

ABSTRACTS OF THESES

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

DOCTOR OF PHILOSOPHY

AGRICULTURAL BUSINESS MANAGEMENT

Behaviour of spot and futures prices of agricultural commodities vis-à-vis policy impact

CHIDANAND PATIL

2014

MAJOR ADVISOR: Dr. BASAVARAJ BANAKAR

Futures prices for agricultural commodities are the main source for price determination in many spot markets. Futures markets help in price discovery, provide price risk management and bring about spatial and temporal integration of markets. Wheat, sugarcane, chana and turmeric are the important cereal, commercial and pulse crops of our country. Variation in the prices of these commodities will have adverse impact on both producers and consumers. The study is a modest attempt to analyse the growth in production of wheat, sugar, chana and turmeric and examines the behaviour of spot and futures prices of these commodities. The study also endeavors to know the interrelationship among production, spot and futures prices and impact of volume of transactions on futures prices of these commodities. Besides, an attempt is made to know the impact of futures ban on spot prices of these

commodities. The growth in production was analysed using growth rate analysis and the results indicated that the production was highly significant in the selected agricultural commodities. The instability in spot and futures prices was highest in turmeric when compared to the remaining three commodities considered for the study (wheat, sugar and chana). The strong interdependence between spot and futures prices in wheat, sugar, chana and turmeric reveals that the futures prices provide transparency for spot price determination rather than causing rise in spot prices. The volume of transaction of selected agricultural commodities did not have much influence on their respective futures prices. The impact of policy intervention on a time series was assessed by chow test which showed that there was a structural break in daily spot prices before and during futures ban of wheat, sugar and chana.

AGRICULTURAL ECONOMICS

Protected cultivation technology in Karnataka- an economic analysis

PAVANKUMAR GAMANAGATTI

2014

MAJOR ADVISOR: Dr. B. L. PATIL

Protected Cultivation Technology (PCT) is used to protect plants from adverse climatic conditions. The economics of PCT was evaluated for the year 2013-14 using 105 PCT farmers *i.e.* thirty farmers each from Rose, Gerbera and Capsicum. Along with five farmers from Anthurium, Orchid and Carnation farms. The per hectare establishment cost was seen high in Anthurium *i.e.* Rs. 13488.83 thousands followed by Orchids (Rs. 13121.54 thousands), Rose (Rs. 11038.65 thousands), Carnation (Rs. 10745.80 thousands), Gerbera (Rs. 9778.27 thousands) and Capsicum (Rs. 7792.39 thousands). The cost C of Anthurium was Rs. 11929.56 thousands, followed by Orchids (Rs. 11395.73 thousands), Rose (Rs. 8955.05 thousands), Gerbera (Rs. 5822.93 thousands), Carnation (Rs. 3700.09 thousands) and Capsicum (Rs. 1560.18 thousands). While per hectare yield obtained from PCT crops were 88.97, 47.99, 33.20, 33.39 and 45.98 lakh numbers in Rose, Gerbera, Anthurium, Orchid and Carnation. Whereas 82,655 kgs of Capsicum

yield was obtained. The gross return received from PCT crops was seen high in Rose *i.e.* Rs. 29961.65 thousands/ha, followed by Orchids (Rs. 29472.95 thousands), Anthurium (Rs. 28301.54 thousands), Gerbera (Rs. 13233 thousands), Carnation (Rs. 11450.32 thousands) and Capsicum (Rs. 2914.92 thousands). Increasing returns to scale for Gerbera (1.09) and Rose farms (1.06), whereas decreasing returns to scale for Capsicum farms (0.97). Channel III was seen efficient, where producer's share in consumer rupee was more than 65 per cent. The Garrett ranking results indicates that non-availability of skilled labour and high cost of plant material was major problem. In all PCT farms, B:C ratio was more than unity and IRR ranged from 26 to 45 per cent which revealed that cultivation of crops under PCT is a profitable venture. Hence, Government needs to encourage developing PCT structures using indigenous technologies with low cost materials *viz.* good quality galvanized iron (G.I.) pipes and plant material.

AGRICULTURAL ENTOMOLOGY

Integrated management of giant African snail, *Achatina fulica* (Ferussac) (Stylommatophora: Achatinidae) in agriculture and horticulture ecosystems

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2014

MAJOR ADVISOR: Dr. R. K. PATIL

The investigations on integrated management of giant African snail in Agriculture and Horticulture ecosystems were carried out in Dept. of Entomology, AC, Dharwad and at Belagutti village of Davanagere district during 2011-13. Roving survey revealed that population of *Achatina fulica* (Ferussac) in different agriculture and horticulture crops was significantly high in Dharwad (39.50 snails/5 m²) while least in Chitradurga district (11.88 snails/5 m²). The damage caused by snail in all the perennial horticultural crops was less (4.94%) than annual agricultural/horticulture crops (18.46%). The peak snail population was recorded in betel vine and arecanut ecosystem during August second and September first fortnight (91.44 and 65.02 snails/ 5 m²) while in groundnut at 31st MSW (25.04/5 m²). Rainfall has highly significant positive association with snail population

in betelvine, arecanut and groundnut. The incidence of *A. fulica* in forest nurseries at Belgaum district indicated that jacaranda, bamboo and *Peltophorum* sp. did not recorded any damage while in others damage was cent per cent. During survey important predators found were firefly, *Lamprigera* sp. (62.54 and 63.69% predation at Haranahalli and Belagutti villages) and pheasant crow, *Centropus sinensis* (Stephens). The economic injury level for medium sized *A. fulica* in groundnut at 15, 30, 45 and 60 DAS was 1.18, 1.47, 2.32 and 4.47 snails/m², respectively. Among the various management practices followed physical barriers like copper sheet, GI sheet+copper sulphate solution, grease+copper sulphate and bordeaux paste prevented snails from crossing the barriers upto 9 days. In cafeteria test highest percent of snails were attracted to moringa

leaves and decomposing weed mass. The botanicals like tobacco decoction+CuSO₄ solution and sapindus+shikai pod extract recorded higher mortality of snails both *in vivo* and *in vitro* conditions. Among the poison baits/chemicals evaluated significantly higher mortality was recorded in bleaching powder, crystal salt, metaldehyde and methomyl

40 SP poison bait. Among the four IPM modules evaluated in groundnut highest mortality of snails was noticed in Module-II followed by Module-I. Among the four modules evaluated in betelvine ecosystem M- II proved to be the best with maximum reduction in snail population followed by M-III and M-I.

Entomopathogens for the management of stored grain pests

ROHINI SUGANDI

2014

MAJOR ADVISOR: Dr. J. S. AWAKNAVAR

Investigations on the entomopathogens for the management of stored grain pests were carried out during 2010-13 at the University of Agricultural Sciences, Dharwad. During survey *Beauveria bassiana* was predominantly encountered in Dharwad and Haveri districts of Karnataka. In grain admixturing bioassay, isolates of *B. bassiana* were found most effective with a mortality range of 82 to 93.33 per cent in *Callosobruchus chinensis*, *Tribolium castaneum* and *Sitophilus oryzae* at different concentrations. Isolate *Metarhizium anisopliae* (Ma-1) proved better over Ma-2 and Ma-3, with a mortality range of 80 to 100 per cent in all coleopteran pests at different concentrations. While,

Bacillus thuringiensis found pathogenic to *T. castaneum* and *Corcyra cephalonica* with a mortality range of 65 to 92.22 per cent at different concentrations. In immersion bioassays, of one lepidopteran and three coleopteran pests, mortality increased with increase in dose rates and exposure time. LC₅₀ values for all the four pests was determined by using the isolates of *B. bassiana*, *M. anisopliae* and *B. thuringiensis*. Entomopathogens proved highly effective on the pests tried at 30°C at 90 per cent RH with the mortality range of 60 to 90 per cent. Organoleptic studies on the entomopathogens admixed with the grains showed high consumer acceptability.

Population dynamics, baseline susceptibility, genetic divergence and management of brinjal shoot and fruit borer (*Leucinodes orbonalis* G.) in south India

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2014

MAJOR ADVISOR: Dr. B. V. PATIL

Investigations were carried out on insecticide usage pattern, baseline susceptibility to different group of insecticides and CryIAC protein, genetic diversity, population dynamics and validation of IPM strategies against *L. orbonalis* in brinjal were undertaken during 2009-10 and 2010-11 at MARS and Department of Entomology, College of Agriculture, Dharwad, Karnataka, India. Across the major brinjal growing regions of south India, farmers applied insecticides from 18-34 sprays at an interval of 4-8 days against *L. orbonalis* per season. Maximum usage of 36 sprays were noticed in Raichur farmers and lowest number of 18 sprays was observed from Margoa and Chennai farmers. Majority of the brinjal farmers across the south India used rynaxypyr followed by spinosad against *L. orbonalis*. LC₅₀ values of CryIAC indicated that populations of *L. orbonalis* across the geographic locations were extremely sensitive to Bt proteins. Lowest and highest LC₅₀ and MIC₅₀ was noticed in Margoa and Raichur population across the south India. Among insecticides,

highest level of resistance development was observed against chlorpyrifos and endosulfan in fourteen geographic populations. Among the insecticides the highest resistance ratio was observed in Raichur and lowest was observed in Margoa populations. Genetic diversity across the fourteen populations revealed that, similarity co-efficients ranged from 0.38 to 0.90 among populations. Genetic similarity of 90 per cent was evident between the populations of Aduthurai and Coimbatore. Among six species of wild brinjal, two species *S. torvum* and *S. viarum* were found to be dominant at all the surveyed locations three species (*S. torvum*, *S. indicum* and *S. macrocarpon*) are classified under tolerant category and two under highly resistant (*S. viarum* and *S. incanum*) category and with only one species found to be fairly resistant (*S. virginianum*) to *L. orbonalis*. Among the different IPM modules, adoptable module significantly reduced shoot and fruit damage recording highest fruit yield with maximum C: B ratio.

AGRICULTURAL MICROBIOLOGY

Isolation, characterization and screening of purple non sulphur bacteria (PPNSB) in paddy (*Oryza sativa* L.)

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2014

MAJOR ADVISOR: Dr. M. N. SREENIVASA

Two hundred isolates of Phototrophic Purple Non Sulphur Bacteria (PPNSB) isolated from paddy rhizosphere in North Karnataka were characterized morphologically, physiologically and biochemically. Further, five efficient isolates were taxonomically identified as *Rhodospirillum rubrum* using 16S rRNA sequencing. The plant growth promotional traits (N₂ fixation, P-solubilization, zinc solubilization and phytohormone production) of each isolate were found to be on par with reference strain *Azospirillum ACD15*. The amount of N₂ fixed by the PPNSB isolates was ranges from 396.50 to 20.6 µg/mg of protein. In the ARA activity ethylene formation was maximum under microaerophilic condition in light with irrespective of the presence of chemical nitrogen. *nif H* gene was amplified from efficient isolates NKPRPPNSB (H10) and NKPRPPNSB (S6) and sequenced. Butachlor utilization was noticed in all the 200 isolates at concentration 0.003M. Crude extract of fifteen isolates were capable of inhibiting plant bacterial pathogen *Ralstonia solanacearum*. Organic acids

production and siderophore production was noticed by 12 isolates. It was observed that the growth parameters viz., plant height, number leaves and root length were maximum in the treatment inoculated with NKPRPPNSB (H10) and given chemical nitrogen under hydroponic system. The growth parameters (plant height, leaf area, chlorophyll content, dry matter production and nutrient content), yield parameters (productive tillers, grain yield per plant and ha) and enzyme activities were maximum in the treatments inoculated isolates NKPRPPNSB (H10) at 100% RDN level and NKPRPPNSB (S6). They were on par with ref. strain *Azospirillum ACD15* at 75% RDN level in pot experiment under puddled condition. Similar kind of results observed in aerobic paddy pot experiment and field experiment. The per cent increase yield (10.00 per cent) was maximum in the treatment inoculated NKPRPPNSB (H10) at 100% RDN level. This was on par with the treatment inoculated with ref. strain *Azospirillum ACD15* at 75 per cent RDN level under field condition.

AGRONOMY

Weed management studies in Bt cotton

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2014

MAJOR ADVISOR: Dr. S. I. HALIKATTI

Two field experiments on “Effect of sequential application of pre emergence herbicides on weed management in Bt cotton” and “Effect of pre and post emergence application of herbicides on weed management in Bt cotton” were conducted during 2011-12 and 2012-13 at ARS, Dharwad Farm. Among the sequential application treatments, pre emergence (PE) application of pyriothibac-sodium 10% EC @ 0.125 kg ha⁻¹ fb pyriothibac-sodium 10% EC @ 0.125 kg ha⁻¹ recorded significantly lower weed density, weed dry weight and nutrient uptake by weeds. It also recorded significantly higher weed control index and seed cotton yield (2863 kg ha⁻¹) as well as higher boll weight (5.92 g), bolls plant⁻¹ (20.60) and higher nutrient uptake by Bt cotton compared to other herbicides. However, it was on par with PE application of butachlor 50% EC @ 1.5 kg ha⁻¹ fb butachlor 50% EC @ 1.5 kg ha⁻¹ and pendimethalin 38.7% CS @ 0.68 kg ha⁻¹ fb pendimethalin 38.7% CS @ 0.68 kg ha⁻¹. But PE application of butachlor fb butachlor recorded the highest net returns (Rs. 62703 ha⁻¹) followed by PE application of pyriothibac sodium fb

pyriothibac sodium. In second experiment, PE application of pendimethalin 38.7% CS @ 0.68 kg ha⁻¹ fb post emergence (PoE) application of pyriothibac sodium 10% EC @ 0.125 kg ha⁻¹ recorded significantly lower weed density, weed dry weight, nutrient uptake by weeds and higher weed control index. Also it recorded the highest seed cotton yield (3015 kg ha⁻¹) as well as higher boll weight (6.06 g), bolls plant⁻¹ (22.20) and higher nutrient uptake by Bt cotton compared to other herbicides. But it was on par with PE application of pendimethalin 38.7% CS @ 0.68 kg ha⁻¹ fb PoE application of quizalofop-p-ethyl 5% EC @ 0.05 kg ha⁻¹ fenoxaprop-p-ethyl 9.3% EC @ 0.1 kg ha⁻¹. Pendimethalin 38.7% CS @ 0.68 kg ha⁻¹ as PE fb pyriothibac sodium as PoE recorded significantly higher net returns (Rs. 66453 ha⁻¹) followed by PE application of pendimethalin 38.7% CS fb PoE application of quizalofop-p-ethyl. The fibre length and strength were significantly decreased in weedy check compared to all other treatments. While fibre fineness and GOT were not influenced by weed management treatments.

Sequential application of herbicides for weed management in drill sown and transplanted onion (*Allium cepa* L.)

KANTESH GANDOLKAR

2014

MAJOR ADVISOR: Dr. S. I. HALIKATTI

Two field experiments were conducted at Regional Horticultural Research and Extension Centre, UHS, Bagalkot during *kharif* season of 2011 and 2012 to study the “Sequential application of herbicides for weed management in drill sown and transplanted onion”. Herbicides *viz.*, pendimethalin, butachlor and oxyfluorfen were used as pre emergence while pendimethalin, butachlor, oxyfluorfen, fenoxaprop-p-ethyl and propaquizafop were used as post emergence. The experiments were laid out in randomized block design with three replications. In drill sown onion, at 14 DAS pre emergence application of butachlor @ 1.0 kg ha⁻¹ was moderately toxic (5.67) to onion while oxyfluorfen @ 0.08 kg ha⁻¹ was slightly toxic (2.17). All the herbicides significantly reduced the number and dry weight of weeds over unweeded check. Weed free check recorded significantly lower dry weight of weeds. Among the herbicides, at harvest sequential application of oxyfluorfen @ 0.08 kg ha⁻¹ followed by (fb) oxyfluorfen @ 0.25 kg ha⁻¹, was quite efficient in controlling weeds which reflected through decreased weed dry weight (6.49 g 0.5 m⁻²), increased weed control

index (80.44%) and lower weed index (13.43%). It also recorded significantly higher bulb yield (23.02 t ha⁻¹) than all other treatments except weed free check (26.80 t ha⁻¹) with higher net returns and B:C (Rs. 1,10,850 ha⁻¹ and 4.95, respectively). In transplanted onion, at 14 DAT slight toxicity was noticed in pre emergence spray of butachlor @ 1.00 kg ha⁻¹ (2.33) and oxyfluorfen @ 0.25 kg ha⁻¹ (3.00) while toxicity was not observed in pendimethalin @ 1.00 kg ha⁻¹. Weed free check significantly reduced the dry weight of weeds. Among the herbicides, at harvest sequential application of oxyfluorfen @ 0.25 kg ha⁻¹ fb oxyfluorfen @ 0.25 kg ha⁻¹ was more effective due to higher weed control index (93.49%), reduced the weed dry weight (4.22 g 0.5 m⁻²) and weed index (12.67%). This treatment also produced significantly higher growth, yield attributes and bulb yield (19.93 t ha⁻¹) with maximum net returns (Rs. 87,163 ha⁻¹) and benefit cost ratio (3.50). Both in drill sown and transplanted onion, sequential application of oxyfluorfen fb oxyfluorfen recorded higher TSS (%), lower physiological loss of bulb weight (%), bulb spouting (%) and bulb rotting (%).

CROP PHYSIOLOGY

Role of fungicide (Opera 18.3% SE) in inducing stress tolerance in soybean

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2014

MAJOR ADVISOR: Dr. M. B. CHETTI

Field and pot experiments were conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *kharif* seasons of 2012 and 2013 to study the influence of fungicide (Opera 18.3% SE) to withstand moisture stress and waterlogging effects on growth, physiology and productivity in soybean. The experiments were laid out in randomized block design with factorial concept consisting of three replications having two factors comprising eight treatment combinations under field and polyhouse conditions. All the morphological and growth parameters decreased with advancement in moisture stress durations from 0 to 15 days and 0 to 9 days waterlogging. Under both stress situations, significant improvements were noticed in all morphological and growth parameters with the application of opera over without fungicide treatment. Advancement in moisture stress/waterlogging duration reduced the maturation period and was slightly extended with application of opera.

Expansion in moisture stress from 0 to 15 and waterlogging from 0 to 9 days decreased the number of secondary roots and nodulation. The biophysical parameters *viz.*, rate of photosynthesis and stomatal conductance, biochemical components *viz.*, chlorophyll, carbohydrates and protein contents were significantly higher with opera application in both stress situations. Membrane injury, proline and ascorbic acid content increased with advancement in the duration moisture stress and waterlogging. Stress either due to reduced moisture or waterlogging elevated the activity of superoxide scavenging enzymes (superoxide dismutase and glutathione reductase) and the activity was higher with opera treatment. Yield and yield components *viz.*, number of pods per plant, number of seeds per pod, 100 seed weight and seed yield were significantly lower with 15 days moisture stress and 9 days waterlogging. Opera showed improvement over control (without fungicide treatment) for these yield traits.

FOOD SCIENCE AND NUTRITION

Nutritional status and strategy to combat malnutrition among preschool children of rural Dharwad

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2014

MAJOR ADVISOR: Dr. PUSHPA BHARATI

An investigation was undertaken to assess "Nutritional status and strategy to combat malnutrition among preschool children of rural Dharwad". Nutritional status of 1620 preschool children attending *anganwadis* of rural Dharwad were assessed. According to IAP classification (1972 and 2006) 63.10 and 89.81 per cent were malnourished. Higher number of children were lighter and shorter compared to NCHS standards at 50th percentile. The intake of all the nutrients was significantly less than the ICMR recommendations. The protein energy dense (PED) mixes were formulated using cereals, pulses, oilseed and vegetable by roasting and dehydration techniques. PED mix with garden cress seeds contained higher amount of energy (399 Kcal/100 g) and protein (18.54 g/100 g) compared to PED mix with carrot shreds (385 Kcal of energy and 16.77 g of protein). PED mixes can be stored beyond period of six months with better sensory scores and minimum changes in moisture and free fatty

acids. *Laddu* incorporated with five grams of roasted peanut pieces and *thepla* with dried carrot shreds received significantly higher sensory scores (between 8 and 9). The preschoolers, their mothers, *anganwadi* and PHC staff accepted both the products. When the PED mix was fed to preschool children (n=60) in the form of *laddu* to provide 460 Kcal of energy and 11 g of protein for 90 days, an improvement in anthropometric measurements like height, weight, MUAC, head and chest circumference was observed which in turn reduced the episodes of morbidity. Cognitive skills of children increased significantly after intervention (from 56.55 to 86.43%). Nutrition education given to mothers using booklet, folder, brochure and power point presentation brought about significant improvement in knowledge scores regarding malnutrition and its preventive measures. Improved knowledge of mothers helped to choose and feed good nutritious foods to children thus enhancing nutritional status.

GENETICS AND PLANT BREEDING

Studies on resistance to jassids (*Amrasca devastans* Dist.) in cotton (*Gossypium hirsutum* L.)

K. T. VENKATESHA

2014

MAJOR ADVISOR: Dr. RAJESH S. PATIL

Investigations were carried out to study the genetic inheritance pattern for jassid resistance and the morphological, biochemical and anatomical bases of resistance to jassid damage in the F₂ and F₃ generations of four different crosses of American cotton (exotic susceptible X indigenous resistant genotypes) grown under unprotected condition, during *kharif*, 2012-13 and 2013-14 at Agricultural Research Station, Dharwad Farm. Inheritance study revealed that Cross I (0774-3-3 x 1-2-1) and Cross II (Raider 276 x 8-1-2) showed 13:3 segregation ratio, suggesting that two dominant genes with epistatic gene action were responsible in the expression of jassid resistance. In Crosses III (0774-3-3 x MCU-12) and IV (Raider 276 x MCU-13), 3:1 segregation was observed, indicating single gene difference between the parents selected. Here, jassid resistance was controlled by dominant gene action making it easier to produce jassid resistant genotypes in upland cotton by simple breeding strategies. A wide range for various pubescence and morphological traits was observed

in F₂ and F₃ generations of all the four crosses. The jassid population and injury grade were significantly and negatively correlated with leaf pubescence traits. There were significant differences in the various biochemical components studied and reducing sugars and crude protein were positively correlated with jassid injury. The phenols, gossypol, chlorophyll and peroxidase enzyme were negatively correlated with jassid population and jassid injury in both generations of all crosses. Leaf lamina thickness positively and significantly correlated with jassid population and jassid injury. The distance between the upper and lower epidermis of midrib, sucking distance, midrib breadth, number of cortical cells per microscopic field and palisade parenchyma cells per unit length were all negatively associated with jassid population and injury grade. Superior jassid resistant recombinant lines were identified with good seed cotton yield. These can be tested on large scale over locations for their commercial exploitation.

Exploitation of heterotic group through reciprocal selection for combining ability in cotton (*Gossypium hirsutum* L.)

K. J. PRANESH

2014

MAJOR ADVISOR: Dr. S. S. PATIL

Exploitation of heterosis and hybrid breeding program in cross pollinated crops is supported by population improvement schemes aimed at improving combining ability but such studies are lacking in self pollinated crop including cotton. Present study was aimed at exploiting robust/ stay green v/s compact groups through reciprocal selection for combining ability. The experimental material consisted two diverse single cross F₁s viz., DSC-7 x DSC-68 from compact heterotic group and DSMR-10 x DSG3-5 from robust stay green heterotic group which were identified through principal of predicted double cross performance. This heterotic box was advanced to F₄ generation and seventy four F₄ lines of DSC-7 x DSC-68 and thirty-seven lines of DSMR-10 x DSG3-5 were randomly selected and utilized in assessing variability for combining ability against reciprocal tester and additional diverse tester. The crosses involving the F₄ lines with opposite testers were referred to as derived F₁s. Those derived F₁s that

were more productive than superior bench mark cross were termed as transgressive segregants for combining ability and some of them were very productive and superior to Bt. check, Mallika. The most potential crosses were COMP-10 x DSMR-10, COMP-57 x DSMR-10, COMP-4 x DSMR-10, COMP-39 x DSG3-5 and COMP-62 x DSG3-5 of compact F₄ lines of DSC-7 x DSC-68 cross and RSG-20 x DSC-7, RSG-12 x DSC-7, RSG-27 x DSC-7, RSG-28 x DSC-68 and RSG-21 x DSC-68 of robust/ stay green F₄ lines of DSMR-10 x DSG3-5 cross were identified as potential crosses. Sub-grouping of lines was done to characterize the combining ability status of these F₄ lines to identify the best combiners against each testers to develop sub population. The expression of heterosis due to diversity in parental combination was also observed at molecular level indicating the possibility of utilizing SSR markers to identify heterotic combinations.

Genetic analysis of drought tolerance in maize (*Zea mays* L.)

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2014

MAJOR ADVISOR: Dr. G SHANTHAKUMAR

The investigation was carried out to elucidate the genetic mechanisms underlying the drought tolerance in maize. One hundred inbred lines were evaluated for drought tolerance under field condition by withholding water before fifteen days of anthesis and silking. Fifteen drought tolerant inbred lines viz., DMIL 101, DMIL103, DMIL112, DMIL117, DMIL122, DMIL125, DMIL129, DMIL130, DMIL136, DMIL140, DMIL145,

DMIL147, DMIL150, DMIL152 and DMIL160 were identified based on the genetic diversity and morpho-physiological traits under water stress condition. Further, these inbred lines were confirmed by molecular characterization using SSR loci linked to candidate genes responsible drought tolerance and root screening studies. Among SSR markers used, *bnlg2248* produced a maximum of seven alleles followed by *bnlg1866*, *bnlg210*,

mmc0181 and *umc1056* tagged to *hsp26*, *abp4*, *sps1* and *bip1* candidate gene produced four alleles each. The inbred lines DMIL152, DMIL136 and DMIL160 exhibited superior performance for various root morphological traits under water stress condition. The fifteen inbred lines were utilized for developing 105 single crosses hybrids through half diallel mating design. These hybrids were evaluated for drought tolerance under field condition and identified the ten superior single cross hybrids viz., DMIL112 x DMIL122, DMIL101 x DMIL117, DMIL145 x DMIL152, DMIL147 x DMIL150, DMIL103 x DMIL147, DMIL117 x DMIL150, DMIL130 x

DMIL152, DMIL122 x DMIL160, DMIL103 x DMIL112 and DMIL152 x DMIL160. The selected ten hybrids were evaluated for their grain yield stability along with checks at three locations viz., ARS, Hanumanamatti, MARS, Dharwad and ARS, Arabhavi under rainfed ecosystem. Among ten hybrids, DMIL103 x DMIL147 was found to be most stable. The predominance of both additive and non-additive gene action was observed in the cross DMIL270 x DMIL101 whereas, DMIL350 x DMIL112 cross exhibited predominance of non-additive gene action which were the potential source for improving the yield and its attributing traits.

PLANT PATHOLOGY

Morphological, molecular characterization and early detection of *Ganoderma* sp. affecting perennial plants

J. RAJU

2014

MAJOR ADVISOR: Dr. S. T. NAIK

Ganoderma lucidum, *Heterbasidion annosum* and *Armillaria mellea* are the important wood decaying fungi occurring throughout the world. Among these *G. lucidum* is a disastrous pathogen that has been causing tremendous losses to economically important crops in many countries. *Ganoderma* spp. are widely distributed and occur on many plants. Survey results revealed that *Ganoderma* wilt disease incidence was more as compared to *Heterbasidion* and *Armillaria* root rots in all surveyed states. The highest disease incidence was recorded in Karnataka and lowest incidence was recorded in Andhra Pradesh. PDA was superior in supporting the growth of *G. lucidum*. Cultural variability among 51 isolates revealed that there is variability in growth and colony characters. Culture of *G. lucidum* showed septate trimitic hyphae. Clamp connections were observed in secondary mycelium in 40 isolates but sporulation was observed only in 15 isolates. Spores were hyaline and ellipsoidal. Grouping of isolates was done based on colour. Growth habit; twenty one isolates had pure white raised cottony colonies. Fruiting bodies of

Ganoderma, *Heterbasidion* and *Armillaria* showed high variability with respect to colour, texture, length, breadth, attachment pattern of stipe to pileus, surface pattern of pileus and occurrence on different hosts. Molecular characterization of *G. lucidum* isolates through PCR and DNA analysis of the ITS rDNA regions showed highest similarity among *Ganoderma* isolates though they came from geographically diverse locations. Sequencing results revealed that all the ten tested isolates belonged to *G. lucidum*. Validation of different early detection techniques showed positive reaction for different tests like KOH (colorimetric method), EDTA, orthophenophthaline, iodine-potassium iodide staining technique and alkaline copper sulphate using leaf, root and bark/stem extracts. Suspected samples were confirmed by using *Ganoderma* specific primers. Among the fungicides and bioagents tested, captan, copper oxychloride, tridemorph, hexaconazole and *Trichoderma koningii* were effective, in inhibiting the mycelial growth of the fungus under *in vitro* conditions.

Studies on characterization and management of mycotoxin producing organisms in groundnut with special reference to *Aspergillus flavus* L. Ex Fries

RANGANATHSWAMY

2014

MAJOR ADVISOR: Dr. S. T. NAIK

An investigation entitled studies on characterization and management of mycotoxin producing organisms in groundnut was carried out with field and laboratory experiments. Survey was conducted for two consecutive years during *kharif* and *rabi* (2012 and 2013). Higher *Aspergillus flavus* incidence and aflatoxin content was observed in rainfed and moisture stress areas (Chitradurga and Davanagere district) as compared to irrigated and normal monsoon receiving areas (Bagalkot district). The *A. flavus* incidence was observed in all APMC yard samples during both the years of survey. Samples collected from storage unit, at monthly interval showed lower *A. flavus* incidence in May 2012 and increased gradually at subsequent months. The pods collected during survey were subjected for isolation of pathogen by using *A. flavus* and parasitic Agar (AFPA) medium. All the 34 isolates of *Aspergillus* spp. were identified based on morphological, cultural and molecular methods. Among them twenty six isolates were toxigenic and five isolates were

non-toxicogenic in all the methods tested. Among 69 genotypes tested only one genotype ICGV02266 showed moderate resistance to invasion under *in vitro*. Studies on biochemical factors showed higher aflatoxin content, increased polyphenol and fatty acid content while decrease in oil content in inoculated genotypes. *In vitro* studies revealed among the non-systemic fungicides, copper oxychloride, among systemic fungicides, tebuconazole, among combiproductions, carbendazim 25% + iprodione 25% (quintal) among chemicals, propionic acid, among natural products, nimbidine and among biocontrol agents, *Trichoderma harzianum* were effective in inhibiting the fungi. Field studies at two locations revealed seed treatment with carbendazim 25% + mancozeb 50% @ 3.0 g/kg of seeds + soil application of *T. harzianum* @ 1 kg/ 50 kg of FYM + foliar spray with carbendazim 12% + mancozeb 63% @ 0.2 % at pegging stage recorded minimum incidence and lower aflatoxin contamination with higher yield of 27.20 q/ha.

Studies on lectins for suppression of soil-borne pathogens

K. JAYALAKSHMI

2014

MAJOR ADVISOR: Dr. S. LINGARAJU

Soil-borne pathogens affecting tomato (*Fusarium oxysporum*, *Sclerotium rolfsii*, *Rhizoctonia solani*, *Ralstonia solanacearum* and *Meloidogyne incognita*) were collected from MARS, UAS, Dharwad. Expression of a fungal lectin SRL1 and a plant tuber lectin RVL1 was checked with total protein isolated from induced *E. coli* BL21(DE3) pLysS. *E. coli* induced RVL1 and SRL1 could agglutinate rabbit erythrocytes. Polyclonal antibody was raised against SRL1 by immunizing rabbits with pure antigen (SRL1) and the specificity of the antiserum (anti-SRL1) was determined by DAC-ELISA. Different concentrations of SRL1, anti-SRL1 and RVL1 were efficacious against soil-borne pathogens as demonstrated by employing different methods

(poison food, spread plate, inhibition zone, spore germination inhibition). Combination of lectins with antagonists (*Trichoderma* spp. and *Pseudomonas fluorescens* strains) was found to be effective in suppressing the growth of soil-borne pathogens. But SRL1 and RVL1 suppressed some of the fungal and bacterial antagonists. Eight transgenic tomato events carrying *srl1* and *rvl1* genes (T_3 generation of homozygous) showed moderately resistant reaction [SRL1- T_0 (21) and RVL1- T_0 (28)] to *Fusarium*, *Ralstonia* and also *Meloidogyne* and to combination of all these three pathogens. Histopathological and histochemical changes in transgenic and non-transgenic tomato plants revealed reduced giant cell formation in *srl1* and *rvl1* transgenics.

Elucidation of the mode of action of SRL1, RVL1 and anti-SRL1 on soil borne pathogens and antagonists: FITC-labelled lectins bound to hyphal wall, septum, and spores of respective fungi; localization of anti-SRL1 on sclerotia of *S. rolfii* and *R. solani* showed a dense mass of congregated

lectin sites. Nematode secretions were observed at amphidial, excretory pore and phasmidial region using CBB-R histochemical dye. Binding of lectins in nematode was found at head region, mid gut of the alimentary-tract, excretory pore which extended to the posterior region (phasmids).

Studies on chilli wilt complex disease

S. RAGHU

2014

MAJOR ADVISOR: Dr. V. I. BENAGI

The maximum disease incidence was noticed in Kurnool district (29.21% and 40.58%) of Andhra Pradesh during 2012-13 and 2013-14. The disease severity was more under irrigated condition. The maximum disease incidence recorded in variety Sitara (42.50%) and in chilli-chilli cropping system. The major pathogens identified were *Fusarium* spp., *R. solani*, *S. rolfii*, *R. solanacearum* and *Meloidogyne* spp. The maximum growth of wilt pathogens observed at 25 to 30°C and pH 5.5 to 6.5 on PDA. *Fusarium* isolates grouped into highly, moderately and slightly pathogenic based on their reaction on three varieties. Molecular identification of *Fusarium* spp. with ITS rDNA region was amplified with ITS-1 and ITS-4 primers at 560 bp and with specific primers at 420 bp specific to genus *Fusarium* and a 658 bp specific to *F. solani*. Multiplex PCR resulted amplification at 420 bp and 658 bp. PCR-RFLP with *ECO-RI* restriction enzyme has resulted in four clusters. The seed borne

nature of *F. solani* was confirmed by PCR amplification at 658 bp. Byadgi Kaddi, Bentur Dabbi, Devanur Local, GPM-02, DCC-07, Sankeshwar, DCC-09, DCC-27, DCC-28, DCC-45, DCC-52, DCC-61, DCC-66, DCC-68, DCC-139 and DCC-142 were moderately resistant. Captan, Tebuconazol, Quintol and micronutrient CuSO_4 were effective against *F. solani*. Zineb, Vitavax power, Avatar and Taqat against *S. rolfii* and Chlorothalonil, Quintol and Avtar against *R. solani*. Neem, Adathoda and Soapnut were most effective. *T. harzianum* (Byadgi isolate). *T. harzianum* (Bailhongal) against *R. solani* and *T. harzianum* (ACDPP) against *S. rolfii*. M-3 (Adoptive module) recorded higher per cent germination, vigour index, low seedling death, lower disease incidence, highest yield and C: B ratio. T_6 (Seed treatment with *T. harzianum* @ 10 g/kg of seeds + soil drenching with vitavax power @ 2.5 g/l of water at 15 days interval) recorded less disease incidence and highest yield (26.75 t/ha) and C:B ratio (1:3.75).

Fruit rot of chilli: Its diversity, characterization, epidemiology and integrated management

SANTOSHREDDY MACHENAHALLI

2014

MAJOR ADVISOR: Dr. V. B. NARGUND

Fruit rot of chilli caused by *Colletotrichum* spp. (*C. capsici*, *C. gloeosporioides* and *C. acutatum*), *Alternaria alternata* and *Fusarium* spp. is major yield limiting factor in all chilli growing areas. Highest fruit rot incidence (19.97%) with 13.77 PDI was observed in Maharashtra. The maximum die-back incidence (11.23%) with 42.79 PDI was observed in Andhra Pradesh followed by Karnataka (9.06%, 38.14 PDI). Predominance of *C. capsici* and *Fusarium* spp. in combination was to the extent of 28.37 per cent. *C. capsici* recorded highest frequency of 38.56 per cent followed by *A. alternata* (18.98%). Molecular identification of fungal pathogens by amplification of ITS rDNA region was done, sequenced and confirmed. By using specific primers amplification of *C. capsici* at 450 bp, *C. gloeosporioides* at 450 bp and *C. acutatum* at 490 bp, *A. alternata* at 390 bp and *Fusarium* spp. at 550-570 bp was obtained. PCR-RFLP with *HaeIII* resulted in

four clusters each in *C. capsici* and *C. gloeosporioides*, five clusters in *C. acutatum* isolates. Digestion with *TaqI* in *A. alternata* isolates resulted in two clusters, *Fusarium* isolates into five clusters. PCR-based method was the best for early detection and quick diagnosis. Seed treatment with carboxin + thiram at 2g/kg and combinations of *Trichoderma harzianum* 5 g + *Pseudomonas fluorescens* 5 g was most effective. Spraying of difenconazole and pyraclostrobin, tricyclazole + mancozeb and pyraclostrobin + metiram were found effective against fruit rot and dieback disease under field conditions. Integrated management study revealed that adoptive module including seed treatment with carboxin + thiram at 2 g/kg, seedling dip in *P. fluorescens* (10 g/l), spray with neem oil (10 ml/l), hexaconazole, propiconazole (0.1%) and carbendazim + mancozeb (0.2%) showed least seedling infection, die-back, fruit rot incidence and severity with high dry chilli yield (8.92 q/ha) and C:B ratio (2.44).

SEED SCIENCE AND TECHNOLOGY

Seed technological studies in forage oat cultivars (*Avena sativa* L.)

M. S. PUNEETHRAJ

2014

MAJOR ADVISER: Dr. B. S. VYAKARANAHAL

The field experiments were conducted on seed technological studies in oat cultivars at the Main Agricultural Research Station, Dharwad during *rabi* 2012 and 2013 and further storage studies conducted during 2013 in the laboratory of Department of Seed Science and Technology at College of Agricultural Sciences, Dharwad. Results revealed that application of nitrogen @ 140 kg/ha was recorded significantly higher green fodder yield (122.22 q/ha) and among the cutting management two cut recorded higher green fodder yield (229.39 q/ha). Among the cutting management no cut treatment recorded higher seed yield (7.61 q/ha) and among nitrogen management (6.99 q/ha) was recorded in nitrogen 140 kg/ha recorded higher seed yield, due to interaction (7.81 q/ha) was recorded in treatment combination of no cut with application of 140 kg N/ha. For the same factors seed quality parameters was also maximum, among the cutting management no cut recorded higher seed germination (94.13%), vigour

index (2426) and among nitrogen management 140 kg N/ha recorded higher seed germination (93.38%) and vigour (2304), due to interaction no cut with 140 kg N/ha recorded higher seed germination (94.75%) and vigour index (2797) in oat cv. JHO-851. Seed quality parameters found higher when harvested at 45 days after anthesis, higher seed germination (92.75%) and vigour (2821) in oat cv. OS-6. Among organics, application of Vermicompost @ 5t/ha was found higher plant growth, seed yield and seed germination (95.44%), vigour index (2776) and with micronutrients Zinc sulphate @ 15 kg/ha was found higher plant growth, seed yield and quality parameters like seed germination (94.88%), vigour index (2620) in oat cv. OS-6. The seeds of oat stored in polythene bag (700 gauge) treated with vitavax+deltamethrin followed by vitavax, deltamethrin, arappu, neem, sweet flag powder storage upto fifteen month with loss of lesser seed quality parameters in oat cv. OS-6.

SOIL SCIENCE AND AGRIL CHEMISTRY

Studies on soil resources in Singhanhalli-Bogur microwatershed of northern transition zone of Karnataka through remote sensing and GIS techniques

DENIS M. K. AMARA

2014

MAJOR ADVISOR: Dr. P. L. PATIL

A detailed soil survey of the study area was undertaken in order to evaluate soil resources, identify and map land degradation, quantify soil loss, identify soil productivity constraints and assess soil quality. Twenty representative pedons representing upland, undulating midland and lowlands were studied for morphological, physical, physico-chemical and chemical properties. One hundred and thirty-three surface samples comprising of red and black soils from 0-30 cm depth were studied for soil properties and available nutrient status. Fourteen series were identified and mapped into 17 mapping units as phases of soil. Seven land capability subclasses viz., II_{tsf}, III_{tsf}, IV_t, IV_s, IV_{tsf}, IV_{tsf} and VI_t and seven land irrigability subclasses viz., S₂₁, S_{2s}, S₃₁, S_{3s}, S_{3ls}, N₂₁ and N_{2s} were identified. The soils were moderately to permanently not suitable for major crops due to climate, landform and soil fertility constraints. The major process of land degradation was

water erosion and type ranging from sheet to rill and gully with severity ranging from slight to very severe. Average annual soil loss of mapping unit ranged from 0.12 t ha⁻¹ yr⁻¹ to 11.6 t ha⁻¹ yr⁻¹, while annual soil loss under land uses ranged from 7.3 t ha⁻¹ yr⁻¹ in forest to 39.9 t ha⁻¹ yr⁻¹ under cultivation. Upland soils were more degraded and severely eroded than undulating midlands and lowlands. Major productivity constraints were weed infestation related to the inability of farmers to access chemical inputs, unfavourable climate and poor soil fertility status related to high gravel content, acidic or alkaline soil reaction, low to medium organic carbon, available N, P, K, S and Zn and Cu deficiencies. Soil quality ranged from low to high with clay, silt, porosity, exchangeable Mg and organic carbon as best soil quality indicators. Soils under cultivation showed low quality and high deterioration than soils under other land uses.

TEXTILE AND APPAREL DESIGNING

Documentation and contemporizing the ethnic costumes of conservative societies inhabited in Karnataka

SHWETA MARIYAPPANAVAR

2014

MAJOR ADVISOR: Dr. SHAILAJA D. NAIK

The present study on "Documentation and contemporizing the ethnic costumes of conservative societies inhabited in Karnataka" was carried out during 2011-2014 with the objectives to document on historical background, constructional details of men and women costumes along with jewellery, accessories, headgear and footwear of conservative societies, to design and develop contemporary ethnic outfits by incorporating style features traditional costumes. A self structured interview schedule was administered on fifty each families of five different conservative societies viz., *Gouli*, *Halakki*, *Kunbi*, *Lambani* and *Siddi* totaling to 250 families, these conservative societies are localized in Dharwad, Haveri and Uttara Kannada districts of Karnataka. The information in detail on origin, deity worshiped, migration, occupation, fairs and festival celebrated, clothing purchasing practices, tradition costumes of men and women, jewellery, headgear and footwear, was documented exclusive for each conservative society. Total five trendy outfits were designed and developed one for each

society, incorporating traditional style features through necessary adaptations, were overlapped dhoti pant with cowl top, single shoulder kurta, off shoulder kurta, anarkali kurta with halter jacket and finally skirt with strapped bodice by slash and spread method for *Gouli*, *Halakki*, *Kunbi*, *Lambani*, and *Siddi* communities, respectively. These five ethnic outfits were assessed by young adults, home scientists and textile experts for resemblance with the traditional style features and colours of the costumes, suitability, value addition, comfortability, overall appearance and cost of production by organizing exhibition. The concept of designing contemporary outfits and overall appearance are found to be excellent. The descending order of preference for outfits was off shoulder kurta, single shoulder kurta, anarkali kurta with halter jacket, overlapped dhoti pant with cowl top and skirt with strapped bodice. Further studies can be taken on documentation of costume and folklore of other conservative societies of Karnataka and other states, as a treasure.

MASTER OF SCIENCE

AGRICULTURAL BIOTECHNOLOGY

Isolation and molecular characterization of salt tolerant genes from marine bacteria

A. H. NETHRAVATHI

2014

MAJOR ADVISOR: Dr. NARAYAN MOGER

A moderately halophilic bacterium produces ectoine which is capable of living in marine water. Ectoine is the compatible solute which accumulates in the cell membrane, are known to be involved in salt tolerance activity in most the halophiles. In the present study an attempt was made to isolate the genes responsible for ectoine synthesis from the marine bacterial isolates. Nine isolates obtained from the culture collection of the Department of Biotechnology, UAS, Dharwad were screened to check their salt tolerance activity on nutrient agar supplemented with different concentrations of sodium chloride from 0, 5, 10, 15 per cent, which revealed that only the four isolates AUDI8, AUDI18, AUDI34 and AUDI144 showing tolerance up to 15 per cent and other isolates showed up to 10 per cent. The total DNA isolated

from the selected marine bacterial isolates was used to identify *ectA* and *ectB* presence with degenerate primers. The PCR analysis revealed that the selected isolates AUDI8, AUDI18, AUDI34 and AUDI144 were positive for the presence of *ectA* and *ectB*. The (AUDI34 isolate) *ectB* was selected further for cloning and expression studies. The *ectB* from AUDI34 was cloned in pTZ57R/T, transformed and maintained in *E. coli* DH5 α and these constructs were named as pNHNM1 and pNHNM3. In order to assess the expression of cloned *ectB*, it was subcloned into prokaryotic expression vector pET32C⁺ transformed into *E. coli* BL21 and named as pNHNM11 and pNHNM13. Then the confirmed clones were induced with IPTG and the SDS-PAGE analysis which showed that 46.1kDa proteins.

AGRICULTURAL BUSINESS MANAGEMENT

Business performance of Co-operative oil seed grower's union in Karnataka - A case of Dharwad union

P. N. ANANDA

2013

MAJOR ADVISOR: Dr. A. D. NAIK

The Co-operatives in the state have made an all-round progress and their role in, and contribution to agricultural progress has particularly been significant. This study was taken up to examine the strengths and weakness of KOF and focuses on the analysis of business performance of the Federation. The secondary data was collected from the audit reports of KOF for the period from 2001 to 2011. The primary data with respect to procurement, pricing, marketing strategies and problems of procurement and marketing of its product management were collected by interviewing the employees. Random sampled employees were interviewed with a pre- set questionnaire at the Head Office. KOF is procuring oilseeds through its own Oilseed Growers' Co-operative

Societies (OGCS) and regulated markets. Further KOF is also importing oil through State Trading Corporation (STC) Ltd. KOF is marketing its branded products through agencies like private companies wholesalers, retailers, Government organizations, etc. The KOF has registered an impressive performance in respect of sales with annual compound growth rate of 13.88. Union is having comfortable liquidity to meet short and long-term financial obligations. The gross profit margin has increased over the years, but net profit margin has remained almost constant, implying that the operating expenses relative to sales have been increasing over the years. Hence there is a need to control increasing expenses should be identified and controlled.

Production and marketing management of commercial broilers in Dharwad district

SHREYA AMARAPURKAR

2014

MAJOR ADVISOR: Dr. C. MURTHY

The present research study was conducted on Production and Marketing Management of Commercial Broilers in Dharwad district. From the district, Kalaghatgi and Dharwad talukas were selected based on concentration of congenial to poultry farms in all aspects especially with respect to climatic variability, production and marketing infrastructure. From each taluka 15 broiler farms, 3 wholesalers and 15 retailers were selected through purposive sampling. Thus, the total sample size is 66. The data was collected through personal interviews from the commercial broiler rearing farmers, wholesalers and retailers with the help of well-structured pre-tested schedule by survey methods. The information gathered was on production, procurement and input cost, marketing channels, factors influencing commercial broilers and problems of commercial broiler rearing, during 2013-14. Small broiler farmers were found to be younger than the medium and large farmers, this indicated that the age older farmers after gaining

experiences expanded their operations to bigger size business. The main occupation of commercial broilers business in primary sectors was 23.07 per cent in medium farms, but in case of large farms it was maximum that is 76.92 per cent of primary occupation. Feed cost was maximum and lowest cost incurred was on litter materials. Even though, commercial broiler farmers purchased the feed from various agencies. In broiler marketing there is heavy price fluctuation during the same season. So the government should intervene to equalize the broiler prices atleast in the state which in turn reduces the price variation to large extent. There is no proper training and education to the farmers in rearing broiler birds. Thus, the farmers are to be educated and should be trained in the skills of rearing poultry birds for better returns. As many firms expressed the constraints in availability of credit system for their business using the lending norms to broiler units.

Consumer preference for ready-to-eat food products- A case study in Belgaum city

G. B. CHAITRA

2014

MAJOR ADVISOR: Dr. N. M. KERUR

Ready-to-eat foods are widely used in catering industries as well as at homes. There are varieties of ready-to-eat foods available in the market to choose as per their desire. Now-a-days they have become a part of everyday life. The present investigation made an attempt to analyze the buying behaviour of ready-to-eat food products by consumers of Belgaum. A total sample of 160 respondents was selected for the study. Majority of the respondents were aware of Parle-G, Big bread, Lays, MTR, Frooti, Kissan jam, Amul and Purohith brands in cases of biscuits, bread, chips,

pickles, fruit juice, fruit jam, ice creams and kunda respectively. Television was the major source for getting information about various brands in all the four products. The major factors considered while purchasing biscuits was convenience to use as snacks (83.13%), bread, fruit jam and kunda (86.25%, 100% and 96.71%) readily available is the major factor, for chips convenience as snacks (96.03%), In case of pickles taste (94.70%), fruit juice (94.67%) and ice creams (98.01 per cent) save the time of preparation was major factor. The average monthly expenditure on ready-

to-eat food products was found to be highest in case of high income group. Planned purchase was common among majority of the respondents for biscuits, bread, pickles, fruit jam, and kunda. Most of the respondents did impulsive buying for chips, fruit juice and ice creams. Majority of the products purchased by consumers from bakeries. The main factors

influencing brand preference for biscuits, bread, chips, pickles, fruit juice, fruit jam, ice creams and kunda were quality, taste and freshness. The study revealed that the younger generation preferred more ready-to-eat food products than the other age groups. The consumer behaviour also varies from product to product.

Dynamics of prices and arrivals of jaggery in North Karnataka - An econometric analysis

J. B. ANITHA

2014

MAJOR ADVISOR: Dr. VILAS KULKARNI

Dynamics 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 order to examine the trends in area, production and yield of sugarcane, Compound Annual Growth Rates (CAGR) were computed for the period 1998-99 to 2012-13. Negative growth rates were observed for production as well as area and CAGR for productivity were insignificant in almost all the selected districts. For studying the dynamics in arrivals and prices of jaggery, monthly modal prices and arrivals were collected from major jaggery markets of North Karnataka for a period of 20 years (*i.e.*, 1993-94 to 2012-13). Increasing trends in arrivals and prices were observed in all the markets, but the quantum of

increase varied from one market to another. Price of jaggery was found to be highest during off season (July-November) in all the markets, except Ramdurg market, and lowest during the other months. The higher seasonal indices of prices were observed during which the arrivals were found to be low. Uneven cycles were observed both in arrivals and prices in all the markets. ARIMA analysis was employed to quantify the variation in prices and also to forecast jaggery prices. The forecast prices in all the markets were found to be increasing. Analysis of co-integration showed that there existed integration among some of the jaggery markets and some markets were not integrated. The analysis revealed that, storing jaggery and selling during off season would help the producer in getting higher returns. Finally it was recommended to disseminate the price forecasts to farmers for their advantage.

Performance of Indian agri exports to European union

ANAND MISHRA

2014

MAJOR ADVISOR: Dr. R. A. YELEDHALLI

The European Union (EU) is an economic and political union of 28 member states located in Europe. EU is the world's biggest single market with regard to agricultural trade bringing together four of the world's seven largest economies. The study endeavors to analyze the trends in exports, direction of trade and competitiveness of agri exports to EU from India. The study was undertaken on a macro framework based on secondary data. Major agricultural commodities thus selected were basmati rice, guar gum, other pressed fruits and vegetable products, fresh grapes and cucumber and gherkins (prepared and preserved). The yearly data on export quantity and value were compiled from various sources such as Agricultural Processed Food Product Export Development Authority (APEDA), Food and Agricultural Organization (FAO) for the period 1998-99 to 2012-13. The results showed increasing trends in export value and quantity in all the five selected commodities. United

Kingdom, Belgium, Netherlands, Italy, France and Germany were found to be major importers. Sweden, Estonia and Spain were found to be emerging EU markets for fresh grapes, cucumber and gherkins and other processed fruits and vegetable products respectively. United Kingdom was found to be stable market for basmati rice, fresh grapes and other processed fruits and vegetables respectively. Netherlands was found to be stable market for four of the selected commodities except guar gum. Germany was found to be stable market for guar gum but highly unstable market for basmati rice, fresh grapes and other processed fruits and vegetable products. It was observed that India has comparative advantage in trading all the five commodities indicated by their high NPC values. The study suggested a high potential in exports of selected commodities and hence, higher production of the same should be encouraged in order to take advantage of the situation.

Performance of belgaum gardeners co-operative society – A management appraisal

VIRUPAKSHA GIDNAVAR

2014

MAJOR ADVISOR: Dr. BASAVARAJ BANAKAR

The Belgaum Gardeners' Co-operative Production, Supply and Sale Society Ltd., was established in the year 1933. The establishment of the society was an outcome of an organized effort of vegetable growers. The main functions of the society is to arrange for sale of garden produce of the members and non- members to the best advantage, to supply input such as seeds, insecticides, fertilizers and other agricultural implements as for their requirements and to provide cold storage facilities to its A class and B class members. The present study was thus aimed at evaluating growth, business performance and managerial aspects of Belgaum Gardeners' Co-operative Society. The manager post which was existing earlier was not yet filled up after the retirement of the incumbent. The actual expenses incurred on personnel in all the years of study was

more than the fixed norms of 2.5 per cent of the turnover. The quantity of total seeds purchased by the society showed negative at the rate 24.60 per cent. The quantity of urea and DAP purchased by the society have decreased over the study period. The purchase and sale of liquid pesticides showed decreasing trend over the years at the rate of 1.31 and 2.32 per cent, respectively. Net worth of the society was negative and decreased by 300 per cent over the base year. This indicated still larger scope for improvement of the net worth position of the society. The average benefit cost ratio of business performance of the society was found to be unity, except in the year 2002-03. The policy makers were of the opinion that, the participation of members in the working of the society is good extent in bringing the produce for sale and purchase of inputs.

Production and marketing of onion in Gadag district – A management appraisal

RAVI GURIKAR

2014

MAJOR ADVISOR: Dr. J. S. SONNAD

Onion is a one of the major crop grown in India. It is common ingredient in the Indian food habit. Onion is used as a vegetable, spice and also it used in the form of salad because of its health benefits to human race. Onion is an important commercial vegetable crop. India is the second largest producer of onion in the world next to China. Multi-stage random sampling technique was employed to select the 120 sample farmers from Gadag district. The results indicated that there was positive

and significant growth in area and production of onion (4.06 and 4.18 per cent per annum, respectively). Among the different category of farms, the total variable cost incurred per hectare by large farmers was highest (Rs. 29535.82/ha) as compared to small (Rs. 26580.72/ha) and medium category farmers (Rs. 27720.34/ha). Among the three categories of farmers, the total cost incurred by the large farmers was the highest (Rs. 34648.61/ha) as compared to small and medium farmers

(Rs. 31460.80/ha and Rs. 32703.53/ha, respectively). The highest yield was obtained by medium farmers (58.56 q) followed by large farmers (57.56 q) and small farmers (55.72 q). Increasing returns to scale was observed for medium (1.09) and large farmers (1.05), where as decreasing returns to scale were observed for small farmers (0.99). The study revealed that most of the resources were under utilised as revealed by MVP: MFC ratios and only Plant Protection Chemicals

was over used in case of large farmers. The marketing analysis reveals that channel III is Producer-Seller — Wholesaler — Retailer was seen efficient, where producer share in consumer rupee was 65.68 per cent. Non-availability of labour was the major problem expressed by most of the respondents, High incidence of pest and diseases and In marketing Poor transportation facility was another serious problem as experienced by many respondents.

An analysis of structural changes in agri-export-import trade in India

MANGALAGOURI AVALI

2014

MAJOR ADVISOR: Dr. R. A. YELEDHALLI

India is predominantly an agricultural economy which contributes at about 14.7 per cent and contributing 2/3rd of countries population. A study was conducted to analyze structural changes in agri-export-import trade in India with the objectives like trends and compositional change in export-import and revealed comparative advantage for exports from India. Secondary data was collected on quantity, value and unit value for major agricultural commodities for a period of 1991-2012. The yearly data was compiled from the official websites of APEDA, Indiatat, FAO, Annual Reports, etc., The trend and cyclic analysis shows an increasing trend for export of agricultural commodities except for pulse because of prohibition of pulse export, import of agriculture commodities also

increasing except for rice, wheat which are declining. The percentage share of export is decreasing (17.80 to 12.85%) and there is a slight increase in the import (3.09 to 3.50%) of agricultural commodities as compared to non-agricultural commodities in total exports, even though there is a increase in the absolute value of agriculture export. India is having revealed comparative advantage for tea, cashew, groundnut and spices since from twenty years, however the others are having many ups and downs. Special pulses mission may be launched at National level to meet the growing demand for pulses and push pulses in the international market. Development of new technologies and innovative ideas to reduce the import of vegetable oil and wood and wood products.

Dynamics of cocoon prices and business performance of silk reeling units in Karnataka

A. N. SOWMYA

2014

MAJOR ADVISOR: Dr. VILAS KULKARNI

Sericulture is a vital income and employment generating activity particularly to the most economically weaker sections of the society. Silk reeling is a main link in sericulture industry having backward linkage with mulberry and cocoon production. Hence the present study was taken up to analyse the dynamics of cocoon prices and arrivals as well as the performance of different types of reeling units. Major cocoon markets, namely Ramanagar, Sidlaghatta and Kollegal were selected for the purpose. The results revealed an increasing trend in both arrivals and prices of silk cocoon over the years. Higher seasonal indices of cocoon prices were observed during January, April and December, which were associated with lower indices for arrivals. There were no constant periods between the cycles in both arrivals and prices

in the selected markets. With respect to cost and returns higher cost of cocoon processing was observed in the cost of multi-end basin followed by cottage basin and charaka units respectively. However, it was observed from the analysis that the quality of silk produced in all the three systems of reeling varied significantly. The quality of raw silk produced by multi-end basin was further as compared to other methods of reeling which fetched higher since in the silk exchange. The package for introduction of silk reeling in non-conventional sericulture areas suffers from non availability of good quality cocoons, fluctuation in cocoon prices and fluctuation in raw silk prices. This package should be reviewed and re-designed to enable this area to function more efficiently.

Estimation of demand for partial mechanization in agricultural operations in North Karnataka

MANGALA V. PATIL

2014

MAJOR ADVISOR: Dr. H. S. VIJAYAKUMAR

This study entitled “Estimation of demand for partial mechanization in agricultural operations in North Karnataka” is aimed to estimate the demand for agricultural machineries in North Karnataka. For the study, primary data collected in year 2011-12 were used to analyze the knowledge gap about the available machineries, cost and returns structure between farmers who used more machineries/implements and less machineries/implements for cultivation. The study throws light on the effect of use of machines on income and to help in decision making for farmers in selection of implements suitable for them. Further, financial feasibility analysis was carried out for implements for highly efficient machine for each operation to recommend them to the target farmers. Demand for machineries and investment required thereof in study area, i.e., Belgaum, Raichur and Haveri districts with respect to sugarcane, paddy and cotton cultivation was estimated. It was observed that, there was significant reduction in the operational cost due to higher

mechanization. In sugarcane cultivation, 6.05 per cent less cost was incurred on operation cost by more mechanized respondents over less mechanized respondents. In cotton cultivation, more mechanized respondents incurred 3.50 per cent less cost on operational cost compared to less mechanized respondents. In paddy cultivation there was 7.27 per cent reduction on operational costs by more mechanized farmers compared to less mechanized respondents. It was observed that huge demand for power tillers, plant setters, weeding machines, sprayers and harvesters exist in Belgaum district with respect to sugarcane cultivation. Demand for power tillers, weeding machines and sprayers exist in Haveri district with respect to cotton cultivation and demand for paddy transplanters, weeding machines and harvesters exist in Raichur district with respect to paddy cultivation. The results thus confirming the existence of gap in use of machineries and huge scope for investment in agriculture implement sector.

Business performance of fisheries cooperative societies in Northern Karnataka - A case study of Gulbarga district

GAYATRI

2014

MAJOR ADVISOR: Dr. S. B. MAHAJANSHETTI

Fishery is an important sector in most of the developed and developing countries of the world. The study was conducted in Gulbarga district which has 22 fisheries cooperative societies. A random sample of six cooperative societies was considered. Further, from each society 20 fishermen/fisherwomen were selected leading to a sample of 120 fishermen/

fisherwomen. Techniques employed included tabular analysis, budgeting analysis and Garret ranking technique. More than 75 per cent of sample fishermen had fisheries as their main occupation. Societies distributed free house, net, life jacket, ice box and bicycles to the members. Labour cost for catching fish was significant accounting for 88 per cent of total

variable cost in capture and culture fisheries activities. B:C ratio indicated fishing was viable activity (2.35 for capture fishing and 1.80 culture fishing). Trading profit was calculated taking into account the cost of fingerlings, labour payment for catching fish and proceeds from the sale of fish. Net profit was calculated taking into account trading profit, payment for secretary, travelling allowance, depreciation, typing and

photocopy expenses, audit fees etc. Overall each society earned the net profit of Rs. 4,119 on an average per year. Total of ten problems were identified, deposit of silt in the tank was the major problem followed by lack of supply of good quality fingerlings and lack of market place for fish. Necessary steps need to be taken for providing materials to the members of the societies in order to improve the efficiency of fishermen.

AGRICULTURAL ECONOMICS

A comparative flow of institutional credit to agricultural and non-agricultural sectors in North Karnataka

A. OLADELE TOYIN

2014

MAJOR ADVISOR: Dr. J. A. HANDIGOL

A study on comparative flow of institutional credit to agricultural and non-agricultural sectors in north Karnataka was carried out during 2004-05 to 2013-14 to analyze the flow of institutional credit in three selected districts. The data was purely based on the secondary data for the districts which has been collected from Annual Credit Plan of Lead District Banks for Belgaum, Dharwad and Gadag respectively. The data thus collected have been analyzed by using compound growth rate, percentages, correlation, regression analysis and discriminant analysis. The results revealed that the cooperatives had the lowest growth rates across all the districts under study whereas commercial bank was most stable source followed by Rural Regional Banks (RRBs). The flow of institutional credit was more to the agricultural sector across the districts selected in which

the crop loan had the largest share and was nearly 50 per cent and above to the TPS. On the contrary, the flow of institutional credit to non-agricultural sector was less than 10 per cent to the TPS across the districts. The factors that influenced flow of credit in the respective districts varied. The result also showed that, agricultural sector was having more than 60 per cent share of the outstanding over what was found in non-agricultural sector (about 30%). Among all under listed constraints, timeliness of credit supply was the only consideration from the borrower's side. Furthermore, the study revealed that Reserve Bank of India (RBI) is a panacea to effective flow of credit to both sectors therefore, strengthening the ground level planning activities and monitoring of banks to fulfill the RBI priority sector lending policy are crucially essential.

Development of irrigation infrastructure, cropping pattern and profitability of crops cultivated in Cauvery river basin of Karnataka

B. C. ASHWINI

2014

MAJOR ADVISOR: Dr. V. R. KIRESUR

The study attempts to know the development of irrigation infrastructure, cropping pattern and profitability of crops cultivated in Cauvery river basin of Karnataka. The study uses primary and secondary data pertaining to Mandya district, which is the major beneficiary of the KRS Project of Cauvery basin for irrigation purpose. For this study 120 farm households were selected through appropriate sampling procedure. The data thus collected were processed using statistical tools including descriptive tools, Compound Annual Growth Rate, Markov Chain Analysis, Cobb-Douglas Production Function and Garrett Ranking Method. The results revealed that, the irrigation intensity in the study area was hardly 118 per cent, and nearly 72 per cent of the gross irrigated area in Mandya district depends on canal water for irrigation, while tanks and tube/bore wells support 16 per cent and 4 per cent, as other sources contributing remaining 8 per cent. Paddy, ragi, coconut, sugarcane, horsegram, maize and sesamum were the major crops cultivated in the study area. Mono-cropping was done season after season and year after year and not much of healthy crop rotation practices were

followed. Given the availability of irrigation water, the current cropping pattern with greater emphasis on paddy and sugarcane for commercial reasons and ragi for domestic consumption purposes, would be likely to continue in the near future. In general in the study area, sugarcane was the most profitable crop with a mean net returns of Rs.1,47,288 per ha and a benefit-cost ratio of 2.02. The corresponding figures for paddy were Rs. 31,342 per ha and 1.52, while for ragi they were Rs. 3,159 per ha and 1.12. Over the last decade, maize, banana, sesamum and coconut have gained importance as indicated by their significant positive high compound annual growth rates in cropped area, which is a desirable change replacing the age-old monotonous sugarcane-paddy cropping system. Labour scarcity and high wage rate were the serious problems faced by the sample respondents in crop production. Amongst the irrigation related problems, untimely and inadequate release of water from the dam for irrigation purposes and sedimentation in canals and tanks were the most serious ones. These problems need to be addressed by the policy makers on priority basis.

Regulated markets in Karnataka: Current status, future needs, innovations, challenges and opportunities

AMRATRAJ I. PATIL

2014

MAJOR ADVISOR: Dr. V. R. KIRESUR

The present study attempts to assess the present status of infrastructural facilities, innovative agricultural marketing practices adopted in regulated markets and problems of border markets in Belgaum, Bijapur, Gulbarga and Raichur districts of Karnataka state. The study is based on both primary and secondary data. Primary data pertaining to the agricultural year 2013-14 were obtained from 120 farmers and 20 traders chosen from the selected markets. Secondary data were collected from the Karnataka State Agricultural Marketing Board, Bangalore. Data were processed using descriptive analytical tools and techniques. There was no difference between interior and border regulated markets with respect to facilities like market office, stalls/godown and telephone facilities, but the negative difference was observed in vehicle parking, fire fighting, rest rooms for farmers and conference hall, shed for animals. There was no difference between interior and border markets with respect to services

like issuing license, collecting market fee, loading, unloading, weighing and recording of disposal, but the negative difference observed in the case of collection of taxes, computer facility and issuing gate pass service. Major constraint faced by the farmers in using ICT's was computer illiteracy (74.17%), followed by lack of interest, lack of computer facility, lack of time, costly technology and illiteracy. Maximum number of farmers used Television as the main source of the market information for its accuracy, timeliness and content. Lack of competitive bidding due to poor arrivals was the major problem faced by the farmers followed by poor infrastructure facilities. Major problem faced by the market intermediaries was poor arrivals, and hence, low turnover followed by quality constraints, and price difference at traditional and regulated markets. There is a need for a targeted Special Programme funded by the State Government to develop and upgrade the border markets.

Poverty in India and Karnataka: Estimation, determinants, vulnerability and coping strategies

R. RANGEGOWDA

2014

MAJOR ADVISOR: Dr. V. R. KIRESUR

The study attempts to analyse the impact of different poverty alleviation programmes in India, document different methodological approaches used for measuring poverty in India, estimate deprivation and inequality in human wellbeing, identify the determinants of poverty at micro and macro levels and also to know vulnerability under poverty condition and coping strategies adopted by households in Bijapur and Tumkur districts of Karnataka State. The multistage random sampling technique was employed to select 120 respondents comprising equal number of landless, marginal, small, medium and large farmers of Bijapur and Tumkur districts. The study was based on both primary and secondary data. Primary data for the agricultural year 2012-13 were obtained from sample farmers. Secondary data were collected from the Directorate of Economics and Statistics and other statistical sources in the state. Data were processed using tabular analysis, compound annual growth rate, regression function and deprivation index.

The study revealed that our Indian government has taken up various measures to overcome the problem of poverty by initiating different poverty alleviation programmes, but only a few programmes had made an immense impact in alleviating poverty directly or indirectly. Out of 27 districts, top 13 districts having least Deprivation Index lie in Southern Karnataka. This means that these 13 districts are the top ones in terms of higher Human Development Index and the bottom 11 districts having highest Deprivation Index or lowest Human Development Index belong to Northern part of Karnataka. Majority of the sample respondents were exposed to different shocks in which illness, poor production, wind damage and loss of livestock caused major problems for livelihood. Farm income saving, borrowing of funds, sale of personal household effects and eating less preferred food were the major coping strategies adopted by the sample respondents under crisis as well as in adverse situation.

Production and marketing of chrysanthemum flower in Tumkur district of Karnataka - An economic analysis

GUNABHAGYA

2014

MAJOR ADVISOR: Dr. S. S. GULEDGUDDA

Tumkur district is well known for flower production and it stands first in area and production of chrysanthemum flower cultivation (2011-12). The present study was conducted using both primary and secondary data. The study aims to analyze growth rate in area, production, productivity, utilization pattern, cost and returns, resource use efficiency and price spread in different channels of chrysanthemum flower marketing. Tabular analysis, budgeting technique and Cobb-Douglas production function were employed as analytical tools. Chrysanthemum flower area and production in Tumkur district has registered a significant positive compound annual growth rate of 14.36 per cent per annum and 11.61 per cent per annum, respectively and the productivity (-2.40%) was found to be negative growth rate. In Tumkur market relatively larger portion of flower was used for preparation of small garlands (37.12%). In case of Bangalore market major quantity of flowers was used for preparation of big garlands (25.58%) followed by

bouquets (24.68%). Per ha cost of cultivation of chrysanthemum flower was Rs. 61,767. The gross return and net returns realised from the chrysanthemum cultivation were Rs. 1,90,540.46 and 1,28,773.46 per ha, respectively and returns per rupee of investment was Rs. 2. The ratio of MVP to MFC was negative for FYM (-0.478), which indicated that the resource was over utilized. The ratios of MVP to MFC were positive and more than unity for human labour (5.680), fertilizer (5.709), plant protection chemicals (44.31) and irrigation charges (37.78), which indicated that these resources were underutilized. Two important marketing channels were identified through which chrysanthemum flower was marketed in the study area. Producer's share in consumer's rupee was higher in channel-I in case of Sira (68.24%), Tumkur (69.30%) and Bangalore markets (70.27%) than that of channel-II under Tumkur (68.09%) and Bangalore markets (65.76%).

An economic analysis of diversity in cultivation of maize hybrids in Haveri district

SHILPA P. CHOWTI

2014

MAJOR ADVISOR: Dr. H. BASAVARAJA

The study attempts to analyze the diversity in cultivation of maize hybrids in Haveri district. The growth in area, production and productivity of maize in Haveri district was analyzed using secondary data for the period from 1998-99 to 2009-10. The primary data obtained from 120 farmers through multistage random sampling. The data collected for the study was analyzed by using Budgeting technique, Compound growth rate, Cobb-Douglas production function, Timmer's measure of technical efficiency, Garrett's ranking technique and descriptive statistics like averages and percentages. The area, production and productivity of maize in the district has recorded an annual growth of 3.41, 2.12 and -1.25 per cent, respectively. Majority of the farmers preferred to cultivate hybrids like CP-818 (45%), NK-6240 (21.66%) and Sunny (4.90%) in *kharif* whereas; in *rabi* about 30.49 per cent of farmers cultivated CP-818 with other hybrids. It was observed that, majority of the farmers cultivated only one hybrid in both seasons, but the proportion

of farmers growing one hybrid was more in *kharif* (82.50%) than in *rabi* (69.51%). Per hectare cost of cultivation was slightly more in NK-6240 (Rs. 37,494) compared to CP-818 (Rs. 34,369) and Sunny (Rs. 36,120) with a benefit cost ratio of 1.88, 1.79 and 1.83 respectively. Per hectare cost for maize in *kharif* season (Rs. 35,716) was high compared to *rabi* (Rs. 30,157) with respective benefit cost ratio of 1.80 and 2.28. The variable resources like seeds and fertilizers exerted positive and significant influence on CP-818 output and in NK-6240, production was significantly and positively influenced by plant protection chemicals and seeds. The average technical efficiency was slightly higher for NK-6240 (82%) compared to CP-818 (79%). The ratio of MVP to MFC for seed, fertilizer and PPC was more than one in CP-818 whereas, in NK-6240 the ratio was greater than one for seed and PPC indicating under utilization of resources. Yield was the single most important factor influencing farmers in selection of hybrids.

Production and marketing of major flower crops in Haveri district – An economic analysis

MALATESH B. HOLAJOGI

2014

MAJOR ADVISOR: Dr. S. M. MUNDINAMANI

The present study was undertaken to analyse the production and marketing of major flower crops in Haveri district of Karnataka. Primary data were collected from 120 flower cultivators in Haveri district. Savanur, Hirekerur and Ranabennur were selected for the study. From each six sampled villages, 20 flower growers were selected randomly. Secondary data were collected from State Department of Horticulture. Multistage sampling technique was adopted in the selection of the district, taluks, villages and cultivators.

For analysis of data compound growth rate, financial analysis and tabular presentation were employed. The labour and material costs accounted for 90.43 and 9.56 per cent of the total establishment cost, respectively. The average maintenance cost (Rs. 305442.40) and average total cost of cultivation (Rs. 325502.00) per hectare were worked out for all age groups gardens. Whereas in marigold and chrysanthemum total cost of cultivation worked out was Rs. 44345.27 and 52613.06 per hectare. The

net returns of jasmine, marigold and chrysanthemum was Rs. 179516.70, 115730.70 and 229004.00, respectively indicating the profitability of major flowers cultivation. The investment appraisal analysis revealed that the net present value of investment was Rs. 739559.98 per hectare at 12 per cent discount rate for jasmine enterprise. The producer's share in consumer rupee was in Channel-I and Channel-II was 70.98 and 75.81 per cent, respectively in jasmine. The scarcity of water was ranked II, III

and II with the mean score of 70, 67.50 and 70.00 respective to jasmine, marigold and chrysanthemum. Majority of the farmers growing jasmine, marigold and chrysanthemum expressed delay payment was the major problem in marketing of major flowers with the mean score of 92.5, 60 and 80 respectively. Lack of floriculture grower cooperative marketing society was also one of the marketing problems in all the crops with mean score of 50, 47.5 and 37.5, respectively.

Diversity in cultivation of Bt-cotton hybrids in Haveri district - An economic analysis

SHWETA YALIWAL

2014

MAJOR ADVISOR: Dr. BASAVARAJA

The focus of the present study was to study the economies of diversity in cultivation of Bt-cotton hybrids in Haveri district. A sample of 120 farmers was selected using multi stage random sampling method. Field level data pertained to the agriculture year 2012-13. For analyzing the data, Growth rate analysis, Cobb-Douglas production function, Timmer's measure of technical efficiency, budgeting technique and tabular analysis were employed. The annual growth rates in area, production and productivity of cotton in Haveri district were positive and significant. More than twenty Bt-cotton hybrids were cultivated in the district. Among these Mayhyo hybrids seeds had highest share of 33.98 per cent followed by Nuziveedu seeds (11.99%), Vikram seeds (7.47%), Vibha seeds (7.40%), Bioseeds (6.93%) etc. Majority of sample farmers (67.50%) were growing

Kanaka a Mayhyo. Most of the farmers (78.33 %) preferred to cultivate only one hybrid, while 19.17 per cent cultivated two hybrids. Average area under Bt-cotton was 1.46 ha. The total cost of cultivation of Yuva Bt hybrid (Rs. 46122), Namdhari hybrid (Rs. 47136) and other hybrids (Rs. 47516) were more when compared to that in Kanaka (Rs. 45936). Thus, Kanaka was more profitable than Yuva Bt, Namdhari and other hybrids and also recorded high B: C ratio of 2.46 over 2.25, 2.10, and 2.13 respectively. The average technical efficiency was higher in Kanaka (85%) as compared to that in other hybrids (81%). The ratio of MVP to MFC for human labour and PPC was more than one in Kanaka hybrid. The ratio in other hybrids was greater than one for human labour indicating under utilization of these resources.

An economic analysis of production and marketing of organic spices in Uttar Kannada district

RUDRAGOUDA B. PATIL

2014

MAJOR ADVISER: Dr. JAYASHREE A. HANDIGOL

The present study was conducted in Uttar Kannada district of Karnataka. A sample of 30 farmers each practicing organic and inorganic cultivation of pepper and cardamom were selected randomly for the study. Data were elicited for the year 2013-14 through survey method. For analysis of data, tabular analysis, budgeting technique, investment appraisal analysis and garette ranking techniques were employed. The per hectare total initial cost of pepper and cardamom mixed cropping in arecanut orchards was Rs. 604,589.20 and 602,966.40 under organic and Rs. 669,420.88 and 661,232.25 under inorganic methods, respectively. Similarly, per hectare maintenance cost of pepper and cardamom mixed cropping was Rs. 95,001.23 and 101,223.56 under organic and Rs. 116,471.51 and 121,225.46 under inorganic methods, respectively. The average yield per hectare of pepper under organic method was 2.08 quintal with a net

returns of Rs. 534,000, whereas under inorganic method it was 2.31 quintal with a net returns of Rs. 510,780. Similarly average per hectare yield of cardamom was 1.97 quintals with a net returns of Rs. 565,142.86. Whereas under inorganic method, it was 2.19 quintal with net returns of Rs. 559,693.93. Under investment appraisal analysis Pay Back Period (PBP), Net Present Value (NPV @ 12.00% discount rate), Benefit Cost Ratio and Internal Rate of Return (IRR) for pepper and cardamom were shown more profitable results compared on organic methods compared to inorganic methods. Under marketing channels, organic marketing channel was more efficient with a marketing efficiency of 7.22 (pepper) and 11.94 (cardamom). The major problems faced by farmers were non-availability of labour and information on organic farming, absence of premium price in local market.

Economic analysis of impact of river water quality on agriculture and rural livelihoods – A case study of Bhima river in Karnataka

SHWETA BYAHATTI

2014

MAJOR ADVISOR: Dr. R. S. PODDAR

Water pollution is a major environmental concern in India. Poor quality of water adversely affects the plant growth and human health. Water pollution is a cause for many diseases and thereby it affects income of a household. Due to illness an individual is not able to work, that is loss of wage in illness period. The medical expenditure increases for recurring diseases due to water pollution. The present study was conducted in Indi taluk of Bijapur district in Karnataka, with an objective to analyze the economic impact of river water quality on agriculture and rural livelihoods. The results revealed that river water is not suitable for irrigation and not suitable for drinking in the study seasons. Decomposition model showed that in sugarcane crop the

contribution of water pollution towards yield difference was 0.88 per cent. Average yield difference between polluted and non polluted villages was 3.43 tonnes/ha of worth Rs. 6177.6. Average per annum veterinary expenses by the household was Rs. 1710, in polluted villages which was more by 34.33 per cent compared to that in non polluted village. The household in polluted villages spent Rs. 8,197 per household per annum on medical expenses, which was 16.26 per cent more when compared to medical expenses Rs. 7,050 spent in non polluted villages. Hence, Government should initiate urgent effective measures to control or regulate pollution and organize awareness programmes regarding health risks by use of polluted water.

Economic evaluation of silk weaving by handlooms and powerlooms in Tumkur district - A comparative study

A. P. BHAVYA

2014

MAJOR ADVISOR: Dr. G. N. KULKARNI

The study on economic evaluation of silk weaving by handlooms and powerlooms in Tumkur district was carried out using primary and secondary data in Karnataka. Analyzed growth in handlooms and power looms for the study area along with costs and returns structures, financial feasibility of investment and constraints of weavers using 120 sample weavers. The annual growth in number of handlooms in Karnataka was

2.12 per cent (CV 10.88%) and in case of power looms it increased significantly by 3.22 per cent (CV 16.29%). The growth of handlooms in Tumkur district decreased annually at 1.50 per cent showing the instability index of 0.08 per cent while in case of power looms it increased at the rate of 1.58 per cent (instability index of 0.25%) during the period of 1995 to 2012. Composition of inputs used varied

according to type of sarees produced. Among different types of sarees produced in handloom, brocade type fetched highest market price of Rs. 4290/saree and net return of Rs. 427.78/saree to weavers and B:C ratio was 1.11. In case of power loom, Resham type fetched highest selling price (Rs. 525.00/saree) with net return of Rs.123.44/ saree and B:C ratio at 1.30. Average weavers share in consumers' rupee was highest in handloom (51%) products compared to powerloom (28%). The average annual income of power loom weavers (Rs.15,53,412) from

different sources was more than the handloom (Rs.11,89,213.51) weavers of which 98 per cent of income earned through weaving. The positive NPV in handloom and power loom units proved investment worthiness in weaving. The IRR on investment in handlooms was lowest (11.86 %) when compared with power looms (from 14 to 27%). The leg pain was the main health problem noticed among handloom weavers (GS:64.50) due to inadequate foot support while in case of power loom weavers it was headache (GS:72.00).

An economic analysis of poultry farms in Belgaum district

V. MAHESHBABU

2014

MAJOR ADVISOR: Dr. S. S. GULEDGUDDA

A study was conducted to analyse the economics of poultry farms in Belgaum district of north Karnataka for the crop year 2013-14. Both primary and secondary data were used. The primary data was collected from 120 poultry farms and 20 market intermediaries by personal interview method using pre-tested questionnaires. Tabular, budgeting technique, financial analysis and garrets ranking technique were employed. The study revealed that, total investment of Rs. 4,08,040 were needed for establishing a small farm, Rs. 7,84,000.30 for medium farm, Rs. 17,61,142.06 for large farm and Rs. 1,10,59,254.52 for establishing layer farm. The total costs incurred per farm on small, medium and large broiler farms was Rs. 13,40,355.69, 28,76,352 and 66,08,920, respectively and in case of layer farms it was Rs. 4,66,17,315. The net returns realised by small, medium and large broiler farms were Rs. 60,634.45, 1,62,399.70

and 4,33,138.90, respectively and in layer farm it was Rs. 36,73,379.32. On the basis of net present value, benefit-cost ratio and internal rate of return, investment in broiler and layer farms has been found that all size groups of broiler farms and layer farms are financially viable and most profitable. The price spread in broiler and layer farms per 100 kg broiler weight (Rs. 6270) and 1000 number eggs (Rs. 4500) is more in channel II followed by channel III (Rs. 5572.50 and 1160) and channel I (Rs. 1600 and 1000). The major problems faced by the broiler and layer farmers were disease infection (83 and 84%), lack of insurance protection (73 and 74%), lack of government subsidy (64.33 and 52.30%), lack of loan facility (62.67 and 50.70%), high price fluctuation (78 and 84%) and entry of middleman (57.80 and 29.13%) were the major problems in the study area.

An economic analysis of agricultural labour in Karnataka

BOURAMMA P. KERUR

2014

MAJOR ADVISOR: Dr. L. B. KUNNAL

The present study on "An economic analysis of agricultural labour in Karnataka" was conducted in Bijapur district of Karnataka state during 2013-14. A sample of 120 agricultural labourers (60 men and 60 women labourers) was selected using multistage random sampling technique from two taluks of Bijapur district namely Bijapur and Indi for collecting the required information. The primary data was collected from the respondents by personal interview method with the help of prestructured schedule. For the purpose of achieving the specific objectives of the study tabular presentation method with averages and percentages and Garrett's ranking were employed. The results of the study showed that the agricultural labourers got maximum employment during kharif (87.15 days) and rabi seasons (76.20 days). They got 186.68 days of employment in agriculture in a year. During off season labourers could not get enough jobs in agriculture as a result among 120 sample labourers 85 labourers got involved in other activities such as cooking in marriage

ceremonies, agricultural works in nearby villages or nearby states, working in construction and mining. The agricultural labourers have mainly three sources of income namely, farm, agricultural wage and non-agricultural wage income. The average income of agricultural labourers was Rs. 75,238.63 per annum. The wage rate for men agricultural labourers was Rs. 250 per day in agriculture and Rs. 275 in nonagricultural activities. And the wage rate for women agricultural labourers was Rs. 150 per day in agriculture and Rs. 170 in non-agricultural activities. The seasonal unemployment of agricultural labourers has caused a severe impact on the income of labourers, family expenditure, savings and migration of labourers. Agricultural labourers perceived poverty as the main problem which was ranked first followed by unemployment during off season and less alternative sources of employment. Nonavailability of MGNREGA jobs was ranked as fourth problem by women agricultural labourers and ranked fifth by men agricultural labourers.

Problems and prospects of small and marginal farmers in Dharwad district - An economic analysis

SAVITA CHOUHAN

2014

MAJOR ADVISOR: Dr. B. L. PATIL

The investigation on problems and prospects of small and marginal farmers in Dharwad district was conducted using primary and secondary data for the year of 2012-13. The results of the study revealed that most of the sample farmers were experienced, and their main occupation was agriculture, but their asset and livestock position was meagre. 50 per cent of the farmers were only primary educated. Technical problem, lack of information, financial and communication problems were major problems faced by the farmers. In case of Organization participation the farmer's performance was not that satisfactory. Most of the farmers were hardly interested in state, district and co-operative societies. But in Self Help Group the data revealed that quite good response for the participation of the small and marginal farmers. Most of the small and marginal farmers adopted financial (65%) and insurance schemes (72.55%), while agriculture, tillage and small

dairy farm (60%) schemes were adopted by the farmers revealed positive impact but in case of technologies adoption, local variety for sowing (100%) and livestock (100%) were adopted, in irrigation techniques drip and sprinkler (12%) irrigation method was adopted by the farmers which had negligible positive impact. The study revealed that more than 74 per cent of the peasants expressed that non availability of better quality of seeds as a major problem and more than 76 per cent of the farmers expressed erratic rainfall was the severe problem of sample farmers. Therefore, the study suggests providing a proper link between supplies of seeds with micro irrigation facilities to solve the two major problems expressed by the sample farmers. Government needs to extend technical guidance and more training programmes to the staff through different extension approaches which can help more sample farmers.

Impact of changes in rainfall pattern on agriculture in Haveri district Karnataka - An economic analysis

KAVITA M. PATIL

2014

MAJOR ADVISOR: Dr. L. B. KUNNAL

Agriculture represents a core part of the Indian economy. While, the magnitude of climate change impact varies greatly by region, it is expected to have an impact on agricultural productivity and shifting crop patterns. The present study was an attempt to analyse the rainfall changes and impact of these rainfall changes on Agriculture in the Haveri district. The study was based on both primary and secondary data. The tabular analysis, compound growth rate analysis, correlation analysis and functional analysis were used for analysing the data. The study revealed that the year 1992 received a maximum rainfall (952.4 mm) and proved to be the wettest year. The year 2001 received lowest quantum of rainfall (300.5 mm) and became the driest year. The growth rates for area, production and productivity of major crops in the district revealed that there was a decrease in the area under paddy (-3.87%) and increased production (3%) and productivity (7.18%) of paddy. In case of maize

and groundnut area (8.06 and 3.23%) and production (5.84 and 0.71%) showed positive growth rates and productivity (-2.05 and -2.44%) was negative in both crops. The study also revealed that there was a high degree of positive correlation between the rainfall and paddy production (0.80), rainfall and paddy productivity (0.88) compared to maize and groundnut. The study also found that the variable pertaining to actual rainfall had a positive and significant impact on the paddy productivity at 10 per cent level of significance but in case of maize and groundnut productivity the variable pertaining to actual fertilizer had a positive and significant impact at 1 per cent level of significance. Among the sample farmers interviewed 32.14 per cent of the farmers reported that they changed their cropping pattern and mixed cropping is other important coping mechanisms in the district to suit the rainfall changes to avoid the risk.

An economic analysis of production of *rabi* sorghum and its competitive crops in Belgaum district of Karnataka

VITTAL SATTIGERI

2014

MAJOR ADVISOR: Dr. L. B. KUNNAL

Sorghum (*Sorghum bicolor* Linn. Moench) occupied an area of 15 million ha in India with the area under *kharif* and *rabi* sorghum showing dynamism during last one decade. Karnataka occupies second place with respect to area and production of sorghum (2010-11) and *rabi* sorghum contributes more than 75 per cent share in production and area of sorghum in Karnataka over the years (2005-06 to 2010-11). The area under *kharif* sorghum has reduced drastically and area under *rabi* sorghum has changed because of other competitive crops in *rabi* season. The present study was conducted in Belgaum district of Karnataka to analyse the growth in area, production and productivity, economics of production, price behaviour and constraints in production of *rabi* sorghum in comparison with its competitive crops (chickpea and sunflower) by using both primary and secondary data. Statistical tools like Tabular analysis, Growth rate analysis, Budgeting

technique, Trend analysis and Garret ranking technique were utilized to arrive at meaningful results. The results revealed that area and production of *rabi* sorghum in the study district is declining over the years while the same under competitive crops was increasing. There is need to stabilize the production of *rabi* sorghum by increasing area under it as it is the staple food crop of the region. To retain the area under *rabi* sorghum it is necessary to increase the returns of *rabi* sorghum by reducing the cost of cultivation, stabilizing the price and increasing the demand for *rabi* sorghum. Seasonal indices of prices indicated that prices of *rabi* sorghum and its competitive crops were higher in off season. Hence, the producers need to be educated to plan their sales of *rabi* sorghum. Non-availability of labour during peak period was the major problem in production of *rabi* sorghum.

Optimization of food consumption and nutrient intake of different income groups in Dharwad district, Karnataka state - An economic analysis

ROHIT P. HIREBIDARI

2014

MAJOR ADVISOR: Dr. J. A. HANDIGOL

Food consumption, mainly governed by poverty or income levels, reflects on standard of living of the society. Estimation of optimum food consumption pattern given the income constraints of the households is vital for meeting the nutritional standards recommended by the Indian Council of Medical Research (ICMR). Secondary data were collected from various published sources of Government of Karnataka, Government of India, NSSO, ICMR and FAO. The requisite primary data were collected by using a well designed and pre-tested schedule. The sample of respondents consisted of 180 households consisting of 90 from rural area and 90 from urban area spread across all the five talukas of the district. Tabular analysis, various forms of Engel's functions, multiple linear regression and linear programming techniques were used to analyse the data. The monthly per capita consumption expenditure on food items in Dharwad district for the year 2012-13 revealed that the rural

households consumed more food as compared to urban households. The expenditure elasticities were positive and less than one for cereals in both rural and urban areas but were more than one for almost all other commodities. The energy derived from consumption of all the food items was higher in urban areas as compared to rural areas across different income groups. The quantity of food items to be consumed as suggested by the optimum food consumption plan was highest in the case of milk followed by jowar, brinjal and potato. The monthly income and number of consumption units per household exerted positive and significant influence on food consumption expenditure in both rural and urban areas. The respondents opined that groundnut, fruits and nuts, vegetables, milk and milk products, egg and meat were expensive. 'Taste and preference' was also an important factor influencing consumption in addition to nutritive value.

Regional disparity in agricultural development of Karnataka - An economic analysis

SHARATKUMAR HANDA

2014

MAJOR ADVISOR: Dr. S. B. HOSAMANI

Regional disparities in agricultural development arise largely due to diverse agro-ecological factors as well as disparate access to technological and infrastructural facilities among various regions. The present study was conducted to compare the regional disparity in agricultural development between south and north regions of Karnataka for the period 2001-02 to 2010-11. The results revealed that the regions were highly despaired with respect to agricultural development. Disparity in

land use dynamics showed that the significant land from desirable ecological sector has shifted to non-agricultural sector in southern region; while, major land shift in northern region was observed from agricultural sector to non-agricultural sector and both were serious matter of concern. Northern region has performed comparatively better in growth rate of production and productivity of cereals and minor millets, horticultural crops, and area and production of pulses. While, southern region performed

better in growth rates of area under cereals and minor millets and horticultural crops, and productivity of pulses. However, growth trends of oilseeds were poor in both the regions. Huge disparity in availability of infrastructural facilities for agricultural development was observed in the study period, but, the gap was declined due to infrastructure development, particularly in north region. There was a disparity in allotment of SDP funds between the regions; where north received 68.38 per cent of total funds allotted to agriculture and allied sector. Further, Theils entropy analysis also confirmed the disparity in flow of

funds between the regions. Comparison of present level of development of selected taluks with HPCFRRI Committee report revealed that some of the taluks have shown development and some remained in backward category. Agricultural development of agricultural sector was not as good as all sector combined together. Opinion about performance of SDP revealed that the programme performed well but, infrastructure for agriculture, area coverage of programmes, horticultural programmes implemented and utilization of local resources in development were poor.

An economic analysis of horticulture based farming systems in Dharwad district of Karnataka

RAGHUPATHI BIDARI

2014

MAJOR ADVISOR : Dr. N. R. MAMALE DESAI

This study was conducted in Dharwad district of Karnataka as it had the largest area under horticultural crops in the UAS, Dharwad jurisdiction and the sample farmers had combined perennial horticultural crops *viz.*, mango, sapota etc., with other seasonal crop enterprises. Similarly at Stage-II, the taluks *viz.*, Hubli and Kalaghatgi were selected with an overall objective of identifying and analyzing for the different horticulture based farming systems. The relevant data so collected from primary source through personal interview method using pre-tested schedule for the agricultural year 2010-11 were analyzed by following tabular and production function techniques. Among the identified farming systems, top five horticulture based Farming Systems *viz.*, Farming System-I, II, III, IV and V were selected for the study. The study revealed that the net farm income was highest

under Farming System-IV which was Rs. 1,62,533, while it was Rs. 1,48,611; 1,32,356; 1,14,187 and 87,505, respectively in Farming System-II, V, III and I. The production function analysis of Farming System for different resources indicated that the elasticity coefficient of land, capital and feeds were statistically significant under Farming System-I. In Farming System-II, the coefficient for land, labour, feed and fertilizer + FYM were relatively significant. In the case of Farming System-III, land, capital, feed and seed had significant influence on gross returns. In the case of Farming System-IV, the resources such as labour and feed were statistically significant, whereas in case of Farming System-V, the labour and feed resources were positive and significant. The constraints and prospects of different horticulture based Farming Systems were identified and suitable suggestions have been made.

Production and export performance of India silk industry - An economic analysis

B. S. SHREEDEVI

2014

MAJOR ADVISOR: Dr. S. S. GULEDGUDDA

Sericulture is an agro-based labour intensive industry. The Indian Silk goods have high export potential because of its distinctness and low production cost. India is ranked as the second major raw silk producer in the world. An attempt has been made to study the production and export performance of India silk industry. The import value of raw silk into India shows a highest positive compound growth rate of 10.10 per cent per annum against export value of silk (9.55% per annum). The area under mulberry cultivation has shown a negative significant growth rate in different states an India as a whole. The Nominal Protection Coefficient (NPC) analysis indicates that India silk goods are not export competitive because of the average NPC value during the study period was more than unity (1.65) under importable hypothesis. Markov Chain analysis indicates that, USA is

one of the major importers of Indian silk as reflected in the probability retention of 0.89 and UK (20%) was least stable market. The Garrett ranking technique was used to evaluate the constraint in production and marketing of silk cocoon using the primary data (2013-14) collected from sericulture farmers in Ramanagar and Haveri districts in Karnataka. The results of Garrett ranking technique revealed that problem of irrigation during summer (75 garret score), high temperature (76.66 garret score) and high price fluctuation (78.33 garret score) were the major constraints in mulberry cultivation, cocoon production and marketing of cocoon, respectively in the study area. Diversification of geographical concentration can be achieved by export promotion policies. The farmers should be given training on production and marketing of quality silk products.

Livelihood issues in flood affected farm economy - A case study of Don river basin, Bijapur district

V. NAVEEN

2014

MAJOR ADVISOR: Dr. R. S. PODDAR

Impacts of natural disasters like flood are focussed widely into public debate due to fast communication and sensitivity of Governments. These events need scientific analysis for long term policy and planning. The study was taken up to analyse the bio-physical and social impacts of floods in Don River in Bijapur district, Karnataka during 2012 on rural livelihoods and to document relief and rehabilitation measures. Flood and heavy rains caused loss to cultivated land, rural roads, bridges, irrigation tanks; water shed structures, urban and rural water supply systems. A comparison of crop yields of flood hit year with normal years revealed a reduction in yields of major crops. Floods caused loss in farm inputs, milk yields, stored grains and household items including food grains. Compensation was provided by the Government towards crop loss due to flooding in the district, which was not found adequate.

Major challenges faced by farmers during floods were non availability of drinking water and food, lack of electricity and medical facilities, closure of schools, problem with dwelling houses, inadequate transportation facilities. Non availability of labourers and farm inputs, field inundation, increased incidence of pest attack, shortage of dry and green fodder and concentrates were other problems faced by farmers. The study highlighted socio-economic losses and their implications for rural livelihoods due floods. As a long term policy, study suggests a rehabilitation programme for Don River with community participation. Strengthening existing District Natural Disaster Management Cell with advance logistic facilities would help in planning and managing the disaster situation effectively. As a short term measure, compensation norms for relief need to be more comprehensive and relief itself need to be more targeted.

AGRICULTURAL ENTOMOLOGY

Faunastic studies on storage pests of cereals and pulses and their natural enemies in Bijapur district

ANAND KATTI

2014

MAJOR ADVISOR: Dr. J. S. AWAKNAVAR

The survey and surveillance was carried out during 2013 at the seed unit (Central store) College of Agriculture Bijapur, Agricultural Produce Market Committee (APMC) market, Food Corporation of India (FCI) and State Warehousing Corporation (SWC) in Bijapur, at monthly intervals for three months, (July to December 2013) and farmers storage in five taluks (Indi, Sindgi, Bijapur, Basavana Bagewadi and Muddebihal) in Bijapur district. During the present investigation, eleven species of coleopteral pests belonging to eight genera and seven families and three lepidopteran pests belonging to three genera and three families were recorded. The natural enemies found were *Amphibolus venator* on *Tribolium castaneum* and *Corcyra cephalonica* in sorghum and pearl millet, *Xylocoris flavipes* on *T. castaneum*, *Sitotroga cerealella* and *Callosobruchus chinensis* in sorghum, wheat and bengal gram,

respectively. *Dinarmus* sp. on *C. chinensis* in pulses like chickpea, redgram, blackgram and mothbean. The biology of *Amphibolus venator* was studied on *C. cephalonica* under laboratory conditions. The egg period was 16.33 ± 1.24 days, with the range of 15-18 days. There were five nymphal instars in *A. venator*. The nymphal period for I, II, III, IV and V instar lasted for 23.33 ± 3.14 , 30.83 ± 6.06 , 38.33 ± 9.70 , 40.16 ± 3.67 and 40.00 ± 4.63 days, respectively. The total developmental period was 172.65 ± 15.50 days. The longevity of female was 63 to 68 days and male was 57 to 62 days, the fecundity per female was 200 to 220 eggs. *A. venator* fed on the eggs of *C. cephalonica* 18, 24, 30, 32, 31 and 30 at 25, 50, 75, 100, 125 and 150 densities of eggs respectively. *A. venator* fed on the larvae of *C. cephalonica* 0, 2, 3, 4, 3, and 4 at 2, 4, 6, 8, 10 and 12 densities of larvae, respectively.

Studies on seasonal incidence, loss estimation and management of bhendi fruit borers

R. VENKANNA

2014

MAJOR ADVISOR: Dr. R. A. BALIKAI

Studies on seasonal incidence of okra pests and their natural enemies, crop loss estimation due to fruit borers and their management was carried out at MARS, University of Agricultural Sciences, Dharwad during 2013-14. Seasonal abundance of okra pests on Arka Anamika and Mahyco hybrid No-55 revealed that leafhopper, aphid, whitefly incidence was maximum from 10 to 12th week after sowing (WAS) and declined later. Aphid population was quite high from 8 to 10th WAS. The abundance of predatory coccinellids grubs and adults appeared from 3rd WAS and reached peak during 14th WAS. The peak population of spiders appeared at 11th WAS. The peak incidence of fruit borer complex was recorded during September and October months. The prediction models with R^2 value of 0.689 was developed for predicting the *Helicoverpa armigera* [$Y = -256.68 + 9.07 (\text{MaxT})$] at two week lead time. Highest avoidable loss due to fruit borers

was recorded in Mahyco hybrid No-55 with 55.31%, followed by Avantika-228 (54.87%) and least avoidable loss was recorded in genotype Arka Anamika (42.83%). Highest per cent avoidable loss was recorded in six sprays at 30, 40, 50, 60, 70 and 80 days after sowing (DAS) with 55.90 per cent followed by five sprays at 30, 40, 50, 60 and 70 DAS and four sprays at 30, 40, 50 & 60 DAS (54.84 and 50.38%, respectively). The plot which received flubendiamide 480 SC @ 0.1 ml/l (1.25%), rynaxypyr 20 SC @ 0.3 ml/l (1.31 %) and spinosad 45 EC (1.67%) recorded significantly least per cent fruit damage followed by indoxacarb 14.5 SC (3.70%). Flubendiamide 480 SC @ 0.1 ml/l registered significantly highest marketable fruit yield of (89.54 q/ha) being on par with rynaxypyr 20 SC @ 0.3 ml/l (88.36 q/ha). Spinosad 45 SC @ 0.2 ml/l (83.64 q/ha) was next best treatment.

Studies on major insect pests of sapota with special reference to sapota fruit borer, *Phycita erythrophila* Hampson and its management

R. VIJAYARAGHAVENDRA

2014

MAJOR ADVISOR: Dr. K. BASAVANAGOUD

The roving survey was carried out during peak flowering period i.e from August to October and February to March in selected taluks of each district of Dharwad, Belgaum and Bagalkot. During the course of study four major species of insect pests of sapota viz., bud borer, *Anarsia achrasella* Bradley, fruit borer, *Phycita erythrophila* Hampson, leaf webber, *Nephopteryx eugraphella* Ragonot and leaf miner, *Achrocercops gemoniella* Stainton and other pests viz., mid rib folder, *Banisia myrsusalis* elearalis Walker, scales, *Coccus viridis* Green and unidentified species of mealybug were recorded. During the survey, natural enemies viz., coccinellid beetle, *Chelomenes sexmaculata* (Fabricius), chrysopid, *Chrysoperla* sp. and an unidentified species of Reduviid bug were recorded. Among four major pests, highest mean incidence of 9.17 per cent was recorded by fruit borer followed by bud borer (6.96%) irrespective of talukas surveyed. The minimum incidence was recorded by leaf miner (2.66%) followed by leaf webber (3.15%). The seasonal incidence of major pests of sapota viz., bud borer on different genotypes (Kalipatti, Cricketball, DSH-1, DSH-2) was

more during dry period i.e. (January to June) which ranged from (2.15 to 6.85%) and low during rainy season i.e. from July to October and fruit borer damage was highest (16.18%) in March and lowest in September (3.92%). The incidence of leaf miner across different genotypes was high (2.27 to 3.79%) during August-November and low (0.00 to 1.58%) during December-July and leaf miner damage was high from September to November (2.78 to 3.02) and in the remaining period i.e. from December to August it was low (0.30 to 1.62). Spinosad 45 SC 0.3 ml/l proved to be very effective in recording lowest fruit damage of 13.70 per cent and highest fruit yield of 5327 kg/ha followed by Profenophos 50 EC 2.0 ml/l (14.23%) (5298 kg/ha) compared to the remaining treatments. Spinosad 45 SC recorded highest B:C ratio of 3.50 followed by Profenophos 50 EC 3.65 in Kalipatti variety. In DSH-2 hybrid, Spinosad 45 SC was highly effective in recording highest fruit yield of 6238 kg/ha with a maximum B:C ratio of 4.10 followed by profenophos 50 EC (51178 kg/ha) with B:C ratio of 3.52.

Impact of groundnut crop based intercropping system on insect pests and their natural enemies

T. GIRIJA

2014

MAJOR ADVISOR: Dr. MAHABALESHWAR HEGDE

Impact of groundnut crop based intercropping system on insect pests and their natural enemies were studied during *kharif* 2013 at Main Agricultural Research Station, Dharwad. The intercrops such as bajra, sorghum, cowpea, lucerne, foxtail millet, chilli and sunflower were sown at 3:1 (groundnut: intercrop) ratio to study their impact on the population of insect pests and their natural enemies on groundnut. The lower incidence of insects (*Spodoptera*, leafhopper, thrips) were recorded in groundnut + foxtail

millet, followed by groundnut + bajra and groundnut + sorghum intercropping. Groundnut+ sorghum intercropping recorded least Percent Disease Index (PDI) of both early and late leaf spot disease, which was followed by groundnut +foxtail millet and groundnut+bajra intercropping. The highest population of coccinellids and predatory spiders were recorded in groundnut+foxtail millet followed by groundnut+bajra and groundnut+sorghum intercropping. Highest per cent parasitisation

(22.33%) due to *Apanatlees. ssp* and *Campolities chlorideae* and higher natural incidence of *N. rileyi* (14.05%) was found at 60 days after sowing (DAS). Highest percent parasitisation of *Spodoptera* larvae was recorded in groundnut+lucerne, followed by groundnut+foxtail millet, groundnut+bajra and groundnut+sorghum intercropping. Where as highest incidence of *N. rileyi* was recorded in groundnut+cowpea intercropping and was at par with groundnut+lucerne intercropping. The highest *Spodoptera* larval mortality was recorded at 10 days after *N.rileyi* spray

in groundnut + cowpea intercropping was at par with groundnut + lucerne intercropping. Groundnut + foxtail millet intercropping yielded maximum (27.33 q/ha) followed by sole groundnut crop (26.20 q/ha), groundnut + bajra (26.00 q/ha) and groundnut + sorghum (24.33 q/ha). The present result indicates that some of the crop combinations will enhance the epizootics of *N. rileyi* by providing suitable microenvironment for their higher activity. The highest economic return was recorded in groundnut + foxtail millet, followed by groundnut + bajra and groundnut+sorghum.

Studies on major sucking insect pests of pigeon pea in northern dry zone of Karnataka

G.H. LINGARAJU

2014

MAJOR ADVISOR: Dr. A. P. BIRADAR

Studies on major sucking insect pests of pigeon pea in northern dry zone of Karnataka were carried out at RARS, Agriculture College, Bijapur during 2013-14. Seasonal incidence studies indicated that, sucking insect pests population like leaf hopper, thrips and pod bugs were very low during seedling stage and gradually increased during vegetative stage of the crop and reached a peak occurrence during reproductive stage. Natural enemies like coccinellid beetles, green lace wing and spiders were noticed in maximum number at reproductive stage of the crop. Among bio-physical and bio-chemical parameters of different pigeon pea genotypes, the lowest number of leaf trichomes, maximum leaf thickness and chlorophyll, total sugar, reducing sugar and protein content were recorded in ICP-87, while the lowest were recorded in TS-3R. Phenol content which imparts resistance against pests was higher in TS-3R and lower in ICP-87. Higher

grain yield was recorded in TS-3R was followed by ICP-8863, Gulyal and ICP-87 genotypes. Management of sucking insect pests of pigeonpea indicated that, nimbecidine @ 5 ml/l, NSKE 5% and biodigester solution @ 1:3 were moderately effective among bio-rationals. While, fipronil 5 SC @ 0.2 ml/l followed by thiamethoxam 25 WG @ 0.2 g/l and imidacloprid 17.8 SL @ 0.3 ml/l were found significantly superior over all other treatments against leaf hopper, thrips and pod bugs among chemical treatments. Highest populations of natural enemies were noticed in biodigester solution and untreated control treatments. Minimum population of natural enemies was noticed in thiamethoxam 25 WG, imidacloprid 17.8 SL and fipronil 5 SC treatments. Higher grain yield and benefit cost ratio were recorded in fipronil 5 SC, thiamethoxam 25 WG and imidacloprid 17.8 SL treatments and were followed by biorational treatments.

Studies on seasonal incidence, biology and management of flower bud maggot, *Dasineura gossypii* Fletcher on cotton

PRITAM CHAKRABORTY

2014

MAJOR ADVISOR: Dr. S. T. PRABHU

A field experiment was carried out during *kharif*, 2013 in Agricultural Research Station, Hanumanamatti to study the seasonal incidence of flower bud maggot, *D. gossypii* on cotton along with a roving survey to know the level of infestation of *D. gossypii* in the different taluks of Haveri district. The detail biology and the management of *D. gossypii* with different synthetic insecticides and botanicals were also studied during the investigation. The present study revealed that the crop sown on 15th June recorded lowest pooled damaged buds per plant of 4.02 due to flower bud maggot and highest pooled damaged buds per plant of 5.38 was recorded in the crop sown on 1st August. It was observed that as the sowing date delayed the incidence of *D. gossypii* increased. Survey which was carried out in September recorded highest and lowest damage of 6.75 ± 2.88 and 3.30 ± 1.51 damaged buds per plant by flower bud maggot in Haveri taluk and Ranebennur taluk, respectively. While the survey in October recorded highest and lowest damage of 8.01 ± 3.13 and 3.41 ± 1.78 numbers of damaged buds per plant by flower bud maggot in

Ranebennur and Hangal taluk, respectively. Different life stages of *D. gossypii* viz., eggs, first instar maggot, second instar maggot, third instar maggot, pupal period, adult stage (male) and adult stage (female) was recorded (days) as 1.5 ± 0.5 , 1.2 ± 0.4 , 1.7 ± 0.45 , 2 ± 0.0 , 4.4 ± 0.66 , 1.2 ± 0.4 and 1.3 ± 0.45 , respectively. After application of first spray at 90 DAS, it has been observed that flubendiamide 480 SC @ 0.2 ml/l was the most effective chemical which recorded lowest of 5.93, 3.44 and 3.24 damaged buds per plant at 1, 3 and 7 days after spray, respectively. Similar trend was observed after second spray where flubendiamide 480 SC @ 0.2 ml/l recorded lowest of 3.87, 3.22 and 1.84 damaged buds per plant at 1, 3 and 7 days after spray, respectively. Maximum kapas yield of 19.67 q/ha was recorded from the treatment of flubendiamide 480 SC @ 0.2 ml/l, followed by 18.52 q/ha from malathion 50 EC @ 2 ml/l. The highest benefit:cost ratio of 2.06 was recorded from flubendiamide 480 SC @ 0.2 ml/l followed malathion 50 EC @ 2 ml/l, where benefit:cost ratio of 2.01 was recorded.

Rearing performance of eri silkworm *Samia cynthia ricini* Boisduval on different species of terminalia and its impact on cocoon quality

MANJUNATHYALIGAR

2014

MAJOR ADVISOR: Dr. G. M. PATIL

Studies on rearing performance of eri silkworm *Samia cynthia ricini* Boisduval on different species of terminalia and its impact on cocoon quality were carried out at Ericulture laboratory, Department of Agricultural Entomology, UAS, Dharwad during, 2012. The host plants significantly influenced the weight of chawki and grown up worms. The maximum larval weight of 0.019, 0.48 and 1.59 g were recorded with castor during I, II and III instars which was on par with carrot (0.017, 0.47 and 1.54 g, respectively). In late age worms the highest mature larval weight (4.62 g) was registered with castor followed by fountain tree (4.48 g) and champaca tree (4.47). Cocoon weight (2.71 g), pupal weight (2.34 g), shell weight (0.35g) and shell ratio (12.81%) were significantly superior with castor which were on par with fountain tree (2.68 g, 2.29 g, 0.33 g and 12.17%) and champaca tree (2.61 g, 1.98 g, 0.29 g and 12.09%), respectively. Maximum moth emergence (98.07%) was recorded with castor and on par with fountain tree (96.49%) and carrot leaves (96.31%). Adult wing expanse of male and female was maximum (10.83 and 11.83 cm) in castor which was on par with fountain tree (10.80 and 11.77 cm) and kindle tree (10.57 and 11.57 cm). Significantly

longest adult longevity of male and female (7.67 and 9.83 days) was on castor which was followed by fountain tree (7.33 and 9.67 days) and champaca tree (7.17 and 9.50 days). The maximum mature larval weight (4.55 gm) was registered with castor+fountain tree followed by castor+champaca tree (4.52 g) and castor+kindle tree (4.47). Cocoon weight (2.66 g), pupal weight (2.28 g), shell weight (0.32 g) and shell ratio (12.05%) were significantly superior with castor+fountain tree leaves followed by castor+champaca (2.63 g, 2.25 g, 0.31 g and 11.79%) and castor+kindle tree (2.60 g, 2.22 g, 0.30 g and 11.55%), respectively. Maximum moth emergence (95.24%) was recorded with castor+fountain tree leaves followed by castor+champaca tree (94.24%). Adult wing expanse of male and female was maximum (10.80 and 11.57 cm) with castor+fountain tree leaves followed by castor+champaca tree (10.80 and 11.50 cm). Significantly longest adult longevity of male and female (7 and 9 days) was on castor followed by castor+champaca tree (6.83 and 9 days). The carrot leaves are the best alternate host for chawki worms and fountain tree leaves for grown up eri worms.

Investigations on seasonal dynamics and insecticides sensitivity of safflower aphid, *Uroleucon compositae* (Theobald) Aphididae - Homoptera

M. N. VANI

2014

MAJOR ADVISOR: Dr. S. S. UDIKERI

Studies on seasonal incidence, bioefficacy of different insecticides and baseline toxicity with respect to safflower aphid were carried out at the College of Agriculture farm, Bijapur *rabi* during 2013-14. Seasonal incidence studies indicated that the susceptible variety Nari-6 the incidence was as high as 177.72 per 5 cm apical twig in unprotected condition. With protection it was restricted to 1.10/5 cm apical twig. The yield advantage through protection in the susceptible variety (Nari-6) was 15.40 q/ha and in Annigeri-1 resistant variety 18.5 q/ha. Further, delay in sowing even with protection in both aphid resistant and susceptible varieties was not in favour of normal yield. Without protection no survival of the plant has been noticed irrespective of the varieties. Among different insecticides and biorationals tested for their

field efficacy against aphids flonicamid 50WG appeared to be more significant with 15.40 q/ha yield against untreated control (2.33 q/ha). The pest incidence in this treatment ranged from zero to 39.11/5 cm apical twig against 58.94 in untreated control. The other insecticides in the order of bioactivity, yield and economics were dinotefuron 20 SG > thiamethoxam 25 WG > acetamiprid 20 SP > imidacloprid 17.8 SL. Thus neonicotinoides appeared effective than organophosphates against safflower aphid. Flonicamid 50 WG, dinotefuron 20 SG, buprofezin 50 SC and fipronil 5 SC appeared were highly toxic based on resistance co-efficient. A low level of resistance was noticed to widely used insecticides viz., acephate 75 SP, monocrotophos 36SL, dimethoate 30 EC, acetamiprid 20 SP, thiamethoxam 25 WG and imidacloprid 17.8 SL.

Studies on crop loss estimation and management of capsule borer, *Helicoverpa armigera* (Hubner) in safflower

K. A. BIRADARPATIL

2014

MAJOR ADVISOR: Dr. S. B. JAGGINAVAR

Studies on survey, crop loss estimation and management of capsule borer in safflower, *Helicoverpa armigera* (Hubner) were conducted at College of Agriculture Bijapur during *rabi* season of 2013-14. The survey indicated that the activity of safflower capsule borer was recorded in all the taluks of Northern Dry Zone of Karnataka. However, the maximum capsule borer larva was recorded in Hunagund and Naragund taluks. Among different cropping systems, sole safflower as well as chickpea based intercropping systems recorded higher capsule borer and natural enemies like *Camptotes chloridae*, coccinellids and *Chrysoperla zastrowi sillemi* recorded more in Hunagund and Basavan Bagewadi taluks. The loss in yield of safflower due to capsule borer was assessed by cage method under field condition.

A maximum yield loss of 62.85 per cent was observed in the 10 larvae of capsule borer were released. The economic injury level of *H. armigera* was found to be 0.53 larva per plant. Among different insecticides tested against capsule borer, the lowest capsule borer per plant was recorded in rynaxypyr 20 SC @ 0.15 ml/l and was on par with emamectin benzoate 5% SG @ 0.20 g/l, novaluron 10 EC @ 0.75 ml/l. Biodigester @ 1:3 ratios, NSKE 5%, NPV @ 250 LE/ha, Btk @ 1 g/ha treatments proved superior in recording the maximum number of predators viz., *C. zastrowi sillemi* and coccinellids. The highest yield and benefit cost ratio was recorded in rynaxypyr 20 SC @ 0.15 ml/l followed by emamectin benzoate 5 per cent SG @ 0.20 g/l and spinosad 45 SC @ 0.1 ml/l.

Management of sucking pests of *rabi* sorghum in the northern dry zone of Karnataka

INDHUSRI CHAVAN

2014

MAJOR ADVISOR: Dr. J. S. AWAKNAVAR

Studies on seasonal abundance of sorghum shoot bug and sugarcane aphid on *rabi* sorghum and their natural enemies, biophysical and biochemical parameters responsible for sorghum varietal resistance and management through soil organic amendments was carried out at College of Agriculture Bijapur during 2013-14. The crop sown during September 1st fortnight recorded significantly higher shoot bug population and plant damage than October month sown crop. Whereas, the highest aphid incidence and aphid index was recorded in 2nd fortnight of October sown crop and also higher population of coccinellids, *Chrysoperla* and spiders were recorded in the 2nd fortnight of October sown crop. Genotypes Phule Vasudha and BJV 44 recorded lowest shoot bug population which has highest trichome density, more seedling vigour, more leaf glossiness. Whereas M 35-1 was moderately susceptible to aphid. Significant and negative correlation was

observed between shoot bug population with trichome density of both upper and lower leaf surfaces and seedling vigour. Positive and non-significant correlation was observed with leaf glossiness. Negative and non-significant correlation was observed between the aphid density with trichome density of both the leaf surfaces and seedling vigour at 14 DAE. Positive non-significant correlation was observed with seedling vigour at 21 DAE. Positive and non-significant correlation was observed between shoot bug populations and reducing sugars. Whereas total sugars and total phenols were negatively correlated. Application of neem cake 6.25 q/ha and FYM 50% + neem cake 50% recorded least shoot bug, aphid density and plant damage were found superior over application of RDF 100% and untreated control and also recorded better grain and fodder yield as compared to untreated control.

Species composition of white grubs in rainfed ecosystem of Dharwad and evaluation of EC formulations of *Metarhizium anisopliae* (Meschinikoff) Sorokin

JEER VINAYAKA

2014

MAJOR ADVISOR: Dr. R. R. PATIL

Investigations on species composition, per cent infestation of white grubs were carried out under rainfed situations of Dharwad. Laboratory and field evaluation of EC formulations of *Metarhizium anisopliae* and newer insecticides were taken up at Department of Agricultural Entomology, College of Agriculture, Dharwad and at Ankali, Hattarawata villages of Belgaum and Nevanagere village of Sirsi respectively during 2013 -14. Irrespective of the locations fifteen species of white grubs were recorded, out of which *A. ruficapilla* was the dominant species, followed by *Sophrops karschi*, *A. bengalensis* and *H. serrata* under rainfed condition of Dharwad. Adult emergence commenced from 16th MSW (April) to 22nd MSW (May). Peak emergence was recorded during 19th MSW (April) and 20th MSW (May). Under laboratory condition, EC formulations were evaluated against all the three instars of *H. serrata*, *H. fissa* and *L. Lepidophora*. Chlorpyrifos

20 EC @ 10 ml/l was significantly superior and recorded highest per cent mortality. However, *M. anisopliae* Novozyme @ 5×10⁹ (3 ml/l) was superior to *M. anisopliae* T-stanes @ 1×10⁹ (3 ml/l) but both were recorded highest per cent mortality as compared to dust formulation of *M. anisopliae* @ 1×10⁸ (5 kg/acre). In all the three ecosystems studied chlorpyrifos @ 10 ml/l and rynaxypyr 4 G (sugarcane and groundnut @ 20 kg/ha, arecanut @ 25 g/tree) were most effective by recording lower larval number (higher per cent mortality in arecanut ecosystem) followed by Novozyme @ 5×10⁹ (3 ml/l) and T-stanes @ 1×10⁹ (3 ml/l) over its lower doses and also over dust formulation *M. anisopliae* @ 1×10⁸ (5 kg/acre). Irrespective of the species EC formulations of *M. anisopliae* were highly infective to first instars as compared to second and third. However, all three instars of *H. fissa* recorded higher mortality compared to *H. serrata* and *L. lepidophora*.

Evaluation of insecticides against maize stem borers and their phytotoxicity to maize

SNEHA P. KULKARNI

2014

MAJOR ADVISOR: Dr. C. P. MALLAPUR

Investigations on evaluation of insecticides against maize stem borers and their phytotoxicity to maize were undertaken at University of Agricultural Sciences, Dharwad during *kharif* 2013-14. Among 15 genotypes evaluated for their reaction to stem borers, Super 900M and Bioseed 9681 were found less susceptible to *Chilo partellus* and *Sesamia inferens*. Whereas, NK 6240, NK 30 and Arjun were found highly susceptible in terms of leaf feeding score, per cent infestation and dead heart formation. Higher trichome density and lower leaf width attributed to low susceptibility of hybrids and vice versa. But however, the leaf colour, number of nodes and cob height did not influence the incidence of stem borers. Among the various insecticides evaluated against stem borers, whorl application of carbofuran 3G @ 7.5 kg/ha proved to be the best by recording less additional infestation of *C. partellus* and *S. inferens* (3.67 to 2.00 and 1.97 to 1.67% at 5 to 10 DAT, respectively) followed by phorate 10 G @ 7.5 kg/ha and emamectin benzoate 5 SG @ 0.2 g/l.

However, the other tested insecticides viz., acephate 75 WP @ 1.0 g/l, chlorantraniliprole 20 SC @ 0.3 ml/l, chlorofluzuron 25 EC @ 2.0 ml/l, fipronil 5 SC @ 1.0 ml/l, neemazal 1.2% @ 3.4 ml/l, dimethoate 30 EC @ 1.7 ml/l and dichlorvos 76 EC @ 0.5 ml/l were less effective. The highest grain yield (95.22 q/ha) was obtained from carbofuran 3G @ 7.5 kg/ha treated plots followed by phorate 10G @ 7.5 kg/ha (93.95 q/ha) and emamectin benzoate 5 SG @ 0.2 g/l (93.89 q/ha). None of the insecticidal treatments revealed phytotoxicity symptoms even with four times higher than the recommended dosage except chlorosis and white blotch symptoms which were observed in dichlorvos 76 EC (2.0 ml/l) and chlorofluzuron 25 EC (8.0 ml/l) treatments. Acephate 75 WP (4.0 g/l) exhibited only white blotch symptoms while, phorate 10G (30.0 kg/ha) application caused chlorosis. When the chemicals were imposed at recommended dosage, both chlorosis and white blotch symptoms were observed only in acephate 75 WP (1.0 g/l).

Seasonal incidence, biology and economic injury level of *Thysanoplosia orichalcea* (Fab.) in soybean

KUBER R. DODDABARAMAPPAVAR

2014

MAJOR ADVISOR: Dr. R. H. PATIL

The survey conducted in northern Karnataka viz., Dharwad, Belgaum and Bagalkot districts revealed that the highest incidence of *Thysanoplosia orichalcea* (1.59 l/mrl) was recorded in Belgaum district while, *Spodoptera litura* (1.71 l/mrl) and *Spilarcia obliqua* (1.16 l/mrl) in Bagalkot district. The maximum number of predators viz., coccinellids (1.51 a/mrl) were recorded in Dharwad district and chrysopids (1.09 a/mrl) in Bagalkot district. The highest incidence of *Nomuraea rileyi* infected cadavers was noticed in Belgaum (1.61 c/mrl). Fixed plot survey carried out at the Main Agricultural Research Station, UAS, Dharwad showed the mean density of 2.60, 3.62 and 1.63 l/mrl with respect to *T. orichalcea*, *S. litura* and *S. obliqua*, respectively. The natural enemy population of 2.26 coccinellids and 1.26 chrysopids adults/mrl was recorded. There was 4.03 per cent infection by

N. rileyi on these caterpillars. Investigation on the biology of *T. orichalcea* on soybean in laboratory revealed that incubation, larval, prepupal and pupal period were 4.17, 17.70, 1.75 and 10.25 days, respectively. The larval body length was 1.57, 9.80, 17.50, 25.00 and 34.90 mm and body breadth of 0.22, 0.47, 0.95, 1.80 and 2.46 mm for the first, second, third, fourth and fifth instar larvae, respectively. The adult longevity of male and female moth was 9.75 and 10.50 days with 10 per cent honey solution. The fecundity was 335.5 eggs per female. Total life cycle occupied 45.37 days during August month. The highest per cent defoliation, loss of pods/plant and yield was recorded at 30 days after sowing (DAS) as compared to 45 DAS. Hence, the EIL for the third instar larvae of *T. orichalcea* was 1.05 larva/plant at 30 DAS and 1.43 larva/plant at 45 DAS, respectively.

Effect of intercropping system on the incidence of key pests of safflower and their management

PRAKASHA BATALLI

2014

MAJOR ADVISOR: Dr. SHEKHARAPPA

The study was carried out at MARS, University of Agricultural Sciences, Dharwad during *rabi* 2013-14. Among different intercropping systems safflower + wheat recorded minimum aphid population at 45 and 60 DAS (19.35 and 24.45 aphids/ 5 cm apical twig). Minimum leaf eating caterpillar population at 45 and 60 DAS (1.17 and 1.72 larvae/plant) was noticed in safflower + sorghum. The minimum capsule borer population (1.38 larvae/plant) was noticed on safflower + wheat intercropping system. Lower capsule damage (20.59%) in safflower + wheat. Highest number of coccinellids and *Chrysoperla* at 45 and 60 DAS were recorded in safflower + sorghum (0.39 and 0.48 adults/plant) and safflower + wheat (0.51 and 0.62 adults/ plant). Significantly highest yield was recorded in safflower + wheat (6.35 q/ha). At 45 and 60 DAS, thiamethoxam 25 WG was highly effective (7.89 and 7.46 aphids) followed by acetamiprid 20 SP (9.26 and

8.17 aphids/5 cm apical twig) in reducing the aphid population at seven DAT. Highest number of coccinellids and *Chrysoperla* at 45 and 60 DAS was recorded in carbofuran 3G (0.50/ plant at 45 DAS and 0.42 adults/ plant) and imidacloprid 45 FS (0.33 and 0.52 adults/ plant). Significantly maximum yield (9.73 and 9.39 q/ha) were obtained from thiamethoxam 25 WG and acetamiprid 20 SP. However, highest B: C ratio was recorded from acetamiprid (1: 2.08). The effect of newer insecticides on leaf eating caterpillar revealed that indoxacarb 14.5 SC (0.10 and 0.26 larvae/ plant) was highly effective at 45 and 60 DAS. Significantly minimum per cent defoliation was recorded in indoxacarb 14.5 SC (11.26 and 13.27% at 1st and 2nd spray, respectively). Spinosad 45 SC was highly effective in reducing the capsule borer damage and it has also resulted in highest B:C ratio was resulted from spinosad 45 SC (1: 2.15).

Eco-friendly management of mulberry thrips, *Pseudodendrothrips mori* (Nawa)

SMITA S. HITLALAMANI

2014

MAJOR ADVISOR: Dr. S. G. RAYAR

Mulberry thrips, *Pseudodendrothrips mori* is a major sucking pest during summer season. Use of insecticides for the management of thrips needs to observe 10 to 15 days waiting period for the leaves to be used for silkworm feeding. Bio-efficacy of botanical extracts were evaluated against thrips. Among the botanicals neem oil and pongamia oil 3 per cent significantly reduced the thrips population and were the next best sprays after dichlorvos (0.02 %). Mulberry leaf yield was significantly enhanced by spraying cow urine 10 per cent (731.15 g/plant) followed by dichlorvos 0.02 per cent (692.51 g/plant) on mulberry against thrips. Mulberry leaf quality viz., moisture (82.94%) was more in neem oil (3%). Chlorophyll content in top, middle and bottom leaves were more in dichlorvos 0.02 per cent (30.67), pongamia oil 3 per cent (38.67) and dashaparni 5 per cent

(38.53), respectively. Mulberry leaves sprayed with dashaparni 5 per cent and cow urine 10 per cent were safe for feeding mulberry silkworm from fifth day after spray. While, *Vinca rosea* leaf extract 5 per cent, chilli+garlic extract 5 per cent and yekki leaf extract 5 per cent were safe to silkworms from sixth, seventh and eighth day after spraying. Neem and pongamia oil 3 per cent were safe from ninth day after spray. Dichlorvos was safe for silkworm from tenth day onwards. Dichlorvos 0.02 per cent recorded higher effective rate of rearing (97.85 %) and the same treatment recorded higher cocoon (20.52 g/10 cocoons) and cocoon shell weight (3.65 g/10 shells). Cocoon shell ratio was more in neem oil 3 per cent (18.81 %). Cocoon yield (702.15 g/df) and filament length (892.26 m) was significantly high in dichlorvos 0.02 per cent.

Studies on population dynamics and biology of stem borer, *Chilo partellus* on grain sorghum and maize

SATISH T. MULLUR

2014

MAJOR ADVISOR: Dr. SHEKHARAPPA

Investigations on the population dynamics, biology of stem borer on sorghum and maize, evaluation of different insecticides for the management of stem borer were carried out during *kharif* 2013 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad. Population dynamics of stem borer revealed that the incidence in late sowing was more i.e., for sorghum and maize 38th standard week (Sept. 18th) as compared to early sowing in both the crops sorghum (DSV-6 and CSH-16) and maize (Arjun and 900-M). The stem borer incidence was minimum in early sown (29th standard week, July 22nd) as compared to late sowing crop for both sorghum and maize. The larval parasitoid, *Cotesia flavipes* was key mortality factor for stem borer larvae. The incubation period ranged from five to seven days on sorghum (CSH-16) and four to seven days on maize (Arjun), larva passed through

six instars on both sorghum and maize. The total larval period ranged from 21-45 days (average 33 days) and 22-48 days (average 35 days) on sorghum and maize, respectively. The total life cycle occupied 33-65 days (average 49 days) on sorghum and 32-67 days (average 49.5 days) on maize. Among the chemicals, flubendiamide 480 SC @ 0.3 ml/l was found best in managing stem borer and recorded 30.01 q/ha, followed by rynaxypyr 20 SC @ 0.3 ml/l (29.89 q/ha), emamectin benzoate 5 SG @ 0.2 g/l (28.60 q/ha) and cypermethrin 10 EC @ 0.5 ml/l (28.35 q/ha). However, carbofuran 3G (7.5 kg/ha) recorded significantly higher grain yield (32.21 q/ha) and next best was spinosad 240 EC @ 0.2 ml/l (30.30 q/ha). Similarly, among the test insecticides the highest BC ratio was obtained in spanosad (1.83) followed by *M. anisopliae* (1:82), *B. bassiana* (1:82). All the above treatments were only next best to RPP carbofuran 3G (2.09).

Insecticide resistance management strategies for sucking pests in Bt cotton

K. A. ROHITH

2014

MAJOR ADVISOR: Dr. B. S. NANDIHALLI

Studies on impact of intercropping, screening of genotypes and sequential application of insecticides with different mode of action against sucking pests in Bt cotton were conducted at Main Agricultural Research Station, Dharwad and also in Agricultural Research Station, Dharwad during 2013-14. Sucking pests were significantly lower on cotton under intercropping system than sole crop. Among the different intercrops, cotton intercropped with cowpea (1:2) was the best intercropping system which recorded less incidence of leafhopper (2.75/3 leaves), thrips (4.66/leaves) and whitefly (1.03/3 leaves) with more number of natural enemies followed by the cotton intercropped with coriander (1:2) and greengram (1:2). However, cotton + beans was significantly superior in recording the highest total yield (20.46 q/ha) followed by cotton + okra (16.86 q/ha) and cotton + cowpea (16.42 q/ha). Out of twenty five genotypes screened against sucking pests, MRC-7918 was resistant; Chiranjeevi was moderately resistant to leafhopper,

aphids, thrips and whitefly; MRC-7351, MRC-7201, MRC-6918, Mallika Bt, Bullet Bt, Steplon, Encounter, Paras Brahma, and MRC-7347 were moderately susceptible. However, none of the genotypes were found resistant to mirid bug but Chiranjeevi and MRC-7918 were moderately resistant. Sequential application of acetamiprid 20 SP - chlorfenapyr 10 SC - fipronil 5 EC - bifenthrin 10 EC - diafenthiuron 50 WP recorded significantly less number of sucking pests which ultimately reflected in highest seed cotton yield of 25.92 q/ha with highest B:C ratio of 3.37 which was followed by spray sequences bifenthrin 10 EC - diafenthiuron 50 WP - acetamiprid 20 SP - chlorfenapyr 10 SC - fipronil 5 EC and fipronil 5 EC - bifenthrin 10 EC - diafenthiuron 50 WP - acetamiprid 20 SP - chlorfenapyr 10 SC by recording B:C ratio of 3.15 and 3.12, respectively. The lowest B:C ratio of 2.58 was recorded in the spray sequence chlorfenapyr 10 SC - fipronil 5 EC - bifenthrin 10 EC - Nimbecidine - diafenthiuron 50 WP.

AGRICULTURAL EXTENSION EDUCATION

An analysis of extension delivery system at the grassroot level in North Karnataka

ALETHEA DYMPEP

2014

MAJOR ADVISOR: Dr. S. S. DOLLI

A study on "An analysis of extension delivery system at the grass-root level in North Karnataka" was undertaken during 2013-14 in Gadag district of North Karnataka with an objective of assessing information and input delivery mechanism to farmers and their impacts. A sample of six RSKs from 3 taluks with their respective AO, 25 AAOs and 90 beneficiary farmers of RSKs were selected by purposive sampling method. The data was collected by personal interview method. The RSKs covered an average of 29 villages, 12,662 farm families, 1,08,848.5 ha within an average of 20 km distance. It was observed the beneficiary coverage ratio of extension personnel to farm families was 1:5 villages, 1:6047 ha area and 1:1406 farm families. RSKs main source for agricultural information and input was KVK and private firms respectively. All RSKs processed the information acquired occasionally 'during season' into local dialects, charts,

etc. The information and input was delivered to farmers mostly during farmers' contact at RSK. The AOs spent most of their time on attending meeting and trainings (34%), while the AAOs spent maximum of their time (39%) on input distribution. The study revealed that the frequency of contact by farmers did not vary with their distance from RSK and size of holding which means their contact to RSK was driven by input requirement rather than information. The RSKs services had significant impact on the farmers' yield level. Major problem expressed by extension personnel was inadequate transport facility while farmers expressed that lack of update information and field official visit were the major constraints with RSK. The suggestions given by extension personnel for improvement were proper transportation with reduction in coverage area and farmers suggested that farm visits should be regular and timely supply of inputs.

Management efficiency of dairy farm women

S. SOWJANYA

2014

MAJOR ADVISOR: Dr. S. V. HALAKATTI

The study was conducted in Belgaum district of Karnataka state. Data was collected by personal interview method from 120 dairy farm women managing dairy enterprise. Management efficiency of dairy farm women was measured on six components viz., knowledge about improved dairy management practices, adoption of improved dairy management practices, ability in planning, rationality in decision making, ability in seeking information and competence in evaluation. The socio-economic profile of dairy farmers revealed that majority of the dairy farm women belongs to middle age, illiterates, medium family size, low experience in dairy farming and low extension participation. Further majority of them are in

medium category with respect to income, economic motivation, scientific orientation, training participation and mass media participation. The involvement index of regular activities accounts 89.25 per cent, health care activities accounts 51.58 per cent and marketing activities accounts 31.74 per cent. Nearly 40.83 per cent of dairy farm women belonged to moderate management efficiency, followed by low (36.66%) and high (22.50%) category, respectively, with a mean management efficiency index of 70.78 and SD of 8.78. Livestock possession, participation in training programme, mass media participation, economic motivation and scientific orientation of dairy farm women were found to have a

positive and significant relationship with all the selected components of management efficiency of dairy farm women. Majority of the dairy farm women stated that low productivity of local breeds, low fat content in

milk of local breeds, non availability of fodder round the year, inadequate knowledge about feeding, lack of grazing land are the major constraints encountered by dairy farm women in dairy farming.

A Study on perception of precision farming by the farmers

MANJUNATH B. KUDARI

2014

MAJOR ADVISOR: Dr. S. L. PATIL

A study was purposively conducted in Bagalkot, Belgaum, Dharwad and Haveri districts of North Karnataka state during 2013-14 with a sample of 76 farmers. The data was collected by personal interview method using structured schedule to assess the socio-economic profile, perception level, impact assessment and constraints of precision farming farmers. The results pertaining to perception of various attributes of precision farming practices revealed that majority of the farmers strongly agree with precision farming helps to apply nutrients based on soil variability (80.26%), precision farming practices suits for all types of soils (77.63%), precision farming practices are difficult to adopt (75.00%), precision farming practices can be tried on all types of soils (76.32%) and savings or optimum utilization of chemical fertilizers can be observed (68.42%). Perception of precision farming by the farmers was positively and significantly correlated with the variables viz., extension contact, innovative proneness, crop productivity and mass

media participation. While material possession had negatively significant relationship with perception of precision farming. Regression analysis revealed that, all the ten independent variables taken together explained 61.60 per cent of variation in the level of perception of precision farming by the farmers. Only one variable namely crop productivity contributed significantly towards variation in the perception of precision farming by the farmers. The percent increase in average yield of sugarcane, cotton and chilli after adopting precision farming practices were 17.80, 36.26 and 26.08, respectively. The per cent increase in income of sugarcane, cotton and chilli after adoption of precision farming practices were 24.51, 75.63 and 29.63, respectively. The major constraint faced by the farmers in precision farming were high initial cost (96.05%), difficulty in formation of grids based on soil variability (93.42%) and difficulty in the soil variability analysis (92.11%).

An analysis of Kisan mobile advisory service (KMAS) of Krishi Vignyan Kendra

SHIVAPPA R. KANAVI

2014

MAJOR ADVISOR: Dr. K. A. JAHAGIRDAR

The study was conducted in Dharwad and Gadag districts in 2013-14, where Krishi Vigyan Kendra (KVKs) are involved in transfer of technology through KMAS. KVK Gadag (NGO Operated) and KVK, UAS Dharwad are disseminating technology to farmers through KMAS network in these two districts. Majority of farmers (67.50%) were under middle age category, 30.83 per cent farmers had pre university education, 44.17 per cent of the farmers were belonged to semi medium farmers, 40.33 per cent of the farmers belonged to medium level of annual income category, medium decision making ability (45.00%), high economic motivation (37.50%), medium innovative proneness (62.50%), medium achievement motivation (50.00%) and high extension contact (40.00%). Among the subject areas, highest number of messages were sent in the area of plant protection. Particularly, total number of SMS sent related to pest management was 54, followed by

disease management (45 SMS), nutrient management (18). Regarding overall usefulness of KMAS about half of (48.33%) of farmers belonged to moderately useful category. KMAS messages related to plant protection perceived as 'most useful' (70.83%). Majority (69.17%) of farmers perceived as messages were 'most useful' for improving the agriculture knowledge. Majority (60.00%) of farmers perceived as SMS, s were most useful for increasing the farm yield and 42.50 per cent of farmers belonged medium level of utility category. Messages related to pest management (65.83%), disease management (62.50%) and seed treatment (57.50%) were regularly utilized by the farmers. Majority (90.00%) of farmers said clarification of the messages is difficult, if any doubt arises, followed by difficult to understand of technical words (72.50%) and lack of practical exposure regarding the technology sent by the KMAS (68.33%).

Technological gap in pepper cultivation in Uttar Kannada district

SANJOTA PAWAR

2014

MAJOR ADVISOR: Dr. K. V. NATIKAR

A study was conducted in Uttar Kannada district of Karnataka during 2013-14 with a sample of 90 pepper growers. The data was collected by personal interview method using structured schedule to assess the socio-economic profile, knowledge level, technological gap, marketing pattern and problems of pepper growers. Most of the respondents (56.67%) had medium level of knowledge about recommended cultivation practices of pepper. Cent per cent of the respondents had knowledge about recommended varieties, sowing time, planting material runners with four eye buds, planting methods of mixed cropping and harvesting method and cent per cent of them adopted it. There was poor adoption in case of spacing in coconut garden. Majority of the respondents (62.22%) and (88.89%) had knowledge about filling material to be used in pits and FYM as basal dose. Merely (44.44%) and (52.22%) of farmers had knowledge about major pests of the crop and major diseases. Majority of the

respondents (63.33%) belonged to medium category of technological gap. More than fifty per cent of technological gap was found in some of the practices like spacing, pit size, bio-fertilizer and FYM application. Higher per cent of technological gap (84.44%) in case of correct dosage of chemicals to be used for pest and disease control. Majority of the respondents (46.67%) and (41%) belonged to middle age group and high school level education. Further, medium land holder's category occupied (42.22%). About (47.77%) were found to have high level of economic motivation, (44.44%) of the respondents were found to have medium cosmopolitaness category. Majority of the respondent (66.77%) grade their produce on the basis of wrinkleness. About (62.22%) respondent sell their produce if price are favourable. Majority of the farmers indicated high labour cost of plant protection chemicals (91.11%), price fluctuation and non-availability (90%) as the major problems.

Analysis of change in cropping system in northern transitional zone of Dharwad district

N. SOWMYA

2014

MAJOR ADVISOR: Dr. S. L. PATIL

The study was conducted during the year 2013-14 in Northern Transitional Tract of Dharwad district. A sample of 180 respondents were selected by using the simple random sampling method. Structured and pre-tested interview schedule was used to collect the data from respondents through personal interview method. The results revealed that percentage of jaydhar cotton growers decreased from 82.22 to zero per cent followed by chilli growers from 76.67 to 10.56 per cent and kharif sorghum from 87.78 to 27.72 per cent and on the other hand percentage of bt.cotton growers

increased from zero to 100.00 per cent followed by wheat growers from 17.78 to 85.56 per cent, maize growers from zero to 61.67 per cent during the period from 1998-99 to 2012-13. Decrease in number of jaydhar cotton, chilli and kharif sorghum crop growers and increase in number of bt.cotton, maize and wheat crop growers from 1998-99 to 2012-13 were significant at one per cent level of probability as evidenced by χ^2 test. The percentage of area under chilli crop decreased from 20.15 to 1.16 per cent followed by jaydhar cotton from 16.42 to zero per cent

and *kharif* sorghum from 16.47 to 2.16 per cent and on the other hand percentage of area under *bt.cotton* increased from zero to 27.09 per cent followed by *bengal gram* from 14.32 to 31.94 per cent, *wheat* from 2.02 to 14.47 per cent and *maize* from zero to 10.85 per cent during period from 1998-99 to 2012-13. Major reasons for change in cropping system

were availability of high yielding varieties, more tedious to harvest crop, reduced rainfall and yield. Major improvements over socio-economic condition due to change in cropping system were purchased T.V., started getting drinking water in their home, provided higher education to their children, could possess more number of livestock etc.

An analysis of technological gap and entrepreneurial behaviour of rose cultivators

NEHA P. KULKARNI

2014

MAJOR ADVISOR: Dr. K. A. JAHAGIRDAR

The present study was conducted in the year 2013-14 in Dharwad district of Karnataka state with a sample size of 120 farmers. Proportionate random sampling procedure was used to select the sample. The data was collected with the help of structured interview schedule. The socio-economic profile of the respondents revealed that, majority (63.33%) of the rose growers belonged to middle age group, 27.50 per cent are illiterate, 35.83 per cent belonged to medium land holding category, 38.89 per cent belonged to high income category, 58.33 respondents belonged to medium family size category, and 74.16 per cent of respondents had an income more than Rs. 51,000, whereas 38.33 per cent of the respondents had medium level of scientific orientation category, 56.66 per cent of the respondents belonged to medium mass media exposure category, 37.50 per cent of the respondents belonged to medium extension contact category. It was found that 40 per cent of the rose growers were fall under

medium technological gap category, followed by high technological gap (33.33%) and low technological gap category (26.66%). The study revealed that, 37.50 per cent of the respondents belonged to medium entrepreneurial behaviour category, whereas, 32.50 per cent and 30 per cent belonged to low and high entrepreneurial behaviour category respectively. The variables like education, mass media participation and extension contact were found to be negatively significant with technological gap. Whereas, age showed positive significant relationship at 0.01 level and the scientific orientation showed negative significant relationship at 0.05 level. The variables like, family size and scientific orientation shows significant relationship with entrepreneurial behavior at 0.05 level of significance. The major constraints faced by the rose growers were price fluctuation (95.83%), non availability of labour in time (91.16%) and lack of knowledge with respect to pest and disease control (89.16%).

Management efficiency of vegetable growers of Belgaum district

BASAVARAJ J. GUNDAPPAGOL

2014

MAJOR ADVISOR: Dr. R. B. BELL

The present study was conducted in the year 2013-14 in Belgaum district of Karnataka state with a sample size of 135 farmers. Random sampling procedure was used to select the sample. The data was collected through structured interview schedule. Management efficiency of vegetable growers was measured on six components. *viz.*, ability in planning, rationality in decision making, ability in seeking information, ability to co-ordinate activities, risk orientation and ability in rational marketing. The socio-economic characteristic of the respondents revealed that, majority (61.48%) of the vegetable growers belonged to middle age group, 30.37 per cent educated up to high school, 49.62 per cent belonged to medium farming experience category, 42.96 per cent belonged to small land holding, 54.81 per cent had high income category, 45.19 per cent belonged to 'low extension contact. Majority of the respondents 98.51 per cent possess TV sets, 45.19 per cent of the growers' belonged

to high innovativeness category. Management efficiency shows that 41.48 per cent of the vegetable growers possess medium management efficiency followed by 34.81 per cent and 23.70 per cent were in high and low management efficiency category, respectively. Growers management efficiency was positively and significantly related with variables such as education, farming experience, Land holding, annual income, mass media participation, extension contact and innovativeness. Age and organizational participation exhibited a non-significant relationship. Majority of the respondents expressed production problems like high incidence of pest and diseases 94.04 per cent. Majority of the farmers expressed the marketing problems like fluctuations in market prices (98.51%) and lack of market information (93.33%). Farmers suggested for pest and disease resistant varieties to be developed (86.66%) and fixing of minimum price for the produce 83.70 per cent.

A comparative study of trained and untrained farmers of district agriculture training center (DATC) Bijapur

KIRANKUMAR JADHAV

2014

MAJOR ADVISOR: Dr. S. G. ASKI

The present research study was conducted in Bijapur district of Karnataka during the year 2013-14. Bijapur district was purposively selected for the study, since the Red gram occupy the majority of the area in the district. Two taluks namely, Sindagi and Indi were purposively selected with one hundred and forty respondents, because these taluks have maximum number of farmers trained under DATC on Red gram cultivation practices. Thus 140 farmers formed the sample for study (*i.e.* 70 trained and 70 untrained farmers). Study revealed that, majority of the trained respondents had correct overall knowledge about improved Red gram cultivation practices as compared to untrained respondents. Nearly 40.00 per cent of trained and untrained respondents were belonged to medium adoption level category. A positive and significant relationship was observed between knowledge, adoption and personal characteristics of trained

farmers with respect to education, mass media participation, extension contact, extension participation and achievement motivation. Major problems faced by trained farmers are high cost of input (92.86%) followed by lack of storage facilities in rural areas (90.00%), high labour charges (88.57%), shortage of labour (85.71%), lack of knowledge about pest and disease control measures (78.57%), interference of middle man in marketing (64.29%), inadequate market information (61.43%), more pest and disease (58.57%), fluctuation of prices (55.71%). Major problems faced by untrained farmers are high cost of input (94.29%) followed by, lack of storage facilities in rural areas (91.43%), high labour charges (91.43%), shortage of labour (90.00%), lack of knowledge about pest and disease control measures (85.71%), interference of middle man in marketing (68.57%), more pest and disease (62.86%), fluctuation of prices (60.00%).

Management of IFS farms in Northern transition and hilly zones of Dharwad district

N. A. RAJESHWARI

2014

MAJOR ADVISOR: Dr. S. S. DOLLI

The present study was conducted in Dharwad and Kalaghatagi taluks of Dharwad district of Karnataka in 2013-14, which represents northern transition and hilly zones of Karnataka, respectively with sample of 120 farmers. Over one third of farmers in Dharwad taluk (36.66 %) adopted the integrated farming systems with agriculture - horticulture-dairy, while in Kalaghatagi taluk 38.33 per cent farmers had practiced agriculture-horticulture-dairy-forestry-vermicompost. Similarly, 36.66 and 41.66 per cent

of the farmers belonged to medium management level followed by high (33.33 and 31.66%) and low (30.00 and 26.68 %) category in Dharwad and Kalaghatagi taluk, respectively. Cotton, maize, and groundnut had given high yield and high net returns per unit area in Dharwad taluk, while soybean and paddy had given high yield and high net returns in Kalaghatagi taluk. Fruit crops like mango and sapota had given more yields in Kalaghatagi taluk compared to Dharwad taluk. Farmers had realised the

net returns up to Rs. 10,000 per annum from the Teak as well as Nilagiri tree species. The productivity and net returns of dairy animals were found higher in Kalaghatagi taluk as compared to Dharwad taluk. About 50.00 per cent of cereal grain was sold in the market and remaining was used for home consumption as well as animal feed. Major portion of crop residues was used for animal feed and minimum quantity was sold. Similar

trend was observed in pulses and oil seeds. In case of dairy, fifty per cent of milk yield was sold and remaining was retained for home consumption by the farmers who maintained 1-2 animals, while, those who maintained 3-5 animals were able to sell over two third of milk. Non availability of inputs in time and high wage rates were major constraints faced by IFS farmers in both Dharwad and Kalaghatagi taluks.

Contract farming of sweet corn in Dharwad district

P. S. GANGADHAR

2014

MAJOR ADVISOR: Dr. S. H. GOTYAL

The study was conducted during 2014 in Dharwad district of Karnataka with a sample of 180. Of which 120 contract and 60 non-contract farmers were selected purposively to study the knowledge and opinion of contract and non-contract farmers about contract farming and their socio-economic profile. More than half of the contract (51.67%) and nearly half of non-contract farmers (45.00%) had medium level knowledge about contract farming and Large majority of contract (94.17%) and 68.33 per cent of non-contract farmers opinioned that contract farming increases the returns from farming. Majority of the contract and non-contract farmers belonged to middle age, educated up to middle school, had semi medium land holdings and medium family income. Whereas more than half of both the farmers had medium risk orientation and innovative proneness. Regarding cosmopolitaness, two third of the contract and non-contract farmers visited once in a fortnight

and majority of them were visited for personal/domestic/entertainment purpose. Private agency was the most contacted agency for extension help and they contacted whenever a problem arised. More than half of contract and nearly half of non-contract farmers were found to participate in krishi mela organized by UAS Dharwad. Procurement and payment at farm gate (100.00%), increase in income (97.50%) and regular technical advices (94.17%) are the major benefits derived by the contract farming of sweet corn production. Major constraints in contract farming of sweet corn were low contract price (100.00%), price of third grade produce (97.50%), high rejection rate (93.33%) and lack of knowledge about grading (91.67%). And the major suggestions were Provision of good price for their grades and required to offer price for third grade produce (100.00%, respectively) and minimum price variation between the grades (93.33%).

Perceived attributes of soybean production technology by the farmers

SIDDALINGAPPA JAMANAL

2014

MAJOR ADVISOR: Dr. SYED SADAQATH

The study was carried in Dharwad district of Karnataka during the year 2013- 14. Following simple random sampling, 150 respondents were selected from 15 villages of three taluks of the district. The data was elicited through personal interview method. Soybean is known as a 'miracle crop' with over 40 per cent protein and 20 per cent oil, originated in China. Farmers adopt any new farm technology or innovation he should consider the attributes of farm technology. Hence the attributes of a farm technology have play significant role in its adoption. Relative advantage, compatibility, complexity, observability and trialability are five attributes according to Rogers will decide the rate of adoption of innovations in a social system. For the country as a whole, the resulting growth rate of soybean area under cultivation was 0.41 per cent per annum for the period 2003-04 to 2012-13, followed by Karnataka

5.64 per cent per annum and 3.12 per cent per annum in Dharwad district respectively. Majority of the farmers 92.24 per cent agreed for relative advantage of soybean production technologies followed by compatibility 97.33 per cent, complexity 47.69 per cent, observability 91.84 per cent and trialability 94.14 per cent. In all the above technology the overall techno-effectiveness was found to be 86.17 per cent respectively. Majority of the respondents 47.33 per cent marketed their produce in local market at village level. Considerable percentage of respondents 54.66 per cent collected the information on market price from others who visited the market. Majority of the respondents expressed the problem of price fluctuation 88.66 per cent, malpractice in weighment 77.33 per cent, high cost of inputs 70.00 per cent, erratic rainfall 65.33 per cent were the constraints expressed by soybean growers.

AGRICULTURAL STATISTICS

Estimation of birth weight of newborns based on fetal weight

JAYALAXMI

2014

MAJOR ADVISOR: Dr. K.V. ASHALATHA

The study was attempted to determine the birth weight of newborns belonging to farmer's family, to study the influence of different factors on birth weight and validation of selected formula for predicting the birth weight of newborns. The present study relies on primary data and secondary data elicited using purposive sampling in Ilkal nursing home, Dharwad district, which has got legal permission to conduct ultra Sonography. For this study 80 samples were selected purposively. The database collected for the study was treated with some of statistical tools like multiple linear regression, mean deviation measurements, correlation analysis, mean square error and also ultrasonographic methods for analysis of data. The results of the study revealed that estimated fetal weight was calculated by

using six standard formulae. Tokyo University formula had highest estimated fetal weight and least estimated fetal weight was observed in Hadlock-2 formula. Multiple regression and step wise regression techniques revealed that Weight of mother is most important factor which contributes 56.80 per cent to the actual birth weight followed by gestational age, age of mother, BPD and height of mother. Validation of different models was done to select the best model by using different statistical tools. Multiple regression was selected as the most accurate and best model which was showing least difference between estimated and observed weight. Other formulae which were nearer to actual birth weight are Hadlock-3 followed by Hadlock-1 formula.

Estimation of yield in groundnut based on weather parameters

K. N. PRAMOD KUMAR

2014

MAJOR ADVISOR: Dr. Y. N. HAVALDAR

The groundnut or peanut is one of the important legume crops of tropical and semiarid tropical countries, where it provides a major source of edible oil and vegetable protein. The experimental data for groundnut was collected based on the experiment conducted by All India Co-ordinated Research Project (AICRP) on groundnut and

meteorological data were collected from meteorological observatory of Main Agricultural Research Station of Dharwad for the year 2012 and 2013. The growing degree days (GDD) showed that days to fifty per cent flowering were on par with each other in responses to temperature regimes. Whereas, days to maturity showed significant results. The

Correlation study revealed that the dry pod yield (kg/plot) was highly significant and positively correlated with kernel yield in case of all the genotypes. Among different non-linear statistical models the cubic model was found to be significant, followed by compound model and best suitable for days to maturity and days to fifty per cent flowering for most of the genotypes. In backward regression models Days to

maturity and rainfall plays major role in estimating dry pod yield. Path analysis for dry pod yield in different genotypes revealed that kernel yield had high direct effect on yield. Whereas, dry fodder yield showed high positive correlation with yield, but path coefficient analysis revealed positive indirect effect on yield. This may be due to positive direct effect of kernel yield.

Development of decision support system for cotton and sugarcane

GURUPADAPPA B. NESUR

2014

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

The Decision Support System (DSS) has been developed in the visual basic V.06. Software includes five windows, user has required to feed the per cent incidence level to get estimated yield of crops based on incidences of biotic stress. DSS includes the information about biotic stresses and also contact address of specialists. Come back facility has been provided in each window to get back into previous window. Statistical investigation was carried out on relationship between weather parameters and biotic stresses, biotic stresses and crop yield. Correlation and regression analysis were used as tools. In case of cotton crop, the maximum temperature and morning relative humidity have significant positive impact on the incidence of aphid. The morning relative humidity has negative impact on incidence of mealy bugs. There was a significant positive contribution of evening relative humidity to the population of leaf hopper in cotton. The morning relative humidity and evening relative humidity has

significant positive impact on incidence of angular leaf spot and rust respectively. Maximum temperature has significant positive and minimum temperature has significant negative impact on growth of *Cynodon dactylon*. There was significant positive contribution of rainfall to the growth of *Cyperus rotundus*. The leaf hopper and angular leaf spot showed significant negative impact on yield of cotton. Similarly in case of sugarcane crop, the population of woolly aphid contributed negatively from all most all the weather parameters. The incidence of root grub was significantly contributed by the maximum temperature. There was significant positive contribution of rainfall on infestation of red rot. Maximum temperature and morning relative humidity have significant positive contribution on incidence of rust. *Parthenium hysterophorus* and *Alternanthera sessilis* were significantly contributed by rainfall. Woolly aphid, ring spot and rust have significant negative impact on yield.

Statistical study on weather parameters and their effect over crop shifting in Dharwad district of Karnataka

H. S. SOWMYA

2014

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

The statistical investigation of impact of climate change on Chilli, Maize, Groundnut, Sorghum, Cotton and Soybean in Dharwad district was conducted based on secondary data. The yield of these crops were obtained from Directorate of Economics and Statistics, Government of Karnataka, Bangalore and the Weather parameters data were from Assistant executive water gauge office sub-division-2 Dharwad. Different statistical techniques such as trend analysis correlation analysis, Kendall's W-coefficient, regression analysis were employed for drawing inference. The results of the study revealed that most of the months showed no trend for rainfall, temperature and relative humidity. There was positive significant correlation of rainfall, maximum temperature and area on production for all crops. There was

positive significant correlation of previous year price on area for groundnut, sorghum and soybean crops. Coefficient of concordance was done to know the association of cropping system over the period for area as well as price. And it was observed that there is association of cropping system. The models were built in order to predict yield with the help of individual weather parameter. Best models were selected based on the value of MSE and R^2 . Different non linear models were used for predicting yield using each weather parameter, among those cubic, quadratic and compound models were found best fit. Backward elimination regression models have been employed to select the best model. Rainfall and maximum temperature plays major role in predicting the yield of selected crops.

Estimation of potato yield in relation to weather parameters

HIMANSHU SHEKHAR

2014

MAJOR ADVISOR : Dr. S. N. MEGERI

Potato (*Solanum tuberosum* L.) is king of the vegetable crops. It is an important crop and can supplement the food needs of the country in a substantial way as it produces more dry-matter, balanced protein and more calories from unit area of land and time than other major food crops. To keep the potato production in profitable manner, estimation of potato yield is essential in relation to weather parameters. The study was carried out based on secondary data. The yearly crop yield data of potato was collected from District Statistical Office, Dharwad. Secondary data on the weather parameters were collected from Main Agricultural Research Station (MARS), UAS, Dharwad. The statistical tools namely correlation analysis, regression analysis and

different non linear models were employed. For estimating *kharif* potato yield minimum temperature and minimum relative humidity were found significantly contributing to the yield. For estimating *rabi* potato yield maximum relative humidity and rainfall were found significantly contributing to the yield. Logistic and Cubic model were found to be best for estimating *kharif* potato yield whereas Quadratic and Cubic model were found to be best for estimating *rabi* potato yield. Trend analysis was carried out. Cubic model was selected to know the trend of both *kharif* and *rabi* potato yield. The average accumulated heat units for *kharif* potato production and *rabi* potato production were found to be 532.76 and 1211.10, respectively.

AGRONOMY

Effect of sequential application of pre and post emergence herbicides in rainfed maize (*Zea mays* L.)

PRIYADARSHINI I. PATIL

2014

MAJOR ADVISOR: Dr. U. K. HULIHALLI

A field experiment was conducted during *kharif* 2013 at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to study the effect of sequential application of pre and post emergence herbicides in rainfed maize. The experiment was laid out in Randomized Complete Block Design with three replications and ten treatments. Treatment combinations consisted of pre emergence application of atrazine @ 1 kg a.i. ha⁻¹ followed by directed spray of post emergence herbicides

such as Glyphosate @ 2.5 kg a.i. ha⁻¹, Paraquat @ 1 kg a.i. ha⁻¹, Glufosinate ammonium @ 0.375 kg a.i. ha⁻¹, Oxyfluorfen @ 0.1 kg a.i. ha⁻¹, Metribuzin @ 0.5 kg a.i. ha⁻¹, 2, 4 - D @ 1 kg a.i. ha⁻¹, 2, 4 - D @ 0.5 kg a.i. ha⁻¹, Standard check (Atrazine @ 1 kg a.i. ha⁻¹ 2 IC + 1 HW), Farmers practice 2 IC + 2 HW and weedy check. The data on weed control rating revealed good to excellent control of weeds in post emergence spray of Glyphosate and Paraquat at 7, 14 and 21 days after spray. Crop toxicity was noticed in

post emergence spray of Oxyfluorfen at 7 days after spray, but crop recovered later. The lowest dry weight of the weeds, total number of weeds, weed index and higher weed control efficiency were recorded in Atrazine @ 1 kg a.i. ha⁻¹ 2 IC + 1 HW and Farmers practice 2 IC +2 HW which were on par with Glyphosate @ 2.5 kg a.i. ha⁻¹ and Paraquat

@ 1 kg a.i. ha⁻¹. The higher maize yield and yield components were obtained with the same treatment. The economics of the study revealed that Paraquat @ 1 kg a.i. ha⁻¹ and Glyphosate @ 2.5 kg a.i. ha⁻¹ recorded higher net returns (Rs. 42279 and 42150 ha⁻¹) and B:C ratio (2.47 and 2.43, respectively).

Effect of foliar application of potassium nitrate, ferrous sulphate and magnesium sulphate on growth, yield and quality of chilli (*Capsicum annuum* L.) Cv. Dyavanur dabbi

MAHADEVAPPA PATYALI

2014

MAJOR ADVISOR: Dr. G. B. SHASHIDHARA

A field experiment was conducted during the *kharif* season of 2013-14 at MARS, UAS, Dharwad to investigate the "Effect of foliar application of potassium nitrate, ferrous sulphate and magnesium sulphate on growth, yield and quality of chilli (*Capsicum annuum* L.) Cv. Dyavanur dabbi". The experiment was laid out in Randomized Complete Block Design with three replications and eight treatments. Treatments consisted of foliar application of KNO₃, FeSO₄ and MgSO₄ each @ 1% alone and its combinations at 60 and 90 DAT. Application of KNO₃ + FeSO₄ + MgSO₄ each @ 1 per cent at 60 and 90 DAT recorded higher growth parameters like plant height (112.30 cm), number of branches per hill (20.60) and total dry matter accumulation, yield parameters like number of fruits per hill (49.67), hundred fruit weight (168.0 g), fruit yield (14.80 q ha⁻¹), quality attributes like colour value (269.63 ASTA units), oleoresin content (16.43%), oleoresin yield (231.05 kg ha⁻¹) and lower discoloured fruits

(5.43%). While lower growth parameters like plant height (96.24 cm), number of branches per hill (16.23) and total dry matter accumulation, yield parameters like number of fruits per hill (41.0), hundred fruit weight (148.47 g), yield (12.27 q ha⁻¹), lower quality attributes were recorded in control (193.17 ASTA units, 11.92% and 136.96 kg ha⁻¹, respectively). The same treatment were recorded higher net returns of Rs. 1,03,830 per ha with an B:C ratio of 3.35 whereas lower net returns (Rs. 54,063 ha⁻¹ and 2.42, respectively) values were obtained in control. Significantly positive correlation was observed between yield Vs number of branches per hill ($r=0.949^{**}$), total dry matter production per hill ($r=0.933^{**}$), number of fruits per hill ($r=0.991^{**}$) and 100 dry fruit weight ($r=0.889^{**}$), quality parameters like colour value ($r=0.885^{**}$) and oleoresin content ($r=0.907^{**}$), however discoloured fruits negatively correlated ($r=-0.716^{*}$) with yield.

Response of summer green gram (*Vigna radiata* L.) to nutrient levels under deficit irrigation

H. L. SANGAPPA

2013

MAJOR ADVISOR: Dr. S. S. ANGADI

A field experiment was conducted during summer 2012-13 at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to study the response of summer green gram (*Vigna radiata* L.) to nutrient levels under deficit irrigation. There were 14 treatment combinations consisting of three levels of major nutrients (25:50:00 kg N:P₂O₅:K₂O/ha, 25:50:20 kg N:P₂O₅:K₂O/ha and 12.5:50:10 kg N:P₂O₅:K₂O/ha as basal + 12.5:00:10 kg N:P₂O₅:K₂O/ha as top dress at 40 DAS), two levels of each zinc (5 and 10 kg/ha) and boron (1.25 and 2.5 kg/ha). Recommended doses of fertilizer and control were included for comparison. The experiment was laid out in Randomized Complete Block Design with three replications. Application of 12.5:50:10 kg N:P₂O₅:K₂O/ha as basal with 12.5:00:10 kg N:P₂O₅:K₂O/ha as top dress at 40 DAS recorded significantly higher seed (1252 kg/ha), haulm yields (2909 kg/ha), WUE (42.9 kg/ha.cm), uptake of N, P, K, S, Zn and B, net return (Rs. 35,103/ha) and B:C ratio (2.41) over

25:50:00 kg N:P₂O₅:K₂O/ha and 25:50:20 kg N:P₂O₅:K₂O/ha. Among zinc levels, application 10 kg Zn/ha recorded significantly higher seed (1222 kg/ha), haulm yields (2868 kg/ha), WUE (41.9 kg/ha.cm), net return (Rs.33,678/ha) and B:C ratio (2.35) over 5 kg Zn/ha. Significantly higher seed (1165 kg/ha), haulm yield (2782 kg/ha), WUE (39.9 kg/ha.cm) and net return (Rs.31,012/ha) were recorded with application of 2.5 kg B/ha over 1.25 kg/ha. Similar trend was noticed in growth and yield parameters at all the stages in major nutrients, zinc and boron levels. The interaction effects of application of 12.5:50:10 kg N:P₂O₅:K₂O/ha as basal with 12.5:00:10 kg N:P₂O₅:K₂O/ha as top dress at 40 DAS with 10 kg Zn/ha recorded significantly higher seed yield (1373 kg/ha) over other combinations. The mean fertilizer applied treatments recorded significantly higher seed yield, WUE, yield parameters and growth parameters of greengram as compared to control at all the growth stages.

Response of sugarcane genotypes to organic nutrient management practices with special reference to jaggery production and quality

SHARANAPPA KURI

2014

MAJOR ADVISOR: Dr. C. P. CHANDRASHEKAR

Field experiment was conducted to study the response of three sugarcane genotypes (CoSnk 07103 (G₁), CoSnk 05104 (G₂) and Co 92005 (G₃)) to different organic nutrient management practices (N₁: 100% organics through farmyard manure (FYM), vermicompost (VC), integrated green manuring of sunhemp (IGMS) equivalent to RDN, N₂: 100% organics through FYM, VC, Enriched Press mud (EPM) 1/3rd each equivalent to RDN, N₃: 100% organics through FYM, VC, IGM and EPM (1/4th each) equivalent to RDN, N₄: 100% inorganics through chemical fertilizers (250:75:190 kg of N: P₂O₅:K₂O ha⁻¹, respectively) and N₅: Recommended package of practices (RPP) with special reference to jaggery production and quality during 2013-14 at ARS, Sankeshwar. The results revealed that CoSnk 05104 recorded higher cane height, cane volume, total dry matter production (TDMP), LAI, cane weight, cane yield (107.97 t ha⁻¹) and total biomass yield (150.8 t ha⁻¹) than G₁ and G₃. The sugar yield was higher with G₁ than G₃.

However, CoSnk 07103 recorded higher jaggery recovery and yield than G₂ and G₃. While, jaggery quality parameters (non-reducing (76.8%) and reducing sugars (11.89%)) were better with G₃ than other genotypes. Among the nutrient management practices (NMPs), RPP recorded higher cane height, LAI, TDMP, cane volume, cane weight, cane (126.5 t ha⁻¹), total biomass (148.9 t ha⁻¹) and jaggery yield (13.83 t ha⁻¹) than other NMPs. Among the organic treatments 100% organics through 1/3rd each of FYM, VC, EPM equivalent to RDN recorded higher TDMP, cane weight, total biomass, cane (116.2 t ha⁻¹), sugar (18.09 t ha⁻¹) and jaggery yield (13.17 t ha⁻¹) than other organic treatments. RPP recorded higher gross and net returns (Rs. 3,16,300 and 1,92,900 ha⁻¹) than other treatments. While, B:C ratio (2.76) was higher with N₄ than other treatments. The economical returns with organic jaggery production were higher with N₂ (5,21,500, 2,87,500 Rs. ha⁻¹ and 2.22 gross, net returns and B:C ratio, respectively) than other treatments.

Response of cowpea (*Vigna unguiculata* L.) genotypes to sowing windows and planting geometry under Northern transitional zone of Karnataka

P. S. PRABHAMANI

2014

MAJOR ADVISOR: Dr. M. P. POTDAR

The experiment was carried out to study the effect of sowing dates and planting geometry on growth attributes, yield attributes, seed yield and economics of two cowpea genotypes. The field trial was conducted during *kharif* 2013 under rainfed conditions in split-split plot design with three replications at Main Agricultural Research Station, Dharwad. The experiment comprised of three dates of sowing (June second fortnight, July first fortnight and July second fortnight) in main plot, three row spacings (30, 45 and 60 cm) in sub plot and two genotypes (DC 15 and C-152) in sub-sub plot. Results of the investigation indicated that significantly higher seed yield (1155 kg ha⁻¹), haulm yield (2535 kg ha⁻¹), net return (Rs. 32816 ha⁻¹) and B:C ratio (3.13) were recorded in cowpea

sown during second fortnight of June as compared to first and second fortnight of July sowing. Similar trend was observed for growth and yield attributing parameters such as number of branches, leaf area, leaf area index, leaf area duration, total dry matter production, number of pods plant⁻¹, seed weight plant⁻¹. Among the row spacings significantly higher growth and yield attributes, seed yield (1062 kg ha⁻¹), haulm yield (2373 kg ha⁻¹), net return (Rs. 28751 ha⁻¹) and B:C ratio (2.83) were recorded in 45 cm row spacing and it was on par with 30 cm as compared to 60 cm row. Genotype DC 15 recorded significantly higher growth and yield attributing parameters, seed yield (1026 kg ha⁻¹), haulm yield (2279 kg ha⁻¹), net return (Rs. 27238 ha⁻¹) and B:C ratio (2.73) as compared to C-152.

Response of sunflower (*Helianthus annuus* L.) to graded levels of sulphur and sulphur oxidizing biofertilizer (*Thiobacillus thiooxidans*)

AMIT M. PUJAR

2014

MAJOR ADVISOR : Dr.. B. N. ARAVINDA KUMAR

A field experiment was conducted during the *kharif* season 2013 at Saidapur farm, University of Agricultural Sciences, Dharwad to study the "Response of Sunflower (*Helianthus annuus* L.) to graded levels of sulphur and sulphur oxidizing biofertilizer (*Thiobacillus thiooxidans*)". The field experiment was laid out on sulphur deficient soil (6 ppm) in Randomized Completely Block Design with three replications and eight treatments. Treatments consisted of four levels of sulphur viz., 0, 10, 20 and 30 kg ha⁻¹ alone or in combination with sulphur oxidizing biofertilizer. Significantly higher seed yield of 2007 kg ha⁻¹ was registered with the application of sulphur at 30 kg ha⁻¹ with sulphur oxidizing biofertilizer and this was on par with 30 kg S ha⁻¹ alone (1955 kg ha⁻¹) and 20 kg S ha⁻¹ with sulphur oxidizing biofertilizer

(1932 kg ha⁻¹). The lower seed yield was realized with control (1404 kg ha⁻¹). Plant height (195.00 cm), number of green leaves plant⁻¹ (10.56), leaf area (26.68 dm²), leaf area index (1.48) and total dry matter production (59.64 g plant⁻¹) significantly higher at 30 kg S ha⁻¹ with sulphur oxidizing biofertilizer and was on par with 30 kg S ha⁻¹ alone and 20 kg S ha⁻¹ with sulphur oxidizing biofertilizer. Similar trend was observed with respect to oil content, oil yield and nutrient uptake by sunflower. Higher net returns and B:C ratio (Rs. 46192 ha⁻¹ and 2.77, respectively) were recorded with application of 30 kg S ha⁻¹ with sulphur oxidizing biofertilizer and it was on par with 30 kg S ha⁻¹ alone (Rs. 44393 ha⁻¹ and 2.71, respectively) and 20 kg S ha⁻¹ with sulphur oxidizing biofertilizer (Rs.44016 ha⁻¹ and 2.72).

Efficacy of sequential application of pre and post emergence herbicides in green gram (*Vigna radiata* L.) in Northern transitional tract of Karnataka

G. K. SHRUTHI

2014

MAJOR ADVISOR : Dr.. S. R. SALAKINKOP

A field experiment to study the sequential application of pre and post-emergence herbicides in green gram was conducted at MARS, Dharwad during *kharif* 2013. The experiment comprised of fifteen treatments included three pre-emergence herbicides (pendimethalin, alachlor and oxyfluorfen) and two post-emergence herbicides (imazethapyr and fenoxypyr-p-ethyl) along with cultural practices. These herbicide treatments were compared with farmers' practice, weed free check and weedy check. Experiment was laid out in complete randomized block design with three replications. Weed control ratings observed after herbicides spray revealed good to excellent control of weeds in pre emergence and sequential application of herbicide treatments. Pendimethalin @ 1.0 kg ha⁻¹ fbimazethapyr @ 75 g ha⁻¹ (T₈) was excellent in controlling all types of weeds and recorded significantly lower weed dry matter, but was

on par with all other treatments except T₁₁, T₁₂ and weedy check. Further, pre-emergence application of either pendimethalin or alachlor alone or in sequence with post emergence herbicides (T₂, T₃, T₅, T₆, T₈ and T₁₀) recorded higher weed control efficiency, lower weed index and nutrient removal by the weeds. Among the weed control treatments, seed yield, haulm yield, yield attributes (number of pods per plant, pod length, number of seeds per pod and 100-seed weight), growth parameters (number of branches, leaf area and total dry weight and its distribution) and nutrient uptake by crop were significantly higher in Pendimethalin @ 1.0 kg ha⁻¹ fbimazethapyr @ 75 g ha⁻¹ (T₈) and was on par with treatments comprising either pre-emergence or sequential application of herbicides (T₇, T₉, T₄, T₅, T₁₀ and T₁₃). Similar trend was followed with respect to gross returns, net returns and B:C ratio.

Effect of crop geometry on pearl millet under dryland conditions

SANGEETA

2014

MAJOR ADVISOR : Dr. V. S. SURAKOD

The field experiment was conducted at College of Agriculture, Bijapur, to know the effect of crop geometry on pearl millet under dry land conditions during *kharif* 2013. The experiment was laid out with eight treatments replicated three times in randomized block design. Wider row spacing of 120 x 5.0 cm recorded significantly higher soil moisture content (cm) on volume basis at all the stages of crop growth when compared to recommended spacing of 60 x 10 cm. All the yield attributing parameters viz, test weight (g), grain weight (g), grain and fodder yield, length of ear head (cm) and ear head circumference (cm) and also the growth components like leaf area (dm² plant⁻¹), leaf area index, dry matter production and its

distribution (g plant⁻¹), SPAD meter values, crop growth rate were significantly higher with the treatment 120 x 5.0 cm as compared to recommended spacing of 60 x 10 cm at all the stages of crop growth. The absolute growth rate, relative growth rate, net assimilation rate, plant height, number of tillers, relative water content (%) were significantly higher with the treatment 135 x 10 cm as compared to recommended treatment 60 x 10 cm at all the stages of crop growth. The closer spacing treatments (60 x 10 cm and 75 x 8 cm) recorded higher blast severity and lower rust severity and on the contrary wider row spacing treatments (120 x 10 cm and 135 x 10 cm) recorded higher rust severity and lower blast severity.

Efficacy of tank mixture herbicides for weed control in maize (*Zea mays* L.)

KAMAIAH INALLI

2014

MAJOR ADVISOR: Dr. B. N. ARAVIND KUMAR

A field experiment was conducted during *kharif* season 2013 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to study the efficacy of tank mixture herbicides for weed control in maize. The results revealed that atrazine @ 0.625 kg ha⁻¹ + pendimethalin @ 0.5 kg ha⁻¹ fb 2, 4-D @ 0.5 kg ha⁻¹ recorded an excellent control of weeds followed by weed free treatment. Significantly lower weed population, weed dry weight and higher weed control efficiency (WCE) was noticed in weed free check and atrazine @ 0.625 kg ha⁻¹ + pendimethalin @ 0.5 kg ha⁻¹ fb 2, 4-D @ 0.5 kg ha⁻¹ during the different growth stages of crop. Significantly higher total weed dry weight was recorded in weedy check. Plant height, LAI and total dry matter production was higher in atrazine @ 0.625 kg ha⁻¹ + pendimethalin @ 0.5 kg ha⁻¹ fb 2, 4-D @ 0.5 kg ha⁻¹.

Significantly higher net returns (Rs. 62628.2) and benefit: cost ratio (2.82) was recorded in atrazine @ 0.625 kg ha⁻¹ + pendimethalin @ 0.5 kg ha⁻¹ fb 2, 4-D @ 0.5 kg ha⁻¹. Application of atrazine @ 0.625 kg ha⁻¹ + Oxyfluorfen @ 0.10 kg ha⁻¹ fb 2, 4-D @ 0.5 kg ha⁻¹ and alachlor @ 0.75 kg ha⁻¹ + Oxyfluorfen @ 0.10 kg ha⁻¹ fb 2, 4-D @ 0.5 kg ha⁻¹ showed phytotoxic effect on crop. The data on dehydrogenase activity revealed that at 15 and 30 DAS of pre - emergence and post - emergence herbicides application of atrazine @ 0.625 kg ha⁻¹ + pendimethalin @ 0.5 kg ha⁻¹ fb 2, 4-D @ 0.5 kg ha⁻¹ recorded higher dehydrogenase activity compared to other weed control treatments except weed free treatment. Whereas, weedy check recorded significantly higher dehydrogenase activity at all the growth stages.

Efficacy of tank mix herbicides and sequential applications on growth and yield of groundnut (*Arachis hypogaea* L.)

H. C. NARENDRA BABU

2014

MAJOR ADVISOR: Dr. RAMESH BABU

A field experiment was conducted during *kharif* season of 2013-14 at MARS, UAS, Dharwad to investigate "Efficacy of tank mix herbicides and sequential applications on growth and yield of groundnut (*Arachis hypogaea* L.)". The treatments comprised of pre-emergence herbicides viz., alachlor and butachlor at 100 per cent of their recommended dose when used alone and were tank mixed with pendimethalin, oxyfluorfen, imazethapyr and pretilachlor at 50 per cent of their recommended dose. These treatments were followed by (fb) sequential application of post emergence herbicide viz., imazethapyr and were compared with recommended weed management practice. The experiment was laid out in Randomized Complete Block Design with three replications. Experimental results revealed that tank mix application of butachlor @ 0.75 kg/ha + pendimethalin @ 0.50 kg/ha fb imazethapyr @ 0.1 kg/ha

recorded significantly lower weed density (1.66 m⁻²) and weed dry weight (1.05 g/m²) over farmers' practice and recommended practice at 30 DAS and significantly higher weed control efficiency (88.71%) and lower weed index (0.10%) when compared to remaining treatments except weed free. Pod yield was significantly higher with this treatment (2784 kg/ha) and with tank mix application of butachlor @ 0.75 kg/ha + oxyfluorfen @ 0.125 kg/ha fb imazethapyr @ 0.1 kg/ha (2754 kg/ha). These treatments were also superior with respect to nutrient uptake by the crop. The same trend was noticed with net returns (77,640/ha and 76,588/ha, respectively) and benefit: cost ratio (3.43 and 3.40, respectively). The dehydrogenase activity was lowest when oxyfluorfen was used in the tank mixture and it was higher with butachlor + pendimethalin at 15 and 30 DAS after application of pre emergence herbicides.

Studies on intercropping of fodder cowpea (*Vigna unguiculata* L.) in hybrid maize (*Zea mays* L.)

A. SUDARSHAN REDDY

2014

MAJOR ADVISOR: Dr. Y. B. PALLED

A field experiment entitled "Studies on intercropping of fodder cowpea (*Vigna unguiculata* L.) in hybrid maize (*Zea mays* L.)" was conducted during *kharif* 2013 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad. There were 11 treatments consisting of two maize planting geometries (60 x 20 cm and 90 x 20 cm), maize + fodder cowpea row proportions (1:1 and 1:2) and four dates of maize sowing. The experiment was laid out in Randomized Complete Block Design with three replications. Sole maize at normal planting geometry recorded significantly higher grain and stover yield (5519 and 7658 kg ha⁻¹) compared to sole maize at planting geometry of 90 x 20 cm and all intercropping treatments except simultaneous sowing of maize + fodder cowpea (1:1). Simultaneous sowing of maize + fodder cowpea (1:1) recorded significantly higher grain and stover yield of maize (5349 and 7581 kg ha⁻¹,

respectively) and maize equivalent yield (6742.77 kg ha⁻¹) over rest of the treatments except maize sown after 1 week at 1:1 row proportion, with which it was on par. Sole fodder cowpea recorded significantly higher green forage yield (35.36 t ha⁻¹) as compared to all other intercropping treatments except maize sown after 2 and 3 weeks at 1:2 row proportion, with which it was on par. Among intercropping treatments, maize sown 3 weeks after at 1:2 row proportion (T₈) recorded significantly higher green forage yield of fodder cowpea (30.96 t ha⁻¹) and was on par with all other intercropping treatments except T₁ and T₂. Significantly higher net returns (Rs. 66088 ha⁻¹) and B:C ratio (2.98) were realized in simultaneous sowing of maize + fodder cowpea intercropping (1:1) compared to all other treatments except maize sown after 1 week at 1:1 row proportion, with which it was on par.

Influence of *in-situ* moisture conservation practice, date of sowing and row spacing on yield and malting quality of barley under rainfed condition

ANJHUGEORGE

2014

MAJOR ADVISOR : Dr. C. P. MANSUR

A field experiment was conducted at Dharwad in farmers' field during *rabi* season of 2013-14 to evaluate the response of barley to *in situ* moisture conservation practice, sowing date and row spacing under rainfed condition. The treatments comprised of two land management practices (M₁: broad bed and furrow (BBF), M₂: flat bed) as main plots, three sowing dates (D₁: first fortnight of October, D₂: second fortnight of October, D₃: first fortnight of November) as sub plots and two row spacings (S₁: 30.0 cm, S₂: 22.5 cm) as sub-sub plots replicated thrice in a split-split plot design. Crop raised on BBF recorded significantly higher grain yield (2714 kg ha⁻¹), economics and soil moisture compared to flat bed. Significantly higher malt recovery, malt yield and reducing sugar (81.18%, 2208 kg ha⁻¹ and 15.06 mg g⁻¹, respectively) were recorded from the grains obtained from BBF compared to flat bed. Significantly higher grain yield (2842 kg ha⁻¹), straw yield (4990 kg ha⁻¹), and economics were recorded by crop sown

during second fortnight of October compared to other sowing dates. Sowing during first fortnight of October recorded significantly higher soil moisture which was on par with second fortnight of October at 60 DAS and harvest. First fortnight of November sown crop (2.98 mg g⁻¹) recorded significantly higher free phenol content in malt. Sowing during second fortnight of October (15.58 mg g⁻¹) recorded significantly higher reducing sugar content and germinative energy (99.33%) which was on par with first fortnight of October. Row spacing of 22.5 cm recorded significantly higher grain yield (2650 kg ha⁻¹), economics and soil moisture compared to row spacing of 30.0 cm. It also recorded significantly higher malt yield (2130 kg ha⁻¹) and total free phenol content (2.71 mg g⁻¹). Among the interactions, significantly higher grain yield (2913 kg ha⁻¹) and economics were recorded by crop raised on BBF during second fortnight of October which was on par with crop raised on BBF during first fortnight of October.

Effect of foliar spray of water soluble fertilizers on growth and yield of pigeonpea [*Cajanus cajan* (L.) Millsp.]

C. M. MAMATHASHREE

2014

MAJOR ADVISOR: Dr. M. B. PATIL

The field experiment was conducted at College of Agriculture, Bijapur, to know the effect of foliar spray of water soluble fertilizers on growth and yield of pigeonpea [*Cajanus cajan* (L.) Millsp.] *kharif* 2013. The experiment was laid out with twelve treatments replicated thrice in randomized block design. The pigeonpea seed yield was higher (1272 kg ha⁻¹) with the foliar spray of 19:19:19 @ 2% compared to all other treatments. The increase in yield was achieved through improvement in yield attributing characters like seed weight per plant and 100-seed weight which were higher with the foliar application of water soluble fertilizers. In the present study, seed weight per plant (23.0 g) and 100-seed weight (12.5 g) were significantly higher with the foliar spray of 19:19:19 @ 2%. The seed weight per plant, number of pods per plant were higher

with the foliar application of water soluble fertilizers. Significantly higher number of pods (193.7) was recorded with foliar spray of 19:19:19 @ 2% when compared to foliar spray of 0:52:34 at 2% (181.1). Similarly, the total dry matter production per plant at harvest was significantly higher with foliar spray of 19:19:19 @ 2% (142.8 g plant⁻¹) followed by foliar spray of 0:52:34 at 2% (129.1 g plant⁻¹, respectively). Foliar spray of 19:19:19 @ 2% had favorable effect on growth and development of pigeon pea as evidenced by higher plant height (185.9 cm), number of primary branches (13.2). Net returns (Rs.33,976 ha⁻¹) and BC ratio (2.7) were significantly higher with foliar spray of 19:19:19 @ 2%, compared to other treatments and it was on par with foliar spray of 0:52:34 @ 2%.

Planting geometry and nutrient requirement of pigeonpea under Zai method of cultivation in dry land situation

MAKTUMSAB M. TAHSHILDAR

2012

MAJOR ADVISOR: Dr. M. B. GULED

The field experiment was conducted at college of Agriculture farm, Bijapur during *kharif* season 2013-14 to study the performance of pigeonpea [*Cajanus cajan* (L.) Millsp.] under different plant population and nutrient levels in Zai method of cultivation under dry land situation. Twelve treatments under Zai method of cultivation with four levels of plant population (22, 18, 14 and 10 seeds per Zai pit) and three levels of fertilizer application (25: 50 : 0, 31.5: 62.5 : 0 and 37.5 : 75 : 0 kg N : P₂O₅ : K₂O ha⁻¹ respectively) were compared with recommended practice. Thirteen treatments were tested in randomized complete block design with three replications. The treatment 22 seeds per Zai+125 per cent RDF with plant population 91674 plants ha⁻¹ produced significantly higher seed yield (2188 kg ha⁻¹) and net returns (Rs. 63427 ha⁻¹) compared to

recommended practice. However, significantly higher pods per plant, pod weight per plant and seed yield per plant was recorded in the treatment receiving 10 seeds per zai + 125 per cent RDF compared with other treatments. Significantly higher soil moisture at 30, 60, 90, 120 and 150 DAS in one metre depth of soil profile was recorded in Zai method of cultivation (T₁ to T₁₂) as compared to recommended practice. The data from nutrient, energy and water balance sheets also showed superiority of Zai method of cultivation as compared to recommended practice. The study indicated that Zai method of cultivation may be advocated to the small and marginal farmers of Northern dry zone of Karnataka for sustained soil fertility, productivity, effective soil moisture conservation and improvement of nutritional status of the farming community.

Effect of phosphorus levels on green gram [*Vigna radiata* (L.) Wilczek] genotypes in Northern dry zone of Karnataka

APPALAL NAIK

2014

MAJOR ADVISOR: Dr. S. B. DEVARANAVADGI

A field experiment was conducted to study the "Effect of phosphorus levels on green gram [*Vigna radiata* (L.) Wilczek] genotypes in Northern dry zone of Karnataka" under rain fed condition in vertisols at College of Agriculture Farm, Bijapur. The experiment was laid out in a RCBD with factorial concept with three replications. There were 15 treatment combinations consisting of five genotypes (Shining mung, S-4, DGGV-2, DGG-4 and IPM-02-14) and three phosphorus levels (15, 25 and 35 kg ha⁻¹). Significantly higher seed yield (1165 kg ha⁻¹), harvest index (0.26) was recorded with DGG-4 owing to higher number of pods per plant (19.10) seed

yield per plant (7.51g) and 100 seed weight (3.58 g) as compared to other genotypes. Application of 35 kg P₂O₅ ha⁻¹ recorded significantly higher seed yield (965 kg ha⁻¹) compared to 25 and 15 kg P₂O₅ ha⁻¹. The higher yield was due higher performance of yield parameters viz., number of pods per plant (17.67), seeds per pod (10.65), 100-seed weight (3.38 g) and seed yield per plant (6.24 g). Significantly higher interaction was recorded with green gram genotype DGG-4 along with application of 35 kg P₂O₅ ha⁻¹ for seed yield (1228 kg ha⁻¹), gross returns (76785 Rs. ha⁻¹), net returns (60401 Rs. ha⁻¹) and benefit cost ratio (4.69) compared to other interactions.

Sequential application of herbicides on weed dynamics, growth and yield of soybean [*Glycine max* (L.) Merrill]

MANJUNATH N. CHANNAMMANAVAR

2014

MAJOR ADVISOR: Dr. J. A. HOSMATH

The field experiment was replicated thrice in RCBD with 11 treatments to study the sequential application of herbicides on weed dynamics, growth and yield of soybean [*Glycine max* (L.) Merrill] at MARS, UAS, Dharwad during *kharif* 2013. The treatments were; Alachlor 50EC at 1.5 kg ai/ha fb Imazethapyr 10SL at 75 g ai/ha, Alachlor 50 EC at 1.5 kg ai/ha fb Imazethapyr 10SL at 100 g ai/ha, Oxyfluorfen 23.5EC at 0.1 kg ai/ha fb Imazethapyr 10SL at 75 g ai/ha, Oxyfluorfen 23.5EC at 0.1 kg ai/ha fb Imazethapyr 10SL at 100 g ai/ha, Pendimethalin 38.7CS at 700 g ai/ha fb Imazethapyr 10SL at 75 g ai/ha, Pendimethalin 38.7CS at 700 g ai/ha fb Imazethapyr 10SL at 100 g ai/ha, Pendimethalin 30EC at 1 kg ai/ha fb Imazethapyr 10SL at 75 g ai/ha, Pendimethalin 30EC at 1 kg ai/ha fb Imazethapyr 10SL at 100 g ai/ha, checks (Alachlor 50EC at 1.5 kg ai/ha fb IC and HW, Farmers practice) and Weedy check. Significantly higher

seed yield (31.99 q/ha) was recorded with the pre-emergence application of Oxyfluorfen 23.5EC at 0.1 kg ai/ha fb Imazethapyr 10SL at 75 g ai/ha and it was on par with other treatments under study and checks. Weed dynamics, weed control efficiency, growth and yield components of soybean, net return and benefit cost ratio followed the similar trend. At 50 DAS, among sequential application of herbicides, lower soil dehydrogenase activity (2.56) was recorded with Oxyfluorfen 23.5EC at 0.1 kg ai/ha fb Imazethapyr 10SL at 100 g ai/ha however, Alachlor 50EC at 1.5 kg ai/ha fb Imazethapyr 10SL at 75 g ai/ha recorded highest soil dehydrogenase activity (4.27) which was next best to farmers practice (5.12) and weedy check (6.88). In the present investigation, sequential application of herbicides (pre-emergence followed by post emergence) imparted season-long weed control in soybean.

Effect of mode of fertilization on growth and yield of cowpea (*Vigna unguiculata* (L.) Walp.) genotypes

T. M. PRADEEPA

2014

MAJOR ADVISOR: Dr. GANAJAXI MATH

A field experiment entitled "Effect of mode of fertilization on growth and yield of cowpea (*Vigna unguiculata* (L.) Walp.) genotypes" was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *kharif* 2013. There were 14 treatment combinations consisting of two cowpea genotypes (DC-15 and DCS-47-1) and seven modes of fertilization. Experiment was laid out in a Factorial Randomized Complete Block Design with three replications. The results indicated that cowpea genotype DC-15 recorded significantly higher seed yield (1548 kg ha⁻¹), haulm yield (2881 kg ha⁻¹), N, P and K uptake (75.17, 11.14 and 45.30 kg ha⁻¹ N, P and K, respectively), net returns (Rs. 31733 ha⁻¹) and

benefit cost ratio (2.80) as compared to genotype DCS-47-1. Among the modes of fertilization tested, 75 per cent RDF with 3 sprays of 2 per cent DAP at 30, 45 and 60 DAS recorded significantly higher values of yield attributing characters like number of pods per plant (15.39), number of seeds per pod (12.09), seed weight per plant (11.95 g) test weight (12.82), seed yield (1630 kg ha⁻¹) and net returns (Rs. 32745 ha⁻¹) over 100 per cent RDF, five sprays of 2 per cent DAP at 15, 30, 45, 60, 75 DAS and control. Further, farmer treatment was on par with 50 per cent RDF with 2 sprays of 2 per cent DAP at 45 and 60 DAS with respect to seed yield (1554 kg ha⁻¹) and net returns (Rs. 31733 ha⁻¹).

Mulching and nutrient management practices to enhance the productivity of Bt cotton

M. C. SHIROL

2014

MAJOR ADVISOR: Dr. T. SUDHA

A field experiment was conducted at Main Agriculture Research Station, University of Agricultural Sciences, Dharwad during *kharif* 2013 on vertisols to study the effect of mulching and nutrient management practices to enhance the productivity of Bt cotton. Experiment involves three main plots viz., M₁: mulching with cotton stalks @ 7.5 t/ha, M₂: mulching with cotton stalks @ 10 t/ha and M₃: no mulching and four sub plots viz., S₁: RDF alone; S₂: RDF + B @ 5 kg/ha; S₃: RDF + Zn @ 10 kg/ha; S₄: RDF + B @ 5 kg/ha + Zn @ 10 kg/ha. The experimental data showed that, application of mulch at 10 t/ha recorded significantly higher seed cotton yield (3099 kg/ha), plant height (128.63 cm), total dry matter production (254.93 g), sympodial branches (25.48), number of bolls (36.82/plant), mean boll weight (7.32 g), stalk yield (33.94 q/ha) over no mulch and was on par with mulching at

7.5 t/ha. Among the nutrient management treatments combined application of RDF + B at 5 kg/ha + Zn at 10 kg/ha recorded significantly higher seed cotton yield (3395 kg/ha), plant height (129.22 cm), total dry matter production (259.16 g), sympodial branches (25.68), number of bolls (38/plant), mean boll weight (7.96 g), stalk yield (36.14 q/ha) over RDF alone. The interaction effect showed that combined application of mulch at 10 t/ha + RDF + B at 5 kg/ha + Zn at 10 kg/ha recorded significantly higher seed cotton yield (3604 kg/ha), plant height (130.80 cm), total dry matter production (254.93 g), sympodial branches (25.48/plant), number of bolls (39.73/plant), mean boll weight (8.49 g), net return (Rs.121507 ha⁻¹) over no mulch + RDF alone and was on par with combined application of mulch at 7.5 t/ha + RDF + B at 5 kg/ha + Zn at 10 kg/ha.

Sequential application of pre and post-emergence herbicides against weeds in green gram (*Vigna radiata* L.)

LAKKAPPA JIDIMANI

2014

MAJOR ADVISOR: Dr. H. T. CHANDRANATH

The field experiment was conducted during the *kharif* season 2013-14 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to study the effect of "Sequential application of pre and post-emergence herbicides against weeds in green gram (*Vigna radiata* L.)". The experiment was laid out in Randomized Complete Block Design with three replications and ten treatments namely, Pendimethalin 30 EC @ 1 kg a.i ha⁻¹ (T₁), Pendimethalin 38.7 CS @ 0.7 kg a.i ha⁻¹ (T₂), Imazethapyr @ 75g a.i ha⁻¹ (T₃), Imazethapyr @ 100g a.i ha⁻¹ with adjuvant (T₄), Pendimethalin 30 EC @ 1 kg a.i ha⁻¹ (PE) fb Imazethapyr @ 75 g a.i ha⁻¹ (T₅), Pendimethalin 30 EC @ 1 kg a.i ha⁻¹ (PE) fb Imazethapyr @ 100g a.i ha⁻¹ with adjuvant (T₆), Pendimethalin 38.7 CS @ 0.7 kg a.i ha⁻¹ (PE) fb Imazethapyr @ 75 g a.i ha⁻¹ (T₇), Pendimethalin 38.7 CS @ 0.7 kg a.i ha⁻¹

(PE) fb Imazethapyr @ 100g a.i ha⁻¹ with adjuvant (T₈), Standard check (Farmers practice) (1IC + 1HW) (T₉) and Weedy check (T₁₀). Significantly lower total number of weeds, dry weight and higher weed control efficiency was observed in T₉, T₆, T₈, T₅, and T₇ when compared to weedy check at all the stages of crop, while nutrient removed by the weeds was least in these treatments. Seed yield was significantly higher in T₉, T₅, T₇, T₆, and T₈ (1523, 1497, 1479, 1422 and 1400 kg ha⁻¹, respectively) than weedy check (791 kg ha⁻¹). The various growth, yield parameters and nutrient uptake by crop followed the similar trend. Application of Pendimethalin 30 EC @ 1 kg a.i ha⁻¹ fb Imazethapyr @ 75 g a.i ha⁻¹ (T₅) recorded highest net income (Rs. 45,920 ha⁻¹) and benefit: cost ratio (2.98) and was on par with T₇, T₉, T₆ and T₈ treatments.

Improving nitrogen use efficiency through split application of nitrogen in rainfed *kharif* sorghum [*Sorghum bicolor* (L.) Moench]

RAVI MARUTI KHIDRAPURE

2014

MAJOR ADVISOR: Dr. V. S. KUBSAD

A field experiment was conducted on improving nitrogen use efficiency through split application of nitrogen in rainfed *kharif* sorghum (*Sorghum bicolor* (L.) Moench) at AICRP on Sorghum, Main Agricultural Research Station, Dharwad during *kharif* 2013. The experiment was laid out in split plot design with fourteen treatment combinations and three replications. The treatment consisted of two genotypes as main plots and seven methods of split application of nitrogen as sub plot. Among the genotypes DSV-6 recorded significantly higher plant height (225.2 cm), leaf area index (3.14), leaf area duration (114.77 days), total dry matter production (237.28 g plant⁻¹), grain weight ear⁻¹ (100.59 g), number of grains ear⁻¹ (4376), nitrogen use efficiency (59.36 kg kg⁻¹), grain yield (5937 kg ha⁻¹), fodder yield (9.09 t ha⁻¹), net returns (Rs. 33241 ha⁻¹) and B:C ratio (1.86). Split application of nitrogen @ 50 % N at sowing + 25 % N at 30

DAS + 25 % N at boot leaf stage recorded significantly higher plant height (196.4 cm), leaf area index (3.51), leaf area duration (95.50 days), total dry matter production (220.48 g plant⁻¹), grain weight ear⁻¹ (99.56 g), number of grains ear⁻¹ (4088), nitrogen use efficiency (64.83 kg kg⁻¹), grain yield (6483 kg ha⁻¹), fodder yield (9.78 t ha⁻¹), net returns (Rs. 39197 ha⁻¹) and B:C ratio (2.00). Interaction effects showed that, split application of nitrogen @ 50 % N at sowing + 25 % N at 30 DAS + 25 % N at boot leaf stage to DSV-6 recorded significantly higher grain weight ear⁻¹ (115.14 g), nitrogen use efficiency (69.00 kg kg⁻¹) and grain yield (6900 kg ha⁻¹). The growth and yield components of sorghum viz., plant height, leaf area, NAR, total dry matter production, test weight, ear length, protein content in seed and N, P, K uptake by crop were also significantly higher as compared to other treatments.

Precision nutrient management in maize

SANTOSH PAGAD

2014

MAJOR ADVISOR: Dr. M. P. POTDAR

The field experiment was conducted to study "Precision nutrient management in maize" at Agriculture Research Station, Mudhol, UAS, Dharwad during *kharif* 2013. The study area (5 ha) was divided into 20 x 20 m grids. Grid wise soil analysis indicated that the soils were alkaline in reaction, normal in electrical conductivity and low to medium in organic carbon content. The study area was low in available nitrogen (86 to 176 kg ha⁻¹) and phosphorus (10 to 37.5 kg ha⁻¹) whereas high in available potash (356 to 1733 kg ha⁻¹). The sulphur content was medium to high (9.8 to 70.7 kg ha⁻¹) whereas Ca (20.4 to 29.1 me 100 g⁻¹) and Mg (9.1 to 23.8 me 100 g⁻¹) were sufficient. The study area was deficient in Zn and Fe and sufficient in available Cu and Mn. Significantly higher grain yield was recorded with application of

nutrients for target yield of 140 q ha⁻¹ (128.26 q ha⁻¹) over target yield of 60, 80, 100 q ha⁻¹, RDF and absolute control. However, it was on par with target yield of 120 q ha⁻¹ (119.7 q ha⁻¹). The target yield of 60 q ha⁻¹ (82.2 q ha⁻¹) and RDF (79.39 q ha⁻¹) were on par with each other. Target yield of 140 q ha⁻¹ recorded significantly higher uptake of nitrogen, phosphorus and potassium (338.4, 60.4 and 104.9 kg ha⁻¹, respectively). Nutrient balance studies indicated that there was net gain in nitrogen and potash and net loss of phosphorus in all the treatments. Significantly higher net return of Rs. 1,25,104 ha⁻¹ was realised with target yield of 140 q ha⁻¹. However, higher B:C ratio (3.89) was recorded with target yield of 120 q ha⁻¹ which was on par with target yield of 140 q ha⁻¹ (3.75).

Foliar nutrition in groundnut (*Arachis hypogaea* L.)

H. M. VINOD KUMAR

2014

MAJOR ADVISOR: Dr. S. R. SALAKINKOP

A field experiment was conducted during *kharif* 2013 to study the "Foliar nutrition in groundnut (*Arachis hypogaea* L.)" at Main Agricultural Research Station, Dharwad under rainfed situation. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications and ten foliar treatments of major nutrients viz., foliar sprays of 1.5% Urea, 2.0% Urea, 1.5% DAP, 2.0% DAP, 1.5% MOP, 2% MOP, 1.5% Urea: MOP (0.5% of each), 2.0% Urea, DAP: MOP (0.7% of each), 0.5% 19 All (19:19:19 N:P₂O₅:K₂O) and control. Foliar spray of major nutrients at 45 days after sowing shown significant effect on growth and yield of groundnut. The yield attributes such as 100 pod weight (117.65 g), total number of pods plant⁻¹ (28.37), 100 test weight (42.19 g), pod yield (3746 kg ha⁻¹),

kernel yield (2905 kg ha⁻¹) and haulm yield (4253 kg ha⁻¹) were higher in foliar spray of 2.0% urea + DAP + MOP combination which was on par with other foliar treatments except 1.5% MOP. Similarly, growth parameters such as leaf area, leaf area index and leaf area duration and total dry matter production were also higher in foliar spray of 2.0% Urea + DAP + MOP combination. Further Oil content, protein content, oil yield and nutrient uptake were significantly higher in foliar treatments compared to control. Among the various foliar treatments net returns (Rs. 108730 ha⁻¹) and B:C ratio (4.12) were the higher in foliar spray of 2.0% Urea + DAP + MOP combination at DAS followed by foliar spray of 19 All (19:19:19 N:P₂O₅:K₂P) (Rs. 108095 ha⁻¹ and 4.12, respectively).

Response of moth bean [*Vigna aconitifolia* (Jacq.) Marechal] genotypes to spacing and organics under dry land situation

S. N. O. SADASHIVANAGOWDA

2014

MAJOR ADVISOR: Dr. S. C. ALAGUNDAGI

A field experiment was conducted at College of Agriculture, Bijapur in Northern dry zone of Karnataka to study the response of moth bean genotypes to spacing and organics during *kharif* 2013. The experiment was laid out in Randomised Complete Block Design with factorial concept and replicated thrice. There were 14 treatments including 12 treatment combinations involving three genotypes (MBS-27, BJMB-1 and local), two spacing (30 x 10 cm and 45 x 10 cm) and two organics (2.5 t ha⁻¹ FYM and 1 t ha⁻¹ vermicompost) along with two controls (local variety at 30 x 10 cm spacing with 10:20 kg N:P₂O₅ ha⁻¹ and local variety at 30 x 10 cm spacing with 10:20:10 kg N:P₂O₅:K₂O ha⁻¹). Seed and haulm yield were recorded and grain quality parameters were analysed. The moth bean

local variety recorded significantly higher seed yield (796 kg ha⁻¹) and haulm yield (3921 kg ha⁻¹) compared to MBS- 27 (681 kg ha⁻¹ and 3246 kg ha⁻¹, respectively) and BJMB-1 (538 kg ha⁻¹ and 2732 kg ha⁻¹, respectively). The spacing of 45 cm x 10 cm recorded significantly higher seed yield (716 kg ha⁻¹) compared to 30 cm x 10 cm. Application of 1 t per ha vermicompost recorded significantly higher seed yield (714 kg ha⁻¹) compared to 2.5 t per ha FYM. However, grain quality was not influenced by genotypes, spacing, organics and their interaction. In Northern dry zone of Karnataka, the moth bean local variety at spacing of 45 x 10 cm with application of 2.5 t per ha FYM produced significantly higher seed yield (983 kg ha⁻¹), haulm yield (4886 kg ha⁻¹) and net returns (Rs. 42425 ha⁻¹).

CROP PHYSIOLOGY**Physiological basis of photosynthetic productivity in soybean [*Glycine max* (L.) Merrill] genotypes**

PRIYANKA BHARTI

2014

MAJOR ADVISOR: Dr. M. B. CHETTI

A field experiment was conducted during *kharif* 2013 at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to study the physiological basis of photosynthetic productivity in soybean (*Glycine max* (L.) Merrill) genotypes differing in leaf characteristics. The experiment was laid out in randomized block design replicated thrice with fourteen genotypes of which only four (JS 335, DSb-21, JS 95-60 and JS 93-05) are released for cultivation; while, the rest ten genotypes (Acc. No. 8, Acc. No. 23-A, Acc. No. 24, Acc. No. 28, Acc. No. 32, Acc. No. 32 A, Acc. No. 34, DSb-12, DSb-17 and DSb-27) belonged to advanced breeding lines of pedigree JS 335 x PS 73-7. Results revealed a wide genotypic variation with respect to various morphological, bio-physical and physico-chemical characters. Among the genotypes, DSb-21, JS -335, Acc. No. 34 and Acc. No. 32A

exhibited superiority over rest of the genotypes in yield while giving a better response to most of the yield contributing characters such as increased photosynthetic rate, stomatal conductance and SPAD reading. Besides, these genotypes also had higher leaf area duration and biomass duration. The present investigation also revealed that the genotypes with high midrib thickness had higher seed yield. However, it was noted from the present study that genotypes had different leaf length and width, and based on leaf length and leaf width ratio, leaf was classified as lanceolate, ovate and oval type. It is inferred from the present investigation that by considering all the morpho-physiological traits and growth parameters of advanced breeding lines, the lines Acc. No. 34, Acc. No. 32A, DSb-17 and DSb-27 are better suited for future breeding programmes.

Effect of zinc nutrition and its relation with drought tolerance in chickpea

VANI ONKAREPPA SANGOLLI

2014

MAJOR ADVISOR: Dr. C. M. NAWALAGATTI

A field experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during *rabi* 2013 to study the effect of zinc nutrition on various morpho-physiological, biochemical traits, growth parameters, yield and yield component in chickpea. The experiment was laid out in randomized block design with three replications. The treatments consist of soil and foliar application of ZnSO_4 at different concentrations. Significant differences were observed for various morpho-physiological yield and yield attributes due to zinc nutrition. Significant increase in plant height, number of branches, days to 50 per cent flowering, RWC, dry matter in leaf, stem and reproductive parts and total dry matter production was due to treatments as compared to control. The growth

parameters viz. LAI, LAD, AGR, RGR, CGR, SLW, NAR and BMD increased significantly due to soil application of ZnSO_4 @ 10 kg per ha + foliar application of ZnSO_4 @ 0.5 per cent. The biochemical parameters viz., chlorophyll content, proline, uptake of zinc and seed zinc content increased significantly due to soil application of ZnSO_4 @ 10 kg per ha + foliar application of ZnSO_4 @ 0.5 per cent. Soil application of ZnSO_4 @ 10 kg per ha + foliar application of ZnSO_4 @ 0.5 per cent recorded significantly higher seed yield. Increase in seed yield due to higher number of pods per plant, test weight and seed yield per plot. From the point of economics foliar application of ZnSO_4 @ 0.5 per cent was more effective and economical in increasing the yield and also the net returns.

Potassium induced salinity tolerance in maize

B. R. MEGHA

2014

MAJOR ADVISOR: Dr. M. B. DODDAMANI

A field experiment was conducted on maize at Roogi village of Mudhol taluk during *kharif* 2013 to study the effect of graded levels of potassium under varying soil salinity to ascertain the variation in growth, physiological, biochemical traits, yield and yield components. The performance of maize was recorded at four salinity levels viz., < 2, 2-4, 4-6 and 6-8 dS m^{-1} in the field under natural soil salinity gradient with the potassium application of 37.5 kg ha^{-1} , 75 kg ha^{-1} , 102.5 kg ha^{-1} and 150 kg ha^{-1} . The experiment was laid out in split plot design with three replications. Significant differences were observed with respect to morpho-physiological traits, growth, yield and yield attributes due to different level of salinity and potassium application. Significant increase in plant height, number of

leaves, leaf area, days to 50 per cent flowering, TDM production were recorded at low salinity level and high dosage of potassium. Similar trend was also observed with the growth parameters namely LAI, LAD, AGR and RGR. Significant increase in chlorophyll content and K/Na ratio were observed with higher dose of potassium (150 kg ha^{-1}) as compared to lowest at higher salinity level (6-8 dS m^{-1}). On the contrary, proline, phenol, and total sugars increased at higher saline level with lesser potassium application. Grain and stover yield were significantly higher at salinity level of <2 dS m^{-1} and potassium application of 150 kg ha^{-1} . Increase in grain yield was due to higher cob length, cob diameter, number of grains per cob, number of seeds per row and test weight.

Screening of maize (*Zea mays* L.) genotypes for drought tolerance

S. AJITH KUMAR

2014

MAJOR ADVISOR: Dr. B. T. NINGANUR

A field experiment was conducted to screen maize genotypes for drought tolerance during 2013. Twelve genotypes were sown with randomization in three replications in a simple RCBD. During the course of investigation all morpho-physiological, biophysical, biochemical, growth, yield and yield attributes were studied at different crop growth stages. The morphological parameters, viz., plant height, leaf area, and dry matter accumulation in leaf, stem and cob were significantly higher in GK 3059, Pinnacle and Bio 9681 at all the stages. The genotypes GK 3059 and Pinnacle maintained higher photosynthetic rate and stomatal conductance at 60 and 90 DAS. The various biochemical parameters viz., total chlorophyll, SPAD values, proline, soluble sugars and potassium content in leaves were higher in GK 3059, Pinnacle and Bio 9681. The genotypes GK 3059, Bio 9544, Pinnacle and DKC 801, recorded significantly higher values for growth parameters viz., LAI, SLW, LAD, NAR, CGR and BMD. Anthesis-silking interval (ASI)

was less in GK 3059, Bio 9681, 900 M Gold and Pinnacle. The genotypes GK 3059, Pinnacle, CP 828, DKC 801 and Bio 9681 recorded maximum RWC under severe moisture situation. Yield and yield components viz., cob weight, cob length, cob girth, test weight, number of seeds per cob, grain yield and harvest index were significantly higher in genotypes GK 3059, Bio 9681, Pinnacle and Arjun. Considering the performance of all the genotypes under severe moisture stress situation, the genotypes like, GK 3059, Bio 9681, Pinnacle and Arjun were realized better with higher plant height, total chlorophyll content, SPAD values, RWC, photosynthetic rate, proline content, soluble sugar content, potassium content and yield performance, whereas ASI was narrow in the former genotypes, while, the susceptible inbred lines viz., CP 848, DKC 801 and Bio 9544 registered lower values for above said traits. Further, it was noticed that ASI was also more in these susceptible genotypes.

Effect of temperature regimes on productivity of chickpea (*Cicer arietinum* L.) genotypes

B. A. KIRAN

2014

MAJOR ADVISOR: Dr. V. P. CHIMMAD

A field experiment was conducted during 2013-14 at Main Agriculture Research Station, University of Agriculture Sciences, Dharwad to assess productivity of chickpea genotypes. The experiment consisted of three genotypes (Annigeri-1, JG-11 and JG-14) with five dates of sowing (from 40th to 48th standard week) laid out in a factorial RBD design. Among all the dates, significantly higher plant height, primary and secondary branches were recorded under D_3 temperature regime (44th standard week sowing). All the phenological parameters like number days to 50% flowering, pod initiation, physiological maturity were significantly more with optimum growing degree days, phenol-thermal index and heat use efficiency under D_3 temperature regimes. Flower production per day per plant and per cent pollen sterility was also differed significantly, where the number of flowers were produced more under D_3 temperature regimes but at the same time it shows maximum per cent of sterile pollens (60%) under the minimum

temperature of (9.7°C). Pollen viability reduces as temperature reduces 5-10°C. The TDM and its distribution, biochemical parameters (SPAD and RWC) growth parameters (leaf area, LAI, LAD, AGR, CGR, RGR and NAR) recorded significantly under D_3 temperature regime. Yield and yield attributes like, number of pods, seeds, seed weight, haulm weight per plant, test weight, HI and seed yield was significantly maximum along with optimum total number of flowers and flower to pod ratio under D_3 temperature regime (44th standard week of sowing). Among the genotypes, JG-14 is best performer under D_3 temperature and delayed sowing, which shows higher plant height, TDM, chlorophyll content, test weight and early flowering, less flower to pod ratio and optimum yield (q ha^{-1}) with less pollen sterility (%) with short duration of 80-95 days. Chickpea productivity under D_3 temperature regime (44th standard week) was best date of sowing for getting a good yield.

Physiological assessment of sunflower (*Helianthus annuus* L.) hybrids for productivity

V. K. PREETI

2014

MAJOR ADVISOR: Dr. B. B. CHANNAPPAGAUDAR

A field experiment was conducted at MARS, University of Agricultural Sciences, Dharwad, during *kharif* 2013 to find out the physiological basis of yield variations in Sunflower genotypes. The experiment consisted of 12 genotypes laid out in randomized block design with three replications in medium black soil under rainfed conditions. The results of the investigation revealed a wide variation among the genotypes with respect to various morphological, growth, phenological, biophysical, biochemical, yield and yield components. Among the genotypes KBSH-44, DSFH-2 and PAC-8699 exhibited superiority over rest of the genotypes in yield by giving a better response to most

of the yield contributing characters, such as more number of leaves and higher distribution of dry matter into reproductive parts, higher LAI, LAD and CGR at later growth stages. Higher chlorophyll content, photosynthetic rate, stomatal conductance, test weight and higher seed yield. However it was noted from the present study that hybrids, DSFH-2 and S-293 recorded higher oil content. It was inferred from the present by considering the relative performance of genotypes with respect to various characters. The hybrids KBSH-44, DSFH-2 and PAC-8699 were more efficient because of improved morpho-physiological parameters.

EXTENSION AND COMMUNICATION MANAGEMENT

Content analysis of english rural magazines

NORA SHALOMEY D. SANGMA

2014

MAJOR ADVISOR: Dr. D. A. NITHYA SHREE

A study on "Content analysis of English rural magazines" was undertaken in the year 2013-2014 in Dharwad and Bangalore districts of Karnataka state which consisted of two parts *viz.*, content analysis of magazines and survey research. In content analysis total 803 articles published in four magazines (LEISA India, Bhoomi, Vatika and Kissan World) were taken. For survey research, 60 subscribers of LEISA India (30) and Bhoomi (30) were selected. The data was collected with the help of questionnaire. Out of 803 articles from four magazines, maximum articles belonged to general information category (13.60%) followed by environmental science and agricultural crops with 12.60 per cent each. The least number of articles were in 'Clothing and Textile' (0.86%). The analysis of the readability showed that articles in LEISA India (50%) and Vatika (35%) magazines were in the difficult category. Most of the articles in Kissan World were in standard category (28%) while in

Bhoomi (37.50%) articles were in fairly difficult. Majority of the readers (36.60%) belonged to medium reading habits. 75 per cent of the readers read the magazines whenever they feel like reading and most of the readers read specific articles in the magazines for ½ hour to 1 hour. Mass media utilization exhibited significant association with reading habits of readers towards the magazine. Most of the readers were most satisfied with the various components of the magazines like subject matter areas, cover page, format, content and language, illustration and management. Education, occupation, social participation, mass media utilization and extension contact had exhibited significant association with satisfaction level of the readers towards the magazines. Majority of the readers preferred multi coloured cover page with 14 font size letters, 5 to 7 sentences per paragraphs, two photographs per article, illustrations in the form of photos and content should appear on first inner page.

Effect of extension teaching methods in diffusion of nutritional aspects of minor millets for rural women

D. GRACE PRIYANKA

2014

MAJOR ADVISOR: Dr. CHHAYA BADIGER

Millets are also known as poor man's cereal. People usually go for other cereals such as wheat or rice, though the millets are highly nutritious. With regard to nutritive value, millets score over most of other grains. Individual, Group and mass methods are used with variety of teaching aids to diffuse the information. To stimulate the learners' interest, the extension worker should use varieties of teaching aids in every contact of teaching situation. Hence, the study was conducted in Narendra, Yettingudda, Byahatti and Kusugal villages of Dharwad and Hubli taluka in Dharwad district with 120 rural women using pre tested schedule. The essential information was collected through interview schedule. To know the impact of different extension teaching methods folders were developed on selected minor millets and distributed. The knowledge gained by farm women was measured through pre and post test. The different teaching methods selected for the study were folder with lecture, method demonstration, radio lessons of Krishi Community Radio Station

of University of Agricultural Sciences, Dharwad. For Byahatti village folder with lecture was used, for Kusugal village various minor millets recipes were prepared through method demonstration was done, for Yettingudda village Krishi Community radio lessons were broadcasted and for Narendra village all the three treatments were used. Cent per cent knowledge was observed regarding usage of finger millet, foxtail millet and little millet, colour and sprouting of millets which makes food nutritious. The highest knowledge index of 82.88 was ranked as first in Narendra village where all the methods Lecture + folder, Method demonstration and K.C.R.S. were used in combination. Knowledge index of 79.33 secured rank second in Kusugal village where method demonstration was used followed by Yettingudda village (76.22) which ranked third place where lessons through K.C.R.S. were employed and Byahatti village ranked fourth with knowledge index of 75.77 where method used was lecture and folders.

FAMILY RESOURCE MANAGEMENT

Impact of entrepreneurship development programmes on women of Dharwad district

YOGITA V. MASUR

2014

MAJOR ADVISOR: Dr. VEENA S. JADHAV

A study on Impact of Entrepreneurship Development Programmes on Women of Dharwad District was undertaken during 2013-14. Two taluks of Dharwad district were selected for the study. One hundred and sixty women beneficiaries who had undergone Entrepreneurship Development Programmes during 2010-2013 were selected from the respective institution *i.e.* Krishi Vigyan Kendra and RUDSETI, 40 each from agriculture and non agriculture based training programmes were selected for the data collection. Eight successful women entrepreneurs were selected for documentation of case studies. Agriculture based training programmes for women conducted

by KVK during 2010-13 in which 536 women had undergone the training programmes. A total number of women participated were 342 in non-agriculture based training programmes. Agriculture based training programmes conducted for women by RUDSETI during 2010-13 in which total of 489 women had undergone training and non-agriculture based training programmes conducted for women total of 466 women had undergone training. Preparation of project report and linkages to banks were the services provided by both the institutes. From the findings it was encouraging to see that psychological empowerment had high significant

difference after undergoing training and this was followed by social, economic and political empowerment. Women who had undergone training in KVK and RUDSETI had high level of income after establishing the enterprise. Majority of the women from KVK (88.88%) had faced personal problem with respect to their education level. Women from RUDSETI

(100%) had faced problem regarding responsibility of performing legitimate household activities. It was observed that women trained in KVK had established their own dairy, roti and phenyl making enterprises. Similarly, women trained in RUDSETI had established dairy and tailoring enterprises.

Knowledge of rural high school students on consumerism in Dharwad taluka

SHREEDEVI

2014

MAJOR ADVISOR: Dr. RENUKA S. SALUNKE

Knowledge of rural high school students on consumerism in Dharwad taluka was undertaken during 2013-14. The study was focused on high school students in rural area. The government high schools located in the villages were selected for the study. From each school 30 students were selected which included 15 girls and 15 boys based on random selection. Thus, the total sample was 150. For intervention study, one village high school was selected based on the low knowledge level of the students regarding consumerism. The findings revealed that purchasing of biscuits by girls and boys was high in the local market when compared to purchasing of biscuits in nearby city. (61.33%) of girls and 57.33 per cent of boys had problem of underweight and measures while purchasing. Irrespective of villages, the knowledge on consumer rights by girl respondents were more when compared to boys. Majority of girl students (69.33%) had knowledge

on checking the expiry date/ manufacturing date of the product where as only 57.33percent of boys had knowledge about checking the expiry date of product. Majority of girls had identification knowledge on food adulterants such as milk (90.66%) and boys had more knowledge when compared to girls in having knowledge on detection techniques of adulterant in the food items. Majority of boys (60%) and girls (53.33%) expressed that they had knowledge to check the right position in the balance scale while purchasing any food items. Irrespective of villages, majority of girls (53.33%) and boys (46.66%) had knowledge on Weights and Measurements Act. Further, the result of intervention programme revealed that lecture cum demonstration was found to be more significant when compared to folder for imparting the knowledge regarding selected aspects of consumerism.

FOOD SCIENCE AND NUTRITION

Designing sorghum [*Sorghum bicolor* (L.) Moench] flakes based snack bar for nutritional and health benefits of children

ALOMIB AUSTINA RIBANAR

2014

MAJOR ADVISOR: Dr. S. HEMALATHA

The present investigation was carried out to develop sorghum flakes based snack bar for nutritional and health benefits of children. Two varieties of sorghum flakes- AKJ-1 and M 35-1, were studied for physicochemical quality. AKJ-1 and M 35-1 sorghum flakes were high in energy, carbohydrate and trace elements such as Mn, Cu, Zn and Fe contents. Sorghum flakes based snack bar was standardized for optimum addition of ingredients and nutritional and storage quality was assessed. Among the two sorghum varieties AKJ-1 exhibited better functional properties. Organoleptically acceptable optimized sorghum flakes based snack bar had 21 per cent AKJ-1 sorghum flakes, 10 per cent almonds, 8 per cent cashew nuts, 19 per cent honey, 13 per cent jaggery, 21 per cent peanut butter and 7 per cent liquid glucose. The energy, protein, energy protein ratio made one

third RDA requirement of children. Moisture, per oxide value and free fatty acid values during storage were within the safety levels. Texture profile like hardness, gumminess, chewiness and sensory attributes had no significant change upon storage and was acceptable during storage period of 90 days. Consumer acceptability test by Food action rating scale found that 82.96 per cent of the children between the age group of 6 to 10 years opined to eat this at every opportunity. Sixty per cent of children could eat all 100g while only 10 per cent could eat 50g completely. At laboratory scale the cost of the raw ingredient per 50 g calculated was Rs. 16 and with a selling price margin of 20 per cent its price was Rs. 31 per unit. The study indicates a healthy, high protein- energy snack food for children with AKJ-1 sorghum flakes can be developed.

FOREST GENETIC RESOURCES

Documenting diversity to develop community biodiversity register (CBR) for tropical fruit tree (TFT) genetic resources in Central Western Ghats

VANISHREE HEGDE

2014

MAJOR ADVISOR: Dr. R. VASUDEVA

Asia is an epitome of tropical fruit tree (TFT) genetic resources, harbouring over 500 species contributing considerably to food/ nutritional security of communities and also provide eco-system services. Central Western Ghats is home to many native and introduced TFT species. Local indigenous communities depend on TFTs for a wide array of uses and over the centuries have developed knowledge on the usage and management these genetic resources. However, today these traditional knowledge (TK) are vulnerable for erosion. Therefore, documentation of TK is the need of the hour. One of the approaches of documentation is a Community Biodiversity Register (CBR), which is essentially a record of the genetic resources in a community, including information on their custodian, passport data, agro-ecology, cultural and use-values of species. The aim of the study was to document TFT diversity in villages and its associated traditional knowledge and to characterize few important native varieties of TFTs to develop CBR.

Cultural Importance Index (CI) was computed to understand the cultural significance of all TFTs found in the villages. The present study was taken up in one village each from up-ghat and coastal bio-climatic zones of Uttara Kannada district through questionnaire survey and personal interview methods for about 40 households each. Totally, 38 TFTs were recorded from both up-ghat (Salkani) and coastal (Murur) villages, of which Mango, Jackfruit, *Garcinia* and Citrus were culturally important. The two villages were amazingly rich and unique in their composition of mango and jack varieties. Only ten out of the total 167 varieties of mango, and none in jack, were common to both the villages. Morphological characterization of 13 fruit mango, 13 *appemango* and 9 jackfruit varieties was done adopting a set of descriptors. Totally 72 TK related to culinary uses, medicinal uses, processing and preservation methods and crop maintenance of TFTs were recorded.

GENETICS AND PLANT BREEDING

Heterosis and combining ability studies in chilli (*Capsicum annum* L.)

MANISH SHARMA

2014

MAJOR ADVISOR: Dr. O. SRIDEVI

The main objectives of present study were the evaluation of double cross F_1 s to identify diverse single cross F_1 s and to estimate genetic variability, correlation and path analysis in segregating populations of chilli. The base material for the first experiment consisted of eight single cross hybrids which were evaluated for genetic diversity using Mahalanobis's D^2 statistics as well as twenty eight double cross hybrids (DCHs) which were developed by crossing eight single cross hybrids in all possible combinations without reciprocals during Rabi Summer 2013 and evaluated during *kharif* 2013. Diversity analysis grouped eight parents into three clusters, highest inter-cluster distance was observed between II and III clusters followed by I and III clusters. The parents falling in these different clusters may have wider variability and crossing these diverse parents from different clusters might result in high heterotic double cross hybrids. Among the double cross hybrids studied SCH 1 x

SCH 3, SCH 2 x SCH 4 were found to be the best cross combinations based on their per se performance, sca effects, quality parameters like capsaicin content, colour value and their reaction to leaf curl complex. These four single cross hybrids (SCH 1, SCH 3, SCH 2, SCH 4) involved in the most productive double cross hybrids were identified as the base material for initiating reciprocal recurrent selection. Segregating F_2 populations of chilli was source material for second experiment in which genetic variability, correlation and path analysis were estimated. Considerable amount of variation for all the characters studied was observed as indicated by high range of mean and phenotypic and genotypic coefficients of variation. In both the populations, fruit related characters showed positive association with yield. Path analysis revealed that number of fruits per plant had maximum direct effect on dry fruit yield per plant.

Genetic studies on seed longevity in soybean [*Glycine max* (L.) Merrill.]

N. R. PAVITHRA

2014

MAJOR ADVISOR: Dr. G. T. BASAVARAJA

An investigation was carried out to elucidate nature and magnitude of genetic variability for yield, seed longevity, correlation and genetic diversity at morphological level and to screen the accessions for seed longevity using molecular markers. 144 genotypes were evaluated for 25 quantitative and qualitative traits. Genotypes exhibited significant variability for all the characters. Plant height, number of pods per plant, 100 seed weight, seed yield per plant, final germination, seed coat permeability (SCP), electrical conductivity (EC), germination after accelerated ageing (AA), root length AA, shoot length AA, seedling dry weight AA, seedling vigour AA and per cent reduction in germination showed high PCV, GCV, heritability and genetic advance as per cent mean, whereas days to 50 per cent flowering, number of seeds per pod, protein content, oil content and mechanical damage showed low PCV and GCV. Number of branches per

plant, number of pods per plant and test weight showed positive and significant correlation with seed yield per plant. Whereas, per cent reduction in germination was positively and significantly associated with test weight, SCP and EC. Positive direct effect on seed yield was exhibited by number of pods per plant and test weight. Similarly, on seed longevity positive direct effect was exhibited by EC and SCP. Genetic diversity analyses using 144 genotypes were grouped into seven clusters. Higher diversity among the genotypes was revealed by high intra and inter cluster distances. Molecular screening with SSR markers revealed that, primer Satt 281 gave distinct banding pattern between good and poor longevity genotypes. From the present investigation, five superior genotypes like DSb 21, DSb 3-4, VLS 14, IC 39751 and SL 48-40 were identified for high yield (19.9-26.3g/plant) with good seed longevity (3.16-11.11%).

Stability of promising genotypes for their rust resistance and productivity in soybean [*Glycine max* (L.) Merrill.]

SHRUTI KORADDI

2014

MAJOR ADVISOR: Dr. G. T. BASAVARAJA

An investigation was carried out to elucidate the information on genetic variability, character association, direct and indirect effects, stability analysis and screen for rust resistance. In the first experiment, 13 genotypes were evaluated, observations were recorded for 11 traits, Highest PCV and GCV values were observed for Plant height, pod weight, seed yield per plant. High heritability coupled with high genetic advance was noticed for the traits viz., days to 50 % flowering, plant height, number of pods, pod weight, number of seeds per pod, 100 seed weight, biomass and seed yield per plant. Correlation studies revealed significant association of seed yield with days to 50 % flowering, plant height, number of branches, number of pods, pod weight, 100 seed weight, biomass and harvest index. The maximum positive direct effect on seed yield was exhibited by pod weight, biomass and harvest index. In second experiment for stability

analysis, the observations were recorded for five traits, and also screening for rust resistance was carried out under natural epiphytotic condition at three locations viz., Dharwad, Bailhongal and Ugarkhurd. The pooled ANOVA revealed significant differences among genotypes and environments for all characters, indicating diverse nature of genotypes and environments. G x E interaction was nonsignificant for all the traits except for number of pods suggesting that genotypes interacted nonsignificantly with the environments. On the basis of stability parameters DSb 21 was identified as stable genotype. However, DSb 23-2 was the highest yielder across environments. The results of screening studies revealed that among the advanced breeding lines, three lines viz., DSb 21, DSb 23-2 and DSb 28-3 exhibited resistant reaction. Rest of all lines exhibited susceptible reaction.

Genetic variability, diversity and character association in foxtail millet for grain yield and nutrition

S. M. BRUNDA

2014

MAJOR ADVISOR: Dr. M. Y. KAMATAR

The study was under taken to know the genetic variability, correlation, path analysis, diversity for grain yield and nutritional traits in 78 genotypes of foxtail millet. ANOVA revealed highly significant differences among the genotypes for all the traits. High PCV, GCV, heritability and genetic advances were recorded for grain yield per plant and minerals both the seasons. While these parameters were moderate for other traits like number of tillers, panicle length, panicle weight and test weight and it was low for the traits like moisture, protein, fat, crude fiber, carbohydrate, minerals and energy content. Grain yield per plant exhibited highly significant positive association with plant height, number of tillers, panicle length, panicle breadth, panicle weight and test weight in both the seasons at both levels. Path analysis revealed that, direct positive contribution of panicle weight, straw weight and test weight towards grain yield per plant at both levels in rainy season

and summer season. Indirect effect of number of productive tillers and straw yield through test weight was positive. On the basis of Mahalanobis D^2 statistics the genotypes were grouped into seven clusters. The highest intra-cluster distance was recorded for cluster-III. The genotypes from cluster V may be crossed with those in cluster VII as they are more diverse. The days to flowering have maximum contribution towards the genetic divergence followed by test weight and grain weight. Among germplasm collections, DHF 1 was superior for grain yield per plant, similarly Ise-1468 for protein, DHF 27 for crude fiber, PS 4 for iron content and DHF 6 for zinc content. The genotypes Ise-758, DHF 2, DHF 5, DHF 9 and DHF 20 were the elite lines for grain yield and nutritional traits. These genotypes which are superior for nutritional traits are good candidate genotypes for using as a donor in breeding programme to improve nutritional quality in foxtail millet.

Combining ability analysis of new restorers developed for resistance to *Alternaria* leaf blight disease in sunflower (*Helianthus annuus* L.)

SHAKUNTALA MALLANNA HOSAMANI

2014

MAJOR ADVISOR: Dr. H. L. NADAF

A study was undertaken to assess the combining ability, heterosis and resistance to *Alternaria* blight using new restorer lines derived from interspecific derivative TX16R through induced mutagenesis and hybridization. The material consisted of two cytoplasmic male sterile (CMS) and 20 new restorer lines crossed in all possible combinations during summer 2013. Total of 22 parents and 40 hybrids along with three check hybrids were evaluated in randomized block design with two replications at MARS, Dharwad during *kharif* 2013. Of all 20 new restorer lines tested, only five restorer lines *viz.*, DSR-66, DSR-8, DSR4, DSR39, DSR-1 restored the complete fertility on CMS-234A and restorers *viz.*, DSR-66, DSR-35, DSR-8, DSR-4, DSR-39, DSR-1 restored complete fertility on CMS-17A. Among the males DSR-66 and DSR-1 were identified as good general combiners for both seed yield and *Alternaria* disease resistance and recorded less AUDPC value

of 549.98 and 783.23. Based on *gca* effect, these new inbreds could be utilized further in heterosis breeding. Highest magnitude of average heterosis was observed for seed yield per plant (65.37%). Maximum value of standard heterosis for seed yield (kg/ha) was recorded by CMS-234A x DSR-1 (101.46%). Majority of the hybrids exhibited negative heterosis for days to 50 per cent flowering and days to maturity. Among hybrids, CMS-234A x DSR-66 and CMS-234A x DSR-1 recorded mean oil content of 39.01% and 38.91%. The SCA variances was larger for all characters except days to 50 per cent flowering and days to maturity indicating predominance of non-additive gene action prevailing for traits. One hybrid CMS-234A x DSR-1 recorded higher seed yield (2128) kg/ha over three commercial checks *viz.*, KBSH-53 (1056) kg/ha, KBSH-44 (1708) kg/ha and SB-275 (1042) kg/ha and also it was resistant to *Alternaria* leaf blight disease.

Estimation of combining ability and heterosis for grain yield and its component traits in newly developed inbred lines of maize (*Zea mays* L.)

K. L. NAVEEN KUMAR

2014

MAJOR ADVISOR: Dr. G. SHANTHKUMAR

The study was conducted to assess the combining ability, nature of gene action and extent of heterosis in respect of grain yield and its component traits, involving 90 hybrids (developed through L x T design using thirty inbreds, three testers) and nine commercial checks in maize during summer and *kharif*, 2013 at MARS, University of Agricultural Sciences, Dharwad. The analysis of variance indicated significant amount of variability among genotypes for 14 quantitative characters studied. The computed variance ratios (GCA: SCA variance) revealed the predominance of non-additive gene action in the inheritance of all the traits. The combining ability revealed that the lines DMIL103, DMIL152, DMIL 699, DMIL765 and DMIL 767 among the parental lines and DMIL011 and DMIL031 from the testers were identified as the best general combiners for grain yield than the rest in both the seasons. The study on standard heterosis revealed that 3 hybrids *viz.*,

DMIL765 x DMIL031 (13.95 %), DMIL318 x DMIL011 (13.08 %), DMIL699 x DMIL031 (1.69 %) in summer and DMIL639 x DMIL011 (29.41 %), DMIL703 x DMIL031 (25.11%) DMIL688 x DMIL011 (24.53 %) during *kharif*, whereas in both the season DMIL103 x DMIL031, DMIL765 x DMIL011 and DMIL765 x DMIL021 exhibited significant positive heterosis over best commercial check Super 900M and also exhibited significant *sca* effect for grain yield and its components, obtained from the parents with high x high and high x low *gca* effects. It is suggested to evaluate the identified hybrids in large scale trial to confirm their superiority. The hybrid, DMIL218 x DMIL021 was showed the significant heterosis as well as *sca* effects for SPAD value (-1.96) and canopy temperature (15.58 %). Most of these were obtained from the parents with high x high *gca* effects. So these crosses can be utilized for exploiting hybrid vigour.

Line x tester analysis across environments for stalk sugar yield traits in sweet sorghum [*Sorghum bicolor* (L.) Moench]

G.C. DEEPAK

2014

MAJOR ADVISOR: Dr. G. M. SAJJANAR

Sweet sorghum which is similar to grain sorghum but with sugar rich stalks, is a new generation bioenergy crop, gaining importance as a raw material for ethanol production, and having multiple uses. The present investigation was carried out to study heterosis and combining ability for stalk sugar yield traits in the B and R lines. A total of 49 crosses derived by using 14 parental lines in a Line x Tester (7 x 7) mating design were evaluated at two locations *viz.*, RARS, Bijapur and ICRISAT, Patancheru during *kharif* (rainy season) 2013 for stalk sugar yield traits, grain yield and yield components. The female parents (lines) used were IS 13871, IS 22670, ICSV 25333, ICSV 93046, NTJ 2, Wray and SPSSV 30, and the male parents (testers) used were PMS 90B, ICSB 323, ICSB 351, ICSB 374, ICSB 480, Parbhani Moti and NSSV 13. The parental lines, ICSV 25333, ICSV 93046 and NTJ 2 (among lines), and Parbhani Moti, PMS

90B and NSSV 13 (among testers) were found to be good combiners for stalk sugar yield and its related traits, in terms of brix (%), total soluble solids, total sugar index etc. Among the crosses evaluated, eleven promising cross combinations *viz.*, IS 13871 x NSSV 13, IS 22670 x ICSB 351, IS 22670 x ICSB 374, ICSV 25333 x PMS 90B, ICSV 25333 x ICSB 351, ICSV 25333 x ICSB 480, ICSV 93046 x PMS 90B, ICSV 93046 x ICSB 323, NTJ 2 x Parbhani Moti, Wray x NSSV 13 and SPSSV 30 x ICSB 480 were identified based on significant *sca* effects and significant estimates of heterosis over mid parent, better parent and standard heterosis in desired direction for various stalk sugar yield related traits, and grain yield and yield components. The good combining parents and crosses identified in the present study can be exploited in breeding for high sugar yielding hybrids in sweet sorghum.

Variability and stability analysis of newly derived S_0 lines of maize (*Zea mays* L.)

VISHWE GOWDA

2014

MAJOR ADVISOR: Dr. M. C. WALI

The present investigation was carried out to study genetic variability, character association and to assess the stability of newly derived S_0 lines of maize. The variability study comprising of 79 S_0 lines and 3 checks of maize was conducted in RCBD with two replications during 2013 at AICMIP, ARS, Arabhavi. The ANOVA revealed significant variability among the lines for all traits. Hundred seed weight and grain yield per hectare (q/ha) exhibited high GCV, PCV and heritability coupled with high GAM indicating the role of additive genes for the expression of

these traits, hence, selection of these traits could be effective. Hundred seed weight, plant height, cob length, cob girth, number of rows per cob, number of kernels per row and shelling percentage had significant positive phenotypic and genotypic association and direct effects with grain yield. The stability analysis comprising of 12 S_0 lines and 3 checks of maize was conducted in RCBD with three replications during 2013 at AICMIP, Arabhavi, MARS, Dharwad and ZARS, Mandya. The pooled ANOVA revealed significant differences among the lines and environments for

all traits studied indicating the lines and environments tested are diverse in nature. $G \times E$ interaction was significant for all the traits suggesting genotype interacted significantly with the environments. The non-linear component was significant for all the traits indicating variance in terms of lines is unpredictable. On the basis of stability parameters,

ARYP-69, ARYP-79 and ARYP-78 were promising S_6 lines for grain yield. ARYP-72, ARYP-75, ARYP-77, ARYP-73 and ARYP-79 were promising S_6 lines for cob length, cob girth, days to 50 per cent tasseling, days to 50 per cent silking, plant height, shelling percentage and test weight.

Genetic studies on iron absorption efficiency in groundnut (*Arachis hypogaea* L.)

ISHWAR H. BOODI

2014

MAJOR ADVISOR: Dr. B. D. BIRADAR

Iron deficiency chlorosis is more common in groundnut particularly in calcareous, alkaline and black soils causing considerable reduction in yield. The present study was undertaken to know the iron absorption efficiency response of 43 groundnut genotypes including released varieties, advanced breeding lines and germplasm lines in a field experiment with randomised complete block design under iron deficient calcareous soil. Among the released varieties, ICGV86031, TG26, GPBD-5, Dh101, and ICGV87846 were found to be efficient/moderately efficient with lower visual chlorotic rating (VCR) and higher SPAD chlorophyll meter reading (SCMR) values, while R9227, Mutant-III, Dh2000-1, R8808, TMV2, TAG24, JL24, Dh40, ICGV91114, GPBD-4, G-2-52, TGLPS-3, JSP39, and S230 were found as inefficient with more VCR and lesser SCMR mean values over three stages. Iron chlorosis caused a significant reduction in yield and yield components in inefficient genotypes compared to efficient genotypes. To know the probable mechanisms, five genotypes with differential response to iron absorption

efficiency viz., ICGV86031, A30b (efficient), TG26 (moderately efficient), TAG24, TMV2 (inefficient) were tested in a pot experiment under factorial design involving soil types (normal and calcareous soil) and genotypes (5). Iron absorption efficient genotypes like ICGV86031, A30b and TG26 recorded significantly lower VCR, higher SCMR, higher active iron content, chlorophyll a, b and total chlorophyll and peroxidase activity in leaf across five stages compared to inefficient genotypes (TMV2, TAG24) suggesting them as probable factors responsible for iron absorption efficiency. Inefficient genotypes recorded significant reduction in yield and yield components compared to efficient genotypes. Phenotyping of 318 recombinant inbred lines (RILs) of the cross TAG24 x ICGV 86031 was done for iron absorption efficiency in iron-deficient calcareous soils. Efficient RILs showed significantly lower VCR and higher SCMR values at all three stages compared to inefficient RILs. Yield and yield components were significantly reduced in inefficient RILs compared to efficient RILs.

Genetic diversity analysis for shoot fly tolerance and productivity traits in *rabi* sorghum [*Sorghum bicolor* (L.) Moench]

N. SWAMY

2014

MAJOR ADVISOR: Dr. B. D. BIRADAR

A field experiment was conducted at Regional Agricultural Research Station, Bijapur during *rabi* season 2013-14, using 122 *rabi* sorghum genotypes (IS lines, selected B and R lines) to assess the genetic divergence for shoot fly tolerance and productivity traits. Genetic divergence studies revealed that, the days to 50 per cent flowering and trichome density on lower leaf surface contributed maximum to the total divergence. The genotype LG 33 shown high intensity of leaf glossiness (3 grade), high trichome density on lower leaf surface (95.61/mm²) (IS 40245, BL-13, EP 94, IS 4576, EP 59, IS 40813, IS 40778) and low oviposition percentage (IS 3121, IS 26025, EP 61, BL-7) by shoot fly can be used in development of tolerant cultivars. The most divergent B lines viz., BL 1, 2, 4, 5, 6, 9, 12, 17, 11, 14 (cluster I) and R lines viz., RL 16, 17, 19, 20, 24 (cluster II) can be used to develop new hybrids with enhanced levels of shoot fly tolerance

after conversion of B lines into male sterile lines. Genetic variability studies revealed higher phenotypic and genotypic variance for the characters, oviposition percentage, dead heart percentage, trichome density on both upper and lower leaf surface, stover weight, panicle weight, grain yield and panicle length. High heritability and genetic advance over mean was obtained for the characters viz., trichome density, leaf glossiness, days to 50 per cent flowering, plant height, panicle length, panicle girth, panicle weight, stover weight, grain yield and 1000-grain weight. Hence, selection made through these characters would be effective. Correlation between oviposition and dead heart percentage with traits like leaf glossiness, seedling height and trichome density was highly significant and negative. Grain yield showed positive and significant correlation with all the characters except panicle length.

Genetic study of root traits in drought tolerant genotypes and stability analysis in rainfed rice (*Oryza sativa* L.)

DHANANJAY NAGANNANAVAR

2014

MAJOR ADVISOR: Dr. N. G. HANAMARATTI

Rice (*Oryza sativa* L.) is one of the most important crops providing staple food for a large segment of the world population. Drought stress is a major limitation to rice yields and its stability in rainfed area is seldom observed. Present study was undertaken to evaluate 74 rice genotypes for assessing genetic variability for root and shoot traits conferring drought tolerance and assess stability of genotypes for productivity under rainfed condition. ANOVA revealed highly significant difference for all the characters. Higher phenotypic and genotypic coefficient of variability for root length, shoot length, number of tillers and leaf area were recorded with high heritability and genetic advance under moisture stress condition. Root length showed positive and significant association with shoot length, root fresh weight, shoot fresh weight, root dry weight, shoot dry weight, plant height, leaf area, root

to shoot ratio and SPAD value. Grain yield exhibited positive and significant association with root length, root fresh weight, root dry weight root to shoot ratio, number of tillers per meter row, number of productive tillers and per cent spikelet fertility. Assessment of the stability for grain yield of 74 genotypes using the Additive Main Effect and Multiplicative Interaction (AMMI) statistical model indicated that the effects of genotypes, environments and Genotype x Environment were significant ($P < 0.05$) for the grain yield. The AMMI model identified BIL-188, RF53-102-3, BD-148 as superior with higher grain yield and PCA score near zero (stable). BIL-149 and Hakkalasali are most stable genotypes for the grain yield across three environments. Genotypes with better root system and stable can be used as donors for root traits in breeding programs for drought tolerance.

Evaluation of Cytoplasmic Male Sterile based hybrids of pigeonpea [*Cajanus cajana* (L.) Millsp.]

H. LOKESH

2014

MAJOR ADVISOR: Dr. B. R. PATIL

Thirty two CMS based hybrids with parents were assessed for heterosis, combining ability in respect of parents and hybrids. Genetic variability, association and path analysis with molecular characterization of parents was undertaken. Crosses 2047A x ICP13579 recorded high per se

performance for days to 50 per cent flowering; 2047A x ICP11910 for pods per plant, 2047A x ICP13167 for yield/ha with significant heterosis in desirable direction. ICP13579, ICP14722 and 2092B possessed additive genes for days to 50 per cent flowering while, ICP7223, ICP6739

and ICP12515 recorded positive significant gca effects for yield/ha. 2092A x ICP7223 recorded negative significant sca effects for days to 50 per cent flowering whereas, 2092A x ICP4575 recorded positive significant sca effects for yield/ha. GCV and PCV were high with narrow difference for pods per plant and yield/ha implying selection of traits. Pods/plant, test weight, protein content and yield/ha registered high heritability coupled with high genetic advance as per cent of mean implying their usefulness during selection. At phenotypic level, yield/ha showed positive significant association with plant height and negative significant association with days to 50 per cent flowering. At genotypic

level, days to 50 per cent flowering and days to full maturity recorded negative significant association with yield/hectare. Path analysis indicated that, plant height exhibited high positive direct effects on seed yield/plant. 150 SSR primers with high PIC based on the previous studies were employed for molecular characterization of the parents used to synthesized hybrids. The molecular analysis revealed five major clusters which were further divided into 10 sub clusters. The mean Polymorphic Information Content (PIC) ranged from 0.00 to 0.69 and 204 alleles were generated with an average number of 2 alleles per marker for the parents evaluated indicating the diversity of the material used in the study.

HUMAN DEVELOPMENT AND FAMILY STUDIES

Social and cognitive skills of high school children

ANURADHA MAHAPATRA

2014

MAJOR ADVISOR: Dr. GANGAYENAGI

The study was conducted to explore the social and cognitive skills of high school children. The sample consisted of 240 high school children (120 boys and 120 girls) studying in class 8, 9 and 10, was drawn randomly from four English schools of urban areas in Dharwad city during 2013-2014. The age of the respondents ranged between 13 and 15 years. Social skills were measured using Social Skills Questionnaire by Spence (1995) and cognitive skills were assessed by using standard Raven progressive matrices by Raven (1936). Socio-economic status was measured by using socio-economic scale by Aggarwal *et al.* (2005) and nutritional status was assessed by taking anthropometric measurement (height and weight). The results revealed that there was a significant association between age and social skills of high school children. The children of 14 years age groups had better social skills compared to 13 years and 15 years old children. No

significant association was found between cognitive skills and age of high school children. There was no significant gender difference on social and cognitive skills. A significant positive relation was observed between nutritional status and cognitive skills and no significant association was found between nutritional status and social skills and cognitive skills of high school children. Ordinal position, caste, type of family, size of family and mother's education had no significant association with social and cognitive skills. Father's occupation showed significant association with cognitive skills but no association with social skills and no significant association were found between mother's occupation and social and cognitive skills of high school children. A positive relationship was found between socio-economic status with social skills whereas no relationship with cognitive skills.

Behaviour of children in late childhood of Dharwad and Wokha regions

RENABENI T. MURRY

2014

MAJOR ADVISOR: Dr. PUSHPA B. KHADI

A differential research design was employed to know the behaviour of children in late childhood of two regions Dharwad and Wokha and to compare between peer accepted and peer rejected children as well as to know the influence of child's, parental and familial characteristics on child behaviour. Children studying in class 3rd to 6th from government and private schools of Dharwad and Wokha constituted the population of the study. A sample of 160 each from Dharwad and Wokha were drawn out from two each government and private schools selected randomly. From the selected schools 10 children from each of the selected class were drawn out through sociometry *i.e.*, five each accepted and rejected boys and girls. Teacher's Report Form (TRF) by Achenbach (2001), Child Parent Relationship Scale (CPRS) by Pianta (1992) and socioeconomic status scale by Aggarwal (2005) were used. The results revealed that for somatic complaints, children from Wokha scored higher than Dharwad. Rejected children had more

behaviour problems than the peer accepted children. Closeness (subscale of CPRS) was found to influence the behaviour problems wherein higher level of closeness between parent and child decreased the behaviour problems. For Wokha region, older children were higher on externalizing and total behaviour problems than younger children and boys scored higher than girls. The children from government schools had more behaviour problems than the children from private school for both the regions. Children whose mothers had lower educational qualification had more behaviour problems. In both the regions, it was also observed that children from low income families had more behaviour problems wherein with increase in income, the behaviour problems decreased. With increase in behaviour problems, the academic achievement decreased in case of Dharwad region. Thus, there is a need for intervention programmes for parents to combat the risks of behavioural problems/disorders.

Mental ability and adjustment among retired senior citizens

MAMATHA

2014

MAJOR ADVISOR: Dr. LATA PUJAR

A study on mental ability and adjustment among retired senior citizens was undertaken during the year 2013-2014 in Hubli and Dharwad city. The sample comprised of 112 retired senior citizens (60 men and 52 women) who were living with their families and had minimum of two years experience of retired life. Raven (2001) scale on Advanced Progressive Matrices was used to assess mental ability of retired senior citizens and Hussain and Kaur (1995) scale on Shamshad Jasbir Old age Adjustment Inventory was used to assess the adjustment of retired senior citizens. Family environment scale by Bhatia and Chadda (1993) and socio economic status scale by Agarwal *et al.* (2005) were used to assess the family environment and socio economic status of respondents. The results revealed that majority of retired senior citizens belonged to average category of mental ability (59.8%) and 27.7 per cent to the above average category. Socio economic status had significant influence on mental ability of retired senior citizens. Positive and significant relationship was observed between family environment and cognitive

changes with mental ability of retired senior citizens. Retired senior citizens belonged to good category of adjustment in the areas of health, home, social, marital and emotional adjustment. Significant difference was observed between retired men and women in health, home, marital, emotional and overall adjustment. Retired senior citizens living with spouse had better adjustment in the health and marital area. Family type had significant association and correlation with the health and marital adjustment of retired senior citizens. Education had significant influence on health, marital, financial and overall adjustment of retired senior citizens. There was positive and significant correlation between adjustment and family environment in the dimension of cohesion, expressiveness, conflict, acceptance and caring, independence and control. Positive and significant relation was found between health status, leisure time activities and cognitive changes with the adjustment of retired senior citizens. There was no significant relationship between mental ability and adjustment of retired senior citizens.

Resiliency in children in late childhood and its correlates

KASANCHI M. SANGMA

2014

MAJOR ADVISOR: Dr. PUSHPA B. KHADI

Resiliency in children in late childhood (8-12 years) was studied on a sample of 310 children of Dharwad and Tura regions drawn from third to sixth class through socio-metry. Child's resiliency was assessed by administering Embury's (2006) scale to children. Robinson's parenting styles scale (1995) and socio-economic status scale by Aggarwal (2005) was administered to the mothers. Results revealed significant association between region and 'trust and support' (sub- component of sense of relatedness, component of resiliency) where in Tura children were significantly higher than Dharwad children. Among both the regions younger age group (8-9 yrs) was significantly more vulnerable than older age group (10-12 yrs). Significant association was found with socio-metric status and self- efficacy (sub- component of sense of mastery) and support (sub- component of sense of relatedness). On multiple regression analysis authoritarian parenting style was a significant predictor of low resiliency

in children. Type of family was associated with resiliency where in children from joint family had higher resiliency than children from nuclear families. Children of Dharwad region whose father was of low level of education (10th class pass but below graduation) was found to be more vulnerable than those who were graduates. Resiliency was negatively correlated with mother's occupation *i.e.*, higher the occupation status, lower was the resiliency and higher vulnerability. Children from low socio economic status were found to be more vulnerable than children from higher socio economic status. Girls were higher on support and comfort (sense of relatedness) and trust (sense of mastery) than boys. In case of Tura region, the children from higher income were more resilient than lower income. Girls were significantly higher on resiliency while boys were significantly higher on vulnerability. Thus there is a need for parenting programmes and support to families of low socio economic status.

Health status, mental health and parenting stress of parents and children's adjustment in dual and single parent families

M. M. SUMA

2014

MAJOR ADVISOR: Dr. SUNANDA K. ITAGI

The present study was conducted during 2013-14 among 60 dual and single parent families belonged to class D workers of UAS, Dharwad. PGI health questionnaire (Wig and Verma, 1978) and Mental Health Inventory (Jagadish and Srivastava, 1983) were used to assess the health status and mental health of the respondents respectively. Parenting stress scale (Abidin, 1995) was used to assess the stress related to life roles and life events experienced by parents. Child's adjustment was assessed by using Child Adjustment Inventory (Sinha and Singh, 1997). The results revealed that 60 percent of mothers belonged to dual parent families showed more neurotic symptoms than the mothers from single parent families (56.6%). There was association observed between mother's occupation and health status among single parent families than dual parent families. There was no significant difference but positive association found between mothers from dual parent families as well as single parent families with respect to mental health. There was no

significant difference and no association found between the parents of dual parent families similarly the mothers from dual and single parent families with regard to parenting stress. Among the mothers of dual parent families there was positive but no significant difference observed between mental health and health status as well as parenting stress and health status. The mothers from single parent families exhibited positive but no significant relationship between mental health and health status. There was positive and high association between parenting stress and health status of the mothers from single parent families. This indicated that increase in parenting stress increased the health problems. There was highly significant difference but no association observed in emotional adjustment but in educational adjustment there was significant difference and also association found among children from dual parent families compared to single parent families. There was no significant difference and no association observed in social adjustment of children.

Emotional competence and family environment of school children (13-15 years)

BANRISHAS. BASAIAWMOIT

2014

MAJOR ADVISOR: Dr. SARASWATI C. HUNSHAL

A study on the emotional competence and family environment of school children (13-16 years) was undertaken in the year 2013-14. The sample for the study included children in the age of 13-15 years who were studying in 8th and 9th standards from different schools located in two cities *i.e.* Dharwad and Shillong of Karnataka and Meghalaya states respectively. Two schools were randomly selected from each cities, one government and a private school. Total 160 school children were selected, out of these 80 were selected from Shillong city and 80 from Dharwad city. Emotional competence scale by Bharadwaj and Sharma (1995) was used for measuring emotional competence. Family environment scale by Bhatia and Chaddha (1993) was used to assess family environment and sociometric technique was employed to see the peer status of the school children. The results of the study revealed significant difference between Dharwad and Shillong children in the

overall emotional competence where Dharwad children had better emotional competence. It was also noticed that peer accepted children had better emotional competence than peer rejected children. In case of family environment dimensions between Dharwad and Shillong children, significant difference was observed in dimensions such as cohesion, expressiveness, acceptance and caring and organization. Also family environment dimensions such as cohesion, expressiveness, acceptance and caring and organization had significant influence on overall emotional competence. The study findings also showed that emotional competence improved with age. The study also revealed that boys had better emotional competence than girls. Familial factors such as parent's education, income, socioeconomic status and family size were significantly associated with overall emotional competence. Private school children were better in emotional competence compared to government school children.

MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Biochemical and molecular studies of the anti-phytopathogenic trait in actinomycetes

KABRAMBAM DASANTA

2014

MAJOR ADVISOR: Dr. P. U. KRISHNARAJ

Two actinomycetes isolates, *Streptomyces shandongensis* AUDT 217 and *Streptomyces parvus* AUDT 248, isolated from rhizospheric soil, were evaluated for their anti- phytopathogenic activity against *Colletotrichum* sp., *Rhizoctonia solani*, *Sclerotium rolfsii* and *Ralstonia solanacearum*. Dual culture bioassay of the selected isolated showed significant antimicrobial activity against the phytopathogens. Pot

assay experiment using cell free culture filtrates of AUDT 217 and AUDT 248 exhibited 69 per cent and 77 per cent disease control of groundnut stem rot caused by *Sclerotium rolfsii*, respectively. Spraying of cell free filtrates of AUDT 217 and AUDT 248 also showed lower sheath blight intensity (SBI) of 10.13 per cent and 8.39 per cent in rice respectively, compared to control plant with 23.584 per cent SBI.

GC-MS analysis of the crude secondary metabolites detected several compounds with diverse biological activity. Antimicrobial compounds viz., tert-Butyl-pbenzoquinone, Benzeneacetamide, Benz[a]anthracene, 8-methyl, etc., antifungal compounds (Diethyl Phthalate, Phenylethyl Alcohol, Phenol, 2, 4-bis (1,1- dimethylethyl)-, etc.) and antibacterial compound (tert-Butyl-p-benzoquinone) were from detected from AUDT 217. Interestingly, lumichrome which is known to stimulate plant growth was also detected with the are coverage 0.18 per cent and 55 per cent purity. Among the prominent compounds produced by AUDT 248, 4, 6-Dimethyl-2-thioxo-1, 2-dihydro-3-pyridicarbonitrile,

(antimicrobial), Benz[a] anthracene, 8-methyl- (antitumor), and Naphthalenone, octahydro-8a-methyl, cis-, (insecticidal) can be highlighted. Two important domains of PKS gene cluster i.e., partial keto synthase and acyl transferases were cloned from both the isolate in order to have better understanding of genetic basis of secondary metabolites production. Clones AUDT 248.1 and AUDT 248.2 showed 85 per cent to 88 per cent homology with putative modular polyketide synthase gene of *Streptomyces ambofaciens* ATCC 23877 right chromosomal arm (AM238664.2), which showed its potential to produce stambomycin antibiotics.

PLANT BIOCHEMISTRY

Evaluating the expression of biochemical metabolites in response to insect damage and mechanical damage followed by insect damage in cotton (*Gossypium hirsutum*) genotypes

R. RASHMI

2014

MAJOR ADVISOR: Dr. H. M. VAMADEVAIAH

A pot experiment was conducted at ARS Dharwad farm during *kharif* 2013 to study the effect of insect damage and mechanical damage followed by insect damage on expression of biochemical metabolites namely total sugars, reducing sugars, non-reducing sugars, total phenol, condensed tannin, gossypol, available potassium, nitrate reductase, peroxidase and lipoxygenase in Laxmi and Sahana genotypes at 45 DAS, 85 DAS, 125 DAS. The experiment was conducted in factorial CRD with three replications. Significant differences were observed with respect to genotypes due to different treatments viz., insect (*H. armigera*) damage and mechanical damage followed by insect damage at different stages. Significant increase in total sugars, non reducing sugars, total phenol, condensed tannin, gossypol, potassium, nitrate reductase activity, peroxidase activity and lipoxygenase activity

in Sahana than Laxmi genotype. Insect survivability was significantly lower in mechanically damaged plants than in undamaged plant in both the genotypes and insect survivability was less in Sahana genotype when compared to Laxmi genotype. This study reports the impact of insect (*H. armigera*) damage and mechanical damage followed by insect damage on cotton host-plant resistance due to biochemical metabolites. It is proposed that cotton plant damaged by *H. armigera* exhibit resistance and cotton plant damaged by mechanical means is less preferred for the growth of *H. armigera*. This is probably due to a reduction in the nutritive quality (Total sugar, Reducing sugar), induction of allelochemicals, such as total phenols, condensed tannin, gossypol and of oxidative enzymes, such as lipoxygenase, peroxidase and nitrate reductase in the damaged plants.

Provenance effect on morpho-chemical, morpho-genetic characterization of oil of *Hydnocarpus pentandra*

N. R. DHATHRI

2014

MAJOR ADVISOR: Dr. P. RAMANA

Provenance influence on growth, productivity, seed quality, fatty acid profile, seed cake quality and biodiesel production of *Hydnocarpus pentandra* were evaluated in Uttara Kannada district (Agro-climatic Zone-9) of Karnataka during 2013-2014. Experiments are undertaken in the already existing trees in natural forests at four different locations with varying altitudes (400-550 m) and rainfall (2000-3200 mm). There was a significant effect of site conditions on various growth and productivity parameters. The soil under *H. pentandra* exhibited better physical and chemical properties as compared to their respective control sites. The fruit, seed and kernel parameters were significantly influenced by different locations and fruit sizes. Kernel fraction was significantly influenced by fruit sizes. Seed oil yield varied from 30.61 to 60.13 per cent and was golden yellow in colour having agreeable smell. The GC-MS chromatogram

of the oil indicated the presence of 8 to 10 compounds, of which 4 to 5 were identified as the major compounds viz. palmitic acid (2.26-4.20%), stearic acid (2.56-5.13%), chaulmoogric acid (24.57-57.07%), hydnocarpic acid (5.85-7.94%) and gorlic acid (12.02-30.17%). The methyl esters (biodiesel) having kinematic viscosity (4.104 cSt), density (827 kg/m³), acidity (0.36 mg KOH/g), specific gravity (0.827), saponification value (284), flash point (165°C), fire point (174°C) and cetane number (63.93) with 82-85 per cent yield was obtained under the optimal condition. The biodiesel parameters fit into the ASTM standards. Macro, micro nutrients and proximate composition of de-oiled cake differed significantly with respect to location and fruit sizes. *H. pentandra* has the potential to capture medicinal and biofuel sector, due to its high oil content, oil quality and biodiesel production potential.

Seed viability and biochemical changes associated with accelerated ageing in soybean

BASAVARAJ A. CHANDAPPAGOL

2014

MAJOR ADVISOR: Mrs. NAGRATNA OLEKAR

Laboratory experiments were conducted to evaluate seed viability and biochemical changes associated with accelerated ageing in soybean varieties viz., JS-335, JS-9305, DSB-21 and DSB-1 during 2012-14. Physiological and biochemical changes associated with accelerated ageing were studied following standard procedure. The accelerated ageing test has reduced all the seed quality attributes in all the four genotypes, highest total soluble sugar, oil content, total soluble proteins and starch content were observed at zero days. Whereas, at twelve days after accelerated ageing the lowest values were recorded for all the biochemical parameters. The highest total soluble sugars, oil content, total soluble protein and starch were observed in JS-335 whereas lowest oil content,

total soluble protein and starch in DSB-21. The lowest soluble sugars were observed in DSB-1. The enzymatic activity of β amylase, lipase and trypsin inhibitor showed slight increase as the ageing increased from zero to two days, but showed a linear and rapid decline up to twelve days of ageing. The enzymatic activity declined in all the genotypes in varied way. The highest mean enzymatic activity was recorded at two days after accelerated ageing in all the genotypes. The β -amylase and lipase activity were maximum. Similarly, trypsin inhibitor activity was the highest at two days of ageing. Among the four genotypes JS-335 recorded highest β -amylase and lipase activity and DSB-21 recorded the highest mean trypsin inhibitor activity and the lowest was in JS-9305.

PLANT PATHALOGY

Studies on non-chemical management of major fungal foliar diseases of garden pea (*Pisum sativum* L.)

T. S. RAMYA

2014

MAJOR ADVISOR: Dr. V. I. BENAGI

Pea is an important vegetable grown in India. The powdery mildew and anthracnose are the most important diseases causing heavy loss. The maximum PDI of anthracnose recorded in Dharwad (19.68%), and powdery mildew in Belgaum (36.68%). The maximum conidial germination of *Erysiphe polygoni* recorded at five per cent concentration in glucose (90.67%). The maximum dry mycelial weight (224.47 mg) of *Colletotrichum truncatum* was recorded on 15th day. Potato dextrose agar recorded maximum colony diameter (90.00 mm) of *C. truncatum* and dry mycelial weight (199 mg) at 25°C. The optimum pH for maximum growth of *C. truncatum* was 7.0 with 96.01 mg of dry mycelial weight. Molecular identification of ITS rDNA sequences of *Colletotrichum* spp. from Garag (Dharwad) and Nesargi (Belgaum) isolates confirmed as *C. truncatum*. Among the genotypes screened against powdery mildew, Arka Ajit, A. Karthik and A. Sampoorna were found to be resistant, Arkel and Greenwood were moderately resistant, AS-10 and I-10 were

highly susceptible to the disease. The total sugar, reducing sugar and non-reducing sugar contents were higher in highly susceptible genotypes than the resistant and moderately resistant genotypes. The higher total phenol and OD phenol recorded in resistant and moderately resistant than highly susceptible genotypes. Among the botanicals NSKE found superior both against *E. polygoni* (77.73 % at 10%) and *C. truncatum* (59.51% inhibition). The maximum inhibition of conidial germination of *E. polygoni* recorded in cow urine (75.08 % at 20 per cent). Maximum conidial inhibition of *E. polygoni* (78.43%) observed in *T. harzianum*. Among the biorationals the maximum inhibition of *C. truncatum* mycelial growth (36.55%) was recorded in vermiwash, followed by cow urine (25.53%). Management of pea powdery mildew under field condition revealed that, foliar spray with NSKE at ten per cent concentration found to be effective in reducing the disease (31.34%) at 60 DAS.

Investigations on bacterial wilt of ginger caused by *Ralstonia solanacearum* (E. F. Smith) Yabucchi *et al.*

I. D. ANAND

2014

MAJOR ADVISOR: Dr. M. R. RAVIKUMAR

The major constraint for cultivation of ginger is bacterial wilt. The result revealed that, bacterial wilt incidence of ginger, range from of 9.34 to 50.25. In Uttara Kannada maximum per cent disease incidence was observed (34.59%) followed by Shimoga (28.04%) and least incidence (15.36%) was observed on Haveri. All the genotypes screened were susceptible but Himachal and Vardha showed moderately resistant in both field and pot studies with less per cent diseases incidence and Reo de janeiro showed high per cent disease incidence. Biochemical studies indicated that genotype Himachal recorded high amount of total phenol, reducing sugar, non reducing sugar compared to other genotypes. Due to infection, the reducing sugar, non reducing sugar and chlorophyll were decreased in all the genotypes but extent of decrease was more in Reo de Janeiro. The isolates showed good variation in different biochemical tests

Almost all the isolates produced strong to weak acids from sucrose, maltose and dextrose, And positive for Hydrogen sulphide production, starch hydrolysis and gelatine liquefaction at different time intervals indicating the existence of variability. *Ralstonia solanacearum* was confirmed through PCR by amplifying flagellin protein (*flaC*) gene specific primer amplified at 400bp region. The results of field experiment indicated that among different treatments rhizomes treated with Streptocycline @ 0.5 g + COC @ 3.0 g/l of water + soil application with neem cake 3 q/ha followed by drenching with bleaching powder (33%) @ 2.0 g/l + Metalaxyl MZ @ 1.0 g/l for water three time at 20 days interval starting with initiation of the disease recorded less incidence (15.50%) when compared to control (47.42%). Maximum yield was (105.93 q/ha) and in control yield was only (73.92 q/ha).

Investigations on early blight of potato caused by *Alternaria solani* (Ellis and Martin) Jones and Grout

G. SUKRUTHA HERLE

2014

MAJOR ADVISOR: Dr. B. C. KAMANNA

Early blight caused by *Alternaria solani* (Ellis and Martin) Jones and Grout is one of the major fungal foliar disease of potato (*Solanum tuberosum* L.). The maximum disease severity was recorded in Dharwad (26.93%) followed by Belagavi (25.52%). Pathogenicity was proved by inoculating the spore suspension. The maximum dry mycelial weight was obtained on fourteenth day (288.66 mg) after inoculation. Maximum length and breadth of conidia was observed in AS 4 isolate (235-285 x 29-32 µm). The growth of the mycelium is very fast in Potato Carrot Agar and least was found in Corn Meal Agar. Sporulation was excellent on PCA in all the isolates. Maximum dry mycelial weight is obtained in isolate AS 4 at 25°C (401.75 mg). AS 2 isolate showed good growth at pH 7 (313 mg). PDI is positively correlated with maximum temperature, rainfall and negatively correlated with minimum temperature, morning and evening relative humidity. The multiple regression model developed for PDI is $Y =$

$753.41 - 5.88 X_1 + 28.71 X_2 - 11.82 X_3 - 0.78 X_4 + 0.24 X_5$ with R^2 value of 0.98. The observed and predicted values were in close resemblance to each other. Hexaconazole, tebuconazole, propiconazole, penconazole, combi products of Zineb 68% + Hexaconazole 4% and captan 68% + Hexaconazole 5% were equally effective and significantly superior with 100 per cent inhibition at all the concentrations tested under *in vitro*. In field evaluation, the best fungicide was found to be Zineb 68% + Hexaconazole 4% (21.50%) with highest yield (18.83 t/ha) and B:C ratio of 4.55. Among 45 genotypes screened, none of the genotypes showed immune and resistant reaction. Six of the genotypes were moderately resistant viz. C-13, Kufri Pukhraj, P-3, AICRP-SH-1, SH-1 and C-17, nine genotypes were moderately susceptible, 23 genotypes showed susceptible reaction and seven genotypes were highly susceptible.

Studies on disease complex involving reniform nematode and *Ralstonia solanacearum* on Bt cotton

NAZIA MANZAR

2014

MAJOR ADVISOR : Dr. S. LINGARAJU

Plant parasitic nematodes belonging to 22 species are reported to be associated with cotton in India. Because of their damage to the cotton crop worldwide, they are a limiting factor in crop production. Reniform nematode and *Ralstonia solanacearum* are also known to be economically important pathogen in cotton causing wilt. The present investigation on Bt. Cotton wilt disease complex caused by *Rotylenchulus reniformis* and *Ralstonia solanacearum* comprised aspects related to identification of participating pathogens, nature of interaction between pathogens involved when inoculated singly or sequentially, reaction of

different cotton genotypes/lines against *R. reniformis* and *R. solanacearum* complex and management of the disease complex. Important diagnostic characters used for nematode identification were nematode rests in 'C' shape when killed by heat. The mature female were swollen, kidney shaped body. *Ralstonia solanacearum* was found to be gram-negative motile and rod shaped. Cells measured 0.5-0.7 x 1.5-2.0 µm and it was positive for KOH test and produced hydrogen sulfide. Maximum wilt per cent was recorded in those treatments where nematode was inoculated 7 days prior to bacterial inoculation or 14 days

prior to bacterial or simultaneously inoculated with bacterium compared to rest of the treatments. Among the fifteen Bt hybrids which were screened to know their reaction to the combined inoculation with reniform nematode and *R. solanacearum*, only three cultivars were found susceptible: MRC-7918, Bunny-BG II and Tulsi-4. MRC-7918

was found to be most affected and recorded least root and shoot length compared to rest of the cotton hybrids. Effective management of disease was obtained with treatment (phorate + neem cake) and phorate. The former was found significant in promoting good growth of cotton plant by causing poor reproduction of nematodes.

Investigation on safflower leaf spot caused by *Alternaria carthami* Chowdhury

M. R. MADHU

2014

MAJOR ADVISOR: Dr. M. P. BASAVARAJAPPA

Safflower leaf spot is the important disease caused by *Alternaria carthami* and is a serious threat to successful cultivation of safflower. The disease severity ranges from 11.55-49.33 per cent in northern Karnataka. The maximum mean disease severity was recorded in Dharwad (37.28%), followed by Bijapur (35.93%), Bagalkot (31.44%) and Gadag (22.62%) districts. The disease was severe in all four districts surveyed. Variation was observed among the twelve isolates in morphological, cultural and physiological studies. The conidia of different isolates varied in septation, 0-4 vertical and 6-9 horizontal septa. The isolate Ac₁₀ showed maximum conidial size of 50.31-101.31 x 10.21-24.26 µm and the least conidial size was observed in isolate Ac₂ (29.56-84.43 x 9.1-16.32 µm). The maximum mean radial growth was observed on Host leaf extract agar followed by Czapeck's dox agar and the least was in Richards' agar medium. The experimental results on different temperature and pH levels revealed that

all the isolates grew well at 25°C to 30°C and optimum pH range for better growth and development of the pathogen was 6 to 7. The RAPD-PCR analysis showed that all twelve isolates of *A. carthami* have considerable genetic variability. Among nine chemicals tested in vitro, hexaconazole, difenconazole and Zineb 68% + Hexaconazole 4% 72 WP were equally effective with 100 per cent inhibition at all the concentrations tested and least was in carbendazim (33.89%) at 0.05 per cent. In field evaluation of nine different fungicides, Carbendazim 25% + Iprodione 25% 50 WP at 0.2 per cent spray showed better control of the disease (34.81 PDI) with maximum yield (10.60 q/ha). The result pertaining to the field screening of genotypes indicated that, none of them showed immune, resistance, moderately resistant reaction, whereas ten showed moderately susceptible, four genotypes showed susceptible reaction and 174 genotypes showed the highly susceptible reaction to disease.

Investigations on purple blotch of onion (*Allium cepa* L.) caused by *Alternaria porri* (Ellis) Cif.

R. U. PRIYA

2014

MAJOR ADVISOR: Dr. ARUN R. SATARADDI

Onion is one of the most important commercial vegetable crops of India. The crop is subject to attack by a number of diseases, of which purple blotch caused by *Alternaria porri* is serious and also a major limiting factor in cultivation of onion. Survey during *kharif* 2013-14 revealed that purple blotch was found in all parts of Northern Karnataka and was severe in Bijapur district. Isolated and pathogen proved pathogenicity. Cultural studies of the pathogen revealed that the growth of the fungus was significantly highest in Czapeck's agar and least was in Toichinai's agar. The isolate Ap5 has recorded maximum radial growth. The fungus reached maximum growth on 14th day of incubation in potato dextrose broth. Among the different liquid media tested Czapeck's medium was best. The isolate Ap1 has recorded highest dry mycelial weight, glucose supported maximum dry mycelial weight. Sodium nitrate supported significantly

maximum growth of all the *A. porri* isolates. All the isolates of the pathogen put up significantly highest mycelial growth at 30°C. The pH 5.0 recorded significantly the highest mycelial growth of all the *A. porri* isolates and the isolate Ap3 recorded significantly maximum mycelial growth. Among the non-systemic fungicides, mancozeb 75 WP gave maximum inhibition of the mycelial growth of the pathogen at a concentration of 0.3 per cent and among the systemic fungicides evaluated propiconazole 25 EC gave maximum inhibition of the pathogen at a concentration of 0.15 per cent, among the combi products evaluated, quintal (iprodione + carbendazim) gave maximum inhibition of the pathogen at a concentration of 0.3 per cent. Among the plant extracts evaluated against *A. porri* maximum inhibition of mycelial growth was recorded with *Azadirachta indica* at a concentration of 15 per cent.

Variability in *Alternaria helianthi* (Hansf.) Tubaki and Nishihara - Incitant of leaf blight of sunflower

BALABHEEM N. HUGAR

2014

MAJOR ADVISOR: Dr. S. N. CHATTANAVAR

Among oilseed crops, sunflower (*Helianthus annuus* L.) ranks third next to groundnut and soybean. Large scale cultivation of sunflower in India was started in 1972 with the introduction of high yielding Russian varieties. Among many biotic factors limiting the yield potentiality of the crop, the foliar diseases in general and leaf blight caused by *Alternaria helianthi* (Hansf.) Tubaki and Nishihara in particular are causing heavy losses. Survey across the different districts of northern Karnataka revealed disease severity of 35.01 per cent, 29.76 per cent and 25.56 per cent in Gulbarga, Yadagir and Bijapur districts respectively, while least severity was observed in Raichur district (13.30%). Morphological differences were observed among 10 isolates for colony diameter (52 to 82 mm), colour of the colony color (dark brown to black) and margin colour (creamy white to dark brown), shape of the colony (regular to irregular), mycelial width of

2.85 to 4.60 µm, variation in sporulation (21 to 30 spores per microscopic field), vertical septa (0 to 1) and horizontal septa (2 to 10) and the size of conidia also varied. Among the different media tested potato dextrose agar, yeast extract agar and potato carrot agar were found better for growth of all the isolates. The ITS rDNA sequence of these isolates separated them in to two clusters. The maximum genetic similarity of 69 per cent was between Ah₁ (Gulbarga) and Ah₇ (Bidar) isolates, least similarity (55 per cent) was observed between Ah₄ (Bijapur) and Ah₃ (Yadagir) isolate. Pathogenic variability among the isolates was also observed on 17 genotypes. Gulbarga isolate was most virulent which infected 12 genotypes while Hitnalli farm isolate was least virulent and could infect only one genotype indicating there is pathogenic variability among the isolates tested.

Studies on little leaf of brinjal caused by *Candidatus phytoplasma trifolii*

RATHNAMMA

2014

MAJOR ADVISOR: Dr. M. S. PATIL

Brinjal (*Solanum melongena* L.) is one of the vegetable crops grown in India and other parts of the world. Brinjal is affected by several diseases of which little leaf caused by phytoplasma is one of the most important limiting factors in brinjal cultivation in many parts of the country. The average disease incidence recorded from 20.11 to 34.6 per cent in northern Karnataka. The phytoplasma successfully transmitted from little leaf

infected brinjal to healthy brinjal through wedge grafting, insect and dodder produced typical little leaf symptoms. Identification of phytoplasma by direct Polymerase Chain Reaction (PCR) was performed using P1/P7 universal primers specific to 16S rRNA gene of phytoplasmas, followed by a nested PCR using R16F2n/R16R2 primers, which resulted in expected amplicons of size ~1.8 kb and ~1.2 kb respectively in case of little leaf

affected brinjal plants only. Cloning and sequencing of 16S rDNA and construction of phylogenetic tree revealed that, brinjal little leaf phytoplasma showed 97 per cent similarity and close association with reference strain of phytoplasma isolate *Mollicutes* sp. from *Solanum melongena*, respectively, which belonging to the phytoplasma clover proliferation group (16SrVI) 'Ca. Phytoplasma trifolii.' Based on these

tests, it is designated that the present isolate as brinjal little leaf phytoplasma Dharwad isolate. Symptom remission and reappearance by using tetracycline antibiotic elucidated that the effect was purely temporary remission of symptoms seen 14 days after spray. The reappearance of little leaf symptoms was observed 21-28 days after last spray.

Investigations on anthracnose of green gram [*Vigna radiata* (L.) Wilczek] caused by *Colletotrichum truncatum* (Schw.) Andrus and Moore

ROOPADEVII

2014

MAJOR ADVISOR: Dr. M. M. JAMADAR

Green gram [*Vigna radiata* (L.) Wilczek] is an important pulse crop grown for seeds, green manure and forage and a rich source of protein, carbohydrate, minerals and vitamins. It suffers from many diseases of which anthracnose due to *Colletotrichum truncatum* (Schw.) Andrus and Moore has become one of the most serious diseases in recent years. A roving survey carried out during kharif 2013 for the incidence and severity of anthracnose of green gram in three major green gram growing districts of northern Karnataka revealed the highest anthracnose severity in Bidar district (59.8%) which stands out as hot spot for the disease. The survival studies of *C. truncatum* in terms of conidial viability in different storage condition revealed varied response to different incubations; conidia remained viable up to 360 days in freeze condition (4-5°C) and 90 days at field conditions. The pathogen *C. truncatum* attained significant maximum

growth after 14 days incubation period. Potato dextrose agar and oat meal agar among solid media and potato dextrose broth among liquid medium supported maximum growth while, 30°C temperature, relative humidity of 95 per cent as well as pH 6.5 were found best. *In vitro* bioassay revealed that among non systemic fungicides; captan (Captaf) 50 WP and mancozeb (Indofil M 45) 75 WP were highly effective while the combi-product; iprodione 25 + carbendazim 25 (Quintal 50 WP) was the most effective fungicide followed by zineb68+ hexaconazole4 (Avtar) 72 WP. Propiconazole (Tilt) 25 EC and carbendazim (Bavistin) 50 WP among the systemic fungicides were found to highly efficient against *C. truncatum* whereas *T. harzianum* (NBAII) and neem among different bioagents and botanicals were effective. All the 16 genotypes showed susceptible to highly susceptible reaction.

Studies on variability and management of *Alternaria* spp. causing leaf blight of cotton

K. D. SANGEETHA

2014

MAJOR ADVISOR: Dr. S. A. ASHTAPUTRE

Cotton is one of the most ancient and important commercial crops next only to food grains. A survey carried out during kharif 2013 revealed the maximum incidence of *Alternaria* leaf blight of cotton in Dharwad. Among different crop stages, maximum mean incidence was recorded in boll initiation stage. Bunny Bt and NAMCOT.612 were more susceptible to *Alternaria* blight. Bt genotypes recorded higher amount of chlorophyll 'a', chlorophyll 'b' and total chlorophyll, total sugar, reducing sugar and non-reducing sugar content and lower amount of total phenol and gossypol content when compared to non-Bt genotypes. Among the ten isolates, two resembled with *Alternaria macrospora*, five showed no resemblance with *A. macrospora* and three isolates resembled with *A. alternata* morphologically with conidial measurements described by Ellis M. B. Sixteen days was required for *A. macrospora* to attain maximum dry mycelial weight. Among the ten

isolates, Chandanamatti (A_6) recorded maximum mean radial growth. Majority of the isolates showed moderate to excellent sporulation and irregular grey colonies. Raised mycelial growth was mainly observed in A_2 , A_3 , A_5 and A_7 , whereas medium raised mycelial growth were seen mainly in A_1 and A_{10} . Sectoring was present in isolates viz., A_1 , A_4 , A_5 , A_8 and A_{10} . The inoculation study conducted to know the transmission property of all the ten isolates revealed that the pathogen got transmitted to cotton crop. Specific primers for *A. macrospora* and *A. alternata* showed rDNA amplicon of all the ten and three isolates at 442 bp and 320 bp, respectively. In *in-vitro* evaluation of systemic fungicides, Hexaconazole, Propiconazole and Hexaconazole 4% + Zineb 68% showed cent per cent inhibition at all the concentrations (0.05%, 0.075% and 0.1%). In field evaluation, Hexaconazole @ 0.1% showed best disease control with high yield (1536.76 kg/ha).

Studies on identification of physiological races and integrated management of *Phakopsora pachyrhizi* Syd. causing soybean rust

H. SHARADA

2014

MAJOR ADVISOR: Dr. SHAMARAO JAHAGIRDAR

Soybean rust caused by *Phakopsora pachyrhizi* Syd. is one of the major constraints in the production of soybean. The maximum rust severity observed in Dharwad (94.66 PDI) followed by Ugarkhurd (87.50 PDI). Morphological variability revealed that colour of the uredospores ranged from light brown to dark brown, pale yellow to colourless and orange brown. Maximum size (93.9 x 72.2 µm) of uredospore was observed with Ugarkhurd isolate. Three pathotypes were identified based on cultural variability on 13 international set of differentials as Cluster I-Reddish Brown (RB) lesion producing pathotypes, Cluster II- TAN lesion producing pathotypes and Cluster III- Mixed (RB + TAN) producing pathotypes. The distribution of the races varied among the 17 locations. Race 2 and 3 were recorded in Karnataka while, only race 2 was observed

in Maharashtra and north eastern states. The molecular variability study revealed that specific primer sequence (PPa 1 and PPa 2) showed greater variation among the isolates of *Phakopsora pachyrhizi*. Based on phylogenetic analysis two main clades of pathogenic races were identified in India. The genotype DSb 21, DSb 23-2, EC 241778 and EC 241780 were identified as resistant sources against rust. The higher phenol and sugars were observed in resistant genotypes than susceptible genotypes. In the integrated management with nutrients and fungicide, spraying of hexaconazole @ 0.1% + neem oil @ 1% or hexaconazole @ 0.1% + KNO_3 2% were found effective in reducing the disease pressure and increase in seed yield with better economic returns both at Dharwad and Ugarkhurd.

Sunflower powdery mildew caused by *Erysiphe cichoracearum* DC. - Epidemiological considerations

A. BHEEMARAYA

2014

MAJOR ADVISOR: Dr. M. M. JAMADAR

Sunflower is one of the important oilseed crops of India. Among the different diseases on sunflower; the powdery mildew caused by *Erysiphe cichoracearum* DC. has been a serious disease in northern Karnataka resulting in sever losses in yield and other quality parameters. In the present investigation, a random roving survey conducted during kharif 2013 in five districts of northern Karnataka revealed maximum disease severity in Raichur (37.73%) followed by Koppal districts (35.58%) and least intensity was observed in Bijapur district (5.73%). The

sunflower crop sown in I fortnight of October recorded maximum disease severity (39.64 %) followed by II fortnight of September (74.07%) and the least disease severity (8.80%) recorded in II fortnight of July sown crop. Maximum conidial germination of 68.24 per cent and 79.70 per cent was found at 25°C temperature and 85% relative humidity, respectively. Maximum and minimum temperature, maximum and minimum vapour pressure and both morning and evening relative humidity had significant negative correlations with disease in irrespective

of different crop growth periods (40, 60, 80 and 100 days after sowing). However, rainfall was negative but non-significant in its relationship with powdery mildew infection. Marked significant positive correlation of cloud cover was noticed with disease intensity at 40, 60 and 80 days crop growth stages. *In vitro* evaluation of different fungicides for their sensitivity against *E. cichoracearum* revealed that propiconazole 25 EC

(94.05%) across all the concentrations was significantly superior in inhibition of spore germination followed by penconazole 10 EC (92.08%) and hexaconazole 5EC (90.93%). Out of 84 genotypes screened, three genotypes viz. DRSI-149, RHA-859 and RHA-278 showed immune reaction, while 25 genotypes were resistant, 50 moderately resistant and 6 moderately susceptible.

Nature of slow rusting resistance in pearl millet genotypes

HANAMANTH

2014

MAJOR ADVISOR: Dr. P. V. PATIL

Pearl millet (*Pennisetum glaucum* (L.) R. Br.) is the most drought tolerant cereal crop predominantly grown as a staple food grain and fodder. Among the many diseases affecting pearl millet, rust caused by *Puccinia substrata* Ell. and Brath var. *indica* (Ramchar and Cummins) is a major disease constraint affecting both forage and grain production grown in the northern dry zone of Karnataka. Slow rusting genotypes plays a major role in reducing the spread of disease and is recognized particularly during epidemics of the rust. Among nine pearl millet genotypes used in the study, five genotypes viz., ADMR 10, ADMR 16, ADMR 17, ADMR 27 and ADMR 49 recorded maximum rust severity at different intervals and four genotypes viz., J 2510, J 2496, J 2517 and 70 SB 13 recorded initially minimum severity and further it was increased. The pearl millet genotypes J 2496 (2786.70), J 2510

(3240.30), J 2517 (3283.35) and 70 SB 13 (3175.55) recorded lower values for area under disease progress curve (AUDPC), increased latent period (11-12 days) and decreased uredial density (5.25/cm² to 6.16/cm²). Apparent infection rate (r) and uredium size were not considered as suitable parameters for assessing slow rusting resistance. Based on data of slow rusting parameters, the nine pearl millet genotypes under study are categorized as slow rusters (J 2496, J 2510, J 2517 and 70 SB 13) and fast rusters (ADMR 10, ADMR 16, ADMR 17, ADMR 27 and ADMR 49). The biochemical studies indicated higher amount of total sugars and reducing sugar in rust infected leaves as compared to healthy leaves and higher amount of phenols, total amino acids and SPAD meter values in healthy leaves as compared to rust infected leaves both at 60 and 80 days after sowing.

Studies on bio-priming for the management of seed-borne diseases of cotton

K. SRIANANTH

2014

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

Seed treatment with bio-control agents along with priming agents may serve as an important means of managing many of the soil and seed-borne diseases, the process often known as "bio-priming". The present investigation on studies on bio-priming for the management of seed-borne diseases of cotton was conducted during 2012-14 which included *In vitro* screening of bio-control agents along with bio-priming agents against seed-borne pathogens of cotton, field evaluation of the best bio-control agent along with bio-priming agents and studies on biochemical changes induced by bio-priming. Among the different priming agents tested along with *Pseudomonas fluorescens* and *Trichoderma harzianum* at 0.8 per cent concentration, against seed borne infections of cotton,

jelly showed least per cent seed infection with maximum per cent germination and vigour index. The results of field experiment conducted to evaluate the efficacy of bioagent along with jelly against seed-borne diseases of cotton indicated that *T. harzianum* at 0.8 per cent performed better in jelly as priming agent along with foliar spray of hexaconazole at 0.1 per cent with least per cent mortality, higher chlorophyll content and least per cent disease index for *Alternaria* blight and Bacterial blight when compared to control. Survival of *P. fluorescens* (NBAIL, Bengaluru) was found to be better in jelly as priming agent. Seed treatment with *P. fluorescens* at 0.8 per cent + Jelly exhibited higher activity of defence enzymes like peroxidase, poly phenol oxidase and catalase over control.

Mass production of *Paecilomyces lilacinus* (Thom.) Samson and bioefficacy against root knot nematode infecting tomato

B. G. ANUSHA

2014

MAJOR ADVISOR: Dr. SHRIPAD KULKARNI

Paecilomyces lilacinus is a common saprophytic, filamentous fungus. A random survey conducted for occurrence and prevalence of *P. lilacinus* in major tomato, brinjal and chilli growing areas of northern Karnataka revealed that root knot nematode intensity was observed among all district surveyed. And also occurrence and prevalence of *P. lilacinus* to be maximum in Dharwad district and completely absent in Gadag district. Totally seven *P. lilacinus* strains were isolated from different solanaceous crop rhizospheres in different districts of northern Karnataka. Symptoms observed were yellowing, stunting on above ground parts of plant and root galls on below ground parts of the plant. Morphological characters of *P. lilacinus* were septate mycelium, hyaline, conidia white to pink coloured colonies and formation of phialides. Among these strains, *P. lilacinus* Mudhol (PL-6) isolate recorded maximum (89.14%) egg hatching

inhibition and also recorded highest mean juvenile mortality (75.55%) over the control. The growth of *P. lilacinus* was tested in different temperature levels, pH levels, different media and carrier materials results indicated that 20-25°C, 8 pH, Sabour's dextrose broth and Talc based formulation supported the growth of *P. lilacinus* with less contamination. In pot experiment, effect of *P. lilacinus* was tested with different methods such as seed treatment, seedling dip and soil application. Among them seedling dip and soil application methods were more effective in reducing disease incidence. These treatments also resulted in increased plant growth viz. plant height, number of branches, fresh and dry weight, root length. Among various bioagents it was most effective bioagent with least number of galls and disease incidence. Shelf life of *P. lilacinus* was upto 8-9 month after that there was significant decline in population.

Studies on fungal foliar diseases of green gram (*Vigna radiata* L.) Wilczek

M. C. KAVYASHREE

2014

MAJOR ADVISOR: Dr. K. B. YADAHALLI

Green gram [*Vigna radiata* L. Wilczek] is an important pulse crop of India. The crop is affected by many fungal foliar diseases such as *Cercospora* leaf spot, powdery mildew and anthracnose. The severity of *Cercospora* leaf spot ranged from 10.38 to 69.62 PDI, powdery mildew (9.13 to 52.64 PDI) and anthracnose (0.00 to 47.34 PDI). The hot spots identified for *Cercospora* leaf spot and anthracnose are Dharwad, Lokur (Dharwad taluk) and for powdery mildew are Sasvihalli, Basapur, Majjigudda villages (Navalgund taluk). Morphological and

molecular identification of pathogens revealed that *Cercospora canescens* Ellis and Martin, *Erysiphe polygoni* DC. and *Colletotrichum gloeosporioides* Penz. are the causal organisms of foliar fungal diseases of greengram. Forty and fifty days old plants were identified as the most susceptible stages for infection of *Cercospora* leaf spot, powdery mildew and anthracnose diseases. *In vitro* evaluation of fungicides revealed that hexaconazole 5% EC (0.1% and 0.15%), carbendazim 25% + mancozeb 50% WS (0.05%, 0.1% and 0.2%) and mancozeb 75

WP (0.2% and 0.25%) were found effective against *C. canescens*. The propiconazole 25% EC, trifloxystrobin 25% + tebuconazole 50% w/w (0.05%, 0.1% and 0.15%) and copper oxychloride 50 WP (0.25%) were identified as the most effective fungicides against *C. gloeosporioides*. The systemic fungicides, hexaconazole 5% EC (0.1%) and azoxystrobin 250% SC (0.15 %) were found effective against *E. polygoni*. The genotypes Selection- 4 × Co-7-2 (F5) and

Selection- 4 × Co-7-10 (F5) were identified as multiple disease resistant lines against foliar fungal diseases under both field and glasshouse conditions. Seed treatment with carbendazim 25% + mancozeb 50% @ 2 g/kg + foliar spray with trifloxystrobin 25% + tebuconazole 50% WG @ 0.05% or spray with hexaconazole 5% EC @ 0.1% were found effective components in managing the fungal foliar diseases and recorded highest yield with better economic returns.

Studies on mycotoxin in maize with special reference to aflatoxin

CHIDANAND M. LOKAPUR

2014

MAJOR ADVISOR: Dr. S. T. NAIK

Present investigation entitled studies on mycotoxin in maize was undertaken for deleterious effect of mycotoxin contamination on production, storage and quality aspects in maize. Incidence of *Aspergillus flavus* and *Fusarium* spp. was noticed in all the surveyed areas, during *kharif* 2013 and *rabi* 2013-14. Incidence of both *A. flavus* and *Fusarium* spp. was highest in Bagalkot district with higher aflatoxin content. Among the genotypes cultivated, highest incidence was observed in 900 M Gold and DKC9117. Incidence of both *A. flavus* and *Fusarium* spp. increased with increase in moisture content of grains. Higher microbial load was observed in dehusked cobs (10.08%) as compared to husked cobs (3.08%). For identification purpose *A. flavus* isolates were grown on *Aspergillus* Flavus and *Parasiticus* Agar medium (AFPA) while *Fusarium* isolates were grown on Nash and synders medium. All the isolates of *A. flavus* were

characterized based on cultural, morphological and molecular characters. *Fusarium* isolates were characterized based on morphological and cultural characters and identity was confirmed as *F. moniliforme*. Among 11 storage units surveyed, two units had excellent storage conditions, three had good storage and six units had poor storage conditions. Samples collected from APMC yards of Jamakhandi taluk showed highest incidence of both *A. flavus* (11.11%) and *Fusarium* spp. (13.89 %) and KMF-Hubballi showed lowest incidence of *A. flavus* (1.39%) and *Fusarium* spp. (3.47%). Isolates of *A. flavus* and *F. moniliforme* showed maximum radial growth at 30 °C (84.12 mm) and 25 °C temperature (88.75 mm), respectively. Both the organisms showed maximum radial growth at 90 per cent RH. Among eight *A. flavus* isolates, six were toxigenic (aflatoxin) and two were non-toxigenic while all the five isolates of *F. moniliforme* were toxigenic (fumonisins).

Studies on loss assessment and host plant resistance against maydis leaf blight of maize

SOUMYA V. GOUDAR

2014

MAJOR ADVISOR: Dr. S. I. HARLAPUR

An investigation was undertaken on loss assessment and host plant resistance against maydis leaf blight of maize caused by *Bipolaris maydis* (Nisikado) Shoemaker at Main Agricultural Research Station, UAS, Dharwad. Significantly maximum conidial germination recorded in Sucrose 5% at 36 hours of incubation (93.42%). Hybrid 900M recorded maximum severity (90.34 %) under inoculated condition, which resulted in significantly highest avoidable loss in grain yield (19.0 %), stover yield (33.93 %), 100 grain weight (15.4 %) and shelling. percentage (4.17%). Initially severity was low during 31st-33rd standard week and moderate during 34th- 35th standard week. However disease progressively increased from 36th standard week onwards and reached maximum at maturity (80.65%). Maximum temperature (26.5°C- 28°C) minimum temperature (19.7-21°C),

Relative humidity (>83 %) and rainfall (119-237.8 mm) was most congenial for disease development. The multiple regression model developed was $Y = 9.825 + 5.199 X_1 - 6.289 X_2 - 0.861 X_3 + 0.886 X_4 + 0.222 X_5 - 0.309 X_6$ with $R^2 = 0.96$. Among 34 inbred lines screened, two inbred lines, viz., BM-55 and BM-148, registered highly resistant reaction. Five hybrids rated as resistant, ten were moderately resistant. Among the 26 hybrids screened, no hybrid was immune and highly resistant, nine found resistant, eight were moderately resistant. Biochemical studies revealed that healthy plants recorded lowest reducing sugar (8.36 mg/g) compared to diseased (22.74 mg/g). However, total phenol content was higher in healthy plants (1.15 mg/g) compared to diseased (0.94 mg/g) indicating phenols play important role in governing resistance against maydis leaf blight.

PLANTATION TECHNOLOGY

Assessment of response to elevated carbon dioxide concentration in *Santalum album* L.

NOORANDAPPA LAMANI

2014

MAJOR ADVISOR : Dr. RAMESH S. RATHOD

Sandalwood (*Santalum album* L.) is a prized gift of the plant kingdom woven into the culture and heritage of India. It has gained prominence over other tree species, because of high demand and increasing commercialization. To fulfill the increasing demand it is needed to achieve fast growth of the seedling in the nursery stage and as well in the planted site. Keeping this as theme, an attempt was made to assess the growth response of sandalwood in context to elevated carbon dioxide conditions. The ambient CO₂ is enhanced by trapping the CO₂ released during dark respiration of the seedlings and also from soil respiration. Seedling were kept in the rectangular trench of 1.5m length, 1.2m width and 0.5m depth and then well exposed to sun light. The trenches were covered by polythene sheets; during 4.00 pm to 11.00 am before closing chamber water was sprinkled. The treatments were consists of control (ambient

condition), elevated CO₂ treatment with FYM (*i.e.*, 3, 6, 9, 12 and 15 kg FYM) and elevated CO₂ treatment with no FYM. The experiment was carried out in Completely Randomized Design with four replications. The morphological parameters such as plant height, collar diameter, and number of leaves, leaf area, seedling biomass and physiological parameter such as photosynthetic rate, transpiration rate, and stomatal conductance were recorded at 120 days. Growth parameters found to be higher in the treatment of elevated CO₂ with 15 kg FYM. The increase in plant height, collar diameter, number of leaves and leaf area is 35.15, 109.85, 68.01 and 28.28 per cent respectively over control. Photosynthetic rate, transpiration rate and stomatal conductance is also found highest in 15 kg FYM treatment *i.e.* 19.66 μ mol. m⁻² s⁻¹, 3.04 m mol. m⁻² s⁻¹ and 0.30 m mol. m⁻² s⁻¹.

SEED SCIENCE AND TECHNOLOGY

Studies on effect of seed hardening, nipping and foliar spary of cycocel on growth, yield and quality of chickpea (*Cicer arietinum* L.)

M. SUJATHA

2014

MAJOR ADVISOR: Dr. D. S. UPPAR

The laboratory and field studies were carried out during *rabi* 2013-14 (October 2013 to February 2014) at Main Agricultural Research Station, Dharwad, to study the effect of seed hardening, nipping and foliar spray of cycocel on seed yield and quality in Chickpea. The laboratory experiment was laid out in Completely Randomized Design with factorial concept and replicated three times. The laboratory experiment consisted of thirty six treatments comprising of three factors *viz.*, Genotypes (A-1, BGD-103 and JG-11), Chemicals (Water soaking, 2% of CaCl_2 , 0.1% of KCl and 0.2% of ZnSO_4) and Soaking periods (3 hours, 6 hours and 9 hours). The field experiment consisted of twelve treatments and laid out in Randomized Block Design with three replications. Laboratory studies indicated that Cv. Annigeri-1 seeds treated with CaCl_2 (2%) and KCl (0.1%) for three hours showed higher germination per cent (99.00 and 98.00), shoot length (13.65 cm and

11.78 cm), length (21.09 cm and 18.72 cm), seedling vigour index (3278 and 2958), seedling dry weight (373.20 mg and 352.07) and field emergence (92.67 and 91.67%) as compared to other genotypes, chemicals and soaking periods. Results with respect to field experiment revealed that the seed hardening with CaCl_2 (2%) + foliar spray of cycocel (500 ppm) at DAS recorded lower plant height (38.45 cm), more number of branches per cent (26.10), number of pods per plant (38.84), number of seed per pod (1.48), 100 seed weight (25.042 g), seed yield per plot (1.38 kg) and per hectare (1274.31 kg) as compared to other treatments. The seed quality parameters such as germination (99.33%), root length (21.50 cm), shoot length (12.70 cm) vigour index (3272) and dry weight of seedling were significantly higher in the treatment of seed hardening with CaCl_2 (2%) + foliar spray of cycocel (500 ppm) at 45 DAS (395.90 g).

Pre and post emergence control measures for shoot fly incidence and its influence on seed yield and quality of little millet (*Panicum sumatrense*)

D. ARUN KUMAR

2014

MAJOR ADVISOR: Dr. A. S. CHANNAVEERSWAMI

Field experiment was conducted to find out the pre and post emergence control measures for shootfly incidence and its influence on seed yield and quality of little millet. The experiments were conducted at the Agricultural Research Station, Hanumanamatti, University of Agriculture, Dharwad during *kharif* - 2013. Variety used for sowing was Sukshema. The experiment was laid out in simple RBD with 13 treatments replicated thrice. In the growth parameters, Among the pre and post emergence treatments, seed treatment with imidacloprid 600 FS @ 5 ml/kg of seed (T_2) recorded higher plant height at 30 DAS (36.67 cm) at 60 DAS (96.00 cm) and at harvest (133.07 cm), number of tillers (7.5), number productive tillers (6.6), number of leaves at 45 DAS (13) and at harvest (26) and took less number of days to flower initiation (47.13), 50 per cent flowering (50.83) and panicle initiation (53.33) and also recorded significantly

least dead hearts at 20 DAS (2.33%) and 35 DAS (23.20%) with highest decrease in dead hearts over the control (136.76 %). Yield parameters like length of panicle (31.87 cm), weight of panicle (956 g) seed yield per plant (6.5 g) and per ha (2165 kg), dry matter production at harvest of (1595 g/m²) and 1000 seed weight (3.42 g) were significantly higher in seed treatment with imidacloprid 600FS @ 5 ml per kg of seed (T_2) and also recorded highest increase in seed yield over control (49.48%). Seed quality parameters like germination percentage (99.17%), seedling length (21.8 cm), seedling dry weight (3.36 mg), seedling vigour index-I (2156), seedling vigour index-II (332.63), field emergence (92.67%), benefit cost ratio (1.68) were significantly higher in seed treatment with imidacloprid 600 FS @ 5 ml/kg of seed (T_2) and also recorded lesser value of electrical conductivity of seed leachate (0.29 dSm⁻¹).

Effect of spacing and mother plant nutrition on crop growth, seed yield, quality and storability of sesame (*Sesamum indicum* L.)

VEERANNA V. GADAD

2014

MAJOR ADVISOR: Dr. M.N. MERWADE

A field experiment was carried out to study the effect of two spacings *viz.*, S_1 - 30 x 15 cm, S_2 - 45 x 15 cm and eight fertilizer levels *viz.*, F_1 (40:20:20 kg NPK/ha), F_2 (50:20:20 kg NPK/ha), F_3 (50:25:25 kg NPK/ha), F_4 (50:30:30 kg NPK /ha), F_5 (60:30:30 kg NPK/ha, F_6 (50:25:25 kg NPK/ha+ sulphur @ 5 kg /ha), F_7 (60:20:30 kg NPK/ha+sulphur @ 10 kg /ha) and F_8 (40:10:20 kg NPK/ha+sulphur @ 15 kg/ha) on crop growth, seed yield and quality of sesame cv DS-5. Among the two spacings, significantly more number of primary branches per plant (5.57), days to flower initiation (41.21), days to 50 per cent flowering (49.05), number of capsules per plant (78.15), number of seeds per capsules (69.03), weight of capsule (0.392 g), seed weight per capsule (0.205 g), seed yield per plant (4.50 g), seed oil content (45.68%), 1000 seed weight (3.75 g), seed germination (91.63%), seedling vigour index (1776) were noticed in S_2 , whereas plant height (138.30 cm), length of capsule (3.15 cm), seed yield per ha (981.20 kg/ha), seed multiplication ratio (245.3), net returns (Rs. 64,863/ha) and B:C ratio (4.80) was maximum in S_1 . Similar results on crop growth, seed yield and quality parameters were recorded

in F_7 , whereas more number of days to flower initiation (42.40) and days to 50 per cent flowering (49.15) were recorded in F_5 level. Treatment combination of 30x15 cm spacing and 60:20:30 kg NPK/ha+sulphur @ 10 kg/ha fertilizer level ($S_2 \times F_7$) recorded significantly highest weight of capsule (0.410 g), seed weight per capsule (0.210 g), 1000 seed weight (3.97 g), seed germination (93.00%), seedling dry weight (23.70 mg 10 seedlings⁻¹) and least electrical conductivity (0.513 dSm⁻¹) of seed leachate whereas seed yield per ha (1178 kg/ha) was significantly highest in $S_1 \times F_7$ treatment combination. A laboratory experiment was carried out under ambient condition for six months to study the seed storability of sesame cv DS-5 with eight fertilizer levels. The results of the storage studies revealed that the seeds produced from 60:20:30 kg NPK/ha+sulphur @ 10 kg/ha (F_7) maintained highest seed germination (76.50%), vigour index (1336) and least electrical conductivity (1.46 dSm⁻¹) and seed infestation (8.24%) at the end of six months of storage period as compared to control, F_1 (40:20:20 kg NPK/ha) (64.75%, 1047, 1.59 dSm⁻¹ and 23.08%, respectively).

Effect of seed treatment on storability of chilli seeds (*Capsicum annuum* L.)

N. SHRUTHI

2014

MAJOR ADVISOR: Dr. B. S. VYAKARANAHAL

fungicide, insecticide and bioagents on storability of chilli Cv. Byadagi kaddi during 2013-14 at Seed Research Laboratory, Department of Seed Science and Technology, College of agriculture, Dharwad. The seeds were treated with (T₂) Carbendizum 50 W.P. @ 2 g/kg of seeds; (T₃) Tebuconazole 2.5% D.S. @ 2 g/kg of seeds; (T₄) Imidacloprid 70 W.S. @ 10 g/kg of seed; (T₅) Thiamethoxam 25 W.G. @ 2 g/kg of seeds; (T₆) *Trichoderma harzianum* @ 2 g/kg of seed; (T₇) *Pacilomyces lilacinas* @ 2 g/kg of seeds; (T₈) : T₂ + T₃; (T₉) : T₂ + T₄; (T₁₀) : T₂ + T₅; (T₁₁) : T₂ + T₆; (T₁₂) : T₂ + T₇; (T₁₃) : T₃ + T₄; (T₁₄) : T₃ + T₅; (T₁₅) : T₃ + T₆; (T₁₆) : T₃ + T₇; and untreated control (T₁), and were packed in aluminium pouch. At the end of twelve months of storage, the seeds treated with combination of carbendizum and

Imidacloprid (T₉) recorded higher germination (82.15%), root length (8.58 cm), shoot length (5.79 cm), seedling dry weight (38.91 mg), vigour index (1194), field emergence (30.17%), seed weight (0.426 g), and lower electrical conductivity of seed leachate (2.019 dSm⁻¹), moisture content (7.88%), pathogen infection (7.99 %), mobilization efficiency (92.43%) compared to control 75.01%, 5.55 cm, 3.60 cm, 31.34 mg, 681, 26.03%, 0.261 g, 2.267 dSm⁻¹, 8.10%, 10.02%, 0.261 g, 98.83% respectively. The combination of carbendizum and Imidacloprid (T₉) showed better nursery performance with highest plant height (13.43 cm, 29.29 cm at 30, 60 DAS, respectively) and number of branches per plant (8.04, 18.19 at 30, 60 DAS respectively), as compared to the untreated control (T₁).

Studies on organic seed production and storability in green gram (*Vigna radiata* L. Wilczek)

A. FAZULLA SHARIFF

2014

MAJOR ADVISOR: Dr. ASHOK. S. SAJJAN

A field experiment was conducted at Bio-Organic farm, UAS, Dharwad during *khariff* 2013, to study the effect of soil amendments and organic foliar sprays on crop growth, seed yield, quality and storability in green gram cv.DGGV-1. The results revealed that application of phosphorus equivalent to recommended dose through FYM 1/3 + vermicompost 1/3 + glyricidia green leaf manure 1/3 with organic foliar sprays of panchagavya (3%) at initiation of flowering and fifteen days later registered highest plant height (66.33 cm), number of leaves (6.87), number of branches (6.20), pods/plant (21.27), pod length (10.25cm), seeds/pod (12.10), hundred seed weight (5.86 g) and seed yield/hectare (1263.68 kg/ha) with higher B:C ratio (3.52). It also recorded higher germination (95.67%), seedling vigour index (3308), seedling dry weight (65.54 mg) and seed protein content (23.79%). More soil microbial population of bacteria (48.67 x 10⁷ cfu/g of soil),

fungal (25.33x 10⁴cfu/g of soil) and actinomycetes (52.64x 10⁵cfu/g of soil) were observed in same treatment. A storage experiment was conducted in Department of seed science and technology, College of Agriculture, UAS, Dharwad during 2013-14. The seeds treated with neem oil @5 ml/kg recorded higher germination (75.25%), shoot length (10.31 cm), root length (11.55cm), seedling dry weight (50.49 mg), seedling vigour index (1615), less insect infestation (23.50%) with lower electrical conductivity (1.46 dSm⁻¹) and moisture content (8.63%) which was on par with deltamethrin @ 40 mg/kg (76.50%, 10.48 cm, 11.33 cm, 51.64 mg, 1667, 23.25%, 1.42 dSm⁻¹ and 8.54%, respectively). The seeds treated with neem oil and deltamethrin maintained germination above the minimum seed certification standards (75%) along with other seed quality parameters even at the end of six months of storage.

Effect of major and micronutrients, plant spacing and stages of picking on seed yield and quality of cluster bean

GIREESH PALANKAR

2014

MAJOR ADVISOR: Dr. T. A. MALABASARI

The two field experiments were conducted at Agricultural Research Station, Bagalkot during *kharif* 2013. To study the effect of major and micronutrients, plant spacing and stages of picking on seed yield and quality of cluster bean (*Cyamopsis tetragonoloba* L. Taub). The results revealed wider spacing (45 x 30 cm) recorded significantly higher seed yield per plant (10.06 g) but higher (898 kg/ha) seed yield per hectare recorded in medium (45 x 20 cm) spacing. And maximum seed quality parameters such as 100 seed weight, germination percentage and seedling vigour index were consistently higher (3.63 g, 93.92% and 3083, respectively) in the wider spacing of 45 x 30 cm. Among the micronutrient spraying of boron @ 0.1 per cent + zinc sulphate @ 0.5 per cent recorded

significantly higher seed yield per plant (9.59 g) and seed yield per ha (898 kg) along with higher 100 seed weight (3.67 g), germination percentage (93.08) and seedling vigour index (2889). In second experiment fertilizer level of 25:94:75NPK kg/ha recorded significantly higher seed yield per plant (9.49 g) and seed yield per ha (835 kg) along with seed quality parameters such as 100 seed weight (3.53 g), germination percentage (91.56) and seedling vigour index (2791), and lower EC (1.29 dSm⁻¹) were recorded. Picking stage of 100 DAS recorded significantly higher pod yield per plant (21.60 g), seed yield per plant (9.20 g) and seed yield per ha (817.57 kg) along with seed quality parameters viz., 100 seed weight (3.52 g), germination (92.00%), seedling vigour index (2919.07) and moisture content (19.11%).

SOIL SCIENCE AND AGRIL. CHEMISTRY**Studies on C, N, P and S dynamics under different land use systems of a micro-watershed in Northern transition zone of Karnataka**

SABYASACHI MAJUMDAR

2014

MAJOR ADVISOR: Dr. P. L. PATIL

A study was correlation among them selves. The average percentage of inorganic P fractions undertaken during 2012-13 to identify the carbon, nitrogen, phosphorus and sulphur dynamics under different land use systems of Singhanhalli-Bogur micro-watershed in Northern transition zone of Karnataka. Three land use systems [agriculture (paddy land and non paddy land), forest and horticulture] were selected for the study. From each land use system, fifteen surface (0-20 cm) soil samples and one representative profile were collected randomly and exact geographical location of the sample site was recorded using a GPS device. The study revealed that, water soluble carbon and active carbon was recorded the highest under forest land use system. Both the fractions of carbon exhibited significant positive relationship with organic carbon and clay. Total nitrogen content decreased with depth in almost all the profiles. The contribution of inorganic nitrogen fractions to available nitrogen was very low. Significant positive correlation was found between total nitrogen and clay content

under all the land use systems except non-paddy land. The amount of different forms of nitrogen present in different land use systems had shown significant positive in surface soils followed the order; Red. Sol. P>Fe-P>Al-P>Ca-P>Occl-P>S-P (paddy land), Ca-P>Red. Sol. P>Al-P>Occl-P>Fe-P>S-P (non-paddy land), Red. Sol. P>Al-P>Fe-P>Ca-P>Occl-P>S-P (horticulture land), and Red. Sol. P>Al-P>Occl-P>Fe-P>Ca-P>S-P (forest land). P fractions exhibited dynamic equilibrium among themselves. Under paddy land use system, Al-P alone accounted for 40 per cent of the variation. Under horticulture land use system, Fe-P contributed greatly to the available P. The occurrence of forms of sulphur under different land use systems followed the order; Total-S>Organic-S>Heat soluble S>Available sulphur>Water soluble sulphur. Total sulphur and organic sulphur maintained a significant positive correlation with organic carbon and clay content. Heat soluble sulphur contributed significantly to the available pool under all the land use systems.

Characterisation of municipal waste water and its effect on soil properties around Hubli city in North Karnataka

BINCY K. VARKEY

2014

MAJOR ADVISOR: Dr. G. S. DASOG

A study was conducted on characterization of the sewage water and effect of its long-term use (>40 years) for irrigation on soil physical, chemical, and biological properties around Hubli city in North Karnataka. The sewage water samples were collected at monthly intervals from three villages Gabbur, Mavanur, Katnur located along the flow of the sewage stream. In each village, soil samples were collected from three depths (0-20, 20-40, 40-60 cm) at a distance of 50, 150, 250 m, off the stream course. Samples were also collected from the farmers' field not subject to sewage water irrigation as a check. The pH, BOD, COD, total nitrogen, calcium and magnesium in sewage water showed lower concentration in monsoon season compared to winter and summer whereas rest of the parameters did not show any marked difference. The pH, EC, micronutrients and heavy metals concentration (except Mn and Hg) in sewage water were within the range prescribed for irrigation. The TSS,

TDS, BOD, COD, sodium, phosphate, chloride and bicarbonate concentration were above the permissible level suggesting the restriction on the use of sewage water for irrigation. A slight decrease in the bulk density, dispersion index and increase in aggregate stability, percent porosity and MWHC of sewage irrigated fields were observed compared to unirrigated soil profiles. A remarkable increase in the organic carbon content in sewage irrigated soils (6.4 g kg^{-1} in Gabbur, 13.1 g kg^{-1} in Mavanur and 9.4 g kg^{-1} in Katnur) was observed compared to the sewage unirrigated soils (4.5 to 5.9 g kg^{-1}). The available N, P_2O_5 , K_2O status in sewage irrigated soils ranged from 169 to 252 kg ha^{-1} , 41.0 to 79.4 kg ha^{-1} , 252 to 479 kg ha^{-1} respectively. The bacteria, fungi and actinomycetes count were about 94, 80 and 67 per cent higher as compared to that of sewage unirrigated soils. The coliform bacteria (*E. coli*) was observed in soil samples irrigated with sewage water.

Phosphorus management in soybean (*Glycine max* L.) under vertisols of Northern transition zone of Karnataka

G. P. GEETHA

2014

MAJOR ADVISOR: Dr. B. M. RADDER

A field experiment was carried out at main agriculture research station (MARS), Dharwad, during 2013-14 to study phosphorus management in soybean under Vertisols of northern transition zone of Karnataka. The soil of experimental site belongs to the sub group *Chromic Haplustert*. The soil sample was neutral to alkaline in reaction, medium in available nitrogen, phosphorus, potassium and sulphur. Experiment consisted of nine treatments with three replications. Application of phosphatic fertilizer @ 80 kg/ha (cured with FYM) + PSB (seed treatment) + VAM (soil application) (T_9) recorded significantly higher growth and yield parameters compared to RPP (T_3) and application of phosphatic fertilizer @ 60 kg/ha (cured with FYM) + PSB + VAM (T_7). Application of RPP recorded higher protein content and nitrogen uptake by soybean crop compared to phosphatic fertilizer @ 80 kg/ha

(cured with FYM) + PSB + VAM and phosphatic fertilizer @ 60 kg/ha (cured with FYM) + PSB + VAM but these treatments are on par with each other. But oil content and oil yield were higher in phosphatic fertilizer @ 80 kg/ha (cured with FYM) + PSB + VAM. Similarly, application of phosphatic fertilizer @ 80 kg/ha (cured with FYM) + PSB + VAM recorded significantly higher available macro nutrients in soil at harvest. Further, DTPA extractable micronutrients were higher in the treatment that received phosphatic fertilizer @ 80 kg/ha (cured with FYM) + PSB + VAM but non-significant was observed among the treatments. Highest B:C ratio of 3.3 was found in the treatment that received phosphatic fertilizer @ 80 kg/ha (cured with FYM) + PSB + VAM and was on par with RPP and phosphatic fertilizer @ 60 kg/ha (cured with FYM) + PSB + VAM.

Effect of nutrient sources on soil fertility and cowpea (*Vigna unguiculata*) productivity in vertisol of Northern transition zone of Karnataka

D. SOWMYA

2014

MAJOR ADVISOR: Dr. K. K. MATH

A field experiment was carried out to study the effect of nutrient sources on soil fertility and cowpea productivity (*Vigna unguiculata*) at the Main Agricultural Research Station, Farm, University of Agricultural Sciences, Dharwad. The experiment was laid out in split plot design with nutrient sources (organics, organics + chemical fertilizers and only chemical fertilizers) as main plot treatments and foliar spray (cow urine, DAP, panchagavya and water spray) as sub plot treatments. Further, a pot culture study was conducted in RCBD design to know the nutrients release pattern from different sources of nutrients under the study. Application of RDF + FYM @ 5 t/ha significantly improved growth, yield attributing characters and seed yield (1122 kg/ha) in cowpea compared to integrated and 100 per cent organics (716 kg/ha) accounting 32.3 and 19.89 per cent respectively but at par with only RDF treatment. The uptake of nitrogen, phosphorus and potassium was also significantly

higher in RDF + FYM treatment which was on par with only RDF but superior to integrated and 100 per cent organic treatments. Among the foliar applications, DAP @ 2 per cent produced 9.51 and 11.15 per cent higher seed and haulm yield in cowpea than cow urine and control due to higher nutrient absorption. Organic manures either alone or in combinations improved soil physical (bulk density and water holding capacity) and chemical properties (organic carbon content, available nutrients namely N, P, K and S). Higher soil microbial populations (N_2 -fixers and P-solubilizers) biomass carbon and nitrogen were also observed with organic treatments. The experimental results clearly showed that application of organic manures in combination with chemical fertilizers improved the soil fertility and cowpea productivity. The pot culture studies on nutrients release pattern as influenced by sources of nutrients supported the findings of field experimental studies.

TEXTILE AND APPAREL DESIGNING

Clothing merchandising and consumer behaviour

RENUKA P. MEDAR

2014

MAJOR ADVISOR: Dr. SADHANAD. KULLOLI

The study on 'Clothing merchandising and consumer behaviour' was carried out during 2012-14 at Hubli- Dharwad corporation area with the objectives: to study the prevailing merchandising practices in clothing sales; to analyse the clothing purchase behaviour of the consumers and to assess the impact of promotional techniques on merchandising. The study comprised of three parts: first part encompassed of market survey by interviewing thirty readymade shop owners to find out the availability of existing readymade garments for ladies, gents and kids wear, branded readymade garments, source of purchasing garments, sales promotion techniques adopted and reasons for turnover satisfaction to know the prevailing sales promotion techniques. While the second part comprised of consumer survey carried out by personally interviewing 150 consumers visiting the readymade garment shops to study their buying behaviour regarding the preference for type of garments, place of purchase, purchase of garments from a particular shop,

frequency of purchase, annual expenditure on clothing and factors considered while purchasing readymade garments. The third part focused on assessing the impact of sales promotional techniques on merchandising and demographic variables on consumer buying behaviour. The data was analyzed with frequencies and percentages, cluster analysis, Garette ranking and chi square test. The results revealed that, majority of the consumers were attracted by discounts and window display sales promotion techniques while purchasing garments and preferred branded and fashionable garments because of quality, comfort and durability. The demographic variables had highly significant impact on consumer buying behaviour variables. However, according to Garette ranking technique, the consumers ranked first to price, second to style and fit, third to brand name followed by colour, design, fibre content, fashion, texture and care label in order of the factors considered while purchasing.

Asymmetrical outfits with variegated hemlines

SHABINABANU S. NADAF

2014

MAJOR ADVISOR: Dr. SHAILAJA D. NAIK

The present investigation on 'Asymmetrical outfits with variegated hemlines' was carried out during 2012-14 with the objectives to ascertain the information on various silhouettes for upper and lower garments available in local market, to explore the possibilities of adapting new silhouettes and develop asymmetrical garments with variegated hemlines and embellishments for women and finally to assess the cost of production. The methodology involved survey and experimental procedures. According to the survey results of readymade garment shop owners and college going girls of Hubli-Dharwad corporation area, and opinion of the textile experts, five styles of tops and skirts were designed for college girls, by design forecasting, developing mood board, colour & fabric swatch and illustration boards. Initially 15 sketches of different styles of tops with variegated collars, sleeves and skirts with different silhouettes and hem lengths were illustrated and obtained the preference by the textile experts. Five each skirts and tops were finally selected from the 15 illustrations and taken

further for construction. A display was organized to know the acceptance for these asymmetrical outfits by college girls and textile experts. The respondents expressed that the concept of designing asymmetrical styles and their appearance to be excellent. The skirts and tops were designed and constructed incorporating variegated princess stylelines, collars, sleeves, silhouettes, hem lengths for skirts and value addition. The respondents irrespective of the categories, opined that the most appealing and accepted designers asymmetrical outfit was 'handkerchief skirt and shawl collar top with set-in sleeve' followed by 'circular skirt and shirt collar top with puff sleeve', 'peplum skirt and mandarin collar top with shirred sleeve', 'fishtail skirt and convertible collar top with leg-o-mutton sleeve', and least being 'bell skirt and bow tie top with bell sleeve'. The study further throws light on designing asymmetrical outfits for normal and physically challenged girls. Fashion designers may focus on lop-sided garments incorporating several texture, colour ways, fullness, and surface ornamentation.