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ABSTRACTS OF THESES

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

DOCTOR OF PHILOSOPHY

AGRONOMY

Response of sugar beet genotypes to sowing dates, graded levels of major nutrients and time of harvest under tropical conditions

KUMAR D. LAMANI 2013 MAJOR ADVISOR: Dr. S. I. HALIKATTI

Field experiments were conducted at ARS, Bailhongal during 2005-06 and 2006-07. Sowing dates experiment comprised of 12 monthly dates (IFN) in main plot and two genotypes in subplots laid out in split plot design. Nutrient management trial comprised of three factors of N (60, 120 and 180 kg ha^{-1}), P_2O_5 (30,60 and 90 kg ha^{-1}) and K_2O (60, 90 and 120 kg ha^{-1}) laid out in RBD with absolute control. Harvesting dates trial comprised of three genotypes in main plot and six harvesting dates in subplot laid out in split plot design . Higher tuber yield (105.77 t ha^{-1}) was recorded when the crop was sown on October I fortnight (FN) over the other sowing dates and it was on par with September I FN sown sugar beet (102.47 t ha^{-1}). Sowing of sugar beet in October I FN recorded significantly higher sucrose content (18.75%) which was on par with September I FN (18.25%) and November I FN (18.09%). Sugar beet sown in October and September IFN recorded significantly higher net returns (₹ 90122 and 86160 ha^{-1}) and B:C ratio (3.45 and 3.34), respectively. Sowing of Cauvery genotype recorded significantly higher sugar beet tuber yield (79.14 t ha^{-1}) than Indus genotype (73.42 t ha^{-1}). The combined application of N120 P_2O_5 60 K_2O 90 and N 120 P_2O_5 60 K_2O 120 recorded higher tuber yield (112.1 and 115.2 t ha^{-1}, respectively) over other combinations. Significantly higher sucrose content (20.54%) was obtained by applying 60:90:90 kg ha^{-1} of N, P_2O_5 and K_2O, respectively. Sucrose content decreased significantly with increasing N levels from 60 (18.41%) to 180 (17.49%) kg ha^{-1}. Whereas, sucrose content increased with increasing K_2O levels from 60 (17.47%) to 120 (18.46%) kg ha^{-1}. Also increasing application of P_2O_5 from 30 to 60 kg ha^{-1} increased the sucrose content. Impurities and sucrose content are negatively correlated. Application of 120:60:90 kg N, P_2O_5 and K_2O ha^{-1} recorded the highest net returns (₹ 103280 ha^{-1}) and B:C ratio (4.31) and was on par with 120:60:120 kg N, P_2O_5 and K_2O ha^{-1}. Sugar beet harvested on 5, 5½ and 6 months recorded significantly higher tuber yield (100.4 - 106.1 t ha^{-1}) and sucrose content (19.30, 18.94 and 18.77%, respectively) as compared to sucrose content either in early harvesting 4½ month (18.48%) or delayed harvesting at 6½ and 7 months (18.33 and 16.12%). Early harvesting at 4½ months reduced the tuber yield drastically. Delayed harvesting upto 6½ months did not have any adverse effect on quality. Cauvery genotype recorded significantly higher tuber yield (108.1 t ha^{-1}), net returns (₹ 92129 ha^{-1}) and B:C ratio (3.45) as compared to Indus (83.90 t ha^{-1}, ₹ 63062 ha^{-1}, 2.68, respectively) but on par with Interprice Brucille.

CROP PHYSIOLOGY

Studies on physiological and biochemical changes during long term storage of paddy and rice under different packaging materials

D. SAIDA NAIK 2014 MAJOR ADVISOR: Dr. M. B. CHETTI

Investigations were undertaken to study the physiological and biochemical changes during long term storage of paddy and rice under different packaging materials at the Department of Crop Physiology, College of Agriculture, University of Agricultural Sciences, Dharwad over a period of 18 months from February, 2011 to August, 2013. The research study consisted of two experiments with eight treatments comprising packing of seeds with different packaging materials *viz;* vacuum packed, polythene, cloth and gunny bags stored at room temperature (25 ± 2º C) and cold storage (4 ± 1º C) for a period of 18 months. The observations recorded at bi-monthly intervals revealed that the seeds stored in vacuum packed bags maintained the quality with least deterioration compared to gunny and cloth bags. The seed quality parameters *viz.,* germination per cent, root length, shoot length, total seedling length, seedling dry weight, seedling vigour index, mean daily germination and mobilization efficiency were very high in vacuum packed bags compared to gunny bags throughout the storage period of 18 months under both ambient and cold storage. Electrical conductivity values were lowest in vacuum packed bags compared to polythene, gunny and cloth bags. The rate of absorbance of moisture content was more in gunny and cloth bags, while vacuum packed bags maintained constant moisture content. The activities of enzymes *viz;* á-amylase, lipase, protease and peroxidase were slightly less in vacuum packed bags compared to gunny and cloth bags in both paddy and rice grains. Mineral contents *viz*., copper, zinc, iron and manganese decreased with advancement in storage period and higher in vacuum packed seeds over all other treatments in both paddy and rice grains. Among the storage conditions, cold storage recorded better seed quality, physiological and biochemical parameters over room temperature, irrespective of the storage containers throughout the storage period of 18 months.

GENETICS AND PLANT BREEEDING

Genetic studies on *alternaria* leaf spot disease resistance and yield component traits in sunflower (*Helianthus annuus* L.)

K. SUJATHA 2013 MAJOR ADVISOR: Dr. H. L. NADAF

The present study was conducted to study the inheritance of resistance to Alternaria blight and to improve the agronomic traits of the known source of resistance TX-16R, through induced mutagenesis and hybridization followed by selection at MARS, Dharwad during 2010-12. Inheritance study of resistance to Alternaria helianthi from four crosses, with common donor parent, TX-16R indicated inhibitory gene interaction with 3 resistant: 13 susceptible ratio. Induced mutagenesis of TX-16R with gamma rays at two doses (200 Gy and 250 Gy) and with EMS (0.015 mols/dm^3 and 0.020 mols/dm^3) was attempted to improve TX-16R for resistance to Alternaria leaf blight and agronomical traits coupled with hybridization programme, of TX-16R was crossed with three male sterile, two maintainer and two restorer lines. Genetic variability among the 159 genotypes derived M_{3-4}/F_{3-4} lines revealed that GCV and PCV were high for seed yield per plant, 100 seed weight and Alternaria disease reaction. Character association revealed that head diameter and 100 seed weight were significantly and positively associated with seed yield. From the

present study recombinant lines 90, (72g), 92 (27.67g) and 133 (32.58g) derived from (CMS 4546A × DSF-2A) × TX-16R cross, 44 (29.67g) from EMS (0.015 mols/dm^3) and 222 (26.5 g) from EMS (0.020 mols/dm^3) treatment were identified in M_3F_3 and M_4F_4 generation for seed yield, of which, recombinant line 133 had high oil content (40.10%) compared to control TX-16R (37.74%). The present study indicated that EMS treatment at 0.015 mol/dm^3 and 0.020 mol/dm^3 was found to be effective in creating more variability and resulted in isolation of desired mutants compared to 200 Gy gamma radiation. From the hybridization programme, derived lines of the cross (CMS 4546 × DSF-2) × TX-16R performed better for agronomic traits with high Alternaria disease resistance that can be utilized in future hybrid development programme for Alternaria disease resistance.

Introgression of foliar disease resistance using synthetic amphidiploids and identification of associated QTLs in groundnut (*Arachis hypogaea* L.)

VARSHA KUMARI 2013 MAJOR ADVISOR: Dr. M. V. C. GOWDA

In an attempt to broaden the genetic base and variability for late leaf spot (LLS) and rust resistance in groundnut, three introgression line (IL) populations, ICGS 76 × ISATGR 278-18 (IL1), DH 86 × ISATGR 278-18 (IL2) and DH 86 × ISATGR 5 (IL3) were developed by crossing disease susceptible varieties with the resistant synthetic amphidiploids (ISATGR 278-18 and ISATGR 5) and backcrossing twice with the recurrent parents. In total 164, 51 and 32 BC_2F_4 ILs constituted IL1, IL2 and IL3, respectively. Field evaluation of the ILs during *kharif* 2011, summer 2012 and *kharif* 2012 showed considerable variability and heritability for disease resistance and most of the agronomic and productivity traits. ILs showed bimodal distribution for LLS, and a normal distribution for rust and agronomic and productivity traits. LLS and rust were negatively correlated, while most of the agronomic and productivity traits were positively correlated. Most of the agronomic and productivity traits exhibited negative correlation with LLS and rust. Linkage mapping with 136 SSR markers in IL1 resulted in map of 1103.2 cM with 19 linkage groups and 8.62 cM inter-marker distance. Single marker analysis showed significant association of a few markers with R^2 ranging from 3.94% to 94.34% for LLS and 3.96% to 68.337% for rust. GM1954 was consistent across the populations for both the diseases. Composite interval QTL mapping identified 26 QTL for disease resistance, and 16 for agronomic and productivity traits. Major QTL consistent across seasons included GM1996-IPAHM103 (31.12%-67.45%), gi-4925-GM2144 (9.70%-14.99%) and TC6E01-GM1409 (9.84%-12.39%) for LLS, gi-4925-GM2144 (10.40%-16.52%), GM2009-GM2301 (7.88%-16.03%) and GM900-GM2082 (5.74%-11.04%) for rust and GM900-GM2082 (13.15%-24.89%) for test weight. The markers flanking the major QTL carried the favorable alleles contributed by ISATGR 278-18, indicating the utility of wild diploids. QTL and the markers identified here need to be validated before deployed for marker assisted selection.

Genetic mapping and QTL analysis for disease resistance, yield and quality in groundnut (*Arachis hypogaea* L.)

V. SUJAY 2013 MAJOR ADVISOR: Dr. M. V. C. GOWDA

Recombinant Inbred Line (RIL) populations of TAG 24 × GPBD 4 (RIL-4) and TG 26 × GPBD 4 (RIL-5) were phenotypically evaluated and genotyped with SSR markers to construct the linkage map and identify the QTL governing resistance to late leaf spot (LLS) and rust, yield and quality traits in groundnut. Ample variability was observed for both the diseases (LLS and rust) however it was low to moderate for morphological and yield related traits in both the populations. A total of 3,101 and 3,284 SSR markers were screened on parents of mapping populations, of which 211 and 210 markers were considered for linkage map construction. A map of 1982.90 cM with 20 linkage groups (LGs) was obtained for RIL-4 with 190 markers, while RIL-5 had a map of 1963.40 cM with 21 LGs with 182 marker loci. Consensus map was developed with 227 SSR loci of which 144 were common between two maps. It had 20 LGs with genome coverage of 1198.76 cM. QTL analysis with composite interval mapping identified a total of 90 (RIL-4) and 60 (RIL-5) QTLs localized on individual maps. From both the populations, a total of 28 QTLs for late leaf spot, 14 QTLs for rust, 36 QTLs for morphological traits, 29 QTLs for yield and 43 QTLs for quality were identified. Among the 150 QTLs identified, 55 were major QTLs and 95 were minor QTLs. Major QTLs for LLS were identified for the first time in cultivated groundnut and they need to be validated. Presence of major QTL for rust was reconfirmed, and in addition to IPAHM103, a few new markers (GM1536, GM2301 and GM2079) linked to rust resistance were identified and validated in diverse germplasm. Further, FAD2A allele specific marker has been validated and mapped on the genetic map. Tightly linked markers for rust and FAD2A allele for oil quality can be deployed simultaneously in marker assisted breeding in cultivated groundnut.

MASTER OF SCIENCE

AGRONOMY

Effect of planting techniques and irrigation methods on growth, yield and economics of turmeric (*curcuma longa* L.)

S. MAHESH CHANDRA 2013 MAJOR ADVISOR: Dr. S. S. ANGADI

An experiment was conducted to study the effect of planting techniques and irrigation methods on growth, yield and economics of Turmeric (*Curcuma longa L.*) during 2012- 13 at Agriculture Research Station, Kalloli (UAS, Dharwad). The experiment was laid out in split plot design with three replications comprising of three irrigation methods i.e. furrow irrigation at 50 per cent soil moisture depletion (I_1), sprinkler irrigation at 50 per cent soil moisture depletion (I_2) and farmer's practice of irrigation i.e. furrow irrigation at weekly interval (I_3) as main plots and four planting methods i.e. planting of rhizomes on one side of the ridges at 2 feet row spacing (M_1), planting of rhizomes on one side of the ridges at 2.5 feet row spacing (M_2), planting of rhizomes on both sides of the ridge at 3 feet row spacing (M_3) and broad bed and furrow system of planting (M_4) as sub plots. The results indicated that, cured yield (3.51 t ha^{-1}) and fresh yield (16.68 t ha^{-1}) of turmeric were significantly higher in I_3 and were on par with I_1 (3.34 t ha^{-1} cured yield and 15.91 t ha^{-1} fresh yield). Among planting methods, M_3 recorded significantly higher cured rhizome yield (3.74 t ha^{-1}) and fresh yield (17.35 t ha^{-1}). With respect to interaction I_3M_3 recorded significantly higher growth parameters and cured rhizome yield (3.95 t ha^{-1}). The sprinkler method of irrigation recorded significantly higher field water use efficiency (145.91 kg ha^{-1} cm) with the lower total quantity of water applied (110.64 cm). The higher gross returns (₹260700 ha^{-1}), net returns (₹198051 ha^{-1}) and B: C ratio (4.16) was recorded with farmer's practice of irrigation and rhizomes planted on both sides of the ridge with 3 feet distance.

Studies on nutrient management practices and genotypes on yield and quality of sugarcane and jaggery

B. A. SHRIDEVI 2013 MAJOR ADVISOR: Dr. C. P. CHANDRASHEKAR

Field experiment was conducted at Agricultural Research station, Sankeshwar to study the effect of nutrient management practices and genotypes on yield and quality of sugarcane and Jaggery during 2012-13. The treatments consists of four nutrient supply systems (100% organics, 100% inorganics, Integrated nutrient management (INM) and Recommended package of practices (RPP)) as main plots and three genotypes (Co-92005, SNK-632 and Co-86032) as sub plots. Supplementation of nutrients as per RPP recorded significantly higher millable cane height (239.0 cm), cane diameter (3.40 cm), total dry matter production (379.61 g plant^{-1}), LAI (3.04), cane weight (1.60 kg cane^{-1}), millable cane number (97770 ha^{-1}), cane yield (153.55 t ha^{-1}) and total biomass yield (189.36 t ha^{-1}) than other nutrient management practices. Similarly, Jaggery recovery (12.54%) and yield (18.96 t ha^{-1}) were higher with RPP. However, better quality Jaggery with higher sucrose (76.05%) and lower reducing sugars (12.82%) were recorded with 100 % organics. Among the genotypes, SNK-632 performed better by recording taller (240.6 cm) and thicker cane (3.35 cm), higher total dry matter production (408.26 g plant^{-1}), LAI (3.40), single cane weight (1.61 kg cane^{-1}), millable cane number (109970 ha^{-1}), cane yield (156.47 t ha-1) and total biomass yield (191.78 t ha^{-1}) than Co-86032 and Co-92005. However, juice quality parameters like pol (19.01%), CCS (13.67%) and purity (96.37%) were higher in Co-86032 than SNK-632. But, better quality jaggery was noticed in Co-92005 than other genotypes. The genotype SNK-632 with RPP recorded higher cane and total biomass yield (198.71 and 238.90 t ha^{-1}) than other treatments. Further, it also recorded higher gross return (₹ 496767 and 686493 ha^{-1}), net return (₹ 396283 and 482559 ha^{-1}), and B:C ratio (4.94 and 3.37) for sugarcane and Jaggery production, respectively over other treatments. Better quality Jaggery with net rendement value of 62.50 was obtained with Co-92005 with the application of 100 per cent organics than other treatments.

AGRI BUSINESS

Business performance of Belgaum milk union

SANTOSH B. BALIKAI 2013 MAJOR ADVISOR: Dr. N. M. KERUR

Indian dairy industry is known to the world as most successful industry which is based on Anand pattern. Livestock sector has been playing an important role in Indian economy and an important sub sector of Indian agriculture. A study was conducted to analyse the performance of dairy cooperatives and their impact on milk production, income and employment. The growth in milk procurement was positive growth 7.21 per cent per annum. The average milk sales were increased by 6.76 per cent per annum due to the popularity of milk brand in the operating area of the union. The major source of milk to the union was DCS, in the total procured milk around 80 percent to 85 percent milk was sold as raw milk and rest was converted in to milk products and sent to the outlets. The physical performance of the societies in the study area revealed that the overall physical indicators had an increasing trend along with the number of employees working in the societies. The profits of societies showed increasing trends in union areas. The share capital, total sales value of milk also increased along with the increase in the members. The compound growth rates in respect of the physical indicators, membership and milk procured were highly significant in the study area. The compound growth rate of financial indicators is almost better in the all aspects and showed highly significant in the study area. Educate the consumer about the KMF products by using appropriate promotional techniques like advertising simultaneously in radio, television and newspaper. The sales promotional techniques have not materialized during the past years. Therefore a market research survey is required to identify the different sources by which the consumers receive the information which required for the improvement of sales promotion measures.

AGRICULTURAL BUSINESS MANAGEMENT

Production and marketing management of organic inputs in dharwad district

UMADEVI S. BIRADAR 2013 MAJOR ADVISOR: Dr. B. K. NAIK

The present study on production and marketing management of organic inputs in Dharwad district was carried out during the year 2011-12 in four villages of two taluks in Dharwad district of Karnataka. In this study, demand forecasting analysis was done for forecasting the demand of different organic inputs for next three years based on the previous year data available. Total production cost analysis showed that 1847, 942, 1317, 1424, 1881, 1716 rupees cost were involved in per ton of production of vermi compost, farm yard manure, sheep manure, goat manure, poultry manure, oil cake manure respectively where as 46.75 and 39 rupees per litre of Jeevamrutha and Beejamruta preparation respectively. The price realized was 2967, 1774, 2250, 2233, 2972 and 2450 rupees per ton of vermi compost, farm yard manure, sheep manure, goat manure, poultry manure, oil cake manure where as 75.89 and 75.58 rupees per litre of Jeevamrutha and Beejamruta respectively.The net returns obtained after sale was ₹ 849, ₹ 562, ₹ 663, ₹ 539, ₹ 821 and ₹ 464 per ton of vermi compost, farm yard manure, sheep manure, goat manure, poultry manure and oil cake manure and ₹ 20 and ₹ 27 per litre of Jeevamrutha and Beejamruta respectively. The benefit cost ratio was found to be 1.61, 1.88, 1.71, 1.57, 1.58, 1.43, 1.61 and 1.93 for vermi compost, farm yard manure, sheep manure, goat manure, poultry manure, oil cake manure, Jeevamrutha and Beejamruta respectively. Marketing efficiency of all the organic inputs was calculated to know the value addition through the marketing system. Marketing margin in selling of various organic inputs was also calculated. Garrett's ranking technique was adopted for studying the marketing problems of all the organic inputs and it revealed that non-availability of exclusive market for organic inputs and non-availability of labour are the major marketing problems.

CROP PHYSIOLOGY

Evaluation of maize genotypes for moisture stress condition

MARUTI BYAKOD 2014 MAJOR ADVISOR: Dr. B. B. C HANNAPPAGOUDAR

Field experiment was conducted at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad during rabi/summer season 2011-12 to evaluate maize genotypes for moisture stress condition. The experiment was laid out in RCBD with two replications consisting of 100 maize genotypes comprising private hybrids (12), public hybrids (4), experimental hybrids (10) and inbreds (74). Among the genotypes, DMIL-62, DMIL-78, DMIL-165, DMIL-181 and ARBMH-1 recorded maximum plant height, leaf area, and dry matter accumulation in leaf, stem and cob at all the stages. The genotypes DMIL-181 and DMIL-78 maintained higher photosynthetic rate and stomatal conductance. The various biochemical

parameters *viz.,* total chlorophyll (SPAD values) and proline content were higher in DMIL-78, DMIL-181, ARBMH-1 and DMIL-52. The genotypes DMIL-181, DMIL-78, ARBMH-1, DMIL-53 and DMIL-54 recorded significantly higher values, growth parameters *viz.,* LAI, SLW, LAD, NAR, CGR and BMD. Anthesis-silking interval (ASI) was less in DMIL-64, DMIL-52, DMIL-78 and DMIL-181. The genotypes DMIL-141, DMIL-63, DMIL-78 and ARBMH-5 recorded maximum RWC under severe moisture situation. Yield and yield components *viz.,* cob weight, cob length, cob girth, test weight, number of seeds per cob, grain yield and harvest index were significantly higher in genotypes ARBMH-1, DMIL-78, DMIL-181 and DMIL-169. Considering the performance of all the genotypes under severe moisture stress situation, the inbred lines like DMIL-39, DMIL-78, DMIL-113, DMIL-117, DMIL-141, DMIL-142, DMIL-169, DMIL-181, CM-501, KDMI-16 and the experimental hybrids like ARBMH-1, ARBMH-3, ARBMH-5 and ARBMH-9 were realized better with higher plant height, total chlorophyll content, SPAD values, RWC, photosynthetic rate, proline content, ASI and yield performance while, the inbred lines like DMIL-27, DMIL-29 and DMIL-43 registered lower values for these traits and were categorized as drought tolerant and susceptible genotypes, respectively.

AGRICULTURAL ECONOMICS

An economic analysis of consumption behavior of pulses in dharwad district

M. K. PRAKASHANAIK 2013 MAJOR ADVISOR: Dr. H. BASAVARAJA

The objective of the present study was to analyze consumption behaviour of pulses in Dharwad district. The study is based on primary data collected from sample of 150 respondents (75urban and 75 rural households)located in urban and rural areas for the year 2012-13. Data was processed using tabular analysis, regression analysisand estimated of income elasticity.The quantity of bengalgram consumed was 7.38 kg and its consumption was highest in IG2 (8.61 kg). The quantity of redgram consumed was 6.23 kg with the highest of 7.60 kg being consumed by IG2. The quantity of greengram consumed was 5.77 kg. The highest quantity (6.92 kg) of this pulse was consumed by IG2. The quantity of blackgram consumed was 4.46 kg and its consumption was highest in IG2 for rural areas. In the urban households, the annual per capita consumption of pulses in all forms was 34.03 kg. The bengalgram, redgram, greengram and blackgram were the most popular pulses consumed. Across income groups generally, middle income group respondents were tend to consume more of all pulses compared to other two income group respondents.The income group wise annual per capita expenditure on pulses was higher in middle income group. The proportion of expenditure on pulses increased with increase in income. The expenditure on redgram and bengalgram was more in rural areas. The estimated income elasticity of pulses was negative for except mothbean and fieldbean in rural areas. The income elasticity was highest for cowpea (0.244) in the case of urban area and was lowest (-0.032) for mothbean in urban areas. The family size was found to have positive and significant influence on pulse expenditure. The family type dummy produced positive and significant influence on pulses expenditure at one percentage level in rural households.

Climate variability and its effect on cropping pattern and farm income : an economic assessment in Dharwad district of Karnataka

SARFRAZAHMED NAIKWADI 2013 MAJOR ADVISOR: Dr. V. R. KIRESUR

Climate change is one of the biggest challenges the world is facing today. Despite technological advances, weather is still a key factor in agricultural productivity. The effect of climate on agriculture is related to variability in local climates rather than in global climate patterns. Most agronomists believe that agricultural production will be mostly affected by the severity and pace of climate change (called “climate variability”), not so much by gradual trends in climate (called “climate change”). The effects of climate variability are many folds. There is a need to create awareness about its impact on various sectors of agrarian economy. The present study analyzed the climate variability and its effect on cropping pattern and farm income in Dharwad District of Karnataka. The study is based on both secondary and primary data. Primary data were collected from Dharwad taluka of Dharwad district, which was purposively selected owing to the presence of agroclimatic observatory. The sample consisted of 120 farm households randomly selected from four villages spread within a radius of 20 km from the meteorological observatory. The data thus collected were analyzed by using compound annual growth rate, multiple regression models, Garrett’s ranking technique, percentages, means, coefficient of variation, mean deviation, correlation matrix and other descriptive statistics. In terms of variability, rainfall showed the highest coefficient of variation, followed by relative humidity, minimum temperature and maximum temperature. The highest mean rainfall was received during monsoon, post-monsoon and premonsoon periods across the study. The highest variation was observed in pre- monsoon rainfall, followed by post-monsoon rainfall, while the least was in the case of monsoon rainfall. This needs a sound ‘Contingent Farm Planning’ by the farmers supported by the extension agencies. Dharwad and Hubli taluks had highest positive correlation (0.8816) in terms of annual rainfall, followed by Hubli-Kundgol, Kundgol-Navalgund and Kalaghatgi-Kundgol.

AGRICULTURAL EXTENSION EDUCATION

Spread of perennial forage crops production technologies in North Karnataka

B. V. RAJANIKANTH 2013 MAJORADVISOR: Dr. NAGARATNA BIRADAR

Livestock plays multifunctional roles in rural households. The dependence on concentrate feeds burden the livestock farmers. Though traditionally farmers cultivated annual forage crops but perennial forage crops gained importance of late. Many perennial forage crops are available for irrigated and rainfed conditions. The study was conducted with the objectives - to identify the dissemination pathways and diffusion of forage technologies; to study the socio economic profile of farmers growing forage crops; to study the utilization pattern of forage technologies and the benefits gained by the farmers and to elicit the constraints faced and suggest efficient dissemination pathways. Mudhol and Jamkhandi taluks of Bagalkot and Gokak and Athani taluks of Belgaum districts and 4 villages from each taluk were selected for the study that covered 16 villages and 150 respondents. Snowball technique was followed to identify and interview the respondents. Data was analysed using appropriate statistical tools. Veterinary office as a source of information and seed/planting material of forage crop was the path emerged as the most followed pathway by 28 per cent of the respondents. The second most followed pathway was relatives/friends for both the information and source as one fourth of the respondents followed it. Third in the line was relatives/friends for information source and SAU for obtaining seed/planting material. One third (33.33%) respondents cultivated Bajra Napier hybrid as sole crop, Rhodes grass was cultivated by 13.33 percent respondents, 18 per cent respondents cultivated Bajra Napier hybrid and Rhodes grass, 24 per cent farmers cultivated Bajra Napier hybrid with Perennial Fodder Sorghum and 11.33 per cent farmers cultivated Rhodes grass with perennial fodder sorghum. The suggested dissemination pathway involves capacity building of Veterinary staff, farmers as technocrats for information source and production of seed material.

Perception and adoption of soil and water conservation practices among beneficiaries and non-beneficiaries of sujala watershed project in Northern Karnataka

P. K. MITHUN 2013 MAJOR ADVISOR: Dr. A. BHEEMAPPA

The study was conducted during 2012-13 in Haveri and Dharwad districts of Karnataka state wherein Sujala watershed project was implemented during 2001 to 2007. From the project area 80 beneficiaries and 80 non-beneficiaries were selected to constitute 160 sample for the study. The results showed that more number of beneficiaries belonged to middle age (42.50%) and young age group (25.00%) as compared to non-beneficiaries (27.50% and 22.50% respectively). Similarly, more number of beneficiaries belonged to nuclear family and high achievement motivation (70.00% and 43.75% respectively) than non-beneficiaries (57.50% and 33.75% respectively). Majority of beneficiaries (45.00%) were noticed in high awareness of soil erosion problems as compared to non-beneficiaries (36.25%). The usefulness of nala bund, contour bund and contour strip was highly perceived by beneficiaries (97.50%, 85.00% and 77.50% respectively) than non-beneficiaries (81.25%, 58.75% and 61.25% respectively). And also high perception of soil and water conservation practices was observed with more number of beneficiaries (56.25%) as compared to non-beneficiaries (40.00%). Adoption of water ways, boulder bund, and water recharging pit were noticed with majority of beneficiaries (65.00%, 62.50% and 58.75% respectively) than non-beneficiaries (23.75%, 43.75% and 27.50% respectively). The adoption of soil and water conservation practices was positively correlated with annual income among both the categories. But the positive relationship of land holding, extension participation, awareness of soil erosion problems and accessibility to farm implements was noticed among beneficiaries only. Majority of non-beneficiaries (63.75%) as compared to beneficiaries (48.75%) expressed the constraint of non availability of suitable implements. Similarly, lack of technical guidance and lack of training was highly expressed by non-beneficiaries (58.75% and 56.25% respectively) as compared to beneficiaries (35.00% and 31.25% respectively). However, the problems of high cost of labours and loss of space for constructing structures were reported by all the non beneficiaries and majority of beneficiaries (87.50% and 77.50% respectively).

Adoption of SRI method of paddy cultivation by farmers in Dharwad district

D. CHANNAMALLIKARJUNA 2013 MAJOR ADVISOR: Dr. SYED SADAQATH

The present study was conducted during 2012-13 in Dharwad district of Karnataka. The total sample comprised of 150 from 10 villages of two taluks. The data was elicited through personal interview method. The main objective was to study the knowledge and adoption of SRI method of paddy cultivation by farmers. The major findings of the study revealed that less than 50.00 per cent of paddy growers (41.33%) had medium knowledge level about SRI method paddy cultivation. Majority of the farmers (90.66%) having knowledge about recommended age of the seedlings. Less than half of the paddy growers (36.00%) had medium level of adoption category and 88.66 per cent of respondents had fully adopted recommended seed treatment. With respect to age, 64.67 per cent of respondents were of middle aged, 36.00 per cent of the respondents studied upto primary school and 59.33 per cent of respondents possessed marginal land holding. About 50.00 per cent of the respondents practiced SRI method cultivation of paddy and more than half of the respondents had medium level of innovative proness, 40 per cent of the respondents participated in 1-2 trainings in Farmers Field School (FFS) and 34.67 per cent of the respondents had the medium level experienced in SRI method of cultivation practices. Majority (83.33%) of the farmers expressed that the weed problem in SRI method was more compared to conventional method, 88.00 per cent of farmers suggested to develop suitable and specific time for use of chemical weed control. Education, Area under SRI method cultivation, Family income, Experience in SRI method, Risk orientation and Extension contact by the farmers showed significant relationship at 0.01 level of probability with knowledge of cultivation and experience in SRI method, Risk orientation, Innovative proness, Extension contact, Cosmopoliteness and FFS found significant at 0.01 probability in adoption level.

FOREST GENETIC RESOURCE

Assessment of tropical fruit tree species diversity in home-gardens and farmlands of Uttara Kannada district

VINAY BHAT 2013 MAJOR ADVISOR: Dr. G. V. NAYAK

Species diversity of tropical fruit trees and mango varietal diversity in home-garden and farmlands of three typical villages each in three broad bioclimatic zones of the central Western Ghats was studied. Using a structured questionnaire, a total of 225 households were studied in eastern plains, up-ghat and coastal bioclimatic zones of Uttara Kannada district in Karnataka. The study revealed some stunning diversity of tropical fruit trees. A total of 10,202 individuals belonging to 55 species of tropical fruit trees were recorded in the home-gardens and farm lands. Mango was the predominantly found tropical fruit tree (TFT) species. Overall, about 29.09 per cent of the TFT species and 27.76 per cent of the individual trees were non-native to the region suggesting a changing patterns of preference among communities to grow the fruit trees. Home gardens and farmlands of the up-ghat zone of the district had the largest diversity of TFT species as well as the diversity of mango varieties. Overall, a total of 162 mango varieties were recorded in the study. Richness and diversity of mango varieties was highest in the up-ghat zone while it was lowest in eastern plains. Overall, 76 wild aromatic pickle-mango varieties (Appe) were recorded from all the three zones. All these 'appe' varieties have been selected and domesticated by the local communities suggesting it to be a major driver of diversity in the region. There was a significant positive association between density of trees and species density in all the nine villages. Species and varietal diversity increased with area of home-garden/farmland. The mean number of species and mean number of varieties per home-garden increased with the positive values accorded by the communities towards fruit tree conservation. However higher family income derived from TFT was not a positive driver to increase its diversity.

Morphological and Biochemical characterization of teak clones of Karnataka for resistance traits to teak defoliator, *Hyblaea puera* (Hyblaeidae: Lepidoptera)

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"Great Indian Teak" is an important timber species preferred all over the world because of its versatile range of uses and priced for its valuable timber. Its distinctive qualities make it an ideal raw material for multifarious products as well as an important agro-forestry species. About 187 insect species have been found feeding on the living teak tree in India. Among these, the teak defoliator, *Hyblaea puera* Cramer is the most widespread and considered as serious national pest. Of the nine leaf traits considered, leaf pubescence and leaf texture was found to be associated with the levels of resistance. Fifty clones of teak from nine provenances of Karnataka have been evaluated for their resistance/susceptible in vivo in search of

resistance against *H. puera.* Clones ID STG-3 and STG-12 (State Graft) were found to be the most resistant and susceptible clone, respectively. The resistance clones *viz.,* STG-3 showed a significant higher concentration of phenol and most susceptible clone, STG-12 of state grafts contain very low amount of phenol (0.02%). The higher concentration of nitrogen was recorded in the most susceptible clone STG-12. Potassium content was directly proportional to their degree of resistant. The leaves of selected teak clones showed gradual increase in moisture contents in relation to leaf area consumption.

FOREST WATERSHED MANAGEMENT

Influence of moisture conservation measures and nutrient management on growth of *Artocarpus heterophyllus* in Terekenhalli watershed area

FARAH NAAZ MANIYAR 2013 MAJOR ADVISOR: Dr. G. V. DASAR

On global scale soil moisture conservation methods have been recognised to play an important role in solving the problem of erosion, siltation of lowlands and retaining the productivity of 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 Arekoppa village, Sirsi Taluk of Uttar Kannada district with a land slope of 5-6% during 2012-2013 on "Influence of moisture conservation measures and nutrient management on growth of *Artocarpus heterophyllus* In Terekenhalli Watershed Area" with four main treatments *viz.,* Full moon basin, Half moon basin, Mulching (Eupatorium @ 5 t/ha), Control and four sub treatments viz., 20:12:6 N:P_2O_5:K_2O kg/ha + FYM (5 t/ha), 10:6:3 N:P_2O_5:K_2O kg/ha + Vermicompost (2.5 t/ha), 10:6:3 N:P_2O_5:K_2O kg/ha + Poultry manure (0.75 t/ha), 30:18:9 N:P_2O_5:K_2O kg/ha + FYM (5 t/ha). Significantly higher plant height was recorded in full moon basin with 30:18:9 N:P_2O_5:K_2O kg/ha + FYM (5 t/ha) at 12 months after treatment (181.70cm). Plant collar diameter (18.31 mm) and crown diameter (103.41cm) recorded significantly higher in full moon basin with 30:18:9 N:P_2O_5:K_2O kg/ha + FYM (5 t/ha) at 12 months after treatment. Number of leaves (48.78) and branches (11.45) recorded significantly higher in full moon basin with 30:18:9 N:P_2O_5:K_2O kg/ha + FYM (5 t/ha) at 12 months after treatment. Soil moisture content at 0-30cm (1168 %) and 30-60cm (12.95 %) recorded significantly higher in treatment receiving full moon basin with 30:18:9 N:P_2O_5:K_2O kg/ha + FYM (5 t/ha) in April month over the other treatments.

GENETICS AND PLANT BREEDING

Heterosis and combining ability studies in maize (*Zea mays* L.) With emphasis on turcicum leaf blight [*Exserohilum turcicum* (Pass.) Leonard and Suggs]

B. C. CHANDANA 2013 MAJOR ADVISOR: Dr. S. K. DESHPANDE

The present study was carried out by crossing 12 lines with 6 testers in line x tester design, the resultant 72 hybrids along with the parents were evaluated for the heterosis, combining ability and screened for the resistance to turcicum leaf blight disease during *kharif* 2012. The analysis of variance revealed significant differences among the hybrids for all the traits. The combining ability analysis revealed presence of higher magnitude of SCA than GCA variance for most of the characters under study indicating predominance of non-additive gene action. BM136xBM1, BM423xBM258, BM423xRNBL4611 were preferably considered as early for silking. With respect to ear weight BM60xBM59 recorded highest ear weight and recorded highest sca effects. Among the parents, the line BM254 and the testers BM59 and BM258 were found to be potentially good combiners for the trait. The important hybrids with respect to 100-grain weight were BM24xBM59 and BM254xBM59 which involved both parents with high gca effects. For grain yield per plant, the top performing hybrids were BM51xBM258, BM254xBM258 and BM254xBM59 involved at least one good combiner. Pooled gca score method revealed that lines (BM254 and BM24) and testers (BM59 and BM258) were excellent combiners for yield and yield related traits. According to pooled sca score method BM52xBM258 was found to be best specific combination. Out of 72 hybrids evaluated for performance under artificially inoculated condition and natural field condition against TLB, hybrid BM8xBM32 possessed a disease score of 1, fifteen hybrids scored 2, were found to be resistant. BM127xBM59, BM254xRNBL4711 and BM8xBM32 were the top hybrids under disease condition. Interestingly, the cross BM254xBM258, showed better performance for yield compared to checks as well as resistance to the disease. Stability analysis revealed that the cross BM136xBM1 showed stable performance over the environments with higher mean ear weight.

Genetic studies on improving the productivity, fiber quality traits and combining ability in *barbadense* cotton

ASHOK KUSUGAL 2013 MAJOR ADVISOR: Dr. S. S. PATIL

The barbadense cotton is known for its fiber quality but the potentiality of the varieties is very less suggesting to the scope for comprehensive genetic improvement. Realizing this main objectives of present study were set to improve barbadense for productivity fiber quality and combining ability leading to potential hybrids. The outcome of ongoing research in the form of 46 barbadense genotypes were evaluated and they revealed significant variability accompanied by significant improvement for seed cotton yield(6), fibre quality(9) superior for both productivity (20 q/ha) and fiber quality, etc. Line YBD-10 recorded highest SCY (26.2 q/ha), DBSI-75-10,1 and RHCB–010 exhibited highest fiber length (35.6 mm) and strength (44.9 g/tex) respectively. To assess potential combining ability of Barbadense lines inter specific hybrids (9Hx4B) and 16 intra barbadense crosses (8x2) were developed in line x tester design and assessed for productivity and fibre traits. Two barbadense parents (ICB-125 and DB-M435) revealed significant positive gca. Potential hybrids HIR7289TxICB-125 and VBCH37xGSB-40 with differing contribution of sca, gca and significant positive heterosis for seed cotton yield were identified. The superior lines for both productivity and fiber quality can be released as variety and also can be utilized in improvement of inter specific hybrids or to develop intra barbadense hybrids to derive new lines. From the group of intra barbadense crosses, line M135 was identified as good general combiner for seed cotton yield and its component characters. Among intra barbadense crosses, DBSI263-8xM135, DBSI-175-16xM135 and DBSI-263-8xDBICP-21 recorded higher yield (>22 q/ha). Six barbadense lines were utilized in 21 different pollen germination media for basic gamatophytic study. The concentrations of five components were varied from the bench mark medium and standardized the medium with highest per cent of germination (94%) as compared to previous reported media (67%). The standardized pollen germination medium can be used in gamatophytic selection for biotic and abiotic stresses.

AGRICULTURAL MICRO BIOLOGY

Studies on beer production from different minor millets

KAMALAKAR R. BOLEGAON 2013 MAJOR ADVISOR: Dr. G. S. GEETA

The minor millet grains were screened for their suitability for beer production based on the amylase activity and reducing sugars of malted grains. Standardization of the parameters for malting and mashing were also carried out along with optimization of fermentation parameters for good quality beer production. The millet grains "Finger millet" showed the highest amylase activity (23.50 mg protein/15 min/g sample) and reducing sugars (25.30 mg/g) for a soaking period of 16h and germination period of 2 days which was followed by 'Little millet', 'Foxtail millet' and Bajra'. The 'Finger millet' was further used to standardize other parameters. The commercial á-amylase (MAPS India Ltd., Ahmedabad) was used during mashing process, at a concentration of 1 per cent at 70 °C for an incubation period of 24h which released maximum reducing sugars (74.19 mg/g) than other treatments. Five strains of Yeast was screened for fermentation of the above hydrolysis and the optimization of the inoculum level and fermentation period were carried out. Among the inoculum levels used (1, 1.5 and 2%), the tannin content and residual reducing sugars of beer decreased significantly up to 2 per cent inoculum. The alcohol content increased as inoculum level increased. Among the yeast strains, Saccharomyces cerevisiae NCIM 3551 performed best when inoculated at 2 per cent inoculums level. The final beer produced was compared with the commercial beer and was favourable when evaluated organoleptically.

MOLECULAR BIOLOGY AND BIOTECHNOLOGY

Evaluation of diverse recombinant inbred lines and advanced backcross lines for productivity traits and validation of markers linked to foliar disease resistance in groundnut

M. SUKRUTH 2013 MAJOR ADVISOR: Dr. R. S. BHAT

Selected Recombinant Inbred Lines (RILs) from TAG 24 × GPBD 4, TG 26 × GPBD 4, TG 49 × GPBD 4 and TG 19 × GPBD 4, and Advanced Backcross Lines (ABLs) from ICGS 76 × ISATGR 278-18, DH 86 × ISATGR 278-18 and DH 86 × ISATGR 5, where ISATGR 278-18 was an amphidiploid (A. duranensis × A. batizocoi) and ISATGR 5 was an autotetraploid (A. magna × A. batizocoi), were evaluated for agronomic, productivity and nutritional traits, in addition to resistance to late leaf spot (LLS) and rust to select the superior genotypes in groundnut. Significant genotypic difference and high variability were observed for all the traits. In general, ABLs exhibited higher variability than the RILs. Resistance to LLS and rust were positively and significantly correlated. Thirteen genotypes showed significantly higher pod yield/plant than the check (GPBD 4). Of them, three RILs (78-1, 44-2 and 100) also possessed significantly higher kernel yield and oil yield over GPBD 4, and were resistant to LLS and rust at 70, 80 and 90 DAS. RILs and ABLs were genotyped with LLS and rust resistance-linked markers that were previously mapped using the RILs of TAG 24 × GPBD 4 and TG 26 × GPBD. Six rust resistance-linked markers (GM2009, GM2301, GM2079, GM1536, GM1954 and IPAHM103) showed significant co-segregation with the phenotype among the RILs of TG 49 × GPBD 4 and TG 19 × GPBD 4, and ABLs of all the three populations, indicating their validation across diverse genotypes. However, only GM1954 co-segregated with LLS resistance among the RILs, but not among the ABLs. The three superior RILs (78-1, 44-2 and 100) carried resistant allele at all the marker loci. The genetic and genomic resources identified in this study could be of great value in groundnut breeding for LLS and rust resistance.

Marker assisted transfer of *Lr24* and *Lr 28* in to Mp-3299 and identification of new SSR markers for improving leaf rust resistance in wheat (*Triticum aestivum* L.)

B. S. SAVITHA 2013 MAJOR ADVISOR: Dr. S. A. DESAI

A study was conducted to transfer the leaf rust resistant genes Lr 24 and Lr28 to MP-3299 in bread wheat during 2011 to 2012. MP-3299, a high yielding genotype suited to rainfed condition but susceptible to leaf rust, was crossed with NIL PBW343 pyramided with Lr24 and Lr28. Parents, F_1 and F_2 were screened for the presence of Lr24 and Lr28 using SCAR markers. These markers were consistent with amplification of specific fragment size of 719 bp with the SCAR marker S73719 for Lr24 gene and the marker fragment size of 570 bp with the SCAR marker S421570 for Lr28 gene. Further, attempts were made to identify the new SSR markers linked to leaf rust resistant genes using the bulk segregant analysis in F_2 population of the cross MP-3299 x NIL PBW343. A total of 35 SSR primers, that amplify sequences on chromosome 3D, on the NIL pair PBW 343 and MP 3299. Eighteen SSRs were polymorphic between the parents, 10 of these were located on chromosome 3DL. F_2 individuals of cross MP-3299 x PBW 343 were used for bulked segregant analysis. Three of the latter were polymorphic between the bulks, and F_2 genotyping suggested that one of them, barc71, was close to SCAR SCS73719. The F_2 population developed using the cross MP-3299 x NIL PBW343 exhibited relatively higher mean performance over the parental means for all the traits under the investigation. Evaluation of F_2 segregating population for yield and yield components revealed the high variance. Most of the characters recorded high to moderately low heritability.

Molecular characterization of mineral phosphate solubilisation in rhizobia

SHRADDHA DAHALE 2014 MAJOR ADVISOR: Dr. S. K. PRASHANTHI

The major goal of the present investigation was to understand the mechanism of mineral phosphate solubilisation in rhizobia sp. (MPS^+) by using forward genetics approach and their effect on nodulation and nitrogen fixation in green gram *(Vigna radiata)*. Two rhizobial strains, LR-34 and MR-54 were screened for their mineral phosphate solubilization phenotype on insoluble medium which showed solubilising efficiency of 205.51 ± 2.61 and 195.14 ± 2.61 per cent respectively at 120 HAI. Inorganic phosphorus (Pi) release and pH drop showed significantly highly negative correlation up to 15 DAI in TCP broth. Gluconic acid was detected in the culture supernatants of these isolates through thin layer chromatographic (TLC) technique indicating presence of direct oxidative pathway. The pqq ACDEF gene was detected in both the strains. Buffering effect and phosphate stress on MPS phenotype of these isolates were observed by external supply of tris buffer and K_2HPO_4 to the MSM agar medium. The results indicated the existence of metabolic control of mineral phosphate solubilisation by Pi and pH. Tn5 mutants (MPS^-) were generated from both the strains by transposon (Tn5) mutagenesis. After screening 1603 colonies of MR-54::Tn5 and 836 colonies of LR-34::Tn5, those mutants which failed to show any solubilisation zone up to 72 HAI on TCP media were selected for further study. Detailed characterization of mutants was

carried out for related properties like colony morphology, Pi release and pH change in TCP broth, organic acid production, surface characteristics, plant growth promoting ability etc. The MPS^- mutant strain significantly reduced the nodulation, nitrogen fixation and phosphate solubilisation in green gram under green house conditions in leonard jar apparatus by supplying N^+P^+, N^+P^-, N^-P^+ and N^-P^- solution as compare to MPS^+ strain. This result indicated the importance of MPS on nodulation and nitrogen fixation for plant growth and development.

Generation of transgenic tomato with *Npr1* and analysis of tomato transgenics carrying *npr1, ech42* AND *bgn*

RITESH THAKRE 2014 MAJOR ADVISOR: Dr. SUMANGALA BHAT

Tomato (cv. Pusa Ruby) transformation was carried out using *Agrobacterium tumefaciens* strain LBA4404 harboring binary vector (pBI121) *carrying npr1* cloned from mustard under CaMV 35S promoter. Putative transformants were selected on MS medium with hygromycin (25 mg/l). Three putative transformants in T_0 generation were confirmed by polymerase chain reaction (PCR) using primer specific to *npr1*. Further, the PCR using *vir* A specific primers in the DNA samples from these plants did not give any amplification and confirmed the integration of *npr1* in tomato genome. Tomato transgenics positive for *npr1* showed enhanced resistance to foliar pathogen *Alternaria solani* in detached leaf assay. Also attempts were made to analyse southern hybridization positive transgenic tomato line (CG2-17-6) carrying both *ech42* and *bgn* under single T-DNA region in T_3 generation. Sixteen progenies were analyzed for the presence of the transgene using *ech42* and *bgn* specific primers. Eleven plants showed presence of both ech42 and bgn. Biochemical analysis confirmed the expression of *ech42* and *bgn*. Expression level of endochitinase and endoglucanase revealed 4.09 and 5.17 fold higher respectively, over non-transgenic control plant. *In vitro* screening of transgenic tomato lines against fungal pathogens *Sclerotium rolfsii*, *Alternaria solani* and *Rhizoctonia Solani* using plate bioassay and detached leaf assay against *Alternaria solani* showed direct relationship between the chitinolytic activity and inhibition of pathogen growth.

PLANTATION TECHNOLOGY

Effect of integrated nutrient management on growth of *Santalum album* in horti-silvi system

T. R. PRAKASH 2014 MAJOR ADVISOR: Dr. G. V. NAYAK

Integrated Nutrient Management (INM) on growth of *Santalum album* is important to understand and to establish successful plantation, it not only minimizes the economic and ecological wastage on other resources but contribute significantly towards the optimization of resources and productivity without hampering the soil health. Keeping these emerging requirements in mind the present study was conducted at farmer's field, Santholli village of Sirsi taluk during 2012-2013. The experiment was carried out in two and half year old sandalwood plantation in a factorial randomised complete block design with 12 treatments and 3 replication. The treatments were categorised into three factors *viz.,* organic manures (FYM @ 2 kg/plant, vermicompost @1 kg/plant), inorganic fertilizers (NPK25:10:10 g/plant, NPK37.5:15:15 g/plant) and bio-fertilizers (VAM @ 100 g/plant, PSB @ 100g/plant, Azospirillum @ 100 g/plant)were given in an integrated manner. Among the organic manures (vermicompost) in inorganic fertilizers (NPK37.5:15:15 g/plant) and in bio-fertilizer (VAM) recorded highest plant height, collar diameter, crown diameter, basal area, number of branches over other treatments at eight months after treatment. In the interaction effect of organic manures (Vermicompost) x bio-fertilizer (VAM) and inorganic fertilizers (NPK37.5:15:15 g/plant) x bio-fertilizer (VAM) treatments showing significant effect at various months in growth parameters. Among the given treatments soil pH varies within the range of 5.75 to 5.85; whereas electrical conductivity varies within 0.01 to 0.05 dsm^{-1} and organic carbon recorded in the range of 1.17 to 1.26 per cent. For the available nitrogen and potassium was recorded maximum in Vermicompost, NPK37.5:15:15 g/plant and VAM. But for the available phosphorus Vermicompost, NPK37.5:15:15 g/plant and PSB recorded maximum. In the interaction effect, organic (Vermicompost) x inorganic fertilizer (NPK37.5:15:15 g/plant) recorded maximum available nitrogen (196.72 kg/ha), inorganic fertilizer (NPK37.5:15:15 g/plant) x bio-fertilizer (VAM) recorded maximum available potassium (166.97 kg/ha) and there was no significant effect shown in interaction effect of available phosphorus.

Standardization of nursery techniques in *Melia azedarach* L.

V. N. SUJATHA 2014 MAJOR ADVISOR: Dr. K. MANJAPPA

A trial was conducted at college of Forestry, Sirsi during 2012-13 to standardize the nursery techniques in *Melia azedarach L.* which is a multipurpose tree species. In first trial, nine pre-sowing treatments were tried to know their effect in improving germination per cent. In second trial, two levels of organic manures (FYM and vermicompost), four levels of bio-fertilizers (no bio-fertilizer, *Azospirillum,* PSB and *Azospirillum* + PSB) and three levels of inorganic fertilizers (no NPK, 0.5 g NPK and 1.0 g NPK) were evaluated to know their effect on seedling growth of Melia azedarach. Out of nine pre-sowing seed treatments tried, maximum germination percentage (84.0%) was recorded in 200 Molar KNO_3 solution. The other quality indices viz, mean daily germination, peak value, germination value and germination rate were also maximum in this treatment. Among the organic manures tried, application of vermicompost recorded maximum seedling height, collar diameter, number of leaves, leaf area, root length, root-shoot ratio, fresh shoot weight, fresh root weight, dry shoot weight, dry root weight, total fresh weight and total dry weight. Among bio-fertilizers, application of *Azospirillum* + PSB recorded maximum seedling and root parameters. Among inorganic fertilizers, application of 1.0 g NPK recorded significantly highest seedling and root parameters. Among the interactions of organic manures and bio-fertilizes, combination of vermicompost + PSB recorded maximum seedling height. The number of leaves, root-shoot ratio, fresh root weight, total fresh weight and root dry weight were maximum in the combination of FYM with *Azospirillum* + PSB. Among the interactions of organic manures and inorganic fertilizers, all the parameters were found maximum in the combination of vermicompost with 1.0 g NPK. Among the interactions of bio-fertilizers and inorganic fertilizers, combination of PSB with 1.0 g NPK recorded maximum seedling height, collar diameter, fresh and dry root weight. The dry shoot weight and total dry weight were maximum in *Azospirillum* + PSB with 1.0 g NPK combination. Among the interactions of organic manures, bio-fertilizers and inorganic fertilizers, combination of vermicompost + PSB + 1.0 g NPK recorded maximum seedling height, leaf area, fresh root weight, dry root weight and total fresh weight.

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SEED SCIENCE TECHNOLOGY

Effect of provenance and storability on seed borne diseases and seed quality of soybean (*Glycine max* L.) in Northern Karnataka

L. NIVEDITA ROY 2013 MAJOR ADVISOR: Dr. N. K. BIRADARPATIL

Soybean tops in the world production of both oil seeds and edible oil. Soybean seeds were collected from different locations of five districts of Karnataka and they were screened for seed borne diseases. Overall, 9 microfloras were isolated from five districts *viz., Cercospora kikuchii, Rhizoctonia bataticola, Colletotrichum truncatum, Fusarium spp. Rhizopus spp.*, and *Xanthomonas axonopodis* pv glycines. Other saprophytic organisms included species of *Penicillium spp., Aspergilus niger, Aspergillus flavus.* Highest occurrence of seed borne diseases was observed in Bagalkot district (6.88%), followed by Bidar (5.30%), and the least was observed in Haveri (3.14%). Belgaum district encountered the maximum infection rate of *Cercospora kikuchii* (13.57%). Whereas, *Colletotrichum truncatum* (12.50%) was predominant in the seeds of Bidar district. *Rhizoctonia spp.* (14.77%) *Fusarium spp* (7.40%), *Rhizopus spp.* (5.50%) *Aspergillus niger* (3.30%), *Aspergillus flavus* (2.17%), *Penicillium spp.* (4.23%) and *Xanthomonas axonopodis* pv gycines (6.57%) were encountered maximum in Bagalkot district. Bidar district reported better seed quality attributes and the least was Bagalkot.A significantly high negative correlation between the per cent infection and per cent germination, vigour index, protein, oil content was recorded. Correlation level was high in Bagalkot district, whereas it was low in the seeds of Bidar district. A laboratory storage experiment was conducted for eight months to know the storability of *Cercospora* infected seeds. These seeds were stored with or without seed treatment with Thiram, Bavistin and Vitavax power in high density polyethylene bags. The result indicated that the purple stained seeds lose viability at a faster rate than the good seeds. More the stain areas on the seed coat, more was the reduction in germination during storage. Irrespective of the seeds infected or not, Vitavax power treated seeds (2 g/kg) stored better compared to untreated seeds.