

A) AGRONOMY

1. Effect of Site Specific Nitrogen Management Approaches in Different Rice Establishment Systems

BHAVYA, M. R.

ABSTRACT

Field experiment entitled “Effect of site specific nitrogen management approaches in different rice establishment systems” was laid out in split-plot design with three rice establishment systems as main plots [aerobic, system of rice intensification (SRI) and conventional] and four nitrogen management approaches as subplots (soil test crop response-STCR, soil test fertilizer recommendation-STL, leaf colour chart-LCC and recommended dose of fertilizer-RDF) in three replications conducted at College of Agriculture, Navile, Shivamogga, Karnataka during *kharif* 2014 and 2015 in a sandy loam soils of low N status. Among different systems of establishment, SRI recorded significantly higher growth and yield parameters *viz.*, plant height, number of tillers plant⁻¹, number of leaves plant⁻¹, leaf area and total dry matter accumulation, number of filled grains panicle⁻¹, panicle length, panicle weight and test weight.

Thereby achieved significantly higher grain (7767 kg ha⁻¹) and straw yield (8878 kg ha⁻¹) compared to conventional (7220 and 8106 kg ha⁻¹) and aerobic (4975 and 5948 kg ha⁻¹) systems. Among different nitrogen management approaches, STCR approach with a target yield of 80 q ha⁻¹ recorded significantly higher growth and yield components, chlorophyll content and nutrient uptake as compared to RDF, STL and LCC approaches. As a result significantly higher grain and straw yield (7182 and 8313 kg ha⁻¹) were realized in STCR approach as compared to RDF (6196 and 6976 kg ha⁻¹), STL (6392 and 7588 kg ha⁻¹) and LCC approaches (6784 and 7697 kg ha⁻¹). Treatment combination of SRI with STCR recorded higher grain and straw yield (8348 and 9479 kg ha⁻¹) followed by conventional system with STCR approach (7921 and 8977 kg ha⁻¹) and SRI with LCC approach (7914 and 8960 kg ha⁻¹). Higher gross returns (Rs. 122201 ha⁻¹), net returns (Rs. 86421 ha⁻¹) and benefit cost ratio (2.42) was obtained under SRI with STCR approach.

2. Optimization of Sowing Dates and Nutrient Management Practices to Enhance the Yield and Quality of Guar Genotypes

PAVITHRA, A.H.

ABSTRACT

Field experiments were conducted at College of Agriculture, UAHS Navile, Shivamogga during the *khari*(seasons of 2014 and 2015 on red sandy clay soil to study the optimization of sowing dates and nutrient management practices to enhance yield and quality of guar genotypes.

The experiment-I was laid out in RCBD with factorial concept involving three dates of sowing viz., 15 August, 30 August and 15 September with three varieties namely RGC-1003, RGC-936 and HG-365. Among the different dates of sowing, the crop was sown on 15 August recorded significantly higher grain yield (445.06 kg ha⁻¹), protein content (33.36%), protein yield (148.65 kg ha⁻¹), gum content (32.11 %), gum yield (154.84 kg ha⁻¹) and endosperm content (32.82 %). Among the genotypes, higher grain yield (416.57 kg ha⁻¹), stover yield (982.51 kg ha⁻¹), protein yield (134.18 kg ha⁻¹), gum content (33.03%), Gum yield (138.78 kg ha⁻¹) and endosperm content (30.56 %) were recorded with RGC-1003.

The experiment-II was laid out in RCBD with factorial concept. The treatments consisted of three different fertilizer levels viz, 30:60:30, 20:40:20 and 10:20: 10 kg N:P205:K20 ha⁻¹ recorded significantly higher grain yield (434.59 kg ha⁻¹), protein yield (142.43 kg ha⁻¹), gum yield (136.11 kg ha⁻¹). With respect to genotypes, RGC-1003 recorded significantly higher grain yield (460.87 kg ha⁻¹), protein content (33.48 %). protein yield (154.33 kg ha⁻¹), gum content (32.61%) and gum yield (147.53 kg ha⁻¹).

The experiment-III was laid out in RCBD with nine treatments replicated thrice. Among the nine different foliar application of nutrients, application of DAP @ 2% at 25 and 45 DAS significantly recorded higher grain yield (612.35 kg ha⁻¹). protein content (33.46%). protein yield (204.92 kg ha⁻¹), gum content (32.86 %). gum yield (204.92 kg ha⁻¹) and endosperm content (35.74 %).

August, 2016

(S. Sridhara)
Major Advisor

3. Studies on Nutrient Management Strategies for Enhancing Productivity and Economics of Maize (*Zea Mays L.*) Cultivation

ULLASA, M. Y.

ABSTRACT

Two experiments were conducted during *kharif* seasons of 2014 and 2015 in sandy loam soils of Zonal Agricultural and Horticultural Research Station, Navile Shivamogga to study the nutrient management strategies for enhancing productivity and economics of maize. First experiment was laid out in split plot design with three fertilizer levels (100, 80 and 60 % RDF) as main plot and eight foliar fertilization schedules (application of one per cent 19:19:19 at different growth stages) as sub plots. In second field experiment different potassium management practices were tested in randomised block design. Among fertilizer levels, higher grain yield (7007 kg ha⁻¹), net returns (₹ 56637 ha⁻¹) and benefit cost ratio (2.56) were recorded with 100 % RDF (150: 75: 40 kg N: P₂O₅ :K₂O ha⁻¹). Among foliar treatments, application of one per cent 19:19:19 at 20, 40 and 60 DAS recorded higher grain yield (7087 kg ha⁻¹), net returns (₹ 57658 ha⁻¹) and benefit cost ratio (2.60) over other schedules.

Interactive effects revealed that, 100 per cent RDF + foliar fertilization at 20, 40 and 60 DAS recorded higher grain yield (7530 kg ha⁻¹) and net returns (₹ 61708 ha⁻¹). It is possible to save 20 % RDF with foliar fertilization as highest B: C ratio was achieved with 80 RDF+ foliar fertilization at three stages. Among different potassium management practices, application of 60 kg K₂O ha⁻¹ in two equal splits (Basal +30 DAS) + foliar fertilization of 1 % potassium sulphate at 60 DAS recorded higher yield (7693 kg ha⁻¹), and net returns (₹ 64,897 ha⁻¹), while highest benefit cost ratio (2.77) was achieved in 40 kg K₂O ha⁻¹ applied in two equal splits + foliar fertilization of potassium sulphate at 60 DAS. Foliar application of 19:19:19 at 20, 40 and 60 DAS along with RDF, and split application of potassium not only found productive for rainfed maize but also economical.

June, 2016

(G. K. Girijesh)
Major Advisor

4. Performance of Aerobic Rice based Intercropping System through Fertigation Technique in Southern Transition Zone of Karnataka

REKHA BADALINGAPPANAVAR

ABSTRACT

Field experiment on performance of aerobic rice based intercropping system through fertigation technique was conducted during *Kharif* 2015-16 and 2016-17 at Shivamogga. First experiment consists of two land configuration techniques and five intercropping systems laid in split plot design with three replications. Second experiment was laid in FRCBD on five intercropping systems to evaluate two levels of fertilizers supplemented with foliar fertilization under rainfed conditions.

The results revealed that, raised bed method recorded higher rice yield of 55.09 q ha⁻¹ (10 % higher) and water productivity of 118.28 kg ha-cm⁻¹ (11% higher) over flatbed method. Among different intercrops, rice+french bean and rice+carrot recorded 68.64 and 62.62 per cent higher rice equivalent yield with monetary advantage of ₹ 69,560 and 70,829 ha⁻¹, respectively and hence achieved higher B:C (3.20 and 2.92) compared to sole crop of rice.

Aerobic rice grown under rainfed situation indicated that, treatment receiving 100 per cent RDF supplemented with foliar spray of one per cent each 19:19:19 and 13:0:45 at maximum tillering stage and grain filling stage, respectively recorded significantly higher grain (39.39 q ha⁻¹) and straw yield (49.92 q ha⁻¹) thereby achieved 14.57 and 13.55 per cent higher compared to 75 per cent RDF with same dose of foliar fertilization. Among different intercrops rice+french bean and rice+carrot gave significantly higher rice equivalent yield of 78.36 q ha⁻¹ (73.32 %) and 73.25 q ha⁻¹ (62.02 %), respectively compared to sole crop of rice (45.21 q ha⁻¹) with monetary advantage of ₹ 42,481 and 40,203 ha⁻¹, respectively there by achieved higher B:C (3.93 and 3.71) compared to sole crop of rice.

Cultivation of aerobic rice through fertigation registered 42.99 and 100.32 per cent higher yield and water productivity, respectively and achieved 61.08, 72.83 and 72.83 per cent use efficiency of NPK respectively, over conventional method of fertilizers under rainfed conditions.

August, 2017

(H. K. Veeranna)
Major Advisor

5. Performance of aerobic rice as influenced by fertigation and irrigation levels in Alfisols of Southern Transitional Zone of Karnataka

YAMUNA, B. G.

ABSTRACT

Two field experiments were conducted at Agronomy Field Unit, College of Agriculture, Shivamogga during *kharif* 2015-16 and 2016-17 & summer 2016 on red sandy clay loam soils to evaluate the performance of aerobic rice as influenced by fertigation and irrigation levels. Experiment on fertilizer levels applied through conventional and fertigation methods was laid out in RCBD with three replications. Daily dripped plots supplied with 25% RDF through soil application + 100% RDF through fertigation recorded significantly higher grain yield per hectare (68.92 q during *kharif* and 71.43 q during summer) and WUE (104.81 and 95.66 kg ha-cm⁻¹, respectively during *kharif* and summer) over other treatments in test. However, higher net returns per hectare (₹.72,517 and ₹.76,420, respectively during *kharif* and summer) and B:C (2.94 and 2.84, respectively during *kharif* and summer) was obtained with soil application of 125% RDF through surface irrigation. Application of RDF through drip fertigation or with different proportions of soil application recorded nearly 40% higher yield compared to soil application of RDF with normal fertilizers. Experiment on scheduling irrigation and fertigation was laid out in RCBD with three replications. Daily drip irrigation at 1.25 PE up to maturity and fertigation with 5 splits of WSF at 20, 35, 50, 65 & 80 DAS recorded significantly higher grain yield (69.80 and 71.46 q ha⁻¹ during *kharif* and summer, respectively) achieving 55% more over surface irrigation with soil application of 100% RDF. Treatments receiving irrigation @ 1.00 or 1.25 PE daily with 5 or 8 splits of fertigation extended up to 80 days resulted better WUE (ranged from 86.40 to 98.20 and 71.00 to 89.80 kg ha-cm⁻¹ of water, respectively for *kharif* and summer) and net returns (₹.74,983 and ₹.79,042 ha⁻¹, respectively during *kharif* and summer) than other treatments thereby minimized 35 to 42% of water compared to surface irrigation with soil application of 100% RDF.

May, 2018

(M. Dinesh Kumar)
Major Advisor

6. Studies on integrated nutrient management in paddy-groundnut cropping sequence for Coastal Zone of Karnataka

NAGARAJ, R.

ABSTRACT

Field experiments were conducted from 2014 to 2016 at ZAHRS, Brahmavar, Udupi to study the effect of integrated nutrient management in paddy-groundnut and groundnut-paddy cropping sequence. Soil type is sandy loam in texture pH in acidic (4.62 and 4.78), high in organic carbon content (1.38 and 1.32 %), medium in available nitrogen and potassium (348.70 & 362.84 and 106.80 and 113.61 kg ha⁻¹, respectively) and high in available phosphorus (59.10 and 56.28 kg ha⁻¹) in both the experiments, respectively. The experiment was laid out in RCBD with twelve treatments replicated thrice. The treatments comprised of recommended nutrient practice (POP) and absolute control for comparison along with supplemental addition of 25 and 50 per cent recommended dose of nitrogen through eupatorium, gliricidia, vermicompost, poultry manure and goat manure, respectively.

In paddy-groundnut cropping sequence significantly higher paddy grain yield (5293 kg ha⁻¹) was realized with POP + 50 per cent RDN through vermicompost. The residual effect of POP + 50 per cent RDN through poultry manure applied to paddy in kharif on *rabi* groundnut resulted in significantly higher pod and kernel yield (1498 and 1075 kg ha⁻¹, respectively) over package of practice. Similarly, in groundnut-paddy cropping sequence with the application of recommended nutrients (POP) + 50 per cent RDN through poultry manure treatment recorded significantly higher pod and kernel yield (2272 and 1665 kg ha⁻¹, respectively) in groundnut during *rabi* and paddy grain yield (3623 kg ha⁻¹) in subsequent *kharif* paddy crop. Higher net returns and benefit cost ratio (Rs. 1, 05,944 ha⁻¹ & 2.18 and Rs. 1, 05,024 ha⁻¹ & 2.09, respectively) in paddy-groundnut and groundnut-paddy sequence were realized with the POP + 50 per cent RDN through poultry manure treatment as compared to package of practice (Rs. 57,573 & 1.58 and 60,304 & 1.64 ha⁻¹, respectively).

July, 2018

(M. Hanumanthappa)
Major Advisor

7. Agronomic interventions to enhance the productivity of foxtail millet (*Setaria italic L.*) in Southern Transition Zone of Karnataka

NANDINI, K. M.

ABSTRACT

Field experiments were conducted at College of Agriculture, UAHS, Shivamogga during the *kharif* seasons of 2016 and 2017 on red sandy clay soil to study the Agronomic interventions to enhance the productivity of foxtail millet (*Setaria italica*L.) in Southern Transition Zone of Karnataka.

The experiment-I was laid out in RCBD with factorial concept involving three dates of sowing *viz.*, June 30th, July 30th and August 30th with three genotypes namely Local, HMT-1 and SIA 2644. Among the different dates of sowing, the crop sown on June 30th recorded significantly higher grain yield (2,049 kg ha⁻¹), straw yield (4,262 kg ha⁻¹) and higher protein and fibre content. Among the genotypes, higher grain yield (1,871 kg ha⁻¹), straw yield (3,981 kg ha⁻¹) and higher quality parameters also were recorded with SIA 2644.

The experiment-II was laid out in RCBD with factorial concept. The treatments consisted of five different nitrogen levels *viz.*, 0, 50, 100, 125 and 150 % N and three genotypes. 125 % N recorded significantly higher grain yield (2,189 kg ha⁻¹), straw yield (4,643 kg ha⁻¹), higher protein and fibre content. Concerning genotypes, SIA 2644 recorded significantly higher grain yield (2,246 kg ha⁻¹), straw yield (4,823 kg ha⁻¹) and higher protein and fibre content.

The experiment-III was laid out in factorial RCBD with twelve treatment combinations comprised of four spacing (30 × 5 cm, 20 × 5 cm, 20 × 10 cm and 10 × 5 cm) and three genotypes. Among spacing significantly higher grain yield (2,227 kg ha⁻¹), straw yield (4,349 kg ha⁻¹), higher protein and fibre content were recorded in plants grown at 30 x 10 cm. Among the genotypes, higher grain yield (1,941 kg ha⁻¹), straw yield (3,919 kg ha⁻¹), higher protein and fibre content were recorded with SIA 2644 compared to other genotypes.

September, 2018

(S. Sridhara)
Major Advisor

8. Standardization of agrotechniques for rainfed hybrid castor (*Ricinus communis* L.) in Central Dry Zone of Karnataka

UMESHA, C.

ABSTRACT

A field experiment was conducted at Zonal Agriculture and Horticultural Research Station (ZAHRS), Hiriyyur, which comes under Central Dry Zone of Karnataka, located at 13.95° North latitude, 76.62° East longitude with an altitude of 630 m (2066 feet) above MSL. The soil of the experimental site was clayey soil. Field experiment was laid out in randomized complete block design with factorial concept with 12 and 9 treatment combinations replicated thrice. Results indicated that the castor hybrids DCH-177 recorded significantly higher seed yield (1568 kg ha⁻¹) over other hybrids. Among the different fertilizer levels, application of 150 per cent RDF along with DCH-177 resulted in higher seed yield (1693 kg ha⁻¹), higher nitrogen, phosphorus and potassium use efficiency (33.50 kg kg⁻¹, 33.50 kg kg⁻¹ and 50.92 kg kg⁻¹, respectively). Whereas, application of 125 per cent RDF along with DCH-177 recorded significantly higher net returns (Rs. 24655) and B: C (1.78) as compared to rest of the treatments.

Among the dates of sowing, DCH-177 sown during June second FN recorded significantly higher total dry matter production (146.52 g plant⁻¹), total number of spikes (7.06), total number of capsules (97.32) and seed yield (1536 kg ha⁻¹) as compared to July second FN. Among the spacings, spacing of 90 x 60 cm recorded significantly higher total nitrogen, phosphorus and potassium uptake (90.66 kg ha⁻¹, 11.23 kg ha⁻¹, 33.24 kg ha⁻¹, respectively) and seed yield (1563 kg ha⁻¹) over 120 x 60 cm spacing.

August, 2018

(C. J. Sridhara)
Major Advisor

9. Studies on Fertilizer Management and Planting Geometry in Pigeonpea based Bio - Intensive Cropping System

MAMATHA SHREE, C. M.

ABSTRACT

Agronomic investigation was carried out to study the fertilizer management and planting geometry in pigeonpea based bio-intensive cropping system during *Kharif* 2016 and 2017 at College of Agriculture, Shivamogga. Study was carried out to optimize planting geometry and fertilizer dosage for pigeonpea + baby corn inter cropping system and possibility of taking one more crop after baby corn as relay inter crop.

To meet the set objectives, two field experiment consisted of 12 and 11 treatments respectively were laid out in RCBD replicated thrice. It was found that pigeonpea (60-120-60 × 30 cm) + baby corn (30 × 30 cm) receiving respective RDF separately by component crops on population basis recorded maximum pigeonpea equivalent yield (4767 kg ha⁻¹), net returns (Rs.1,91,943), B:C (3.28) and monetary advantage (Rs.1,05,207) with 64 per cent land saving. The next best treatment was pigeonpea (60-120-60 × 30 cm) + baby corn (60 × 20 cm) in which the component crops received their respective RDF separately on population basis. In the relay intercropping study, higher pigeonpea equivalent yield (4327 kg ha⁻¹) was realized with pigeonpea (60-120-60 × 15cm) + baby corn (30 × 30 cm) *fb* vegetable field bean. This was 98 per cent and 8 per cent higher over sole pigeonpea and pigeonpea + baby corn in terms of main crop equivalent yield. Thus, it can be concluded that growing pigeonpea in paired row system with a crop geometry of 60-120-60 × 15 cm and two rows of baby corn in between paired row and taking vegetable field bean or vegetable cowpea after the harvest of baby corn, resulted not only higher monetary benefits and land advantages but also exploits residual moisture and nutrients with surplus green fodder yield of 20 t ha⁻¹.

December, 2018

(G.K. Girijesh)
Major Advisor

1. Genetic Variability and Stability Analysis for Yield and its Attributing Traits in Guar (*Cymopsis tetragonoloba* L. Taub)

NIRANJANA KUMARA B

ABSTRACT

The present investigation was carried out in *Kharif* 2014 (E1), Summer 2014(E2) and Summer 2015 in Department of Genetics and Plant Breeding, College Of Agriculture, UAHS, Shivamogga. Experiment was composed of 85 genotypes replicated thrice in RCBD. Observations were recorded on ten quantitative traits. All the traits had shown variability in terms of Phenotypic Variance, Genotypic Variance, Phenotypic Coefficient of Variation, and Genotypic Coefficient of Variation across the season, all the ten traits had shown the high Heritability coupled with high Genetic advance in both the environments. Ten clusters were formed from eighty-five genotypes shown maximum genetic diversity among the genotypes, grain yield per plant (37.90%) was contributed more per cent contribution towards divergence.

Twenty two genotypes were found stable performance across the environments tested by using Eberhart and Russel model. The genotypes namely IC-311393, IC-421816, IC-373427 and IC-415151 were identified as potential they possess higher level of gum, crude protein and crude fat. However, the trait narrow leaf type with pubescence leaf surface is a characteristic of gum yielding genotypes. Seven traits were studied about variability among root parameters, root length and root volumes are significantly correlated to seed yield. IC-311403, IC-311432, IC-311449, IC-324023 and IC-325800 were shown resistant to powdery mildew.

July-2016

(Gangaprasad S)
Major Advisor

2. Generation Mean Analysis for Cured Leaf Yield and Quality Traits in Flue Cured Virginia Tobacco (*Nicotiana tabacum* L.)

NETRAVATI

ABSTRACT

Tobacco is an important commercial crop in view of revenue generation, export earning and employment potential. Among all types of tobacco, Flue Cured Virginia (FCV) is the major exportable tobacco type and is mainly used in cigarette manufacturing. The yield levels in FCV tobacco has stagnated at 1500-1700 kg/ha in Karnataka. In the present situation of increasing input costs, to make tobacco cultivation more profitable to the farmers, it is necessary to breed varieties with an yield levels of 3000kg /ha or more. Considering the above facts and the economic importance of the crop, the present investigation was carried out at the College of Agriculture, University of Agricultural and Horticultural Sciences, Navile, Shivamogga during *Kharif* season of 2016, to understand the inheritance pattern of leaf yield and quality traits using biometrical technique - Generation Mean Analysis. Experimental material consisted of six generations of two crosses (TB-70 x TB-102 and TB-100 x TB-102) produced by crossing new donar parents for high yield and quality viz., TB-70, TB-100 and TB-102. Gene effects for leaf yield and leaf quality traits were estimated.

Generation mean analysis revealed that dominance and dominance based gene effects were involved in the expression of most traits along with duplicate epistasis for most of the characters viz., like days to flowering, plant height, leaf area, fresh leaf yield, cured leaf yield, top grade equivalent in both crosses and leaf length, leaf area chlorophyll content and all leaf quality traits except reducing sugar (L) which could be exploited by biparental mating in segregating generations followed by pedigree selection.

A wide range of variability was observed for most of the traits under study in F_2 populations of both the crosses. High heritability coupled with high genetic advance was observed in leaf area per plant, fresh leaf yield, cured leaf yield, top grade equivalent and leaf quality traits indicating additive gene action and scope for practicing selection. In both the crosses, characters leaf length, leaf breadth, leaf area, fresh leaf yield and top grade equivalent showed significant positive correlation and days to flowering recorded negative correlation with cured leaf yield. Therefore, selection should be practiced by considering these characters for direct improvement of cured leaf yield.

The present study, revealed that the cross TB-70 x TB-102 was the potential source for improving the cured leaf yield and its component traits without sacrificing the quality and can be advanced for subsequent generation for identifying the promising cultivars.

January, 2017

(H. D. Mohan Kumar)
Major Advisor

3. Studies on Submergence Tolerance Mechanism in Rice Germplasm Lines with Relation to Genetic, Molecular and Physiological Aspects

NISHANTH G.K

ABSTRACT

The present investigation consisted of 525 rice germplasm lines laid out in augmented design to screen them for submergence tolerance in rainfed lowland areas of Nagara, Shivamogga during *Kharif* 2015. Among germplasm lines none of the lines have recorded 100% survival, two have recorded 95-99% survival, 68 lines falls under 75-94% survival, under 50-74% survival rate 230 lines were observed. The lines which recorded more than 50 per cent survival rate were selected to study physiological basis of tolerance, yield and yield related traits during Summer 2016. The analysis of variance indicated the presence of significantly higher difference among the germplasm lines for most of the characters studied. High heritability was observed for all the traits. Genetic advance as per cent mean was high to moderate, yield per plant and number of productive tillers per plant recorded very high genetic advance as per cent mean. Cellulose content before submergence was maximum in IET21330 (251.40 mg/g) and minimum in KHP-10 (207.50 mg/g). Cellulose content after submergence highest in IET21330 (230.50 mg/g) and lowest was in KHP-10 (199.75 mg/g). Range for hemicellulose content was 118.75 mg/g (IET16907) to 135.00 mg/g (IET21465) in before submergence condition while in after submergence condition was 84.00 mg/g (IET14819) to 107.00 mg/g (IET21465). Cellulose and hemicellulose content depletion after submergence was more in susceptible germplasm lines compared to tolerant lines. Two allele specific SSR markers SC3 and ART5 were screened across 65 germplasm lines to find out the presence or absence of *Sub1A* and *Sub1C* locus responsible for tolerance. Twelve lines have recorded positive to presence of *Sub1A* locus and 15 lines recorded positive to presence of *Sub1C* locus. Thirteen SSR markers revealed presence of high diversity. IET21464 was identified as suitable line with high yield for both submergence and non submergence condition. IET21465, AC38575, AC35323, IET21330 and IET6074 are the significantly superior, stable, physiological and molecular level.

August, 2017

(Dushyanthakumar, B. M)
Major Advisor

4. Marker Assisted Characterization and Exploitation for Salinity Tolerance in Landraces of Rice (*Oryza sativa* L.)

RAGHAVENDRA P

ABSTRACT

The present study composed of 177 rice landraces and six checks. Screening under saline field condition based on salt injury score revealed that, 20 landraces were tolerant and 39 landraces were highly susceptible. The selected 144 landraces were evaluated in augmented design for yield and related traits during *Kharif* 2016 and 2017. The pooled Analysis of variance revealed that significant difference present among the landraces for the studied characters. High heritability coupled with high genetic advance over mean were recorded for SPAD reading (97.62 and 72.80) and total tillers (80.44 and 53.23). Trait association studies indicated that, yield had positive and highly significant association with panicle weight (0.497) followed by total tillers (0.456) whereas, the association of grain yield was significant and positive with CHOS (0.1962). The nutrient composition analysis of grains revealed that the average grain protein content and CHOs was increased in saline condition. The physiological characters studied showed that, chlorophyll content (0.205) is positively correlated whereas, Na^+/K^+ ratio (- 0.170) is negatively correlated with salinity tolerance in landraces. The screening of 24 selected landraces using petridishes and PVC pipes in saline solution of 0, 100 and 200 mM indicated that gradual decrease in germination percentage and seedling vigour traits with increase in salinity. However, the percent reduction over control was less in tolerant lines. Validation of 22 *Saltol* locus linked SSR markers revealed that RM140, RM1287 and RM3412 were found best markers in classifying landraces for salinity tolerance. Based on morphological, physiological and molecular confirmation ‘Doddabaikalu’, ‘Kalaadikonda’, ‘Gajagunda’ and ‘Anekombinabattha’ were identified as superior donor for salinity tolerance. Among saline tolerant landraces two restorers were identified and 13 maintainers were identified these could be further developed in to new male sterile lines so that saline tolerant rice hybrids could be developed.

July, 2018

(Dushyanthakumar, B. M)
Major Advisor

5. Genetic and Molecular Analysis of Leaf Blast Resistance in Rice (*Oryza sativa* L.)

SHESHAIAH

ABSTRACT

Rice is one of the world's major staple food crop but its production is severely affected by blast. The present study evaluated 35 rice germplasm lines for leaf blast resistance at AHRS, Ponnampet during *Kharif 2014*. Germplasm lines, Tadukan and Tetep showed highly resistant reaction, KPR-1, KPR-2, Kiruwana and IR-64 recorded resistant reaction and whereas, CO-39, HR-12, Jaya, Intan, Ambemori, Bheemasali, Chittiga and FR-13A showed high susceptibility to leaf blast. The analysis of variance showed significant differences among the germplasm lines and Kiruwana has recorded highest yield per plant under blast hot spot condition. Grain yield per plant recorded highest GCV and PCV and most of the traits recorded high heritability coupled with high GAM. Mahalanobis D^2 statistics grouped total germplasm into six clusters and maximum number of germplasm observed in cluster-I. Among studied characters leaf blast and grain length major contributing traits to the total divergence. Based on leaf blast screening, *per se* performance and diversity studies, Kiruwana was chosen as a donor parent to the most popular blast susceptible cultivar, Jyothi. The F_1 's developed and true F_1 identified at both phenotypic and molecular level. The F_2 population showed positively and negatively skewed platykurtic distribution for studied traits. High heritability coupled with high GAM observed for days to flowering, days to maturity, plant height, number of tillers and productive tillers per plant. The selfed F_2 's were advanced to F_3 and were scored for leaf blast reaction. Among 226 F_3 families, 178 showed resistant and 48 showed susceptible reactions and fit to the expected ratio of 3:1. The marker RM 1337 showed goodness of fit to the expected ratio of 1:2:1 and significantly associated with phenotypic evaluation. The present investigation revealed that germplasm used in the study are diverse and leaf blast resistance in Kiruwana is governed by single dominant gene and RM 1337 has associated with that gene [*Pi-20(t)*].

August, 2018

(Dushyanthakumar, B. M)
Major Advisor

6. Genetic Basis of Fruit Biochemical, Morpho-Physiological and Yield Traits Governing Shelf Life in Tomato (*Solanum lycopersicum* L.)

PAVAN M P

ABSTRACT

An investigation was undertaken with objectives to estimate variability in tomato germplasm lines and F₂ segregating individuals, heterosis and combining ability and to study nature of gene action through generation mean analysis for extended shelf life at the University of Agricultural and Horticultural Sciences, Navile, Shivamogga, during summer and *Kharif* 2016, summer and *Kharif* 2017 and summer 2018. Thirty tomato germplasm lines grouped into seven clusters. Number of clusters contributed most to total diversity. ANOVA revealed significant differences among germplasm lines. Mean for studied traits lower in summer than in *Kharif* indicating influence of environment. Close correspondence between PCV and GCV noticed for most characters. High broad sense heritability and GAM recorded for most characters indicated role of additive gene effects. The high shelf life tomato germplasm lines had slow respiration rate leads to slow water loss and weight loss. Higher shelf life in Red ball, P-4, TLB-133 and L-00191 is due to cumulative effect of higher fruit firmness, pericarp thickness, calcium and fruit epicuticular wax content. The hybrids IIHR 2349 × Arka Vikas and IIHR 2349 × Arka Saurabh recorded significantly higher yield potential and standard heterosis for shelf life. Shelf life had significant and positive correlation with fruit firmness, pericarp thickness and titratable acidity. The F₂ mean is lower than F₁ mean indicating role of dominance gene action. The mean of B₁ and B₂ was very close towards P₁ and P₂ respectively. The inadequacy of additive-dominance model indicates significance of the joint-scaling test. Focus should be on improving individual characters separately based on nature of gene action. One or two cycles of biparental mating followed by recurrent selection are advisable with dissipating dominance and enhancing frequency of genes. One has to practice selection of desirable genotypes in advanced segregating generations by evaluating a large number of families. Both additive and dominance with a predominance of dominance effects of genes are important in inheritance of shelf life.

September, 2018

(Gangaprasad, S)
Major Advisor

7. Studies on heterosis for fruit yield, quality and Yellow Vein Mosaic Virus resistance in Okra (*Abelmoschus esculentus* L.Moench.)

SHASHIKALA S KOLAKAR

ABSTRACT

The present investigation on screening, heterosis and combining ability for fruit yield, quality and resistance to Yellow Vein Mosaic Virus (YVMV) in Okra [*Abelmoschus esculentus* (L.) Moench] was carried out during summer and kharif seasons of 2016 and summer season of 2017 at Zonal Agricultural and Horticultural Research Station, Brahmavar and Department of Genetics and Plant Breeding, College of Agriculture, University of Agricultural and Horticultural Sciences, Shivamogga respectively.

The results of the experiment revealed that, there were significant variation among the genotypes for fruit yield and its component traits and incidence of YVMV disease. Broad sense heritability and genetic advance was higher for almost all the characters studied. Direct and indirect association analysis revealed that number of fruits per plant had highest direct effect followed by average fruit weight on fruit yield per plant. Diversity analysis for all the genotypes based on Mahalanobis D² values were grouped into twelve clusters. Cluster I was largest consisting of 30 genotypes. YVMV incidence contributed maximum followed by average weight of fruit for the divergence. None of the genotype was immune or free for the YVMV disease incidence.

Heterosis study recorded that the crosses which had significant heterosis over standard check were IC45818 × IC43735 for days to 50 per cent flowering, IC45818 × VRO103 for plant height, Arka Abhay × Halubende for fruit length, IC45980 × Halubende for average weight of fruit and IC45980 × Parbhani Kranti for fruit yield per plant. These hybrids can be used for exploitation of hybrid vigour on commercial scale. Combing ability analysis revealed that both general and specific combining ability variance were highly significant for almost all the characters. Parents IC45818, IC45980, Parbhani Kranti, Arka Abhay and Halubende were proved to be good general combiners and Arka Abhay × Halubende was good specific combiner for most of the fruit yield and its component traits. Lowest incidence of YVMV disease was recorded in the cross IC45980 × Halubende. The biochemical analysis recorded higher nitrogen and sugar contents in susceptible genotypes while mucilage content, peroxidase activity and polyphenyl oxidase activity were higher in resistant genotypes. Genotypes IC45818, IC43735, IC45980, NO.135 and UAHS1-1 with the low disease incidence values can be further tested in hot spots to confirm their potentiality.

8. Assessment of Morpho-physiological, Molecular Parental Diversity and Heterosis for Salinity Tolerance in Rice (*Oryza sativa* L.)

(MADHURI, R.)

ABSTRACT

The present investigation composed of 100 rice genotypes conducted at Farmer's field, Thyavanige, Davangere district, Karnataka were screened under augmented design along with five checks during Kharif2016. Analysis of variance revealed that significant differences present among the genotypes for the ten quantitative traits studied. High estimates of PCV (45.29%) and GCV (42.65%) was observed for chlorophyll content followed by yield (39.02%) and (36.51%) indicated wide range of variability for these traits. Based on screening results, Kishora, Kartha and Ragoli were identified as salt tolerant genotypes at reproductive stage. Six susceptible high yielding genotypes were selected and hybridized with five tolerant rice genotypes in Line x Tester fashion to produce 30 F1s. F1s were evaluated at ICAR-Central Soil Salinity Research Institute, Karnal, Haryana and Farmer's field, Thyavanige, Davangere district, Karnataka during Kharif2017 and Kharif2018, respectively in Randomised Complete Block Design with two replications. Among the hybrids, Pusa-44 x CSR 10 and Sarjoo-52 x CSR 27 were identified as best specific combiners for grain yield/ha under salinity condition for Karnal and Davangere location, respectively. Parental molecular diversity was assessed using 500 SSR markers, out of these 168 markers has exhibited polymorphism between eleven parents. The similarity coefficient ranged from 0.22 to 0.81. The maximum similarity coefficient was observed between PR-123 and CSR 36 (0.48) which indicated that these genotypes were more closely related. While, the minimum similarity value of 0.15 was observed between the genotypes CSR 30 and CSR 66, which indicated that these two varieties were highly divergent. Correlation was negatively significant for grain yield/ha ($r = -0.40$ and -0.39) under both the saline situation and significant positive correlation for grain yield / ha ($r = 0.34$) was estimated from the estimates of SSR based molecular divergence and mid parent heterosis.

August, 2019

(Dushyanthakumar, B.M.)
Major Advisor

1. Bio-Ecology and Management of Shoot Fly, *Atherigona Pulla* (Wiedemann) (Muscidae: Diptera) in Little Millet and Proso Millet

RAVULAPENTA SATHISH

ABSTRACT

Survey for the incidence of shoot fly, *Atherigona pulla* on little millet and proso millet was conducted during 2015-16 in Chitradurga, Davanagere and Haveri districts. The highest per cent deadheart was recorded in Haveri district (15.41 and 22.29 %) whereas, the lowest was recorded in Davanagere district (8.0 and 17.01 %) at 21 and 28 DAE of little millet crop, respectively. However, in proso millet maximum per cent deadheart was recorded in Haveri (14.04 and 21.76 %) whereas, the lowest was in Chitradurga (7.88 and 16.86 %). Effect of date of sowing of little millet and proso millet and biology, screening of genotypes and eco-friendly management against shoot fly in little millet was carried out at the Zonal Agricultural and Horticultural Research Station (ZAHRS), UAHS, Hiriyur during *kharif* and *rabi*, 2015-16. Among different dates of sowings, 1st May to 15th June sowing was effective in reducing the number of eggs and per cent deadheart. Relative humidity had direct negative correlation with shoot fly incidence. Biological studies of *A. pulla* revealed that, during *kharif* the mean incubation, maggot, pre-pupal and pupal periods were 1.92, 9.16, 1.36 and 8.40 days, respectively, as against 2.12, 12.56, 1.72 and 9.88 days, respectively, in *rabi*.

The longevity of male and female adult was 7.40 and 10.12 days, respectively in *kharif* and 6.96 and 9.32 days in *rabi*. The female laid 22.0 eggs in *kharif* and 15.84 eggs *rabi*. Comparative biology revealed that total life cycle was longer in *rabi* than *kharif*. Among 51 little millet genotypes tested, 34 were tolerant, 16 were moderately tolerant and one genotype showed susceptibility to shoot fly. Among different intercropping systems evaluated, little millet + onion recorded least number of eggs (0.27 and 0.47 eggs/plant) and deadhearts (8.08 and 6.59 %) compared to other intercrops both in *kharif* and *rabi*, respectively. Evaluation of organics, botanicals and insecticides against shoot fly revealed that, seed treatment with imidacloprid @ 5.0 g/kg seed was effective in reducing the oviposition and per cent deadheart by recording highest grain yield (12.01 and 12.07 q/ha), fodder yield (78.99 and 81.54 q/ha) with high B:C ratio (3.28 and 3.43) during *kharif* and *rabi*, respectively.

June, 2016

(M. Manjunatha)
Major Advisor

2. Taxonomy, Distribution and Diversity of Termite (ISOPTERA) Fauna of Western Ghats

VIDYASHREE, A.S.

ABSTRACT

Western Ghats is one of the important biodiversity hot spots in the world, rich in flora and fauna including insects. The diversity of termites from this region has been poorly described. Studies were made to identify the species diversity existing in Western Ghats with their distribution pattern. A total of 42 termite species belonging to 13 genera and six subfamilies under two families viz., Rhinotermitidae and Termitidae were recorded. Termitidae was the most dominant family which represented 97.99 per cent with 37 species in eleven genera. Among the subfamilies, Macrotermitinae contributed the highest (81.11%) followed by Amitermitinae (7.36%), Nasutitermitinae (6.68%), Termitinae (2.84%), Coptotermitinae (1.34%) and Heterotermitinae (0.67%) in the overall collections. Highest number of species (18) collected belongs to two genera, namely *Microtermes* and *Odontotermes* of the subfamily Macrotermitinae. An illustrated identification key was developed for the termite species collected in the study area. The morphological identification is consistent with the molecular findings. Statistically distinct 16S rRNA profiles were observed in Amitermitinae, Macrotermitinae, Nasutitermitinae and Rhinotermitinae. Species diversity and richness varied across three habitats. The forest habitat had more number of species (12) than plantation habitat (10) and pasture habitat (7). Distribution maps were developed for all collected species, however, the following species recorded in only one locality which includes *Coptotermes kishori*, *C. heimi*, *Heterotermes balwanti*, *Eurytermes buddha*, *E. assmuthi assmuthi*, *O. bhagwatii*, *O. globicola*, *O. horni*, *O. peshawarensis*, *Nasutitermes gardneri*, *Trinervitermes nigrirostris*, *Angulitermes fletcheri* and *Dicuspiditermes incola*. All the collected specimens were deposited in Department of Entomology, UAHS, Shivamogga.

March, 2017

(Kalleshwaraswamy, C.M.)
Major Advisor

3. Reproductive Status, Burrowing Behaviour and Nonchemical Management of *Leucopholis* spp. (Scarabaeidae: Coleoptera) Infesting Arecanut

ADARSHA S. K.

ABSTRACT

Investigations on the reproductive status of adult beetles emerged and their burrowing behaviour was conducted between 2015 and 2017. Various nonchemical management strategies were also evaluated under field condition. Peak emergence of females was observed between 18:40-19:20 hrs, when light intensity fell to 83.62 lux. The highest number of males approached to virgin female at 18:50 hrs (15.99 lux) and terminated at 19:20hrs (0.26 lux). *Leucopholis lepidophora* showed a unique mating behaviour with copulation period of 74.60 ± 6.61 min. Most of the emerged beetles were virgin females (51.62 %). Among the different female-baited traps evaluated, bucket trap with the plastic box was found to be significantly superior (14.14 ± 0.9 males/trap/week). Mated females found to burrow deeper than male and virgin female beetles. Evaluation of different commercial formulations of entomopathogenic nematodes, bioagents and plant products indicated *Bacillus thuringiensis* 20g/palm was found to be effective whereas commercial formulations of EPNs such as Soldier, Grub terminator and Calterm super were found to be moderately effective against white grubs. Plant products also reduced the grub population which was not significant. However, in all the experiments, insecticide *i.e.*, Imidacloprid 17.8 SL @ 1.5ml/palm was found to be most promising followed by Chlorpyrifos 20 EC 6ml/palm. Underground drainage system with gravel soil and stone application was most effective among all the treatments and recorded the lowest larval population both around the palms (0.74 larvae/palm) and in between the palms (0.43 larvae/palm). Application of gravel soil and stone did not affect the physical property, chemical property and major nutrients like 'Phosphorus' and 'Potassium' except 'Nitrogen' in the soil. Insecticidal spray (Imidacloprid 17.8 SL @ 0.50ml/lit) with flooding for eight days brought the larvae to an upper surface of 15 cm and reduced the grub population of both *L. lepidophora* and *L. burmeisteri*.

October, 2017

(B. K. Shivanna)
Major Advisor

4. Survey, Comparative Development of Rice Weevil, *Sitophilus oryzae* L. in Different Split Legumes and its Management Using Botanicals and Modified Atmospheric Methods

NANDINI

ABSTRACT

During 2015-17 an investigation was carried out at the Department of Agricultural Entomology, College of Agriculture, University of Agricultural and Horticultural Sciences, Shivamogga and Department of Processing and Food Engineering, College of Agricultural Engineering, University of Agricultural Sciences, Raichur on *Sitophilus oryzae* L. in different split legumes. The survey of rice weevil, *S. oryzae* infestation and its larval parasitoid, *Theocolax elegans* (Westwood) was known to exist only on the split field bean dhal, split red gram dhal and split bengal gram dhal. Among the tested split legumes, the comparative development of rice weevil, *S. oryzae* was better in split field bean dhal being the most highly preferred host. The physical and biochemical analysis revealed that there was significant increase in adult population, protein, ash and moisture content and reduction in fat, fiber and carbohydrates. With respect to management of *S. oryzae* in split field bean dhal, among the different concentrations of tested plant products, sweet flag rhizome powder at one per cent was found to be significantly superior followed by cashew nut shell powder. Evaluation of two formulations of different plant products revealed that, solid formulation was found to be significantly superior compared to gel formulation. However, sweet flag rhizome powder at one per cent was found as effective as malathion (standard check). The effect of modified atmospheric gas concentrations showed that M₁ (80 % N₂: 0% O₂: 20 % CO₂) found to be significantly superior. Whereas, the effect of modified atmospheric gas (O₂ and CO₂) concentrations along with sweet flag rhizome powder at one per cent revealed that T₁ (80 % N₂: 0 % O₂: 20 % CO₂ + SF 1 %) was significantly superior with cent per cent mortality and no weight loss.

September, 2017

(M. Manjunatha)
Major Advisor

5. Evaluation of Rice Genotypes for Resistance to Lepidopteran Pests

ASHRITH K N

ABSTRACT

Investigations were made to evaluate rice genotypes for resistance to lepidopteran pests between 2016 and 2018 at College of Agriculture, University of Agricultural and Horticultural Sciences, Shivamogga. A total of 14 genotypes were screened and classified; among them TKM 6 (3.86%), Kiruvana (4.71%) and Kesari (4.50%) were resistant; KHP 2 (8.19%), JGL 1798 (8.94%), KRH 2 (8.98%), MO4 (8.02%), Jyothi x Kesari (8.35%), Jyothi x Bilya (7.96%), Tunga (14.90%) and Akkalu (15.39%) were moderately resistant for yellow stem borer (YSB) infestation. TKM 6 (4.98%), Jyothi x Kesari (8.24%), Jyothi x Bilya (7.38%), Kiruvana (7.81%), Bilya (9.87%), Kesari (6.48%), KHP 2 (8.24%) and JGL 1798 (9.37%) were resistant to rice leaf folder (RLF). From the morphological basis of resistance, the cultivar with highest number of productive tillers was recorded in TKM 6 (17.69), Kiruvana (17.16), JGL 1798 (16.31) and KHP 2 (16.11) which had significantly negative relationship with YSB damage. Correlation between morphological characters of plant and leaf folder infestation indicated that there was a negatively significant relationship with trichome density ($r=-0.950^*$) and significant positive relationship with leaf width ($r=0.932^*$) at mid point. The highest amount of total sugar was attributed to rice leaf folder and yellow stem borer susceptibility. Phenolic content in the healthy leaves was significantly more when compared to susceptible checks TN-1 (3.56 mg/g) and Jyothi (4.79 mg/g). Potassium and silicon content were significantly high in resistant check TKM 6 (19.94 mg/g) and Kiruvana (17.29 mg/g). Induction of silicon followed by the reaction to YSB and RLF was estimated. The treatment with NPK+FYM+Foliar silicon was most effective treatment as it recorded significantly lowest infestation (3.57 and 1.07%). Application of silicon source significantly increased the rice grain yield. Further in organic amendment treatment plot receiving neem cake recorded lowest per cent leaf (5.96%) and white earhead (3.13%) damage as against the untreated control. The maximum damage by the stem borer was noticed with NPK (12.41%) followed by FYM (12.24%) and vermicompost (10.34%).

July, 2017

(Kalleshwaraswamy, C.M.)
Major Advisor

6. Survey, Feeding Preference of Lesser Grain Borer *Rhyzopertha dominica* (Fab.) and Maize Weevil *Sitophilus zeamais* (Motsch.) and their Management on Stored Maize

(NARAYANA SWAMY K. C)

ABSTRACT

Investigation was carried out during 2016-2018 at the department of Agricultural Entomology, College of Agriculture, University of Agricultural and Horticultural Sciences, Shivamogga on lesser grain borer *Rhyzopertha dominica* and maize weevil *Sitophilus zeamais* in stored maize. Survey revealed that among the three districts selected in Karnataka, the highest number of stored insect pests were recorded in Shivamogga district as compared to rest of districts and lowest number of pests were recorded in Chitradurga district. Various storage insect pests were noticed in three districts. Among different storage insect pests the *Sitophilus oryzae* was most dominant, whereas *Trogoderma granarium* was least dominant in all the above three districts. Evaluation of different storage containers revealed that maize seeds stored in polythene bags of 700 gauge was found to be most effective in reducing seed damage and number of adult survival without affecting the moisture content and seed weight loss by *R. dominica* and *S. zeamais* upto 120 days after treatment followed by plastic containers and glass bottles. Based on different biological parameters the maize hybrids Hema and CP818 proved tolerant against both *R. Dominica* and *S. zeamais*. The hybrids RMH-462, Nithyashree and NK6607 were more susceptible based on oviposition period, fecundity and developmental period. Evaluation botanicals and animal origin bioproducts revealed that application of *Acarus calamus* rhizome powder @ 2 per cent were found to be most effective against both *R. dominica* and *S. zeamais* even 180 days after storage followed by *Annona squamosa* @ 2 per cent and cow dung ash powder @ 2 per cent and maintained seed quality parameters above minimum seed certification standards.

June, 2019

(Hanumanthaswamy, B. C.)
Major Advisor

7. Molecular Characterization of Green Peach Aphid, *Myzus persicae* (Sulz.) and its Transmission Efficiency of Potato Viruses

(KAVITA HEGDE)

ABSTRACT

The present investigation on molecular characterization of *Myzus persicae* and their endosymbionts was carried out during 2017-2019. At the same time, the transmission efficiency of two major potato viruses i.e., PVY and PLRV and colony developmental behaviour on potato varieties was studied. Efforts were also made in field condition to understand the influence of primary infection of viruses in seed tubers and its effect on secondary spread of PVY. All the 124 *M. persicae* populations collected from various geographical regions in Deccan Plateau of India on diverse host plants exhibited 95 per cent nucleotide similarity with *M. persicae*. The phylogenetic analysis formed eight different clusters separately suggesting the host associated genetic differences within *M. persicae* population in Deccan Plateau of India. A primary bacterial endosymbiont, *Buchnera aphidicola* was successfully detected by 16S rRNA gene sequence analysis in all the populations collected. Transmission efficiency analysis of five geographically separate *M. persicae* clones showed the efficient transmission of PVY and PLRV but at different rate. Hassan clone and Chickmagalur clone were efficient transmitters of PVY and PLRV, respectively than Belgaum, Chikkaballapura and Dharwad clones. Among the three antibiotics (tetracycline, rifampicin and ampicillin trihydrate), tetracycline @ 50 µg/ml was most efficient in reducing the transmission efficiency of PLRV. Colony development behaviour results showed that KufriJyothi and FC 3 varieties were more preferred by adults and nymphs of *M. persicae* than FL 1533. Aphids were found preferring mixed infected plants (PVY + PLRV), than healthy and single infection of PVY and PLRV. When 100 per cent healthy tubers of KufriJyothi were used for sowing, the virus incidence was significantly low (21.67%) and recorded the maximum average plant height (54.24 cm), number of stems per plant (4.83), number of tubers per plant (5.79) and yield per plant (374.23 g) in Kharif 2018. The similar trend was recorded in Rabi 2018-19. Among the different insecticides evaluated, thiamethoxam 25 WG @ 0.5g/l was found to be superior with the maximum yield (20.38 t/ha, 20.79 t/ha and 20.58 t/ha) and cost: benefit ratio (1:4.32, 1:5.20 and 1:4.56) in Rabi 2017-18, Kharif 2018 and pooled as well, respectively.

October, 2019

(Kalleshwaraswamy, C. M.)
Major Advisor

8. Bio-ecology and Evaluation of Different Management Modules against Spider Mite, *Tetranychus macfarlanei* Baker and Pritchard (Acari: Tetranychidae) on Cucumber

(LATHA M)

ABSTRACT

Investigations were carried out on bio-ecology and evaluation of different management modules against spider mite, *Tetranychus macfarlanei* on cucumber between 2016 and 2018 at College of Agriculture, University of Agricultural and Horticultural Sciences, Shivamogga. The survey revealed that incidence of spider mite was observed in all the places. *Tetranychus macfarlanei* Baker and Pritchard was the most common species found in Shivamogga district. The highest mean population (19.14 ± 2.1 mites/sq. inch) of spider mites recorded in Shivamogga taluk followed by Honnali taluk of Davangere district (12.31 ± 1.1 mites per sq. inch). Among eleven places; higher mean mite population was seen in Polyhouse condition. Correlation studies revealed that maximum temperature, predatory mite and predatory coccinellids showed highly significant positive correlation. The total life period occupied by *T. Macfarlanei* varied from 21.60 to 27.46 days with an average of 24.90 ± 1.98 days in male and 29.13 to 32.87 days with an average of 31.40 ± 0.98 days in female. The innate capacity of increase (rm) and finite rate of increase () of *T. Macfarlanei* reached maximal values (0.123 and 1.131) at 32 °C. The mean generation time (T) and doubling time (DT) were shortest (12.31 and 2.43) at 32 °C. All the life stages of predatory mite preferred eggs followed by larval instars and least were on adults and duetonymphal stages of spider mite. Among the four modules evaluated against spider mite in cucumber grown under polyhouse condition during Kharif and summer season, lowest mean mite population was recorded in M1-Chemical intensive module (4.30 mites per sq. inch) in Kharif and M2-IPM module (5.37 mites per sq. inch) in summer season. Highest B: C ratio (3.63 and 4.34) was obtained with M2-IPM module and offered highest yield (33.12 and 30.04 t ha⁻¹) in Kharif and summer crop.

December, 2019

(M. Manjunatha)
Major Advisor

D) PLANT PATHOLOGY

1. Investigations on Wilt Complex of Banana Cv. Ney Poovan (AB) caused by *Fusarium oxysporum* f. sp. *cubense* (E.F. Smith) Snyder and Hansen and *Radopholus similis* (COBB and Thorne)

MURALI, R.

ABSTRACT

Banana (*Musa* spp.) is one of the major fruit crop grown throughout the humid tropics and subtropics. Wilt complex caused by *Fusarium oxysporum* f. sp. *cubense* (Foc) and *Radopholus similis* is most destructive disease on many cultivars of banana. Survey in southern Karnataka during 2015 revealed that, highest wilt incidence was recorded in Shivamogga (27.63 %) district whereas, the least incidence of 15.75 per cent was recorded in Chitradurga district.

Among the different solid and liquid media were tested against Foc, Richard's medium supported maximum growth of fungus (89.55 mm and 336.42 mg) whereas, least growth was recorded in host extract medium (21.82 mm and 70.87 mg). The nutritional studies of Foc revealed that, maximum dry mycelia weight of fungus was recorded in Sucrose as carbon source (404.28 mg) followed by nitrogen source as potassium nitrate (440.50 mg), sulphur source magnesium sulphate (401.37 mg) respectively. In interaction studies, maximum reduction in plant height, pseudostem girth, root length, fresh shoot and root weight was noticed in simultaneous inoculation of *R. similis* and Foc over control. Molecular characterization of Foc revealed that, RFLP analysis of PCR product obtained from amplification with TEF-1F and TEF-1R primers with restriction endonuclease enzymes *viz.*, *TaqI*, *AluI* and *MspI* showed high degree of genetic similarity among 24 Foc isolates studied, indicating close relationship between the Foc isolates.

Sequencing analysis of PCR products revealed that Foc as race 2. *In vitro* evaluation of eight plant extracts against Foc revealed that, higher per cent inhibition was recorded by Neem @ 20 per cent (80.73 %). Among eight bioagents, *Trichoderma viride* (76.66 %) (Shivamogga isolate) was significantly found effective in inhibiting the mycelial growth of Foc. *In vitro* screening of fungicides against Foc revealed that, Captan at 100 ppm Propiconazole and combi products, Carbendazim + Iprodione (100 %) was found effective in inhibiting the mycelia growth of Foc @ all concentrations. Integrated management of wilt complex was conducted in the farmers orchard during 2015 revealed that, the combined soil application of Neem cake (250 gm/pl), 25gms of each *T. viride*, *P. fluorescens*, *P. lilacinus* along with FYM, Carbofuran (20 gm/pl) + stem injection of Carbendazim @ 2 percent (at 5, 7, 9 months) recorded the maximum plant height with reduced the *R. similis* population, less wilt incidence (11.12 %), maximum bunch weight(16.80 kg) and yield (26.33 t/ha) respectively.

June, 2016

(H. Narayanaswamy)

Major Advisor

2. Diversity of *Exserohilum turcicum* (Pass.) Leonard and Suggs. and Genetics of Resistance vis-à-vis Integrated Management of Turcicum Leaf Blight in Maize

MANU T. G.

ABSTRACT

Maize is third major cereal crop of India. Among the diseases affecting maize, turcicum leaf blight (TLB) caused by *Exserohilum turcicum* is of worldwide importance. Survey for the incidence of turcicum leaf blight revealed that, the highest PDI among seven districts was noticed in Chickmagalur district. Thirty two isolates from different parts of southern Karnataka showed significant differences in relation to radial growth, colony character, pigmentation and spore characters on potato dextrose medium. Shivamogga isolate was found to be fast growing and carrot agar, rye agar A, potato dextrose broth and Richard's broth were found to be better media. In nutritional studies, mannose and aspergin were found to be the best carbon and nitrogen sources respectively. Molecular variability studies showed that the primers SSR 23 and SSR 24 were polymorphic and variability exists among the isolates. Screening of germplasm revealed that, only nine lines were found to be resistant to the TLB disease at both the locations and during both the years. The six generation mean analysis indicated the significance of additive, dominance and additive x additive gene effects for TLB and based on the opposite signs of [h] and [l] gene effects indicated the presence of duplicate gene interaction in the genetic control of turcicum leaf blight in the crosses CML 502 x CML 511 and CM 202 X CML 509. The SSR marker, *bmc1767* acts as dominant marker and is tightly linked to the resistant trait against TLB. Among the fungicides, Tebuconazole, Propineb and Carbendazim 12% + Mancozeb 63%, whereas, among the botanicals, garlic bulb extract and bio-agent *Trichoderma harzianum* -2 were found to be effective in inhibiting the mycelial growth of *E. turcicum* in-vitro. In field conditions, spraying of Propiconazole showed least PDI with more yield and BC ratio in both years and at both locations.

March, 2017

(B. Gangadhara Naik)

Major Advisor

3. Studies on Pomegranate Wilt Complex Incited by *Ceratocystis fimbriata* Ell. and Halst. and *Meloidogyne incognita* Kofoid and Chitwood

IMRAN KHAN, H.S

ABSTRACT

Pomegranate wilt complex incited by *Ceratocystis fimbriata* and *Meloidogyne incognita* is one of the important diseases which affect the crop in major growing regions of Karnataka. The disease was noticed in all districts surveyed in Karnataka, ranging from 17.11 per cent in Chickmagalur district to 33.91 per cent in Koppal district. Maximum incidence of wilt was observed in red sandy loam (38.40 %) and maximum soil population of *Meloidogyne incognita* recorded in Koppal district with RKI of 5.0. Cultural studies revealed that malt extract agar was found to be the best source for growth of all the isolates. Interaction studies revealed combined inoculation of *C. fimbriata* and *M. incognita* recorded least shoot, root growth and fastened the wilt incidence. Dendrogram obtained from RAPD analysis indicated three major clusters formed which separated Cf-R from rest of the isolates, The isolates from Cf-Ct, Cf-H, Cf-K, Cf-T and Cf-B were grouped in second cluster. While, third cluster consisting of isolates Cf-B, Cf-C and Cf-V. The average polymorphism percentage ranged from 33.33 to 83.20 per cent. RAPD profiles showed a high level of genetic variability among the isolates of *C. fimbriata*. Propiconazole recorded cent per cent inhibition of mycelial growth of *C. fimbriata* followed by hexaconazole. *Trichoderma harzianum* and *Trichoderma viride* were found to be the most effective under *in vitro*. Application of propiconazole along with carbofuran, neemcake and microbial consortium of *T. harzianum* and *P. fluorescens* along with vermicompost were found effective in reducing the incidence of wilt complex disease with highest B:C ratio of 2.23.

April, 2017

(H. Ravindra)
Major Advisor

4. Morphological and Morphometrical Studies of *Meloidogyne graminicola* under different Soil Types of Major Rice Growing States of India

NARASIMHAMURTHY, H. B

ABSTRACT

Of late, rice root-knot nematode (*Meloidogyne graminicola*) has emerged as a major threat throughout the world and it has occupied a place of 'National Pest' owing to its severity. This is a major constraint in successful rice cultivation leading to significant loss to the rice grower. Studies were carried out with respect to morphology, morphometrics, identification of races, survival strategies under different soil and moisture regimes, galling pattern, biology and management using biocontrol agents. Morphological and morphometrical comparisons were made for 12 populations of *M. graminicola*, collected from different agro-ecological regions of India namely, Gujarat, Hyderabad, Assam, New Delhi, Orissa, Uttar Pradesh and different districts of Karnataka viz., Shivamogga, Mandya, Davanagere, Chikmagalur, Kodagu and Udupi in respect of eggs, second stage juveniles and females by employing Duncan's Multiple Range Test and Multivariate Analysis with standardized Canonical discriminant function. Out of 12 *M. graminicola* populations, three populations namely, New Delhi, Shivamogga and Hyderabad appeared quite different from typical *M. graminicola*. In host range studies, all the tested cultivars were infected by *M. graminicola*, except cotton and bhendi where no galls were observed on these cultivars. However, North Carolina tomato cv. Rutgers was infected by this *M. graminicola*, hence, it is an indication of occurrence of new species/race in this location. Survival of *M. graminicola* studies revealed that, the location having sandy loamy soil, acidic soil pH, with least soil organic carbon, higher nitrogen, lower phosphorous and potassium with higher moisture content in the soil which recorded higher nematode population. Different galling patterns were observed from different locations, which may be the indication of new races/ species in rice. In biology study, second stage juveniles were attracted to the roots and moved towards the root tip. The infective second stage juveniles of *M. graminicola* entered the rice roots within 24 hrs of inoculation and they started feeding and became stationary. The duration of second, third, fourth and adult female stages lasted for 1-5, 6-8, 9-12 and 28 days respectively. The total life cycle including the preparasitic stage was 25-28 days. Among different bioagents tested, application of consortium of *P. fluorescens*+ *T. harzianum* was found effective in reducing the incidence of *M. graminicola* with highest B: C ratio of 1:1.32.

September, 2017

(H. Ravindra)
Major Advisor

5. Investigation on Ginger Rhizome Rot Complex with Special Emphasis on *Ralstonia solanacearum* (E.F. Smith) Yabuuchi *et al.*, in Southern Transition Zone of Karnataka.

NAGARAJA, H

ABSTRACT

Rhizome rot complex is one of the major constraint in ginger cultivation. causing heavy economic loss. In present investigations carried out on various aspects of ginger rhizome rot caused by *R. solanacearum* during 2014 to 2016 with respect to survey, identification characters and management. During 2014-15 and 2015-16 survey, the maximum disease incidence of 29.54 % and 30.56 % and the minimum of 15.87 % and 17.74 % were recorded in Shivamogga and Bidar districts respectively. The isolated bacterium was confirmed as *R. solanacearum*, gram negative, rod shaped. The bacterial colonies on TZC medium exhibited white with light pinkish center and highly fluidal with copious slime. Biochemical characters revealed that, the bacterium showed positive for acid production from maltose, sucrose and dextrose, starch hydrolysis, hydrogen sulphide production, gelatin liquefaction, gas production, KOH solubility test, urease test and catalase test. Among thirteen ginger genotypes (IISR, Calicut) screened against bacterial rhizome rot complex, Varada genotype showed moderately resistant and other 12 genotypes showed susceptible reaction both under field and glass house condition. Among the botanicals, bioagents and antibacterial chemicals tested against *R. solanacearum*, neem leaf extract at 20% (12.43 mm), *Pseudomonas fluorescens* (Shivamogga isolate) (16.85 mm) and streptomycin + copper oxychloride at 500 + 300 ppm (29.38 mm) were found superior and showed maximum inhibition zone under *in vitro* condition. Integrated management of rhizome rot under field condition, rhizomes treated with Streptomycin @ 0.5 g + COC @ 3.0 g/lit of water + soil application with neem cake 3q/ha followed by drenching with bleaching powder (33%) @ 2.0 g/lit + Metalaxyl MZ @ 1.0 g/lit for three time at 20 days intervals + Ginger special spray 45 DAS for three time at 20 days interval starting with initiation of the disease was effective and recorded less disease incidence of 14.23 % with higher yield of 110.27 q/h compared to other treatments and control. There was significant increase in the percent germination of rhizomes in solarized plot when compared to non solarized plot.

September, 2017

(H. Narayanaswamy)
Major Advisor

6. Epidemiology and management of chrysanthemum leaf blight incited by *Alternaria* spp.

DIVYAJYOTHI, U.

ABSTRACT

Chrysanthemum leaf blight is one of the important disease caused by *Alternaria* spp. and is a serious threat to successful cultivation of chrysanthemum. During 2016-17, the disease was severe in all the surveyed districts and average disease severity ranged from 39.42 to 80.64 per cent. The maximum mean Percent Disease Index (PDI) was observed in Tumkur district (74.70) followed by Davangere (57.93), Chitradurga (47.57) and least was noticed in Shivamogga (43.86). On the basis of morphological and molecular studies, the pathogen was identified as *Alternaria* spp. The pathogen grouped into eight isolates viz., SSA, SBA, DHA, DJA, TTA, TSA, CCA and CHA isolates. The conidia of different isolates varied in septation, with 1 to 2 vertical and 4 to 7 horizontal septa. The width of the conidia varied from 5.46 to 9.29 μm . The cultural characters of the *Alternaria* spp. were studied on different media where the growth was fast in potato dextrose agar medium and slow growth in the V₈ juice agar. The pathogen produced maximum growth at 25-30°C temperature. The weather studies revealed that PDI was progressing at linear rate throughout the plant growth and it was negative correlation with minimum temperature and evening relative humidity and positive correlation to maximum temperature and rainfall. In aerobiological study, the spore load was maximum during August and October months, and in different date of planting the maximum PDI was observed in 25th July planted crops. PCR sequencing results revealed that out of eight tested isolates, seven isolates (SBA, SSA, DJA, DHA, TSA, CCA and CHA) belonged to *A. alternata* and one isolate (TTA), belonged to *A. tenuissium*. *In-vitro* evaluation of fungicides reveals that, tebuconazole, trifloxystrobin+tebuconazole, and propiconazole, showed cent per cent inhibition at all the concentrations (0.05%, 0.1% and 0.2%). In field evaluation, tebuconazole @ 0.1% recorded least PDI with high yield (8.78 t/ha) was recorded. Among seventeen genotypes evaluated, Vasanthika was found resistant.

July, 2018

(Suresh D. Ekabote)
Major Advisor

7. Molecular Detection and Management of Mycotoxigenic Fungal Contamination in Maize (*Zea mays* L.)

(AJITHKUMAR, K.)

ABSTRACT

Mycotoxin contamination in maize is the major post harvest constraint, affects quality and quantity of the produce, there by affects exporting of maize and effects on human as well as animal health. The survey results revealed that, the maximum per cent severity of mycotoxigenic fungus in the field was noticed in Shivamogga, Koppal (8.70) and Haveri district (17.64) as against the least severity in Raichur district with 3.81 and 2.38 during 2017-18 and 2018-19, respectively. The higher per cent incidence in godowns and markets was recorded in Shivamogga (40.40) and Ballari (58.67) districts whereas minimum incidence was recorded in Haveri (22.73%) during 2017-18 and Mandya, Shivamogga (31.87%) during 2018-19. Culturally and morphologically identified *Aspergillus flavus* isolates were further confirmed molecularly, wherein the ITS region of rDNA of all 20 isolates were amplified at 550 bp. For toxigenic conformity, isolates were amplified with aflJ-R, aflJ-F and were also detected through ELISA and the results revealed that, all the isolates were toxigenic in nature. Twenty isolates of *Fusarium* spp. were confirmed as *Fusarium verticillioides* based on cultural and morphological characters, of which only 18 *F. verticillioides* isolates were amplified at 550 bp with ITS primers. For toxigenic conformity isolates were amplified with VERTF-1, VERTF-2 and were also detected through LC-MS and the results revealed that FM-6, FM-15, FM-16 and FM-19 were positive for fumonisin production. The response of 125 maize germplasm for mycotoxigenic fungi showed that none of them expressed immune or resistant reaction. An integrated approach was attempted for the management of mycotoxin contamination in maize. The soil enrichment with neem cake, *T. harzianum*, *P. fluorescens* and foliar spray of carbendazim were effective in reducing the infection with maximum yield of 60.59 and 57.61 q/ha and highest BC ratio of 3.34 and 3.15 in first and second circumstances, respectively.

August, 2019

(M. K. Naik)
Major Advisor

8. Studies on the Impact of Increasing Temperature and CO₂ on Fusarium Wilt Disease of Chickpea (*Cicer arietinum* L.)

(SUDHARANI)

ABSTRACT

The Fusarium wilt of chickpea caused by *Fusarium oxysporum* f. sp. *ciceris* (Foc) is one of the major production constraints in many parts of the world. Under changing climatic scenario, elevated CO₂ and temperature have shown potential impact on host pathogen interaction, plant resistance mechanisms and pathogen virulence. Hence, the present study was focused to assess the impact of elevated CO₂ (ambient, 550 and 700 ppm) and temperature (25, 30 and 35 °C) on incidence of Fusarium wilt of chickpea in JG 62 (susceptible) and WR 315 (resistant) cultivars,. Irrespective of temperature, the incubation period was delayed in elevated CO₂ (550 and 700 ppm) when compared to ambient CO₂ condition. In JG 62 at 25 °C and 30 °C with ambient and 700 ppm CO₂ combination, maximum disease incidence of 100 per cent was observed when compared to 550 ppm CO₂. Moreover, at 35°C least disease incidence was recorded in all combination of CO₂. To improve the resistance level, attempts were made to understand the molecular basis of chickpea x Foc interaction through quantitative PCR (qPCR) to quantify the expression of several candidate chickpea defence and Foc virulence related genes in both cultivars. As compared to elevated CO₂, the expression of defence and virulence response genes in chickpea inoculated seedlings were highly up-regulated in ambient CO₂ condition in combination with 25 and 30 °C when compared to 35 °C. Our results suggests that among the different defence related genes studied, peroxidase gene is highly expressed in WR 315 cultivar, there by restricting the Foc colonization by providing an evidence of efficient defense mechanism in the resistant cultivar. Moreover, in JG 62 secreted in xylem (SIX 14) gene was highly expressed as a virulence gene as it mainly helps in colonization of Foc by defeating its defense in susceptible cultivar.

September, 2019

(B. Gangadhara Naik)
Major Advisor

9. Investigation on Maize Cyst Nematode *Heterodera zae* Koshy et al. in Karnataka

(RANI, N.)

ABSTRACT

Maize is considered as the queen of cereals and third most important crop after rice and wheat. *Heterodera zae* reported to cause significant losses in maize. However, little work has been initiated on this tiny hidden enemy of maize crop in Karnataka. Hence, the present investigation on maize cyst nematode *H. zae* was undertaken. Survey was conducted in all the 13 major maize growing districts of Karnataka which revealed that, it was widespread and distributed in all the surveyed districts. Sandy loamy soil and monocropping system supported the maximum nematode infection. All the genotypes grown were found susceptible for *H. zae*. Haralahalli, Katihalli, Isuru, Siddapura, Goravarahatti and Chilurukadakkatte villages recorded highest cyst hence were considered as 'hot spots' for *H. zae* in Karnataka. Total life cycle was completed within 23 days after inoculation of second stage juveniles. Twelve plants belonging to family Poaceae were found to be hosts for *H. zae*. Morphology and morphometrics comparisons of eggs of Chitradurga, Davanagere and Shivamogga populations showed maximum length. Second stage juveniles of Chitradurga population appeared longer, while maximum tail length was noticed in Chitradurga and Davanagere population. Cysts were lemon-shaped, fenestra was ambifenestrated. The highest mean value of cyst body length, width and cone top height was observed in Chitradurga population. Molecular study using PCR amplification at 1050 bp and restriction of the same indicates that, variation was present among ten populations. Among different bio-agents, botanicals and green nano products, *Trichoderma harzianum*, papaya leaf extract, and ZnPfs, were found best under in-vitro juvenile mortality test. Field management study during 2017 and 2018 revealed that, application of consortium of *P. fluorescens* + *T. harzianum* + *B. subtilis* at 20g/m² was found most effective in reducing nematode population, cysts with increased yield and maximum B:C ratio in both the locations and seasons tested.

October, 2019

(H. Ravindra)
Major Advisor

1. Soil Quality and Other Properties as Influenced by Different Land Use Systems in Jambadahalla Subwatershed, Tarikere, Chikkamagaluru District

NETHRAVATHI, B

ABSTRACT

An investigation was under taken at University of Agricultural and Horticultural Sciences, Shivamogga during the period of 2014 to 2016 to study the soil quality and related other properties as influenced by different land use systems in Jambadahalla subwatershed, Tarikere, Chikkamagaluru district. Based on soil type and cropping pattern assessment soil sampling was done on the basis of management zones and they were analysed for physical, chemical and biological properties. Soil profile studies were taken up, ten profiles were excavated and studied in the field for their morphological features and they were analysed for chemical and biological properties. physical, chemical and biological properties as influenced by different land use systems viz., natural forest, eucalyptus, arecanut, coconut, potato and maize were studied under red soils whereas in black soils four different land use systems viz., arecanut, coconut, potato and maize were studied. Laboratory incubation studies were carried out for a period of 60 days to study the effect of different land use systems on mineralisation of added N in soils. Physical, chemical and biological properties of soils under different land use systems determined in red and black soils were used to develop soil quality indices (SQI).

The results indicated that among the various land use systems studied in red soils significantly higher levels of water stable aggregates (WSA), organic carbon stock (OCS), total microbial activity (TMA) and other properties were recorded in forest land use systems (77.5%, 24.23 Mg ha⁻¹ and 37.9 mg CO₂-C kg⁻¹ day⁻¹) and lowest values were recorded in the intensively cultivated maize land use system. Among the various land use systems studied in black soils significantly higher levels of water stable aggregates (WSA), organic carbon stock (OCS) were recorded in maize land use system (72.36 % and 24.20 Mg ha⁻¹ respectively) as it is followed on deep, clayey textured soils and the lowest values in the potato land use system.

Natural forest (0.46) followed by eucalyptus land use system (0.42) recorded highest soil quality index and maize land use system (0.32) recorded the lowest soil quality index among the different land use systems practised on red soils. The principal component analysis identified eight soil attributes including OC, Fe, Zn, and MWD contained in eight PCs accounting for an overall cumulative variance of 81.5 per cent. Maize land use system recorded highest soil quality index (0.40) and potato the lowest soil quality index (0.28) among the different land use systems practised on black soils. The principal component analysis identified seven soil attributes including TC, Mn, Ca and MWD contained in seven PCs accounting for an overall cumulative variance of 82 per cent. Organic carbon with highest communality factor of 97 per cent was the major contributor towards the variance in soil quality index among all the soil attributes studied in both red and black soils. Soil organic carbon and bulk density recorded very high communality value in the present study and hence it is implied that soil management practices need to be adopted at the farm level that increase the efficiency of organic matter cycling and maintain favorable soil structure to improve the soil quality.

April, 2017

(T. S. Vageesh)
Major Advisor

2. Studies on characterization of soil resources and zinc nutrition of finger millet in Lingalapura sub-watershed, Chikkamagaluru District, Karnataka

SARASWATHI

ABSTRACT

A study was undertaken to characterize soil resources and zinc nutrition of finger millet in Lingalapura sub-watershed, Chikkamagaluru district, Karnataka. Twenty soil profiles and concurrently two hundred surface (0-15) and subsurface samples (15-30 cm) were drawn from the farmers' fields in different land use systems viz., arecanut, coconut, maize, ragi and natural vegetation in different micro-watersheds to study the morphological, physico-chemical properties of soil and their distribution of zinc fractions in relationship with soil properties. The soils were shallow to deep in red soil areas while moderately deep to deep in areas dominated by black soils. The soil structure was crumbly to sub-angular in surface and sub-angular in sub surface horizons. The soil reaction (pH) in the red soil varied from slightly acidic to alkaline, whereas the pH of the black soil ranged from neutral to alkaline in nature. The zinc status in study area ranges from sufficiency to deficiency while iron, copper and manganese content were sufficient in all micro-watershed. The order of magnitude of different zinc fractions was water-soluble + exchangeable zinc < organically bound zinc < manganese oxide bound zinc < amorphous sesquioxide bound zinc < crystalline sesquioxide bound < residual zinc. A field experiment was carried out to study the response of finger millet to nanozinc oxide formulation in the micro-watersheds. Significantly higher grain (9.60 g pot⁻¹) and straw yield (15.87 g pot⁻¹) was recorded in the treatment (T₇) which receives foliar spray nanozinc oxide @ 500 ppm recorded compared to control. The highest zinc uptake in grain and straw (0.34 and 0.49 mg plant⁻¹) in T₇ and lowest was recorded in absolute control (0.22 and 0.29 mg plant⁻¹). The available zinc content in the soil was higher (0.60 mg kg⁻¹) in T₇ with the application of nanozinc oxide particles @ 500 ppm respectively.

June, 2018

(Y. Vishwanatha Shetty)
Major Advisor

3. Dynamics of boron in soils under paddy land cover of Bhadra command, Karnataka

PRASHANTH, K. M.

ABSTRACT

An investigation was carried out in order to study the dynamics of boron in soils under paddy land cover of Bhadra command in Karnataka. Collected soil samples were characterized for chemical properties, available boron status, fractionation and adsorption behavior of boron. Field experiments were also conducted at AHRS, Bhavikere and Kathalagere to study the response of paddy for different levels of boron application.

Results of the study indicated that the pH of soils of Bhadra command varied from 5.02 to 8.62 with 37.5 per cent of soils were found to be acidic and remaining samples were in the range of neutral to alkaline. Organic carbon status of these soils was in the range of 3.60 to 13.50 g kg⁻¹. Only 16.90 per cent samples analysed were recorded low organic carbon status and remaining samples were in the range of medium (22.50 %) and high (60.60 %) organic carbon status.

Hot water extractable boron status in soils varied from 0.26 to 0.94 mg kg⁻¹ and it was noticed that 38.12 per cent of the soils were recorded deficient and remaining 61.88 per cent of soils were recorded sufficient in status of boron.

The fractions of boron in soils reveal their relative dominance in order of RES-B > Org-B > Ox-B > Sp-B > Rs-B. Boron adsorption ranged from 7.76 to 165.46 µg g⁻¹ as the boron concentration increased from 1.0 to 20.0 µg ml⁻¹ in the equilibrium solution. Order of adsorption was found as follows; Silty clay loam > Sandy clay loam > Loamy sand > Sandy clay > Sandy loam soils.

Application of borax @ 8 kg ha⁻¹ significantly increased grain and straw yield of paddy but application of borax @ 20 kg ha⁻¹ increases uptake of boron in grain and straw and available boron in soils at both the locations.

July, 2018

(H. M. Chidanandappa)
Major Advisor

4. Soil Resource Characterization, Classification and Productivity Assessment of Sigehadlu Micro Watershed of Chikkamagalur District

RAJASHEKHAR L

ABSTRACT

An investigation was carried out to soil resource characterization, classification and productivity assessments of Sigehadlu micro watershed of Chikkamagalur district during the year 2017-18 at Department of Soil Science and Agricultural Chemistry, College of Agriculture, OUAHS, Shivamogga.

Gridwise surface soil samples were collected at 250m X 250 m interval and soil fertility status maps were prepared. The soils were slightly acidic to moderately alkaline in pH. The soil OC and available N were low to medium whereas P, K and S medium to high. The exchangeable calcium, magnesium and micronutrients like iron, copper, manganese were sufficient, while zinc was 84.15 percent of area was sufficient and 16 percent of area deficient.

Ten soil profiles were studied based on soil heterogeneity. Soil structure of pedons varied from sub-angular to angular blocky and soil texture varied from sandy loam to clay. The soil OC, available N, P, K, and S were decreased with increasing depth. Based on morphological, physical and chemical properties these soils were grouped into *Alfisols*, *Inceptisols* and *Vertisols*. Land capability classification showed that majority of soils belong to class III and IV with limitations of erosion and texture. Land suitability evaluation for sorghum, maize, ragi, groundnut, sunflower, mango, coconut, arecanut, guava was moderately to marginally suitable, sapota were highly to moderately suitable. In general organic and inorganic nitrogen fractions under different land use systems were found to be highest in horti system-arecanut followed by coconut land use and lowest was observed in current fallow land use system. The results of the field experiment indicated that treatment which received nitrogen in integrated form of fertilizers and organics significantly higher grain yield (65.21 q ha⁻¹) and stover yield (84.30 q ha⁻¹) of maize. Significantly higher nitrogen use efficiency was also observed in the treatment which received nitrogen in integrated form.

December, 2018

(K.T Gurumurthy)
Major Advisor

5. Status and Behaviour of Zinc in Soils under Paddy Land Cover of Hilly Zone in Karnataka

SHRUTHI, T. M.

ABSTRACT

An investigation was carried out in order to study the dynamics of zinc in soils under paddy land cover of hilly zone in Karnataka. Soil samples were collected from twelve taluks under the zone and were analyzed for chemical properties, available zinc status, fractionation and adsorption behavior of zinc. A pot experiment was conducted to study the response of paddy for different levels of zinc application and to find the critical nutrient limit of zinc for rice crop.

Results of the study indicated that the pH of paddy soils of hilly zone varied from 3.13 to 7.05, out of this, only 0.52 per cent of soils were neutral in soil reaction and remaining 99.48 per cent soils were recorded the acidic pH. Organic carbon status in soils varied from 2.1 to 27.3 g kg⁻¹. Further, 5.22, 20.63 and 74.15 per cent of the soils were found to be low, medium and high in organic carbon status, respectively.

DTPA extractable zinc status in soils varied from 0.20 to 6.62mg kg⁻¹, it was noticed that 85.38 per cent of the soils were recorded sufficient. The contribution of different fractions to the total zinc was in the order of water-soluble < carbonate bound < organic matter bound < easily reducible manganese bound < iron and aluminum oxide bound < sorbed zinc < residual zinc. Zinc adsorption ranged from 56.32 to 973.18 µg g⁻¹ as the zinc concentration increased from 5.00 to 220.00 µg ml⁻¹ in the equilibrium solution.

The results of pot culture experiment indicated that application of ZnSO₄ @ 25 kg ha⁻¹ recorded highest yield and was on par with soil treated with ZnSO₄ @ 20 kg ha⁻¹ and it revealed that, critical limit for zinc in soil is 1.08 mg kg⁻¹ for the recorded yield and zinc concentration in soil. By considering the redefined critical limit of zinc, it showed that 42 per cent of soils studied were deficit in available zinc.

February, 2019

(H. M. Chidanandappa)
Major Advisor

6. Soil Properties as Influenced by Levels of Biochar and FYM Application under Aerobic Rice-Pulse Cropping System

(ARUNKUMAR, B. R.)

ABSTRACT

Two field experiments were conducted at ZAHRS, Navile, UAHS, Shivamogga, during summer and *Kharif* 2018 to know the effect of biochar and FYM on soil properties, soil carbon pools, yield of aerobic rice and green gram. The experiment was planned in RCBD design with 16 treatments consisting of four levels of biochar at 2, 4, 6 and 8 t ha⁻¹ and two levels of FYM at 5 and 10 t ha⁻¹ which were applied alone and in combinations. The recommended dose of fertilizer was applied commonly to all the treatments with three replications.

The result revealed that combined application of 8 t ha⁻¹ biochar + 10 t ha⁻¹ FYM with RDF(100:50:50 kg ha⁻¹) to soil significantly influenced the soil BD, porosity, MWHC, FC, PWP and water stable aggregates, pH, EC, CEC, available nutrients status, soil enzymes and microbial biomass compared to absolute control and RDF alone treatments. Soil carbon pools viz., potassium dichromate and permanganate oxidizable carbon and soil microbial biomass carbon contents were significantly increased due to combined and alone application of biochar and FYM compared to absolute control and RDF alone. The TOC and TC contents in soil increased with increase in biochar rate but statistically non-significant effect. Combined application of biochar @ 8 t ha⁻¹ + FYM 10 t ha⁻¹ with RDF recorded significantly higher aerobic rice grain 6184.0 kg ha⁻¹ and straw 7724.0 kg ha⁻¹ yield and yield parameters viz. number of panicles hill⁻¹ and number of grains panicle⁻¹. Residual effect of applied @ biochar 8 t ha⁻¹ + FYM 10 t ha⁻¹ with RDF (20:50:50 kg ha⁻¹) increased the soil physical, physico-chemical, available nutrients status, soil carbon pools, soil enzymes, microbial biomass and significantly higher yield of green gram (871.0 kg ha⁻¹) and stover (1708.0 kg ha⁻¹) as compared to absolute control and RDF alone.

September, 2019

(Thippeshappa, G. N.)
Major Advisor

7. Productivity of Foxtail Millet (*Setaria italica* L.) and Dynamics of NPK in Soil as Influenced by NPK Levels

(KANTHARAJ, T.)

ABSTRACT

Field experiments were conducted at Zonal Agricultural and Horticultural Research Station, Navile, Shivamogga during 2017 and 2018 to study the influence of NPK levels on productivity of foxtail millet and their dynamics in soil. Three levels of nitrogen (0, 15 and 30 kg N ha⁻¹), two levels of phosphorus (0 and 15 kg P₂O₅ ha⁻¹) and three levels of potassium (0, 10 and 20 kg K₂O ha⁻¹) were tried in a factorial randomized block design with three replications.

Results of the experiments indicated that the combination N₃₀P₁₅K₂₀ was found to have significantly higher positive influence on plant height (130.2cm), number of tillers row length⁻¹ (49.3), number of leaves plant⁻¹ (25.8), panicle length (18.3cm), grain yield panicle⁻¹ (6.15g), test weight (3.79g), grain yield ha⁻¹ (1388.6 kg) and straw yield ha⁻¹ (2834.6 kg) of foxtail millet compared to all other treatment combinations. The extent of individual influence of nutrients at higher levels was lesser than the combined application of N₃₀P₁₅K₂₀, which enhanced significantly superior interaction effect on growth, yield and quality indices of foxtail millet. The nutrient content and uptake by foxtail millet was significantly superior in N₃₀P₁₅K₂₀ compared to other combinations. The NPK combination at N₃₀P₁₅K₂₀ enhanced the values of grain quality indices viz., crude fibre (8.4%), protein (12.5%), zinc (3.2 mg 100g⁻¹) and iron (4.6 mg 100g⁻¹).

Increase in the levels of NPK and their combinations were increased the available N and P₂O₅ status in post-harvest soil. However, the treatment receiving N₃₀P₁₅K₂₀ recorded significantly higher available N (173.9 kg ha⁻¹) and P₂O₅ (29.1 kg ha⁻¹). The available K₂O (54.25 kg ha⁻¹) values significantly reduced with increased N levels during consecutive of two years study. The dynamics in post-harvest soil revealed that the greater reduction in organic-P and K fractions with increase in N levels except nitrogen and inorganic-P fractions.

November, 2019

(H.M. Chidanandappa)
Major Advisor