

ABSTRACTS OF THESES

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

DOCTOR OF PHILOSOPHY

AGRONOMY

Nutrient management approach for mitigating leaf reddening in Bt cotton (*Gossypium hirsutum* L.)

D. SHIVAMURTHY

2014

MAJOR ADVISOR: Dr. D. P. BIRADAR

Two field experiments were conducted on “Assessment of yield loss due to leaf reddening in different Bt cotton genotypes” and “Effect of different foliar sprays on leaf reddening, growth, yield and quality of Bt cotton” during 2010-11 and 2011-12 at Main Agricultural Research Station, Dharwad. Mean of two years data indicate that, Bt cotton hybrid JKCH-99 Bt BG-I with application of RDF (80:40:40 kg NPK ha⁻¹) + FYM (10 t ha⁻¹) + Soil application of MgSO₄ @ 25 kg ha⁻¹ + 1.0% MgSO₄ foliar sprays at 70, 90 and 110 DAS registered significantly higher seed cotton yield (2936 kg ha⁻¹), total dry matter (TDM) production (311.7 g plant⁻¹), yield plant⁻¹ (177.2 g) and total harvested bolls plant⁻¹ (50.5), higher gross returns (₹ 125768 ha⁻¹), net returns (₹ 68994 ha⁻¹) and benefit cost ratio (2.21) with significantly minimum red leaf index (1.14) as compared to other treatment combinations. However, RCH-2 Bt BG-II was on par with JKCH 99Bt BG-I under same treatment. The JKCH-99 Bt BG-I with application of RDF (80:40:40 kg NPK ha⁻¹) + FYM (10 t ha⁻¹) + Soil application of

MgSO₄ @ 25 kg ha⁻¹ + 1.0% MgSO₄ foliar spray at 70, 90 and 110 DAS caused for 29.1 per cent higher seed cotton yield as compared to Chiranjeevi Bt BG-I with application of RDF (80:40:40 kg NPK ha⁻¹) + FYM (10 t ha⁻¹). Further, soil application of MgSO₄ (@ 25 kg ha⁻¹) + 3 foliar sprays of MgSO₄ (1%) and 19:19:19 (1.0%) water soluble fertilizer at 70, 90 and 110 DAS along with RDF + FYM recorded significantly higher seed cotton yield (2781 kg ha⁻¹), yield per plant (177.3 g), TDM (306.7 g plant⁻¹) and number of bolls (48.3 plant⁻¹) as compared to other treatments. The treatment also recorded higher total chlorophyll content (1.452 mg g⁻¹ fresh weight), SPAD value (41.3), nitrate reductase activity (84.52 µg NO₂ g⁻¹ fresh weight), net return (₹ 62563 ha⁻¹), B:C ratio (2.10), lower content of anthocyanin (0.128 mg g⁻¹ fresh weight) and lower red leaf index at 90 and 110 DAS (0.47 and 0.70, respectively) over other treatments.

Performance of oat genotypes as influenced by cutting interval and nitrogen levels under fodder-food production system in northern transition zone of Karnataka

P. A. SMITHA PATEL

2014

MAJOR ADVISOR: Dr. S. C. ALAGUNDAGI

A field experiment entitled “Performance of oat genotypes as influenced by cutting interval and nitrogen levels under fodder-food production system in northern transition zone of Karnataka” under irrigated condition was conducted at Agriculture College Farm of UAS Dharwad during rabi 2011-12 and 2012-13. The experiment was laid out in RCBD with factorial concept and replicated thrice, with 18 treatment combinations involving three genotypes (Kent, JHO-822 and JHO-99-2), three nitrogen levels (90, 120 and 150 kg N ha⁻¹), two cutting intervals (55 and 65 DAS for fodder harvest) and with two control (fodder-fodder system and raised for grain purpose). Genotype JHO-99-2 recorded significantly higher green forage (37.71 t ha⁻¹), dry matter yield (7.45 t ha⁻¹) and yields of all the quality parameters compared to JHO-822 and Kent. Among nitrogen levels, 150 kg N ha⁻¹ recorded significantly higher green forage (39.41 t ha⁻¹), dry matter yield (7.79 t ha⁻¹), content and yield of all the quality parameters

compared to 120 and 90 kg N ha⁻¹. The cutting interval of 65 DAS harvested for fodder recorded significantly higher green forage (35.39 t ha⁻¹), dry matter yield (7.19 t ha⁻¹) and yields of all the quality parameters. The genotype Kent recorded significantly higher grain (2121 kg ha⁻¹), straw yield (3.84 t ha⁻¹) and contents of quality parameters. Among the nitrogen levels, 150 kg N ha⁻¹ recorded significantly higher grain (1836 kg ha⁻¹), straw yield (3.75 t ha⁻¹) and contents of all the quality parameters. Whereas, cutting intervals were contrary to forage yield with 55 DAS recorded significantly higher grain (1870 kg ha⁻¹), straw yield (3.51 t ha⁻¹) and contents of all the quality parameters. Oat genotype JHO-822 with 150 kg ha⁻¹ nitrogen with cutting interval for fodder at 55 DAS produced higher green forage (38.14 t ha⁻¹), grain yield (1948 kg ha⁻¹), net returns (₹ 41780 ha⁻¹) and benefit cost ratio (2.16) with superior forage and grain quality under fodder- food production system.

AGRICULTURAL ENTOMOLOGY

Studies on survey, seasonal incidence, varietal screening and management of major insect pests of pigeonpea in the northern transitional zone of Karnataka

BANDI SANJAY MARUTI

2013

MAJOR ADVISOR: Dr. L. KRISHNA NAIK

Investigation on survey, seasonal incidence, varietal screening and management of insect pests of pigeonpea in the northern transitional zone of Karnataka was carried out at MARS, UAS, Dharwad during 2011 to 2013. The pest spectrum of pigeonpea in the northern transitional zone included 31 insect pests belonging to orders lepidoptera, hemiptera, coleoptera, diptera, thysanoptera, hymenoptera and orthoptera. The studies revealed that the highest population of insect pests on pigeonpea was recorded in Haveri followed by Dharwad and lowest in Belgaum district. The peak activity of pod borer, *Helicoverpa armigera* (Hubner) was observed during 48th week (November) for both the years of study. The maximum population of plume moth was noticed at 47th (November) and 48th week (November) during first and second year. The influence of different dates of sowing on pest incidence revealed that the early sown pigeonpea crop (1st week of June, 3rd week of June and 1st week of July) registered lower incidence of pest and higher grain

yield. The field screening of pigeonpea cultivars for their tolerance to pest damage revealed that ICP-8863 registered least inflorescence damage by flower webber, *Maruca vitrata* (Geyer). The cultivar, BSMR-736 suffered with lesser damage by leaf webber (*Grapholita critica* Meyr.) and gram pod borer (*H. armigera*). The incidence of bud weevil, *Ceuthorrhynchus asperulus* (Faust.), pod bugs (*Anoplocnemis phasiana* (Fabricius), *Riptortus pedestris* (F.) and *Clavigralla gibbosa* Spinola), plume moth, *Exelastis atomosa* (May.) and pod fly, *Melanagromyza obtusa* (Malloch) were least on cultivar, GC-11-39. The efficacy of different insecticides tested revealed that indoxacarb 14.5 SC (0.5 ml/l), spinosad 45 SC (0.3 ml/l), emamectin benzoate 5 SG (0.2 g/l) and flubendiamide 480 SC (0.1 ml/l) were highly effective against *H. armigera*. Among the entomopathogens tested, *HaNPV* (250 LE/ha) and *Bacillus thuringiensis* (2.0 kg/ha) were found superior in suppressing the population of *H. armigera*.

Studies on present status of white grub, *Holotrichia serrata* (Fabricius) (Coleoptera; Scarabaeidae) in Belagavi district and its management

P. S. TIPPANNAVAR

2013

MAJOR ADVISOR : Dr. R. R. PATIL

Studies carried out in Belagavi district of Karnataka during 2011 and 2012 on species composition, population dynamics, behavior pattern of adult white grub, loss estimation, both laboratory and field evaluation of entomopathogens and newer chemical insecticides revealed that *Holotrichia serrata* and *Holotrichia fissa* were the dominant species in irrigated and rain fed ecosystem respectively. Adult emergence of *H. serrata* commenced from 7th Meteorological Standard Week (MSW) (February) and continued upto 18th MSW (May), whereas in rainfed ecosystem adult emergence of *H. fissa* was recorded from 14th MSW (April) and continued upto 22 MSW (May). Adult trapping with various sources indicated that neem (*Azadirachta indica*) was the best source to trap the adults of *H. serrata*. Studies on host range indicated the spread of white grub population from sugarcane to other crops namely, groundnut, soybean, maize, paddy, turmeric and vegetables under *kharif* and wheat, sorghum and bengalgram under *rabi* conditions. Fungal pathogens evaluated

under laboratory conditions against second instar *H. serrata* grub revealed that the combination of *Metarhizium anisopliae* and *Beauveria bassiana* @ 4x10⁹ conidia/g was most effective but on par with *M. anisopliae* and *B. bassiana* alone @ 4x10⁹ conidia/g. Similar to laboratory conditions field evaluation of fungal pathogens for two years (2011-2012) revealed that higher dosages of fungal pathogens @ 25 kg/ha and FYM @ 125 kg/ha were more effective in reducing grub population significantly. Field evaluation of novel insecticide revealed that significant superiority of imidacloprid + fipronil 80 WG @ 1000 g/ha and on par with rynaxypyr 4G @ 20 kg/ha, lambda cylothrins 5 EC @ 1500 ml/ha and imidacloprid 17.8 SL @ 1000 ml/ha were found superior to other insecticides by recording higher larval mortality. Among the five sugarcane genotypes screened both under protected (*M. anisopliae*) and unprotected conditions against *H. serrata* grub. CoM 265 variety emerged as tolerant followed by CoSnk 03632.

FOOD SCIENCE AND NUTRITION

Prevalence and management of adolescent obesity through millet based foods

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2013

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An investigation was undertaken with an objective to know the prevalence of adolescent obesity, assess nutritional status, develop millet based low calorie food for obese adolescents and know its impact on management of obesity. A total of 1000 adolescents of 13 to 17 years were selected from both rural and urban Dharwad to know the prevalence rate. Further, 100 obese adolescent subjects were selected to study the nutritional status. Information pertaining to demographic profile, socio economic status, nutritional status, food habits and activity pattern were collected by pretested questionnaire. Little millet based low calorie noodles and foxtail millet bread were developed and evaluated for their physical characteristics. To know the impact of millet based foods in management of obesity, an intervention was carried out for a period of 90 days (Control =14 and experimental =12). Six popular and frequently consumed foods were prepared by modifying standard recipes. Habitual lunch of experimental

subjects was replaced with six little millet foods. The prevalence of obesity was more in boys (urban=4.02%, rural=1.18%) compared to girls (urban=1.69%, rural 0.41%). Both abdominal and general obesity was more in girls compared to boys. Intake of protein and fat was high where as minerals and vitamins were lower than the RDA. Energy expenditure was less. Intervention with millet foods resulted in reduction in body weight (-2.42%), BMI (-7.23%), total cholesterol (-1.17%), triglycerides (-4.01%), LDL-C (-0.15%), TC: HDL-C ratio (-0.79%) and LDL-C: HDL-C ratio (-0.95). Millet intervention proved beneficial by increasing haemoglobin (4.59%) and HDL-C (0.49%) in the experimental group. Low level of physical activities, consumption of energy dense foods resulted in positive energy balance. Intervention for a period of 90 days with little millet based foods resulted in marginal reduction in body weight and lipid profile of obese adolescents.

HORTICULTURE

Evaluation of genotypes and standardization of production technology in coriander

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2013

MAJOR ADVISOR : Dr. RAMAKRISHNA V. HEGDE

Studies were conducted in *rabi* 2009-10 and 2010-11 to evaluate the performance of different genotypes of coriander and to know the effect of dates of sowing and row spacing on yield and quality in coriander at Agricultural Research Station, Janwada Farm, Bidar. Among the 41 genotypes evaluated Hisar Sugandh was found to be superior recording seed yield of 11.64 q/ha along with higher oil yield. It was also the superior genotype among the long duration genotypes. GCr-2 (7.70 q/ha seed yield) was the superior genotype under medium duration group whereas, the check variety DWD-3 remained the superior genotype among the short duration types. High phenotypic and genotypic coefficients of variation were observed for all the characters except plant height at harvest, 50 per cent flowering, umbellets per umbel, seeds per umbellet and 1000 seed weight. Heritability estimates were of very high magnitude for all the characters. The highest heritability

estimates were obtained for plant height at flower initiation (99.44) followed by plant height at harvest (99.07). The highest genetic advance over mean was obtained for essential oil content (136.90) followed by essential oil yield per hectare (131.97) and seed yield per plant (109.67). Study on effect of dates of sowing and row spacing in coriander cv. CO-4 consisted of five dates of sowing (D₁ - 1st October, D₂ -15th October, D₃ - 1st November, D₄ - 15th November and D₅ - 1st December) as main plot treatments and three row spacings (S₁ - 15 x 15 cm, S₂ - 22.5 x 15 cm and S₃ - 30 x 15 cm) as sub plot treatments with three replications. Seed yield per plot, seed yield, and essential oil yield were observed to be significantly highest in D₂ (188.91 g, 6.46 q/ha and 2.57 kg/ha, respectively), S₂ (124.48 g, 4.21 q/ha and 1.65 kg/ha, respectively) and among the treatment combinations in D₂S₂ (213.26 g, 7.18 q/ha and 2.85 kg/ha, respectively).

PLANT PATHOLOGY

Studies on soil borne diseases of Stevia and their management with special reference to *Sclerotium* wilt

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2013

MAJOR ADVISOR : Dr. YASHODA R. HEGDE

Stevia rebaudiana an important medicinal crop is infected by soil borne fungal pathogens like *Sclerotium rolfsii*, *Fusarium solani* and *Rhizoctonia bataticola* among which *S. rolfsii* is becoming a major threat in establishment of crop on a commercial basis. Survey on disease incidence in Karnataka revealed 6.25 to 42.75 per cent incidence. PDA, Richards's broth, sucrose and potassium nitrate supported maximum growth of all three pathogens. Maximum growth of *S. rolfsii* was observed at 10 days of incubation at 30°C to 35°C temperature and at 4.0 pH, *F. solani* at 12 days of incubation at 25°C to 30°C temperature and at 6.5 pH, *R. bataticola* at 12 days of incubation at 25°C to 30°C temperature and at 7.0 pH. The study on variability indicated that all isolates showed marked differences in their growth rate, time taken for sclerotial initiation, colour, size and weight of sclerotial body. Virulence was correlated with many aspects; small sized sclerotia, high virulence index and more oxalic acid production (SrGKVK,

SrKAL, SrSAI, SrRCR and SrBGM). RAPD analysis with 24 random primers grouped 14 isolates into three major clusters. ITS region of rDNA amplification with ITS1 and ITS4 universal primers produced approximately 650 to 700 bp confirmed the identification of *S. rolfsii*. Increase in total phenol and decrease in sugar content was recorded due to infection of *S. rolfsii*. Host range studies revealed that coleus, aloe, mint, brahmi and patchouli were collateral hosts. In the interaction studies, simultaneous inoculation of all three pathogens recorded 100 per cent wilt incidence. Under *in vitro* studies, *Trichoderma harzianum* among bioagents; duranta, glyrecidia and multineem among the botanicals; mancozeb, thiram and captan among contact fungicides, propiconazole and hexaconazole among systemic fungicides were effective against all three pathogens. In field, soil drenching of hexaconazole @ 0.1% helps to manage disease effectively and to increase the yield.

SEED SCIENCE AND TECHNOLOGY

Standardization of seed production technologies in lucerne (*Medicago sativa* L.) cv. RL-88

ARUNAKUMAR

2014

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An investigation entitled Standardization of seed production technologies in lucerne (*Medicago sativa* L.) cv. RL-88 was carried out during *rabi*-summer seasons of 2010-11 and 2011-12 at Indian Grassland and Fodder Research Institute, Southern Regional Research Station, Dharwad and Department of Seed Science and Technology, University of Agricultural Sciences, Dharwad with four field and two laboratory experiments. The results on the cutting management practices revealed that two cut (T_2) treatment recorded significantly the highest seed yield (228.93 kg/ha.), seed quality parameters like seed germination (87.50 %), seedling vigour index (1152). Among the different time of sowing treatments, sowing on December 14th registered significantly higher growth, seed yield (222.41 kg/ha.), seed quality like seed germination (87.13 %) and seedling vigour index (1137). Seeds harvested from two cut treatment and 14th December sown crop showed higher seed quality

parameters during all the months of ambient storage over other cutting management and time of sowing treatments. The seeds stored in polyethylene bag (700 gauge) were superior over cloth bag throughout the storage period. Among the supplementary pollination techniques, spraying of Jaggery solution (10 %) recorded highest seed setting (61.73 %), seed yield (297.90 kg/ha) and seed quality traits like seed germination (87.59 %), seedling length (12.89 cm) and seedling vigour index (1129) as compared to other techniques. The experiment on seed development and maturation studies revealed that harvesting of pods and seeds on 35 days after anthesis (DAA) produced higher seed quality attributes like seed germination (85.67 %), seedling length (13.86 cm), seedling vigour index (1187). It also indicated that harvesting pods on 35th DAA is the actual physiological maturity stage for obtaining better seed quality in lucerne.

MASTER OF SCIENCE

AGRIBUSINESS MANAGEMENT

Value addition in bengal gram – a business management appraisal

AMIT KUMAR

2013

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Bengal gram is an important pulse crop in India, belongs to Leguminosae Family. In Karnataka it is grown in a area of 7.3 lakh hectare, with a productivity of 575 kg/ha. Gadag district has an area of 69488 hectares with a production of 48641 tonnes and with a productivity of 700 kg/ha. In Karnataka 4427 small and medium scale Bengal gram mills and 291 Bengal gram mills in Gadag district. For the purpose of fulfilling the objectives of the study, data were analysed by tabular presentation method. The overall average of total fixed capital investment in the Bengal Gram processing unit was found to be ₹ 78.64 lakh. It was observed that in the study area, the Bengal Gram processing units procure raw material (seeds) through two channels, they are: Pattern. I- Farmer→Processing unit/ processor. Pattern. II- Farmers→Commission agent→processor. Among the processing units

the cost of procurement of raw material was high in flour mill compared to other units and the cost of returns was also found to be high in flour making unit. The cost of marketing of the products was high in channel-II as compared to channel I. The major problems faced by the units high cost of transport, inadequate power supply and labour availability. The fixed capital investment was high as compared to in all types of processing units. In the procurement of raw material by the units was mainly from channel-I which is found to be less costly. The average total cost of processing one quintal of dal was ₹ 881.14 and returns was ₹ 4752. The benefit cost ratio was found to be 1.08, 1.12 and 1.18 in dal, Fried gram and flour mills, respectively. Therefore the establishment of integrated processing units may be encouraged in the production area of Bengal gram.

AGRICULTURAL ECONOMICS

Microcredit impact analysis on agricultural productivity and income of small and marginal farmers in Dharwad district

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2014

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In developing countries like India, among other things, lack of finance is one of the fundamental problems hampering production, productivity and income of rural farm households. Since access to institutional finance is very limited, the majority of the poor are forced to search financial services through informal channels with higher rate of interest. The study was sought the impact of access to microcredit on agricultural productivity and income of small and marginal farmers in Dharwad district. A multi-stage sampling method was employed to select two taluks out of five taluks and 120 farm households. Structured interview schedule was developed, pre-tested and used for collecting quantitative data for the study from the sampled farm households. Descriptive statistics, budgetary technique and logit model, were employed in analysing data. The results revealed that beneficiary's productivity of major crop cultivated such

paddy, maize, cotton and groundnut per hectare was significantly greater than non-beneficiaries productivity per hectare. Beneficiaries of microcredit earned significantly higher income level on average (₹ 52,900) as compared to non-beneficiaries (₹ 20,100). It was also found out that, microcredit helped beneficiaries of microcredit to generate more employment on average (176 man days/annum) than non-beneficiaries of microcredit (144 man days/annum). This suggesting that, access to agricultural credit could lead to improved farmers' productivity and income. This study therefore concluded that to improve farm productivity and income of the farmers' government policies design should emphasise more rural financial outlets to the financial institutions, whose lending should be timely and in larger amounts without discriminating against small and marginal farmers.

Economics of cotton based inter cropping systems in Gadag district of Karnataka

SANGAMESH B. MANGOJI

2014

MAJOR ADVISOR : Dr. M. T. DODAMANI

Focus of the present study was on economic evaluation of the cotton based inter cropping systems in Gadag district. The impact of different cotton based inter cropping systems on cost, returns and profit of farmers would through light on and enable the farmers to plan for the right cropping system. A sample size of 120 farmers was selected using multistage random sampling method and data were elicited for the agriculture year 2012-13 through survey method. The techniques of tabular and functional analysis were employed. CS-I (onion + chilli + cotton), CS-II (groundnut + cotton), CS-III (greengram + cotton) and CS-IV (cotton sole crop) were the four important cotton based inter cropping systems followed in the study area. Under rainfed condition, it was found that, per hectare total variable cost was high in CS-I (₹ 48311.50), followed by CS-II (₹ 42140.80), CS-III (₹ 36263.50) and CS-IV (₹ 33274.20). The hectare total fixed cost was high in CS-IV

(₹ 6193.60), followed by CS-I (₹ 6182.40), CS-II (₹ 6143.20) and CS-III (₹ 6129.76). The maximum net returns were found under CS-I (₹ 53637.10/ha), followed by CS-II, CS-III and CS-IV (₹ 36635.00, ₹ 30272.30 and ₹ 26987.30/ha, respectively). Returns per rupee of investment was found to be highest in CS-I (1.98), followed by CS-II, CS-III and CS-IV with values of 1.75, 1.71 and 1.68, respectively. The results of the functional analysis revealed that the ratio of MVP to MFC was greater than one for seed positive for FYM, fertilizer and PPC under different cropping system, indicating further scope for using additional units of these inputs to increase gross income. Majority of farmers faced the problems of exogenous factors, non availability of water for irrigation, non availability of labour, price fluctuation, lack of storage facilities, scarcity of own fund which lead to uncertainty of income to the farmers.

Production and marketing of organic arecanut and pepper in Uttara Kannada district – an economic analysis

PRAVINKUMAR KUMBAR

2013

MAJOR ADVISOR : Dr. S. S. GULEDGUDDA

Production and marketing of organic arecanut and pepper in Uttara Kannada district – an economic analysis was carried out during 2012-13 in terms of financial feasibility of investment, costs and returns in arecanut + pepper mixed cropping orchards under both organic and inorganic methods and marketing channels and problems faced by farmers in production and marketing of arecanut and pepper. Primary data were collected from 120 sample farmers comprising of 60 organic and 60 inorganic farmers spread over entire three predominantly arecanut and pepper growing taluks of the district. For analysis of data, tabular analysis, budgeting technique and investment appraisal analysis were employed. The per hectare total initial cost and maintenance cost incurred were found to be ₹ 6,42,676 and ₹ 1,27,135 under organic methods and ₹ 7,02,508 and ₹ 1,45,032 under inorganic methods respectively. The average per hectare yield of arecanut and pepper under organic methods was 19.94 and 2.08 quintals, respectively

with a net returns of ₹ 4,93,461, whereas under inorganic methods it was found to be 21.96 and 2.31 quintals respectively with a net returns of ₹ 4,86,944. Under investment appraisal analysis pay back period (PBP), net present value (NPV@ 12.00 per cent discount rate) benefit cost ratio and internal rate of return (IRR) were found to be 7.80 years, ₹ 6,67,552, 1.74 and 23 per cent under organic methods, whereas 8.02 years, ₹ 5,59,219, 1.56 and 21 per cent under inorganic methods respectively. Under marketing channels, organic pepper marketing channel was more efficient with a marketing efficiency of 4.73. The major problems faced by farmers were non-availability of labour and information on organic farming, absence of premium price in the local market. The study suggested for partial mechanization of operations, large scale multiplication of organic inputs, and establishment of suitable markets for organic produce.

AGRICULTURAL ENTOMOLOGY

Studies on maize cob borer complex and their management

NEELAKKA GOUDAR

2014

MAJOR ADVISOR : Dr. C. P. MALLAPUR

Investigations on maize cob borer complex and their management were undertaken at Main Agricultural Research Station, UAS, Dharwad during kharif 2012-13. The studies revealed five species of insect pests feeding on maize cobs. The peak population of *Helicoverpa armigera* and *Chilo partellus* were noticed during second and fourth week of September, respectively. Whereas, the peak population of *Stenachroia elongella*, *Sesamia inferens* and *Euproctis* spp. were found during fourth, second and third week of October, respectively. The cob damage was as high as 28.04 per cent during fourth week of October followed by third week of October (27.42%). The maximum activity of *Coccinella septempunctata*, *Menochilus sexmaculatus*, and *Chrysoperla zastrowii* were noticed during third week of September, second week of October, fourth week of October, respectively. Among the ten maize hybrids tested for their reaction to cob borers, Arjun,

DKC- 8101, Maharaja and Bioseed-9681 were found less susceptible, where as 900M Gold, CP-818 and NK-6240 were found highly susceptible. Higher population of *C. septempunctata*, *M. sexmaculatus*, *C. zastrowii* were recorded in Arjun, Bioseed-9681, CP-818 and PAC-740 while, the minimum activity was noticed in 30B-07, NK-6240, DKC-8101 and Pinnacle. Among the various insecticides and biopesticides evaluated against maize cob borers, emamectin benzoate 5SG @ 0.2 g/l proved to be highly effective followed by profenophos 50EC @ 2.0 ml/l and spinosad 45SC @ 0.1 ml/l. However, the biopesticides particularly, *Beauveria bassiana* @ 2.5 kg/ha and *Nomuraea rileyi* @ 2.0 g/l were found to be the less effective. The other molecules viz., carbaryl 50WP@ 4.0 g/l, thiodicarb 70WP @ 1.0 g/l, indoxacarb 14.5EC @ 0.25 ml/l and nimbecidine @ 3.0 ml/l recorded moderate effectiveness against the cob borers.

Bioefficacy of phytoformulations against mulberry thrips and their effect on mulberry and silkworms

RAMRAO

2014

MAJOR ADVISOR : Dr. S. G. RAYAR

Twenty six mulberry genotypes were screened against thrips, *Pseudodendrothrips mori* during summer of 2011 revealed that MR-2 (17.60 thrips/leaf) harboured more thrips followed by V-1 (9.46 thrips/leaf) and lowest thrips population recorded in Mysore local (5.58 thrips/leaf) at 25 day after pruning. On 20th, 30th and 40th days after pruning phytoformulations were sprayed on mulberry against thrips. Among the phytoformulations Dashparni 5 per cent (3.06 thrips/leaf), Neem oil 3 per cent (3.17 thrips/leaf) and Pongamia oil 3 per cent (3.41 thrips/leaf) significantly reduced the thrips population as compared to untreated control (21.35 thrips/leaf) and were next best to DDVP 0.076 per cent (1.86 thrips/leaf). The safety of phytoformulations sprayed leaves to silkworm showed that Thuja leaf extract 3 per cent was safe from second day, 3 days for Neem leaf extract 5 per cent, NSKE 5 per cent,

Coconut+Sorghum leaf extract 4 per cent and Biodigester 10 per cent. Pongamia leaf extract 5 per cent, Vitex leaf extract 5 per cent and Dashparni 5 per cent were safe from fourth day after spray. Neem oil 3 per cent and Pongamia oil 3 per cent were safe to silkworms from seventh and eight day after spray, whereas DDVP 0.076 per cent was safe from 10th day of spraying. Highest leaf moisture in top and middle leaves was recorded in all the treatments except untreated control. In top leaves highest chlorophyll was recorded in Vitex leaf extract 5 per cent (31.33) sprayed leaves. Mulberry leaf yield was highest in Biodigester 10 per cent (540.17 g/plant), followed by Neem oil 3 per cent (533.31 g/plant) sprayed leaves. The highest chawki larval weight (2.92 gm/10 larvae) and mature larval weight (39.17 g/10 larvae) was recorded in Biodigester 10 per cent spray other. Highest cocoon yield was recorded in Biodigester 10 per cent (786.14g/df).

AGRICULTURAL EXTENSION EDUCATION

Awareness and perception of integrated farming system by SC/ST farmers

M. D. YOUNUS

2013

MAJOR ADVISOR : Dr. N. MANJULA

A Study on "Awareness and perception of integrated farming system by SC/ST farmers" was undertaken during 2012-13 with a sample of 117 farmers. The data was collected by personal interview method using structured schedule to assess the awareness and perception of farmers regarding integrated farming system (IFS), socio-personal characteristics of farmers. The data was analysed using statistical tools viz., frequency, percentage and correlation. It was found clear that 35.89 per cent of the respondents had high awareness followed by low 31.62% and medium 32.47% awareness about IFS, respectively. A maximum number of SC/ST farmers had high awareness about the fact that, IFS is an integrated crop and animal enterprises components (82.90%). More than half of the respondents were under old age (56.42%) followed by middle age (35.04%) and young age (8.54 %). Most of the SC/ST farmers attended the krishimela (60.68%), followed by demonstration (41.03%), training

programmes (29.06%), agriculture exhibition (28.21%), educational tours and field days (23.93%), field visits (22.22%), and group meeting (11.97%). Forty seven per cent of the farmers were illiterates followed by farmers who had studied up to primary school level (38.46%), middle school level and high school (4.27%), PUC (3.42%) and degree level (2.58%). Majority of the SC/ST farmers (49.57%) were having high perception towards integrated farming system, while 22.22 per cent of them had low perception and the remaining 28.20 per cent belonged to medium level perception of IFS. Education, Family size, land holding, farming experience, organization participation, extension participation, extension contact, mass media exposure, and Utility of income generated were positively and significant related with perception, the other one variable age did not show significant relation with perception of IFS farmers.

EXTENSION AND COMMUNICATION MANAGEMENT

Impact of nutrition and health education intervention on rural high school students

PREETY

2014

MAJOR ADVISOR : Dr. UMA S. HIREMATH

The study was undertaken in the year 2013-2014 in Alnavar village of Dharwad district of Karnataka with a sample size of 75 rural high school students. An education intervention of before and after experimental design was provided on nutrition and health with the help of lecture supported by power point presentation and flash cards. The change in knowledge was measured by assessing pre and post test with the help of structured interview schedule. The retention of knowledge was measured through the same schedule after 15 and 30 days of delivered lesson. Among the five chapters of nutrition, the increase in number of students who gave correct answers were maximum in water and dietary fibre (26.67%) followed by minor millets (22.67%), healthy cooking methods (21.34%), food (20.00%) and balanced diet (17.33%) after the intervention. With reference to health maximum change in number of students who answered correctly was regarding community health (36.00%)

followed by protein energy malnutrition (34.67%), personal health (29.33%), school health (25.33%) and deficiency diseases (22.67%). A highly significant difference in mean knowledge scores of students was found in both nutrition and health. The mean retention scores of the students decreased after 15 days but increased after 30 days. The overall mean retention score of the students with respect to knowledge about nutrition was 72.67 before the intervention which was increased to 82.44 after 30 days of the intervention. A change in mean retention scores of the students from 69.31 to 84.47 with regard to health in the tests before and after 30 days of the education intervention was noted. The difference in the mean retention scores regarding nutrition and health was found to be highly significant. Thus, it is clear that the education intervention had a positive impact on the knowledge and retention of the students regarding nutrition and health.

FOREST WATERSHED MANAGEMENT

Studies on effect of moisture conservation measures and nutrient management on growth of *Pongamia pinnata* in Varada watershed area

S. KOTRESH

2014 MAJOR ADVISOR : Dr. MALLIKARJUNAPPA GOWDA

Soil and moisture conservation measures are one of the most important factors for the improvement of degraded lands. The rainy season is usually short but occasional rainfall can take the storm of heavy surface runoff. Moisture conservation measure is to achieve the maximum cultivated soil for the survival and growth of trees. There is need to diverse suitable techniques of moisture conservation measures and nutrient management. A field experiment was carried out at Karjagi of Haveri taluk during 2012-2013 on "Moisture conservation measures and nutrient management on growth of *Pongamia pinnata* with Ring basin, Crescent bunds, control and organic manures as Vermicompost (2.5 t/ha), FYM (5 t/ha) and *Glyricidia* (1.25 t/ha) and also inorganic fertilizers 100:50:100 N: P₂O₅:K₂O

kg/ha and 150:75:150 N: P₂O₅: K₂O kg/ha. Significantly maximum plant height was observed in Ring basin + Vermicompost @ 2.5 t/ha + 150:75:150 N, P₂O₅, K₂O kg/ha was recorded significantly higher plant height (3.62 m) at 12 months after treatment. Collar diameter (4.04 cm) and crown diameter (2.54 m) recorded significantly higher in ring basin at 12 months after treatment. Significantly maximum number of branches was observed in Ring basin + Vermicompost @ 2.5 t/ha + 150:75:150 N: P₂O₅:K₂O (34.13). In ring basin + Vermicompost @ 2.5 t/ha + 150:75:150 N, N: P₂O₅:K₂O had recorded significantly higher on organic carbon (0.82), pH (5.89), available nitrogen (318.45 kg/ha) and phosphorous (28.45 kg/ha) potassium (185.60 kg/ha) over the other treatment.

Studies on effect of *in-situ* moisture conservation measures and organic manures on growth of *Simarouba glauca* in Varada watershed area

MANIKHANTHA M. VAIDYA

2014

MAJOR ADVISOR : Dr. GOPAL V. DASAR

Soil and water conservation measures are one of the most important factors for the improvement of degraded lands. Water conservation technique like *in-situ* soil moisture conservation measures and application of organic manures is to achieve the maximum cultivated soil for the survival and growth of seedlings. A field experiment was carried out at Karjagi village, Haveri Taluk of Haveri district with a land slope of 3-4 per cent during 2012-2013 on "Studies on effect of *in-situ* moisture conservation measures and organic manures on growth of *Simarouba glauca* in Varada watershed area" with four main treatments viz., Conservation pit, Ring basin, Half ring basin, Control and four sub treatments with organic manures viz., Farm yard manure (5 t/ha), Vermicompost (2.5 t/ha), Poultry manure (0.75 t/ha) and Control.

Significantly higher plant height was recorded in ring basin with Vermicompost (2.5 t/ha) at 12 months after treatment (1.94 m). Plant collar diameter (3.97 cm), crown diameter (133.83 cm) and number of leaves (63.07) recorded significantly higher in ring basin with Vermicompost (2.5 t/ha) at 12 months after treatment. Soil moisture content at 0-30 cm (7.77 %) and 30-60 cm (13.07%) recorded significantly higher in the treatment receiving ring basin with Vermicompost (2.5 t/ha) at 10th month over the other treatments. In combination of Ring basin with Vermicompost (2.5 t/ha) had recorded significantly higher on organic carbon (1.01%), higher available nitrogen (277.13 kg/ha), phosphorus (27.81 kg/ha) and potassium (170.54 kg/ha) over the other treatments.

Studies on effect of moisture conservation structures and nutrient management on growth of *Melia dubia*

T. P. NIVEDITHA

2014

MAJOR ADVISOR : Dr. S. S. SHIRAHATTI

On global scale soil moisture conservation methods have been recognised to play an important role in solving the problem of erosion, siltation of lowlands and retaining the productivity of soil. Soil moisture and nutrients are critical for better growth. There is need to diverse suitable techniques of soil moisture conservation and also nutrient management. A field experiment was carried out at Malagi, Uttara Kannada district with a land slope of 2% during 2012 - 2013 on the Effect of moisture conservation structures and nutrient management on growth of *Melia dubia* with four main treatments viz., Conservation pit, Ring basin, Half ring basin, Control and four sub treatments viz.,

Farmyard manure (5 t/ha), Vermicompost (1.25 t/ha), NPK (100:50:100 kg/ha), NPK (150:75:150 kg/ha). Significantly higher plant height was recorded in ring basin with NPK (150:75:150 kg/ha) at 12 months after treatment (5.53 m). Plant collar diameter (3.81 cm), crown diameter (2.53 m), Basal area (11.65 cm²) and number of leaves (32.73) recorded significantly higher in ring basin with NPK (150:75:150 kg/ha) at 12 months after treatment. Soil moisture content at 0 - 30 cm (13.53%) and 30 - 60 cm (14.53%) recorded significantly higher in treatment receiving ring basin with NPK (150:75:150 kg/ha) in 10th month over the other treatments.

GENETICS AND PLANT BREEDING

Association analysis for taxonomic traits using transposon specific markers (*AhMite*) in a mutant population of groundnut

VENKATESH

2014

MAJOR ADVISOR : Dr. A. G. VIJAYAKUMAR

A population consisting of 53 mutants, their parents and eight cultivated varieties belonging to two subspecies of groundnut were evaluated during *kharif* 2012 for taxonomic, productivity and nutritional traits, and

resistance to late leaf spot (LLS) and rust to assess any association between these traits and the transposable element (TE) markers. Genotypes showed significant differences, and high PCV and GCV for all the traits. Based on

the taxonomic traits like main stem flowering and growth habit, 21 and 40 genotypes were classified under *ssp. hypogaea* and *ssp. fastigiata*, respectively. Of the 41 TE markers used for genotyping the population, many showed high genotype discriminating power in terms of polymorphism information content (PIC). The overall marker polymorphism across various mutant-parent pairs was 17.56 per cent. Highest (47.62%) polymorphism was observed between Dharwad Early Runner (DER) and its mutant VB 6. However, VR 1A versus VR1B, 45 versus 45 (S), and 110 versus 110 (S) did not show any polymorphism. Analysis of molecular variation (AMOVA) of the genotypes revealed a significantly high proportion of the total genetic variation associated with the differences between *ssp. hypogaea* and *ssp. fastigiata*.

MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Evaluation of mini core germplasm of *rabi* sorghum for charcoal rot resistance and yield component traits, expression analysis of selected R-genes during charcoal rot disease incidence

BHABESH BORPHUKAN

2014

MAJOR ADVISOR : Dr. B. FAKRUDIN

A sorghum mini core consisting of 242 accessions was evaluated during 2012-13 *rabi* season revealed significant variations both at phenotypic and genotypic level for charcoal rot resistance and yield component traits. High PCV, GCV and heritability coupled with GA was recorded for plant height, panicle excretion, length of infection and percent lodging within the mini core. Positively significant association with seed yield per plant was recorded for earhead length, numbers of spikelet, numbers of leaves and 100 seed weight. The estimated total phenol content ranged from 3.12 (IS31714) to 7.22 (IS13549) mg/g of sample while lignin content ranged from 3.31 (IS12965) to 5.49 (IS4515) mg/g of sample revealed significant variation between resistant and susceptible accessions. Mahalanobi's D^2 analysis grouped minicore into 15 clusters where plant height contributed maximum (22.01%) and per cent lodging minimum (0.66%) genetic diversity. Total 50 accessions were identified as resistant with per cent lodging having =10%. Spanning DNA markers screening for

Kruskal-Wallis ANOVA and locus by locus AMOVA identified 8 markers that had significantly high contribution in differentiating the two subspecies. Fourteen out of 26 mutants showing similar taxonomic shift, also carried similar allelic shift (transpositional activity) at AhTE205 locus, indicating its potential to distinguish the two subspecies of groundnut. Single marker analysis revealed significant association of Ah TE205 with number of pods per plant, pod yield per plant and shelling percentage. Significant association was also found for AhTE333 with test weight, AhTE343 with LLS (90 DAS), AhTE373 with oil content (%) and AhTE211 with oleate content and O:L ratio. These markers need to be validated for their trait association before they are employed for groundnut improvement.

charcoal rot resistant QTLs (*qCr1*, *qCr2* and *qCr3*) revealed 10 accessions (IS4515, IS13549, IS29582, IS25301, IS12735 and IS23514) to carry all the three QTLs (*qCr1*+*qCr2*+*qCr3*); 26 accessions with *qCr1*+*qCr2*; 24 accessions with *qCr1*+*qCr3*; 12 accessions having *qCr2*+*qCr3* while 40, 51 and 23 accessions found to carry single QTL either of *qCr1*, *qCr2* and *qCr3*. 56 accessions did not record presence any charcoal rot QTL. In silico identification of 33 putative R-proteins showed diversity within NBSLRR domain as revealed by phylogenetic analysis. Significant upregulation recorded for five *SbRGA* genes viz., *SbRGA114* (6.36), *SbRGA113* (7.11), *SbRGA212* (5.54), *SbRGA214* (9.51), *SbRGA222* (6.87), along with two charcoal rot QTL gene of *AntfQ3* (7.97) and *NrcQ2* (6.10) during real-time PCR expression analysis within selected mini core accessions. Newly identified resistant accessions and R-genes could be useful for breeding or transgenic approach for improving sorghum.

Association analysis for yield related traits and foliar disease resistance using transposon specific markers in a mutant population of groundnut

MAHESH V. KAMBLE

2014

MAJOR ADVISOR : Dr. RAMESH BHAT

An effort was made to identify association of transposable element (TE)-specific markers with productivity and nutritional traits in a mutant population consisting of thirty five mutants and their parents in groundnut. Field evaluation of the genotypes during *kharif* 2012 showed significant genotypic differences and considerable variability for majority of the traits. Genotyping of mutant population with 47 TE markers showed very high genotype-discriminating power in terms of polymorphism information content (PIC) for a large proportion of the markers. The overall polymorphism across mutant-parent pairs was 27.7 per cent. Highest polymorphism of 72.3 per cent was observed between Spanish Improved and TG 1. Three mutants, TG 2, TGM 8 and TGM 58 failed to show any polymorphism for the markers tested when compared to their parent (Spanish Improved). Marker-trait association was analysed by single marker analysis. Markers exhibiting significant association with number of pods/plant, pod yield/plant, shelling percentage, sound mature kernel weight (SMKW), test weight and disease resistance were identified.

AhTE324 (44.41%), AhTE305 (23.55%), AhTE372 (18.00%), AhTE491 (10.52%), AhTE373 (22.80%), AhTE130 (11.85%) and AhTE491 (11.85%) showed the highest R^2 (phenotypic variance explained) towards number of pods/plant, test weight, resistance to LLS resistance and rust, pod yield/plant, shelling percentage and SMKW, respectively. The markers identified as significantly associated with the traits were validated by employing the independent mutants with phenotypic change in positive and negative direction, but no evidence in favour of marker-trait association could be observed. Mutants with unusual phenotypes like disease mimicking leaves, mosaic leaves, fused leaflets and crinkle leaves, and long and narrow leaves were observed. However, these phenotypes did not show any significant association with any of the markers tested. Hence, the markers identified in this study as associated with important yield related traits and resistance to LLS and rust need to be validated across other genotypes before employed for groundnut breeding.

SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

Studies on zinc, iron and boron nutrition on yield, quality and nutrient uptake by cabbage (*Brassica oleracea* var. *capitata* L.) in northern transition zone of Karnataka

CHIDANAND HALLUR

2014

MAJOR ADVISOR: Dr. C. M. POLESHI

A field experiment was conducted to study the effect of zinc, iron and boron on yield, quality and nutrient uptake by cabbage (Var. Golden Super N -50) under northern transition zone of Karnataka during *kharif* 2011 on typic haplustalf soil type which is having available Zn, Fe and hot water soluble B of 0.43, 15.48 and 0.52 mg kg⁻¹, in Horticulture block of Main Agricultural Research Station (MARS) at UAS, Dharwad with 11 treatments. The treatments are RDF (control), application of Zn, Fe and B @ 25, 25 and 2 kg ha⁻¹ along with RDF respectively and their combinations and also gypsum equivalent S in FeSO₄ and ZnSO₄. Application of ZnSO₄ @ 25 kg ha⁻¹ + Borax @ 2 kg ha⁻¹ along with RDF (T₉) was found superior in terms of growth parameters, yield (38.52 t ha⁻¹, 18.74 %

increase over control), gross return (₹ 192600) and net return (₹ 148528). It also recorded highest B: C ratio (3.37) and increase the quality parameters of cabbage like crude protein (8.79%), ascorbic acid (56.80mg 100 g⁻¹) and TSS (7.07 Brix°) compared to rest of the treatments. It also builds up the available Zn (0.48 mg kg⁻¹), Fe (17.10 mg kg⁻¹) and hot water soluble B (0.64 mg kg⁻¹) status in soil after the harvest of the crop. The next best treatment (T₉) ZnSO₄ @ 25 kg ha⁻¹ + FeSO₄ @ 25 kg ha⁻¹ + Borax @ 2 kg ha⁻¹ along with RDF. In soils of zinc and boron deficiency, the application of ZnSO₄ @ 25 kg ha⁻¹ + Borax @ 2 kg ha⁻¹ was economically viable for obtaining higher productivity and quality in cabbage besides maintaining zinc, iron and boron status in soil.