

ABSTRACTS OF THESES

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

DOCTOR OF PHILOSOPHY

AGRICULTURAL ECONOMICS

Economic evaluation of integrated organic farming systems in Northern Karnataka

S. VIJAYACHANDRA REDDY

2013

MAJOR ADVISOR: Dr. S. M. MUNDINAMANI

The study on economic evaluation of organic farming systems was carried out in northern Karnataka. It was based on primary data collected from the 285 sample respondents in Bagalkot, Bijapur and Gadag districts of Karnataka for the year 2010-11. The sample respondents practiced as many as 16 different organic farming systems, which included field crops, vegetables, plantations, dairy and goat rearing activities. The top three farming systems in each of the districts based on highest per cent of farmers practicing organic farming systems were considered for economic analysis. Among inputs utilization pattern in the study area Farm Yard Manure (FYM) and vermicompost together accounted for more than 70 per cent of value per hectare among different organic farming systems. The dairy was the most common noncrop component included in almost all the farming systems and it was found profitable.

Goat rearing activities were included in Bijapur district under Farming System-II, where major inputs were concentrates and farm produced green fodder and dry fodder. The MVP: MFC ratio indicated that the profitability from most of the farming systems can be increased by reorganization of the resources. The Cost and returns analysis of major organic farming system revealed that, net returns realized by the farmers was found to be maximum in FS-III in Gadag (₹ 97,437), organic FS-II in Bijapur district (₹ 43,990) and FS-III in Bagalkot (₹ 40,760) district, which were found to be most profitable compared to other farming systems in the study area. Lack of market information, Infrastructure support, lack of compost, knowledge of compost making, using modern techniques and price fluctuation were the major constraints in adoption of organic farming systems.

AGRICULTURAL ENTOMOLOGY

Tritrophic interactions between pigeonpea genotypes, *Helicoverpa armigera* (Hubner) and natural enemies

SHIDDALINGAPPA V. HUGAR

2012

MAJOR ADVISOR: Dr. K. BASAVANA GOUD

The present investigation on "Tritrophic interaction between pigeonpea genotypes, *Helicoverpa armigera* (Hubner) and natural enemies" was carried out during 2008-12 at ICRISAT (Patancheru, Hyderabad). Under no, dual and multi-choice conditions, egg laying by *H. armigera* on ICPW 125 was minimum due to high density of type D trichomes, while it was maximum on ICPL 87. The per cent Parasitisation by *Trichogramma chilonis* Ishii was higher on ICPB 2042 and by *Campoletis chloridae* Uchida it was greater on ICPL 87 and ICPL 87091 due to longer pods and clustering type of habitat and ICPL 87119 due to higher pod wall thickness. Odors from the flowers of ICPL 84060 and ICP 7035 attracted *T. chilonis*, and *C. chloridae*. *C. chloridae* performed better on LRG 41, ICP 7035 and ICPL 84060. Larvae failed to pupate in insects reared on leaves of ICPL 87 and ICPL 332 WR, due to lower protein content and high amounts of carbohydrates and lipids,

respectively. There was no adult emergence from the larvae reared on leaves of ICPL 87119. Consumption index, approximate digestibility and efficiency of conversion of ingested food into body matter of the unparasitized larvae was greater than that of the parasitized larvae. Odor stimuli from the hexane extract of flowers of ICPB 2042 attracted *C. chloridae*, while the methanol extract of flowers of ICPL 84060 attracted *T. chilonis* females. Odor stimuli from the hexane extract of ICPB 2042 and ICPL 87119 pods attracted the females of *T. chilonis*, while the methanol extract of pods of ICPL 87, ICPL 87119 and ICPL 87091 attracted *C. chloridae* females. *T. chilonis* and *C. chloridae* responded positively towards volatile compounds viz., (E)-Alpha faenesene, methylbenzoate (Z)-3-hexene-1-ol and linalool, while benzaldehyde and acetaldehyde were not attractive to these parasitoids. β -caryophyllene attracted *T. chilonis*, but not the *C. chloridae*.

AGRICULTURAL EXTENSION EDUCATION

Innovative behaviour and diffusion of technology by awardee farmers in North Karnataka

RAJASHEKAHAR T. BASANAYAK

2012

MAJOR ADVISOR: Dr. L. MANJUNATH

The study on innovative behaviour and diffusion of technology by awardee farmers in north Karnataka was undertaken during 2011-12. Innovative behaviour scale was developed to collect the data from 120 awardee farmers by personal interview method. The analysis of the results revealed that more farmers were of middle age (45.00%), of high school education (24.17%), from medium family size (58.33%), having big land holding (35.00%), with farming experience (57.50%), having high income (62.50%), with moderate material possession (34.16%), and with high leadership ability (63.00%), level of decision making ability (63.33%), information seeking behaviour (65.00%), with medium mass media exposure (46.66%) and scientific orientation (56.67%), but with low extension participation (40.00%) and social participation (40.83%). More farmers had low, followed by high (32.50%) and medium (25.83%)

innovative behaviour. A positive and significant relationship was observed between education, land holding, material possession, mass media exposure, extension participation with innovative behaviour. The results of the regression analysis indicated that all the factors contributed more than 61.00 per cent of the variation in innovative behaviour. Size of the land holding, material possession, and mass media exposure and extension participation were significant predictors of innovative behaviour of awardee farmers. Ranking of factors based on their direct effect revealed that material possession, size of the land holding and extension participation occupied first three ranks. Other farmers (25%) and friends (48.33%) had consulted the awardee farmers. Cent per cent of the awardee farmers said that they had taken up farming due to their self-interest with innovativeness (98.33%).

AGRONOMY

Endotoxin expression as influenced by nutrient levels and nitrogen split application and refuge crop management in Bt cotton under irrigation

M. A. BASAVANNEPPA

2012

MAJOR ADVISOR: Dr. V. V. ANGADI

Among two field experiments conducted at Agricultural Research Station, Siruguppa during 2007-08 and 2008-09, the experiment entitled “ δ -endotoxin expression as influenced by nutrient levels and N split application on Bt cotton (*Gossypium hirsutum* L.) genotypes under irrigation” was laid out in split-split plot design with V₁: MECH-162 Bt, V₂: RCH-2 Bt, V₃: JK-Durga Bt (BG-I) and V₄: MRC-7201 (BG-II) genotypes as main plots, nutrient levels F₁: 120:60:60 (Recommended), F₂: 160:80:80 and F₃: 200:100:100 (Farmers’ practice) N:P₂O₅: K₂O kg ha⁻¹ as sub plots and nitrogen split application A: 50 per cent N as basal + 50 per cent N in three equal splits at 50, 80 and 110 DAS + foliar spray of urea @ 2 per cent at 80 and 100 DAS and B: 12.5 per cent N as basal and at 30, 90 and 120 DAS and 50 per cent N at 60 DAS with foliar spray of urea @ 2 per cent at 105 and 135 DAS as sub-sub plots. Second experiment on “Standardization of refuge crops/cropping systems in Bt cotton under irrigation” was laid out in RCBD with T₁: 100 per cent Bt cotton, T₂: Bt cotton (80%) + Non Bt cotton (20% as border crop), T₃: Bt cotton + Non Bt cotton (8:2 row proportion), T₄: Bt cotton + okra-chickpea (8:2 row proportion), T₅: Bt cotton + pigeonpea (8:2 row proportion),

T₆: Bt cotton + maize (One week advance sowing) – chickpea (8:2 row proportion) and T₇: Bt cotton + maize – chickpea (8:2 row proportion). Significantly higher seed cotton yield was recorded with MECH-162 Bt (2537 kg ha⁻¹) followed by RCH-2Bt. Application of 200:100:100 N:P₂O₅:K₂O kg ha⁻¹ recorded higher seed cotton yield (2515 kg ha⁻¹) compared to other nutrient levels. Split application of 12.5 per cent N as basal and at 30, 90 and 120 DAS and 50 per cent N at 60 DAS with foliar spray of urea @ 2 per cent at 105 and 135 DAS produced significantly higher seed cotton yield (2397 kg ha⁻¹). V₁F₃B recorded significantly higher yield (2736 kg ha⁻¹), gross return (₹ 76600 ha⁻¹), net return (₹ 52690 ha⁻¹) and B: C ratio (3.21). Higher d-endotoxin concentration (2.67 mg g⁻¹) was observed with V₃F₃B at 45 DAS. Seeding with 100 per cent Bt cotton (T₁) recorded significantly superior seed cotton yield (1942 kg ha⁻¹) compared to other treatments. Whereas, Bt cotton + okra-chickpea (8:2 row proportion) recorded highest Bt cotton equivalent yield (2446 kg ha⁻¹), gross return (₹ 68481 ha⁻¹), net return (46585 ha⁻¹) and B: C ratio (3.13), which were on par with those of 100 per cent Bt cotton.

GENETICS AND PLANT BREEDING

Fine mapping of candidate gene for root length for adaptation to drought, inheritance and validation of gene based markers linked to aroma in upland rice (*Oryza sativa* L.)

PRAKASH I. GANGASHETTI

2012

MAJOR ADVISOR: Dr. P. M. SALIMATH

An investigation was carried out to fine map the candidate gene for root length qAZRL9 on chromosome 9 and its validation in local land races of rice; morphological and molecular characterization of local short grain aromatic genotypes, inheritance and validation of gene based markers linked to aroma. The qAZRL9 (RM242-RM201) was fine mapped to small genomic regions between RM24569-RM242 (0.13 Mbp) and RM5661-RM24579 (0.40 Mbp). The marker RM242 was found to be closely linked to increased root length in local land races of rice, thus can be effectively used in MAS and MABC programmes. Morphological characterization of 42 landraces revealed that, Gandhasali was superior for test weight and grain yield per plant, Pusa suganda-4 was superior for grain yield per plant, while, Kalanamak and Ambemohor were rich in Fe and Zn in grains. Genetic diversity analysis indicated that inter cluster distance was not consistent with the geographic distribution of land races. The land races belonging to diverse ecological regions were clustered together,

whereas, land races of the same region were grouped into separate clusters. Grain yield per plant had maximum contribution towards the genetic divergence, followed by grain length and plant height. Molecular characterization by SSR and InDel markers revealed presence of variation between basmati and short grain aromatic genotypes. Most of the basmati genotypes were grouped to one cluster, while, all the local short grain aromatic genotypes were grouped into another cluster. These markers can be used for preventing adulteration of Indian basmati rice with other basmati rice. Study on inheritance pattern of aroma in three populations viz., the F₂ of IR-64 × Ambemohor, F₇ RILs of IR-38 × Jeerige sanna and BC₂F₂ of Kalinga III × Azucena NILs indicated that, aroma was controlled by single recessive gene. The validation of gene based markers linked to aroma has shown that BAD II had maximum phenotypic variation; hence can be used for MAS programmes for selecting aromatic genotypes in segregating populations.

Identification of molecular markers for fusarium wilt resistance in pigeonpea (*Cajanus cajan*)

NALINI DHARWAD

2012

MAJOR ADVISOR: Dr. P. M. SALIMATH

The investigation was carried out to identify the molecular markers linked to *Fusarium* wilt resistance in pigeonpea and to identify the high yielding lines associated with *Fusarium* wilt resistance. Cultivars, ‘ICP 8863’, a highly resistant genotype to *Fusarium* wilt and ‘GS-1’ a highly susceptible genotype were used as parents to develop mapping population. ‘ICP 8863’ and ‘GS-1’ were crossed during kharif 2007 and advanced to get F₂ during kharif 2008. A total of 492 SSR markers were employed to assign the parental polymorphism. Of them only two markers (P70 and P155) were found polymorphic. These two markers were analysed through bulk segregant analysis in F₂, in which SSR marker P70 confirmed its close linkage with trait of interest. Marker P70 was genotyped in RILs of 150 populations to validate the genetic linkage of the marker. The segregation pattern based on both phenotypic value of the wilt reaction and marker data in RILs

analysed through chi-square test confirmed the expected results. High yielding pigeonpea RILs associated with *Fusarium* wilt resistance were isolated from the experiments conducted at UAS, Dharwad and ARS, Gulbarga during 2009-2012. It was possible to isolate transgressive wilt resistant plants in F₂ and high yielding resistant recombinant inbred lines (RILs) from RIL population derived from ‘Maruti’ × ‘GS-1.’ Lines/plants were selected based on seed yield and yield related traits such as 100 seed weight and no. of pods per plant. Phenotyping 288 F₂ plants for yield related traits and screening F₂:3 for *Fusarium* wilt reaction helped to isolate 10 transgressive wilt resistant plants in F₂ seed yield ranging from 169.15 to 217.78 g per plant and 100 seed weight from 9.14 to 13.57 g. Further, two high yielding wilt resistant RILs, 109 and 243 were identified with seed yield of 15.33 and 13.65 q per ha and with seed weight of 10.08 and 11.19 g, respectively.

Genetic transformation for drought resistance in cotton

PRASHANTH SANGANNAVAR

2012

MAJOR ADVISOR: Dr. I. S. KATAGERI

Different concentrations and combinations of growth regulators supplemented to MS medium were tried to study the callogenesis from cotyledon and hypocotyl explants of Coker-312 cotton. The media combination of 0.1 mg/l 2, 4-D and 0.5 mg/l kinetin resulted in early callus initiation (10days), high per cent callus induction (99%) and high amount of fresh callus weight (0.88g) with cream friable calli. Irrespective of growth regulators, hypocotyl, is better explant than cotyledon for callus initiation, per cent callus induction and fresh callus proliferation. Higher callus induction (94%) was observed in 3% glucose. Reduction of 2, 4-D (0.01mg/l) and kinetin (0.1mg/l) resulted in highest per cent of embryogenesis (71%). Embryo maturation from torpedo embryo's to plantlets was highest (95%) in media devoid of growth regulators. Incubation in basal MS medium for 4 weeks in *in vitro* culture condition followed by 1 week incubation in growth chamber in soil and peat mixture resulted in establishment of higher number of plants (95%). *Agrobacterium* strain LB-4404 carrying pCambia with *AtDREB1a* and

pBinAR with *BcZAF12* transcriptional factors were used for genetic transformation. Colonization for 10 minutes followed by 24 hours co-cultivation resulted in explants free of *Agrobacterium* contamination. Cefotaxime at 1000 mg/l showed complete elimination of excess *Agrobacterium* from explant surface. Pre-culture of explants for 48 hours prior to transformation resulted in highest number of kanamycin resistant calli (29). Colonization of *Agrobacterium* with vacuum infiltration for 30 minutes resulted in kanamycin resistant calli (28). Analysis of the putative transformants for the presence and expression of gene revealed that the transformation efficiency was 2 per cent and 0.6 per cent, respectively for *AtDREB1a* and *BcZAF12* transcriptional factors in transformation *via* somatic embryogenesis in Coker-312, and transformation efficiency of 1.4 per cent and 2.5 per cent, respectively for *AtDREB1a* and *BcZAF12* in transformation *via in planta* in Sahana was recorded. RT-PCR and dot blot confirmed expression and integration of genes for transcriptional factors in plants.

Genetic enhancement for drought tolerance and durable blast resistance in rainfed rice (*Oryza sativa* L.)

E. A. SANGODELE

2013

MAJOR ADVISOR: Dr. R. R. HANCHINAL

The primary objective of this study includes screening introgressed population (Swarna x WAB 450 BILs) for physiological and yield component traits under upland condition to identify QTL linked to drought and blast disease, identify top performing BILs tolerant to drought and resistant to blast disease and carry out G x E analysis of selected superior BILs under rainfed condition. One hundred and eighty eight BILs along with 10 checks were screened in pots and on the field in a randomized block design with two replications. Drought stress was imposed at the onset of the reproductive growth phase until grain filling stage by withholding irrigation from the treatment plot until severe leaf rolling was observed. BILs were genotyped with 58 polymorphic SSR markers and marker data were used for the construction of linkage map using QTL IciMapping software. Analysis of variance indicated highly significant differences among BILs for most of the traits under both water stress and non-stressed conditions, except harvest index that was significant at 0.05 level of probability. Fifteen QTL were detected for

various traits based on composite interval mapping under water stress and non-stress condition with significant contribution from the donor parent, WAB 450. In this study, 10 QTL were detected for physiological, productivity related traits under water stress, whereas, 5 QTL were identified under nonstress condition. All identified QTL under water stress for various traits exhibited high phenotypic variance, except leaf temperature. WAB 450 contributed all the alleles that enhance drought resistance for all QTL identified in this study, except two QTL identified for relative water content and spikelet fertility. Reaction to blast was assayed over the period of two seasons from which 10 BILs were identified as resistant to both leaf and neck blast. WAB 450, BILs No 48, 183 and 188 were identified in the two consecutive seasons as promising lines that were resistant to leaf and neck blast. A number of BILs better than the parents and checks in drought tolerance, blast resistance and G x E interaction were identified as promising for upland ecosystem.

Genetic studies of yield and its component traits and identification of molecular markers linked to bacterial wilt resistance in tomato (*Solanum lycopersicum* L.)

RAMESH S. MANE

2013

MAJOR ADVISOR: Dr. O. SRIDEVI

A study was conducted to understand the inheritance and identification of markers associated with resistance to bacterial wilt in tomato. Among the 24 tomato genotypes screened for bacterial wilt resistance, two highly resistant genotypes, CLN2768A and CLN2777H and a highly susceptible Pusa Ruby were used in this study. F_2 and backcross (B_1 and B_2) populations of crosses Pusa Ruby x CLN2768A and Pusa Ruby x CLN2777H were used to study inheritance pattern of bacterial wilt resistance. In F_2 population of both crosses, segregation ratio 3 resistant: 1 susceptible was obtained, which was confirmed in backcross populations with 1:1 ratio. These results confirmed the role of single dominant gene for governing the bacterial wilt resistance. A total of 57 SSR and 79 RAPD markers were screened for parental polymorphism and polymorphic markers were used for Bulk segregant analysis. BSA results confirmed a single SSR marker in cross Pusa Ruby x CLN2768A

and two SSR markers in cross Pusa Ruby x CLN2777H putatively linked to bacterial wilt resistance gene. However, none of the RAPD markers exhibited consistent polymorphism between resistant and susceptible bulks of both crosses. Upon subjecting the F_2 individuals for genotyping with the markers selected in BSA, genetic association analysis indicated that SSR 20 marker linked to the bacterial wilt resistance in both crosses. The SSR 20 marker can be used in future for marker assisted selection of bacterial wilt resistance. Generation mean analysis was done for understanding the nature and magnitude of gene effects of different yield related characters. Epistasis was confirmed by scaling test and joint scaling tests for all yield and yield components. The six generation mean analysis showed the importance of dominant and dominant x dominant interaction in governing most of the yield and yield components.

HORTICULTURE

Genetic variability and improvement studies in Gladiolus (*Gladiolus hybridus* Hort)

B. ARCHANA

2013

MAJOR ADVISOR: Dr. V. S. PATIL

The present investigation was aimed towards flower quality improvement in two cultivars (Ethyl Cav cole and White prosperity) of gladiolus (*Gladiolus hybridus* Hort.) through induced mutagenesis using physical mutagens, gamma rays (10 Gy, 20 Gy and 30 Gy) and chemical (EMS-0.25%, 0.50% and 0.75%) and diversity analysis of thirty gladiolus hybrids

was undertaken from 2009 to 2012 at Department of Horticulture, UAS, Dharwad. Mutagenic treatment with EMS 0.25% and 0.50% and gamma rays at 10 Gy and 20 Gy showed the reduction of vegetative and flower characters which were less compared to higher doses. Moderate to high PCV and GCV estimates were recorded for corm weight, corm diameter,

number of leaves per plant, plant height, days to spike initiation in 0.50% EMS and 20 Gy treated mutant populations. Rest of the characters showed moderate to low values. High heritability estimates along with moderate genetic advance (GA) and genetic advance over mean recorded for all characters. In Ethyl Cav Cole and White Prosperity mutant populations, spike length had significant positive association with most of the characters at 0.5% EMS and 20 Gy gamma treated populations. The superior mutants for spike length EC-20-40 (79.55cm), EC-0.50-19 (78.54 cm), WP-20-13 (93.00 cm) and WP-0.25-24 (91.50 cm) from mutant populations of

SEED SCIENCE AND TECHNOLOGY

Standardisation of hybrid seed production techniques in watermelon (*Citrulus lanatus* Thumb.)

SANJEEVKUMAR B. BELLAD

2012

MAJOR ADVISOR: Dr. M. N. MERWADE

The field and laboratory investigations on standardisation of hybrid seed production techniques with respect to pollen storage, pollination time, agronomic practices, fruit load, harvesting and drying methods and storage conditioning in watermelon cv. Arka Jyothi were conducted at ARS, Kawadimatti Farm, UAS, Dharwad during *rabi* season of 2005-06 and 2006-07. In the first field experiment, female parent (IIHR-20) pollinated between 6:00 to 7:00 am recorded higher fruit set (23.24%), seed yield per vine (23.60g) and percentage of filled seeds (84.26) with better germination (82.49%) and vigour index (1891) as compared to other pollination periods. Similarly, the female parent pollinated with fresh pollen of Crimson red recorded higher fruit setting (25.53%), seed yield per vine (24.67g), filled seed (87.21%) and better seed quality traits as against other treatments. In second field experiment, the female parent sown on 15th January with a spacing of 3.00 x 1.00 m and fertilizer dose

both varieties. Genetic diversity study indicated that among the 17 characters studied, thirty genotypes were grouped into 8 clusters and among them, cluster I was the largest with 9 genotypes followed by cluster II (7) and IV (6) and cluster III with 3 genotypes. Genetic diversity at molecular level was estimated by using RAPD markers. RAPD profiles for selected 30 genotypes were generated with 20 random decamer primers. Out of twenty primers used for the study, OPAT 06 (47.00%), OPC 09 (47.00%) and OPB 08 (46.00%) showed highest per cent polymorphism.

of 150:135:150 kg NPK/ha recorded significantly higher seed weight per fruit (4.89g), seed yield per vine (22.69g) with better seed quality traits as compared to 100:90:100 NPK kg/ha and 2.50 x 1.00 m spacing. In third field experiment, foliar spray of ethrel @ 250ppm at fruit initiation stage recorded significantly higher fruit weight (7.32kg), 100 seed weight (7.34g) and germination (81.44%), followed by GA₃ as against control (water spray). Similarly, two fruit load per vine recorded significantly higher fruit weight (7.42kg), seed weight (7.95g) and germination (82.60%) as against all fruit loads per vine. In fourth experiment fruits harvested at 65 DAA and extracted seeds dried under shade recorded higher filled seed percentage, germination and vigour. In storage experiment, seed treated with thiram (2.5 g) and stored in aluminium pouch recorded higher germination (82.89%) and vigour (1698) as compared to untreated seeds and stored in cloth bag through out the twelve month storage period.

SOIL SCIENCE AND AGRIL. CHEMISTRY

Studies on organophosphorus pesticide residues in paddy ecosystem and evaluation of Zn and Fe content in paddy grains and soils of Gangavati taluka in North Karnataka

S. SELVARAJ

2012

MAJOR ADVISOR: Dr. N. S. HEBSUR

The present studies were carried out to evaluate the organophosphorus pesticide residues in soil, water and plant samples of paddy eco-system. The soil, water and paddy grain samples were collected from five farmers' fields from each village in a cluster of twelve villages and analyzed for organophosphorus residues viz., chlorpyrifos, quinalphos, monocrotophos and dichlorvos. The soils were also analysed for different fractions of zinc and iron and their contents in paddy grains. The soils were neutral to strongly alkaline in reaction, non-saline, low to high in organic carbon status with enough calcium carbonate. The analytical results indicated that chlorpyrifos was the only chemical detected in grains. In soils, chlorpyrifos was below detection limit and chemicals such as quinalphos, monocrotophos and dichlorvos were not detected. In water samples also, the concentration of these chemicals were below

detection limit. The fractionation studies indicated that the order of zinc fractions in soils were: Water soluble + exchangeable Zn < Amorphous bound Zn < Manganese oxide bound Zn < Organically bound Zn < Sesquioxide bound Zn < Residual Zn < Total Zn. And dominant iron fractions were: Water soluble Fe < Exchangeable Fe < Residual Fe < Crystalline bound Fe < Amorphous iron oxide bound Fe < Total Fe. Zinc content in paddy grains varied from 12.17 ppm in Basapatna sample to 37.43 ppm in Karatagi sample with mean value of 21.39 ppm. Iron content ranged from 86.41 ppm in Sangapura sample to 213.31 ppm in Karatagi sample with mean value of 115.49 ppm. In conclusion, chlorpyrifos chemical residue was the only organophosphorus pesticide quantified in grain samples (0.01 ppm MRL) in paddy ecosystem of Gangavati taluka.

TEXTILE AND APPAREL DESIGNING

Naturally coloured cotton designer's apparel: An emerging trend in *khadi* world

M. NAMRATA

2012

MAJOR ADVISOR: Dr. SHAILAJA D. NAIK

The present study on "Naturally coloured cotton designer's apparel: an emerging trend in *khadi* world" was carried out with the objectives to explore the possibilities of designing and weaving variegated stripe and checks naturally coloured cotton *khadi* fabrics, to assess the impact of special finishes on these *khadi* fabrics; to design, develop and embellish the trendy *khadi* apparel and enumerate consumer's acceptance and to calculate the cost of production of designer's *khadi* apparel. Six types of designer's *khadi* fabrics viz., white cotton (WC), naturally coloured cotton (NCC), pin stripe, medium stripe, small checks and medium checks were constructed and subjected to bio-desizing, bio-polishing and silicon softener wash. On finishing, both WC and NCC yarns became finer with slight increase in cloth count. A considerable reduction in bending length, tensile strength and elongation; improvement in crease recovery angle and drapability of all the six fabrics was observed. Whereas, no considerable change in abrasion and pilling was observed. Except WC, other five fabrics were further taken for

designing and construction of three garments with a concept of detachable components - necklines and lower panel for ladies top; cuff, collar and buttonstand for gent's shirt and collar and buttonstand for gent's kurta. Survey was conducted in Dharwad city with a sample consisting of each 120 adolescent boys and girls between 16-22 years and 60 Home scientists to identify the suitable surface embellishments on ladies and gents apparel. Accordingly, Karnataka kasuti, machine embroidery and zardosi were planned on ladies top, whereas Karnataka kasuti and machine embroidery on gents shirt and kurta. The consumer acceptance for designer's *khadi* apparel was enumerated on the same sample size and locale. Ladies top-cum-kurta and gents shirt were found to be most relevant for adolescents, whereas gents kurtas for early adults. Hand embroidery was found to be most suitable on all three garments and was relevant for traditional wear. The cost of production of designer's wear with detachable garment components is more than garment without detachables.

MASTER OF SCIENCE

AGRICULTURAL BUSINESS MANAGEMENT

Price dynamics and export competitiveness of rose onion in Karnataka

H. A. CHITHRA

2011

MAJOR ADVISOR: Dr. BALACHANDRA NAIK

India ranks second in production of onion, next only to China, but rose onions are mainly grown in Karnataka. Prices play predominantly vital role in agriculture. Analysis of prices and forecasting the prices over time is important for formulating sound agricultural policy. Since, rose onion is export oriented produce, it is necessary to know the export competitiveness and direction of trade of rose onion from India. In view of this the present study was undertaken by collecting monthly model prices of rose onion in selected markets of Karnataka (i.e. Chikkaballapura, Kolar and Yashwantpura) for a period of twenty four (1986-2011) years, export prices and quantity exported to various countries for the period 2001-2010. Increasing trend in prices was observed in all the markets, but the quantum of increase was different from one market to another market. ARIMA model was employed to

forecast the prices, the forecasted prices in all the markets under study showed increasing values. Analysis co-integration showed that there existed a strong integration between the selected markets, where in Yashwantpura has emerged as price leader. It is also observed that rose onion export had a high degree of comparative advantage in the world market and Bangladesh was one of the most stable countries among major importers of Indian rose onion. Hence, it is necessary to improve the production and planning the marketing of rose onion in off season, which would help the producer in getting higher returns. Since, the expected exports to different destinations under study is much higher than the existing one, there is lot of scope for farmers to produce good quality rose onion in the study region and export them to demanding destinations.

Business performance of tur board in Karnataka-an appraisal

SHRIKRISHNA

2013

MAJOR ADVISOR: Dr. V. S. KULKARNI

Pulses play an important place in Indian agricultural economy, as they are rich sources of proteins and constitute ten to fifteen per cent of India's food grain diet. The Karnataka Togari Abhivrudhi Mandali Limited Gulbarga (Tur Board) was registered under the Companies Act 1956 and started in the year 2002. The present study was undertaken to study the business performance of the Board. The data relating to the procurement of tur for the past ten years i.e. 2002-03 to 2011-12, cost and margin were taken from the books of accounts of the Board. In the study growth analysis, ratio analysis and Likert scaling techniques were used to analyze the different objectives of the study. There is a line organizational structure in Tur Board, which might be due to less number of activities and low investment. Presently Tur Board is procuring tur

from all taluks of Gulbarga and Bidar districts by establishing procurement linkage in all taluks. The trend in total income earned from tur by the board was increasing in the first stage. The overall results of liquidity ratios projects that the Tur Board is not in much comfortable position to meet its immediate financial obligations. The firm has generated a return of ₹ 1.83 for every rupee of fixed assets held, indicating that board is more efficient in utilization of fixed assets to generate sales. The net profit margin has remained constant and declined, implying that operating expenses relative to sales have been increasing over many years. The major constraint observed in Tur Board was stability in financial resources, which can be overcome by proper planning and execution of financial policies by the Government.

AGRICULTURAL ECONOMICS

Growth and export dimensions of livestock sector in Karnataka - an econometric analysis

V. A. RAMACHANDRA

2012

MAJOR ADVISOR: Dr. S. B. HOSAMANI

In the present study, six species of livestock viz., cattle, buffalo, sheep, goat, pigs and poultry were selected for detailed analysis, since these constituted nearly 95 per cent of the livestock population of Karnataka. The necessary data were collected both at district and state level from various issues of integrated sample survey reports (1995-96 to 2010-11). The cattle and buffalo population registered growth rate of 0.19 and 0.41 per cent, respectively. The sheep, goat, pig and fowl population registered growth rate of 4.23, 3.28, -0.49 and 6.03 percent per annum (from 1990 to 2007), respectively. Karnataka registered annual growth of 1.6, 2.99 and 2.42 per cent w.r. to milk, egg and meat production, respectively. A higher growth rate of 9.49 per cent was noticed in the productivity of milch buffalo, which was higher than crossbred cow (2.27%). The productivity of desi and improved bird exhibited positive growth rate (3.02% and 0.16%). The growth in per capita milk

availability was 2.42 per cent. The Markov chain analysis revealed that buffaloes in milk and indigenous milch cows were having highest stability (65 and 75%, respectively). The graded, indigenous (buffalo) and crossbred (cattle) population, were major factors influencing milk production. Improved and desi hen population and number of veterinary/poultry institutions were the main factors influencing egg production. The production of milk and their prices were not moving with their corresponding nominal and real prices in long run. Whereas, egg and mutton production was moving with their prices in long-run. Saudi Arabia, USA, Australia were loyal markets with retention capacity of 57 and 15 per cent, respectively. In the case of egg USA and Afghanistan were loyal markets. Whereas, in meat EAR (100%) was found to be loyal market. The milk and egg become price sensitive, within and between markets there was some extent of market integration.

Performance of dairy co-operatives in Haveri district - an economic analysis

N. NAVEEN

2012

MAJOR ADVISOR: Dr. N. R. MAMLE DESAI

Milk co-operatives are an integral part of the milk marketing and dairy development programme in India. In Haveri district, about 412 Dairy Co-operative Societies (DCS) were functioning till 2010. The present study aimed at analyzing the physical and financial performance of dairy co-operatives, followed by costs and returns structure in milk production, extent of milk production, income and employment generation to farm households and constraints involved in production

and marketing of milk by member producers. For evaluating the objectives of the study, both primary and secondary data were used. The primary data was collected from 120 dairy farmers, while secondary data on various activities of the Milk Producers Co-operative Societies (MPCS) selected for the study were collected from different sources for a period of thirteen years from 1997-98 to 2009-10. Tabular analysis, compound growth rate and financial ratio analyses were employed. The milk

production in the study area was mainly contributed by buffaloes. Overall, physical indicators had an increasing trend, except the total milk procured by societies. The share capital, total sales value of milk also showed fluctuating trend along with increase in the members. The compound growth rates in respect to the physical indicators and membership was highly significant, whereas, milk procured showed negative growth for Byadgi (-6.67%) and Ranebennur (-0.88%) taluks. The financial indicators showed high percent of growth in Ranebennur compared to

Byadgi. Members of the societies opined that the performance of Byadgi was better than Ranebennur. The MPCs operating in study area can improve the quantity of milk procured by providing remunerative prices to the members as in case of private milk vendors operating. The cost on concentrate can be reduced by adopting Green Fodder Production Unit by DCS on a co-operative basis. These were some of the policy suggestions made by the study for better performance of dairy co-operatives in the study area.

An economic analysis of mulberry cultivation, production and marketing of silk cocoons in northern Karnataka

C. O. DYAVAPPA

2012

MAJOR ADVISOR: Dr. G. N. KULKARNI

Sericulture is one of the important sub-sectors of Indian agriculture and plays an important role in the farm economy. The present study was attempted to analyse trends in mulberry area, cocoon production, and its productivity in the traditional and non-traditional districts and for the state as well for the period from 2001-02 to 2010-11. Costs and return structures, marketing of cocoon, constraints in sericulture were analyzed using primary data collected from a sample of 120 farmers of Belgaum and Bagalkot districts in north Karnataka. The Cobb-Douglas Production function, tabular approach and budgeting technique and Garrett's ranking technique were employed to analyze the data. Annual growth rates estimated using exponential growth function w.r.t. mulberry area showed a decline both in traditional (4.09%) and non-traditional (3.70%) districts. The annual decline in area was significant at 3.38 per cent for the state as a whole. There was also a decline in cocoon production (1.17%/annum) in the state during the period. While, there was a significant increase in per

hectare productivity of cocoons for the state. The cost of cultivation of mulberry garden was worked out to be ₹ 12699.82/acre/rearing. Cost of silkworm rearing per acre per rearing for 300 dfles was relatively more in Bagalkot (₹ 34,539.49) over Belgaum (₹ 32,498.13). Net returns realized per acre per rearing and B:C ratio were more in case of Belgaum (₹ 6432.96 and 1.19) when compared to Bagalkot (₹ 3900.83 and 1.11, respectively). Transportation cost was a major cost in cocoon marketing in both districts accounted for 24.85 per cent of the total marketing cost of ₹ 1200.50/quintal. The main constraints encountered by farmers revealed through Garrett's score in mulberry cultivation were shortage of irrigation water and persistence of high temperatures that affected silk worm rearing during summer and high market price fluctuations was another major constraint in the cocoon marketing. Farmers with more than 2.00 acres farm size under mulberry having four crops per annum realized maximum profits.

AGRICULTURAL ENTOMOLOGY

Management of pod borer, *Caryedon serratus* Oliver on seed groundnut under stored condition

VIJAY KOTABAGI

2013

MAJOR ADVISOR: Dr. L. KRISHNA NAIK

Studies on the relative susceptibility of groundnut varieties and management of groundnut bruchid, *Caryedon serratus* (Olivier) were conducted in the Department of Entomology, College of Agriculture, University of Agricultural sciences, Dharwad during 2010-2011. The performance of different varieties was tested based on adult emergence, mean development period of *C. serratus*, per cent pod damage and seed quality parameters of groundnut. The test varieties were grouped into three categories on the basis of degree of susceptibility as least susceptible, moderately susceptible and highly susceptible. The varieties JL-24 and DH-3-30 recorded least number of adult emergence, high mean development period, minimum pod damage and maintained satisfactory seed quality parameters like germination, shelling percentage, seedling vigour index, pH and EC of seed leachate, respectively which were categorized as least susceptible varieties. Among the different insecticides as dust formulation evaluated malathion 5D at 2.5 g/kg and quinalphos 1.5D at 2.5 g/kg of groundnut

Pods were found to be most effective in minimizing per cent pod damage and weight loss. Among the different insecticides evaluated as surface treatment for gunny bags, beta-cyfluthrin 2.5EC at 0.5 ml/litre, lambda – cyhalothrin 5EC and deltamethrin 10EC at 0.5 ml/litre were found to be most effective in minimizing per cent pod damage and weight loss. Under evaluation of different methods of management against the *C. serratus* indicated that Aluminium phosphide (3g) used by fumigation method was found to be most effective in minimizing the beetle population, minimum per cent pod damage, weight loss and recorded numerically higher germination, shelling percentage, seedling vigour index with less pH and EC of seed leachate. The next best treatment was deltamethrin by dipping method, deltamethrin by both topical method and physical methods were proved to be effective in controlling the *C. serratus*. All the different management methods employed for management were superior over sun drying method (untreated check.)

Studies on pod borer complex and their management in hybrid pigeonpea

MANJUNATH AJAGOL

2013

MAJOR ADVISOR: Dr. C. P. MALLAPUR

Investigations on pod borer complex and their management in hybrid pigeonpea were undertaken at the MARS, UAS, Dharwad during 2011-12. During the study period, eight species of insect pests were recorded on the crop. Among them, *Grapholita critica* and *Euproctis* spp. were found in vegetative stage with peak population during third and fourth week of August, respectively. *Maruca testulalis*, *Helicoverpa armigera*, *Exelastis atomosa*, *Clavigralla gibbosa* and *Ceutorhynchus asperulus* occurred in reproductive stage with peak population during 1st week of November, 1st week of December, 2nd week of December, 3rd week of November and 4th week of November, respectively. The natural enemies viz., spiders, wasps and ladybird beetles were found in negligible numbers. Higher pod damage was observed due to *H. armigera* (52.49 and 49.27%, in ICPH 2671 and Maruti, respectively) over *Melanagromyza obtusa*,

E. atomosa and *C. Gibbosa*. There was no significant difference between ICPH 2671 and Maruti with respect to pest population and pod damage. Crop loss due to pod borer complex revealed the superiority of the crop sown on 20th of June by recording least crop loss over protection (444 and 302 kg/ha in ICPH 2671 and Maruti, respectively) and per cent crop loss over protection (19.77 and 22.94% in ICPH 2671 and Maruti, respectively) with highest grain yield over the crop sown on 5th of July. However, the crop sown on 20th of July was found to be inferior. Pesticide based IPM module was cost effective by recording highest grain yield (2819 kg/ha) and BC ratio (4.09), followed by recommended package of practice (2441 kg/ha grain yield and 3.85 BC ratio) and bio-intensive IPM module (2174 kg/ha grain yield and 3.29 B:C ratio).

Studies on host plant resistance and management of *Thrips tabaci* Lindeman in onion

M. VIJAYALAKSHMI

2013

MAJOR ADVISOR: Dr. MAHABALESHWAR HEGDE

Thrips is an important insect pest responsible for reduction of onion bulb yield. Screening of 17 onion genotypes for thrips resistance revealed that Cv. Bidar-I and Krishnavaram were resistant and Bidar-II (White), Gadag local (White), Belgaum local (White), Bidar district (Nizam local) were moderately resistant. The nasik red supported higher number of thrips population and was highly susceptible to thrips. The biophysical and biochemical characters of genotypes were correlated with thrips population. The results revealed that leaf angle and leaf water content had negative and highly significant relationship with thrips population. The leaf color and leaf thickness (without press) at bottom, middle and top was positively correlated and all the correlations were significant with thrips population. Total phenols and tannin contents exhibited negative significant correlation, whereas total sugars and soluble amino acids exhibited a positive

significant correlation with thrips population. Six colored sticky traps were evaluated for their preference to thrips, leaf hoppers and coccinellids, both in wind ward and lee ward direction. Yellow sticky trap caught maximum number of thrips and leafhoppers, was at par with blue sticky trap. Red sticky trap caught moderate number of thrips, leafhoppers and least number of coccinellids. Spinosad 45 SC @ 0.25 ml/l consistently proved to be the best insecticide in checking thrips population as at par with thiamethoxam 25 WG @ 0.2g/l and imidacloprid 17.8 SL @ 0.25 ml/l. Among botanicals and biopesticides neem crude oil @ 40ml/l and *Lecanicillium lecanii* @ 2g/l recorded comparatively lower number of thrips. Pongamia oil 40ml/l, dashparni 50ml/l and neem crude oil 40ml/l recorded higher number of coccinellids and spider population after spray. The highest bulb yield and net profit was recorded in spinosad (33.05t/ha).

Seasonal incidence of sucking pests of cotton and insecticide resistance

V. B. PHULSE

2013

MAJOR ADVISOR: Dr. S. S. UDIKERI

Studies on seasonal incidence of sucking pests in Bt transgenic and desi cottons and insecticide resistance in sucking pests was carried out at the Department of Agricultural Entomology, College of Agriculture, Dharwad during 2011-2012. Thrips incidence was noticed up to first fortnight of October and its peak on MRC-7918 Bt (20.3/3 leaves) at KVK, from Hanumanmatti followed by MRC-6918 non-Bt on DDhC-11, which recorded least thrips incidence at ARS, Annigeri. Leafhopper population remained above ETL (2/ leaf) throughout season, except July second and August first weeks. The highest incidence of leafhopper was on MRC-7918 Bt (7.4/3 leaves) at Hanumanmatti and least on DDhC-11 at Dharwad Farm. Highest aphid population was recorded on DDhC-11 (26.6/3 leaves) at the end of season at Annigeri and lowest on RCH-2 non-Bt at Dharwad Farm. Higher predatory coccinellids activity was

noticed from October to December. Spider population was recorded from August II fortnight till January I fortnight with peak population during November. The mean highest *Chrysoperla zastrowi arabica* was 0.7/pl in MRC-7918 Bt at Dharwad and Annigeri. Similarly, spider activity was higher in MRC-7918 Bt at Annigeri. Based on changes in LC₅₀ values and comparison with recommended dosages, resistance in leafhoppers was alarming to neonicotinoids. Leafhopper population of Hanumanmatti acquired 1.05 fold resistance to imidacloprid and 1.09 folds to thiamethoxam, which was higher than the resistance in Dharwad and Annigeri populations. The resistance in aphids recorded against imidacloprid was highest with LC₅₀ value of 0.18 ml/l in Hanumanmatti population. Among organophosphates the resistance was highest against dimethoate (LC₅₀ 1.6 ml/l) as revealed by Hanumanmatti population.

AGRICULTURAL STATISTICS

Application of probability distributions and statistical models for productivity of *Acacia mangium*

V. SHILPA

2013

MAJOR ADVISOR: Dr. S. N. MEGERI

Acacia mangium is very good, short rotation forestry species, good for pulp wood purpose and adopts well to high rainfall areas. The study was conducted based on secondary data collected from AICRP on Agroforestry, UAS Dharwad. The main objectives of the study were to identify suitable statistical models for estimating the productivity (height/dbh) of *Acacia mangium* in respect of different sources, fertilizer level and spacing and to fit suitable probability distribution for growth. (Sources:- Kerala, Bangalore, Chikkamagalore, Thiruthahalli; Fertilizer combination:- 25:50:25, 50:100:50, 75:150:75 NPK gm/tree; Spacing:- 4x1 m, 4x2m, 4x3m). The data pertaining to height and dbh of different sources, spacing and their fertilizer combination were collected. In predicting the height growth of *Acacia mangium*, among all the sources, Bangalore (S₂) x 50:100:50 (F₂) is the best source and weibul model is the best model with

higher R² value and lower SE and RMSE. (R² = 0.991, SE = 0.194, and RMSE = 0.171) and for spacing combination, 4x3m (SP3) x No fertilizer (F0) is best spacing and rational function is the best model with higher R² value and lower SE and RMSE. [(R² = 0.997, SE = 0.085, and RMSE = 0.068)]. In case of Diameter at breast height (dbh), among all sources, Bangalore (S₂) x 50:100:50 (F₂) is the best source and MMF model is the best model with higher R² value and lower SE and RMSE [(R² = 0.993, SE = 0.249, and RMSE = 0.220)] and for spacing combination, 4x3m (SP3) x No fertilizer (F0) is the best spacing and MMF model is best model with higher R² value and lower SE and RMSE (R² = 0.998, SE = 0.172 and RMSE = 0.140) is the best spacing for *Acacia mangium* plantation. For fitting probability distribution, the weibul distribution fitted well for dbh values than the height values.

AGRONOMY

Performance of maize (*Zea mays* L.) to fertiliser levels and foliar applied fertilizers under northern transition zone of Karnataka

U. MANJA NAIK

2012

MAJOR ADVISOR: Dr. G. B. SHASHIDHARA

A field study was conducted during *kharif* 2011 at Main Agricultural Research Station Farm, Dharwad, to study the response of maize to foliar fertilizers in combination with the soil applied fertilizers. The treatments consisted of three fertilizer levels (100, 75 and 50 per cent RDF) at two concentrations (1.5% and 2%), sprayed at 4 stages (at 8th leaf, grand growth period, tassel emergence and dough stage) and 2 stages (at 8th leaf and tassel emergence) of plant growth. Urea and DAP foliar sprays @ 2 per cent at two stages were kept as controls. The results revealed that, the 100 per cent RDF (150:75:37.5 kg ha⁻¹) along with foliar feeding of 2 per cent starter dose at 8th leaf + grand growth period followed by booster dose at tassel emergence and dough stage recorded significantly

increased growth, yield, total sugar content and nutrients uptake in maize. The magnitude of per cent increase of grain yield and total sugar content over control (100% RDF only) was 14.38 and 34.18, respectively. Whereas, the higher protein content (12.31%) was reported with foliar spray of urea @ 2 per cent at two stages in presence of 100 per cent RDF. The 100 per cent RDF with 2 per cent foliar spray at four stages recorded the higher gross returns (₹ 73,039/ha) with the net returns of ₹ 48,527/ha and the higher net returns was recorded with the treatment 75 per cent RDF + 2 per cent foliar spray at four stages (₹ 50,269) with a gross returns of ₹ 70,811 ha⁻¹. However, the higher B:C ratio of 3.47 was recorded in 75 per cent RDF with 2 per cent foliar spray at two stages.

Management of *Cuscuta* spp. in transplanted onion under irrigated condition

SARDHAR

2012

MAJOR ADVISOR: Dr. A. K. GUGGARI

Field experiment was conducted to study the management of *Cuscuta* spp. in transplanted onion under irrigated condition in Bijapur district, Karnataka during *rabi* 2011-12. There were 10 treatments with three replications laid out in RBD. The results indicated that, pendimethalin @ 1 kg a.i./ha as preemergence (PE) followed by (fb) oxyfluorfen @ 0.25 kg a.i./ha as post emergence (POE) at 5 weeks after transplanting (WAT) and weed free check recorded significantly higher (weed control efficiency) WCE with respect to *Cuscuta* (41.85 and 100%, respectively) and lower weed index (WI) values (3.83 and 0%, respectively) compared to weedy check (0% WCE and 52.92% WI). The bulb yield of onion was significantly higher in weed free check (28.20 t/ha) compared to other treatments. However, it was on par with pendimethalin @ 1 kg a.i./ha as PE fb oxyfluorfen @ 0.25 kg a.i./ha as POE at 5 WAT (27.10 t/ha), pendimethalin @ 1 kg a.i./ha (PE) + 1 HW at 40 DAT (25.40 t/ha) and

oxadiargyl @ 0.4 kg a.i./ha (PE) fb oxyfluorfen @ 0.25 kg a.i./ha (POE) at 5 WAT (23.70 t/ha), whereas, the lowest bulb yield was recorded in weedy check (13.30 t/ha). Among the different weed control treatments, application of pendimethalin @ 1 kg a.i./ha (PE) fb oxyfluorfen @ 0.25 kg a.i./ha (POE) at 5 WAT recorded significantly higher net returns (₹ 89,271/ha) and it was on par with weed free check (₹ 84,826/ha). Whereas, significantly lower net returns was recorded in weedy check (₹ 36,688/ha) compared to other treatments. Significantly higher benefit:cost ratio was recorded with pendimethalin @ 1 kg a.i./ha (PE) fb oxyfluorfen @ 0.25 kg a.i./ha (POE) at 5 WAT over rest of the treatments, however, it was on par with pendimethalin @ 1 kg a.i./ha + 1 HW at 40 DAT (4.82) and oxadiargyl @ 0.4 kg a.i./ha (PE) + oxyfluorfen @ 0.25 kg a.i./ha (POE) at 5 WAT (4.33). Significantly lower B:C ratio was recorded in weedy check (3.05) over rest of the treatments.

Effect of dry sowing and normal sowing on the performance of sorghum based intercropping systems

A. D. PANHALE

2012

MAJOR ADVISOR: Dr. S. S. ANGADI

A field experiment was conducted at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *kharif* 2011 to study the effect of sorghum based intercropping systems under dry and normal sowing conditions. The experiment was conducted with two factors (sowing time and cropping systems) and replicated thrice. Dry sowing enhanced yield of sorghum (51.85 q ha⁻¹) and legumes (12.74 q ha⁻¹) by 16.8 and 19.95 per cent, respectively over normal sowing of sorghum (43.14 q ha⁻¹) and legumes (10.30 q ha⁻¹). However, sole crop of sorghum recorded significantly higher grain yield (52.48 q ha⁻¹) and stover yield (14.97 t ha⁻¹) over intercropping. However it was on par with sorghum intercropped with soybean. Increased grain yield of sorghum and legumes were due to higher grain weight per ear (95.10 g), ear weight per plant (131.20 g) and test weight (33.51 g) of sorghum and number of pods per plant (37.89), number of grains per pod (9.87) and test weight (67.79 g) of legumes in dry sowing condition than normal sown conditions. Similarly, grain weight per ear (99.02 g), ear weight per plant (136.73 g) and test weight (34.55g)

of sole sorghum were significantly higher and were on par with sorghum intercropped with soybean. Significantly higher plant height, leaf area, LAI, LAD and total dry matter production were recorded at harvest of sorghum. Similarly plant height, number of branches per plant, leaf area, LAI and total dry matter were higher at harvest of legumes in dry sowing as compared to normal sowing. Similarly, sole sorghum recorded significantly higher LA, LAI, LAD and total dry matter per plant at harvest, which were on par with sorghum intercropped with soybean. Significantly higher sorghum equivalent yield (SEY) was recorded in sorghum with soybean in 2:2 row proportion (74.85 q/ha) followed by sorghum with (62.44 q/ha) blackgram in additive method of intercropping. Resource use efficiency in terms of LER, ATER and LTR were superior in sorghum intercropped with soybean. Dry sowing of sorghum intercropped with soybean recorded significantly higher gross return (₹104827), net return (₹ 81635) and B:C ratio (₹ 3.52). Thus, dry sowing of sorghum with soybean was found profitable under changing rainfall conditions.

BIO TECHNOLOGY**Profile of *cry* from native *Bacillus thuringiensis* isolates and expression of *cryII***

A. S. POOJA

2013

MAJOR ADVISOR: Dr. S. K. PRASHANTHI

The characterization of 255 *Bacillus thuringiensis* isolates of Coorg, Sharavatti and BR Hills, containing genes known to be active against coleopterans viz., *cryI*, *cry3*, *cry7*, *cry8*, *cry14*, *cry18*, *cry26*, *cry28*, *cry34*, *cry35*, *cry36*, *cry23*, *cry55*, *cry37* and lepidopteran specific genes like *cry1*, *cry2*, *cry8*, *cry9*, *cry20*, *cry1Aa1*, *cry1Ab2*, *cry1Ac1*, *cry1Ad1*, *cry1Ae1*, *cry1Ca1*, *cry1Da1*, *cry1Ea1*, *cry1Fa1*, *cry1Ia1*, *cry2Aa1*, *cry2Ab1*, *cry2Ac1*, *cry9Aa1*, *cry9Ca1* was done through PCR amplification using the specific and degenerate primers. The isolates were also tested for their insecticidal activity against *P. xylostella*. Among the coleopteran specific genes, the most predominant was *cryII* gene, present in 18 isolates at a frequency of 7.05 per cent. *cryI* gene was most abundant (35.39%) followed by *cry2* (33.62%) among lepidopteran

specific genes. A variant of *cryII* gene based on amplicon restriction fragment length polymorphism (ARFLP) was cloned into pTZ57R/T, transformed into *E. coli* DH5 α and subcloned in an expression vector pQE-30 after amplification of a 2169bp DNA fragment of *cryII* gene from *Bacillus thuringiensis* DBT189, the sequence of which showed 99 per cent homology with known *cryIIa* gene from *Bacillus thuringiensis* subsp. *kurstaki* suggesting that there is one per cent sequence variation with respect to reference strain and there were six mismatches between the two amino acid sequences. The *cryII*- type gene consisted of an open reading frame of 2124 bp that would encode for 720 amino acids. An expected band size of 81kDa was observed after SDS-PAGE analysis indicating the expression of *cryII* gene.

Expression of *Serratia marcescens* AUDS744 *chiaA* in *Escherichia coli* and *Saccharomyces cerevisiae*

MOHAN N. WAWGE

2013

MAJOR ADVISOR: Dr. P. U. KRISHNARAJ

Serratia marcescens, a gram negative bacterium, classified in the large family of *Enterobacteriaceae*, is very efficient in degradation of chitin because of its ability to produce different chitinolytic enzymes, which hydrolyze the β -1, 4 linkages in the chitin microfibril. In the present study, an attempt was made to isolate the variant chitinase gene from the bacterium and their expression in *E. coli* and yeast. One hundred and twenty isolates of *S. marcescens* from the culture collection of the Department of Biotechnology, University of Agricultural Sciences,

Dharwad were screened for efficiency on the basis of their chitinolytic activity on colloidal chitin media, enzyme activity by DNSA method and *chi* profile in comparison with the reference strain *Sm141*. ARFLP profile revealed that *SmAUDS794chiA*, *SmAUDS795chiA*, *SmAUDS796chiA* and *SmAUDS744chiA* has different restriction fragments compared to the reference *Sm141chiA*. Based on the enzyme activity and difference in banding pattern, *SmAUDS744chiA* was selected further for cloning and expression studies. The variant *chiA* from

S. marcescens AUDS744 was cloned in pTZ57R/T and further sub-cloned into pET32C⁺ and pYES2/CT. The SDS-PAGE analysis showed that the expression of *chiA* as a 57 kDa protein. To find out the functionality, the IPTG induced protein from *E. coli* BL21 clone was subjected for bioassay against fungal pathogens viz., *S. rolfsii* and

R. solani and it showed crescent shaped growth inhibition of fungal pathogens compared to the control. The enzyme activity of galactose induced yeast clone was calculated and found that it was higher in supernatant than the lysate. It was 2.32 times higher than plain INVSc1 and 2.85 times higher than pYES2/CT, which was used as a control.

Development and evaluation of *Ds* tagged mutants in sorghum

AMRISH H. ANTRE

2013

MAJOR ADVISOR: Dr. RAMESH S BHAT

Maize Dissociator (*Ds*)-mediated insertional inactivation tagging and activation tagging were attempted in M 35-1, a popular *rabi* variety of *Sorghum bicolor* L. (Moench) for its gene discovery and functional genomics. Six and five transgenic events produced from pUR224NA and pNU435, respectively were used as the *Ds* starter lines for insertional inactivation tagging. Five *Ds* events obtained with pUbiDS were used for activation tagging. Five events of iAc plants obtained with pKU352NA were used as the source of transposase. *Ds* starter lines with single copy of the launch pad (T-DNA/*Ds*) were selected by segregation analysis and used for crossing with iAc plants following artificial emasculation and hand pollination. The seeds set on the female plant were harvested and sown in the green house. The plants showing the presence of both *Ds* and iAc as tested by various PCR were regarded as true F₂s. The seeds borne on the true F₁s were harvested to raise the F₂ generation. Among

the F₂ plants, those with transposed *Ds* (excised out of launch pad and re-inserted within the genome) and without iAc were identified by various PCR as *Ds* tagged stable mutants. In total, five and three insertionally inactivated mutants (IIM) were obtained from the launch pads of pUR224NA and pNU435, respectively. In addition, three activation tagged mutants (ATM) were recovered from the launch pad of pUbiDs. Majority of the mutants showed unlinked *Ds* transposition as they did not carry the empty launch pad (T-DNA without *Ds*). Six mutants (IIM2, IIM3, IIM6, IIM7, ATM1 and ATM3) with unlinked transposition showed *Ds* insertion within genic regions, indicating tagging of six different genes of sorghum. Preliminary phenotyping of the *Ds* tagged mutants (without ascertaining their zygosity) under green house for various morphological traits did not reveal any gross morphological changes, when compared to M 35-1 (wild type).

CROP PHYSIOLOGY

Influence of seed hardening and foliar nutrition on drought tolerance in Bt - cotton

AMIT A. BIJJUR

2012

MAJOR ADVISOR: Dr. K. N. PAWAR

A field experiment was conducted during *kharif* 2010-2011 to study the effect of seed hardening and foliar spray with agro-chemicals on Bt-cotton under rainfed condition at Agricultural Research Station, Dharwad. The experiment consisted of fourteen treatments viz., five seed hardening treatments (CaCl₂, CCC, KNO₃, ZnSO₄ and water soaking), four foliar sprays (CaCl₂, CCC, KNO₃ and ZnSO₄) and other four were the combination of seed treatment and foliar spray of the above mentioned agro-chemicals. The experiment was laid out in randomized block design with three replications. The plant height increased significantly from 60 DAS due to seed hardening with CaCl₂ at 2 per cent and there was a decreased number of days for 50 per cent squaring, 50 per cent flowering and 50 per cent boll opening as compared to control. Seed hardening with CaCl₂ at 2 per cent and foliar spray at 0.5 per cent recorded significantly more total dry matter and Leaf area index. The pre-sowing

seed hardening and foliar spray techniques significantly increased AGR, CGR, RGR, NAR and SLW at all the intervals as compared to other treatments. The seed treatment with CaCl₂ at 2 per cent and foliar spray at 0.5 per cent recorded significantly higher photosynthesis rate, total chlorophyll content and relative water content as compared to other treatments. There was significant decrease in proline content and transpiration rate due to various treatments. The seed cotton yield and yield components viz., yield (2276 kg/ha), boll weight (5.12 g/boll) and number of bolls per plant (28.00) showed significantly higher values due to seed hardening with CaCl₂ at 2 per cent and foliar spray at 0.5 per cent as compared to control. It is concluded that, seed hardening with CaCl₂ at 2 per cent and foliar spray at 0.5 per cent followed by seed hardening and foliar spray with ZnSO₄ at 0.5 per cent is more effective and economical in increasing the yield in Bt-cotton.

HUMAN DEVELOPMENT AND FAMILY STUDIES

Influence of maternal knowledge regarding infant development and self efficacy on home environment and infant developmental outcomes in rural and urban areas

SUMA G. PATIL

2012

MAJOR ADVISOR: Dr.(Mrs.) PUSHPA B. KHADI

The influence of maternal knowledge regarding infant development and self efficacy on home environment and infant developmental outcomes in rural and urban areas was studied on a sample of 80 mothers of infants. MacPhee's (1983) Knowledge of Infant Development Index (KIDI), Caldwell and Bradley's (1984) HOME Inventory, Sud's (1998) Self-efficacy scale, Agarwal's (2005) Socio-economic status scale were administered to the mothers. Nutritional anthropometry was employed to assess the infant developmental outcomes. Correlation-coefficient, chi-square and regression analysis were used. The results revealed that rural mothers had slightly higher scores than urban mothers on 'right answers' and 'accuracy answers' and they were significantly low on 'wrong answers'. The demographic factors such as parent's occupation, family size, income, SES did not influence the parental knowledge. Home environment score was significantly higher among urban mothers

than rural mothers. There was significant association between home environment and infant's age in urban group only, but infant's gender was significantly associated in both rural and urban group, where in boys had better home environment than girls. On Self-efficacy, rural and urban mothers did not differ significantly. Family income was associated with self-efficacy in case of rural mothers only. More number of urban infants (40%) fell under normal category of nutritional status while 80 percent of rural were in undernourished category. Maternal knowledge's 'accuracy' score was significantly correlated with weight of urban infants, indicating that as 'accuracy score' increased, weight of urban children also increased. Self-efficacy did not influence infant developmental outcomes. In case of rural group the maternal knowledge 'wrong score' was negatively related with self-efficacy, indicating that as the self-efficacy of rural mothers increased the 'wrong score' decreased.

POST HARVEST TECHNOLOGY

Studies on jackfruit (*Artocarpus heterophyllus* Lam.) wine production

S. M. MANJUNATHA

2010

MAJOR ADVISOR: Dr. S. L. JAGADEESH

An investigation was carried out to standardize the concentration of TSS, pH and dilution level in jackfruit *must* for wine making at Department of Post-harvest Technology, Kittur Rani Channamma College of Horticulture, Arabhavi during the year 2009-2010. In the investigation on standardization of TSS and pH, the maximum ethanol (10.29%) was produced in the treatment T7 (*must* with 240 Brix TSS + 3.5 pH) followed by *must* with 240 Brix TSS + 4.0 pH (Ethanol 10.19%). The total score for sensory evaluation was more in T7 (13.20 and 15.53) both at 3 and 6 month after aging. The TSS, Total residual sugars, reducing sugars, non-reducing sugars, titratable acidity, pH in the wine of treatment T7 after 6 months of aging was 7.73° Brix, 7.56, 6.13, 1.4, 1.069 and 3.22 per cent, respectively. The treatment T7 secured highest organoleptic score after 3 and 6 months of aging followed by T 8 at 3 months and by T4 at 6 months of aging. The clarity of wine as revealed by OD value decreased with the increase in pH of the *must*

with the T7 recording maximum transmission with an OD value of 0.179. The wine recovery exhibited a direct relation with the TSS and inverse relation with the pH. In the experiment on dilution level, the dilution of pulp in the *must* had no significant effect on the recovery of wine. However, the recovery of wine increased with the increase in the dilution with yield of 70.44 per cent in T4. The colour of wine in the treatments T2, T3 and T4 showed statistical similarity as revealed by OD value. The treatment T1 containing more pulp (less dilution) was less clear than the other 3 treatments recording significantly higher OD value (0.307). In conclusion, jackfruit wine made from *must* with 240 Brix and 3.5 pH was organoleptically more acceptable than the other eight combinations of pH and TSS tried. In respect of diluting the jackfruit pulp to make *must*, the dilution level of 1:2 (Jackfruit pulp: water) was found suitable for yielding wine with higher total scores for sensory quality.

SEED SCIENCE AND TECHNOLOGY

Effect of staggered sowing, nitrogen application and plant nutrient spray on seed yield and quality of sunflower hybrid KBSH-53

BASAVARAJA

2013

MAJOR ADVISOR: Dr. T. A. MALABASARI

The present investigation was carried out to study the influence of staggered sowing of male parent on synchronization of flowering with the female parent and application of nitrogen on synchronization of flowering on seed set, seed yield and seed quality of sunflower hybrid KBSH-53. Male parent flowered late by five to six days than female with simultaneous sowing. Among different techniques to achieve synchronization of flowering, Sowing of male parent by 7 days late to female along with application of 25 kg nitrogen per hectare at button stage to female parent resulted in better synchronization of flowering and resulted in significantly highest seed yield (579 kg/ha) over simultaneous sowing (565 kg/ha). This treatment also hastened the days to flower initiation in male (58.37), days to 50 per cent flowering male (62.21), days to physiological maturity (male) (97.37), head diameter (16.25 cm), head weight (410 g), number of seeds per head (738), seed

weight/head (72.50 g), 1000 seed weight (56.25 g), volume weight (43.80 g), seed set (78.57%), seed yield per plant (73.25g), seed yield per net plot (1260 g), seed yield (579 kg/ha) and seedling vigour index (3142) compared to other treatments. The results of another field experiment conducted to study the effect of plant nutrients spray to female parent of sunflower hybrid KBSH-53 revealed that, Spraying of TIBA @ 50 ppm influenced higher seed yield (629 kg/ha) over control. This treatment also hastened the seed yield per plant (90.64g), seed yield per net plot (1450g), head diameter (15.66 cm), weight of head (422g), seed weight per head (90.64g), volume weight (43.80g), 1000 seed weight (48.13g), seed set (89.61%), number of seeds per head (865), shoot length (20.81cm), root length (10.51cm), vigour index (2921), seedling dry weight (63.8 mg) and minimum electrical conductivity (0.350) under Bagalkot condition.

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

Refinement of existing soil test based NPK recommendation for yield maximization in irrigated maize in vertisol

SUDHIR KUMAR JITTI

2012

MAJOR ADVISOR: Dr. MANJUNATHA HEBBARA

A survey was conducted during May 2010 in maize growing area of zone-III to study the physico-chemical properties and nutrient status of surface soil samples. Soils were neutral to alkaline in reaction (PH: 7.60 to 8.50), and nonsaline (EC: 0.61 to 3.73 dS m⁻¹), available nitrogen status was low (89.0 to 224.0 kg ha⁻¹), available P₂O₅ was low to high (5.6 to 119.5 kg ha⁻¹), but available K₂O was medium to high (120.0 to 1470.0 kg ha⁻¹). All the micronutrient cations were above critical limit, except iron. A field experiment was also conducted during *kharif* 2010 on Vertisol to study the effect of different levels of fertilizer recommendation based on soil test values on yield of hybrid maize under irrigation in the farmer's field at Savadatti village in Northern Dry Zone (Zone-III) of Karnataka representing predominantly low-high-high (LHH) fertility status with respect to N (171 kg ha⁻¹), P₂O₅ (69.2 kg ha⁻¹) and K₂O (367 kg ha⁻¹), respectively. The experiment consisted of six

treatments with four replications having different levels of fertilizer recommendation based on soil test values. The STCR dose of NPK (327:166:201 N, P₂O₅ and K₂O kg ha⁻¹, respectively) recorded highest grain yield, which was on par with modified RDF₂ treatment that received 225:37.5:19 N, P₂O₅ and K₂O kg ha⁻¹, respectively. The stover yield, weight of 100 grains, number of seeds per row, number of seed rows per cob, girth of cob and length of cob were maximum in STCR treatment and on par with modified RDF₂. Highest B:C ratio (2.38) was recorded in the treatment having modified RDF₂ (+50% N, -50% K₂O and -25% P₂O₅ of RDF). The nutrient content in the index leaf (N, P, K, Zn, Fe, Mn, and Cu) was higher with STCR dose followed by modified RDF₂ over rest of the treatments. The (grain + stover) uptake of N, P, K by maize plant and available N, P₂O₅, K₂O in soil were also higher under STCR dose followed by modified RDF₂ over rest of the treatments.

SPICES AND PLANTATION CROPS

Evaluation of coriander (*Coriander sativum* L.) genotypes and nutritional studies in var. Sadhana

H. T. SUNILKUMAR

2010

MAJOR ADVISOR: Dr. S. I. HANAMASHETTI

A field experiment was conducted to evaluate the coriander genotypes for growth, yield and quality attributes and to study the response of coriander variety Sadhana to inorganic and organic nutrition during 2009-10 at Kittur Rani Channamma College of Horticulture, Arabhavi. The field trials were laid out in a randomized block design in both *kharif* and *rabi* seasons. Among the different genotypes evaluated, higher plant height was recorded in Sadhana (44.46 cm and 42.88 cm in *kharif* and *rabi* seasons, respectively). Higher number of primary branches per plant was recorded in Sadhana (7.12 and 7.62 in *kharif* and *rabi* seasons, respectively). Higher dry weight was recorded in Sadhana in *kharif* (9.14 g) and *rabi* (10.58 g) in *rabi* seasons. In *kharif*, maximum number of umbles (24.32/plant) and number of seeds per umbellet (5.82) were observed in IND-2, while in *rabi*, maximum number

of umbles (26.26/plant) and number of seeds per umbellet (5.79) were observed in Sadhana. Higher seed yield was recorded in Sadhana (6.02 and 7.24 q/ha) in *kharif* and *rabi* seasons. Higher oil content was recorded in CIMAP0-S-33 (0.74%) in *kharif* season and Rcr-41 (0.72%) in *rabi* season. Among the 15 different nutritional treatments during *rabi* season, higher plant height (44.26 cm) was recorded by the application of 50 per cent recommended dose of fertilizer (60:40:20 kg NPK/ha + FYM 10 t/ha), while the least was recorded by the application of neem cake 0.75 t per ha (39.94 cm). Similarly, higher seed yield was recorded by application of 50 per cent recommended dose of fertilizer + vermicompost 1.0 t per ha (6.40 q/ha). However, higher B:C ratio was recorded in 75 per cent recommended dose of fertilizer + vermicompost 0.5 t per ha.