Karnataka J. Agric. Sci., 27 (4): (555-567) 2014

ABSTRACTS OF THESES

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

DOCTOR OF PHILOSOPHY

AGRICULTURAL ECONOMICS

An economic analysis of production, marketing and export of major fruits of Karnataka

D. K. KUSUMA 2014 MAJOR ADVISOR: Dr. H. BASAVARAJA

The focus of the present study was on production, marketing and export of major fruits of Karnataka. Based on highest fruit area, four major fruits *i.e,* mango, banana, sapota and grapes were selected. A size of 360 selected fruit crop growers and 94 marketing intermediaries was selected using multiple stage random sampling method. Field level data were elicited for the agriculture year 2012-13 through personal interview method. The secondary data on area, production and productivity of the selected fruit crops and country wise quantity of different fruits exported was obtained from Directorate of Horticulture, Bangalore and District Statistical Offices and various published issues of APEDA respectively. For analyzing the data collected during the study growth rate analysis, instability analysis, financial feasibility analysis, tabular analysis/ budgeting technique, Markov chain analysis and garrett ranking technique were used. The growth rate analysis indicated that the increase in production of fruits was due to the increase in area rather than productivity which calls for intensive efforts to increase productivity of fruits by adopting improved cultural practices. Investment in these fruits was found to be financially feasible and economically viable. The exploitation by village traders, wholesalers and retailers in marketing of fruits is too much as is evident by the smaller portion of producer's share in consumer rupee. So, farmers can sell their produce through pre-harvest contractors who will provide organic inputs and financial assistance. The Markov chain analysis for these fruits indicated high dependence on a few export markets *viz.,* Middle-east which would increase the trade risk in the long run. Non-availability of infrastructure facilities like cold storage, grading and processing was one of the major factor contributing to lower returns from these fruits. Therefore, suitable infrastructure facilities are essential to stabilize the returns of fruit growers by increasing the storage life of the fruit.

AGRICULTURAL ENTOMOLOGY

Population dynamics, molecular diversity and management of leafhopper, *Amrasca biguttula biguttula* (Ishida) in Bt and non-Bt cotton

B. HALAPPA 2014 MAJOR ADVISOR: Dr. R. K. PATIL

Investigation on population dynamics, molecular diversity, economic injury level, screening of Bt and non-Bt cultivars, differential reaction of neonicotioid group of insecticides and management of cotton leafhopper, *Amrasca biguttula biguttula* (Ishida) was carriedout at MARS, UAS, Dharwad during 2012-13 and 2013-14. The peak activity of leafhopper was observed during 45th Meterological standard Week (MSW) and least (0.2 leafhoppers/three leaves) during 7th MSW. The influence of different dates of sowing on pest incidance revealed that cotton crop sown during 1st week of June and 1st week of August registered lower incidence of pest. The Economice Injury Level for cotton leafhopper in Bunny Bt and non-Bt was 2.10 and 2.44, 3.78 and 3.96 and 4.75 and 4.97 leafhoppers per leaf at 30, 60 and 90 DAS, respectively. Molecular analysis of mitochondrial DNA, the leafhopper population from nine states, cytochrome oxidase subunit I (COI) gene sequences were confirmed as *Amrasca biguttula* COI gene. The COI gene sequences of Gujarat and Rajasthan showed 99 per cent, while Karnataka, Punjab, Madhya Pradesh and Haryana showed 98 per cent, Maharashtra and Tamil Nadu showed 96 per cent and Andhra Pradesh showed 94 per cent similarity. Screening of Bt and non-Bt cotton cultivars revealed that the H x B were more susceptible than H x H type. Morpho-anatomical characters and biochemical parameters of leaf in both Bt cotton cultivars and *G. hirsutum* lines showed that resistant cultivars had higher trichome density, higher palisade length, number, cortex cell density, longer sucking distance, higher content of phenols, gossypol and reducing sugar than susceptible cultivars. Six neonicotinoid insecticides were bioassayed from low, medium, high and very high pesticide usage areas of Karnataka, among them imidacloprid registered higher LC_{50} values while lower LC_{50} values were recorded in dinotefuran. Insecticides bioefficiacy studies revealed that the per cent reduction in leafhopper population was highest (>70 %) in dinotefuran 20 SG @ 0.20 g/l followed by diafenthiuron 50 WP (0.75 g/l).

Evaluation of different management strategies against thrips in Bt cotton

VIVEK UPPAR 2014 MAJOR ADVISOR: Dr. B. S. NANDIHALLI

Investigations on population dynamics, dates of sowing, molecular diversity, performance of sticky colour traps, screening of Bt cotton genotypes and bioassay of neonicotioid group of insecticides in the management of cotton thrips, *Thrips tabaci* (L.) were carried out at ARS, Dharwad during 2012-13 and 2013-14. The peak activity of thrips commenced during 27th Meteorological Standard Week (MSW) and attained relatively more activity at 42nd MSW. MRC-7351 and Chiranjivi recorded least mean thrips as compared to other five genotypes. The influence of five dates of sowing on pest incidence revealed that cotton crop sown during 1st fortnight of June registered lower incidence of pest followed by 2nd fortnight of June and 1st fortnight of July. Cytochrome oxidase subunit I (COI) gene sequences of thrips population from Dharwad and Belgaum districts of northern karnataka were confirmed as *Thrips tabaci* COI gene with (88%) homology, while *Scirtothrips dorsalis* COI gene sequences of Gulberga and Raichur populations showed 91 per cent homology with NCBI published sequence. Among screening of 25 genotypes, Chiranjivi and MRC-7351 were resistant and RCH-708, Kashinath, RCH-530 and DCH-32 were highly susceptible. With respect to morphological and biochemical parameters MRC-7351 and Chiranjivi had higher trichome density, trichome length, lamina thickness, gossypol glands, total chlorophyll, phenols and gossypol than susceptible genotypes. White colour traps were found to be superior in recording more number of thrips followed by yellow and light blue colour traps. The traps kept at the crop height recorded more number of thrips. The order of toxicity of neonicotinoid group of insecticides against thrips under laboratory, was clothianidin> thiacloprid> acetamiprid> thiamethoxam> imidacloprid. In field experiment, diafenthiuron 50 WP @ 0.75 g/l was significantly superior in reducing the thrips with highest yield and BC ratio which was followed by thiacloprid 40% SC, fipronil 5per cent SC and thiamethoxam 25 WDG.

AGRONOMY

Effect of conservation agriculture practices on productivity and resource use efficiency in maize- chickpea sequence cropping

B. R. MANJITH KUMAR 2014 MAJOR ADVISOR: Dr. S. S. ANGADI

Investigation to study the effect of conservation agriculture practices on productivity and resource use efficiency in maize- chickpea sequence cropping was conducted during 2010-11 and 2011-12 at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad. Conventional tillage recorded highest maize grain (59.1 q/ha) and stover (8.1 t/ha) yields. Mulching practice of maize stover @ 4 t per ha recorded highest maize grain and stover yields. Application of atrazine @ 1.25 kg a.i. per ha followed by 2,4-D sodium salt @ 2.00 kg a.i. per ha recorded highest grain (59.8 q/ha) and stover yields (7.9 t/ha) and was on par with application of atrazine @ 1.25 kg a.i./ha. Minimum tillage with mulching @ 4 t per ha and application of atrazine followed by 2, 4-D was on par with conventional and zero tillage practices with respect to growth, yield and yield components, water use efficiency, protein yield, availability of major nutrients, uptake, gross returns (₹ 62901/ha), net returns (₹ 37165/ha) and BC ratio (2.44). Energy use efficiency (EUE) was highest in minimum tillage (5.56) and was on par with zero tillage practice. Minimum tillage with no mulching and application of atrazine recorded highest EUE (8.73) in maize. In sequence crop of chickpea, conventional tillage recorded higher grain (14.2 q/ha) and haulm (2.2 t/ha) yields over minimum and zero tillage practices. Mulching practice recorded highest growth, yield and yield components. Application of pendimethalin @ 1.00 kg a.i. per ha recorded highest grain (14.3 q/ha) and haulm (2.2 t/ha) yields. Minimum tillage with mulching @ 4 t per ha and application of pendimethalin was on par with zero and conventional tillage practices with respect to growth, yield, protein content and protein yield, availability of major nutrients, uptake, gross returns (₹ 48266/ha) and net returns (₹ 32875/ha). Zero tillage with no mulching and unweeded check recorded higher EUE (13.21) in chickpea and was on par with zero tillage with no mulching and application of alachlor @ 1.25 kg a.i. per ha. The results indicated that minimum tillage with mulching and application of atrazine @ 1.25 kg a.i./ha followed by 2,4-D sodium salt @ 2.00 kg a.i./ha in maize performed better with respect to yield, quality, soil properties, EUE and economics. Whereas in chickpea, minimum/zero tillage with mulching and application of pendimethalin @ 1.00 kg a.i./ha was better with respect to yield, soil properties, EUE and economics.

FAMILY RESOURCE MANAGEMENT

Women in dairy farming - An analysis of human cost of work

DEEPA NAIK 2014 MAJOR ADVISOR: Dr. P. R. SUMANGALA

Dairy farming is one of the important activities of the rural population of our country. The present study is designed to study the role of women in dairy farming and to assess the Human cost of work of dairy farming based on ergonomic evaluation. The research design used for the present investigation was exploratory and experiment. The survey was conducted in Dharwad and Kalghatagi taluks. A total of 210 dairy farm women were selected for the survey. A representative subsample of 35 women subjects participated in ergonomic analysis experiement. The data revealed that in Dharwad and Kalaghatgi taluks had higher percentage of dairy farmers with more than 15 years of experience in dairy farming. In Dharwad taluk profit gained in dairy farming business was ₹ 1,53,64,951/- per annum. Whereas in Kalaghatgi, profit gained was ₹ 99,34,734/- per annum. Participation of women in all the activities of dairy farming was more and that was followed by men. The human cost of work of dairy farming is a collective effect of independent variables *viz*., physiological (energy expenditure and physiological cost of work), physical (grip strength of both the hands) and biomechanical variables (body angles at work) has revealed that the use of drudgery reducing tool (DRT) in carrying out milking and cleaning of animal shed activity was found to be effective as the total score of all comprehensive selection of variables considered under HCWIDF was recorded low when compared to traditional method of performing the above mentioned activities. It could be concluded that by using DRT *viz*., Revolving milking stand and stool for milking activity and Gopal Khore spade for cleaning of animal shed has reduced the human cost of work.

GENETICS AND PLANT BREEDING

Genetic characterization of advance breeding lines derived from recombination and irradiation in desi cotton

BANGAREMMA WADEYAR 2014 MAJOR ADVISOR: Dr. S. T. KAJJIDONI

The experimental material comprising of F_4M_4, F_4, M_4 and three double cross F_3 and their advanced generations were used in the present investigation. The results of variability study conducted involving F_4M_4, M_4, F_4 and double cross F_3 progenies indicated superior performance of irradiated compared to double cross progenies for number of bolls per plant, seed cotton yield, ginning out turn, seed index, lint index, uniformity ratio, maturity ratio and fiber elongation traits. The mean performance of double cross progenies was superior for the traits 2.5 per cent span length and tenacity traits. The variability parameters like PCV, GCV, heritability, GA and GAM estimates were high for boll weight in irradiated progenies. The higher number of superior was recorded by irradiated progenies for boll weight and 2.5 per cent span length traits while double cross progenies for tenacity trait. The progenies of F_5M_5, M_5, F_5 and double cross F_4 were evaluated at two locations, the results revealed high PCV, GCV, heritability, GA and GAM estimates for seed cotton yield and number of bolls per plant at both the locations. Association analysis recorded significant positive correlation of number of bolls per plant, boll weight and plant height with seed cotton yield per plant at both the locations. Genetic diversity study revealed that 202 progenies were grouped into twelve clusters at Annigeri and eleven clusters at Dharwad location. The trait seed index was the major contributor towards the divergence. Evaluation of best performing progenies (155) of F_6M_6, M_6, F_6 and double cross F_5 revealed higher estimates of PCV and GCV for seed cotton yield and number of bolls per plant, while moderate PCV and GCV estimates were recorded for RWC, plant height and SLW and lint index traits. Molecular characterization for fiber length and strength revealed that, two markers NAU 1200 and JESPR 65 explained 14 and 9.4 per cent of phenotypic variability, respectively. The four single cross irradiated progenies KDC-59-5C, KDC-59-4, KDC-21-5 and KDC-60-5 were superior for seed cotton yield and fiber quality traits compared to Jayadhar.

HUMAN DEVELOPMENT AND FAMILY STUDIES

Infant attachment: Correlates and intervention

KAMALAVVA B. BAILUR 2014 MAJOR ADVISOR: Dr. PUSHPA B. KHADI

Infant attachment its correlates and intervention studied on a sample of 60 each urban and rural infants and parents of Dharwad taluk revealed that most (63.3%) of the urban and rural (60%) infants had secure attachment while the rest had insecure attachment. Pattern of the attachment did not differ significantly between urban and rural infants. The factors that had direct influence on infant attachment in both urban and rural areas were Mother's and father's knowledge on infant development and mothers acceptance. Father's self esteem had influence exclusively in case of urban infants and infant temperament, mothers self esteem and mothers involvement with infants had influence exclusively in rural infants. While responsivity, parenting stress of mother and father, fathers temperament had indirect effect on urban and rural infants attachment. Mothers occupational stress, mothers' involvement with infants and child care, mothers self esteem, mothers and infant temperament had indirect effects on urban infant attachment. Infant attachment influenced the socio-emotional behaviour, language development and adaptive behaviour of urban and rural infants.As maternal knowledge on infant development, self esteem and infant temperament had a direct influence of infant attachment an educational package was developed for parents to strengthen infant attachment for enhancing parents knowledge on infant development, self esteem and infant temperament. An intervention was provided for 40 rural mothers of 11-24 months infants through an interrupted time series experimental research design. The post intervention scores revealed significant increase in right knowledge and decrease in wrong knowledge on infant development and significant increase in self esteem level among rural mothers.

MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Agrobacterium tumefaciens mediated transformation of pigeonpea for independent expression of *cry*1Ac, *cry*2Aa, *cry*1F and *cry*1Acm against *Helicoverpa armigera* and molecular analyses of selected events

M. MAHALE BARKU 2014 MAJOR ADVISOR: Dr. B. FAKRUDIN

In ICPL87119 and BSMR736, MS medium supplemented with 2.0 mg/l BAP, 4.0 mg/l TDZ and 2.0 mg/l zeatin, separately, induced maximum shoot buds, 53.7, 46.1 and 40.9 respectively; any further increase in cytokinins levels resulted in reduced shoot buds. The MS basal with 0.5 mg/l IBA induced maximum and healthier roots (4.8±0.7). *In planta* transformation revealed 80.00, 85.00, 66.50 per cent explant response, 53.75, 90.00, 90.98 per cent explant survival and 3.0, 6.5, 12.0 per cent transformation efficiency in *Agrobacterium tumefaciens* infection alone, *A. tumefaciens* culture with tobacco leaf extract and air evacuation, respectively. The 88 putative transformants carrying *cry*1Ac were developed, of which 48 showed 3:1 transgene segregation pattern in T_2. Insect mortality ranged from 25.0 to 70.0 per cent whereas, *cry*1Ac protein level from 0.31 to 0.85 µg/g and *cry*1Ac transcript level from 15.6 to 165.1 ng/µl, validated through northern blotting in different tissues (leaf, flower and pod). In case of *cry*2Aa, 65 transformants developed, of which 16 showed 3:1 transgene segregation in T_2. Insect mortality ranged from 5.25 to 65.75 per cent whereas, *cry*2Aa protein and transcripts ranged from 0.01 to 3.23 µg/g and 41.2 to 134.5 ng/µl, respectively. Southern and juncture analyses of selected three *cry*1Ac and five *cry*2Aa transformants confirmed T-DNA integration in plant genome. Fourteen transformants carrying *cry*1F were developed, of which seven showed 3:1 transgene segregation pattern in T_2, wherein insect mortality ranged from 10.0 to 62.5 per cent, *cry*1F protein level from 0.113 to 1.032 µg/g and transcripts ranged from 45.2 to 105.3 ng/µl. Similarly, eleven cry1Acm transformants were developed, of which seven showed 3:1 transgene segregation in T_2. Insect mortality ranged from 35.0 to 62.5 per cent whereas, protein level and transcripts ranged from 0.19 to 0.91 µg/g and 41.2 to 134.5 ng/µl, respectively, in tested tissues. Pigeonpea transformation procedures and generated events of present study could be prospected for their further use.

PLANT PATHOLOGY

Studies on virus derived coat-protein mediated resistance against bud necrosis disease in groundnut (*Arachis hypogaea* L.)

K. M. SWAMY 2014 MAJOR ADVISOR: Dr. M. S. PATIL

Groundnut bud necrosis virus (GBNV) is thrips transmitted a member of genus *Tospovirus* under the family *Bunyaviridae* and has became major constraints in groundnut production. Survey was conducted during 2012-13 to assess the GBNV incidence in major groundnut growing areas of Karnataka. Bud necrosis incidence ranged from 2.10 to 32.40 and 4.15 to 39.50 per cent during *kharif* 2012 and *rabi*/summer 2012-13, respectively. The highest mean incidence of GBNV was noticed in the crop cultivated under red soil (15.86%), at maturity stage (17.56%) and irrigated condition (16.09%). The highest mean incidence of 19.70 per cent was recorded at latitude of 16°01'N-16°59'N, longitude of 077°01'E-077°59'E (20.81%) and at elevation of 400-499 m (20.92%), *t*his may be due to influence of microclimate on vector activity. Groundnut bud necrosis was detected by DAC-ELISA. The highest virus titre was found in chlorotic spots symptom on leaves and the lowest was in terminal necrotized bud of diseased plant. The GBNV coat protein and movement protein genes were amplified at 831 bp and ~900 bp, respectively. The *CP* gene was cloned, sequenced and BLAST analyses of eight isolates confirmed them as strain of *Groundnut bud necrosis virus*. Coat protein gene of Dharwad isolate was cloned in pTZ57R/T (pSM831) and subcloned into plant transformation vector pCAMBIA1305.1 at *Bam* HI and *Kpn* I site. Recombinant clone was mobilized into the *Agrobacterium tumefaciens* LBA 4404 strain and was used for *in planta* transformation. Of the 200 groundnut seeds (cv. GPBD 4), 13 T_0 transformed plants were confirmed by PCR for *CP*-gene and histological GUS assay. Of the 52 T_1 transgenic plants, 37 plants showed positive for presence of CP-gene by PCR, expression was confirmed by DAC-ELISA and resistance by challenge inoculation with GBNV. The 37 PCR positive plants have shown the resistance to GBNV without any symptom development. These results demonstrated that *in planta* transformation was the best method to achieve coat protein mediated resistance for GBNV in groundnut plants.

SOIL SEIENCE AND AGRIL. CHEMISTRY

Studies on irrigation regimes and fertigation levels on soil properties, yield and quality of tomato (*Solanum lycopersicum* L.) under greenhouse

KARAM A. ELZOPY 2014 MAJOR ADVISOR: Dr. H. T. CHANNAL

A field experiment was conducted for two seasons during 2012-2013 at Hi-Tech-Horticulture unit, Saidapur, UAS, Dharwad to evaluate the effect of drip irrigation and fertigation levels on tomato hybrid STH-801 under greenhouse. The experiment was laid out with three drip irrigation regimes (40, 60 and 80 % ETc) and three fertigation levels (50, 75 and 100% RDF) in RCBD design with factorial concept and replicated thrice with one absolute control. The results showed that the highest plant growth, available nutrients in soil, nutrients uptake by plants, soil enzymes activity, yield of tomato (115.14 and 89.56 tonnes ha^{-1} in first and second season, respectively) and BC ratio (3.39 and 4.39 in first and second season, respectively) were registered in I_3 (80% ETc) irrigation regime. However, it was on par with I_2 (60% ETc) irrigation regime (yield 114.97 and 89.26 t ha^{-1}; BC ratio 3.38 and 4.38 in first and second season, respectively) but they were significantly superior over I_1 (40% ETc) irrigation regime (yield 102.00 and 76.57 t ha^{-1}; BC ratio 3.01 and 3.77 in first and second season, respectively). Similarly, application of F_3 (100% RDF) recorded the highest plant growth, available nutrients in soil, nutrients uptake by plants, soil enzymes activity and yield of tomato (113.75 and 87.50 t ha^{-1} in first and second season, respectively) which was on par with F_2 (75% RDF) (113.31 and 86.84 t ha^{-1} in first and second season, respectively) and significantly superior over F_1 (50% RDF) (yield 105.05 and 81.05 t ha^{-1} in first and second season, respectively). Irrigation at I_2 (60% ETc) with fertigation at F_2 (75% RDF) found to be optimum to attain higher plant growth, available nutrients in soil, nutrients uptake by plants, soil enzymes activity and yield of tomato (118.94 and 92.02 t ha^{-1} in first and second season, respectively). However, irrigation at I_1 (40% ETc) registered higher quality of fruits and water use efficiency (WUE) as compared to other irrigation regimes. Fertilizer use efficiency (FUE) was significantly superior in F_1 (50% RDF) followed by F_2 (75% RDF) over F_3 (100% RDF). The results indicated that fertigation of water soluble fertilizers was more beneficial than soil application of conventional fertilizers. The findings also suggested that in water scarcity areas irrigation at 40 per cent ETc can be useful to attain marginal tomato yield.

Characterization of sugarcane growing vertisols of north Karnataka and response of sugarcane (*Saccharum officinarum* L.) to identified micronutrients constraints by GIS technique

S. A. NADAF 2014 MAJOR ADVISOR: Dr. P. L. PATIL

A study was undertaken in northern dry zone and northern transition zone of Karnataka with the objectives of characterization of sugarcane growing Vertisols, identification of micronutrients constraints by GIS technique and to study the response of sugarcane to identified micronutrients constraints. Characterization of six Vertisol pedons from both the zones revealed that the soils were deep to very deep with abundance of $CaCO_3$ concretions (89.7 to 146.5 g kg-1), slightly saline to alkaline nature. Organic carbon status in the pedons was low (1.19 to 6.2 g kg^{-1}). Distribution of Zn, Fe, Mn, Cu and B in the profiles was irregularly distributed with increasing soil depth. Soil fertility maps of the selected micro-watersheds prepared by GIS technique (*Arc* GIS 10.0 software) revealed that, soils were alkaline in nature (7.44 to 9.33) with $CaCO_3$ accumulation (37.30 to 22.85 g kg^{-1}) and low in organic carbon status (2.2 to 17.8 g kg^{-1}). The major portion of the area in the micro-watersheds studied were deficient in available N, P and S with higher level of available potassium, copper and manganese in the soils. Area under deficiency of Zn (58.30 and 63.50%), Fe (69.90 and 64.6%) and B (64.30 and 61.80%) in the micro-watersheds of both zones, respectively. Field experiments were conducted in each zone for both plant and ratoon crops to study the response of sugarcane zinc, iron and boron. The results of the experiments revealed that, in comparison to control, application of vermicompost chelated iron sulphate and zinc sulphate each @ 50 kg ha^{-1} plus borax @ 5 kg ha^{-1} along with three foliar application of $FeSO_4$ and $ZnSO_4$ each @ 0.5 per cent and boron @ 0.1 per cent increased all the growth parameters, cane yield (46.31%), quality parameters (brix, pole, juice purity, juice reduc ing sugar and CCS per cent) and uptake of Zn, Fe and B by sugarcane in plant and ratoon crops under both northern dry zone and northern transition zone of Karnataka with the lowest values recorded in the treatment receiving only RDF.

TEXTILE AND APPAREL DESIGNING

Eco-friendly antimicrobial finishes on natural colour cotton knits

RAJKUMARI DHANALAXMI DEVI 2014 MAJOR ADVISOR: Dr. JYOTI V. VASTRAD

The present investigation titled 'Eco-friendly antimicrobial finishes on natural colour cotton knits' was conducted at University of Agricultural Sciences, Dharwad, Karnataka during 2011-2014 with an aim to design natural colour cotton knits with eco-friendly antimicrobial finish. Medium Brown-DMB-225 was processed into single jersey and double jersey fabric. The fabric was tested for its physical and mechanical properties. Bioassay test confirmed the anti microbial activity of extracts that were later applied by direct and microencapsulation methods on to the knits by pad-dry-cure technique. The performance of finished fabric was carried out through AATCC-147 and AATCC-30 test method. Knit wear products for compressional, intimate, sports and casual uses were designed, some of which were assessed for functionality among the patients with skin disorders. Experimental results revealed that waxed yarn exhibited better coefficient of friction and reduced yarn hairiness that could withstand the abrasion caused during fabric construction. Wale per inch, course per inch, stitch length, stitch density and grams per square meter, bursting strength of double jersey fabric was higher than single jersey fabric. However, single jersey fabric exhibited better air permeability than double jersey fabric. The phytochemicals such as alkaloids, flavonoids, phenolic acid and tannins, saponins and terpenoids were present in asan, cinnamon, jamun and neem extracts but, saponins was absent in jamun leaf extract. Total phenolic content of the ethanolic extract was higher than methanolic or aqueous extracts. Concentrated extracts showed greater zone of inhibition against *S. aureus* and *E. coli* followed by 10 and 5 per cent extract concentrations confirmed by bio-assay results. Fabric finished with neem extracts showed greater zone of inhibition followed by cinnamon, asan and jamun treated fabrics. Characterization of microcapsules through SEM analysis revealed the adherence of the microcapsules between fibre assembly and the size ranging from 4 to 22 µm. Fabric treated with microcapsules are more wash durable than fabric finished with direct method. Extract of such plant sources can also be utilized in other ancillary applications, cosmetics, laundry reagent and skin care products of medicinal value and medical application especially for the compression garments and bandage material wherein durable antimicrobial finish is essential. Besides, the protocol of microencapsulation can be used for variegated end uses *viz.*, aroma fabric, flame retardency, UV protective fabric and phase change material.

MASTER OF SCIENCE

AGRICULTURAL BUSINESS MANAGEMENT

Production and marketing management of mulberry silk cocoon in Haveri district

ROOPA HOSALI 2014 MAJOR ADVISOR: Dr. C. MURTHY

Sericulture is one of the important sectors of economy in India and plays an important role in poverty alleviation. Compared to agricultural crops, sericulture provides more employment round the year and fetches higher income to the rural farm families. The study was conducted on production and marketing management of mulberry silk cocoon in Haveri district, because of this district is having highest mulberry cultivation and cocoon production.A random sampling procedure for adopted for selection of taluka, village and sample farmers. In Haveri district two taluka were selected namely Haveri and Ranebennur maximum farmers were adopting mulberry cultivation and cocoon production. In each talukas 20 marginal farmers, 20 small farmers and 20 medium farmers. The primary data was collected to personal interview from the farmers with the help of well structured and pre structure scheduled. Sericulture is labour intensive enterprise providing employment to both men and women in mulberry cultivation and cocoon production. In the study area, family labour was employed in this enterprise all around the year. Thus, encouraging this enterprise would help to generate additional income and observed family member which is employment during off season. The cost of mulberry cultivation was found to be ₹ 25,878.54 marginal farmers, ₹ 27,716.18 in case of small farmers and ₹ 28,958.52 in medium farmers. The cost of cocoon production for medium farmers ₹ 51,346.54, followed by small farmers ₹ 57,336.06 and marginal farmers ₹ 61,737.02. The investment appraisal reviled that the BC ratio was found to be 2.14 from marginal farmers, 2.07 for small farmers and 1.9 in case of medium farmers.

Export performance of Indian frozen marine products - An economic analysis

QUASER GULL RATHER 2014 MAJOR ADVISOR: Dr. A. D. NAIK

India is the third largest fish producing country in the world. The 8,118 km coastline from both inland and marine resources provides it a greater scope for being associated with marine activities and exporting various marine products. MPEDA is the nodal agency for promotion of export of marine products from India. Exports aggregate up to 892311 tonnes valued at ₹ 18372 crores in 2012-13. Sea food exports recorded a growth of 3.51 per cent in quantity, 10.69 per cent in value terms. Frozen marine products contribute 79 per cent of the total marine products exported in quantity terms and 73 per cent in value terms. In total agriculture exports frozen marine products contributes 6 per cent in value terms. Frozen Shrimp continued to be the major export item in value terms followed by Frozen Fish. In quantity terms Frozen Fish has retained its position as the principal export item. Growth rate of frozen marine products export from India was found to be positive with respect to quantity (4.77%) as well as value (7.11%). Vietnam was found to be the emerging market with growth rate of 69.78 per cent in quantity terms and 52.34 per cent in value terms. Among the importing countries USA was found to be most stable market with the retention probability of 87 per cent UK was found to be least stable. The NPC value of less than one to different countries indicates that that frozen marine products are export competitive and hence worthwhile to export rather than to sell in domestic market. The marine product export sectors is having ample opportunity to growth with vast potential ahead, hence government should put efforts to boost the exports by focusing on various schemes related to the export of these marine products.

AGRICULTURAL ECONOMICS

An economic analysis of sugarcane production under conventional and transplanted methods in Belgaum district - A comparative study

VIJAY BHUPAL KERABA 2014 MAJOR ADVISOR: Dr. M. T. SHARMA

The present study was to know the comparative study between conventional and transplanting methods of sugarcane cultivation in Athani, Raibag and Chikkodi taluks of Belgaum district of Karnataka with the help of 120 sample farmers through purposive sampling. The study proposed with the objectives to ascertain reasons for adoption of transplanted method of sugarcane production, to estimate cost and returns, to analyze resource use efficiency and to study the constraints in production of sugarcane. The analytical tools like, tabular analysis, Budgeting technique, Cobb-Douglas production function and Garrett ranking technique were used to analyse the data. The results revealed that majority of farmers shifted towards transplanted method because of delay in onset of monsoon, change in temperature as climatic reasons, High transportation costs of planting material and high cost of planting as financial reasons, high rate of mortality in conventional methods as major agronomic reason, and neighboring framers have motivated majority of farmers to shift towards transplanted sugarcane from conventional method. The benefit cost ratio was higher in case of transplanted method of sugarcane cultivation (2.02) compared to conventional methods (1.87). The resource use efficiency analysis revealed that the resources are not optimally utilized in cultivation of sugarcane under both methods as guided by the economic principles. The MVP/MFC ratio was less than unity for human labour indicating over-utilization and for other resources it was under-utilization. The farmers need to be educated and advised about the proper use of these resources. Limited and irregular power supply was the major problem and need to be overcome by proper supply of electricity by the concerned agencies. Delay in crop cutting order of sugar factory and price fluctuation was socio-economic problems and proper schedule should be fixed in sugar mills for harvesting of produce and for the payment of bills to the farmers.

An economic analysis of tomato hybrid seed production under contract farming in Haveri district

NAGARAJ M. SANNAMANI 2014 MAJOR ADVISOR: Dr. S. M. MUNDINAMANI

Tomato hybrid seed production under contract farming is highly profitable, even small farmers can practice it. Farmer is assured of better returns compared to other field crops as the companies offer relatively better prices. The farmers will get all required things for cultivation of tomato such as inputs, technology and extension services in one roof. The present study was conducted in Haveri district of Karnataka. Both primary and secondary data were used in the study in order to ascertain the cost and returns, resource use efficiency, extent of income and employment and problems faced by the farmers and firms in production, processing and marketing of tomato hybrid seeds. Tabular presentation method, Budgeting technique, Cobb-Douglas production function and Garrett's ranking techniques were employed for the analysis

of data.The results revealed that the total cost of tomato hybrid seed production per acre was found to be ₹ 3,87,708.34. Among the various costs, the maximum cost ₹ 2,22,287.55 was found on human labour. The average total fixed cost incurred was ₹ 5,177.59.The tomato hybrid seed production was found to be profitable with ₹ 8,97,554.00 per acre as gross returns, ₹ 5,15,023.25 net returns over total cost of cultivation. The seed growers would get ₹ 2.31 for every rupee investment in seed production. The MVP to MFC ratio of FYM and bullock and machine hour was greater than unity implying under utilizations of resources. The MVP to MFC ratios of seedlings, human labour, fertilizer, PPC and stacking materials were substantially lesser than unity implying excess utilization of resources. Non-availability of skilled labours, high wage rate, higher rejection rate, irregular payments, and low contract price were the major problems expressed by the farmers. Major problems expressed by the firms were mixing of lower grade with higher grades, fixing of contract price and land constraints.

AGRICULTURAL ENTOMOLOGY

Studies on varietal screening, monitoring and management of paddy yellow stem borer, *Scirpophaga incertulus* (Walker) in rainfed ecosystem of Uttara Kannada district

H. SOMASHEKARA 2014 MAJOR ADVISOR: Dr. JAVAREGOWDA

The field experiment was conducted at ARS, Sirsi during *kharif* 2013, to study the varietal screening, monitoring and management of paddy yellow stem borer (YSB), *Scirpophaga incertulus* (Walker). The result indicated that Peak catches of 51 moths was recorded during 38 and 39th standard week. Population of YSB moth catches in pheromone trap ranged from 0.37 to 9.75 during 26 and 38th standard week. Peak catches of 9.75 moths was recorded during 38th standard week at ARS, Sirsi. Population of YSB moth catches in pheromone trap ranged from 0.25 to 8.50 during 26 and 38th standard week. Peak catches of 8.50 moths was recorded during 38th standard week at farmers field Gudnapur. Relationship of weather factors with moth catches by light and pheromone traps revealed evening RH (-0.56) and RF (-0.57) had significant negative correlation and min. temp. (0.21), max. temp (0.25) and morning RH (0.27) had non significant positive correlation with the moth population. Out of 82 rice cultivars screened under field condition for resistant/susceptibility against yellow stem borer population, per cent dead heart and white ear head at 30 DAT and 60 DAT varied between 0.00 (highly resistant) to 32.17 (susceptible) and 0.00 (highly resistant) and 20.51 (susceptible) respectively. Seventy four rice cultivars proved highly resistant, six rice cultivars reacted as moderately susceptible and two showed susceptible at vegetative and reproductive stage. Among the treatments evaluated for the management of YSB, Fipronil 40 WG @ 1 g/l registered its superiority over botanicals. All insecticides are found on par in the order of their efficacy *viz*, fipronil 0.3 G @ 0.075 kg a.i./ha, cartap hydrochloride 50 SP @ 300 g a.i./ha, cartap hydrochloride 4 G @ 750 g a.i./ha, carbofuran 3 G @ 1 kg a.i/ha and chlorpyriphos 20 EC @ 2.5 ml/l. Similarly, all the botanicals were on par with each other in suppressing the pest over untreated check.

Studies on population dynamics, varietal screening and management of spotted pod borer, *Maruca vitrata* (Geyer) in blackgram

MANJUNATH G. NAIK 2014 MAJOR ADVISOR: Dr. C. P. MALLAPUR

A field experiment was conducted at Main Agricultural Research Station, Dharwad during *kharif* 2013 to study population dynamics,varietal screening and management of spotted pod borer (SPB), *Maruca vitrata* (Geyer). The results indicated that the mean larval population of SPB ranged from 0.20 to 4.42 larvae/plant during August. Further, the pest density declined with the age of the crop and the maximum pest population was observed at the time of flowering stage during 35th to 36th standard week at MARS, Dharwad. The studies on relationship of weather factors with SPB revealed highly significant positive correlation with maximum temperature (r=0.78**) but however, it had negative correlation with minimum temperature (r=-0.04), morning RH (r=-0.57), evening RH (r=-0.35) and rainfall (r=-0.50). Out of 15 blackgram cultivars screened under field condition for their reaction to spotted pod borer, the genotypes *viz*., WBU-108, PU-31, COBG-653, LBG-685and VBN-05 recorded lower incidence with respect to infestation of plants, number of webs and pod damage (22.50%, 1.51 & 9.25%; 20.00%, 1.61 & 10.10%; 17.14%, 1.96 & 9.35%; 20.00%, 1.93 & 8.25% and 22.86%, 1.55 & 9.30%, respectively). Five blackgram cultivars proved resistant while, four cultivars reacted as moderately resistant, one moderately susceptible and five cultivars were found susceptible both at flowering and reproductive stage. Among the insecticide molecules evaluated for the management of SPB, profenophos 50 EC @ 2.0 ml/l + DDVP 76 EC @ 0.5 ml/l proved its superiority over other treatments. All other insecticides were found on par with each other and found effective in suppressing the pest over untreated check (in the order of their efficacy emamectin benzoate 5 SG @ 0.25 g, flubendiamide 480 SC @ 0.3 ml, spinosad 45 SC @ 0.2 ml, thiodicarb 75 WP @ 1.0 g, rynaxypyr 20 SC @ 0.3 ml and nimbecidine @ 3.0 ml along with DDVP 76 EC @ 0.5 ml).

Seasonal incidence and management of brinjal pests with special reference to shoot and fruit borer, *Leucinodes orbonalis* (Guen.)

ANIL AMRESH SAJJAN 2014 MAJOR ADVISOR: Dr. C. M. RAFEE

Field experiments were conducted at MARS, Dharwad during *kharif 2013*-14, to monitor brinjal pests and their natural enemies, mass trapping of moths with water traps and management of shoot and fruit borerwith insecticides. The survey inBelagavi and Dharwad districts at vegetative and reproductive stages indicatedhighest shoot infestation (18.9 %) in vegetative and reproductive stage (10.5 %) in Belagavi. Likewise highest fruit infestation (18.8 %) also more in Belagavi compared to Dharwad district (16.4 %).The sucking pests and natural enemies were more in Belagavi district compared to Dharwad at both the stages. Incidence of BSFB on shoots was highest (34.30 %) during September third week and maximum damage on fruitswasduring October second week(35.10 %).The incidence ofleafhopperwas highest at October third week (23.30/ 3 leaves), white fly during first week of November (12.10/ 3 leaves), aphids during first week of November (10.60 / 3 leaves) and mite during third week of November (14.50/4 cm^2). These sucking pests showed highly significant positive correlation with maximum temperature.The highest activity of coccinellids was observed infirst week of November (1.80 /plant), spider during last week of October (1.30 /plant) and chrysopid during October last week (1.30 /plant).The peak moth catch was recorded at September last week (10.7 moths /trap), shoots infestation highest damage was observed during September 4th week (31.6%) and highest larval population was observed during October last week (4.20 larvae /plant). Among the insecticides evaluated for the management of BSFB cyantranilprole 10% OD @ 0.3 ml/l, rynaxypyr 20 SC @ 0.15 ml, spinosad 45 SC @ 0.1 ml/l registered significantly lowest shoot and fruit damage with higher yield of 198.20, 197.15 and 194.65 q/ha, respectively. Among the insecticides flubendiamide recorded higher BC ratio (1:5.42).

Population dynamics of soil arthropods as influenced by different farming and agro ecosystems

MD. SALAVUDDIN 2014 MAJOR ADVISOR: Dr. R. K. PATIL

A study on population dynamics of soil arthropods as influenced by different farming and agro ecosystems was conducted at UAS, Dharwad during 2013-14. The results of the present findings indicated that organic farming system recorded significantly higher population of both micro and macro arthropods (39.37 /100 g of soil and 147.64 /15 pitfall traps) followed by integrated farming system (24.04 micro arthropods/100 g of soil and 91.90 macro arthropods/15 pitfall traps) and conventional farming systems (15.73 micro arthropods /100 g of soil and 91.90 macro arthropods/15 pitfall traps). Among the different farming systems, peak population of soil micro arthropods was recorded during first fortnight of September (36.22/100 g of soil) and least population was recorded during second fortnight of December (18.11/100 g of soil). Among the different ecosystems, forest ecosystem harboured more population of micro arthropods (64.31/100 g of soil) and followed by horticulture (51.10/100 g of soil) and agriculture (34.14/100 g of soil). Similar trend was observed in macro arthropods recorded in forest (177.55/15 pitfall traps) followed by horticulture (151.14/15 pitfall traps) and agriculture ecosystems (116.33/15 pitfall traps). Peak population of micro arthropods was recorded during the month of August (3.43/100 g of soil) and least population (33.77/100 g of soil) was recorded during the month of December. Macro arthropods highest population recorded during second fortnight of August (225.44) and least population recorded during second fortnight of December (74.78/ 15 pitfall traps). Among the different manures, poultry manure (88.37 meso arthropods/100 g of sample) and goat manure (79.87 meso arthropods /100 g of sample) recorded more population of meso arthropods compared to other manures. In pot culture experiment amended with different manures, meso arthropods like collembolans (7.09/100 g of soil) and other mites (7.90/100 g of soil) were significantly higher than other meso arthropods population.

AGRICULTURAL EXTENSION EDUCATION

A study on crop residues management for livestock by farmers

AKSHATA K. KERUR 2014 MAJOR ADVISOR: Dr. NAGARATNA BIRADAR

Study was carried out during 2013-14 in Dharwad district of Karnataka. Twelve villages were selected randomly and 120 farmers formed the sample of the study. The data was collected by personal interview method using structured interview schedule. Objectives were-to study the availability and utilization pattern of crop residues for feeding livestock by the farmers; to analyze the economic value of crop residues as livestock feed; to find out the problem faced by the farmers in management of crop residues for livestock and to know the technological requirement of farmers for efficient use of crop residues for livestock. The annual mean availability of sorghum stover was 1.65, 3.69 and 5.41 t, maize stover was 1.08, 1.22 and 2.08 t, paddy straw was 1.16, 2.10 and 3.14 t and legume hay was 1.0, 1.12, and 2.06 t to small, medium and large farmers, respectively. F value indicated highly significant difference in availability of all types of crop residues among different categories of farmers. Almost equal percent of farmers belonged to poorly managed (30.84%), moderately managed (31.66%) and well managed (37.50%) categories of crop residue management. The F value indicated highly significant difference in the selling price of all types of crop residues studied. Problems expressed by the farmers during crop residue management were labour problem (100%), more distance from field to storage yard (86.7%) and selective consumption of feed by animals (78.3%). Machine to bale crop residue for easy transportation was rated as very much required technology by 9 out of 10 scientists. Improved crop residues storage structure which requires less space and prevents rodents' infestation was considered as very much required technology by 8 scientists.

AGRONOMY

Nutrient management through organics in summer mungbean (*Vigna radiata* L. Wilczk)

SHARVAN KUMAR YADAV 2014 MAJOR ADVISOR: Dr. H. B. BABALAD

A field investigation was carried out to study the "Nutrient management through organics in summer mungbean (*Vigna radiata* L. Wilczk)" on sandy loam soil at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad. The experiment was laid out in a split plot design with three replications. The main plot comprised of three organic manures and subplots were of six liquid organic manures spray with eighteen treatment combinations. Application of enriched compost ($^1/_3$) + vermicompost ($^1/_3$) + gliricidia green leaf manure ($^1/_3$) equivalent to recommended dose of phosphorus (RDP) with 5 t FYM (M_2) recorded significantly higher mungbean yield (1368 kg/ha) which was 8.5 per cent higher over application of enriched compost + vermicompost + gliricidia green leaf manure equivalent to RDP alone (1258 kg/ha) (M_1) and on par with RDF + FYM (1301 kg/ha). Growth and yield components of mungbean followed the similar trend as that of yield. Among liquid organic manures treatments, foliar application of panchagavya @ 5 per cent at flowering and 15 days after flowering recorded significantly higher mungbean yield (1430 kg/ha) as compared to water spray treatment (1147 kg/ha) but it was on par with the vermiwash spray @ 10 per cent (1383 kg/ha). Soil available nitrogen, phosphorus and potassium increased significantly with the application of organic manures as compared to application of recommended dose of chemical fertilizers + FYM. Application of organic manures and liquid organic manures significantly increased the nodule number per plant as compared to RDF + FYM. Significantly higher net returns (₹ 45,437/ha) and BC ratio (2.99) was recorded with the application of recommended chemical fertilizers + 5 t FYM per ha treatment as compared to application of enriched compost + vermicompost + gliricidia green leaf manure + FYM (₹ 40,536/ha and 2.30, respectively).

CROP PHYSIOLOGY

Morpho-physiological characterization of soybean [*Glycine max* (L.) Merrill] mutants for yield and yield attributes

K. S. SANTHOSH 2014 MAJOR ADVISOR: Dr. U. V. MUMMIGATTI

Field experiment was conducted during *kharif*-2013 at the Main Agricultural Research Station, University of Agricultural Sciences, Dharwad to study the morpho-physiological characterization of soybean genotypes and mutants for yield and yield attributes. The experiment was laid out in complete randomized block design with eleven treatments having two check varieties (DSb-21 and Kalitur), two parents *viz.,* JS-335 and KHSb-2 and their seven mutants and were replicated thrice. In general, no specific trend was observed in any of the genotypes or mutants. At harvest significantly higher plant height was noticed with Kalitur. Genotype KHSb-2 had significantly more number of branches and nodes, which also had higher number of leaves and leaf area per plant at 60 DAS. At later phases, DSb-21 excelled over rest of the

genotypes and mutants for leaf parameters. Total dry matter production was maximum in DSb-21 followed by KHSb-2 and JS-335. Phenologically two mutants of KHSb-2 *viz.*, KE-4-11 yellow and KE-4-11 green have significantly lesser days (10 days early) for physiological maturity than their parent. Similarly all the mutants of KHSb-2 had significantly higher number of root nodules than parent. The mutants KE-4-11 yellow and JE-31-28 had higher number of root nodules at 60 DAS and these could be used for root nodule improvement.The biophysical parameters such as rate of photosynthesis, stomatal conductance and rate of respiration were also higher with DSb-21, JS-335 and KHSb-2. However, mutants did not differ significantly with their parents in any of the biophysical parameters. Further, BS-KHSb-2 had higher values of SPAD and leaf nitrogen contents. All the yield and yield components were significantly higher with DSb-21 and was closely followed by JS-335, KHSb-2 and JS-335 mutant J20-33-4. Data on quality parameters like seed oil and seed protein contents were higher with KHSb-2.

FOOD SCIENCE AND NUTRITION

Nutritional education - A strategy for management of kidney stones

VANISHRI K. UMARJI 2014 MAJOR ADVISOR:Dr.USHA MALAGI

Kidney stone disease is among the most painful and prevalent urologic disorders. An investigation was undertaken with an objective to assess the nutritional status, food habits of kidney stone patients and to develop nutrition education material and to assess its impact on management of kidney stones. About 100 kidney stone patients were selected from local hospitals of Hubli - Dharwad. Educational intervention was given to 30 selected kidney stone patients and equal number of age and gender matched controls were not given any intervention. Nutrition education was given for 2 months on different aspects of kidney stones and its management through power point presentations, flash cards and booklet. Knowledge and diet related modification and practices were assessed before and after the intervention. The results of the study revealed that, sedentary life style, higher body weight, less fluid intake, higher consumption of purine, oxalate and sodium rich foods and genetic predisposition had contributed to the risk of urolithiasis. Maximum patients in both experimental and control groups had low knowledge scores about the disorder (40% v/s 43.33%), followed by moderate knowledge (33.33% v/s 13.33%). knowledge level of kidney stone patients was positively associated with education level. After the intervention, knowledge gain with regard to the disease was significantly higher in experimental group compared to control group (experimental: 41.67±8.04% vs control: 1.98±2.08%). About 53.33 per cent subjects showed positive improvement in their dietary and life style pattern after the intervention *viz.*, increased water and fluid consumption, restricting salt, tea, bakery products, sugar, animal foods, fats, purine and oxalate rich foods. It can be concluded that, nutrition education is useful in increasing the knowledge and the practices pertaining to diet modifications and life style factors.

FOREST BIOLOGY AND TREE IMPROVEMENT

Studies on seed moisture content, pre-sowing treatments and storage media and containers on seed germination and seedling quality in *Garcinia gummi-gutta* L.

M. SHANKAR 2014 MAJOR ADVISOR: Dr. A. KRISHNA

Garcinia gummi-gutta is one of the economically important recalcitrant species which is rich in Hydroxycitric acid (-HCA), an important biologically active plant metabolite used as an anti-obesity drug. Seeds of *G. gummi-gutta* loose its viability within few days under natural conditions, when the seed moisture content reduces below a high critical value. Germination of this tree is also very poor and late. The present investigation was taken up in College of Forestry, Sirsi in 2013-2014 on *G. gummi-gutta* in order to enhance the quality for better and quick germination. The maximum germination percent (34 per cent) and moisture content (41.97%) was observed in freshly decoated seeds. The moisture content of 28.84 % was found to be critical moisture content for seeds, as below this germination was zero. The maximum mean daily germination (0.19), peak value (0.22) and germination value (0.04) was recorded in fresh decoated seeds. Out of eleven different pre-sowing treatments tried, the maximum germination percentage (86.33%) was recorded in decoated seed treated with GA_3 50 ppm for 12 hrs as compared to other treatments. The other higher quality indexes *viz*., mean daily germination (0.48), peak value (0.58), germination value (0.28), shoot length (13.33 cm), root length (13.43 cm), seedling height (26.76 cm), seedling dry weight (1.26 g) and seedling vigour index (2311) also recorded in this treatment. During six months of storage, the seeds stored in ash treatment recorded maximum germination at the first month of the storage and decline in germination was noticed with advancement in the storage period. Germination per cent in control was negligible after 3 months of storage. Among the all treatments the maximum germination percentage was maintained in pet jar upto sixth months of storage.

FOREST GENETIC RESOURCES

Documentation and characterization of tropical fruit tree genetic resources and associated indigenous traditional knowledge in coastal and up-ghat regions of Uttara Kannada, Central Western Ghats

SEEMA KAMATEKAR 2014 MAJOR ADVISOR: Dr. JAVAREGOWDA

Species diversity of Tropical Fruit Tree (TFT), mango and jackfruit varietal diversity in home-garden and farmlands, its associated Indigenous Traditional Knowledge (ITK) documentation of two typical villages each in two bioclimatic zones of Uttara Kannada district in Karnataka was studied. Using a structured questionnaire, total of 80 household survey in up-ghat and coastal zone. A total of 41 species were recorded from both villages, among a total of 1876 individuals belonging to 28 species of Tropical Fruit trees were recorded in home-gardens and farm lands. Cashew was the predominantly found followed by mango and jackfruit. Home-gardens of both up-ghat and coastal zone are the major production of Tropical fruit trees. The value of Shannon's index was higher for up-ghat village (2.484) when compared to the coastal village (1.638) suggesting that the farmland and home garden of the up-ghat zone recorded higher as well as more evenly-distributed diversity compared to the coastal zone. The up-ghat recorded higher diversity of mango (203 varieties) and jackfruit (269 varieties) then coastal zone. Traditional knowledge related to management of insect pest, total 14 ITK from two biological zones was recorded, mango was recorded highest ITK practices. A total 19 TFT species had been used in culinary and its associated with total 43 ITK had documented, for medicinal purpose total 11 TFT species and total 20 ITK had been documented, for processing and preservation total seven TFT species used and total 14 ITK was documented and total seven TFT species related nine ITK was documented for nursery and maintenance of TFT.

FOREST PLANTATION TECHNOLOGY

Standardization of nursery techniques in *Lagerstroemia lanceolata* wall

K. B. CHAYA 2014 MAJOR ADVISOR: Dr. K. S. CHANNABASAPPA

Lagerstroemia lanceolata belongs to family Lythraceae. It is one of the important species from genus *Lagerstroemia*. Timber is most economical part of this species. It is a valuable and important timber tree, much in demand and provides one of the best of the woods of western India. The demand for nursery grown seedling of *Lagerstroemia lanceolata* has increased immensely for planting under agroforestry programme and massive afforestation programme taken up by the government agencies. Poor natural regeneration, low rate of seed germination has lead to scarcity of these species in its natural habitat. Keeping these points in view the present study was carried out at College of Forestry, Sirsi during 2013-14. In the present study, twelve pre-sowing treatments tried to improve seed germination, seeds treated with GA_3 100 ppm for 12 hour recorded significantly maximum seed germination (17.33 %) and also with respect to mean daily germination, peak value, germination value, germination rate over control. Among different manures and fertilizers, application of PSB (10 g) + Mycorrhizae (10 g) + NPK (1 g each) significantly increased seedling growth attributes *viz* seedling height, collar diameter, number of leaves and leaf area by 29.58, 28.30, 25.03 and 63.18 per cent, respectively over control, also number of lateral roots, length of lateral roots, chlorophyll content, total fresh weight and total dry weight increased by 60.31, 51.69, 52.10, 37.15 and 56.98 per cent due to same treatment at 180 days after planting over control. Hence, fertilizers can be used in combination of biofertilizers to get good quality seedlings.

GENETICS AND PLANT BREEDING

Genetic analysis of micronutrient content in rice (*Oryza sativa* L.)

MADDEPPA MALLIMAR 2014 MAJOR ADVISOR: Dr. P. SURENDRA

The present investigation was carried out in the segregating population of two rice cross combinations *viz.*, Swarna x Ranbir basmati and Swarna x BR2655. The experiment was carried out at Agriculture Research Station (Paddy), Sirsi. The F_3 generation was raised during August to September 2013. The results revealed that the appreciable genetic variability for grain iron and zinc content along with other biometrical traits. The high genotypic and phenotypic coefficient of variations were observed for panicle weight, grain yield kg per ha, in Cross 1 (Swarna x Ranbir basmati) and in Cross 2 (Swarna x BR2655) for number of panicles per plant, panicle weight, grain yield, indicating the high variability among the genotypes studied. High heritability coupled with high genetic advance as per cent of mean were recorded for plant height, number of panicle per plant, panicle weight, number of grains per panicle, L/B ratio, grain yield kg per ha in Cross-1 and Cross 2 for number of panicle per plant, panicle weight, number of grains per panicle, grain yield kg ha^{-1}. This indicates scope of selection in the population, since there is a wide range of variation and additive gene action.Correlation studies indicated highly significant and positive correlation of grain yield with number of panicle per plant, panicle weight, test weight, grain breadth, and L/B ratio. Among micronutrients significant positive correlations were observed between iron and zinc content among themselves. Studies on gene effects in generation mean analysis revealed that additive gene effect [d] was significant in both the crosses for iron and zinc content in rice grain. The results indicated that there exist scope for direct selection for iron and zinc in the population.

Confirmation and expression analysis of transgenic events for pest tolerance in cotton

MANJUNATHSWAMY N. HIREMATH 2014 MAJOR ADVISOR: Dr. MANJULA S. MARALAPPANAVAR

Transgenic events carrying *Cry*1Ac genes developed at Agricultural Research Station, Dharwad were evaluated for presence of transgene, expression of transgene and characterization of resistance to *Helicoverpa armigera* neonates at T_3 generation. Lectin transgenic events carrying *srl* and *rvl* were tested to identify transgenics at T_1 generation, transgene specific PCR carried out for Bt events identified that all plants belonging to Event-32, Event-76 and Event- 78 were positive. In case of lectin transgenics PCR test identified 47 plants in Event-477, 16 plants in Event-395 producing amplicon size of 410 bp. For *rvl* transgenics, 55 plants in Event-430, 16 plants in Event-502 and six plants in Event-A-141 and Event- 431 were found transgene positive by producing expected amplicon of 773 bp.Spatial and temporal variation in *Cry*1Ac gene was evident through ELISA when the toxin concentrations were pooled across the interval of estimation it was clear that Event-78 recorded highest toxin concentration in top leaves (10.49 µg/g), middle leaves (12.02µg/g), bottom leaves (7.26 µg/g), bracts (3.28µg/g), staminal column (2.23µg/g) and seeds (6.21µg/g). Wherein Event-32 recorded highest concentration in petals (2.44 µg/g) and boll rind (3.05µg/g) analyzed. Irrespective of events and checks studied across the intervals toxin quantity gradually increased and reached a peak at 75 DAS and further showed a declining trend along the season. *Cry*1Ac gene expression was higher in vegetative tissues than in reproductive tissues. Characterization of resistance through bioassay indicated that Event-78 was effective with 100 per cent mortality at 60 and 70 DAS in leaves as well as in squares (100 DAS) which reduced to 92.6 per cent and 96.4 per cent in top and middle leaves. These values were higher than the commercial Bt checks (BG-I and BG-II). Event-32 recorded on par mortality rates in leaves and squares in comparison with checks.

Genetic variability for morpho-physiological traits for moisture stress tolerance in cotton (*Gossypium hirsutum* L.)

MARUTI A. LADDI 2014 MAJOR ADVISOR: Dr. I. S. KATAGERI

The responses of 27 *Gossypium hirsutum* L. genotypes with three checks (Sahana, MCU 5 and Bikaneri Narma) to water stress were examined at Agricultural Research Station, Dharwad farm during 2012-13 and 2013-14. Root, Morphological, Physiological and Biochemical traits were assessed at 75 and 105 days after planting. Yield and yield contributing traits were also assessed at harvesting stage. CPD 14-3, CPD 14-2, CPD 14-5 and CPD 14-1 showed higher seed cotton yield under drought condition than checks and other genotypes, as they exhibited higher primary root length, secondary root number, root volume, dry root weight, relative water content, proline content and number of boll retention capacity in drought condition. Therefore they may be considered as genetic resources in moisture stress resistant breeding. The drought susceptible genotypes like G. Cot-16, RHC 0811, HLS 321729, CPD 2007-4 and CPD 464 showed drastic reduction in root biomass, shoot biomass, relative water content and seed cotton yield in drought condition. Secondary root number, root diameter, root volume, leaf area, leaf area duration, stem diameter, fresh shoot weight and shoot dry weight showed higher heritability and genetic advance over mean in drought condition. These traits help to develop drought tolerance in cotton. The correlations among primary rot length, secondary root number, leaf area, root volume, fresh root weight, plant height, stem diameter, specific leaf weight and chlorophyll content were significantly positive in drought condition. Thus, such traits can be simultaneously used as drought tolerance selection indices owing to the absence of undesired relationships.

Genetic variability studies in free threshable segregating and advanced mutant populations of dicoccum wheat (*Triticum dicoccum* (Schrank) Schuebler)

CHANNAPPAGOUD PATIL 2014 MAJOR ADVISOR: Dr. V. RUDRA NAIK

Dicoccum wheat nutritionally rich species of wheat provides valuable source of resistance genes. *Dicoccum* wheat are difficult in harvesting and threshing due to fragile rachis and non-free threshing kernels. An investigation was carried out during *rabi* 2013 to elicit information on genetic variability and character association for yield and its component traits in *dicoccum* wheat using an augmented RBD design. Experimental material consisted of various segregating populations derived from two crosses of *dicoccum* wheat (DDK-1025 X ML-1 and DDK-1025 X ML-2) and along with an advanced free threshable mutant lines. Genetic variability, character association, path analysis and diversity analysis for yield and other related traits were estimated. The amount of variability generated by F_2 of both crosses for most of the traits studied found to be maximum compared to the F_3 and subsequent backcross populations in both the crosses. In case of advanced free threshable lines higher GCV and PCV were obtained for flag leaf length, peduncle length, B-carotene, gluten index, rachis, threshability and grain yield per plot. Association analysis revealed that high grain yield was contributed by number of tillers per plant, number of grains per spike, spike density and thousand grain weight in all kind of segregating populations and mutant lines.Ten out of twenty six characters which includes flag leaf length, number of spikelets per spike, threshability etc had shown direct positive effect on yield by path coefficient analysis. Among the various characters studied grain yield per plant, number of tillers per meter row and gluten index had high contribution for diversity. The investigation revealed that the cross DDK-1025 x ML-2 was the potential source for improving the free threshability and yield. Presently growing dicoccum varieties can be replaced by promising advanced free threshable lines after confirming for their quality performance.

Genetic studies of yield and fibre quality traits in intra *hirsutum* (*Gossypium hirsutum* L.) crosses

RAVI K. KULKARNI 2014 MAJOR ADVISER: Dr. MANJULA S. MARALAPPANAVAR

Cotton has been principal commercial crop of India since time immemorial. To meet the requirements of the ever growing population of the country with limited land resources, breeding programmes should aim at increasing the productivity per unit area. Exploitation of heterosis has played a major role in crop improvement. The main objective of the present study was to improve yield and fibre quality traits in intra *hirsutum* crosses. Significant variability was observed for all the 11 traits studied among 62 parental lines. High heritability (>60%) was observed for all traits except boll weight. A total of 120 hybrids derived as crossing 60 lines and 60 lines and two testers were evaluated for combining ability and heterosis using L x T design. Two lines, AKH-032 and AKH-030 and testers IC-3594 revealed significant positive GCA for seed cotton yield and were found to be good combiners. Among crosses highest yield was recorded by AKH-032 x IC-3594 (31.02q/ha) with fiber strength of 22.9g/tex with significant SCA. Association studies revealed that yield was positively correlated with all the traits except number of monopodia and days to boll opening. Among 40 SSR's used to study the polymorphism between two contrasting parents for fiber strength P56-4 and RS-2013, only one SSR was polymorphic indicating the low level of polymorphism. This marker, CIR 276 when used to screen 173 F_8 RIL population showed R^2 value for 2.5 per cent span length 1.3, for uniformity ratio 25, for fiber strength 0.0094, for micronaire value 4 and for uniformity ratio 8.7. The superior hybrids identified in this study can be tested in MLT trials to confirm their yield potential and to know their stability over different agro-climatic situations. Low R^2 for the markers indicates the need to use more markers to utilize these RIL's for molecular mapping of fiber properties.

PLANT PATHALOGY

Studies on variability, epidemiology and managementof brown leaf spot of tobacco caused by *Alternaria alternata* (Fr.) Kiessler

LINGARAJ DIP 2014 MAJOR ADVISOR: Dr. A. R. HUNDEKAR

Brown leaf spot caused by *Alternaria alternata* (Fr.) Kiessler is one of the major diseases of tobacco. A roving survey conducted in Nippani area for brown leaf spot disease of tobacco during 2013 revealed that September and October months were favorable period for brown leaf spot. The villages Akkol and Aadi showed highest disease severity. Four isolates of *A. alternata* were collected from four different geographical locations, *viz.,* ARS, Nipani (Aa-1), Akol (Aa-2), Lingnur (Aa-3) and Shimoga (Aa-4) and were studied on potato dextrose agar for cultural and morphological variability. The isolates produced moderate to good sporulation on PDA.The conidia of isolates showed variability with septation of 0-3 vertical and 3-6 horizontal septa. In growth phase study, the maximum growth of the fungus was found on 16th day of incubation. Carrot agar and Czapeck's agar, and carrot broth and Czapeck's broth supported the maximum growth and sporulation of the fungus. Aa-1 isolate performed better in different temperature and at wide range of pH. 30^{o}C temperature and pH 7 supported maximum growth of the fungus. In epidemiological study, the multiple regression model developed for PDI is $Y = -247.97 + 5.73X_1 + 4.65X_2 + 1.46X_3 - 1.39X_4 - 0.03X_5$, with $R^2 = 0.87$. ABD-129, Bhavyashree, ABD-123, ABD-125, ArBD-6 and Bhagyashree showed moderate resistance whereas A-119 showed highly susceptible reaction. All the triazoles were highly effective against the pathogen under *in vitro* condition whereas Hexaconazole (0.1%) was effective in minimizing the disease and getting higher yield (1450 kg/ha) under field condition. Among the botanicals, Prosopis leaf extract was found to be most effective, followed by Parthenium and NSKE under *in vitro* condition but it was ineffective in field condition. Among the bioagents, *Trichoderma harzianum* was most effective against the pathogen under *in vitro* condition but it was found ineffective under field condition.

SEED SCIENCE AND TECHNOLOGY

Influence of micronutrients on field performance and polymer seed coating with chemicals on storability of sweet corn [*Zea mays* (L.) Saccharata]

IRAPPA JAKATI 2014 MAJOR ADVISOR: Dr. R. B. JOLLI

A field experiment was carried out during *kharif,* 2013 at MARS, University of Agricultural Sciences, Dharwad to investigate the effect of micronutrients on seed yield and quality of sweet corn (cv. Madhuri). It comprised of eight treatments *viz.,* T_1: Zinc 0.2%, T_2: Boron 0.1%, T_3: Iron 0.1%, T_4: Zinc 0.2% + Boron 0.1%, T_5: Zinc 0.2% + Iron 0.1%, T_6: Boron 0.1% + Iron 0.1%, T_7: Zinc 0.2% + Boron 0.1% + Iron 0.1%, T_8: Control with three replications in RBD. The results revealed that, the foliar application of zinc 0.2% + boron 0.1% + iron 0.1% + RDF

(100 kg N, 50 kg P_2O_5, 25 kg K_2O, 10 kg SO_4 and FYM 7.5 t ha^{-1} has recorded higher plant height (200.6 cm), cob weight (102.0 g), seeds per cob (590.7), 100 seed weight (12.03 g) and seed yield (31.79 q/ha) and seed quality traits like germination (99.30%), seedling vigour index (4210) and seedling dry weight (2.50 g) as compared to other treatments. Laboratory experiment was carried out in two factorial concepts with CRD. First factor consisted of eight treatments and second factor consisted of two containers *viz*., cloth bag and polythene bag. The results of investigation revealed that seeds stored in HDPE (polythene) bag showed better storability as compared to the cloth bag. At the end of eight months of storage period, seeds treated with polymer seed coating @ 10 ml/kg of seed + deltametrin 2.8 EC @ 0.4 ml/kg seed + bavistin 50 WP @ 2 g/kg seeds stored in polythene bag recorded significantly higher seed germination (89.00%), shoot length (17.81 cm) and root length (19.58 cm), seedling vigour index (3390), ten seedling dry weight (2.36 g), 100 seed weight (10.81 g) and lower EC value (0.341 dSm^{-1}) was recorded by T_7 as compared to control.

Effect of pulsed electromagnetic field on seed yield, quality and storability of greengram [*Vigna radiata* (L.) Wilczek]

L. B. NAGARAJ 2014 MAJOR ADVISOR: Dr. RAVI HUNJE

The experiments on effect of pulsed electromagnetic field on seed yield, quality and storability in greengram was conducted during *kharif* 2013 at Water and Land Use Management Institute (WALMI) Farm, Dharwad and storage experiment was carried out from June, 2013 to April, 2014 in the Seed Quality and Research Laboratory, National Seed Project (Crops), University of Agricultural Sciences, Dharwad. This experiments involve four pulsed electromagnetic field such as F_1- Control, F_2-1 Hz, F_3-10 Hz, F_4-50 Hz and F_5-100 Hz on fresh (L_1) and revalidated seed lots (L_2) of greengram Variety S-4. The fresh seed lot with 50 Hz pulsed electromagnetic field recorded significantly higher plant height (57.63 cm), number of branches per plant (4.30), number of pods per plant (14.57), number of seeds per pod (12.23), seed yield (1191.67 kg/ha), 100 seed weight (3.83g), germination (93.83%), seedling length (36.65 cm), seedling vigour index (3409) and protein content (24.17%) it was on par with plots having sown with seeds of 100 Hz pulsed electromagnetic field compared to control. A laboratory experiment was carried out under ambient condition for ten months to evaluate storage performance of both fresh and revalidated seed lots with pulsed electromagnetic field treatments. Significantly higher seed germination (76.00%), seedling length (23.15 cm) field emergence (64.83 %) vigour index (1792) and lower electrical conductivity (1.249 dS m^{-1}) were recorded in fresh seed lot treated with 50 Hz pulsed electromagnetic field at the end of ten months storage period compared to control. These results indicates that 50 Hz pulsed electromagnetic field treatment improves the seed yield, quality and storability in greengram.

SOIL SCIENCE AND AGRIL. CHEMISTRY

Studies on the transformations of carbon, nitrogen, phosphorus and sulphur under different nutrient management practices and cropping systems in vertisol of northern transition zone of Karnataka

JAHNAVI R. KATTI 2014 MAJOR ADVISOR: Dr. K. K. MATH

A long term field experiment was conducted on a Typic Haplustert at MARS, Dharwad which stated during 2004-05. The experiment comprises of four nutrient management practices (organic, inorganic, integrated and RDF+FYM) and five cropping systems (groundnut-sorghum, soybean-wheat, maize-chickpea, pigeonpea+ soybean and cotton+peas). After eight years of continuous cropping, the effect of different nutrient management practices was studied on different forms of carbon, nitrogen, phosphorus, sulphur and soil microbial activities.Organic carbon (6.7 g/kg), water soluble carbon (56.7 mg/kg), labile carbon (960 mg/kg) and total carbon (20.6 g/kg) were significantly higher in the treatment that received continuous application of organic manures than inorganic nutrient management practice (5.2 g/kg, 38.4 mg/kg, 723.7 mg/kg and 12.1 g/kg, respectively). Similarly, NH_4-N (28.7 mg/kg), NO_3-N (9.6 mg/kg) and total-N (664.1 mg/kg) showed statistically higher values in the treatment which received organic manures application. All the forms of nitrogen were significantly and positively correlated with each other. Significantly higher P fractions in the order Ca-P>Al-P>Fe-P>occluded-P>saloid-P were recorded in conventional method of farming while available-P were statistically lower in this system. All the fractions of phosphorus were highly inter-related and significantly correlated with each other. Sulphate-S (24.8 mg/kg), organic-S (337.8 mg/kg) and total-S (362.6 mg/kg) were significantly higher in the treatment which received organic manure application followed by integrated and inorganic nutrient management practices. All the forms of sulphur were significantly correlated with each other. Hundred percent organic management practice increased the soil enzyme activity (urease, phosphatase and dehyrogenase) and soil microbial biomass carbon and nitrogen and significant positive correlation existed between them. Organic nutrient management practice resulted in improvement of soil physical (bulk density, porosity and maximum water holding capacity), chemical (organic carbon and CEC) and biological properties. Improvement was seen in all the forms of carbon, nitrogen and sulphur and available-P content in soil under organic nutrient management practice.

Studies on zinc sulphate and borax on yield, quality and nutrient uptake by knol-khol (*Brassica oleracea* Var. *gonglodes* L.) in alfisols under northern transition zone of Karnataka

SHRISHAIL ARABHAVI 2014 MAJOR ADVISOR: Dr. C. M. POLESHI

A field experiment was conducted to study effect of zinc sulphate and borax on yield, quality and nutrient uptake by knol-khol (Var. Large Green) in Alfisols under Northern Transition Zone of Karnataka during *kharif* 2013 in Horticulture block of Main Agricultural Research Station at UAS, Dharwad with 17 treatments. The treatments included were three levels of zinc sulphate ($ZnSO_4.7H_2O$) *viz,* 10, 20 and 30 kg ha^{-1}, three levels of boron ($Na_2B_4O_7.10H_2O$) *viz,* 2.5, 5 and 7.5 kg ha^{-1} alone and in combination along with RDF as control and gypsum ($CaSO_4.2H_2O$) equivalent to sulpher in $ZnSO_4.7H_2O$ @ 15 kg ha^{-1} and FYM @ 25 t ha^{-1} applied to all the treatments. The treatments were replicated thrice in a Randomized Block Design. The effect of these two nutrients individually and in combinations on growth parameters, yield attributes, yield, quality and nutrient uptake by knol-khol was ascertained at three stages *viz*., vegetative, knob development and at harvest and also evaluated for the available nutrient status of the soil after harvest of the crop. The growth parameters *viz.,* plant height, number of leaves per plant, spread of plant and dry matter accumulation in knol-khol increased significantly due to soil application of zinc, and boron. Application of $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 2.5 kg ha^{-1} along with RDF (T_{11}) was found superior in terms of growth parameters, yield, gross return and net return. It also recorded highest B:C ratio as compared to all other treatments. The next best treatment (T_{12}) $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 5 kg ha^{-1} along with RDF. Hence, it is advisable to the farming community that application of $ZnSO_4$ @ 20 kg ha^{-1} + Borax @ 2.5 kg ha^{-1} was economically viable for obtaining higher productivity and quality in knol-khol besides maintaining zinc and boron status in soil.

Effect of fly ash and organic manure on growth of tree borne oilseed *Simarouba gluca* seedling and properties of potting mixture

L. RAJASHEKAR 2014 MAJOR ADVISOR: Dr. N.A.YELEDHALLI

Effect of fly ash and organic manure on growth of tree borne oilseed *Simarouba gluca* seedling and properties of potting mixture experiment was conducted at Agro Forestry nursery at MARS, Dharwad Karnataka during 2013-2014. Fly ash was obtained from West Coast Paper Mills limited Dandeli as an amendment for preparation of pot mixture with organics *viz*., FYM and VC. These pot mixtures are mixed in 9 different ratios combinations on w/w basis with and without soil including two controls. The data on bulk density, water holding capacity and organic carbon content of fly ash based mixture in different treatment combination differed significantly. It was observed that the bulk density, water holding capacity and organic carbon content was 0.61 Mg m^{-3}, 69.34 per cent and 15.29 g kg^{-1} respectively in pot mixture containing fly ash, FYM/VC and soil in different proportions. The growth parameters *viz*., plant height, number of branches, root length and total dry biomass improved significantly and the nursery seedling height was 120 per cent in to the treatment receiving fly ash, FYM/VC and soil 1:2, 1:3 and 1:2:1, 1:3:1 with soil over the control and other treatments. There was significant improvement in the above biometric parameters in the treatments due to incorporation of soil in the pot mixture when compared to pot mixture without soil. Further, there was increased all the treatment receiving organic with or without soil. Further, there was increased uptake of major and micro nutrient in all the treatment receiving organics with or without soil. However, there was marginal variation in the physic-chemical properties of pot mixture over a period of 150 days after the of nursery seedlings. Incorporation of fly ash in pot mixture with organic substrates resulted in a concentration dependent improvement in dehydrogenase activity in pot mixture. Hence, fly ash can promote microbial activity when mixed with organic substrate which enhanced its benefits, which assumes importance owing to eco friendly disposal of fly ash. The results of the study indicated that fly ash can be used as an alternative to soil for pot mixture for raising of nursery seedlingsss.

Characterization of soils and soil organic matter fractions of selected tree plantations

JEETENDRAPRAKASH 2014 MAJOR ADVISOR: Dr. MANJUNATHA HEBBARA

A study was conducted at the Main Agricultural Research Station, UAS, Dharwad, Karnataka to characterize soils and soil organic matter fractions under teak (*Tectona grandis*), sissoo (*Dalbergia sissoo*), catechu (*Acacia catechu*), bamboo (*Dendrocalamus strictus*), eucalyptus (*Eucalyptus tereticornis*) and casuarina (*Casuarina equisetifolia*) tree plantations. Irrespective of tree species, soils under tree plantations registered lower pH and higher electrical conductivity values over control (cultivated land). The pH of surface soils (0-30 cm) lower than subsoil (30-60 cm). The lowering of pH was to a greater extent under bamboo (*D. strictus*) compared to all other plantations. Soil organic carbon and total N were more under tree plantations than control. The C:N ratio did not vary much among tree species and cultivated land. Tree species registered higher available status for nitrogen, phosphorus and potassium compared to cultivated land. Among different tree plantations, soils under the canopy of bamboo (*D. strictus*) followed by Sissoo (*D. sissoo*) registered significantly higher organic carbon content and available status of N, P_2O_5 and K_2O. Soils under *D. strictus* registered higher DTPA extractable iron and manganese contents whereas higher copper and zinc contents were recorded in soils under *E. tereticornis*. Cultivated land recorded lower heavy metal (Cd, Cr, Ni, Pb) contents compared to tree plantations. Among different tree plantations *D. strictus* recorded higher CEC, humic acid and fulvic acid contents. Humic and fulvic acids extracted from *D. strictus* plantation recorded the highest total acidity and E4/E6 ratio. Irrespective of tree species, humic acid had higher iron content followed by zinc, copper and manganese. Higher copper and manganese contents were recorded in humic acid compared to fulvic acid. The chromium concentration was the highest in leaf litter of all plantations as compared to other heavy metals. The leaf litter of *D. sissoo* had higher nitrogen, phosphorus and potassium contents over other trees.

Effect of long-term irrigation with bio-methanated spentwash on properties of a vertisol and performance of sugarcane crop

S. M. KAMBLE 2014 MAJOR ADVISOR : Dr. MANJUNATHA HEBBARA

A field experiment was conducted at Ugar-Khurd, Athani taluk, Belagavi, Karnataka to study the effect of different periods of spentwash application (5-10, 10-15, 15-20 and > 20 years) on soil properties and performance of sugarcane crop in a Vertisol of Northern Dry Zone (Zone-III) of Karnataka.The results revealed that application of spentwash for 5 to 10 years was superior with respect to growth, yield and quality parameters of sugarcane like millable cane height, diameter of cane, number of internodes, internodal length, number of millable canes, single cane weight, dry matter content, yield brix per cent, pol per cent and purity per cent. The crop could not be established in the plot which received spentwash for >20 years. The uptake of nitrogen, phosphorus and potassium was higher in the treatment that was irrigated with spentwash for 5 to 10 years which decreased with increased periods of spentwash application. The sodium uptake by sugarcane increased due to continuous application of spentwash and recorded the highest uptake under 15 to 20 years of spentwash application. Long-term application significantly reduced the soil bulk density, erosion index, dispersion index and increased maximum water holding capacity, aggregate stability and infiltration rate. The EC and ESP values increased with increased periods of spentwash application recording the highest values under >20 years of spentwash application. The salinity value increased beyond the threshold for sugarcane crop. The available nutrient status, CEC, base saturation, ESP and $CaCO_3$ content in soil was higher in the plots irrigated with spentwash for >20 years. The higher soil bacteria, fungi and actinomycetes population was found in the treatment that received spentwash for 10 to 15 years, which decreased at > 20 years of spentwash application.

TEXTILE AND APPAREL DESIGNING

Blend analysis of trouser materials

PARVEENKAUSAR M. LATHIWALE 2014 MAJOR ADVISIOR: Dr. SADHANA D. KULLOLI

The present research on “Blend analysis of trouser materials” was carried out during the year 2012-14, with the objectives; to find out the varied trouser materials available in the market, to study the consumer preference for trouser materials, to analyze the blend proportion and to assess the performance characteristics of trouser materials. The study comprised of two parts *viz*., survey method and experimental procedure. Thirty each exclusive men trouser material shop owners and men respondents were interviewed using self structures questionnaire, to gather information about availability of trouser materials and to know the preference for type of trouser material, brand, blends, colour, frequency of purchase and the factors considered while purchasing trouser materials. In experimental procedure; most

popular and preferred four blended trouser materials *viz*., polyviscose of 55:45 & 75:25 and terrywool of 55:45 & 75:25 were selected for the study and were subjected to 5, 10 and 15 washings. Further, the control and washed samples were assessed chemically for blend analysis using m- cresol, H_2SO_4 (70%), NaOH (5%) and sodium hypochlorite (4-6%); and tested for mechanical and physical properties (geometric, performance, durable and comfort properties). The data was analyzed with frequency, percentages, Z- test, two way ANOVA and t-test. The results revealed that, the polyviscose and terrywool blended trouser materials with varied blend proportions were available in majority of the shops while, majority of the respondents always preferred polyviscose and terrywool blended trouser materials. It was found that, there existed non-significant differences between washings and among the geometrical, performance, durable and comfort properties and significant difference was observed in abrasion resistance (cycles) before and after washings in all the samples.

Designing adaptive clothing styles for visually impaired children

LEELA N. WALMIKI 2014 MAJOR ADVISIOR: Dr. JYOTI V. VASTRAD

The study on 'Designing adaptive clothing styles for visually impaired children' was carried out during 2012-2014 at Dharwad, Belgum and Uttar kannada Districts with the objectives: to study the clothing selection and laundering practices among blind adolescents, to identify the explicit recognition processes in identification of clothes, to assess the clothing problems of the blind adolescents, to design adaptive clothing with self-help features and to study the suitability and comfortability of the adaptive styles. The study comprised of two parts viz., survey method and experimental procedures. The primary data on clothing purchases and laundry practices was collected through survey method by interviewing 50 each visually impaired adolescent girl and boys using self structured interview schedules. In experimental procedure 5 adaptive clothing were designed for visually impaired adolescent girls for studying suitability and comfortability of the newly designed garment. The survey results revealed that, the visually impaired boys and girls were 'always' assisted by parents, teachers while purchasing clothes, boys 'always' purchased readymade garments and girls preferred tailor made garments. The visually impaired adolescents 'always' faced problem in selecting colour of the clothes followed by pattern. Colour identification, matching of upper and lower garments was the major problem reported by visually impaired adolescents. Majority of the girls always washed garments by themselves than the boys. Majority of the respondents opined that, Braille labels were highly suitable and functional followed by buttons, appliqué/patch work and bead work in identification of garment colour, style right/wrong and front/back of the garment. Among the garments, divided skirt and blouse, Kameez - salwar, and top wraparound skirt and leggings were found to be 'highly acceptable' adaptive garments.