out in 2010-2011. The study was conducted on 70 nursing mothers and infants belonging to Muslim community. The objectives of the study were to assess the existing knowledge, attitude and practices of nursing mothers about infant feeding and to assess the nutritional status of nursing mothers and their infants. Information on knowledge, attitude and practices of the mothers about infant feeding was

collected by a structured questionnaire. Nutritional status was assessed by anthropometry, diet survey, biochemical analysis and clinical examination. Results showed that non significant association between the knowledge, attitude and practices of mothers with locality. Prolonged breast feeding and late introduction of weaning foods was observed in rural infants compared to urban. The mean anthropometric measurements of infants showed that upto 9 months of age the anthropometric values were higher in rural infants compared to urban. According to Waterlow's classification,

more number (82.85%) of urban infants were found in normal category compared to rural (45.71%). With regard to muac, more number (85.71%) of urban infants were in normal group compared to rural (37.14%). According to hc/cc ratio, 71.42 per cent of urban and 54.28 per cent of rural infants were found in normal group. Prevalence of clinical symptoms were seen more (25.7%) in rural compared to urban infants (11.42%).

Screening of potato varieties for chemical composition and processing

HABUNG GANGA

2011

A total of ten potato varieties viz., Kufri Chipsona-2, Atlanta, Kufri Surya, Kufri Pukhraj, Kufri Khayti, Kufri Jyoti, Kufri Pushkar, Kufri Bahar, Kufri Ashoka and J/99-242 were analysed for different physico-chemical attributes and processing quality during 2010-11 at UAS Dharwad. The length, breadth, mass, volume and specific gravity of the potato varieties were found to be optimum for processing. Reducing sugar, non reducing sugar, total sugar and moisture contents ranged between 55.13-210 mg/100g, 104.43-711.90 mg/100g, 216.1-816.6 mg/100g and 78.87-84.33 mg/100g respectively. The dry matter and starch content of potatoes ranged between 15.30 g/100g-20.93 g/100g and 52.55 g/100g-85.67 g/100g respectively. Among the varieties, Kufri Khayti had optimum moisture (79.00±0.20 g/100g), dry matter (20.93±0.12 g/100g), starch (85.67±1.57 g/100g), reducing sugar (75.9±5.77 mg/100g), non reducing sugar (140.77±6.90 mg/100g), total sugar (216.67±1.15 mg/100g), colour score (2) and thus was found to be

About 40 per cent of rural and 31 per cent of urban mothers were having ideal bmi. Analysis of diet survey revealed that the intake of all the nutrients except niacin was less compared to rda, in both the groups. Hemoglobin assessment showed that anaemia was present (>90%) in both the groups. Clinical symptoms were found more in rural compared to urban mothers.

MAJOR ADVISOR: Dr. UMA N. KULKARNI

suitable for processing. Chips prepared from potato slices of 1.8mm width, dried for 9 mn, fried at 185 °C for 4 mn were found to be optimum. Potatoes weighing 121g to 160 g, cooked at 15 lb/inch² pressure for 20 mn were highly acceptable. The optimum baked potatoes were obtained by baking potatoes (101g to 140g), at 100 P for 4 mn in microwave oven. Screening of tuber varieties for chips preparation revealed that Kufri Khayti with lowest peel loss (2.84%), highest yield of raw slice (91.9%) and chips yield (24.6%) was found to be optimum. Among the varieties screened both J/99-242 Kufri Khayti had less flesh loss (0.96%-1.6%), optimum doneness and acceptable sensory profile and thus were found to be optimum for pressure cooking. Varieties Kufri Khayti and Kufri Bahar had less flesh loss (6.7%-10.4%) and maximum doneness and thus were ranked first among the screened tubers for microwave baking.

Educational strategies to improve the nutritional status of pregnant women of Hubli rural and its outcome

ANNAPURNA SANGALAD

2011

A study was carried out among 77 pregnant women (46 in I-trimester and 31 in II-trimester) from four villages of Hubli taluk of Dharwad district to test the impact of educational intervention on nutritional status and pregnancy outcome. Nutritional status was assessed before and after nutrition education (six sessions of 1 to 2½ hours). Mean height, weight and MUAC of subjects were 149.40 and 149.96cm; 43.28 and 46.89kg; 22.73 and 23.43cm, in I and II trimesters respectively. According to BMI 47.83 and 42.39 per cent subjects in I and II trimesters respectively were normal, while 97.83 and 90.32 per cent were suffering from anemia. After intervention, mean weight and MUAC increased from 43.34 to 48.21kg and from 23.5 to 24.87cm respectively while, such an increase was not evident in control group. The average gain in weight in experimental and control groups was 4.71 and 2.56 kg. Hemoglobin content

MAJOR ADVISOR: Dr. PUSHPA BHARATI

increased from 9.46 to 9.90 after education in experimental group with a reduction in anemia from 94.74 to 89.47 percent, whereas negative shift was observed in control group. Consumption of cereals, roots and tubers, GLVs, fruits and milk increased in women receiving education. Significant enhancement in the intake of energy and blood forming nutrients was observed in the women of experimental group, as against lower increase in control group. Before education, 42.11 per cent of the women never consumed IFA tablets while, after education 42.11 per cent of the women consumed 91 to 100 tablets followed by 39.25 percent consuming 51 to 90 tablets. In control group 48.72 per cent consumed less than 50 tablets, no change was observed after three months. The birth weight of infants was 3 kg in experimental group and 2.52 kg in control group.

Awareness creation and efficacy testing of omega 3 fatty acid rich food

SNEHA SHET

2011

Omega 3 fatty acids are polyunsaturated fatty acids essential for growth, development, health and reduce risks of metabolic disorders. A study was conducted to create awareness about significance of omega 3 fatty acids among 103 urban women (20-70 years) from five different locations of Dharwad. Efficacy of omega 3 rich food on lipid profile of 12 hyperlipidemic women volunteers was tested through dietary intervention of 90 days. Nutrition education materials viz., booklet, pamphlet, charts and power point slides depicting significance of omega 3 fatty acids were developed in both English and Kannada language. Education sessions included lectures, discussions, demonstrations and exhibition. Two educational sessions were conducted with an interval of 15 days. Omega 3 rich foods viz., *chapathi*, *laddu*, and *chutney* powders incorporating flaxseed (*Linum usitatissimum*) a richest plant source of omega 3 fatty acid

MAJOR ADVISOR: Dr. BHARATI CHIMMAD

(22.8g/100g) were promoted in daily diet. Gain in knowledge was evaluated using an open ended questionnaire. Results indicated a significant gain in knowledge, besides a positive change in terms of omega 3 fatty acid enrichment of diets among the respondents. Omega 3 fatty acid rich *chapathi* was the most acceptable (67.98%). Dietary intervention with omega 3 rich *chapathi* among hyperlipidemics revealed significant reduction in total cholesterol (12.20%), triglycerides (15.29%), low density lipoprotein cholesterol (13.85%), very low density lipoprotein cholesterol (12.00%). High density lipoprotein cholesterol increased by 3.41 per cent. The decrease in ratio of TC: HDL-C (15.00%) and LDL-C: HDL-C (17.20%) were observed. The systolic blood pressure decreased by 7.83 per cent after intervention. The study indicated beneficial impact on knowledge gain and improvement of lipid profile.

Nutritional status and school adjustment of juvenile diabetics

PRIYA WADAWADGI

2011

An investigation on the "Nutritional status and school adjustment of juvenile diabetics" was undertaken in the year 2010-2011 to record the prevalence of juvenile diabetes in Hubli and Dharwad cities according to registry, to assess the nutritional status in terms of anthropometry and nutrient adequacy. School adjustment was assessed in terms of social, emotional, educational adjustment, by a scale developed by Sinha and Singh (1997), academic performance and participation in extracurricular activities was assessed by a structured questionnaire. Thirty juvenile diabetics aged below 18 years were selected randomly, equal number of age, gender and region matched subjects

MAJOR ADVISOR: Dr. B. KASTURIBA

served as controls. The study revealed that there is an increasing incidence of type I diabetes in children, growth is retarded in diabetic children and belonged to underweight category (40%) due to lower adequacy of nutrients, imbalanced intake of nutrients and poor metabolic control. Poor metabolic control was evident in higher percentage of diabetics as evidenced by FBG (63.33%) and PPBG (76.66%). Life style changes such as insulin therapy, frequent visits to clinics, making suitable food choices, frequent missing of schools, make juvenile diabetic children different from the normal peer group and thus resulting in lower academic achievement and poor social, emotional and

educational adjustment. Doctors, dieticians and parents have to play a significant role in tackling these problems. Hence, education regarding nutrition, coping skills, treatment adherence and control of disease,

psychological interventions can be imparted to the children with diabetes and their parents so that they can lead a healthy and normal life as that of their peers.

Development of foxtail millet based breakfast muffin

ASHWINI GARWADHIREMATH

2011

MAJOR ADVISOR: Dr. G. S. SHARADA

Foxtail millet (*Setaria italica*) is one of the important small millets. Compared to cereals, this millet has several desirable nutritional attributes, such as dietary fiber, protein, trace elements and phytochemicals. In the present investigation foxtail millet based breakfast muffin was developed and evaluated for its nutrient adequacy. The foxtail millet based muffin was standardized for optimum addition of foxtail millet flour to refined wheat flour, sugar, fat, egg and baking powder by varying quantity and evaluated organoleptically for acceptability of suitable proportion by semi-trained panellists. The developed muffin was enriched by addition of dehydrated papaya powder at different levels and assessed for proximate composition, trace elements and total α -carotene content. Shelf-life was assessed for moisture, free fatty acids and organoleptic characteristics. The developed millet muffin was tested for acceptability of consumers in comparison with refined wheat flour muffin. Standardization trials indicated that foxtail millet flour could be incorporated at 50 per cent and 5 per cent decrease in fat in the standard recipe and further enriched with 10g of papaya powder, to yield acceptable breakfast muffin. Nutrient analysis revealed that, the moisture, protein,

fat, ash, crude fiber and carbohydrate contents of refined flour breakfast muffin was 24.95, 12.87, 24.80, 0.67, 0.11 and 36.59 per cent respectively. Replacement of foxtail millet flour significantly increased the nutrient composition of breakfast muffin. Foxtail millet muffin was found superior nutritionally compared to refined wheat flour muffin as it increased the protein, crude fiber and mineral contents by 12.5, 90 and 28 per cent respectively. Copper zinc and iron contents increased by 34.5, 24.5 and 49.9 per cent respectively. Further enrichment of foxtail millet muffin with dehydrated papaya powder significantly increased the copper, zinc, and iron by 30, 5 and 41 per cent respectively. The total carotene content of refined wheat flour breakfast muffin was 124.60 $\mu\text{g}/100\text{g}$, with incorporation of foxtail millet flour and enriched with papaya powder, the total α -carotene content increased by 93% (291.36 $\mu\text{g}/100\text{g}$). The developed foxtail millet based breakfast muffin possessed the shelf-life of 4 days. The enriched foxtail millet breakfast muffins were liked very much by the consumers. Thus, local underutilized small grains can be incorporated to enrich the nutritional quality of convenient foods.

FLORICULTURE AND LANDSCAPING

Effect of pulsing and vase solution on vase life of Heliconia

NARASIMHAMURTHY. H.

2010 MAJOR ADVISOR: Dr. B. SATHYANARAYANAREDDY

The investigation were carried out during 2009-2010 to know the effect of pulsing with different antimicrobial agents on vase life of heliconia flowers in the Department of Floriculture and Landscaping at K.R.C.C.H, Arabhavi, University of Agricultural Science, Dharwad. Pulsing of heliconia cv. Golden Torch with 20 per cent sucrose + 200 ppm CoCl_2 for four hours Showed favourable results with respect to water uptake, water loss, water balance and fresh weight which ultimately led to increased vase life (16.33 days) respectively when compared to control (11.67 days). Holding of heliconia cv. Golden Torch in solutions having 2 per cent sucrose + 2 mM silver thio sulphate resulted in improved water uptake, water loss, water balance, and fresh weight which ultimately led to increased vase life

(18.33 days) when compared to control (11.67 days). Pulsing of heliconia cv. Golden Torch in solutions having 20 per cent sucrose + 200 ppm CoCl_2 for four hours and holding in 2 per cent sucrose + 2 mM silver thio sulphate Showed favourable results with respect to Water uptake, Water loss, Water balance and fresh weight which ultimately led to increased vase life (16.00 days) respectively when compared to control (11.50 days). Holding of heliconia cv. Golden Torch in solutions having 2 per cent sucrose + 5 per cent tulsi leaf extract resulted in improved water uptake, water loss, water balance, and fresh weight which ultimately led to increased vase life (15.00 days) when compared to control (11.67 days).

FORESTRY

Evaluation of forest plant products against teak defoliator, *Hyblaea puera cramer* (Hyblaeidae : Lepidoptera)

SEEMA P. A.

2010

MAJOR ADVISOR: Dr. S. K. PATIL

Teak (*Tectona grandis*) is a species of worldwide reputation as paragon among timber species. It belongs to the family Verbenaceae and is distributed predominantly in tropical and subtropical regions. It is being attacked by two serious lepidopteron pests namely the defoliator, *Hyblaea puera* Cramer (Hyblaeidae: Lepidoptera) and Skeletonizer, *Eutectona machaeralis* Walker (Lepidoptera: Pyraustidae). Present study was under taken to test the efficacy of some locally available plant products against *H puera*. 25 plant species belonging to 20 families are widely used in management of various pest and diseases of crop plants by farmers of Sirsi and Siddapur region of Uttara Kannada district. High crude extract yield can be obtained by using ethanol and acetone solvents for *Strychnos nux-vomica*, *Azadirachta indica* and *Gnidia glauca* while, *Euphorbia acaulis* and *Datura stromonium* yield more in distilled water. Petroleum ether extracts of *E. acaulis* and *G. glauca* cause maximum egg hatch inhibition.

Among the solvent systems, petroleum ether extracts have highest ovicidal action at higher concentration level and acetone extracts at lower concentration. Distilled water extracts of *E. acaulis* and *A. indica* cause maximum larval mortality on third instar larvae. Aqueous and ethanol extracts of *D. stromonium* cause highest larval mortality of on fourth instar larvae of *H puera*. Majority of the plant products show very high antifeedant activity against the pest irrespective of concentration level. Petroleum ether extracts of *E. acaulis* and *D. stromonium* cause maximum loss in larval weight after 24 h on third instar larvae, after 48 h by acetone extract of *G. glauca*. Distilled water extract of *E. acaulis*, *D. stromonium* and acetone extract of *S. nux-vomica* cause maximum loss in larval weight of fourth instar larvae. The ethanol plant extracts contained more phytochemical groups. Extracts with higher phenolic content have very good biological activity against the pest.

Standardization of nursery techniques in *Strychnos nux-vomica* and *Lannea coromandelica*

DEEPAK A. C.

2010

MAJOR ADVISOR: Dr. B. S. JANAGOUDAR

Strychnos nux-vomica and *Lannea coromandelica* are the major plant species in the Western Ghats. These two are species gaining more popularity because of high medicinal value. In recent years, the demand for nursery grown seedlings of these two species has increased immensely for planting under various planting programmes. So there is need to produce healthy and

vigorous seedlings in short duration and need to standardize the optimum quantity of nutrients to enhance the growth of container seedlings. With these points in view the present study was carried out in College of Forestry, Sirsi during 2008-2010. The results revealed that among the various pre-sowing treatments, the treatment of alternate wetting and drying for 14

days in cold water (62.00%) in *Strychnos nuxvomica* and chemical scarification along with GA₃(100ppm) in *L. coromandelica* (68.89 %) showed significantly maximum germination per centage and also mean daily germination, peak value, germination value, germination rate of seedling over control. Application of 20g poultry manure along with red soil, sand and farm yard manure in the ratio of 2:1:1, significantly increased the

seedling growth attributes viz., seedling height, collar diameter, number of leaves, root length, number of lateral roots, total fresh and dry weight by 106.22, 76.74, 78.85, 41.30, 105.60, 87.71, 65.65 per cent in *Strychnos nuxvomica* respectively, similarly, 58.35, 48.83, 81.29, 108.48, 151.65, 33.30, 39.65 per cent in *L. coromandelica*, respectively at 180 days after planting when compared to control.

Macro and micropropagation of *Salacia chinensis*

CHAITRA M. S.

2011

MAJOR ADVISOR: Dr. B. S. JANAGOUDAR

Salacia chinensis is one of the important medicinal climber found in moist deciduous and evergreen forest. The genus *salacia* belongs to family Celastraceae. The family is principally pan tropical consisting of woody lianas, shrubs and trees. It is widely distributed throughout the world except for arctic regions. The roots of many *salacia* are utilized in the various traditional systems of medicine has antidiabetic drug. Its becoming popular now a days because of its medicinal properties. The roots are acrid, bitter, thermogenic, urinary astringent, anti inflammatory and used in treatment of diabetes. It contains two potent α -glucosidase inhibitors: Salicinol and Kotalanol 9. In view of standardizing macro and micropropagation of this commercially important species a study on seed germination, vegetative propagation techniques through stem, root cuttings and air layering and callus induction using different explants was carried out at college of forestry, Sirsi during 2009-2010. Among the different treatments tried pre sowing

treatments influenced seed germination significantly up to 37 days and the maximum seed germination of 69.00 per cent was found in GA₃ at 300 ppm for 6hr soaking. The other germination parameters like mean daily germination, peak value, and germination rate were also found to increase significantly over control. In vegetative propagation stem cuttings showed maximum sprouting and rooting per cent when treated with IBA 2000 ppm for 1 min and root cuttings in keradex treatment. In air layering the maximum callusing and rooting per cent was observed in coumarin 300 ppm for 5 min. Among stem, root cuttings and air layering, root cuttings were found better with maximum transplantation success. The callus induction was achieved in MS medium fortified with 6-Benzyl Amino Purine (0.125mg/l) and 2,4-Dichloro phenoxy acetic acid (1mg/l) using stem nodal explants. Pretreatment with both a fungicide and an anti biotic is required for establishing the aseptic *in vitro* cultures.

Investigation on phenology, yield and quality traits among tamarind (*Tamarindus indica* L.) clones

RUBIN B. R.

2011

MAJOR ADVISOR: Dr. S. K. PATIL

India is a country where land degradation and soil moisture deficit are the concerns to already impoverished farming communities. In arid and semi-arid areas of the country, domestication and promotion of multipurpose trees species that are adapted to water deficient areas is greatly important. *Tamarindus indica* L. which establishes well in poor shallow soils, thrives under dry climate and provides wide array of useful products is one such species which deserves sufficient attention in support of selection and improvement. Keeping these points in view the present study was carried out in Main agricultural research station, University of Agricultural Sciences, Dharwad to assess 14 tamarind clones with respect to their phenology, yield, quality traits and tree characteristics and to select suitable ideotype for agroforestry. Highest fruit set percents were recorded from

the clones NTI-84 (16.14), NTI-31 (14.00) and NTI-79 (10.06) which have flowered during the mid and late in the season. A fruit yield of more than 30 kg per tree was recorded from the clones SMG-13, NTI-14, NTI-79. Tree height and diameter at breast height were not found vary significantly across most of the clones. Least crown diameter was recorded from the clone NTI-79 (5.52 m) and maximum was recorded from the clone NTI-14 (7.05 m). Maximum number of branches was recorded for the clone PKM-1 (12.62). Branch angle ranged between 39° (NTI-79) and 66° (PKM-1). Maximum light intensity per cent was recorded for the clone NTI-79 (6.73 %) and the minimum was recorded for the clone NTI-15 (3.44%). The clones NTI-79, NTI-5 and NTI-80 have shown promising agroforestry ideotype characters.

Mapping, regeneration assessment and development of quantitative descriptors for wild pickle-mango genetic resources of central western ghats

TESFAYE ASHINE ABEBE

2011

MAJOR ADVISOR: Dr. R. VASUDEVA

Wild pickle-mangoes are special type of genetic resources, with unique effervescent property, found predominantly along the riparian forests of the Central Western Ghats, Karnataka and extensively wild-harvested by people. Because of the deep cultural attachment, people have recognized several hundred pickle-mango types from the wild habitats. As a result, farmers of Central Western Ghats have shown interest in bringing these genetic resources under cultivation; however, there are very few attempts to domesticate wild pickle-mangoes. Thus, the study aimed to assess the regeneration status, describe the variations in fruit traits and develop fruit ideotype characters for genetic improvement of these resources in two geographically distinct populations from Sirsi and Siddapur localities. The distribution of regenerating individuals into different size classes showed a typical reverse 'J' shape with few individuals in the higher class indicating failure of seedlings to advance. Highly significant and continuous tree-to-tree variation was found in all

economically important fruit and kernel traits considered with fruit mass ranging from (15.50-84.27 g), flesh mass (13.93-79.91 g), kernel mass (1.37-8.93 g); fruit length (28.23 - 102.51 mm); kernel length (20.43-55.59 mm), skin thickness (0.87-1.25 mm) flesh depth (5.27-11.62 mm), fruit width: length ratio (0.34-0.85), indicating the potential for selection of superior trees. Considerable tree-to-tree variation in fruit aroma, keeping quality, fruit shape and fruit sourness was also observed. Principal Component Analysis suggested that every wild pickle-mango population may represent a divergent population each with unique set of traits which needs to be conserved. Based on the responses of the consumers/ farmers / collectors, an ideal pickle-mango type would be expected to have minimum size, elongated shape, cumin aroma, high quantity of latex, very strong sourness and excellent keeping quality. Two trees from Sirsi (SIR 03 and SIR 30) and one tree from Siddapur (SID 52) locality were close to this ideotype.

Effect of moisture conservation measures and nutrient management on growth of *Eucalyptus pellita* in Dharma watershed

SHIVAPUTRA BAMMANAHALLI

2011

MAJOR ADVISOR: Dr. G. V. DASAR

On global scale soil moisture conservation methods have been recognised to play an important role in solving the problem of erosion, siltation of lowlands and retaining the productivity of lands. Soil moisture and nutrients are critical for better growth. There is need to diverse suitable techniques of soil moisture conservation and also nutrient management. A field experiment

was carried out at farmers field, Dasankoppa of Sirsi taluk during 2010-2011 on Effect of Moisture Conservation Measures and Nutrient Management on growth of *Eucalyptus pellita* in Dharma Watershed with four main treatments viz., Trapezoidal Staggered Trench, Conservation Pit, Ring Trench and Control and four sub treatments viz., 200:100:200 N,

P₂O₅, K₂O Kg/ha, 250:125:250 N, P₂O₅, K₂O Kg/ha, 125:75:75 N P₂O₅, K₂O kg/ha+ FYM (5 t/ha) and Control with all the combinations. Significantly higher plant height increment was recorded in Trapezoidal staggered trench with 200:100:200 N, P₂O₅, K₂O kg/ha from 3 to 12 months after treatment (1.27 to 5.25 m). Plant diameter increment (4.48 cm) and crown diameter increment (10.86 cm) noticed significantly higher in Trapezoidal staggered trench with 200:100:200 N, P₂O₅, K₂O kg/ha 12 months after treatment.

Influence of *in-situ* moisture conservation measures and organic manures on growth of *Eucalyptus pellita*

CHANDRAKANT H. HIPPARAGI

2011

MAJOR ADVISOR: Dr. G. V. DASAR

Soil and water conservation measures are one of the most important factors for the improvement of degraded lands. The rainy season is usually short but occasional rainfall can take the storm of high intensity leading to heavy surface runoff and loss of water in flood spates. Water conservation technique is to achieve the maximum cultivated soil for the survival and growth of seedlings. There is need to diverse suitable techniques of *in-situ* soil moisture conservation and organic manures. A field experiment was carried out at Dasankoppa of Sirsi taluk during 2010-2011 on Influence of *In-situ* Moisture Conservation Measures and Organic Manures on growth of *Eucalyptus pellita* with four main treatments viz., Staggered Trench, Ring basin, Half ring basin and Control and four sub treatments viz., Farm yard manures (5 t/ha), Vermicompost (2.5 t/ha), Poultry manures (1.25 t/ha) and control with all the

combinations. The significantly higher plant height increment was recorded in Trapezoidal staggered trench with 200:100:200 N, P₂O₅, K₂O kg/ha 12 MAT. Soil moisture content at 0-30 cm depth in treatment receiving Trapezoidal staggered trench with 200:100:200 N, P₂O₅, K₂O kg/ha was maximum 12.43 % at 10 months after treatment and Soil moisture content at 30-60 cm depth in Trapezoidal staggered trench with 125:75:75 N, P₂O₅, K₂O kg/ha+ FYM (5 t/ha) was 13.16 per cent.

combinations. The significantly higher plant height increment was recorded in Staggered trench with Poultry manure (1.25 t/ha) from 3 to 12 months after treatment (1.25 to 5.96 m). Number of branches (25.33) and volume increment (11.503 m³/ha) recorded significantly higher in staggered trench with poultry manures (1.25 t/ha) at 12 MAT. Soil moisture content at 0-30 cm depth in treatment receiving staggered trench with vermicompost (2.5 t/ha) was maximum (12.40 %) at 10 months after treatment. In combination of staggered trench with Vermicompost (2.5 t/ha) had recorded significantly lower bulk density and particle density (1.18 and 2.30 g/cc respectively). Staggered trench with vermicompost had recorded significantly higher on organic carbon (0.80 %), pH (5.92), available nitrogen (281.26 kg/ha), phosphorus (36.77 kg/ha) and potassium (191.87 kg/ha) over the other treatments.

Species diversity and impact assessment of watershed development project in devargadde sub-watershed

SNEHAL VIJAY KHAPNE

2011

MAJOR ADVISOR: Dr. A. G. KOPPAD

Uttar Kannada district is bestowed with higher forest resource constituting 76 per cent of total geographical area and 13 per cent under cultivation which is also diverse. The region harbors at least 1741 species of flowering plants and 420 species of the birds and other wildlife. Thus, it is necessary to assess the species diversity in this area. The present study indicated that the vegetation in the treated area was found to have comparatively higher species diversity as compared to that of the untreated area IVI in tree species *Xylia xylocarpa* was found to be dominated in the treated area, while in the untreated area the highest IVI was seen in *Strychnos nuxomica*, IVI of herbs was found more in *Brassica juncea* in treated and *Datura metel* untreated area. The IVI in case of shrubs in the treated area, the highest was found in case of *Demodiu gangeticum*, while that in case of untreated area

Clerodendrum serratum. Maximum IVI was recorded in the treated area as compared to that of the untreated area. The critical observation of cropping pattern indicated that the area under paddy was relatively less in the treated area 32.60 per cent compared to untreated area 57.64 per cent. In the treated area the area under horticultural crops increased by 67.39 per cent as compared to 42.35 per cent in untreated area. The gross cropped area was more in case of treated area (22.9) acre compared to untreated area (13.41) acre. Cropping intensity enhanced 167.39 per cent in the treated area. The income group for the large farmer ranges above ₹ 176515.8 in treated and relatively low ₹ 143383.3 in the untreated area. Thus the overall benefit cost ratio which was derived in the treated area was higher (3.59) as compared to the untreated area.

Studies on seed biology, pre-sowing treatments and nutrient response in *Melia dubia* Cav.

JIYAS JAMALUDEEN LEBBA

2011

MAJOR ADVISOR: Dr. A. KRISHNA

Melia dubia Cav. is a species of high medicinal and industrial economic value commonly referred as Malabar Neem Tree. Recently this species is gaining more popularity in India for its fast growth and wide adaptability in diverse edaphic and climatic conditions. And the demand for nursery grown seedlings of this species has increased immensely among farmers. So there is need to produce large stock of healthy seedlings, by appropriate pre-sowing treatment and by applying optimum level of nutrients. For this, information on its seed biology and standardized nursery techniques is very essential. With this point in view the present study was carried out in College of Forestry, Sirsi during 2010-2011. In the present study the selected population of *Melia dubia* starts flowering at the month of January. The fruit setting starts on the month of April and maturation occurs in the month of January in succeeding year. The average fruit length was

22.52 mm and the thickness was about 13.42 mm. The fruit volume of *Melia dubia* was found to be 1.50 cm³ and its density was 1.23g/cm³. The average weight of fruit was recorded to be 1.85 grams and seed test weight was 185.52 grams. The predominant shapes found in the fruit of this species were ovate. Out of eleven different pre-sowing seed treatments tried, the maximum germination percentage (44.67%) was recorded in cow dung treatment for 5 days over control. The other quality indexes viz, mean daily germination, peak value, germination value, germination rate of seedling also high in this treatment. Application of NPK 1:1:1 (Sampurna 19:19:19-1.0 g/seedling) significantly increased the seedling growth attributes viz seedling height, number of leaves, collar diameter, root length, total fresh and dry weight by 60.90, 57.78, 69.46, 56.63, 19.88, 15.90 per cent respectively at 90 days after planting when compared to control.

Standardization of nursery techniques in *Hydnocarpus pentandra* (Buch -Ham)

MANASIR. NAVALE

2011

MAJOR ADVISOR: Dr. K. S. CHANNABASAPPA

Hydnocarpus pentandra is one of the species from genus *Hydnocarpus* valued for its seed oil. Oil is used for treatment of leprosy and is effective in decreasing size of nodules, anaesthetic patches, skin lesions and antihelminthic action against human tapeworm. Due to high medicinal properties of this oil, exploitation of fruits from wild is going on leading threat to regeneration of this species. Hence there is urgent need to commercialize this species and this requires knowing seed storage period, development of techniques to produce seedlings in short duration and combination of nutrients to apply

to get sturdy, vigorous seedlings for plantations. With this point of view present study was carried out at college of forestry Sirsi during 2010-2011. Out of the thirteen pre sowing treatments given, treatment of alternate wetting and drying in Cowdung slurry for fifteen days gave maximum germination (72.67 per cent) and also other germination parameters like mean daily germination, peak value, germination value and germination rate over control. Seed storage studies revealed that seeds can be stored up to 150 days with (15 %) germination and after this they lost viability

completely. Application of NPK (1:1:1) 1g each with 5g mycorrhiza significantly increased seedling growth attributes viz seedling height, collar diameter, number of leaves and leaf area by 32.34, 55.80, 54.19 and 61.27 per cent over control also root length, length of lateral roots, number of

lateral roots, total fresh weight and total dry weight increased by 38.35, 53.44, 169.45, 146.17 and 114.72 per cent due to same treatment at 180 days after planting over control. Hence fertilizers can be used in combination of biofertilizers to get good quality seedlings.

Studies on variation for root traits, alkaloid content and *in vitro* regeneration in *Rauwolfia serpentina* (L.) Benth.

PAMPOSH MOHAN KOUL

2011

MAJOR ADVISOR: Dr. B. S. JANAGOUDAR

Rauwolfia serpentina a highly important medicinal plant is known from many centuries. This plant is facing a high threat from various kinds of poachers in the wild due to improper ways of collection as well as almost no conservation strategy. However sustainable harvesting of plant parts of various genotypes leads to a massive conservation of germ plasm imparting vividness in relevance to diversity of the concerned species. Along with this there is a huge need for *in vitro* propagation and timely assessment of alkaloid content. The plant height, number of inflorescence, shoot length, root length and root fresh weight was significantly influenced due to the genotypes at different growth stages. Genotype SRS 1 recorded significantly higher plant height (73.31 cm) along with higher root length (34.09 cm) and significantly higher root fresh weight (15.94 gm). Whereas, KMT 2 recorded significantly higher shoot length (43.71 cm) and SRS 2 recorded significantly higher number of inflorescence (3.16). Explants were pretreated with fungicidal solution of bavistin (1%) for time duration of 30 minutes

followed by immersing in 0.05 % mercuric chloride for 3 minutes along with 50 % (v/v) sodium hypochlorite for 2 min proved to be the best surface sterilant. MS medium supplemented with IBA 0.125 mg/l + BAP 1.0 mg/l was found to be best suited for callus induction from both leaf and stem explants. Similarly, MS medium supplemented with IBA 0.125 mg/l + BAP 1.0 mg/l results in maximum shoot proliferation from both apical as well as from nodal bud explants. High reserpine content was noticed in the roots of genotype SRS 1 while it was low in genotype SRS 3. MS media supplemented with 2, 4-D 0.250 mg/l + BAP 1.0 mg/l accumulates high reserpine content and media supplemented with 2, 4 D 0.125 mg/l and BAP 1.5 mg/l results in very low reserpine content for callus cultures of leaf explant. Whereas, MS media supplemented with 2,4-D 0.125 mg/l + BAP 1.0 mg/l accumulates high reserpine content and media supplemented with IBA 0.125 mg/l + BAP 1.5 mg/l results in very low reserpine content for callus cultures of stem explant.

Effect of moisture conservation structures, manures and fertilizers on growth of *Acacia auriculiformis*

SANTOSH SUMBALI

2011

MAJOR ADVISOR: Dr. A. G. KOPPAD

Moisture and nutrients are basic resources for the growth and productivity of trees. Conservation of soil moisture, application of manures and fertilizers helps for growth and productivity of trees. A field trial was conducted to investigate the effect of moisture conservation structures, manures and fertilizers on growth of *Acacia auriculiformis* in Hegdekatta Watershed area of Uttar Kannada district during 2010–2011. The plantation of three year old *Acacia auriculiformis* was selected and experiment was planned with split plot design. The moisture conservation structures were imposed as a main plot treatments viz., Continuous contour trenches (0.5 m Width X 0.3 m Depth), Ring basin (0.6 m Radius or 1.2 m Diameter) and Half ring basin (0.6 m radius). Application of manures and fertilizers viz., FYM (Farmyard manure-5 t/ha), Vermicompost (2.5 t/ha), Poultry manure (1.25 t/ha), Biofertilizers (Mycorrhiza + Azotobacter +

Phosphorus solubilizing bacteria-30 g each/plant) and RDF (Recommended Dose of Fertilizers - NPK 200:100:100 + FYM- 5 t/ha) as a subplot treatments. The plant growth parameters viz., Plant height, diameter at breast height, collar diameter and number of branches were recorded at every three month interval. The results indicates that significantly highest current annual increment of *Acacia auriculiformis* plantation was observed in Ring Basin + RDF (45.56 m³) and lowest was observed in control (17.80 m³). The soil moisture was drawn at the depths of 0-30 cm and 30-60 cm at every month interval. The significantly higher soil moisture at depth of 0-30 cm and 30-60 cm was conserved by Continuous Contour Trenches + RDF (20.07% and 22.05%) as compared to control (17.04% and 18.53%). The increased current annual increment was due to higher per cent of moisture conservation, application of manures and fertilizers.

GENETICS AND PLANT BREEDING

Evaluation of groundnut (*Arachis hypogaea* L.) genotypes and RILs for foliar disease resistance, nutritional quality and productivity traits under organic cultivation practices

KRISHNAMURTHY D.

2011

MAJOR ADVISOR: Dr. P. V. KENCHANAGOUDAR

The ten genotypes viz., Dh 4-3, Dh 86, Dh 2000-1, Dh 101, Mutant III, JL 24, TMV 2, TGLPS 3, GPBD 4 and GPBD 5 were evaluated for yield and quality traits under organic, inorganic and integrated cultivation to identify the genotype suitable for organic farming. Genetic variability in two mapping populations, derived from TG 49 x GPBD 4 (187 RILs) and TG 19 x GPBD 4 (86 RILs) was assessed by growing them under organic condition at MARS, Dharwad. Dh 4-3, GPBD 4 and TGLPS 3 genotypes recorded significantly superior pod yield, kernel and oil yield compared to best check TMV-2. In organic cultivation Dh 4-3, GPBD 4 and TGLPS-3 recorded higher pod yield coupled with disease resistant of LLS and rust. Test weight was significantly higher in Mutant-III and GPBD-5. The oil content was significantly more in GPBD 4 and TGLPS 3 followed by Dh 86, Dh 4-3, JL 24 and mutant II. For protein content was significantly more

in organic compared to integrated and inorganic cultivation. The genotypes GPBD 4, Dh 4-3, Dh 2000-1 and GPBD 5 recorded significantly for protein content. High PCV, moderate GCV, moderate heritability and low genetic advance was recorded for pod yield, Moderate PCV and GCV recorded for 100-seed weight, GCV and PCV for rust and LLS revealed significant variation indicating moderate to high level of variability for TG 49 x GPBD 4 population in which 1-27 Transgressive segregant observed for combination of traits. In population TG 19 x GPBD 4, low heritability and genetic advance was observed pod yield. Test weight recorded moderate PCV, GCV and high heritability. GCV and PCV for both the diseases revealed significant variation. Low PCV and GCV, high heritability and low genetic advance were recorded for protein and oil in both populations.

Evaluation of advanced generation genetically introgressed lines for fibre traits in cotton (*Gossypium* spp.)

VITHOBA M. CHOUDKI

2011

MAJOR ADVISOR: Dr. I. S. KATAGERI

Higher rate of success in crop improvement has been achieved due to the presence of high genetic variability. Genetic variability is generated through intra, interspecific crosses and mutation breeding. In the present study, advanced generation recombinant lines obtained from different interspecific

crosses were evaluated at ARS, Dharwad Farm, during 2009-10, under Augmented Design-II. The data obtained was mainly discussed on genetic variability and *per se* performance of recombinant lines. Recombinant lines of *G. hirsutum* x *G. barbadense* cross: Genetic variability was significant

for seed cotton yield, yield contributing and fibre quality traits except plant height, uniformity ratio and fibre elongation. Top four recombinant lines namely HBS-115 (2360 kg/ha, 24.68 g/tex), HBS-232 (1642 kg/ha, 24.83 g/tex), HBS-23 (1617 kg/ha, 28.23 g/tex) and HBS-114 (1317 kg/ha, 27.28 g/tex) recorded significantly higher seed cotton yield and fibre strength than Sahana (high yielding check, 1214 kg/ha, 21.30 g/tex) and MCU-5 (quality check, 912 kg/ha, 20.00 g/tex) respectively. About 48 RIL's were screened using RAPD markers and distributed in different clusters with lowest and highest record of similarity coefficients 0.38 and 0.93, respectively. Recombinant lines of *G. herbaceum* x *G. anomalum* cross: Genetic variability was significant for seed cotton yield; all yield contributing and fibre quality traits. Top five recombinant lines namely PSCANOI-166 (1896 kg/ha, 20.75 g/tex), PSCANOI-173 (1777 kg/ha, 20.45 g/tex), PSCANOI-170 (1761 kg/ha, 21.85 g/tex), PSCANOI-42 (1737 kg/ha, 21.45 g/tex) and PSCANOI-5 (1703 kg/ha, 19.55 g/tex) recorded significantly

higher seed cotton yield and fibre strength than DDhC-11 (702 kg/ha, 17.63 g/tex) and DLSa-17 (1236 kg/ha, 20.16 g/tex). Recombinant lines of *G. herbaceum* x *G. barbadense* cross: Genetic variability was significant for seed cotton yield, yield contributing and fibre quality traits except seed index, ginning outturn, lint index, uniformity ratio, micronaire and fibre elongation. Top five recombinant lines namely PSCCOL-32 (2525 kg/ha, 18.3 g/tex), PSCCOL-36 (2356 kg/ha, 19.2 g/tex), PSCCOL-30 (2279 kg/ha, 19.5 g/tex), PSCCOL-31 (2253 kg/ha, 18.4 g/tex) and PSCCOL-62 (1725 kg/ha, 18.2 g/tex) recorded significantly superior fibre strength and seed cotton yield than DDhC-11 (987 kg/ha, 17.10 g/tex) and they also recorded significantly higher seed cotton yield than DLSa-17 (1124 kg/ha, 20.40 g/tex). Recombinant lines of *G. herbaceum* x *G. anomalum* cross were more superior than RILs of *G. herbaceum* x *G. barbadense* cross in both seed cotton yield and fibre quality. It indicated that *G. anomalum* is more desirable as a donor parent.

Genetic studies in *Gossypium barbadense* L. cotton for productivity

DEEPIKA M.

2011

MAJOR ADVISOR: Dr. S. S. PATIL

Gossypium barbadense species of cotton proved to be better in quality but poorer in yield compared to other cotton species, the present study was undertaken for evaluating intra barbadense F_1 s and varieties aiming at better yield and better pollen germination. Four intra barbadense crosses and six generations (P_1 , P_2 , F_1 , F_2 , B_1 and B_2) of each cross were subjected to generation mean analysis. Results showed that majority of the traits were influenced by non-additive gene action and the crosses exhibited heterosis and heterobeltosis for yield and important yield attributing traits such as number of bolls, boll weight, lint yield and number of sympodia. Cross RAB 531 x RAB 533 with highest magnitude of dominance and highest per cent mid parent heterosis of 26.4 per cent for seed cotton yield. Heterosis and Combining ability studies for yield characters in twenty four barbadense F_1 s were carried out. None of the F_1 s surpassed the commercial check DCH-32

in yield and it is noted that among the four testers studied RAB 533 appeared to be the best general combiner and among the six lines PIMA 54 appeared to be the best general combiner. Cross ICB 181 x RAB 533 had significant positive heterosis of 30.67 per cent over mid parent. Variability studies in eighteen three way cross F_1 s were taken up and was observed that higher heritability coupled with high genetic advance was noticed in seed cotton yield and plant height which gives an indication of predominance of additive genetic effects in controlling the character. A basic pollen germination study was taken up in twenty four barbadense F_1 s and their parents. The parents and hybrids showed significant differences with respect to the pollen germination percentage. Crosses RAB 532 x USA 206, RAB 531 x USA 788, RAB 532 x USA 788 had better per cent pollen germination over standard check DCH 32.

Evaluation of double cross derived lines for their combining ability of fruit yield and its component traits in okra [*Abelmoschus esculentus* (L.) Moench]

LAXMAN MALAKANNAVAR

2011

MAJOR ADVISOR: Dr. G. SHANTHAKUMAR

Okra is an economically important vegetable crop, has good nutritional value particularly vitamin C (30 mg/100 g), Ca (90 mg/100 g) and iron content (1.50 mg/100 g) in edible fruit. An investigation was made to study magnitude of heterosis, combining ability, path of productivity, heterotic grouping and the evaluation of selected genotypes for disease resistance and iron content. The F_1 's were obtained by crossing the ten newly derived inbred lines in full diallel design. Analysis of variance of parents was significant for fruit yield and yield traits. Maximum standard heterosis of 79.59 per cent for fruit yield per hectare was observed in cross 18 x 5, followed by 5 x 37 (67.38%) and 37 x 16 (56.33%) over Pusa Sawani. The crosses like 4 x 5, 5 x 37, 6 x 37, 16 x 2, 22 x 6 and 12 x 6 had maximum standard heterosis for traits like number of fruits per plant, 100-seed weight, number of seeds per fruit, fruit length and number

of branches per plant, respectively. The GCA and SCA ratio variance was less than unity for all characters indicating predominance of non-additive variance. Lines 4, 5, 37, and 22 categorized as good general combiners. The crosses 6 x 16, 4 x 37, 13 x 18 were identified as best specific combiners for all traits studied. Path of productivity indicated fruit weight and number of fruits per plant have maximum contribution to yield and double cross predicted *per se* performance aids in the heterotic grouping i.e., the lines 4 and 13 belong to same group and lines 37 and 18 belong to another group. The lines 4, 6, 13 and 16 showed multiple disease resistance for yellow vein mosaic virus, powdery mildew and alternaria leaf spot diseases and cross combination of 4 x 22, 4 x 5 yielded higher iron content. Best Cross 5 x 37 had Fe (1.30 mg/100 g), moderately resistant to alternaria leaf spot and resistant to powdery mildew.

Genetic and breeding investigation on wilt and drought in chickpea (*Cicer arietinum* L.)

SHIVAKUMAR M. S.

2011

MAJOR ADVISOR: Dr. P. M. SALIMATH

Chickpea with very low productivity is constrained by biotic and abiotic factors like wilt and drought respectively. With objective of combining resistance to wilt, drought and productivity, investigation was carried out in F_2 population and F_2 derived F_3 families of cross between ICC 13124 and WR315 of chickpea. While ICC 13124 is tolerant to drought but susceptible to wilt, WR 315 is resistant to wilt and relatively less tolerant to drought. The F_2 population and F_{2-3} families were evaluated to elicit information on nature and amount of variability generated with respect to yield and its components. Further the plant to progeny rows from F_{2-3} families were evaluated for wilt and drought. The F_2 population was raised in *rabi* 2009-10. Randomly 575 plants were selected from F_2 population to record observation. Comparison of mean, range and variance in early segregating generation revealed that the parents involved in construction of cross differ significantly.

The F_{2-3} families were evaluated for yield components and screened for wilt and drought separately in *rabi* 2010-11. Screening for wilt was carried out in wilt sick plot ICRISAT, Hyderabad and evaluation for drought was carried out in UAS, Dharwad. From investigation, 48 F_{2-3} families were found to be promising with respect to drought while 17 families were found to be promising with respect to wilt thus indicating the possibility of widening the germplasm resource for drought and wilt. About 27 families were superior with drought tolerance and yield. While 9 families were found to be better with respect to drought tolerance and wilt resistant. However, two families showed desired wilt resistant, drought tolerance and high yield. These families can be advanced to further generation to stabilize the families. Best families can be identified for release as variety or as germplasm line for breeding wilt and drought resistance in combination.

Genetic studies involving inter plant type crosses in cotton (*Gossypium hirsutum* L.)

RANGANATHA H. M.

2011

MAJOR ADVISOR: Dr. S. S. PATIL

Cotton is one of the most important commercial crops which has occupied importance from historic days. To increase productivity of hybrids there is a need for identifying and exploiting genetic diversity available in cotton in terms of contrasting plant type traits. The nine robust types are crossed with six compact types in a Line x Tester fashion to develop inter plant type crosses so as to combine the desirable features of compact plant types on the framework of robust plant types and were evaluated for potentiality and plant type traits in F_2 s as influenced by their diverse parents. Combining ability analysis revealed that estimates of SCA variances were of greater magnitude than GCA variances for majority of the traits. The parents RAH 100, RAH 101, RAMPBS 155 and RACH 226 were the potential combiners based on the gca effects. Among crosses tested, RAH 101 x RACH 226 and RAMPBS 155 x RACH 16 recorded higher seed cotton yield. Most of

the crosses were potential, this is because of blending of ideal features of both robust and compact lines, such as utilization of additional three dimensional space of robust and efficient packing of bolls as observed in compact plant types. Four F_2 populations were studied for comparing the variability among inter and intra group crosses of cotton. Based on prediction of the double cross performance of genotypes, (RAH-101 x RACH-226) x (RAMPBS-155 x RACH-16) is the best combination of genetically diverse single crosses and since they have significant gca and sca effects, they can be utilized in initiating Reciprocal selection for combining ability. Estimation of genetic correlation among different quantitative characters was done and these were compared with genotypic and phenotypic correlations. At the breeding level, seed cotton yield exhibited highest positive genetic correlation with number of bolls per plant, boll weight and other traits.

Evaluation of advanced generation lines derived from single and double cross hybrids of cotton (*Gossypium hirsutum* L.)

CHITTI BHARAT KUMAR

2011

MAJOR ADVISOR: Dr. RAJESH S. PATIL

One hundred and fifteen genotypes, in F_4/F_5 , isolated from double crosses and single crosses produced using hybrids from the All India Coordinated Cotton Improvement Project were evaluated under rainfed situation at Agricultural Research Station, Dharwad during *Kharif* 2010-11. The detailed objectives included performance evaluation, assessment of variability generated, association and path co-efficient analyses, assessment of genetic diversity in the new germplasm lines and molecular diversity among some selected lines of this germplasm. Genetic variability revealed high values for single cross than the double cross derivatives for all characters except halo length. Comparison among genotypes revealed highly productive segregants developed from the crosses. Lines DC-632 (39.10g), DC-131 (37.20g), DC-642 (35.90g) and DC-1101 (35.00g) were better than the released check Sahana (32.08 g/plant) and another genotype, RAH-221 (34.70g). Association analysis across genotypes revealed highly significant correlation for seed cotton yield per plant with number of

bolls per plant, boll weight, number of monopodia, sympodial length at 50 per cent plant height, number of nodes, interboll distance, stem diameter, lint index, ginning outturn and halo length. Physiological traits *viz.* photosynthetic rate, stomatal conductance, transpiration rate, chlorophyll content and relative water content revealed significant correlation with seed cotton yield. Path analysis revealed high positive direct effect of number of monopodia, number of sympodia, interboll distance, boll number and lint index on seed cotton yield. Among physiological characters the traits, photosynthesis, stomatal conductance and chlorophyll content revealed high positive direct effect on seed cotton yield whereas, transpiration rate and relative water content revealed direct negative effect on seed cotton yield. The genetic diversity noticed was mainly due to plant height followed by seed cotton yield, sympodia per plant, halo length and ginning outturn. The single cross and double cross derived genotypes were grouped in to 12 and 6 clusters respectively.

Genetic variability for oil content, oil quality and other yield traits in advanced breeding lines of groundnut (*Arachis hypogaea* L.)

DEBASIS MAHIMAPRASAD PRADHAN

2011

MAJOR ADVISOR: Dr. H. L. NADAF

An investigation on genetic variability for oil content, oil quality and other yield traits in advanced breeding lines of groundnut was undertaken during summer 2009-10 and *Kharif* 2010 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad. The experimental material comprised of 150 advanced breeding lines with 10 checks. The advanced breeding lines were grown in a replicated yield trial by adopting RBD design and observations were recorded on fourteen quantitative characters, different fatty acids, foliar disease and iron chlorosis incidence. Significant genetic variation was observed in advanced breeding lines studied as evidenced by wider range and high PCV and GCV for most of the characters studied. High heritability with high genetic advance were recorded for 100- kernel weight, pod yield, kernel yield, oil yield, oleic acid, linoleic acid, and O/L ratio. Character association study revealed positive association of number of primary branches, pod weight

per plant, days to 50 per cent flowering, days to maturity, oil content with pod yield. Oleic acid and linoleic acid were negatively and significantly correlated, whereas O/L ratio had significant positive correlation with oleic acid and significant negative correlation with linoleic acid. The superior advanced breeding lines identified for different economic traits were ICGV07249, ICGV06038, ICGV 06142, ICGV 03106, ICGV 04061, ICGV 05100 for oil content (>54%), ICGV 05097 for kernel yield (>2950 kg/ha), ICGV 06142, ICGV 05097 for oil yield (>1465 kg/ha), ICGV 06229, ICGV 86564, ICGV 07368, ICGV 06188, ICGV 06199, ICGV 06124 for 100- kernel weight (>68 g), ICGV 06110, ICGV 06175, ICGV 00446, ICGV 00440 for oleic acid (>63%), ICGV 03043, ICGV 02410, ICGV 04061, ICGV 06142 for foliar disease resistance and ICGV 99019, ICGV 99017, ICGV 07026, ICGV 06424 for tolerance to iron chlorosis.

Heterosis and combining ability studies involving new hirsutum lines in cotton (*Gossypium hirsutum* L.)

RAJEEV S.

2011

MAJOR ADVISOR: Dr. S. S. PATIL

Present study was undertaken for estimation of heterosis levels and for identification of potential combiners and combinations from robust x robust intra plant type crosses where both parents involved are robust types and it is not possible to ascribe specific reasons for genetic divergence of the parents either in terms of plant type differences or conceivable differences in terms of physiological processes. In fact the robust group itself includes genotypes which are tall compact, robust open, bushy etc., with varying levels of differences in leaf characters, photosynthetic efficiency etc., the potentiality of the crosses involving diverse intra robust plant types was assessed. Eight robust and six other diverse testers from heterotic group representation were crossed in Line x Tester mating design to develop 48 intra plant type crosses. Combining ability effects and heterosis were determined for sixteen

different characters. The forty six F_1 's and their parents along with checks were planted in a Randomized complete block design with two replications during *kharif* 2008. Intra plant type crosses exhibited heterosis over mid parent ranging from 21.30 to 223.07 per cent for seed cotton yield. The crosses like RAH-53 x RAH-10, RAH-53 x RAH-110 and RAH-370 x RAH-8 were highly heterotic for seed cotton yield. The general combining ability (GCA) of the parents and specific combining ability (SCA) of hybrids and the gene effects were estimated. Parents and their hybrids differed significantly for *gca* and *sca* effects, respectively. Among the lines tested three (RAH-53, RAH-215 and RAH-25-7) were identified for their high general combining ability for seed cotton yield and other traits. Similarly, among testers RAH-10 and RAH-8 were found to be better combiners. Three cross *viz.*,

RAH-53×RAH-10, RAH-53×RAH-110 and RAH-370×RAH-8 were found to be the best crosses for seed cotton yield. Results showed that

non additive gene action is an integral component of the genetic architecture of different characters in the material used in cotton.

Genetic analysis on seed dormancy in groundnut (*Arachis hypogaea* L.)

YALLAPPAGOUDA B.N.

2011

MAJOR ADVISOR: Dr. P. V. KENCHANAGOUDAR

Pre-harvest sprouting in groundnut (*Arachis hypogaea* L.) seeds belonging to subspecies *fastigiata* is undesirable. Since it leads to substantial loss of seeds, both in quantity and quality. A short period of dormancy is therefore desirable in the subspecies to reduce such losses. Evaluation of fresh seed dormancy was conducted for two seasons to determine the intensity and duration of dormancy in mapping population wherein 268 RILs lines developed from crosses between the moderately dormant parent GPBD-4 and non dormant parent TAG-24. The intensity of dormancy ranged from 0 to 100% in summer season. Whereas in *kharif* season ranged 0 to 90%. There was large variation in the intensity of dormancy which could be related to genetic differences between the entries tested. When intensity of dormancy is considered the RIL no. 165, 259, 160, 172, 209, 254,

213, 247, and 248 recorded very high values above 70 per cent in two seasons. While RIL no. 84, 89, 110, 195, 257 and 267 fluctuated widely for intensity of dormancy over seasons. The variation for dormancy in terms of duration as revealed by G 70 estimates was subsequently large as compared to the intensity of dormancy among 268 dormant RILs. The RIL no. 5, 40, 84, 165, 183, 209, 213, 248, 254, 259 and 265 were found to have more than two weeks of dormancy (G 70) in all the two seasons. A period of 2-3 weeks of dormancy was exhibited by RIL no. 5, 30, 40, 84, 110, 165, 183, 219 and 267 during *Kharif* and RIL no. 5, 40, 84, 89, 165, 172, 267 and 183 during summer. The study has given evidence that for seed dormancy in this mapping population is controlled by duplicate recessive area.

Genome wide identification of “r” genes and exploitation of candidate RGA markers in mungbean (*Vigna radiata*) and urdbean (*Vigna mungo*)

ASHWINI NARASIMHAN

2011

MAJOR ADVISOR: Dr. B. R. PATIL

The present investigation was carried out with an objective to characterize the NBS-LRR degenerate markers in urdbean and mungbean and thus to study the polymorphism at RGA loci. Thirteen and twelve genotypes of mungbean and urdbean were screened for MYMV, powdery mildew and CLS diseases. The genetic variability was also studied. Similarly, genetic variability and molecular diversity was studied in the germplasm lines of mungbean and urdbean in three different experiments. None of the mungbean genotypes were found resistant to all the three diseases while Uttara was found resistant to all the three diseases among the urdbean genotypes. RGA1-TG and MtB99 were specific to MYMV. Selection based on number of pods per plant, number of branches and bunches and total seed yield with high GCV and PCV is effective. Very high heritability and genetic advance estimates were recorded for all the characters studied among mungbean, unlike in urdbean, where high

heritability with high genetic advance estimates were recorded for plant height, number of branches, number of bunches, number of pods per plant and total seed yield indicating the role of additive gene action. Seed yield was found to have non significant association with all the characters studied among the urdbean genotypes. The genotype TAU7 formed a separate cluster from the rest of the thirty nine genotypes making it an obvious choice in breeding program. Among the seventy nine germplasm lines of mungbean seed yield per plant was significantly and positively associated with number of pods per plant, number of seeds per pod and test weight. The genotype Uttara can be used as one of the parents in resistance breeding programme. The two putative markers identified can be used to differentiate the resistant and susceptible genotypes among mungbean genotypes and they could also be further validated using mapping populations.

Genetic studies on fertility restoration, heterosis and combining ability of *alternaria* tolerant inbred lines in sunflower (*Helianthus annuus* L.)

NAIKNAVAR M.A.

2011

MAJOR ADVISOR: Dr. K. G. PARAMESHWARAPPA

An experiment was conducted to know fertility restoration, heterosis and combining ability and inheritance of *Alternaria* resistance adopting 12 x 8 Line x Tester design during summer-2011. The study revealed that two hybrids were tolerant for *Alternaria* disease recording grade 6 at maturity. The inbred TX16R found to be the resistant male parent which restored fertility on most of the CMS lines except CMS300-2A. Among the female lines FMSR265 A was moderately resistant. Two hybrids CMS 103 A x TX 16R and PET 2-7-1Ax TX-16R showed moderate degree of tolerance to *Alternaria* disease and can be involved in the breeding programme to develop superior inbred lines. The line CMS300-2A appeared to be unique in its diversity as a majority of the lines could not restore fertility CMS 335Ax Tx-16R found to be a good combiner for an array of traits like

seed yield, oil yield, disease resistance and head diameter. Among the males line TX 16-R appeared as good combiner for disease resistance and host of other traits like head diameter, per cent seed filling, volume weight and oil content. Among the 48 hybrids CMS335A x TX16R was the only cross that expressed standard heterosis for seed yield over KBSH-44 (23.34 per cent) and oil yield (23.09 percent) over KBSH-1. It was also found to be heterotic for the characters like days to fifty percent flowering, days to maturity, plant height, seed filling-percentage, volume weight, hull content and PDI at maturity. The parents CMS335A and TX16R found to be contrasting with respect to their GCA effects for the characters showing heterosis. Most of the hybrids showing high sca effects were the combination of parents with low x low, high x low gca effects.

Genetical studies of yield and quality traits in maize (*Zea mays* L.)

MAHESH N.

2010

MAJOR ADVISOR: Dr. M. C. WALI

The study was conducted to assess the magnitude of heterosis, combining ability, nature of gene action, nature and extent of association between qualitative traits, starch, protein and oil in single cross hybrids of maize. A line x tester (L x T) was obtained by crossing 29 lines with three testers. Eighty seven new single crosses along with parents and three commercial checks were planted in a randomized block design with two replication in *kharif*, 2009 at AICMIP, Agriculture Research Station, Arabhavi, University of Agricultural Sciences, Dharwad. Hybrids exhibited significant variability for 16 characters studied. The computed variance ratios (δ^2GCA/δ^2SCA and δ^2A/δ^2D) revealed the predominance of non-additive gene action in the inheritance of all the traits studied. The study on the combining ability revealed that the lines; YP-4, YP-9 and the tester; KDMI-16 was found to be best general combiners than the rest. Regarding SCA effects, ARBMH-09-01 and ARBMH-09-29 showed significant sca effects for grain

yield. While ARBMH-09-29, ARBMH-09-78 and ARBMH-09-11 showed highest SCA effects for starch, protein and oil respectively. The crosses; ARBMH-09-45, for grain yield and starch where as ARBMH-09-40, for protein and ARBMH-09-27, for oil showed the highest heterosis percentage. These crosses were from parents with high x high and high x low GCA combination, respectively. The correlation studies depicted that plant height, ear length, ear circumferences, number of kernels per row, number of kernel rows, 100-grain weight, fodder yield and grain yield per plant were positively associated with yield per ha and starch content, while they had negatively associated with maturity characters, protein and oil content. on other hand grain yield had positively correlated with starch and negatively correlated with protein and oil content. These results revealed the possibility of realizing higher yield, starch, protein and oil content through heterosis breeding.

Mutagenesis, screening and evaluation for biotic (jassid, bacterial leaf blight) and abiotic (drought) stresses in sahana genotype of cotton (*Gossypium hirsutum* L.)

REMYA RAJAN V.

2011

MAJOR ADVISOR: Dr. B. M. KHADI

The genotype Sahana (*G. hirsutum*) was irradiated at various doses of gamma ray, EMS and its combination aiming at improvement of quantitative and qualitative traits in cotton with special reference to improvement upon drought tolerance, jassid tolerance and bacterial leaf blight resistance in an experiment conducted at MARS, UAS, Dharwad during summer 2009-10 and 2010-11. A vast amount of variability was generated for 12 quantitative as well as qualitative characters under study. Mutagenic effectiveness of various doses of mutagens could be revealed by the expression morphological mutants in M_1 and M_2 generation of Sahana. In the protected condition 34 mutants were identified to be drought tolerant (T-1-13, T-9-60, T-12-11, T-10-22) with high relative water content and low leaf temperature, whereas in unprotected condition 17 showed drought tolerance. For jassid tolerance, 36 mutants (T-4-25, T-8-4, T-12-5, T-8-63) were identified and 22 bacterial leaf blight resistant mutants (T-3-14, T-7-7) also could be isolated. Thirteen

mutants showed drought tolerance and jassid resistance, whereas 11 mutants were identified with drought tolerance and bacterial leaf blight resistance. With respect to bacterial leaf blight resistance and jassid tolerance together, 12 mutants were found tolerant to both. Eight mutants were identified as tolerant to drought and jassid infestation along with resistance to bacterial leaf blight (T-1-3, T-1-16, T-2-19). Considering the high yielding mutants possessing resistance to biotic and abiotic stresses, 22 mutants were identified to be high yielding and drought tolerant whereas 14 and 5 high yielding mutants were respectively jassid tolerant and bacterial leaf blight resistant. A few mutants identified were found to possess larger boll size and high ginning outturn, high fibre strength and micronaire values compared to control. Thus a large number of useful mutants for different characters which were isolated can be evaluated and further used as genetic stocks in future breeding programme.

Genetic variability studies in free threshable and spot blotch resistant derived dicoccum lines

VIJAYAKUMAR

2011

MAJOR ADVISOR: Dr. V. RUDRA NAIK

Dicoccum wheat (*Triticum dicoccum* (Schrank) Schulb) is nutritionally superior compared to durum and aestivum. The present investigation was carried out to study genetic variability, free threshability and spot blotch resistance in 95 advanced generation mutant lines. Development of free threshable lines which are resistant to spot blotch (*Helminthosporium sativum*) is of prime requirement. These 95 mutant lines were sown along with five checks during *rabi* 2010-11. Observation on yield, yield components, morpho-physiological, grain quality parameters and disease scoring for spot blotch and rust were recorded. Analysis of variance revealed the prevalence of significant difference among the genotypes for all the morphological and quality parameters studied. GCV and PCV were found to be high for seed yield per plant and tillers per plant. Heritability and genetic advance over mean were high for thousand grain weight (g) seed yield per plant, spike length, tillers per plant and seeds per

spikelet. Quality parameters like starch content, wet gluten and sedimentation value shown significant positive association with yield. Among 95 mutants 15 shown immune and remaining were resistant for spot blotch disease. Considerable amount of genetic diversity was observed in the material with respect to tillers per plant and wet gluten. Out of thirteen characters studied six shown direct effect on yield. Comparative study among mutants revealed that direct mutation was superior in comparison with hybridization followed by mutation. All the twenty RAPD primers used in the study were polymorphic. Mutant No. 845, 873, 2292, 2758 and 2761 were found to be superior in comparison with both durum and dicoccum parents with respect to yield and yield attributing traits. Outstanding productive and potential mutants could be evaluated to isolate the superior high yielding free threshable lines and resistance to spot blotch disease.

Line x tester analysis for yield, yield attributing characters and bacterial wilt disease resistance in tomato (*Solanum lycopersicum* Mill.)

A. USHA

2011

MAJOR ADVISOR: Dr. O. SRIDEVI

A field experiment was conducted to study heterosis and combining ability for yield and yield contributing traits and inheritance pattern of bacterial wilt resistance in tomato (*Solanum lycopersicon* Mill.). The experiment was conducted at Agriculture College, University of Agricultural Sciences, Dharwad. Forty-two crosses were developed by crossing three females with fourteen males following line x tester design. Variance due to the parents and crosses were found significant for all the yield and yield related components, except number of branches and fruit diameter for crosses. The line x tester analysis revealed that no single line or tester is superior for all the traits under consideration. Nevertheless, male parent CLN2777A exhibited high *per se* performance for plant height, number of branches per plant, average fruit weight and pericarp thickness, while CLN2123E exhibited highest *per se* performance for total fruit yield per plant. Maximum standard heterosis for total yield per plant was observed in the cross Pusa Ruby x CLN2777A followed by Megha x CLN2768A and

Megha x CLN2777F. While the hybrid Megha x CLN2777F showed significant standard heterosis for plant height, number of branches, number of fruits per plant, fruit length, fruit weight and pericarp thickness. The cross Megha x CLN2768A exhibited significant sca effect for fruit yield traits like total fruit yield per plant, days to 50 per cent flowering, number of fruits per plant and fruit quality traits like fruit length, TSS and ascorbic acid. It also exhibited recorded standard heterosis over all three checks Namdhari 2535, Maharani and MHTM-256 for total fruit yield per plant, while Megha x CLN2777F recorded significant sca effect for fruit length and ascorbic acid content. All the potential lines used for screening were identified as resistant to bacterial wilt while all testers Pusa Ruby, Megha and DMT-2 were found to be susceptible. Two F_2 populations Pusa Ruby x CLN2777A and Pusa Ruby x CLN2400B used for screening resistance for bacterial wilt exhibited 15:1 ratio indicating resistance to bacterial wilt is governed by two duplicate genes.

HORTICULTURE

Integrated nutrient management studies in potato (*Solanum tuberosum* L.)

MATIWOS TAYE

2011

MAJOR ADVISOR: Dr. T. R. SHASHIDHAR

A field experiment was conducted during *kharif*, 2010 in University of Agricultural Sciences, Dharwad "H" block of Main Agricultural Research Station to evaluate the influence of integrated nutrient management practices on growth, nutrient uptake, yield and quality of potato. Totally 11 different treatments consisting of different organic and inorganic fertilizers, both alone and in combination have been tried. Among the different integrated nutrient management practices, application of 100% RDF + 25 tonnes of FYM ha^{-1} and 75% N through RDF + 25% N through

sheep manure +25 tonnes of FYM ha^{-1} were significantly superior over the other treatments for all growth, yield, quality and nutrient uptake parameters and economics of production. Application of 100% RDF + 25 tonnes of FYM ha^{-1} has resulted in higher plant height (46.33 cm), number of leaves and number of shoots (40.47 and 5.20, respectively), leaf area (113.19 cm^2), leaf area index (3.79) and leaf area duration (69.48 days), higher uptake of major nutrients viz., nitrogen, phosphorus and potassium (165.28, 125.60 and 152.02 kg/ha, respectively) in potato plant. Yield

attributing characters viz., yield per plant (223.33 g), mean tuber weight (65.23 g), tuber girth (14.32 cm), marketable yield (11.91 t/ha), total tuber yield (12.60 t/ha) and highest crude protein content in tuber (8.98%) was found with the application of 100% RDF + 25 tonnes of FYM ha⁻¹ and

was on par with the application of 75% N through RDF + 25% N through sheep manure + 25 tonnes of FYM ha⁻¹. Apart from this the highest net income (₹ 70164) and benefit cost ratio (2.46:1) was also realized with the application of 100% RDF + 25 tonnes of FYM ha⁻¹.

Heterosis and combining ability for productivity related traits in tomato (*Solanum lycopersicum* L.)

AKSHAY ANGADI

2011

MAJOR ADVISOR: Dr. P. R. DHARMATTI

The investigation was conducted to assess the heterosis and combining ability for productivity and bacterial wilt resistance in tomato during 2009-10 in the Department of Horticulture, UAS, Dharwad. The experimental material consisted of fourteen parents including five female and nine male parents. Forty five F₁ hybrids were produced in a line × tester mating design for heterosis and combining ability studies. Female parents were selected with diversity for bacterial wilt and male parents with diversity for horticultural traits. Hybrids showed significant differences for all the characters studied except pH of the fruit juice. Significant *per se* performance and economic heterosis in desirable direction was recorded in several crosses. The crosses DMT-1 × Arka Alok, DMT-1 × DMT-2 and DM-3 × DMT-2 expressed significant

heterosis over commercial check (Ruchi) for economic characters like yield per plant and bacterial wilt resistance. When the analysis of variance for combining ability with respect to yield was looked into, it revealed that line × tester contribution was higher than that of lines and testers contribution individually. Among lines, DMT-1 was good general combiner and among testers, DMT-2 was good general combiner. Here SCA variance was greater than GCA indicating the predominance of non-additive gene action. DMT-1 × Arka Alok, DMT-1 × DMT-2 and DM-3 × DMT-2 crosses had significant SCA effects for yield per plant. DM-3 × DS-1 and DM-5 × IMP-B were suitable for processing. The present study reveals that heterosis breeding is useful for development of tomato through exploitation of non-additive gene action.

Studies on extension of shelf-life of guava (*Psidium guajava* L.) fruits and vegetative propagation of guava and dhamini (*Grewia tiliacefolia* Vahl.)

DEEPAK PATEL

2011

MAJOR ADVISOR: Dr. J. C. MATHAD

An investigation was carried out to study the influence of post-harvest treatments with waxol (17 and 25 % nipro and citrus wax), potassium permanganate impregnated on paper shreds, potassium metabisulphite (1000 ppm) and calcium compounds (1% calcium nitrate and 2% calcium chloride) coupled with packaging in polyethylene bags of 200 gauge with 1 percent vents or wrapped with tissue paper on physico-chemical parameters, organoleptic characters and shelf-life of Sardar guava fruits under ambient conditions. The guava fruits treated with 25 per cent citrus wax and packed in polyethylene bag (200 gauge having 1% area of vents) and stored under ambient conditions had a shelf-life of 8.21 days, with lowest shrinkage index (3.00%), physiological loss in weight (3.99%) and retained highest

total soluble solids (10.22%), reducing sugars (4.10%), non-reducing sugars (2.12%), total sugars (6.22%), ascorbic acid (213.37 mg/100 g of fruit) and total titratable acidity (0.665%) among the 15 treatments throughout the storage period of 10 days. Organoleptic scores for colour and appearance (4.28), texture (4.30), taste and flavour (4.38), overall acceptability (4.31) was also found to be highest in this treatment. The fruits treated with citrus wax (17%) and packed in polyethylene bag with vents had a shelf-life of 7.46 days followed by 7.42 days in fruits treated with nipro wax (25%) and packed in polyethylene bags with vents. No rooting was observed in guava and dhamini soft-wood cuttings treated with IBA and NAA at the rate 1000 to 3000 ppm concentrations even under poly tunnel condition.

Evaluation of fenugreek genotypes in northern transitional tract of Karnataka

BHOJANAGOUDA PATIL

2011

MAJOR ADVISOR: Dr. RAMAKRISHNA V. HEGDE

Studies were undertaken in fenugreek (*Trigonella foenum-graecum* L.) with nine genotypes having diversified origin to assess the extent of variability, to estimate the heritability and to study the genetic diversity present among the genotypes. Based on *per se* performance in *rabi*, the genotypes DFC-2 (20.13 q/ha), DFC-1 (19.72 q/ha) and DFC-7 (19.63 q/ha) were found superior for yield. Whereas in late *rabi*, DFC-4 (12.90 q/ha), DFC-7 (12.28 q/ha) and DFC-3 (12.21 q/ha) recorded higher yield. Moderate to high genotypic coefficients of variation were observed for plant height, number of leaves, number of pods, 100 seed weight and yield per plant indicating wide variability with low environmental influence. The heritability was high for the characters like plant height at 30, 60

and 90 DAS, days to 50% flowering, days to maturity, 100 seed weight and yield per plant. Genetic advance as per cent of mean was found to be highest for plant height at 30 DAS (57.57%), number of leaves at 30 DAS (25.26%) and 100 seed weight (37.94%). In diversity study of fenugreek genotypes, three clusters were formed in *rabi* and two during late *rabi*. Among the characters studied, days to maturity and 100 seed weight contributed more to diversity. Thus these characters with wide variability and less environmental influence can be used for further improvement. Present study indicated that DFC-7 was found to perform well during both the seasons. The diversity of genotypes was independent of geographical origin of the genotype.

Performance of tomato (*Solanum lycopersicum* L.) hybrids under shade house condition

ISHWARAPPA KENGAR

2011

MAJOR ADVISOR: Dr. RAMAKRISHNA V. HEGDE

A field experiment was carried out at the department of horticulture, Hi-tech Horticulture Unit, Saidapur Farm, University of Agricultural Sciences Dharwad during 2009-10 to study the performance of tomato hybrids under shade house condition. Among the vegetative parameters STH-801 tomato recorded higher plant height (309.03 cm), maximum number of branches per plant (8.17) whereas, STH-801 hybrid recorded more number leaves (85.67/plant). Hybrid STH-901 recorded longer internodes (6.96 cm), higher leaf width (5.82 cm) and longer leaves (15.40 cm) and STH-39 recorded thick stem (1.78 cm). Plants trained under single stem recorded higher plant height (270.08 cm), stem girth (1.75 cm), number of branches per plant (7.78), intermodal length (6.75 cm), leaf length (15.10 cm), leaf area (77.06 cm²) compared to

the plants trained with two stems. Number of leaves per plant (82.80) was found maximum in plants trained under double stem. Days to fifty per cent flowering, days taken from flowering to fruit development were not influenced by training. Among the hybrids, STH-801 recorded higher number of cluster per plant (12.15), number of fruit per cluster (7.75) and percent fruit set (93.17). STH-801 recorded the highest yield per plant (6.52 kg), yield per square meter (15.68 kg) and number of seeds per fruit (141.50). Whereas, STH-39 recorded the highest average fruit weight (115.50 g), average fruit diameter (6.30 cm) and average fruit volume (157.00 cc). Plants with double stem recorded increased yield per plant, yield per square meter (6.30, 15.36 kg respectively). Plants with single stem recorded highest average fruit

weight, average fruit diameter, average fruit volume and number of seeds per fruit (105.50 g, 5.59 cm, 143 cc, 115 respectively). STH-801 tomato juice possessed higher amount of TSS and pH (5.47 °B, 6.20

respectively). The study revealed that hybrid STH-801 performed best with yield of 6.52 kg per plant and STH-801 on double stem training system was superior to all the other treatment combinations.

Integrated nutrient management studies in double daisy (*Aster amellus* L.)

VITHAL CHOUGALA

2011

MAJOR ADVISOR: Dr. V. S. PATIL

The present study was aimed to find out the influence of integrated nutrient management (INM) on growth, yield and quality of double daisy at new orchard, floriculture unit, Department of Horticulture, College of Agriculture, University of Agricultural Sciences, Dharwad, during *khari* season of 2010-11. The experiment was laid out in randomized complete block design with three replications and eight treatment combinations. The growth parameters, maximum plant height (62.34 cm) was recorded with the application of Azospirillum, PSB, Vermicompost equivalent 50 % RD+N 50 per cent recommended NPK. Similarly, the maximum number of branches per plant (30.90), number of suckers per plant (17.05), total dry matter production (43.73 g) and most of the physiological parameters were noticed in the same treatment. It was significantly superior to all other treatments. The

flower characters like stalk length (49.97 cm) and flower diameter (3.06 cm) were significantly higher in treatment receiving Azospirillum, PSB, Vermicompost equivalent 50% RD+N, and 50 per cent recommended NPK. The maximum number of flowers per plant (296.33), number of flower spikes per plant (7.97) number of flower spikes per hectare (8.74 lakhs) and maximum vase life (5.12 days) were also higher in the same treatment. The application of FYM equivalent 50 per cent RD+N, and 50 per cent recommended NPK resulted in lowest value of these parameters. The economics analysis clearly indicated that net returns per hectare and B:C ratio was the highest in the plots treated with Azo+PSB+VC equivalent to 50% RD 'N' + 50% RDF (₹ 386430.72 and 7.61 respectively) and these findings can be used in making double daisy production more profitable.

Air layering in guava as influenced by growth regulators and *Azospirillum*

SANJEEV KUMAR

2011

MAJOR ADVISOR: Dr. S. G. ANGADI

An investigation on air layering in guava as influenced by growth regulators and *Azospirillum* was carried out in the mother plants block of guava at the Silver Jubilee Orchard (SJO), Department of Horticulture, College of Agriculture, University of Agricultural Sciences, Dharwad during 2010-11. The study aimed to find out suitable root inducing treatment and its optimum concentration for maximum survival percentage in mature shoot air-layers of guava Cv. L-49. There are 14 treatment combinations with three replications laid out in Randomised Block Design. In general, both growth regulators viz. IBA, NAA alone and in combination with *Azospirillum* favoured rooting in air-layers. A synergistic effect was noticed in terms of higher percentage of rooting where the two growth regulators were used in combination with *Azospirillum*. Among the different combinations, the layers which had received *Azospirillum* 37.5g + IBA (Indole butyric acid) 3000 ppm + NAA (Naphthalene acetic acid) 3000

ppm (T_{12}) recorded significantly higher percentage (91.68%) of rooting with desirable root characters such as higher number of primary and secondary roots, longer length of primary roots and higher girth of primary roots. Next to this treatment, the other favourable treatments were IBA, 3000 ppm + NAA, 3000 ppm (T_6), IBA, 2000 ppm (T_1), *Azospirillum* 37.5g + IBA, 4000 ppm (T_9), *Azospirillum* 37.5 g + IBA, 6000 ppm (T_9), *Azospirillum* 37.5 g + IBA, 2000 ppm + NAA, 2000 ppm (T_{11}). The use of medium concentration (3000 ppm) of both the growth regulators (IBA and NAA) with *Azospirillum* 37.5g was more effective as compared to either lower (2000 ppm) or higher (6000 ppm) concentrations of IBA and NAA. With regard to survivability of rooted layers, maximum survival percentage (98.14%, 60 days after separation) was noted in the layers treated with *Azospirillum* 37.5g + IBA, 3000 ppm + NAA, 3000 ppm (T_{12}).

Heterosis and combining ability of advanced generation lines in tomato (*Solanum lycopersicum* L.)

GURUBASAVARAJ K.

2011

MAJOR ADVISOR: Dr. R. V. PATIL

An investigation was conducted in the Department of Horticulture, College of agriculture, Dharwad to study the heterosis and combining ability in tomato (*Solanum lycopersicum* L.) with the objectives of identifying good general combiners and to assess the magnitude of heterosis for sixteen characters and isolation of economic segregants in double cross F5 population. Among 18 hybrids, three crosses DTHVI-5 (12-1) × DTH5N-3 (4-8) (1528g), DTHVI-5 (12-13) × DTH5N-3 (4-8) (1493.17g) and DTHVI-5 (12-11) × DTH5N-3 (4-8) (1411.59g) expressed considerable magnitude of heterosis for yield. Hybrids DTHVI-5 (12-1) × DTH5N-3 (4-8), DTHVI-5 (12-13) × DTH5N-3 (1-12) and DTHVI-5 (12-13) × DTH5N-3 (4-8) had high fruit weight 66.63g, 57.53g and 57.00g respectively. None of the hybrids had significant positive heterosis over commercial check for yield. DTH5N-3 (4-8) was better yielding among the three testers (1441.97g). Significantly good

GCA was observed in lines DTH5N-3 (4-8) (162.03) for yield per plant and number of fruits per plant, DTHVI-5 (12-1) (5.17) and DTH5N-3 (4-8) (3.76) for fruit weight. The top three crosses DTHVI-5 (12-1) × DTH5N-3 (4-8), DTHVI-5 (12-13) × DTH5N-3 (1-12) and DTHVI-5 (12-1) × DTH5N-3 (4-15) exhibited high SCA effects for total yield per plant. The cross DTHVI-5 (12-5) × DTH5N-3 (1-12) and DTHVI-5 (12-13) × DTH5N-3 (4-8) exhibited significant SCA effect for number of fruits per cluster, DTHVI-5 (12-15) × DTH5N-3 (4-8) for average fruit weight. Analysis of segregants in nine double cross hybrid populations with regard to important component characters in tomato revealed that there was higher frequency of transgressive segregants for number of fruits per plant followed by for fruit weight. DTH4U-1 x DTH5N-3 (15-11) had higher economic segregants for number of fruits per plant (40.4%), fruit weight (35.1) and yield per plant (35.2).

HUMAN DEVELOPMENT AND FAMILY STUDIES

Self concept and social maturity of urban and rural primary school children

PARVATI S. HUNDEKAR

2011

MAJOR ADVISOR: Dr. PUSHPA B. KHADI

Self concept and social maturity of urban and rural primary school children was studied on 300, 5th to 7th standard students studying in Government and private (Aided and Unaided) schools of Dharwad taluk. Both English and Kannada medium schools were selected. Children were drawn equally on the basis of peer acceptance/rejection, age and gender. Ahluwalia self concept scale (2003), Rao's (1971) social maturity scale, Aggarwal's (2005) socio-economic status scale were employed. Peer accepted and rejected children were identified through socio-metry. Structured schedule was used to elicit information regarding children's, parent's and familial characteristics. Results

revealed that majority of the children (93.3%) of urban and rural (94.7%) had high level of self concept. On social maturity, 66 percent of urban and 70 percent of rural children were slightly socially matured. Self concept improved with age. It was significantly associated with their perceived health status, parenting style and their career aspirations. Father's education, occupation and family size and academic achievement had positive and significant influence. Children's characteristics such as gender, ordinal position, sibling status, change in school, friendship ties and familial characteristics such as caste, family type, living standard, income had no

influence on self concept. Significantly higher proportions of boys were socially matured than girls. First borns were in larger numbers than later borns, children from nuclear families were better than joint family. Child's

age, father's education and family size had significant and positive influence on social maturity. Social maturity and self concept were positively and significantly correlated.

Mental health and self-efficacy of working and non-working women from rural and urban area

RENUKA MANKANI

2011

MAJOR ADVISOR: Dr. GANGA YENAGI

The study was conducted to analyse the mental health and self-efficacy of working and non-working women from rural and urban area. The sample consisted of 90 working and 90 non-working women from rural and urban area in Dharwad district during 2010-11. Farm women were considered as rural working women and non-working group as housewives. Teachers constituted working group whereas housewives a non-working group in urban area. Mental health was measured using the mental health inventory by Jagadish and Srivastava (1983) and self-efficacy was measured using self-efficacy scale by Sud *et al.* (1998). Socio economic status was measured using socio economic status scale by Aggarwal *et al.* (2005) in addition to personal information. The results revealed that the working and non-working women had average mental health in both rural and urban area. There was no significant difference between working and non-working

women on mental health. But there was a significant difference between mental health of rural and urban women. Urban women had better mental health than that of rural women. Age, education, income and number of children had positively and significantly related to mental health of working women while family size was negatively but significantly related to mental health of working women. Most of the working and non-working women from rural and urban area exhibited high level of self-efficacy. Social participation was positively and significantly related to self-efficacy of working women. The study also indicated that as number of children increased mental health of rural women also improved. Family size was positively and significantly related to self-efficacy of urban women. Mental health had positive and significant relationship with working and non-working women from rural and urban area.

Subjective well-being and distress of institutionalized and non-institutionalized senior citizens

SHAKUNTALA S. PATIL

2011

MAJOR ADVISOR: Dr. SUNANDA ITAGI

A study on the Subjective well-being and distress of 65 institutionalized and 75 non-institutionalized senior citizens was conducted in Hubli-Dharwar city during 2010-2011. Institutionalized senior citizens with age group of 60 years and above were randomly selected from three geriatric homes of Hubli-Dharwar. The non-institutionalized senior citizens from the families of same age group were randomly selected. The subjective well-being status was assessed using ICMR Subjective well-being Inventory developed by Sell and Nagpal (1992). Distress status was assessed by Cornell Medical Index Health Questionnaire developed by Wig *et al.* (1999). While, the socio-economic status of the non-institutionalized senior citizens by scale given by Aggarwal *et al.* (2005). The results revealed that majority of the institutionalized and non-institutionalized senior citizens indicated high level of well-being (96.9-100%), and ill-being (81.5-93.3%). In case of distress, 33.3-36.9%, 30.8-36.9% and 35.4-36.0% of institutionalized and non-institutionalized senior citizens expressed high level of physical, emotional and total distress respectively. Institutionalized senior citizens

had more Family Group Support and Transcendence in well being dimensions. Whereas, non-institutionalized senior citizens showed more of perceived ill-health and deficiency in social contact in ill-being dimensions. The selected demographic factors such as, age showed negative and highly significant relationship with well-being whereas, positive and highly significant relationship with ill-being status. Education had positive and highly significant relationship with well-being and ill-being status among both groups. Negative and significant relationship was observed between well-being and each type of distress. Positive and highly significant relationship between ill-being and each type of distress whereas negative and highly significant relationship between subjective well-being and each type of distress was observed in both groups. Hence, increase in the well-being and overall subjective well-being status reduced the each type of distress whereas, increase in ill-being status increased the each type of distress significantly among institutionalized and non-institutionalized senior citizens.

Maternal involvement and attitude towards pre-school education

SHILPA MUGALI

2011

MAJOR ADVISOR: Dr. LATA PUJAR

A study on "Maternal involvement and attitude towards preschool education" was conducted in Dharwad taluka during 2010-11. Two hundred mothers of preschool children with age range of three to six years, residing in rural (n=100) and urban area (n=100) of Dharwad taluka were selected for the study. Kale (1974) scale on Parent-Child Interaction was used to assess the extent of interaction between mother and children and Venkatesan (2002) scale on Parental Attitude towards Preschool Education was used to assess the maternal attitude towards preschool education. Aggarwal *et al.* (2005) scale was used to assess the socio economic status of a family. Correlation coefficient and 't' test were used for analysing the data. The results of the present investigation revealed that majority of the mothers from rural (75.0%) and urban (56.0%) area had medium level of involvement and 44 percent of mothers from urban and 25 percent mothers from rural area had high level of involvement with their children. The demographic factors

such as education, occupation, family income and socio economic status were positively and significantly influenced the maternal involvement with their children. Mothers from both urban and rural (75.0% and 85.0%) area had average attitude towards preschool education and none of mothers from both the locality had unfavourable and highly unfavourable attitude towards preschool education. The demographic factors like age, education and occupation of the mothers, family size, family income and socio economic status were not significantly influenced mothers' attitude towards preschool education. Maternal involvement with their children and attitude towards preschool education did not vary according to age, gender and ordinal position of the child. Maternal involvement and their attitude towards preschool education was positively and significantly related. Hence as the mother's involvement with their children increased, their attitude towards preschool education also increased.

Mental health of rural and urban elderly: Relationship with physiological health and social support

ASHWINI MORAB

2010

MAJOR ADVISOR: Dr. V. S. YADAV

This study was to assess status of health, social support and mental health and their relationship among elderly. The sample consisted of 160 elderly comprised of 80 from urban (40 male and 40 female) and 80 from rural (40 male and 40 female) background by snowball technique. Personal information schedule, Physiological problem checklist (Ashwini, 2011), Mental health inventory (Jagadish and Srivastava, 1983) and Social support questionnaire (Heitzmann and Kaplan, 1988) were administered individually. The data were subjected to percentage, correlation, chi

square and ANOVA analyses. The results revealed that there was negative and significant relationship between age, education, income and mental health, but size of family was significantly & positively related to mental health of elderly. There was significant negative relationship between physiological health and mental health and significant positive relationship between social support and mental health of elderly. About 56 percent of elderly had very poor mental health, 49 percent of elderly had 11-30 number of health problems and 76 percent of elderly

received support from 3-6 numbers of members. Rural female elderly were better in mental health compared to male elderly. Female elderly were experiencing social support from more number of members compared to male elderly. In rural area male elderly were better in

physiological health compared female elderly. In urban area female elderly were better in mental health compared to male elderly and male elderly were better in physiological health compared to female elderly.

Conflict management and marital satisfaction among dual earning couples

SUMALATA BYADGI

MAJOR ADVISOR: Dr. V. S. YADAV

The study was conducted to identify status and relationship of "Conflict management and marital satisfaction among dual-earning couples during the year 2010-11 in Dharwad city. One hundred and fifty working couples residing in Dharwad urban locality were selected purposively. Thomas-Kilmann MODE Instrument (1977) and marital satisfaction scale developed by Roach *et.al* (1981) were administered individually to assess conflict management and marital satisfaction of the couples. Garrett ranking, chi-square and correlation analyses were used to analyze the data. The results revealed that husbands preferred the collaboration style followed by accommodation, avoidance, compromise and then competition whereas wives preferred accommodation style followed by collaboration, compromise, avoidance and then competition to resolve conflict. Husbands were significantly high in the usage of collaboration style compared to wives whereas wives were significantly high in the usage of accommodation style compared to husbands. Wives with younger Age, higher income, larger family size and more than 20 years of married

life were significantly high in the adoption of accommodation style, and husbands with higher education and working in private organization were significantly high in their adoption of collaboration style and husbands living in small family were significantly high in the adoption of compromise style and those living in large family were high in the adoption of avoidance style. Correspondingly more number of wives (56%) were satisfied with their marital life compared to husbands (50%). Wives with advanced age, length of marriage and number of children were significantly less satisfied with their marital life whereas husbands with higher income and secured occupation were significantly more satisfied with their marital life. Husbands were more satisfied when they adopted collaboration style and their wives adopted accommodation style. Similarly, wives were more satisfied when they adopted collaboration style and their husband adopted accommodation style and were less satisfied when they adopted competition style in their conflict management process.

MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Molecular characterization of mineral phosphate solubilization in *Serratia marcescens* and *Methylobacterium* sp.

ARCHANA KUMARI

2011

MAJOR ADVISOR: Dr. P. U. KRISHNARAJ

The major goal of the present investigation was to study the mechanism of mineral phosphate solubilization in *Serratia marcescens* and *Methylobacterium* sp. All the 157 isolates of *S. marcescens* and 73 isolates of pink pigmented facultative methylotrophs were screened for their mineral phosphate solubilization phenotype on solid media viz., Modified Sperber's and TCP agar media. Eight most potent isolates along with one reference strain *Serratia marcescens* ER2 were further screened for pH drop and Pi release in NBRIP-BPB and TCP broth. Both pH drops and Pi release were highly correlated upto 15 days. AUDS-151 and PPFM87 were the most potent 'P' solubilizing isolates. Gluconic acid was detected in the culture supernatants of these isolates through thin layer chromatographic technique. Effect of buffering and phosphate stress on MPS phenotype of these isolates were observed by external supply of tris buffer and K_2HPO_4

to the MSM agar medium. It indicates the metabolic control of mineral phosphate solubilization by external factors which either resist the change in pH or alters the gene expression. Tn5 mutants were generated from the most potent P solubilizing isolate AUDS-151 by biological (Tn5) mutagenesis. Mutants failed to show MPS activity even after 5 DAI. Strain identity of AUDS-151 and PPFM-87 was confirmed as *S. marcescens* and *Methylobacterium mesophilicum* respectively through 16S rDNA sequencing. All the *pqq* operon gene (s) were amplified from AUDS-151 and PPFM-87 and the most conserved *pqqE* gene was cloned into *E. coli* DH5a from both the isolates. Both the clones pAMK101 and pASK101 were sequenced and showed 97 per cent homology with the *Methylobacterium* Sp. (CPOOOO367) and 94 per cent homology with *Serratia marcescens* (DQ868536), respectively.

Generation and characterization of transformation events in tomato carrying *Sclerotium rolfsii* lectin gene (SRL1) for root knot nematode and white fly resistance

ASHLESHA C. PATIL

2011

MAJOR ADVISOR: Dr. RAMESH BHAT

Transgenic tomato plants carrying *Sclerotium rolfsii* lectin gene (*srl1*) were generated by *Agrobacterium*-mediated transformation. Of the 90 independent regenerants, 40 could amplify 429 bp product with *srl1*-specific PCR. Segregation analysis in three selected events indicated single copy insertion in SRL1-T₀(7) and multi-copy integration in SRL1-T₀(10) and SRL1-T₀(21). In SRL1-T₀(7), the T-DNA/*srl1* insertion was in a non-genic region between 85,375 and 85,376 bp of the clone C11_HBa0054I23 (GenBank Acc. No. AC212431.2) of chromosome 11. Crude extract of SRL1-T₀(7), SRL1-T₀(10) and SRL1-T₀(21) showed an extra band of 17 kDa on SDS-PAGE. This protein along with their partially purified forms could agglutinate rabbit erythrocytes, indicating lectin activity. Specific activity of the lectin was more in the partially purified samples compared to protein from the crude extracts. Bioassay with second stage juveniles (J2s) of *Meloidogyne incognita*, the root knot nematode showed that on 3rd day of inoculation the infection rate was 66.66, 83.33, 91.66 percent in

SRL1-T₀(7), SRL1-T₀(10), SRL1-T₀(21), respectively compared to 100 per cent infection in the non-transgenic plant. On 6th day, the percentage of vermiform J2s developed into sausage-form was higher in non-transgenic plants compared to transgenic lines. After 70 days of inoculation, non-transgenic plants showed an average gall number of 59.6 per plant whereas, it was reduced to 33.6, 43.2 and 40.8 galls/plant, respectively in SRL1-T₀(7), SRL1-T₀(10), SRL1-T₀(21). In general, non-transgenic plants showed a gall index of 7, hence they were rated as "highly susceptible", whereas transgenic lines with a gall index of 3 were classified as "moderately resistant". Nematode infection also resulted in significantly reduced average shoot and root length, and biomass in non-transgenic plants compared to transgenic plants. Transgenic plants were evaluated for white fly (*Bemisia tabaci*) mortality. It was 24%, 22% and 16% in SRL1-T₀(7), SRL1-T₀(10), SRL1-T₀(21), respectively, which were higher than that found in non-transgenic plant (10%).

Functional and molecular characterization of native isolates of actinomycetes from soil and endorhizosphere of medicinal plants

GAYATREE MOHAPATRA

2011

MAJOR ADVISOR: Dr. NARAYAN MOGER

Microbial metabolic repertoire represents the primary resources from which new biomolecules are derived. Recently, the rise of resistance in pathogens renewed the interest on actinobacteria. In the present study, a total of 248 actinomycetes colonies were recovered from rhizosphere, endorhizosphere of 27 medicinal plants, an aquatic weed and road side

run off soil. Randomly 114 actinobacteria isolates were picked for functional characterization against *Rhizoctonia solani*, *Sclerotium rolfsii*, *Colletotrichum capsici*, *Ralstonia solanacearum* and 40 actinobacteria against an insect *Plutella xylostella*. Out of which, 25, 85.5, 16 and 10 per cent of total isolates displayed an antagonism of (90-100) per cent

against *Rhizoctonia solani*, *Sclerotium rolfsii*, *Colletotrichum capsici*, *Ralstonia solanacearum* respectively, and 20 isolates displayed more than 50 per cent mortality against *Plutella xylostella*. 26 isolates were selected for identification due to its functional significance through ARDRA. They were found to be members of *Streptomyces*, *Microbispora*, *Nonomuraea* and *Amycolatopsis* genera. Similarly, 16S rDNA sequence analysis of 11 extra potent isolates out of 26 isolates clustered them into *Streptomyces* genera. The REP PCR fingerprinting of whole genome

of all these 26 isolates displayed 75 per cent identity among themselves. Supplementing to functional capability of these isolates 76 and 52 per cent total isolates were positive for NRPS and PKS I genes respectively. Cloning of partial sequence of PKS I gene of AUDT 248 exhibited an identity to the antibiotics, stambomycin gene cluster which was further supplemented with LC-MS analysis. Similarly, partial PKS I gene of AUDT 217 showed homology to the modular PKS of unknown biosynthetic identity.

Analysis of cry contents in native *Bacillus thuringiensis* isolates and cloning of cry gene

JOHNSON LUWANG W.

2011

MAJOR ADVISOR: Dr. NARAYAN MOGER

The present investigation was carried out to analyse *cry* gene content in 100 native isolates of *B. thuringiensis* randomly chosen from the *Bacillus thuringiensis* culture collection centre of the Department of Biotechnology, UAS Dharwad, and to clone *cry* gene based on variation in amplicon restriction fragment length polymorphism (ARFLP). From 100 native isolates tested for the presence of crystals, the most predominant crystal type was spherical (58%) followed by irregular (26%), bipyramidal (5%), rhomboidal (10%) and triangular (1%). Bioassay against third instar larvae of *Plutella xylostella* revealed 13 potent isolates. Two isolates DBT 2336 and DBT 2510 exhibited 100 per cent mortality at 72h of exposure whereas the reference strain HD1 exhibited 93.33 per cent mortality. SDS-PAGE profile revealed the presence of 135 kDa in 7 potent isolates. Most of the isolates screened for *cry* showed amplification

with at least one *cry* type. The most predominant gene was *cry1* (30%), followed by *cry2* and *cry6* (28% each), *cry3* (23%), *cry9* (18%), *cry20* (17%), *cry23* (16%), *cry4* (11%) and *cry8* (4%). None of the isolates amplified for *cry10*, *cry34* and *cry35*. The variant full length *cry1* gene from the isolates DBT 2510 was cloned into pTZ57R/T and labelled as pJJK101. The nucleotide sequence showed 99 per cent homology with the reference *cry1Ac22* (EU282379.1). The 3-dimensional structure of variant *Cry1* (pJJK101) toxin was deduced and validated with Ramachandran plot analysis with 94.3 per cent residues in the favoured region, 4.7 per cent in allowed region and 1 per cent in outlier region. Changes in the electrostatic potential distribution of the surface of *Cry1* (pJJK101) toxin molecule were observed in relation to reference *Cry1Ac22* toxin predominantly at domain III region.

PLANT BIOCHEMISTRY

Studies on biochemical quality parameters of wheat as influenced by location

SHABANA NADAF

2010

MAJOR ADVISOR: Dr. P. W. BASARKAR

Three different wheat varieties that are popular and recently released from each of the three species *T. aestivum*, *T. durum* and *T. dicoccum* grown during *rabi* 2007- 2008 at MARS, Dharwad and ARS, Arabhavi were studied for biochemical parameters. Total carbohydrate content of *T. aestivum* varieties registered higher value at Dharwad, whereas *T. durum* varieties registered higher value at Arabhavi. Starch content of *T. aestivum* was comparable at both the locations. *T. dicoccum* varieties had higher nitrogen, crude protein (17.91%) and oil content at Dharwad location. *T. durum* varieties registered increase in β -carotene (4.62 mg/g) content at Dharwad over Arabhavi. Soluble proteins were higher in *T. dicoccum* varieties at both the locations. Wet gluten content of *T. durum* varieties exhibited higher

values at Arabhavi, whereas *T. dicoccum* contained higher phenol content at both the locations. Micronutrient content of *T. durum* varieties was high at Dharwad. DWR-1006 had good micronutrient content (Cu 1.77, Zn 2.58, Fe 8.40 and Mn 3.63 mg/100g). Specific activities of hydrolytic enzymes, β -amylase and acid invertase exhibited increasing trends in their activities up to 72 h of germination as compared to ungerminated seeds. The hydrolytic enzymes registered higher activities in germinated *T. aestivum* varieties at both the locations. Fractionation of HMW-GS and LMW-GS of protein carried out by SDS PAGE revealed different patterns. *T. dicoccum* and *T. aestivum* genotypes were more suitable for Dharwad environmental conditions, whereas *T. durum* varieties were suitable for Arabhavi.

In vitro screening for salt tolerance in cotton

NIRMALA

2011

MAJOR ADVISOR: Dr. H. M. VAMADEVAIAH

A laboratory experiment was conducted during 2009-10 in the 'Tissue culture laboratory' of Agriculture Research Station, Dharwad Farm, University of Agricultural Sciences, Dharwad to study the effect of *in vitro* induction of salt stress on growth parameters, osmoprotectant and two enzymes belonging to the class of oxido-reductases in three cotton genotypes viz. Bikaneri Nerma, female parent of NHH44, a popular cotton hybrid for rain-fed situation, AC-738, male parent of same hybrid and Jayadhar, a diploid cotton cultivated under rain-fed conditions. The salinity stress was induced by incorporating different concentrations of salts to generate EC 2, 4, 6 and 12 referred to as T_1 to T_5 , respectively. The experiment was laid out in completely randomised design with three replications. Reduction in seedlings fresh weight, shoot length, root weight, root length and root dry weight was significantly less in Bikaneri Nerma under salt stress as compared to Jayadhar and AC- 738.

Salinity stress led to significant increase in proline content in shoots and roots of Bikaneri Nerma when compared to Jayadhar and AC-738. Bikaneri Nerma showed significantly increased Nitrate reductase (NRA) and Peroxidase (POD) in shoots from treatments T_1 to T_5 , whereas in roots the activities of NRA and POD increased up to T_2 and T_3 onwards the activities declined. The protein expression was studied by SDA-PAGE in all the three genotypes under control and at EC level of 6. The Bikaneri Nerma and Jaydhar genotypes expressed extra protein. Polymorphic difference was also observed among the genotypes. The genotypes studied differed widely in their response to salinity exhibiting thereby that different genotypes may have different adaptation levels against salinity stress. The information generated from the present investigation reveals that the genotypes Bikaneri Nerma and Jayadhar may be better suited for salinity stress conditions.

Response of tomato (*Solanum lycopersicum* L.) to homa organic farming practices

BRUNDA R.

2011

MAJOR ADVISOR: Dr. P. W. BASARKAR

A field experiment laid out in completely randomised block design with 11 treatments exposed to Homa atmosphere replicated thrice was conducted during *kharif* 2010 to study response of tomato (*Solanum lycopersicum* L.) to homa organic farming practices. The conventional control (CC) and control without Homa (CWH) were maintained almost 1 km away. The soil type was sandy loamy. All the seedlings were grown on raised beds, transplanted after one month and were given fresh cow dung and cow urine as basal treatment except absolute control, CC and

CWC. Non-homa ash was collected after burning the agricultural waste. Agnihotra homa (AH) was performed at sun rise and sun set and Om Tryambakam homa (OTH) was performed for 3-4 h daily during experimental period which yielded smoke and ash. A special bio-digester called Gloria Biosol was prepared which contained AH ash. The Non-homa ash, AH ash, OTH ash and Gloria Biosol were used for soil and foliar application. Soil and foliar application of Gloria Biosol was significantly superior over organic control in plant height, number

leaves, number of branches, root length, yield attributes, microbial population in the soil, increase in the activities of soil dehydrogenase (5-52%) and soil phosphatase (2-34%), soil N and K and micronutrients, Cu and Mn and quality parameters like lycopene (40.69%), phenol (7.28%), ascorbic acid (49.05%), TSS (10.2%) and total sugar (9.68%) showed significant increase. Soil and foliar application of AH ash increased

soil phosphorus and micronutrients, Zn and Fe. Shelf life of tomato fruits increased by 7-12 days due to different homa treatments as compared to organic and conventional control. Incidence of Leaf spot and insect attack was reduced significantly (37.2% - 40.17%, respectively) due to soil and foliar application of Gloria Biosol which was superior over homa ashes and control.

Biochemical studies on homa organic farming practices in cabbage (*Brassica oleracea* var. Saint)

HATTALLI SACHIN AMRUTRAYA

2011

MAJOR ADVISOR: Dr. P. W. BASARKAR

A field experiment laid out in Completely Randomised Block Design with 13 treatments replicated thrice was conducted during *kharif* 2010 to study the biochemical studies on Homa organic farming practices in cabbage (*Brassica oleracea* var. Saint). The conventional control (CC) and control without homa (CWH) were maintained almost 1 km away. The soil type was red black. All the seedlings were grown on raised beds, transplanted after one month and were given fresh cow dung and cow urine as basal treatment except absolute control, CC and CWC. The non-homa ash was collected after burning the agricultural waste. Agnihotra homa (AH) was performed at sun rise and sun set and Om Tryambakam homa (OTH) was performed for 3-4 h daily during experimental period. A special bio-digester called Gloria Biosol was prepared which contained AH ash. The non-homa ash, AH ash, OTH ash and Gloria Biosol were used for soil and foliar application. Soil and

foliar application of Gloria Biosol was significantly superior over organic control in plant height, number of outer leaves per plant, leaf area, number of inner leaves per head and yield attributes, microbial population in soil, increase in the activities of soil dehydrogenase (15-54%) and soil phosphatase (6-18%), soil N, K, Cu and Mn and cabbage TSS (41%), ascorbic acid (11%), phenols (18%), crude protein (16%), N (16%), S (71%), K (22%), P (22%), Cu (13%), Zn (8%), Mn (9%) and Fe (4%) showed significant increase over organic control. Soil and foliar application of AH ash significantly increased soil P, Zn and Fe. Significant reduction was observed in the incidence of black rot (29-55%), black spot of leaf (39-73%), insect attack (head borer (18-69%), diamond back moth larvae (25-64%) and *Spodoptera litura* larvae (40-62%) per plant due to soil and foliar application of Gloria Biosol and different homa treatments.

PLANT BIOTECHNOLOGY

Activity of synthetic and rice putative promoters in tobacco

RASHMI M. HEGDE

2010

MAJOR ADVISOR: Dr. RAMESH S. BHAT

Four synthetic and two rice putative promoters were checked for inducibility in response to salicylic acid, methyl jasmonate and *Cercospora nicotianae* using SgfpS65T and XylanaseA reporters. T1 transgenic tobacco plants with test promoters driving SgfpS65T were infected with *C. nicotianae*. After 24 hr, the highest promoter activity was observed with 3 x GCC followed by 2 x S, 2 x W2 and 2 x GCC. Fold induction was highest for 2 x GCC followed by 2 x S and 2 x W2. All four synthetic promoters were stronger than CaMV 35S. Plants with test promoters driving XynA were sprayed with 5 mM salicylic acid and methyl jasmonate, and inoculated with *C. nicotianae*. In response to methyl jasmonate, 2 x GCC showed marginally higher promoter activity compared to 2 x W2 at 24 hr. But both the putative promoters of rice were very weak. 2 x W2

had a marginally higher fold induction compared to 2 x GCC. At no point of time, the strength of 2 x W2 and 2 x GCC promoters surpassed the level of CaMV 35S. 2 x W2 and 2 x GCC promoters showed considerably high activity in response to salicylic acid treatment, whereas rice promoters showed very weak activity. 2 x W2 had marginally higher activity than 2 x GCC, which was stronger than CaMV 35S. 2 x W2 showed maximum induction compared to 2 x GCC after 12 hr of treatment. Inoculation with the pathogen could induce 2 x GCC and 2 x W2. They recorded higher promoter activity compared to rice promoters. 2 x GCC showed significantly higher promoter activity than 2 x W2 at different time intervals, but both of them were weaker than CaMV 35S. Hence 2 x GCC and 2 x W2 promoters could be employed for driving R genes.

Cloning of endochitinase and endoglucanase genes from native isolates of *Trichoderma*

MANJUNATH SWAMY J. K.

2009

MAJOR ADVISOR: SUMANGALA BHAT

Eighty six *Trichoderma* isolates previously isolated and maintained in the Department of Biotechnology, were screened against *Sclerotium rolfisii*, *Rhizoctonia solani* and *Colletotrichum capsici* through dual plate assay. Based on growth inhibition, they were grouped into efficient, moderate and poor isolates. Further, endochitinase (*ech42*) and endoglucanase (β , 1-6 endoglucanase) genes were cloned from efficient, moderate and poor isolates of *T. harzianum* using specific primers. Differences were not observed in the amino acid sequences of *ech42* cloned from efficient, moderate and poor isolates of same species (*T. harzianum*). However, *ech42* cloned from most efficient isolates of *T. virens* showed

differences at amino acid level in 15 positions compared to *ech42* cloned from *T. harzianum*. Further, the β , 1-6 glucanase gene cloned from efficient, moderate and poor isolates showed differences at amino acid level. The gene cloned from efficient (IABT 1041) *T. harzianum* isolates differed from other two cloned from moderate and poor isolates (IABT 1046 and IABT 1054) in 10 amino acid positions and the β , 1-6 glucanase cloned from IABT 1046 and IABT 1054 differed at 2 amino acid positions. The cloned genes can be further subjected for expression and bioassay studies to know their utility in development of transgenic plants.

Metagenomic analysis of forest and farm soils

SACHIN A. MORE

2011

MAJOR ADVISOR: Dr. P. U. KRISHNARAJ

Metagenomics is an emerging field of science mainly aims at studying the activity of uncultured microorganisms through the nucleotide sequences. Standard culture techniques allow only 1% of microorganisms to grow in defined laboratory conditions. Thus, culture dependent study of microbial diversity unravels only part of the microbial populations present in the environment. The present study was done to analyze the soil microbial diversity between forest and farm soils through the metagenomic approach. The success of any metagenomic study depends on the method of DNA extraction. So considering the significance and need, method was optimized for extraction of microbial community DNA from forest and farm soils.

Extracted DNA was purified with the aid of chemical flocculation using FeCl_3 as chemical flocculent. Purity of DNA was confirmed by effective PCR amplification using 16S rDNA primers. The purified DNA from respective soil was PCR amplified using DGGE specific 16S rDNA primers. The amplified PCR products were then separated on DGGE gel to analyze fingerprinting pattern in each soil types. Soil microbial diversity analyses of fingerprints were done by using NTSYS software. DGGE analysis was shown that forest soil microbial community shares more similarity with organic farming soil microbial communities. The sequence based metagenomics approach was used to know the microbial community

composition. This was done by constructing PCR based 16S rDNA library of metagenome of each soil using T/A cloning method. About 17 clones of each soil were randomly selected from respective 16S rDNA library and sequenced. Blast analyses of each clone from respective soil were done in

RDP database to know the taxonomic affiliation of each clone. Further the processed 51 sequences were then submitted to NCBI database. Blast results obtained shown that majority of the microbial communities in forest and farm soil contained uncultured microorganisms.

PLANT PATHOLOGY

Studies on downy mildew of gherkins caused by *Pseudoperonospora cubensis* (Berk. and Curt.) Rostow

SANTOSHREDDY MACHENAHALLI

2011

MAJOR ADVISOR: Dr. M. S. L. RAO

Gherkin or pickling cucumber (*Cucumis sativus* L.) is an exotic vegetable being grown in several parts of Karnataka for export. This vegetable is suffering from several economically important foliar diseases like downy mildew, which is posing a serious threat to the successful large scale cultivation of this vegetable in Karnataka. Survey results indicated that severity of gherkin downy mildew was more in Koppal followed by Gadag, Haveri, Dharwad, Bellary, Bagalkot districts and the per cent disease index varied from 63.21 to 70.58. The disease starts from 20 days after sowing, almost all stages of the crop were found to be susceptible. Among the fourteen genotypes evaluated against *P. cubensis*, genotype 'Sparta' was found moderately resistant. Three genotypes viz., Vertina, Nun-5508 and Shakthi-RZ were found to be moderately susceptible. The size of sporangia of *P. cubensis* from different hosts

varied between 45-56 × 26- 37µm. The maximum sporangial germination observed at 20°C with 100 per cent relative humidity. Among the different fungicides, botanicals and bioagents tested against *P. cubensis*, Fenamidon + Mancozeb, Metalaxyl + Mancozeb, garlic bulb extract and *Pseudomonas fluorescens* were found superior, in inhibiting the sporangial germination under in vitro condition. Integrated disease management study under field conditions revealed that, the treatments with foliar sprays of Metalaxyl-MZ+ Fenamidon + mancozeb @ Dimethomorph at 0.2 per cent recorded least per cent disease index which was found on par with Metalaxyl-MZ and Fenamidon + Mancozeb spray alone. As the rotation of different molecules of fungicides avoids the resistance development by the pathogen against fungicides, rotation of fungicides is beneficial rather than the single molecule usage.

Studies on management of rhizome wilt of ginger with special reference to *Ralstonia solanacearum* (E. F. Smith) Yabuuchi *et al.*

RAGHU S.

2011

MAJOR ADVISOR: Dr. M. R. RAVIKUMAR

India is considered as the "magical land of spices", no other country in the world has such a diverse variety of spice crops as India. Ginger is one of the most important spice crop of India. The major constraint for the cultivation of ginger is the rhizome wilt disease. The rhizome wilt incidence was noticed in all the surveyed locations of Shimoga, Uttara Kannada and Haveri districts ranges from 4.20 to 50.50 per cent. The maximum disease incidence was observed in Shimoga district (34.66%), followed by Uttara Kannada (31.92%). The least incidence was observed in Haveri (8.19%). The major diseases diagnosed were soft rot caused by *Pythium* spp., wet rot caused by *Fusarium* spp., bacterial wilt caused by *R. solanacearum*, sclerotium rot caused by *Sclerotium rolfsii* and plant parasitic nematode *Meloidogyne*, all these pathogens individually or in combination leads to rot formation. *In vitro* evaluation of antibacterial chemicals revealed that

streptocycline at 500 ppm was best chemical followed by K-cycline. Among the botanicals tested, soapnut + meswak at 20% gave best results and among bioagents *Pseudomonas fluorescens* were found effective both in Mycelial disc and culture filtrate methods. Results on evaluation of neem based commercial products indicated that ahook has shown significantly superior efficacy at all the concentrations with greater efficacy at 30%. Field experiment was conducted during kharif 2010. The results indicated that among the different treatments, Rhizome treated with streptocycline at 0.5 g per lit + COC at 2.0 g per lit + soil application of carbofuran + drenching with metalaxyl MZ 1 g per lit. The streptocycline at 0.5 g per lit of water twice at 20 days interval starting with initiation of disease recorded very less disease incidence (20.70%), when compared to control (40.85%) and given maximum yield of 224.00 qt per ha.

Studies on loss assessment and management of common rust of maize caused by *Puccinia sorghi* Schw.

UTPAL DEY

2011

MAJOR ADVISOR: Dr. S. I. HARLAPUR

Common rust of maize caused by *Puccinia sorghi* Schw. is an important disease which results in heavy yield loss. Laboratory and field experiments were carried out to study the loss assessment and management aspects of the disease. Spore germination was maximum within 24 hr at temperature in the range of 20-30°C. The maximum spore germination recorded at 25°C (66.16%) which is statistically on par at 30°C. Differential spray schedule with Hexaconazole 0.1% revealed that, rust index was least in T5, i.e., five sprays of Hexaconazole (30.25%) and the disease was completely free with T6, i.e., six sprays of Hexaconazole. Maximum grain yield (35.58 q/ha) was obtained with six sprays of Hexaconazole. Highest per cent avoidable grain yield loss was recorded with six sprays of 0.1% Hexaconazole (60.53%) over untreated control. This indicates that common rust disease can cause up to 60.53 % yield loss in susceptible cultivar CM-202. The disease development started on 30 days (22.34% PDI) and increased progressively up to 90 days (88.56% PDI) and later on became stable. Maximum rust severity of

89.82 per cent was observed on 60 days old plants which was on par with 70 days (89.61%) and was significantly superior to rest of the plant age group. Among the inbred lines MI-12 and Indimyt-345 are highly resistant to common rust of maize and among hybrids viz., NK-6240, NK-61, NK-7305, CP-808, GK-3090, 30R77, CP-818, C-1945, JKMh-502, PAC-740, NK-121, Pro-311, DK-984 and Swarna registered resistant reaction under artificial inoculated field condition. A systemic fungicide, Tebuconazole 250 EC and nonsystemic fungicide, Mancozeb + Phyton and botanical product, Neemazol F 5% were most effective which resulted in less per cent germination of uredospore. The ITK's viz; Jeevamrutha @ 20 per cent concentration caused significantly less per cent germination (22.69%). Among the bio-control agents evaluated, *Trichoderma harzianum* found effective against the pathogen. Significantly minimum PDI (19.74%) and maximum grain yield (66.87 q/ha) was recorded in treatment T1, i.e., foliar application of Tebuconazole @ 0.1% at 35 and 50 DAS.

Studies on variability and management of *Sclerotium rolfsii* Sacc. causing wilt of stevia

SHWETHA G. S.

2011

MAJOR ADVISOR: Dr. YASHODA R. HEGDE

Stevia rebaudiana is a perennial herbaceous medicinal plant belonging to family Asteraceae. Wilt caused by *Sclerotium rolfsii* is major constraint in stevia production. Ten pathogenic isolates of *Sclerotium rolfsii* were obtained during survey from different locations of Karnataka and per cent disease incidence varied from 8-40%. The study on variability indicated that all isolates showed marked differences in their growth rate and time taken for sclerotial initiation, colour, size and weight of sclerotial body. Cultural

studies on different media revealed that potato dextrose agar and potato dextrose broth were best for growth of all the isolates. The isolates varied in their growth in all temperature and pH. Maximum growth rate of all isolates was observed at 300 - 35°C while, no growth at 40°C and optimum pH for isolates varied from 4 to 5. Present study clearly indicated that the virulence was correlated with many aspects like isolates with small sized sclerotia, high virulence index, more oxalic acid production and least vigour

index (SrKAI, SrNID and SrSAI) were highly virulent while, isolates with big sized sclerotia, low virulence index, less oxalic acid production and high vigour index were less virulent viz, SrBEN, SrGAN, SrRIP and SrSIR. Host range studies revealed that coleus, tulsi, shatavari, brahmi, rose mary, patchouli and aloe were collateral host. Aswagandha, lemon grass and basmati were non host. Investigation on sensitivity of isolates to hexaconazole revealed that all isolates except SrSAI, SrNID and SrKAL found sensitive to

hexaconazole upto 100 ppb. In chemical studies except carbendazim all were effective. In biological management trial, duranta, eupatorium, cow urine, panchagavya, *Trichoderma harzianum* and *T. viride* were effective under *in vitro* condition. *In vivo* studies revealed that soil drenching with 0.1 per cent hexaconazole or propiconazole, 10 per cent *Eupatorium odoratum* and *Duranta repens*, *T. harzianum*, *T. viride* helped to manage the sclerotium wilt successfully.

Molecular characterization of virus associated with chilli (*Capsicum annuum* L.) murda complex

PRADEEP MANYAM

2011

MAJOR ADVISOR: Dr. A. S. BYADGI

Chilli murda complex associated with thrips, mites and a virus is one of the most serious diseases of chilli (*Capsicum annuum* L.) where the role of virus was poorly understood. The survey was undertaken in four northern districts of Karnataka. Where, Haveri district recorded the maximum average disease incidence (45.86%) followed by Dharwad (39.36%), Belgaum (31.68%) and Gadag (30.81%). Symptomatically murda complex was noticed with severe leaf curling in both upward and downward directions with puckering, crinkling, elongated petiole and complete sterility. Dark green mottling with vein banding symptoms was also observed. The electron microscopic observation of murda infected chilli samples showed the presence of flexuous rod shaped particles. Direct Antigen Coating Enzyme Linked Immuno Sorbant Assay indicated the presence of potyvirus particles in murda samples detected with Tobacco etch virus antiserum. Whereas, begomovirus and tospovirus particles were not detected in murda infected

chilli samples. RT-PCR analysis of diseased specimens yielded 1200 bp DNA fragment with the primer set designed to amplify CP gene of Chilli vein mottle virus. But, murda samples failed to amplify for both degenerate primers of DNA-A component of geminiviruses and primers that amplify the sequences between gL3637 and gL4435c of L RNA of tospoviruses. Whereas, individual plants showing chlorotic and necrotic spots with apical necrosis observed sporadically were amplified for conserved L genes of tospoviruses. Thus, the detection through Electron microscopy and with suitable control included in ELISA and PCR based detection have led to establish the association of a potyvirus with the disease and chilli vein mottle virus may be the possible causative agent at the species level. Among management practices taken up, Imidacloprid 17.8SL (0.03%) application for 3 sprays at main field found effective against sucking pests and disease incidence.

Investigations on chrysanthemum leaf blight caused by *Alternaria alternata* (Fr.) Keissler

DEVARAJA ODENAPUR

2011

MAJOR ADVISOR: Dr. B. C. KAMANNA

Among the several diseases, *Alternaria* leaf blight is one of the most destructive foliar disease which causes heavy loss in chrysanthemum. Survey during *Khari/Rabi* 2010 revealed that *Alternaria* leaf blight was severe in all five districts viz., Dharwad, Haveri, Gadag, Koppal and Belgaum. Isolation and morphological studies revealed *Alternaria alternata* (Fr.) Keissler as causal organism. In cultural studies maximum growth was observed in potato dextrose agar (81.60mm), followed by Richard's agar (78.50mm). Nutritional requirement of the pathogen were studied with different carbon and nitrogen sources. Among carbon compounds, mean dry mycelial weight of the pathogen was maximum in glucose (359.67mg), followed by sucrose (276.62mg). Among the nitrogen sources, maximum mean dry mycelial weight was observed in Asparagine (383.33mg). In pH studies maximum growth of pathogen found at 6 pH. The maximum growth was observed, when cultures were exposed to alternate cycles of

12hr light and 12hr darkness. Optimum temperature range for the growth of the pathogen was found to be between 25°C -30°C. The survival of pathogen in chrysanthemum crop debris was more than 183 days under in all three different conditions viz., refrigerator, glasshouse, laboratory. Out of nine hosts range studies, sunflower and day flower produced symptoms. Among the five chrysanthemum varieties screened for their reaction to leaf blight under artificial conditions all are shown the susceptible reaction. Among ten different fungicides tested *in vitro*, Propiconazole, Difenconazole, Penconazole and Hexaconazole at 0.1% concentrations completely inhibited the mycelial growth of *A. alternata*. In case of field evaluation of fungicides Hexaconazole (0.1%) effectively controlled the disease incidence and recorded very less per cent disease index (5.18) which was on par with the Difenconazole (0.1%) having a per cent disease index 5.74.

Studies on sorghum ergot caused by *Claviceps africana* Frederickson mantle and De milliano

SHIVAKUMAR. R

2011

MAJOR ADVISOR: Dr. A. R. HUNDEKAR

Ergot (sugary disease) caused by *Claviceps africana* has become major constraint particularly in the cultivation of sorghum hybrids and hybrid seed production. The survey data indicated that average disease incidence of 6.6% and severity of 17.56 PDI was recorded in Northern Karnataka. The maximum incidence of 12.02% and severity of 25.94 PDI were observed in Belgaum district followed by Dharwad, Gadag, Haveri and Raichur. Isolation and morphological studies confirmed that *C. africana* as causal organism of the disease. The pathogen attained maximum growth on 12th day of incubation in T2 broth. T2 agar and Kirchhoff's agar media were the best for colony growth and sporulation. The maximum dry mycelial weight of *C. africana* was observed at 200C (114 mg) and it was least at 400C (12mg). *In vitro* cent percent inhibition of mycelial growth was observed with Hexaconazole 5%EC, Captan70%+Hexaconazole5% and Hexaconazole4%+Zineb68%.

Adusoge at 10 per cent was found most effective among plant leaf extracts. *In vitro* cent percent inhibition of mycelial growth was observed with Achook 0.15%EC, Neem Extra Power 10000 ppm and Nimbidine 0.03%EC @15% concentration. The sorghum grain yield loss of 38.47% due to ergot disease was observed with unsprayed treatment over five sprays of Hexaconazole @ 1ml/l. Yield loss due to ergot disease decreased with increased number of Hexaconazole sprays. Hexaconazole5% EC @1ml/l, Propiconazole25%EC @1ml/l and Captan70%+Hexaconazole5% @2 g/l were found effective in reducing the incidence and severity of the disease and thereby increasing the sorghum grain yield. Hexaconazole @1 ml/l was found most effective. None of the plant leaf extracts was effective to as that of Hexaconazole. None of the genotype showed resistant reaction against the disease among the ten genotypes screened under artificial condition.

Studies on root rot/wilt of soybean

SANGEETHA T. V.

2011

MAJOR ADVISOR: Dr. SHAMARAO JAHAGIRDAR

Soybean Glycine max (L.) Merrill is protein rich oilseed crop. It is considered as a golden bean, miracle bean and wonder crop of the 20th century because of its characters and usage. Wilt/root rot is caused by *Sclerotium rolfsii*, *Rhizoctonia sp.* and *Fusarium sp.* are major constraints in soybean production. Isolates of all the pathogens were obtained during

the survey from different locations of northern Karnataka and the disease incidence varied from 3.36 to 36.30 per cent. The study on variability of the causal organisms was undertaken. Isolates of all the pathogens showed marked difference in their growth rate and time taken for sclerotial initiation and spore production. Cultural studies on different media revealed

that *S.rolfsii* and *Fusarium sp.* grew well on Potato Dextrose Agar and *Rhizoctonia sp.* grew well on Sabouraud's Agar. Isolates varied in their growth in all the temperature tested. Maximum growth rate and spore germination was observed at 30°C while no growth at 40°C. *In vitro* studies revealed that *Trichoderma viride*, *Trichoderma harzianum*, Azadirachtin, neem oil, Mancozeb, Carbendazim, Thiophanate methyl, Hexaconazole,

Propiconazole, Carbendazim + Mancozeb and Carboxin + Mancozeb were more effective in inhibiting the mycelial growth of all the three pathogens. Glasshouse studies revealed that soil drenching with Carbendazim, Carboxin+Thiram, Thiophanate methyl, Hexaconazole, Neem oil, Nimbicidine, *T.harzianum* and *T. viride* helped to manage the disease successfully.

Organic management of anthracnose of chilli caused by *Colletotrichum capsici* (Syd.) Butler and Bsbby

REENA B. RAJPUT

2011

MAJOR ADVISOR: Dr. M. G. PALAKSHAPPA

Chilli, Capsicum annum L. is an annual herbaceous spice/vegetable/cash crop grown in both tropical and sub-tropical regions. Among the fungal diseases anthracnose or ripe fruit rot of chilli caused by *Colletotrichum capsici* (Syd.) Butler and Bisby is one of the limiting factors in cultivation of chilli. The survey revealed that the highest severity of anthracnose of chilli was recorded in Nalsvadi (46.35%). Plant extracts *Ocimum sanctum*, Neem Gold (300 ppm), Achook (1500 ppm) and Neem Fighter (10,000 ppm), *T. harzianum*, commercial bioagent Biocure F and Criyagen F, organic products Neem oil and Neem oil plus butter milk were found highly effective in inhibiting mycelial growth of *C. capsici*. Highest fungal population before planting and at flowering was noticed in Vermicompost (VC50%) + Farm yard manure (FYM50%) equivalent to recommended dose of nitrogen (RDN) with seedling dip in Panchgavya @ 3%, sulfur @ 0.2%, panchagavya @ 3%, nimbicidine (0.03% EC) @ 0.25% and VC

50% + FYM 50% equivalent to RDN with seedling dip in cow dung slurry @ 10% + *Trichoderma harzianum* @ 10g/l, sulfur @ 0.2%, nimbicidine (0.03%EC) @ 0.25%. The highest bacteria population before planting and at flowering was noticed in untreated check (VC50% + FYM50% equivalent to RDN) and VC50% + FYM50% equivalent to RDN with seedling dip in cow dung slurry @ 10g/l + *Pseudomonas fluorescens* @ 10g/l, sulfur @ 0.2%, nimbicidine (0.03%EC) @ 0.25%. Highest germination, seedling growth and vigour index was noticed in (VC50% + FYM50%) equivalent to RDN along with seedling dip in cow dung slurry @ 10% + *Pseudomonas fluorescens* 10g/l, sulfur @ 0.2%. The field trial results indicated that VC50% + FYM50% equivalent to RDN with seedling dip in cow dung slurry @ 10% + *Pseudomonas fluorescens* 10g/l, sulfur @ 0.2% recorded least per cent disease index and per cent infection in first and second picking and yielded (4.38q/ha).

Studies on molecular variations in *Puccinia arachidis* Speg. causing rust of groundnut

C. B. TASHILDAR

2011

MAJOR ADVISOR: Dr. S. S. ADIVER

An investigation was carried out to study morphological and molecular variation in *Puccinia arachidis* Speg. Five isolates were collected from different varieties grown in MARS, Dharwad and ten isolates from other locations. Morphological variation was studied by considering uredospore morphology. Molecular variation was studied by PAGE technique using selected isozymes and RAPD technique using ten random primers. In morphological variation, the dimension of uredospores of all isolates was in the range of 21-26 × 18-21 µm. Nearly all spores had light cinnamon colour and globose to ovoid shape. The pits on the surface of the spores were observed in Annigere, Bellary, Jalgaon and Kolhapur isolates only. The echinulations were scarce to fine in all isolates. A teleospore measuring 30.64 x 19.33 µm was found in the Gadag isolate. This is a rare occurrence and needs further study. PAGE analysis of Peroxidase revealed two distinct groups in Dharwad isolates. Dh-86, Dh-101, GPBD-4 and JL-24 isolates formed one group whereas and

TAG-24 isolate formed another group. In other locations, Gadag isolate formed a distinct group. Other isolates formed another group. Polyphenol oxidase analysis too revealed two distinct groups in Dharwad isolates. Dh-86, Dh-101 and JL-24 isolates formed one group. GPBD-4 and TAG-24 isolates formed another group. In other locations too, Jalgaon isolate formed a distinct group. Other isolates formed another group. In case of molecular variation with the RAPD markers, OPD-18 (5'-GAGAGCCAAC-3') gave highest amplification. RAPD analysis revealed two distinct groups within Dharwad isolates. Dh-86, Dh-101 and TAG-24 isolates formed one group. GPBD-4 and JL-24 isolates formed another group. In other locations, Dharwad and Raichur formed a distinct group. Rest of the isolates formed another group. Isozyme studies with PAGE and RAPD revealed minor variation in the pathogen in spite of insignificant morphological variation; which is useful to understand host-pathogen interaction.

Biochemical factors governing interactions in rice genotypes against *Pyricularia grisea* (Cooke) Sacc.

SOWMYA H. M.

2011

MAJOR ADVISOR: Dr. S. K. PRASHANTHI

Rice blast caused by *Pyricularia grisea* (Cooke) Sacc. continues to be a serious constraint to rice production in both tropical and temperate regions. Roving survey carried out during kharif 2010 in Karnataka showed that blast severity ranged from 20.17 to 58.72 Percent Disease Index. Field screening of 210 genotypes against blast showed that, seven genotypes viz., Casebatta, Jasmine -85, Siddasala, IR-64, Diamond Sona, Vajram, MGD 101 were resistant to both leaf and neck blast. Fifty five genotypes were resistant and Eighty five genotypes were moderately resistant to leaf blast. Influence of blast on different biochemical components present in resistant, moderately resistant and susceptible genotypes at different stages of blast infection was investigated. Total phenol, Orthodihydroxyphenol, total sugar, reducing sugar and non reducing sugar content was more in resistant and moderately resistant varieties compared to susceptible genotypes at all the stages of infection but they decreased slightly during

neck blast stage. Accumulation and increase of phenol content in resistant genotypes was quick and more compared to moderately resistant and susceptible genotypes. Total amino acid content was more in resistant genotypes compared to susceptible genotypes. Total amino acid content increased from before disease initiation stage to neck blast stage. Protein content was more in susceptible genotypes compared to resistant and moderately resistant varieties and it decreased from before initiation stage to neck blast stage rapidly. Decrease of protein content from before disease initiation stage to peak stage was maximum in resistant varieties than moderately resistant and susceptible varieties. Isozyme study on peroxidase indicated significant variations among resistant, moderately resistant and susceptible genotypes. Phenylalanine ammonia lyase activity was more in resistant genotypes compared to moderately resistant and susceptible genotypes.

Studies on production of oil based formulation of *Trichoderma* and their efficacy on foliar diseases of groundnut

AHAMED MUJTABA V.

2010

MAJOR ADVISOR: Dr. SHRIPAD KULKARNI

Isolation of *Trichoderma harzianum*, maintenance of pure culture, mass production and preparation of oil based formulations were carried out at Institute of Organic Farming and field experiments and studies on shelf life and field evaluation of different oil based formulation against rust and late leaf spot of groundnut were carried out during kharif 2010 at MARS, University of Agricultural Sciences, Dharwad, Karnataka. Among the several

diseases affecting the groundnut crop, foliar disease cause heavy loss in yield. These include late leaf spot [*Phaeoisariopsis personata* (Berk. and Curt.) V. Arx] and rust (*Puccinia arachidis* Speg.). Results of *in-vitro* studies of present investigation on shelf life reveals that among various oil based formulations Canola oil + Glycerol based formulation (3.00 x 10⁶ cfu/ml) was found to be the best formulation with highest shelf life, followed by

Paraffin oil based formulation (2.00×10^6 cfu/ml). In *in-vitro* evaluation of different *Trichoderma* oil based formulations against pathogenic propagules of rust and late leaf spot causing fungi indicated Paraffin oil + Neem oil based formulations to be superior with 4.79% and 3.67% uredospore germination and conidial germination, respectively followed by Neem oil based formulation with 5.68% and 4.59% germination against 92.27% and 95.60% uredospore and conidial germination in control. Among different

oil based formulations tested for the management of both rust and late leaf spot, Canola oil + Glycerol based formulation was found to be most effective in reducing the incidence of both rust and late leaf spot with PDI of 11.70 and 12.64, respectively compared to rust and late leaf spot with PDI of 35.62 and 38.45 in untreated check. Similar trend was also observed with respect to groundnut pod yield, treatment with Canola oil + Glycerol oil based formulation had shown maximum pod yield of 22.22 q per ha.

SEED SCIENCE AND TECHNOLOGY

Studies on seed production techniques and effect of botanicals on storability of sweet corn (*Zea mays* L. *Saccharum*)

SANDEEP DANGI

2011

MAJOR ADVISOR: Dr. N. K. BIRADAR PATIL

An experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *kharif* 2008, to find out the influence of NPK and spacing on growth, seed yield and quality sweet corn. Storage study was also carried out to enhance storability of sweet corn seeds through use of botanicals treatment. Application of fertilizer level 150:75:37.50 kg NPK per ha (F_3) recorded significantly higher plant height (221.08 cm), early tasseling (57.32 days), early silking (60.53 days), higher cob length (17.58 cm), number of seeds per cob (358.4), 100 seed weight (11.64 g), recovery per cent (96.64) and seed yield (25.87 q/ha). The seed quality parameters *viz.*, germination (92.26 %), root length (22.25 cm), shoot length (21.87cm) and vigour index (4218) was also higher with F_3 . Among the spacing 60 x 30 cm (S_4) recorded significantly higher plant height (220.87 cm) higher 100 seed

weight (11.83 g), seed recovery per cent (97.74), seed yield of 26.94 q per ha. Significantly higher number of seeds per cob and seed germination (92.33 %) was observed with a spacing of 75 X 20 cm. other seed quality parameters like root length (22.70 cm), shoot length (21.54 cm) and vigour index (4295) were higher with 60 X 30 cm (S_4). Among the treatment combinations of fertilizer levels and spacings, F_3S_4 recorded significantly higher plant height (227.41 cm), seed recovery (98.50), seed yield (28.68 q/ha), where as F_3S_3 recorded significantly higher vigour index (4652) The storage studies conducted revealed that seeds treated with sweet flag rhizome powder @ 10 g per kg of seed has recorded higher germination (94.70 %), dry weight of seedlings (2.01g), vigour index (2864) and less infestation (3.60 %) at the end of 10 months of storage.

Influence of electrical energy on seed quality attributes of cereal crops

MUTTANNA M. DHANAGAR

2011

MAJOR ADVISOR: Dr. A. S. CHANNAVEERSWAMI

The laboratory experiment entitled influence of electrical energy on seed quality attributes of cereal crops was carried out in the Department of Seed Science and Technology, University of Agricultural Sciences, Dharwad. The study revealed both positive and negative impact on its beneficial and harmful effects. Hence, there is a need to standardize the effective optimum dose of electric current in relation to seed quality. Results of the experiment revealed that among three electrical current intensities *viz.*, 910 mA, 1023mA and 2750 mA, the electric current intensity of 1023 mA found to be optimum for enhancing various seed quality attributes such as per cent germination, first count of germination, root and shoot lengths, seedling dry weight, seedling vigour index, speed

of germination, Bartlett's germination rate index and field emergence with decreased electrical conductivity of seed leachate for four vigour level seeds of five cereal crops *viz.*, Maize, Sorghum, Paddy, Wheat and Bajra. The exposure of all the vigour level seeds of Maize, Sorghum, Paddy, Wheat and Bajra seeds to one minute duration in all the current intensity levels was found to be beneficial for various seed quality parameters over control and found to be optimum period of exposure. Interaction between the treatment electric current intensity of 1023 mA for one minute duration of exposure was found to be best to obtain better seed quality of all the vigour level seeds of maize, sorghum, paddy, wheat and bajra seeds.

Influence of magnetic field intensity on seed quality attributes of cereal crops

MALLAPPA S. BUJRUKH

2011

MAJOR ADVISOR: Dr. A. S. CHANNAVEERSWAMI

The study entitled influence of magnetic energy on seed quality attributes of cereal crops was carried out in the Department of Seed Science and Technology, University of Agricultural Sciences, Dharwad. All the vigour level seeds of Maize, Sorghum, Paddy, Wheat and Bajra when exposed to the magnetic field intensity of 100 mT recorded on par values for various seed quality parameters over control, subsequent increase in the magnetic field intensity of 200 mT was found to be the optimum intensity to get beneficial effect which recorded higher values for various seed quality parameters studied namely; germination percentage, first count of germination, root and shoot length, seedling vigour index, seedling dry weight, speed of germination, Bartlett's germination rate index, electric conductivity of seed leachate and field emergence and field emergence over control, further increase in the magnetic field intensity to 300 mT recorded lesser values for various seed quality parameters over control and this intensity nullified the positive effect and was detrimental to seed quality. The exposure of

different vigour level seeds of Maize, Sorghum, Paddy, Wheat and Bajra to two hours duration in all the magnetic field intensity levels for was found to be beneficial for various seed quality parameters over control and found to be optimum period of exposure, again further increase in duration of exposure to more than two hours in all the magnetic field intensity levels was found to be detrimental for various seed quality parameters over control. The different vigour level seed when exposed of magnetic field intensity of 200mT for two hours recorded best interaction treatment to obtain better seed quality and the treatment combination of magnetic field intensity of less than 200 mT for varied durations was not effective to get beneficial influence on various seed quality seed parameters over control. The magnetic field intensity of more than 300 mT for varied durations was detrimental on various seed quality seed parameters over control. Therefore, the study revealed both positive and negative impact on its beneficial and harmful effects. Hence, there is a need to standardize the effective optimum dose of magnetic field intensity in relation to seed quality.

Studies on effective methods for synchronization of flowering in parents of DMH-2 hybrid maize

YEGAPPA HIPPARAGI

2011

MAJOR ADVISOR: Dr. V. K. DESHPANDE

The present investigation was carried out to study the influence of seed treatment with hydration, gibberellic acid and soil application of additional nitrogen in combination with urea spray to female parent (CI-4) and only Abscicic acid seed treatment to male (KDMI-10) on synchronization of flowering between the parental lines, seed yield and quality of hybrid maize DMH-2 at MARS, UAS Dharwad during *kharif* 2010. Female parent flowered late by six days than male

with simultaneous sowing. Among the different techniques to achieve synchronization of flowering, pre sowing seed hydration(6hrs) + 10 % additional N soil application to female parent resulted in better synchronization of flowering (1.34 days) and resulted in significantly highest seed yield (38.33 q/ha) over simultaneous sowing control (23.07 q/ha). This treatment also hastened the first flowering in female parent (47.33 days) and increased the

cob length, cob weight (163.00 g/ plant), number of seeds rows per cob (14.00), seed weight per cob (132.07 g), seed set % (96.45), 100 seed weight (29.79 g) and fodder yield (3.33 q) compared to other treatments. The results of another field experiment conducted during 2010-11, to study the effect of time of sowing on flowering behavior of parental lines of DMH-2 maize hybrid revealed that, sowing dates influenced the flowering behavior of the

parental lines. Sowing in mid July caused early initial and 50% flowering by 4 days and 3 days between female and male parents respectively and the difference was gradually increased up to January 1st sowings. None of the sowing did not give cent per cent synchrony and the flowering difference (50%) ranged from 3 to 11 days during June 1st 2010 to January 15th 2011 under Dharwad condition.

Effect of seed treatments and containers on storability of jute varieties (*Corchorous olitorius*)

KIRAN KUMAR M. S.

2011

MAJOR ADVISOR: Dr. M. B. KURDIKERI

The storage potential of JRO 204 and JRO 524 jute seeds was undertaken with seven seed treatments viz. captan @ 2g per kg seeds, chlorox @ 2g per kg seeds, boric acid @ 2g per kg seeds, calcium chloride @ 2g per kg seeds, tannic acid @ 2g per kg seeds, ascorbic acid @ 2g per kg seeds, control and were packed in cloth bag and polythene bag (700 gauge) and stored under ambient conditions for 12 months. The JRO 524 jute variety recorded higher germination and seedling vigour parameters compared to the JRO 204 at the end of 12 months of storage. Among the seed treatments, seed treated with tannic acid recorded higher germination (84.81%) and other seed quality parameters at the end of storage period. Seeds packed in polythene bag recorded higher germination (76.28%), vigour parameters with lower electrical conductivity and moisture content as compared to seeds stored in cloth bag at the end of storage period. In the interaction effect of varieties

and treatments (VxT), JRO 204 and JRO 524 seeds treated with tannic acid recorded significantly satisfactory higher germination (83.38% and 86.23% respectively) as per minimum seed certification standards and other vigour parameters throughout the storage period. In the interactions between varieties and packaging materials (VxC), JRO 524 variety seeds packed in polythene bag was superior in all the seed quality parameters compared to cloth bag. In the interactions of seed treatments and containers (Tx C), seed treated with tannic acid and stored in polythene bag recorded higher satisfactory germination (85.61%) with higher vigour parameters at the end of storage period. Among the interactions of varieties, seed treatments and containers (VxTx C), JRO 524 seeds treated with tannic acid and packed in polythene bag recorded higher satisfactory germination (87.36%) and other seed quality parameters at the end of storage period.

Influence of insect attractants, micronutrients and growth regulators on growth, seed yield and quality in lucerne (*Medicago sativa* L.)

SREEDHARA K.

2011

MAJOR ADVISOR: Dr. KRISHNAA

The field experiment was conducted during Rabi season of 2010-11 at the Main Agricultural Research Station, University of Agriculture Sciences, Dharwad. The experiment consisted of eight treatment combinations involving two insect attractants, viz., Jaggery solution @ 2% (A₁), Commercial attractant (Bee-Q @ 0.175%) (A₂), Two micronutrients (M) viz., Boron @ 0.8% (M₁), Molybdenum @ 0.05% (M₂) and Two growth regulators (G) viz., Gibberellic acid (GA₃) @ 50 ppm (G₁), Naphthalene Acetic Acid (NAA) @ 50 ppm (G₂). The results indicated that and it was laid out in RBD with factorial concept. Among the insect attractants sprayed, Bee-Q recorded significantly higher plant height (87.37 cm) compared to Jaggery solution (82.29cm). Application of Boron @ of 0.8 per cent as a foliar spray recorded significantly higher plant height (84.98 cm) compared to the Molybdenum at the rate of 0.05 per cent application. Among the growth regulators used Gibberellic acid @ 50 ppm sprayed at

the time of 50% flowering showed significantly higher plant height than the Naphthalene acetic acid @ 50 ppm. The interaction effect between insect attractants, micronutrients and growth regulators exhibited significant variation on pod set per cent. The treatment combination of A₁M₁G₁ (Jaggery solution + Boron + GA₃) found significantly superior over all other treatment combinations. Significantly higher seed yield per ha (268 kg) was noticed with foliar application of Bee-Q when compared to Jaggery solution (227 kg) with the extent of 18% of increase. Plots sprayed with Boron recorded maximum seed yield compared to the Molybdenum spray. Among the growth regulators, GA₃ @ 50 ppm recorded maximum seed yield when the crop was sprayed at 50 per cent flowering stage. Among the insect attractants sprayed, Bee-Q recorded significantly higher test weight (2.62 g), germination percentage (91.16) compared to Jaggery solution.

Effect of planting geometry and foliar spray of micronutrients on plant growth, seed yield and quality of bell pepper (*Capsicum annum* L.)

DILIP KUMAR M. R.

2011

MAJOR ADVISOR: Dr. T. A. MALABASARI

The field experiment was conducted to study the effect of planting geometry and foliar spray of micronutrients on plant growth, seed yield and quality of bell pepper (*Capsicum annum* L.) at Agricultural Research Station, Bagalkot, University of Agricultural Sciences, Dharwad during rabi 2010-2011. The experiment was laid out in split plot design consisting of 15 treatment combinations with 3 spacings as one factor and 5 foliar sprays of micronutrients as another factor, three sprays were given at 30, 45 and 60 days after transplanting. The spacing of 60x45 cm took least number of days to 50 per cent flowering (44.33) and maturity (68.6) and borne more number of fruits per plant (7.50), higher fruit yield per plant (337.05g) and seed yield per plant (7.63g). But spacing of 45x45 cm recorded significantly higher seed yield per ha (352.88 kg). Seed quality parameter like germination (81.25%), seedling vigour index (93.97),

seedling dry weight (49.21mg) with lower electrical conductivity (0.37dSm⁻¹) of seed leachate were also observed with spacing of 60 x 45 cm. Among the foliar spray of micronutrients borax (0.5 %) recorded significantly less number of days (43.56) to 50 per cent flowering and to maturity (73.33) with more number of fruits per plant (8.3g) and fruit yield per plant (377.8g). Significantly higher number of seeds per fruit (221.20), seed yield per fruit (1.06g), seed yield per plant (8.63g) and seed yield per ha (342.45kg). Quality parameters like higher germination (83.82%), seedling vigour index (1000.4), seedling dry weight (51.10mg) with lower electrical conductivity (0.36dSm⁻¹) were recorded with borax (0.5%) foliar spray. In terms of economics spacing of 45x45 cm with borax (0.5%) foliar spray gave higher net returns of ` 1,96,480 per ha with the cost of seed production of ` 88,870 per ha and a Cost Benefit Ratio of 1:3.21.

Investigations on growing condition, spacing and calcium sprays on seed yield, quality and storability of tomato (*Solanum lycopersicum* L.) seeds

HARISH S.

2011

MAJOR ADVISOR: Dr. N. K. BIRADAR PATIL

Field and laboratory experiments were conducted to find out the effect of growing condition, spacing and calcium sprays on seed yield, quality and storability of tomato seeds in National Seed Unit, UAS, Dharwad. Field experiment was conducted in split-split design consisted of two growing conditions viz., open field and naturally ventilated polyhouse

condition with three levels of spacing viz., 60 x 45 , 60 x 60 and 60 x 75 cm and four stages of calcium sprays viz. control, weekly, fortnightly and monthly spray. Between two growing conditions, polyhouse grown condition recorded significantly higher seed yield (477.85 kg/ha), germination (87.91 %) and vigour index (1149) compared to open field.

Among the spacings, higher seed yield (465.28 kg/ha) with better seed quality traits were recorded with 60 x 60 cm spacing. The higher seed yield (450.98 kg/ha) was recorded with fortnightly calcium spray. In polyhouse condition, among the calcium sprays, higher 1000 seed weight (2.62 g) and better seed quality traits were recorded with fortnightly calcium spray. Among five pickings, second picking recorded higher germination (96.45 %) and vigour index (1352). The storage experiment was conducted with the seeds produced under two growing condition viz., open field and polyhouse, and six seed treatments viz.,

control and seed treatment with chemicals like thiram, vitavax power @ 2g/kg of seeds, polymer coating @ 20ml/kg of seeds, thiram @ 2g + polymer coating @ 20ml/kg of seeds and vitavax power @ 2g + polymer coating @ 20ml/kg of seeds and stored under ambient condition for 6 months period. Between growing conditions, polyhouse grown seeds recorded higher germination (75.35 %) and vigour index (1373) compared to open field at the end of 6 months storage period. Among the seed treatments, vitavax power and polymer coated seeds retained higher germination (76.38 %) and other seed quality parameters.

Molecular, morphological and chemical characterization of tomato genotypes (*Solanum lycopersicum*) genotypes and influence of organic manures on seed yield and seed quality in tomato cv. DMT-2

RAMAGONDAPPA SUNNADAGUDI

2011

MAJOR ADVISOR: Dr. R. GURUMURTHY

The laboratory and field experiments were conducted, during *kharif*, 2010 for identification of tomato genotypes through morphological, chemical and molecular markers and influence of organic manures on seed yield and seed quality in tomato cv. DMT-2 at Seed Quality and Research Laboratory of National Seed Project, and main agricultural research station VAS, Dharwad respectively. Twelve tomato genotypes were grouped into 18 groups based on the seed morphological characters such as seedling leaf color, days to maturity, foliage density, leaf type, exterior color of immature fruit, fruit shape fruit size, exterior color of mature fruit, from pedicel, fruit shoulder shape, skin color ripe fruit, flesh color intensity, fruit cross sectional shape, number of locules, shape pistil scar and fruit blossom end shape. The chemical tests viz., Phenol, modified phenol, Peroxidase, NaOH and KOH tests disabled the grouping

of tomato ge~otypes based on the color response. Genotypes used in this investigation did not exhibit change in seed coat color as well as solution. Based on the seedling growth response to GA₃, genotypes were grouped as low, moderate and high response and based on 2,4-D genotypes were grouped as least, moderate and highly affected. Random amplified polymorphic DNA profile for all 12 genotypes was generated with 20 random decamer primers. The highest molecular diversity was observed between the genotypes DMT-3 and DMT-6 & high similarity with Sij 0.99 was observed between genotypes DMT-5 and DM-4. The field experiment consisted of 11 treatments involving different organic manures. Among the treatments recommended dose of fertilizer (T11) recorded significantly superior values over other treatments with respect to growth, yield and seed quality parameters.

Investigations on seed dropping and biofertilizer and calcium seed treatments on crop growth, seed yield, quality and storability of soybean varieties

SURESHA K. G

2011

MAJOR ADVISOR: Dr. M. N. MERWADE

Two field and laboratory experiments were conducted to find out the effect of manual seed dropping heights and seed treatment with biofertilizers and calcium salts on crop growth, seed yield, quality and storability in soybean varieties in Department of Seed Science and Technology, University of Agricultural Sciences, Dharwad. Field experiment was conducted in split-split design consisted of three soybean varieties viz., JS-335 (V₁), JS-9305 (V₂) and DSb-1 (V₃) with three levels of seed dropping heights viz. no dropping (D₀), six feet dropping (D₁) and nine feet dropping heights (D₂) and two biofertilizer seed treatments viz. Rhizobium (B₁) and Rhizobium + PSB (B₂). Among three varieties DSb-1 variety recorded higher seed yield (2106.1 kg/ha), germination (91.25%), vigour index (3746) and other seed quality parameters compared to JS-9305 and JS-335. Among the dropping heights, higher seed yield (2160.5 kg/ha) with better seed quality traits were recorded in the undropped seeds compared to nine feet dropped seeds. The maximum seed yield (2024.6 kg/ha) was recorded in the

seed pretreated with rhizobium + PSB compared to Rhizobium alone. The interaction between varieties, seed dropping heights and biofertilizers was found non significant for all the test parameters studied. The second storage experiment was conducted with above said soybean varieties, dropping heights and seed treatment with calcium salts (untreated control, calcium chloride and calcium carbonate) stored under ambient conditions for 12 months period. Among varieties, DSb-1 variety recorded higher germination (33.33%), vigour index (812) and less mechanical damage compared to JS-335 and JS-9305 varieties at the end of 12 months storage period. The undropped seeds have retained higher germination (70.68%), vigour index and other seed quality parameters compared to nine feet dropped seeds during entire storage period. Among seed treatments, calcium chloride treated seeds retained higher germination (34.27%) and other seed quality parameters followed by calcium carbonate compared to untreated seeds at the end of 12 month storage period.

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

Influence of phosphorus solubilizing fungi and phosphorus levels on growth, yield and nutrient uptake by maize and soil properties

PRAVEEN PATIL

2011

MAJOR ADVISOR: Dr. V. B. KULIGOD

A field experiment was conducted at MARS, UAS, Dharwad during *rabi/summer* season of 2009-10, to study the influence of phosphorus solubilizing fungi and phosphorus levels on growth, yield and nutrient uptake by maize and soil properties. The experiment was laid out in randomized block design with fifteen treatments and four replications. These treatments consisted three levels of phosphorus substitution viz., 0, 50 and 100 per cent of the recommended P₂O₅ along with PSF₁, PSF₂, PSF₃ and no PSF inoculation. Application of 100 per cent RD P₂O₅ in combination with PSF₂ inoculation significantly increased the growth, yield and yield attributes of maize. With respect to grain yield, highest grain yield of maize (56.14 q ha⁻¹) was obtained by addition of 100 per cent RD P₂O₅ plus PSF₂ inoculation, which was found superior compared to control. Increase in grain yield over control (neither PSF nor P₂O₅) was 22.8 per cent in maize for 100 per cent RD

P₂O₅ + PSF₂ treatment. Nitrogen, phosphorus, potassium, calcium, zinc, iron and copper tissue content and phosphorus uptake by maize increased significantly due to application of 100 per cent RD P₂O₅ along with PSF inoculation. Application of 100 per cent RD P₂O₅ along with combined inoculation of PSF₁ and PSF₂ recorded higher nutrient content and P uptake as compared to other treatments. The available phosphorus, potassium, iron and copper in soil and chemical properties like EC (dSm⁻¹) and soil phosphatase enzyme activity were significantly increased due to application of 100 per cent P₂O₅ plus PSFs inoculation. Application of 100 per cent RD P₂O₅ along with PSF₁ + PSF₂ increased significantly the available P₂O₅ in soils after the harvest of maize crop. The highest B:C ratio of 1.44 was observed for 100 per cent RD P₂O₅ + PSF₂ followed by 100 per cent RD P₂O₅ + PSF₁ + PSF₂ (1.42).

Effect of phosphate solubilizing fungi at varied levels of phosphatic fertilizer on growth and yield of Chickpea (*Cicer arietinum* L.)

NETHRA B.

2011

MAJOR ADVISOR: Dr. N. S. HEBSUR

A field experiment was conducted to study the effect of phosphorus solubilizing fungi and levels of phosphatic fertilizer on growth and yield of chickpea (Var A-1) during *Rabi* 2009-2010, in the farmer's field at Kapali village of Nargund taluk in Gadag district. Field experiment consisted of two factors, factor one is phosphorus solubilizers viz., PSF₀, PSF₁, PSF₂, PSF₃ and PSF₄ and factor two is phosphorus levels viz., P₀, P₁ (50%) and P₂ (100%) was laid out in factorial RCBD design with four replications in medium black soil under protective irrigation. Morphological characters like plant height, number of branches and number of nodules were enhanced due to the inoculation of phosphate solubilizing fungi and levels of phosphorus fertilizer over control. Among the various interactions, PSF₂ and P₂ recorded the higher growth

parameters. Yield parameters such as pods plant⁻¹, seed weight, pod weight plant⁻¹, and seed weight plant⁻¹ were also significantly influenced by P- solubilizing fungi and levels of P fertilizers. PSF₂ inoculation recorded 12 per cent increase in yield (27.25 q/ha) over control and was followed by treatment PSF₃ (26.14 q/ha) and PSF₄ (25.35 q/ha). P₂ (100% RDP) application recorded 9 per cent increase in yield over control and was on par with P₁ (50 % RDP) application. A significant increase in the nutrient uptake viz., nitrogen, phosphorus and potassium with PSF₂ inoculation, 100 per cent RDP and also with their interaction over control. The soil dehydrogenase activity and phosphatase activity were maximum with PSF₂, 100 per cent RDP and their interaction of PSF₂ and P₂. PSF₂ and P₂ was on par with PSF₂ and P₁.

Characterization and classification of soils of a microwatershed on basalt parent rock in northern transition zone of Karnataka

MANOJ KUMAR DABI

2011

MAJOR ADVISOR: Dr. P. L. PATIL

A study was undertaken to characterize and classify soils of a microwatershed in northern transition zone of Karnataka to assess land capability and soil-site suitability for irrigation and crops with a special objective to study fertility constraints by GIS techniques. The microwatershed has topographic variations with slope ranging from 1 to 15%. Ten pedons representing the microwatershed were characterized, classified and assessed for land capability and suitability for crops. Soils were shallow to deep, dark reddish brown to very dark greyish brown, granular to sub-angular blocky in structure, excessive to poorly drained, slightly acidic to slightly alkaline (pH, 6.22- 8.42), non-saline (EC, 0.20-1.03 dS m⁻¹), low to high in organic carbon (1.3 -11.5 g kg⁻¹) and low to moderate in CEC (5.12-66.31 cmol (p+) kg⁻¹) with wide textural variations (extremely gravelly sand to clay) with depth. Argillic horizon and slickensides were prevalent in pedons of red and black soils, respectively. According to Soil Taxonomy, out of ten pedons, three were Lithic

Ustorthents, Typic Haplustepts and Typic Haplustalfs while others were Typic Haplusterts at sub-group level. Five soil series were identified and mapped into ten mapping units which were evaluated for land capability, irrigability and soil-site suitability for crops. Land capability subclasses in the study area were III, IV and VII with limitations of texture, drainage, fertility and topography. Land irrigability classes were currently unsuitable to marginally suitable with limitations of topography and texture. No land was highly suitable for crops. Majority of the crops were moderately to marginally suitable and few were currently and potentially unsuitable. Assessment of soil fertility status revealed that, majority of the soil of the area was high in organic carbon and available nitrogen status. Available P ranged from low to medium in status. The microwatershed was rich in available potassium except hill-tops. Entire area was high in Cu, Fe and Mn but low in available S and Zn.

Nitrogen use efficiency in drill sown paddy as affected by different coatings of urea under two row spacings

HANUMANTHAGUDA M. SANNAGOUDRA

2011

MAJOR ADVISOR: Dr. G. S. DASOG

A field experiment was conducted during the *kharif* 2010 at Agricultural Research Station Mugad, UAS, Dharwad to study the effect of urea coated and/or treated with different substances under two row spacings on growth and yield of drill sown paddy and nitrogen use efficiency. The experiment was laid out on clay loam soil by adopting split plot design. The treatments consisted of two row spacings (20 and 30 cm) as main plots and seven treatments [Uncoated urea, granulated urea, tar coated urea, tar coated urea + neem cake added, tar coated urea + neem oil, used engine oil coated urea and used engine oil coated urea+ neem cake added] as subplots. Fifty per cent of nitrogen was applied during sowing through complex fertilizer and remaining fifty per cent was applied as two equal splits one at maximum tillering stage and another at panicle initiation stage through different coatings of urea as mentioned above. Significantly higher number of tillers, leaf area, LAI, higher dry matter

production, and yield attributes were noticed in 30 cm row spacing compared to 20 cm row spacing. Treatments sown with 30 cm row spacing recorded significantly higher grain yield (54.12 q ha⁻¹), nitrogen uptake (167.26 kg ha⁻¹) and PFP-N (54.12 kg kg⁻¹) compared to 20 cm row spacing (49.98 q ha⁻¹, 147.76 kg ha⁻¹, 49.98 kg kg⁻¹, respectively). Application of tar coated + neem cake added urea resulted in significantly taller plants, higher number of tillers, more leaf area, highest dry matter production, higher grain yield and yield attributes and higher PFP-N. The results were on par with the treatment that received used engine oil coated + neem cake added urea. Soil after harvest did not vary significantly with respect to EC, pH, available N, P₂O₅ and K₂O. Results from an incubation study showed that the rate of nitrogen mineralization was lowest in the treatment that received tar coated + neem cake added urea.

Studies on soil organic carbon and availability of nitrogen in rice soils of different zones of north Karnataka

PRASHANTHA KUMAR. P.

2011

MAJOR ADVISOR: Dr. S. K. GALI

In India, two approaches have been followed to predict available N status in soil viz., soil organic carbon (SOC) content and alkaline KMnO₄-N content. Further, soil testing laboratories predict the available N status in soil based on SOC content. But, however, many a times the SOC status does not agree with the available N status when determined chemically. Keeping this in view, the present investigation was undertaken. Fifty composite surface soil samples from each of rice growing areas viz., Gangavathi, Belgaum and Hanagal taluks representing zone 3, 8 and 9, respectively were collected after harvest of crop during 2007. The samples were analysed for particle size distribution, pH, EC, SOC and Total-N. The available N was estimated by alkaline KMnO₄, acid KMnO₄, acid K₂Cr₂O₇, and mineralizable N by standard methods.

Simple correlations were worked out to know the relationship between SOC and available N indices. With low SOC status, alkaline KMnO₄-N showed positive and significant correlation with SOC in Belgaum and Hanagal soils and with mineralizable -N in Gangavathi soils. With medium SOC status, total N showed positive and significant correlation with SOC in Gangavathi and Hanagal soils, whereas, in Belgaum soils all the methods were positively correlated with SOC. From results of correlation of indices with N uptake, it was clear that for all the 3 soils, alkaline KMnO₄ showed consistently significant correlations followed by SOC < total N < Mineralizable N. Prediction of N availability based on SOC alone may not serve as good index for soil with medium organic carbon status irrespective of method of size cultivation.

TEXTILE AND APPAREL DESIGNING

Variegated printing media on knitwear

SPOORTI V. UPPINAL

2011

MAJOR ADVISOR: Dr. SHAILAJA D. NAIK

The research was conducted during 2009-2011 with the objective to study the impact of laundering on physical parameters of five knit samples each printed with different media. The study consisted of survey and experimental procedure. Interview schedule was administered on thirty each working, nonworking mothers to elicit information on clothing preference, clothing purchasing practice and laundry practices; and readymade shop owners regarding fibre content, branded knitwear and embellishment techniques commonly adopted to knitwear viz., discharge, flock, foil, pigment and plastisol were chosen and subjected for fifteen hand washes by kneading and squeezing. After every fifth wash the samples were assessed for fabric count, thickness, weight, shrinkage and colour of wales and courses per inch, thickness (mm), weight (GSM) but reduction in colour strength of both printed and

unprinted areas of all knit samples compared to their corresponding control values after fifth wash. All the knit samples attained dimensional stability before fifth wash. Flock print exhibited very poor colour strength (K/S) values, followed by pigment and plastisol. The percentage of slenderness of print area reflected poor strength, durability, quality and standard of the print media, print style and printing method. It is evident that flock printed knit sample was found to be very poor, since the flock was completely washed off and disappeared by fifteenth wash leaving a part of thickening agent which was held mechanically. Home laundering did affect the physical parameters of both unprinted and printed area of knit samples, as the composition of all the five print media was not similar. Hence, the level of impact of home laundering on physical parameters varied greatly.

Two faced outfits for school going girls

SHWETA MARIYAPPANAVAR

2011

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Clothing is an integral inseparable part of mankind that meets the basic necessity along with food and shelter and even denotes wealth, power, position and mode of adornment. Clothing has become a preferred means of individual expression and economic concerns, and it is within this context the researcher planned the concept of developing 'Two faced outfits' could be worn two ways. There is no true "inside out" to a reversible outfit, since either way it gives a fashionable appearance. Two faced outfits are been designed for the school going girls who are pretty fashion conscious, demand for new dresses during special occasions. Hence, the present study is taken up to design two faced outfits for school going girls and appraise the acceptance and calculate the cost of production of these designer's outfits. The methodology consisted of survey and experimental procedures. Keeping in mind the colour preference by the school going

girls mood, swatch, colour and illustration board were prepared prior to product development. Three sets of skirt – top on the basis of standard measurements developed were godet skirt – halter top, circular skirt – sling top and wrap around skirt – strap top. The cost of production was calculated and the acceptance for the outfits was assessed by four categories of respondents. The result revealed that irrespective of the categories of the respondents', the most accepted designer's two faced outfit was wrap around skirt – strap top, followed by circular skirt – sling top finally the godet skirt – halter top. These outfits provide greater scope for mix and match and pair off outfits that are remarkably cost effective. This study further throw light on designing reversible winter clothes for kids, special clothes for physically challenged, expectant and lactating mothers as well senior citizens; a trust area for apparel industry and a challenge for commercial production.

Extraction and spinnability of mesta (*Hibiscus sabdariffa*) fibre

RAJKUMARI DHANALAXMI DEVI

2011

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The present investigation entitled "Extraction and Spinnability of Mesta (*Hibiscus sabdariffa*) Fibre" was carried out during 2009-2011. Mesta variety AS73 CP 560 grown in Institute of Organic Farming, University of Agricultural Sciences, Dharwad was selected for the study. Fibres were extracted from stalks harvested at two different stages of plant growth using urea treatment and different steeping methods. Scoured, bleached and dyed mesta fibres were assessed for quality viz., length, fineness, strength and elongation, colour strength and colourfastness. Spinnability of the fibres in different blend proportions with cotton was studied and the yarn parameters were assessed. Results revealed that stalks harvested at physiological maturity stage processed by urea treatment and vertical-horizontal steeping produced higher fibre yields. Longitudinal structure of mesta fibres is striated, with nodes that are more clear and developed at physiological maturity stage. Cross section depicted the existence of a

number of fibrils. Presence of lignin in the physiological matured stalks was noticed. Fibres extracted by vertical-horizontal steeping had less amount of waxes and gums as indicated by the cross sectional structure. There was a successive reduction of fibre quality on wet processing treatments. The physical characteristics of 80:20 cotton/mesta blended yarn were better than the 100 per cent organic cotton and 60:40 cotton/mesta blended yarns. Moreover, mesta fibres have added strength to cotton yarn and simultaneously decreased the elongation making the blend suitable for knits, curtains & draperies and other household textiles including table & kitchen linen. Addition of mesta fibres has also reduced the cost of production of pure cotton yarns. Expediting the usage of such minor fibres not only saves natural fibres for multiple applications but also ensures the availability of eco-friendly goods at nominal prices.
