Agriculture

Agricultural Entomology

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Agri.) theses abstracts produced in the Department of Agricultural Entomology

1. FAUNA OF SHOT HOLE BORERS IN PLANTATION ECOSYSTEM

(HARISH, S.)

ABSTRACT

Shot hole borers (Curculionidae: Scolytinae and Platypodinae) are most problematic pests found in various ecosystems across the world. They are primarily composed of two groups: bark and ambrosia beetles. These beetles bore tunnels in the trees and feed predominantly on the phloem tissues parallel to the xylem vessels. Among these, ambrosia beetles cultivate symbiotic fungal gardens and feed on it. In this study, the species diversity of the shot hole borers in plantations crops *viz.*, arecanut, coconut and coffee was conducted at Shivamogga and Chikkamagaluru districts of Karnataka. Study revealed the presence of 11 beetle species belonging to six different genera. Among these, *Crossotarsus* sp. and *Euplatypus parallelus* belonged to subfamily Platypodinae; whereas *Xylosandrus crassiusculus*, *Xylosandrus compactus, Xylosandrus discolor, Xylosandrus* sp., *Xyleborus perforans, Xyleborus* sp., *Euwallacea fornicates, Ambrosiodmus minor* and *Premnobius cavipennis* belonged to sub family Scolytinae. Symptoms of their damage in arecanut and coconut revealed the appearance of yellowing and drooping of leaves, oozing of gum and extrusion of frass from the bored hole which spread as powdery matter around the base of tree and death of palms. In coffee, drooping and drying of leaves and twigs were observed. Culturing of associated fungal organism from six beetles recorded a total of 10 fungal isolates *viz., Lasiodiplodia theobromae, Fusarium verticiloides, Fusarium oxysporum, Fusarium* sp.1 and sp.2, *Alloascoidae* sp., *Paecilomyces* sp., *Pencillium* sp., *Gliomastix polychroma* and *Aspergillus* sp. A field experiment on the efficacy of insecticide, fungicide and their combinations against coffee shot hole borer, *Xylosandrus compactus* conducted at the Zonal Agricultural and Horticultural Research Station, Mudigere showed Chlorpyrifos 20 EC @2ml/L in combination with propiconazole 25 EC @1ml/L had better control with 2.33 dead shoots per plant reducing 64.13 per cent reduction of dead shoots over the control which was followed by Chlorpyrifos 20EC @ 2ml/L alone with 2.52 dead shoots per plant reducing 58.56 per cent reduction over the control.

November, 2023

(Girish, R.)

Major Advisor

2. EFFICACY OF MERCURY BASED PRODUCT FOR THE MANAGEMENT OF PULSE BEETLE, *Callosobruchus maculatus* (F.) AND ITS RESIDUE LEVEL ON GREEN GRAM

(KAVYASHREE, H. T.)

ABSTARCT

A laboratory experiment was carried out at Department of Entomology, College of Agriculture, Shivamogga during 2022-23. Five different concentrations of mercury based product *viz.*, 95.75, 191.5, 383, 766, 861.75 mg per 200 grams of grains, alongside two standard checks (malathion and aluminium phosphide). Several key parameters related to *C. maculatus* were examined. The best concentration was later used for management for *C. maculatus* and to work out same observations as above using different storage bags such as Grain Pro, SaveGrain, PICS, HDPE, Polyethylene and polypropylene bag. The findings of the study highlighted that the most effective concentration of the mercury-based product was 383 mg per 200g of grains and was next best compared to standard checks. Also, fecundity (30), mean number of eggs (1.22), were laid with same concentration with no hatching success, adult emergence, grain damage and weight loss but observed adult mortality (100 %) at 10 days after insect release (DAIR). For management of *C. maculatus*, the green gram stored in PICS bag emerged to be the most effective under both untreated and treated conditions with fecundity (72.2 eggs), mean number of eggs laid (86.72) and cent per cent adult mortality of *C. maculatus* at 10 DAIR and least grain damage (2.33) and weight loss (1.33) at 90 DAIR. GrainPro bag was proved to be next best treatment. Green gram stored in different bag with mercury based product for 30 and 90 days of storage was analysed for residue level using Gas Chromatography Mass Spectrometry and results revealed only VOCs (2-dodecene and 5-(2methylpropyl)-nonane) were detected at 90 days after storage in all bags.

November, 2023

(Shivanna, B. K.)

Major Advisor

3. TAXONOMY AND GENETIC DIVERSITY OF PADDY GUNDHI BUGS, *Leptocorisa* spp. FROM INDIA

(LAHARI SHETTY)

ABSTRACT

Among various rice bug species, *Leptocorisa* spp. known as the Paddy gundhi bugs are commonly found in the Indian subcontinent. Studies on the Taxonomy and the Genetic Diversity of Paddy Gundhi Bugs, *Leptocorisa* spp. from India, were conducted during 2022-2023. During the investigation, the collections made from Southern, Western and Northern India revealed three species of *Leptocorisa* bugs, with *L. oratoria* (92.9%) to be predominantly found across India. Mixed populations of *L. oratoria* along with *L. acuta* (5.04%) or *L. lepida* (1.13%) were also found during the collections. The bugs were identified based on the morphological characters of the males, especially the male parameres. The bugs were also morphometrically differentiated and illustrated identification keys for males and females were generated to determine the three species. The majority of the collections were made in paddy fields, a few individuals were also collected from weed, *Echinocloa* spp. and other plants. The *L. oratoria* from 14 regions of India were analysed for variations in the *mtCOI* gene to identify genetic diversity. The nucleotide variations at various sites were examined and maximum variations at 21 sites were observed in the population of NRRI, Odisha. Variations in the amino acids revealed the maximum composition of Leucine in all the 14 sequences, with higher A+T bias. The phylogenetic analysis was conducted using the neighbour-joining method and high genetic variability was observed among the population as North and South Indian subpopulation groups. The species collected from different parts of South India formed a clade. Populations from Bantwal and Chitoor exhibited a similar sister group clustering. Likewise, Assam and Gujarat appeared as sister groups within the larger clustering. Maximum genetic distance was found between Vellayani and NRRI, Odisha. Haplotype analysis yielded 12 haplotypes from 14 sequences of *L. oratoria.*

November, 2023

(B. C. Hanumanthaswamy)
Major Advisor

4. SCREENING OF CARDAMOM GENOTYPES AGAINST SHOOT AND CAPSULE BORER, *Conogethes punctiferalis* (GUENEE) AND ITS MANAGEMENT

(MUNAVATH PARASHURAM)

ABSTRACT

An investigation was carried out on 'Screening of cardamom genotypes against shoot and capsule borer *Conogethes punctiferalis* (Guenee) and its management' under field conditions during 2022-23 at Zonal Agricultural and Horticultural Research Station, Mudigere. Out of fifteen genotypes screened, P-1 and HS-1 were found moderately resistant with shoot damage of 11.65 and 11.88 per cent, respectively. M2 (13.94%) and D-140 (17.08%) were moderately susceptible. MCC-12, SKP-21, D-11, KMRD-10, Kallar, D-163, CL-679 and ICRI-11 were susceptible to shoot damage. However, NG Gold was highly susceptible to shoot damage (22.98%) by the borer. Genotypes, P-1 and HS-1 were tolerant to capsule damage of 9.41 and 9.85 per cent, respectively. Other ten genotypes were moderately tolerant, while CL-692 (20.62%), CSS-872 (20.73%) and NG Gold (22.25%) were moderately susceptible. The phenol and tannin content in the cardamom plant provided resistance to the genotypes in moderately resistant and tolerant genotypes. While, high total sugar and protein content in the plant induced higher infestation on shoot and capsule in moderately or highly susceptible genotypes. Population of the borer fluctuated from 6.59 to 56.67 and 8.97 to 38.89 per cent damage on shoots and capsules, respectively. The peak incidence was observed during first fortnight of December (56.67%) on shoots and first fortnight of October (38.89%) on panicles. Correlation studies with weather parameters showed that, maximum temperature and sunshine hours had significant positive correlation with shoot damage while relative humidity, minimum temperature and rainfall were significantly and negatively correlated. However, morning relative humidity had significant positive correlation with capsule infestation and rainfall had non-significant negative correlation. Among the insecticides evaluated against the borer Emamectin benzoate 5 SG + Lufenuron 40 WG (0.1g/l) was effective in controlling the shoot and capsule borer with 75.84 per cent reduction over control, high capsule yield (352 kg/ha) and highest cost-benefit ratio (1:5.16).

November, 2023

(Suchithra Kumari, M. H.)

Major Advisor

5. STUDIES ON THE NON-TARGET EFFECTS OF THE BIORATIONALS ON THE NATURAL ENEMIES OF RUGOSE SPIRALING WHITEFLY, *Aleurodicus rugioperculatus* MARTIN ON COCONUT

(RAKSHITH, H. S.)

ABSTRACT

An experiment was conducted on non-target effects of the biorationals on the natural enemies of rugose spiraling whitefly, *Aleurodicus rugioperculatus* Martin on Coconut during 2022-23 under laboratory and field conditions by the Department of Entomology, College of Agriculture, Shivamogga. Under laboratory conditions, the application of *Isaria fumosorosea* (*Pfu* 5) @ 5 ml/L was found safety to the adults of *Encarsia guadeloupae* which recorded lowest per cent mortality of 14.00. Studies on the effect of *I. fumosorosea* (*Pfu* 5) @ 5 ml/L on the larvae and pupae of *E. Guadeloupae* also exhibited the same results with 80.40 per cent adult emergence. Assessing the impact on different life stages of the predator, *Apertochrysa astur* under laboratory conditions revealed that, *I. fumosorosea* (*Pfu* 5) @ 5 ml/L was found safe for the eggs of *A. Astur* with 88.33 per cent egg hatching. *I. fumosorosea* (*Pfu* 5) @ 5 ml/L was also found safer to the grubs and adults of *A. astur* with per cent mortality of 3.33 and 6.67, respectively. Under field studies during May 2023, *I. fumosorosea* (*Pfu* 5) @ 2.5 ml/L + spirotetramat 15.31 OD @ 0.6 ml/L was found safer to *E. guadeloupae* parasitism with 13.37 per cent parasitism reduction and during July 2023, *I. fumosorosea* (*Pfu* 5) @ 5 ml/L was found as the safer treatment with 18.47 per cent parasitism reduction over control. Furthermore, field investigations on the impact of biorationals on the emergence of *E. guadeloupae* adults from *A. rugioperculatus* nymphs during May and July, 2023 revealed that, *I. fumosorosea* (*Pfu* 5) @ 2.5 ml/L + spirotetramat 15.31 OD @ 0.6 ml/L was the safest recording mean per cent adult emergence of 85.64 and 86.43, respectively. Under field studies, during May and July, 2023, *I. fumosorosea* (*Pfu* 5) @ 2.5 ml/L + spirotetramat 15.31 OD @ 0.6 ml/L was also found safest for *A. Astur* with 23.83 and 20.34 per cent reduction in grubs of over control, respectively.

November, 2023

(Jayalaxmi Narayan Hegde)
Major Advisor

6. SCREENING OF BRINJAL GENOTYPES AGAINST SHOOT AND FRUIT BORER, *Leucinodes orbonalis* GUENEE (LEPIDOPTERA: CRAMBIDAE) AND SCHEDULING OF INSECTICIDES

(SARVADAMAN S UDIKERI)

ABSTRACT

Two field experiments were conducted at the Agricultural and Horticultural Research Station (AHRS), Bavikere, during summer 2023 to know the host plant resistance in different brinjal genotypes and to check the schedule of varying insecticide combinations for their efficacy against *Leucinodes orbonalis*. Among the various commercial genotypes evaluated, Dhruva emerged as the best, displaying minimal shoot (8.45) and fruit (25.42) damage percentage, along with the highest marketable yield of 15.67 t/ha and being categorized as tolerant. Conversely, Harsha exhibited the least desirable traits, with increased damage percentage and a lower marketable yield. Among the morphological characteristics assessed, shoot thickness and leaf trichome density showed a positive (r = 0.82) and negative (r = -0.98) correlation with shoot damage, respectively. The colour and shape of the fruits had no significant influence on the level of infestation. Additionally, biochemical analysis revealed that, genotypes with higher phenol (r = -0.94) and tannin (r = -0.87) content exhibited reduced fruit damage. In contrast, higher sugar (r = 0.83) and chlorophyll (r= 0.89) content were correlated with increased fruit and shoot damage, respectively. In another independent study, six plant protection regimes and an untreated control had been imposed against *L. orbonalis*. The results revealed that sequence (T_2) chloranraniliprole 18.5 SC @ 0.3 ml/l-spinosad 45 SC @ 0.4 ml/l- lufenuron 5 EC @ 1.0 ml/l- *Bacillus thuringiensis* var. *kurstaki* @ 2.0 g/l showed promising results, demonstrating the least shoot and fruit damage, along with the highest marketable fruit yield and return on investment. In conclusion, this comprehensive investigation provides valuable insights into brinjal genotypes' performance, their morphological and biochemical characteristics influencing tolerance, and the effectiveness of insecticidal schedules. The findings are crucial for devising strategies to mitigate losses caused by the *L. orbonalis*, ultimately benefiting farmers and bolstering brinjal cultivation in India.

November, 2023	(L. Hanumantharaya) Major Advisor

7. BIOCHEMICAL MECHANISMS FOR ACARICIDE RESISTANCE AND MANAGEMENT OF TWO-SPOTTED SPIDER MITE, *Tetranychus urticae* KOCH (ACARINA: TETRANYCHIDAE) ON ROSE UNDER FIELD CONDITIONS

(SOUMYA, M. BHOOMANAGOUDRA)

ABSTRACT

The study was conducted during 2022 to 2023 to assess resistance levels in the two-spotted spider mite, *Tetranychus urticae* Koch. against different acaricides in five districts of Karnataka, India. The research also sought to know the mechanisms of resistance and evaluate the efficacy of acaricides on rose crop. For resistance study, the susceptible laboratory population served as a reference point for baseline susceptibility indicators, with LC_{50} values of 0.0054 µL/mL for spiromesifen 240 SC, 0.0075 µL/mL for chlorfenapyr 10 SC and 0.002 µL/mL for cyenopyrafen 30 SC. Field populations of Shivamogga, Kolar, Belagavi, Mysuru and Chikkamagaluru exhibited varying resistance levels against spiromesifen 240 SC (138.14-33.33 folds), chlorfenapyr 10 SC (79.33-18.66 folds) and cyenopyrafen 30 SC (17- 52 folds). The study analyzed enzyme activities namely, carboxylesterases (CEs), glutathione-S-transferase (GST) and mixed function oxidases (MFO) to know the mechanism of resistance. Enzymes activity ranged from, CEs (31.61 to 202.98 nanomoles/min/mg of midgut protein), GST (240.29 to 717.35 nanomoles/min/mg of protein) and MFO (14.65 to 42.87 nanomoles/min/mg of protein). The evaluation of different acaricides against *T. urticae* on rose crop indicated that cyenopyrafen 30 SC was the most effective acaricide with 87.42 per cent reduction in the total mite population, followed by fenpyroximate 5 EC (81.40 %) and diafenthiuron 50 WP (79.65 %). Ethion 50 EC was the least effective. The order of efficacy is: cyenopyrafen 30 SC (87.42 %) > fenpyroximate 5 EC (81.40 %) > diafenthiuron 50 WP (79.65 %) > chlorfenapyr 10 SC (73.67%) > spiromesifen 240 SC (69.21 %) and > ethion 50 EC (59.46 %). This study provides valuable insights into the resistance levels and mechanisms in *T. urticae* populations across Karnataka and identifies effective acaricides for managing spider mite infestations in rose crops which can aid in sustainable pest management strategies.

November, 2023

(Rajashekharappa, K)

Major Advisor

Agricultural Extension

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Agri.) theses abstracts produced in the

Department of Agricultural Extension

1. ASSESSMENT OF LIVELIHOOD SECURITY AMONG FARM WOMEN

(ABHISHEK, P. J.)

ABSTRACT

The present study was conducted in Davanagere district of Karnataka in 2022-23 to assess the livelihood security among farm women. Channagiri, Davanagere and Jagaluru taluks were purposively selected because of their highest area under the plantation, cereals and vegetable crops, respectively and also due to their higher farm women population. From each taluk five villages were selected based on maximum number of farm women. Ten farm women were selected randomly from each village constituting total sample size of 150. The study indicated that nearly half of the farm women belong to high category of overall livelihood security in plantation cropping situation (44.00 %) followed by medium category in cereal cropping situation (58.00 %), vegetable cropping situation (44.00 %) and also in pooled situation (46.00 %). The Kruskal-Wallis one-way ANOVA test showed highly significant difference among livelihood security of farm women in different cropping situations with computed test static 11.75 with p value 0.003. The characteristics such as land holding, annual income, cosmopoliteness and stress bearing ability of farm women had a highly significant association with the livelihood security at one per cent level of significance. The variables like, social participation, achievement motivation and assets owned of farm women had a significant association with the livelihood security at five per cent level of significance. The constraints faced by farm women concerning their livelihood security are lack of knowledge about balanced diet for the family ranked 1st, lack of credit to invest in other income-generating activities other than agriculture ranked 2nd and electricity problem ranked 3rd. The major suggestions provided by farm women to improve their livelihood security were; to provide knowledge about balanced diet for the family (Rank I), close behind is the recommendation for timely credit with subsidy (financial support) (Rank II) and regular supply of power (Rank III).

November, 2023

(Bharath Kumar, T. P.)
Major Advisor

2. IMPACT OF MARKET-LED EXTENSION ON PROFITABILITY OF FARMING

(ALEKYA,B. M.)

ABSTRACT

Market-led extension (MLE) acts as a tool for effective decision on production and marketing issues to realize an optimum returns. For study, four crops like pomegranate, onion, tomato and pineapple were selected from Chitradurga, Shivamogga and Davanagere. By random sampling, 40 farmers from each crop and 30 respondents each from public and private extension personnel were selected for the study, thus total sample was 220. Majority of pomegranate farmers had knowledge on consumer preference. Whereas, in case of Pineapple(73.00), Onion(62.00), Tomato(62.50) farmers had more knowledge on Production Practices. Majority of public and private extension personnel had high(43.33%) to medium(43.34%) level of knowledge on MLE. In fruits, institutional arrangements, farmer's friendliness, demand driven and value addition were important factors influencing the attitude of farmers. Post harvest avenues, risk bearing, assured market and inclusiveness were the important factors influencing attitude of vegetables farmers about MLE. Majority of public(53.33%) and private(66.67%) extension personnel had favorable attitude towards MLE. Significant positive social impact could be observed in standard of living, change resistance, purchasing power and marketing efficiency in fruit based MLE and Onion. Change resistance, marketing efficiency and standard of living in Tomato. Positive economic impact could observed in Pomegranate and Pineapple where, High Market Led Extension (HMLE)(2.61,2.19) farmers had higher returns compared to Low Market Led Extension (LMLE)(2.13, 1.82). Similarly, in Onion and Tomato HMLE(1.54,1.60) farmers had higher returns compared to LMLE(1.16,1.36), respectively. Major constraints faced by pomegranate and tomato farmers were weather fluctuation. Whereas, shortage of labour in pineapple and onion. Timely weather based information and information on latest cultivation technologies were suggested by Pomegranate and Pineapple farmers. Whereas, Timely supply of quality inputs and subsidy on fertilizers, chemicals by onion and tomato farmers. Results from study provides Policy decision to incentivize the farmers to take up profit-oriented market led extension practices

November, 2023

(Sahana S)
Major Advisor

3. DECISION MAKING PROCESS OF KRSHI VIGYAN KENDRA (KVK) SCIENTISTS IN KARNATAKA

(CHITHRASHREE, G. S.)

ABSTRACT

The present research was conducted in Karnataka during 2022-23 to analyse the decision making process of Krishi Vigyan Kendra (KVK) scientists in Karnataka, along with their perception about decision making process. A sample of 130 scientists from 33 KVKs of Karnataka were selected for the study. The data was collected through questionnaire developed for the study. The salient findings of the study - were majority of the respondents were found to be in 'medium' category with respect to psychological characteristics *viz.*, Risk orientation, Job autonomy, Job stress, Organizational commitment and Job satisfaction. The results revealed that, a greater proportion of KVK scientists (46.15 %) had medium decision making pattern in implementation of programmes. Majority 46.15 and 30.77 per cent of the respondents had high to medium perception about decision making process. The dominant methods used from programme identification to feedback stages of decision making by scientists of KVK were feedback report (92.30 %), analysing the cause/source of the problem (97.69 %), discussion with staff at various levels using past experience (91.53 %), availability of resource required to implement the alternatives (86.76 %), personal contact (90.00 %), scheduling actions and setting up bench marks for monitoring (90.00 %), monitoring on the field (96.92 %). About 39.23 per cent of KVK scientists had medium level of participation at different levels in various activities of decision making process. Majority of the KVK scientists faced the problem of less number of staff with Garret score of 63.80 (I rank). Lack of co-ordination with other institutions with Garrett score 61.03 (II rank), followed by government policy with a Garrett score of 49.22 (III rank), followed by lack of adequate trainings to staff concern with a Garrett score 46.00 (IV rank).

November, 2023

(Krishnamurthy, A. T)
Major Advisor

4. IMPACT OF ARECANUT AREA EXPANSION ON LIVELIHOOD ASSETS OF FARMERS IN CHITRADURGA DISTRICT

(HARSHA, C.)

ABSTRACT

The present study was conducted in Chitradurga district of Karnataka state during the year 2022-23. Simple random sampling procedure was used to select 150 farmers with 1 to 5 years age of arecanut garden. The primary data was collected from farmers using pre- tested interview schedule. The results of the study indicated that before arecanut cultivation majority of the farmers had low level of human capital (57.3 %), low level of social capital (62.00 %), medium level of natural capital (52.00 %), medium level of physical capital (56.60 %) and medium level of financial capital (50.66 %). After arecanut cultivation majority of farmers had medium level of human capital (46.00 %), medium level of social capital (55.33 %), high level of natural capital (56.66 %), low level physical capital (62.00 %) and low financial capital (57.34 %). In case of food security, before arecanut cultivation majority of farmers had high level of food security (41.34 %), after arecanut cultivation majority of farmers had medium level of food security (51.33 %). The psychological characteristics of respondents revealed majority of the respondents belong to high level of motivation (52.66 %), medium level of innovative proneness (41.33 %), high credit orientation (41.34 %), high risk orientation (46.00 %) and medium level of decision-making ability (46.66 %). The variables like education, land holding, farming experience, occupation, annual income, motivation, innovative proneness, credit orientation, risk orientation and decision making ability were significantly associated with the livelihood assets. In case of food security education, land holding, occupation, annual incomes were significantly associated. The major constraints faced by farmers were non- availability of quality samplings locally, non- availability of required amount of institutional credit and high cost of irrigation facilities.

November, 2023

(Dhananjaya, B.)
Major Advisor

5. A STUDY ON PERFORMANCE OF LARGE-SCALE ADIVASI MULTI-PURPOSE COOPERATIVE SOCIETIES IN KARNATAKA

(VARSHA, S. C.)

ABSTRACT

The present study was conducted in Karnataka state during the year 2022-23, to assess the performance of LAMPS. Ten functioning LAMPS were selected for the study based on highest membership. From each LAMPS 15 members were selected randomly. Thus, the total sample was 150 respondents. For analyzing the details of NTFPs 85 respondents who were involved in NTFP collection were selected. The study indicated that exactly half of the selected LAMPS (50.00 %) had medium level of overall performance. Medium level of knowledge about the activities of LAMPS was found in 52.00 per cent of the respondents. About 51.34 per cent of the respondents belonged to middle age group and educated up to high school (27.33 %). Majority of the respondents belonged to nuclear family type (66.00 %) and small family size (56.00 %). More than half of the respondents had marginal land holding (58.00 %) and had taken up agriculture as primary occupation (56.00 %). Majority belonged to medium level of annual income (54.67 %), mass media exposure (40.67 %) and extension contact (47.33 %). Majority (71.33 %) of the respondents borrowed credit from LAMPS. NTFP collection was done by more than half (56.67 %) of the respondents. Less than half (40.00 %) of the respondents had medium level of experience in NTFP collection and earned medium (44.71 %) level of income from NTFP collection. The major benefits derived by members from LAMPS are credit services (70.00 %), NTFP marketing (56.67 %), social activities (54.00 %) and agricultural inputs and implements (49.33 %). Non-availability of loan in required quantum, not conducting training programs on regular basis, government restrictions in collecting NTFP from forest and lack of processing units were the problems expressed by members of LAMPS.

November, 2023

(Basavaraj Beerannavar)
Major Advisor

6. A STUDY ON KNOWLEDGE AND SOCIO-ECONOMIC IMPACT OF CARP FISH SEED GROWERS IN SHIVAMOGGA DISTRICT

(MANJUNATH, D.)

ABSTRACT

India is known for production of major carp fish species such as Catla, Rohu and Mrigal and it was dominates in carp farming due to the tolerance of carp species to adverse water qualities and having assured market in the country. India is self-sufficient to meet out the existing demand of seed of principal carp fish species. At present India has produced 52,170.6 million Carp fries and Karnataka state was producing 1603.71 Lakh fries among those districts Shivamogga has highest production of 435.54 lakhs fries. Thus, study on knowledge and socio-economic impact of carp fish seed growers in Shivamogga district was conducted during 2022-23. For the present study two taluks viz., Shivamogga and Bhadravathi were selected based on highest area under carp fish seed production. From each taluk 80 respondents were selected. By random sampling techniques. Thus, total sample size for the study was 160. The primary data were collected using pre-tested interview schedule. The results shows that majority of respondents had medium (54.38%) level of knowledge. More than ninty per cent of farmers (93.12%) had shown a positive social impact with a significant z value of 10.06. The Positive economic impact was observed. The net returns per rupee of expenditure came to Rs. 1.67/- from carp fish seed production compared to paddy production at Rs. 1.26/- which was relatively higher. In this study major technical constraints faced by farmer was high rate of mortality with mean score of 65.34 and poor transportation facilities with mean score of 51.52 ranks first in infrastructural constraints whereas, in economic constraint, high initial investment with mean score of 69.44. Majority of respondents suggested accessibility to credit facilities (74.38%). Due to lack of knowledge on scientific management farmers cannot take up in time operations. Hence, suitable strategies should be developed to achieve the success.

December, 2023

(T. S. Ganesh Prasad)
Major Advisor

7. STUDY ON FORWARD LINKAGE ACTIVITIES OF GROUNDNUT GROWERS IN CHITRADURGA DISTRICT OF KARNATAKA

(MUTTU NAGAPPA MALLAPPANAVAR)

ABSTRACT

The study was conducted in the year 2022-23 in Chitradurga district of Karnataka. The total sample size was 160 farmers who were cultivating groundnut were selected by simple random sampling method. The study aims to assess the knowledge level of groundnut growers regarding forward linkage activities (FLAs) and documenting the FLAs followed by the farmers of Chitradurga district. The results indicated that majority (43.75 and 41.25 %) of groundnut growers had medium level knowledge regarding processing and marketing of groundnut FLAs respectively. Further, the majority (36.25 %) of the respondents had low level knowledge on value-addition in groundnut. The results indicated that majority of them belonged to medium level (39.37 %) over all knowledge on groundnut FLAs. It was observed that majority (81.25 %) of groundnut growers were from the middle age group (36 years to 55 years) and two-fifth of the respondents earned less than Rs. 1 lakh per annum. On documenting of FLAs, majority (75.63 %) of respondents harvested the groundnut manually and 39.38 per cent harvested by tractor. In case of stripping, cent per cent of respondents stripped manually, out of which 45.00 per cent of them also used threshers. Majority (91.25 and 88.75 %) of respondents followed the preparation of masala and roasted groundnut as value-added product. For packing of value-added products, 20.63 per cent respondents used polyvinylidene chloride bag. Among constraints faced by them, (76.25 %) of respondents expressed complex procedures to avail credit from the financial institutions to establish enterprise was the most severe constraint. Need machineries at subsidised rates was major suggestion given by majority (82.55 %) of the respondents to strengthen FLAs. The study identified various constraints regarding the groundnut FLAs. To minimise these constraints, the Govt. and concerned departments/organizations should take necessary measures to solve these problems.

December, 2023

(K. Amaresh Kumar)
Major Advisor

Agronomy

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Agri.) theses abstracts produced in the Department of Agronomy

1. PERFORMANCE OF CHICKPEA GENOTYPES TO DIFFERENT LAND CONFIGURATION

(ANJANEYA, K.)

ABSTRACT

A field experiment was conducted to study the "Performance of chickpea genotypes to different land configuration" at ZAHRS, Hiriyur during *rabi* 2022. The experiment was laid out in split plot design with 12 treatment combinations and replicated thrice. Main plot treatments include three land configuration techniques *viz.*, flat bed (L_1), ridges and furrow (L_2) and broad bed and furrow (L_3). Sub plot treatments include four genotypes *viz.*, JG-11 (G_1), JAKI-9218 (G_2), Super Annigere-1 (G_3) and BGD 111-1 (G_4). The results revealed that, among different land configuration techniques, broad bed and furrow (L_3) recorded significantly higher total dry matter (22.13 g plant^{-1}), effective nodules (26.66), seed yield (1623 kg ha^{-1}) and haulm yield (2166 kg ha^{-1}) with higher uptake of total nitrogen, phosphorus and potassium (73.22, 13.44 and 77.24 kg ha^{-1}, respectively). It also recorded higher gross return (₹ 87104), net return (₹ 55002) and B:C (2.71) compared to ridges and furrow (L_2) and flat bed (L_1). Among genotypes, JAKI-9218 recorded significantly higher total dry matter accumulation (21.36 g plant^{-1}), effective nodules (25.13), seed yield (1579 kg ha^{-1}) and haulm yield (2131 kg ha^{-1}) with higher uptake of total nitrogen, phosphorus and potassium (71.27, 12.94 and 74.45 kg ha^{-1}, respectively). It also recorded higher gross return (₹ 84731), net return (₹ 53988) and B:C (2.76) compared to Super Annigere-1 (G_3), BGD 111-1 (G_4) and JG-11 (G_1). Among different land configuration, broad bed and furrow recorded 18.38 per cent higher seed yield and 10.67 per cent haulm yield over flat bed. Among genotypes, JAKI-9218 recorded 12.22 per cent higher seed yield and 6.92 per cent haulm yield over JG-11.

November,2023

(Kumara, O.)
Major Advisor

2. EFFECT OF BIOSTIMULANT ON GROWTH, YIELD, QUALITY AND NUTRIENT UPTAKE OF TOMATO (*Lycopersicon esculentum* L.) UNDER SOUTHERN TRANSITION ZONE OF KARNATAKA

(ABHISHEK, D.)

ABSTRACT

A field experiment was conducted at Zonal Agricultural and Horticultural Research Station, Navile, Shivamogga during *Rabi* 2022, to study the effect of biostimulant on growth, yield, quality and nutrient uptake of tomato (*Lycopersicon esculentum* L.) under Southern Transition Zone of Karnataka. The experiment was laid out in Randomized Block Design with eleven treatments and replicated thrice. The treatments include *viz.*, package of practice (PoP) (T_1), foliar application of biostimulant @ 1 ml l^{-1} (T_2), 2 ml l^{-1} (T_3), 2.5 ml l^{-1} (T_4), 3 ml l^{-1} (T_5) and 4 ml l^{-1} (T_6) each at pre-flowering, flowering and fruit development stages and soil application of biostimulant @ 10 kg ha^{-1} (T_7), 15 kg ha^{-1} (T_8), 17.5 kg ha^{-1} (T_9), 20 kg ha^{-1} (T_{10}) and 25 kg ha^{-1} (T_{11}) each at transplanting and pre-flowering stage. Among the treatments, foliar application of biostimulant @ 4 ml l^{-1} recorded significantly higher fruit yield (71.76 t ha^{-1}) and was on par with soil application of biostimulant @ 25 kg ha^{-1}, foliar application of biostimulant @ 3 ml l^{-1} and soil application of biostimulant @ 20 kg ha^{-1} treatments. Significant lower yield was recorded in PoP treatment. Foliar application of biostimulant @ 4 ml l^{-1} recorded an increase of 20.97 per cent in yield over PoP treatment. Similar trends were observed in all the growth and yield attributes. The uptake of nutrients also follows a similar trend. Foliar application of biostimulant @ 4 ml l^{-1} recorded significantly higher total uptake of nitrogen, phosphorus and potassium (161.26, 27.94 and 235.10 kg ha^{-1}, respectively) at harvest. Treatment T_6 also recorded significantly higher net returns (Rs. 12,45,896 ha^{-1}) and B:C ratio (6.75) and significantly lowest nutrient uptake, net returns and B:C ratio were observed in PoP treatment.

November,2023

(Basavaraj Naik, T.)
Major Advisor

3. EVALUATION OF CROP SPECIFIC BLENDED FERTILIZER IN MAIZE (*Zea mays* L.)

(ARUN SAJJANAR)

ABSTRACT

A field experiment on "Evaluation of crop specific blended fertilizer in maize (*Zea mays* L.)" was conducted during *Rabi* 2022 at AHRS, Kathalagere. The experiment was laid out in Randomized Completely Block Design consisting of ten treatments, replicated thrice. The treatments T_1, T_2, T_3 consisted of application of basal blended fertilizer (16:18:11:4:1 N:P:K:S:Zn) @ 312.5, 412.5 and 515 kg ha^{-1}, respectively and top dress blended fertilizer (27:0:13 N:P:K) @ 237.5, 312.5 and 390 kg ha^{-1}, respectively. Basal blended fertilizer @ 412.5 kg ha^{-1} + top dress of urea at 30 and 45 DAS (T_4), PoP through straight fertilizer (T_5), PoP through complex fertilizer (T_6), recommended dose through Urea, DAP, MOP and $ZnSO_4$ + top dress of nano urea @ 0.4% at 30 and 45 DAS (T_7), physical blending of Urea, SSP, MOP and $ZnSO_4$ (16:18:11:4:1 N:P:K:S:Zn) for basal and Urea and MOP (27:0:13 N:P:K) for top dress (T_8), farmers' practice (T_9) and absolute control (T_{10}). Among all treatments, application of nutrients through blended fertilizer as basal (515 kg ha^{-1}) and top dress (390 kg ha^{-1}) showed significantly higher plant height (222.4 cm), number of leaves (10.3), leaf area (36.79 dm^2) at harvest, cob length (21.31 cm), number of kernels cob^{-1} (516.57), kernel yield (69.51 q ha^{-1}) and stover yield (89.30 q ha^{-1}). Significantly lower value was recorded in absolute control. Higher total nutrient uptake of nitrogen (157.83 kg ha^{-1}), phosphorus (45.84 kg ha^{-1}) and potassium (121.46 kg ha^{-1}) was recorded in the same treatment. The available nutrient status of soil after harvest of crop was significantly affected due to different sources of fertilizers. Significantly higher protein (8.82 %) in maize kernel was recorded in T_3 and the same treatment recorded higher gross return (₹ 1,50,432 ha^{-1}) and net return (₹ 88,739 ha^{-1}) while T_2 recorded higher B:C (2.49).

November,2023

(Soumya T M)

Major Advisor

4. STUDY ON RESPONSE OF RAGI TO NANO UREA UNDER IRRIGATED CONDITION

(CHANDAN, B. M.)

ABSTRACT

A field experiment was conducted at Agricultural and Horticultural Research Station, Bavikere, KSNUAHS, Shivamogga during Late *Kharif* 2022. The experiment was laid out in RCBD design with eleven treatments replicated thrice. The treatments comprised of absolute control (T_1), recommended dose of fertilizer (100:50:50 N:P_2O_5:K_2O kg ha^{-1}) (T_2), 50 per cent RDN + two sprays of 0.4 per cent nano urea fertilizer at 30 & 45 DAT (T_3), 75 per cent RDN + one spray of 0.4 per cent nano urea fertilizer at 30 DAT (T_4), 75 per cent RDN + two sprays of 0.4 per cent nano urea fertilizer at 30 & 45 DAT (T_5), 100 per cent RDN + one spray of 0.4 per cent nano urea fertilizer at 30 DAT (T_6), 50 per cent RDN + two sprays of 2 per cent urea fertilizer at 30 & 45 DAT (T_7), 75 per cent RDN + one spray of 2 per cent urea fertilizer at 30 DAT (T_8), 75 per cent RDN + two sprays of 2 per cent urea fertilizer at 30 & 45 DAT (T_9), 100 per cent RDN + one spray of 2 per cent urea fertilizer at 30 DAT (T_{10}), four sprays of 0.4 per cent nano urea fertilizer at 15, 30, 45 & 60 DAT (T_{11}). The results revealed that application of 100 per cent RDN + one spray of 0.4 per cent nano urea fertilizer at 30 DAT recorded higher plant height (94.13 cm), number of tillers $hill^{-1}$ (8.85), total dry matter (46.75 g $hill^{-1}$), grain yield (3812 kg ha^{-1}), net return (₹ 81494 ha^{-1}) and B:C (2.52), which was on par with T_{10} and T_5. Treatment T_6 produced 9.32 per cent higher grain yield compared to T_2. Treatment T_5 recorded higher nitrogen use efficiency (48.41 %) compared to T_2 (36.41 %).

November,2023

(Sunil, C.)
Major Advisor

5. RESPONSE OF FINGER MILLET GENOTYPES UNDER DIFFERENT METHODS OF TRANSPLANTING

(KASHOJU HARISH)

ABSTRACT

A field experiment entitled "Response of finger millet genotypes under different methods of transplanting" has been conducted during *Kharif* 2022 at Agricultural and Horticultural Research Station (AHRS), Bavikere, Tarikere taluk, Chikkamagalur district. The three ragi genotypes *viz.*, GPU-28, KMR-340 and KMR-630 were grown at three different spacing methods *viz.*, 30×10 cm, 30×30 cm (Guli method-1) and 25×25 cm (Guli method-2). The experiment was laid out in Factorial RCBD of Nine treatments replicated thrice. The treatments consisted of transplanting GPU-28 at a spacing of 30×10 cm (T_1), transplanting GPU-28 in Guli method-1 at a spacing of 30×30 cm (T_2), transplanting GPU-28 in Guli method-2 at a spacing of 25×25 (T_3), transplanting KMR-340 at a spacing of 30×10 cm (T_4), transplanting KMR-340 in Guli method-1 at a spacing of 30×30 cm (T_5), transplanting KMR-340 in Guli method-2 at a spacing of 25×25 (T_6), transplanting KMR-630 at a spacing of 30×30 cm (T_7), transplanting KMR-630 in Guli method-1 at a spacing of 30×30 cm (T_8) and transplanting KMR-630 in Guli method-2 at a spacing of 25×25 cm (T_9). Among the treatments, KMR-340 transplanted in Guli method-1 at a Spacing of 30×30 cm (T_5) showed significant higher grain yield (4214 kg ha^{-1}) and straw yield (6966 kg ha^{-1}). It is mainly due to higher growth and yield parameters like plant height (75.66cm), leaf area(2270.40 cm^2) at 90 DAT, dry matter (40.33 g $plant^{-1}$), number of tillers per plant 1 (8.33) and yield parameters like number of earheads $plant^{-1}$ (7.33). However, lowest values for observations were recorded in treatment T_1, It is concluded that the ragi genotype KMR-340 with guli method in square planting (30×30 cm) given 38.80 per cent higher yield due to more growth and yield parameters.

November,2023

(Jadeyegowda, M.)
Major Advisor

6. EFFECT OF CONVENTIONAL AND NANO DAP ON GROWTH AND YIELD OF MAIZE (*Zea mays* L.)

(SACHIN, M. L.)

ABSTRACT

A field experiment entitled "Effect of conventional and nano DAP on growth and yield of maize (*Zea mays* L.)" was conducted during *Kharif* 2022 at College of Agriculture, Navile, Shivamogga. The experiment was laid out in RCBD consisting of 11 treatments replicated thrice. The treatments consist of package of practice (POP) (T_1), POP + seed priming with DAP at two per cent (T_2), POP + seed priming with nano DAP (T_3), application of conventional DAP at 75 and 50 per cent of the recommended dose of phosphorus, along with seed priming and two foliar applications at 30 and 60 DAS, either alone or combination with nano DAP (T_4-T_9), only nano DAP seed priming followed by two foliar applications at 30 and 60 DAS (T_{10}) and these treatments were compared with absolute control (T_{11}). Among the treatments, application of 75 per cent RDP through DAP, seed priming followed by two foliar applications of nano DAP at 30 and 60 DAS showed significantly higher values of plant height (161.43 cm), dry matter (251.47 g plant^{-1}), number of grains cob^{-1} (476.35), cob weight (136.19 g), grain yield (6254 kg ha^{-1}), stover yield (7716 kg ha^{-1}), N:P:K uptake (144.89:33.14:79.73 kg ha^{-1}), grass returns (1,38,429 Rs. ha^{-1}) and net returns (73,553 Rs. ha^{-1}). The treatment POP with nano DAP seed priming showed significantly higher root volume (65.33 cm^3), root dry weight (26.84 g plant^{-1} at 60 DAS) compared to other treatments. The yield increment achieved by these treatments was 6 and 3.81 per cent higher than that of POP, respectively. However, the treatment relying solely on nano DAP through seed priming and two foliar applications resulted in 42.26 per cent yield improvement over the absolute control. Despite this improvement, grain yield reduction was 27.09 per cent compared to the recommended POP.

November,2023

(H. K. Veeranna)
Major Advisor

7. SCREENING OF NEW HERBICIDE MOLECULES FOR PADDY UNDER HILLY ZONE OF KARNATAKA

(SANGAMESH HIREMATH)

ABSTRACT

A field experiment entitled "Screening of New Herbicide Molecules for Paddy under Hilly Zone of Karnataka" was conducted during *Kharif* 2022 at ZAHRS Mudigere. The experiment consisted of eleven treatments replicated thrice in RCBD. The herbicides investigated were Quinchlorac 35% SC at 350, 437.5 and 525 g a.i ha^{-1}, Bentazone 48% SL at 720, 960 and 1200 g a.i ha^{-1}, Bispyribac Sodium 10% SC 25 g a.i ha^{-1}, 2,4-D 2000 g a.i ha^{-1} and Londax power at 660 g a.i ha^{-1} as post emergent application. Hand weeding up to 60 DAT and weedy check were used for comparison. Among the herbicides, Londax Power recorded significantly lower weed population (6.86 to 27.35 /0.25 m^2), dry weight (1.23 to 2.90 g/0.25m^2), weed index (8.44 %) and higher WCE (84 to 68 %). Among the screening molecules, Quinclorac 35 % SC @ 437.5 g a.i ha^{-1} and Bentazone 48 % SL @ 1200 g a.i ha^{-1} reported significantly lower weed population (17.20 to 42.12 and 18.00 to 43.15 /0.25 m^2), dry weight (3.36 to 5.86 and 3.55 to 5.97 g/0.25m^2), weed index (19.95 and 21.83 %) and higher WCE (55 to 39 and 53 to 37 %), respectively. However, significantly higher growth and yield attributes *viz.*, plant height (102.87 cm), number of tillers (21.87 $hill^{-1}$), leaf area (1011.60 cm^2 $hill^{-1}$), total dry matter production (44.32 g $hill^{-1}$), number of panicles (18.04 $hill^{-1}$), panicle weight (2.90 g $panicle^{-1}$), higher grain (5128 kg ha^{-1}) and straw yield (6158 kg ha^{-1}) was recorded with the application of Londax Power @ 660 g a.i ha^{-1}. This was on par with the application of Bispyribac sodium @ 25 g a.i ha^{-1}. Further, the same treatment recorded significantly higher net returns (₹ 59754 ha^{-1}) and B:C (2.09) compared to hand weeding and weedy check.

November,2023

(Shivaprasad, M)
Major Advisor

8. EFFECT OF SECONDARY NUTRIENTS ON GROWTH AND YIELD OF MAIZE (*Zea mays* L.)

(SRINIVAS, P.)

ABSTRACT

A field experiment was conducted during *Rabi* 2022 at the Agricultural and Horticultural Research Station, Honnavile, Shivamogga to study the response of maize to secondary nutrients. The experiment was laid out in RCBD and consisted of nine treatments replicated three times. The treatments consisted of package of practice (POP) (T_1), POP + soil application of two levels of calcium, *i.e.*, 25 and 50 kg/ha through lime (T_2 and T_3), dolomite (T_4 and T_5, which amount to 15.02 and 30.04 kg/ha of magnesium, respectively) and gypsum (T_6 and T_7, which amount to 19.96 and 39.91 kg/ha of sulphur, respectively). Treatments T_8 and T_9 consisted of POP + combined application of all three secondary nutrients through lime, magnesium sulphate and bentonite sulphur to meet the same level of nutrient as treatments T_2 to T_7. Among the treatments, application of POP + calcium @ 25 kg/ha through lime + 15.02 kg/ha of Mg + 19.96 kg/ha of S (T_8) showed significantly higher plant height (196.65 cm), leaf area (4804.70 cm^2), total dry matter (273.80 g $plant^{-1}$), cob length (16.93 cm), number of grains cob^{-1} (511.08), kernel yield (6772 kg/ha) and stover yield (8221 kg/ha). Similarly, higher total nutrient uptake of nitrogen (160.90 kg/ha), phosphorous (39.80 kg/ha), potassium (119.78 kg/ha), calcium (42.55 kg/ha), magnesium (19.70 kg/ha) and sulphur (25.85 kg/ha) was recorded with the same treatment. The available primary and secondary nutrients status in post-harvest soil significantly increased due to the application of the secondary nutrients along with POP. Significantly higher protein content (8.99 %) in maize kernel was recorded by the application of POP + calcium @ 25 kg/ha through lime + 15.02 kg/ha of Mg + 19.96 kg/ha of S. Further the same treatment also registered the highest gross returns (Rs. 146324/ha), net returns (Rs. 82695/ha) and benefit cost ratio (2.30).

November,2023

(Sannathimmappa, H. G.)
Major Advisor

9. WEED MANAGEMENT IN DIRECT SEEDED RICE UNDER PUDDLED CONDITION IN COASTAL KARNATAKA DURING *RABI* SEASON

(GUNDAPPA)

ABSTRACT

A field experiment was conducted during 2022 at ZAHRS, Brahmavara to study the "**Weed management in direct seeded rice under puddled condition in Coastal Karnataka during *rabi* season".** The experiment was laid out in RCBD with Factorial concept with two methods of establishment *viz.*, broadcasting and drum seeding and five weed management options and was replicated thrice. The predominant weed flora observed in the experimental field were *Echinochloa colonum, Cyperus difformis* and *Cyperus procerus* among monocots, *Monochoria vaginalis, Ammania baccifera, Ludwigia parviflora* and *Marsilea quadrifolia* among dicots. The study revealed that, **the** sequential application of pre-emergence herbicide pendimethalin 38.7 % CS @ 750 g a.i. ha^{-1} at 0-3 DAS (*fb*) early post-emergence application of bispyribac sodium 10 % SC @ 25 g a.i ha^{-1} at 13-15 DAS recorded lowest weed density (36.92, 31.73 and 40.45 No. m^{-2}) and highest weed control efficiency (89.44, 95.04 and 80.30 %) at 15, 30 and 45 DAS, respectively under drum seeding and was at par with the sequential application of pre-emergence application of pendimethalin 38.7 % CS @ 750 g a.i. ha^{-1} at 0-3 DAS (*fb*) post-emergent application of penoxsulum 1.02 % + cyhalofop-butyl 5.1 % OD @ 150 g a.i ha^{-1} at 30 DAS. The highest yield and yield attributing parameters like number of tillers (291.33 m^{-2}), panicle length (19 cm), filled grains (89.33 $panicle^{-1}$), grain yield (4221 kg ha^{-1}) and straw yield (5387 kg ha^{-1}) were observed in sequential application of pre-emergence herbicide pendimethalin 38.7 % CS @ 750 g a.i. ha^{-1} at 0-3 DAS (*fb*) early post-emergence application of bispyribac sodium 10 % SC @ 25 g a.i ha^{-1} at 13-15 DAS under the drum seeding. The highest net return (₹ 82586 ha^{-1}) and B:C ratio (2.81) was also recorded in the same treatment.

December,2023

(N. E. Naveen)
Major Advisor

10. EFFECT OF DIFFERENT BIOSTIMULANTS ON GROWTH, YIELD AND QUALITY OF RICE

(PRAVEENKUMAR HIREHAL)

ABSTRACT

A field experiment entitled "Effect of different biostimulants on growth, yield and quality of rice" was conducted during *kharif* 2022 at Agricultural and Horticultural Research Station, Kathalagere. The experiment was laid out in RCBD design consisting of ten treatments replicated thrice. The treatments consist of control (T_1), soil application of humic acid at 5 kg ha^{-1} (T_2), soil application of humic acid @ 10 kg ha^{-1} (T_3), foliar application of humic acid @ 0.2 per cent (T_4), soil application of seaweed extract @ 5 kg ha^{-1} (T_5), soil application of seaweed extract @ 10 kg ha^{-1} (T_6), foliar application of seaweed extract @ 0.2 per cent (T_7), soil application of both humic acid @ 5 kg ha^{-1} and seaweed extract @ 5 kg ha^{-1} (T_8), foliar application of both humic acid @ 0.2 per cent and seaweed extract @ 0.2 per cent (T_9) and foliar application of jeevamrutha @ 3 per cent (T_{10}). Among all the treatments, foliar application of humic acid @ 0.2 per cent, and seaweed extract at 0.2 per cent along with RDF at tillering and panicle initiation stage recorded significantly higher plant height (98.93 cm), number of tillers (19.26), leaf area index (3.36), total dry matter (73.61 g), panicle length (20.52 cm), number of grains per panicle (100.47), grain yield (5678 kg ha^{-1}) and straw yield (7483 kg ha^{-1}) compared to other treatments. Similarly, significantly higher total nutrient uptake of nitrogen (134.64 kg ha^{-1}), phosphorous (39.30 kg ha^{-1}), potassium (93.66 kg ha^{-1}) and protein content (8.10 %) in grain were recorded. Followed by T_8. An increment in the grain and straw yield was achieved to an extent of 14.6 and 19.9 per cent, respectively over control. The same treatment registered higher gross return (Rs. 1,19,587 ha^{-1}), net return (Rs. 68,981 ha^{-1}) and B:C (1.46).

December,2023

(A Y. Hugar)

Major Advisor

11. PERFORMANCE OF SAFFLOWER VARIETIES UNDER DIFFERENT DATES OF SOWING AND CROP-WEATHER RELATIONSHIPS

(SAIF ALI KHAN, A.)

ABSTRACT

A field experiment was conducted during *Rabi* 2022 at the Zonal Agriculture and Horticulture Research Station, Hiriyur, Chitradurga to study the "Performance of safflower varieties under different dates of sowing and crop-weather relationships". The experiment was laid out in a split plot design with four dates of sowing (7th October, 21st October, 4th November and 18th November) and three varieties (PBNS-86, Annigeri-1 and A-300), replicated thrice. The results revealed that, crop sown on 21st October recorded significantly higher seed yield (1298 kg ha^{-1}) and oil yield (388 kg ha^{-1}) with higher growth and yield components, and was statistically on par with crop sown on 7th October (1223 kg ha^{-1} and 359 kg ha^{-1}, respectively). Among the varieties, PBNS-86 produced significantly higher growth, yield components and seed yield (1233 kg ha^{-1}) and oil yield (364 kg ha^{-1}), and found statistically on par with Annigeri-1 (1197 kg ha^{-1}) and (337 kg ha^{-1}). The interaction effect was found non-significant. Correlation analysis between weather parameters and seed yield at different phenophases of safflower indicated that maximum relative humidity (r = 0.485**), minimum relative humidity (r = 0.554**), cumulative bright sunshine hours (r = 0.355*), from flowering to capitulum and seed development stage had significantly positive relationship with seed yield. Similarly, maximum temperature from sowing to emergence (r = 0.599**), minimum temperature from sowing to emergence and emergence to rosette stage (r = 0.632** and r = 0.471**) had a significant positive relationship with seed yield. On the other hand, maximum temperature (r = -0.599**), minimum temperature (r = -0.407*), diurnal temperature range (r = -0.533**), solar radiation (r = -0.479**), wind speed (r = -0.574**) and pan evaporation (r = -0.463**) during flowering to capitulum and seed development stage had a significant negative relationship with seed yield.

December,2023

(Kumar Naik A. H)
Major Advisor

Genetics and Plant Breeding

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Agri.) theses abstracts produced in the Department of Genetics & Plant Breeding

1. ASSESSMENT OF GENETIC VARIABILITY IN ADVANCED BREEDING LINES OF RICE (*Oryza sativa* L.) AND THEIR COMPARATIVE STUDY UNDER SUBMERGENCE

(AKSHATA JADAR)

ABSTRACT

The present investigation was conducted during *Kharif* 2022. Forty five advanced breeding lines of rice of cross RNR-15048 × Tunga, along with five checks were studied under randomised complete block design for genetic variability, genetic diversity and character association under non- submergence condition at AHRS, Kathalagere. Same advanced breeding lines of rice along with four checks were screened for submergence tolerance under the submerged condition at ZAHRS, Navile, Shivamogga. Under non-submergence, analysis of variance revealed high significant differences for all the characters studied. Genetic variability revealed moderate to high estimates of PCV, GCV, heritability and genetic advance for the traits *viz*., plant height, number of tillers per plant, number of productive tillers per plant, panicle length, number of spikelets per panicle, number of filled grains per panicle, test weight, grain length breadth ratio and grain yield. Correlation study revealed a significant positive association of the number of tillers per plant, number of productive tillers, number of spikelets per panicle, number of filled grains per panicle, panicle length, spikelet fertility, test weight and grain length breadth ratio with grain yield. Mahalanobis D^2 statistics grouped 45 advanced breeding lines of rice along with checks into seven clusters. Maximum inter-cluster distance was observed between cluster VI and VII. Among advanced breeding lines of rice screened under submerged condition, the highest survival percentage was observed for R×T-8-9-25, R×T-8-9-17, R×T-8-9-14, R×T-5-9-5, R×T-2-4-5. Genetic variability revealed high PCV, GCV, heritability and genetic advance for survival percentage and stem elongation percentage. Phenotypic correlation for physiological traits revealed significant positive correlation of survival percentage with grain yield. Advanced breeding lines R×T-8-9-25, R×T-8-9-17, R×T-8-9-14, R×T-5-9-5, R×T-2-4-5 could be proposed for further screening in different locations of hill zones of Karnataka.

October, 2023

(Manjunatha B)

(Major Advisor)

2. GENETIC VARIABILITY AND CHARACTER ASSOCIATION STUDIES IN F_4 POPULATION OF RICE (*Oryza sativa* L.)

(ANIL H. M.)

ABSTRACT

A study was conducted during *Kharif* 2022 at ZAHRS, Mudigere to investigate genetic variability parameters and character association studies in F_4 population of two rice cross combinations, Cross I (Tunga x KHP 13) and Cross II (Tunga x KPR 1) in an augmented design. For the trait filled grains per panicle high values of phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) were observed in lines of Cross I (21.33%, 20.30%) and Cross II (20.39%, 20.03%) respectively. In lines of Cross I moderate PCV and GCV were observed for spikelets per panicle (17.83%, 17.04%) followed by grain yield per plant, tillers per plant and productive tillers per plant. In lines of Cross II moderate PCV and GCV were observed for grain yield per plant (16.39%, 11.29%) followed by spikelets per panicle, panicle fertility, tillers per plant and productive tillers per plant. Filled grains per panicle recorded high heritability coupled with high genetic advance as *per cent* of mean (GAM) in lines of Cross I (92.36%, 40.25%) and Cross II (96.59%, 40.62%) respectively. Moderate heritability and high GAM were observed for grain yield in lines of Cross I (58.13%, 21.19%) while, moderate GAM in Cross II (47.38%, 16.05%). Filled grains per panicle, spikelets per panicle, productive tillers per plant, tillers per plant, panicle length, test weight and L/B ratio exhibited positive significant association with grain yield in lines of both crosses. Positive direct effect was exhibited by days to maturity, productive tillers per plant, panicle length, filled grains per panicle, test weight and L/B ratio in lines of both crosses. The results showed that the lines $9F_2$-90-07, $9F_2$-15-14 and $9F_2$-67-12 in Cross-I and $8F_2$-318-14, $8F_2$-120-09 and $8F_2$-107-20 in Cross-II were found early maturing and high yielding.

October, 2023

(Lakshmana D.)

(Major Advisor)

3. GENETIC VARIABILITY AND CHARACTER ASSOCIATION STUDIES IN COWPEA [*Vigna unguiculata* (L.) WALP.] FOR YIELD AND YIELD ATTRIBUTING TRAITS

(JYOTI I. TONDI)

ABSTRACT

A field experiment was carried out during *Rabi* 2022 at College of Agriculture, Navile, Shivamogga to study genetic variability, genetic diversity, correlation, path analysis and quality traits of 65 cowpea genotypes. High genotypic coefficient of variation (GCV) was observed for pods per cluster (58.01 %) followed by pods per plant, clusters per plant and seeds per pod. Moderate GCV was observed for seed yield per plant (18.42 %). High and moderate GCV indicates better scope for improvement of characters. High phenotypic coefficient of variation (PCV) was observed for pods per cluster (60.97 %) followed by pods per plant, clusters per plant, seeds per pod and seed yield per plant. High heritability combined with high genetic advance as *per cent* of mean was found for pods per cluster (90.52 %) followed by seeds per pod, pods per plant, clusters per plant and seed yield per plant which indicated that improvement of those characters through selection can be possible due to additive gene action. Five clusters were formed based on *k-means* clustering analysis. Highest intercluster distance was observed between Cluster IV and V (6.82) and Cluster III (4.39) has highest intracluster distance. Cluster per plant (0.82) showed the highest positive significant association with seed yield per plant followed by pods per plant, pods per cluster, seeds per pod and pod length. Clusters per plant (1.29) showed the highest positive direct effect on seed yield. Based on mean performance, genotypes VCP-17-019, PMCP-1131, 202854(97) and EC-472271 were identified as high yielding and quality analysis for seeds of these genotypes revealed that crude protein content ranges from 20 to 27.25 %, Ca content ranges from 120 to 184 mg/100g, Mg content ranges from 180 to 250 mg/100g, Fe content ranges from 6.57 to 13.10 mg/100g and Zn content ranges from 2.94 to 4.13 mg/100g.

October, 2023

(Lakshmana D.)

(Major Advisor)

4. GENETIC VARIABILITY AND DIVERSITY STUDIES IN RED RICE (*Oryza sativa* L.) MUTANT LINES OF KHP-10

(NIMISH BHUSHAN C. N.)

ABSTRACT

An experiment was conducted during Kharif 2022 at ZAHRS, Mudigere, to study genetic variability, correlation and path coefficient analysis for yield and its attributing traits in M_5 mutant lines of red rice variety KHP-10. The experiment consists 90 mutant lines along with four checks laid out in an augmented design. High phenotypic coefficient of variation (PCV) was recorded for grain yield per plant (20.54%). Moderate genotypic coefficient of variation (GCV) was observed for tillers per plant (16.83%), productive tillers per plant (15.40%), grain yield per plant (15.37%) test weight (11.49%) and filled grains per panicle (10.90%). High heritability combined with high genetic advance as *per cent* of mean were documented for LB ratio (98.93%, 20.16%), test weight (98.59%, 23.55%), tillers per plant (96.05%, 34.04%) and productive tillers per plant (83.41%, 29.01%). Character association studies revealed that grain yield per plant showed positive and significant correlation with productive tillers per plant (0.89), tillers per plant (0.71), panicle length (0.38) and panicle fertility (0.38). Path coefficient analysis showed direct positive effect on days to maturity, tillers per plant, productive tillers per plant suggesting that these traits can be considered as selection criteria in the yield improvement program. The highest positive direct effect was exhibited by productive tillers per plant (0.65). Based on k-means method, mutant lines were grouped into eight clusters. The maximum number of mutant lines were observed in Cluster VII (22). The maximum intra cluster distance was shown by Cluster VI (5.2967) and highest inter cluster distance was noticed between Cluster III and Cluster VI (8.3775). Number of tillers per plant (17.33 %) contributed maximum towards genetic divergence. Based on the height and mean performance of yield, 400Gy-16-13-324, 400Gy-11-01-316, 400Gy-04-16-303, 400Gy-04-28-306 and 500Gy-07-03-388 were identified as high yielding dwarf mutant lines of KHP-10.

October, 2023

(Lakshmana D.)

(Major Advisor)

5. ASSESSMENT OF GENETIC VARIABILITY IN ADVANCED BREEDING LINES OF RICE (*Oryza sativa* L.) AND SCREENING FOR SUBMERGENCE TOLERANCE

(PAVANA, D. SINGH)

ABSTRACT

The present investigation was conducted during *Kharif* 2022. Thirty two advanced breeding lines of rice cross RNR-15048 × KPR-1 and five checks were studied under randomised complete block design for genetic variability, character association and genetic diversity under non-submergence condition at AHRS, Kathalagere. Same advanced breeding lines and four checks were screened for submergence tolerance under submerged condition at ZAHRS, Navile, Shivamogga. Under non-submergence, analysis of variance revealed high significant differences for all the characters studied. Genetic variability revealed moderate to high estimates of PCV, GCV, heritability and genetic advance for the traits *viz*.. plant height, number of tillers per plant, number of productive tillers per plant, number of spikelets per panicle, number of filled grains per panicle and grain yield. Correlation study revealed significant positive association with grain yield for number of tillers per plant, number of productive tillers, number of spikelets per panicle, number of filled grains per panicle, panicle length, spikelet fertility, test weight and length breadth ratio. Mahalanobis D^2 statistics grouped 32 advanced breeding lines with five checks into six clusters. Maximum inter-cluster distance was observed between cluster IV and VI. Among advanced breeding lines screened under submerged condition, highest survival percentage was observed for R×K-1-4-5 and R×K-1-4-17. Genetic variability revealed high PCV, GCV, heritability and genetic advance for survival and stem elongation percentage. Phenotypic correlation for physiological traits revealed significant positive correlation of survival percentage with grain yield. Advanced breeding lines R×K-1-4-5 and R×K-1-4-17 could be proposed for further screening in different locations of hill zone of Karnataka.

October, 2023

(Manjunatha B)

(Major Advisor)

6. GENETIC VARIABILITY STUDIES IN GROUNDNUT FOR TOLERANCE TO LEAF MINER (*Aproaerema modicella* D.)

(PREETHI L. R.)

ABSTRACT

A field experiment was conducted during early *Rabi* 2022 at the ZAHRS, Hiriyur to screen 34 groundnut genotypes for tolerance to leaf miner (*Aproaerema modicella* D.) under field condition. The genotypes were sown in a RCBD with 2 replications each in control (with suitable pest control measures) and leaf miner stress (without any pest control measures). Visual observations were made on *percent* foliage damage (0-100%) due to leaf miner infestation at four stages *i.e.*, 30, 60, 90 days after sowing and at maturity by following the standard 1-10 scale for categorization of genotypes. ANOVA for damage score based on *percent* foliage damage revealed high GCV and PCV, high heritability coupled with high genetic advance as *per cent* mean (GAM) at all the four stages. Among the characters assessed, most of the traits exhibited decrease in *per cent* mean under leaf miner infestation when compared with that of control for days to maturity, number of mature pods per plant, pod yield per plant, kernel yield per plant, pod yield per hectare, kernel yield per hectare and haulm yield per plant. The results of field screening of groundnut genotypes against leaf miner revealed that, the genotypes K-1812 and R-2001-3 were tolerant with a least foliage damage, whereas K-9, HG 2023, R-8808, KDG-128 and Dh-256 were found to be moderately tolerant and remaining genotypes were susceptible. A wide range of variability and high heritability coupled with high GAM were recorded for most of the yield contributing traits. The association studies revealed that, pod yield recorded significant and positive association with plant height, number of primary branches per plant, number of mature pods per plant, haulm yield per plant, shelling percentage, kernel yield per plant, kernel yield per hectare, test weight and pod yield per hectare and negative significant association with leaf miner damage.

October, 2023

(B. N. Harish Babu)

(Major Advisor)

7. GENETIC VARIABILITY AND CORRELATION STUDIES IN SOYBEAN GERMPLASM

(SINDHU R. HADAPAD)

ABSTRACT

A field experiment was carried out during *Kharif* 2022 at ZAHRS, Hiriyur to determine the genetic parameters among 110 soybean germplasm lines. Significant variations in germplasm lines were documented for most of the traits through analysis of variance indicating the vast genetic variability. The traits like plant height, number of branches per plant, number of pods per plant, seed yield (Kg/ha), 100 seed weight and seed yield per plant exhibited moderate to high genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability accompanied with genetic advance as *per cent* of mean. The estimated GCV and PCV values depict the level of variability available in the population. High heritability combined with high genetic advance as *per cent* of mean indicates that effective selection can be made for these traits. Correlation studies displayed that traits *viz*., number of branches per plant, number of pods per plant, seed yield (Kg/ha) and 100 seed weight were positively and significantly correlated with seed yield per plant. Based on *k-means* clustering method, germplasm lines were grouped into eight clusters. The highest inter cluster distance was shown between cluster IV and cluster VIII (6.14) followed by cluster IV and cluster V (6.12). Such germplasm lines from the clusters showing high inter cluster distance coupled with high grain yield can be used as parents in future breeding programs for developing varieties with high yield and desirable quality. The germplasm lines GPM-1704, GPM-1056 and GPM-1735 have demonstrated both elevated protein levels and high yield. Furthermore, among the 45 germplasm lines assessed for protein content, GPM-651 (41.65%), GPM-535 (41.3%), GPM-913 (40.47%) and GPM-1704 (40.26%) have exhibited notably high protein content. Germplasm lines GPM-1056 and GPM-1704 were superior for the traits, seed yield per plant, early maturity and protein content.

October, 2023

(B. N. Harish Babu)

(Major Advisor)

8. COMPARATIVE ASSESSMENT OF BREEDING POTENTIAL IN THE DOUBLE CROSS F_2 POPULATIONS OF OKRA [*Abelmoschus esculentus* (L.) MOENCH]

(LAAVANYA G. A.)

ABSTRACT

Selection in populations derived from bi-parental crosses, usually results in the possible fixation of only two alleles governing traits in the populations. In contrast, selection in double cross derived segregating populations can result in fixation of more alleles governing complex traits. Thus, double cross derived F_2 populations generated by employing two single cross combinations are ideal for recovering superior recombinants and identifying suitable inbred lines. Okra is one of the important vegetable crops where heterosis has been exploited successfully. In this context, breeding potential of four double cross F_2 populations of okra designated as DC_1F_2 (NS864 × Arka Nikitha), DC_2F_2 (Mahyco10 × OH-102) , DC_3F_2 (Raadhika × Shakti) and DC_4F_2 (Samrat × SVOK5151) were evaluated in the field during *Rabi* 2022 at the experimental plots of College of Agriculture, Navile, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga for the traits plant height, number of internodes, internodal length, fruit length, average fruit weight, number of fruits per plant and fruit yield per plant. Breeding potential was assessed for the seven productivity traits in terms of means, standardized range, coefficient of variation and frequency of transgressive segregants recovered through rank-sum method. Double cross F_2 populations designated as DC_3F_2 (rank-sum 58) and DC_2F_2 (rank-sum 69) with lower rank-sum were considered to possess higher breeding potential. High frequency of transgressive segregants were recovered from the populations DC_3F_2 (19.33%), DC_1F_2 (13.00%) and DC_4F_2 (11.67%) which could be preferentially advanced to isolate inbred lines. Plant height, number of internodes and number of fruits per plant were identified as the field assayable proxy traits to select for fruit yield.

November, 2023

(R. C. Jagadeesha)

(Major Advisor)

9. STUDIES ON GENETIC VARIABILITY FOR YIELD AND YIELD RELATED TRAITS IN F_3 POPULATION OF OKRA [*Abelmoschus esculentus* (L.) MOENCH]

(MAHAMMADIMRAN B)

ABSTRACT

An experiment was conducted during *Kharif* 2022 at College of Agriculture, Shivamogga to assess the extent of genetic variability, character association, path analysis and identification of productive lines among 120 F_3 lines of okra. Significant variations among progeny lines were documented for most of the traits through analysis of variance, indicating the vast genetic variability. High phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV) was observed for the number of primary branches. The estimated GCV and PCV values depict the level of variability available in the population. Narrow difference between GCV and PCV implies lesser influence of the environmental effects on the trait expression. High heritability combined with high genetic advance as *per cent* of mean were documented for traits, number of primary branches, average fruit weight, number of fruits per plant, fruit length, number of seeds per fruit. this indicates that effective selection can be made for these traits. Fruit yield per plant had positive and significant association with plant height, number of primary branches, number of internodes, fruit length, fruit diameter, average fruit weight and number of fruits per plant. Path coefficient analysis revealed that number of fruits per plant had the highest positive direct effect followed by average fruit weight. Thus, selection for number of fruits per plant and average fruit weight would be rewarding. Among the studied lines, identified productive lines such as MC21-32, MC21-28, MC21-91, MC21-5, MC21-62, MC21-55, MC21-4, MC21-45, MC21-39, MC21-117, MC21-3 and MC21-27 which exhibited higher fruit yield per plant can be used in further crop improvement programmes.

November, 2023

(Narayanaswamy M)

(Major Advisor)

10. ASSESSMENT OF INDUCED VARIABILITY IN GAMMA IRRADIATED RED RICE MUTANT LINES FOR YIELD ATTRIBUTING TRAITS AND NUTRITIONAL PARAMETERS

(NACHIKETHA T. K.)

ABSTRACT

In *Kharif* 2022, a research experiment was conducted at the ZAHRS Brahmavar. The aim was to investigate genetic variability resulting from different doses of gamma rays (15, 25, 35, and 45kR) in the M_6 generation of the red rice IRRI line IRGA-318-11-6-9-2B and assess grain quality in selected productive mutant lines. The analysis of variance revealed extensive variations among the mutant lines for various traits. Flag leaf width exhibited high values for both phenotypic coefficient of variation (PCV) and genotypic coefficient of variation (GCV), suggesting minimal environmental influence. Number of productive tillers per plant, number of filled grains per panicle, panicle weight, and grain yield per plant showed high heritability and genetic advance as *per cent* of the mean (GAM), indicating additive gene influence. Grain yield per plant had positive correlations with several traits including number of productive tillers, number of grains per panicle, number of filled grains per panicle, panicle weight, spikelet fertility, flag leaf length and width but negative correlations with days to fifty *per cent* flowering, days to maturity, and plant height. Iron content, zinc content, volume expansion ratio, and gruel solid loss displayed moderate levels of PCV and GCV, with high heritability and GAM. Association studies revealed that grain length before cooking had positive relationship with test weight, while milling percentage showed negative association with test weight. Hulling percentage, head rice recovery, protein content, zinc content, grain length after cooking, amylose content, gel consistency and water uptake ratio had positive direct effects on test weight, while other traits had negative direct effects. Based on analysis, superior lines were selected for further breeding processes, considering both grain yield and grain quality parameters. This research demonstrates the potential of gamma irradiation in creating genetic variability for crop improvement.

November, 2023

(Shridevi, A. Jakkeral)

(Major Advisor)

11. GENETIC VARIABILITY AND ASSOCIATION STUDIES IN MUTANT LINES OF BLACKGRAM [*Vigna mungo* (L.) HEPPER]

(NUNE NAGAMANI)

ABSTRACT

A field experiment was carried out during *Kharif* 2022 by using 90 mutant lines derived from a cross PU 31×Rashmi and was laid out in augmented design at AHRS, Bavikere, Shivamogga. High PCV, GCV, broad sense heritability and genetic advance as per cent of mean observed for the number of clusters per plant, number of pods per cluster, pod length, number of seeds per pod and seed yield per plant. Association studies displayed that, traits like number of branches per plant, number of clusters per plant, number of pods per cluster, number of pods per plant, pod length,100 seed weight and number of seeds per pod were positively and significantly correlated with seed yield per plant. BLM 12, BLM 20, BLM 27, BLM 36 and BLM 73 were found to be high-yielding among mutant lines. BLM 9, BLM 20, BLM 29, BLM 44, BLM 51 and BLM 58 showed resistant reaction against YVMV. For second season, based on seed yield, disease index and incidence, 30 mutant lines were selected for summer 2023 from the first season and laid out in RCBD design. The moderate PCV, GCV and high broad sense heritability with genetic advance as per cent mean was observed for the number of branches per plant, number of clusters per plant, number of pods per cluster, number of pods per plant and number of seeds per pod. The traits like number of pods per cluster, number of pods per plant and pod length exerted a significant positive direct association on seed yield per plant. BLM 30, BLM 33, BLM 51, BLM 85 and BLM 90 were found to be high-yielding. BLM 30 and BLM 51 showed resistant to YVMV in blackgram. Hence, these mutant lines can be used for further crop improvement.

November, 2023

(Shashikala S Kolakar)

(Major Advisor)

Plant Pathology

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Agri.) theses abstracts produced in the Department of Plant Pathology

1. STUDIES ON ANTHRACNOSE OF DRAGON FRUIT (*Hylocereus* spp.)

(BHAGYASHREE, G.)

ABSTRACT

Dragon fruit is an exotic crop cultivated in many parts of India due to its nutritional qualities and health benefits. This crop suffers from various diseases, among them anthracnose is the major disease causing 30-50 per cent yield loss annually. Present study was carried out with objectives of isolation, identification and characterization of pathogen by cultural, morphological and molecular means along with *in vitro* evaluation of various botanicals, bioagents and fungicides against pathogen. Pathogen was isolated from diseased stem samples of dragon fruit plant and was confirmed based on its mycelial and conidial characters. Upon confirmation, the pathogen was maintained on Potato Dextrose Agar medium for further studies. Koch's postulates were proved by detached leaf technique as well as pot experiment in glasshouse. Cultural characters of pathogen was studied on different growth media and the results revealed maximum mycelial growth of 88.67 mm on Mathur's agar medium. Morphological studies revealed the production of white cottony mycelia which later turns to grey colour and the conidia were found to be aseptate, hyaline and cylindrical shape with round ends. Molecular characterization of two pathogen isolates was done through amplification of ITS regions of rDNA yielding bands at 550 bp. Sequencing and blast analysis of both isolates showed 98 per cent homology with *Colletotrichum fructicola*. Obtained sequences were deposited at GenBank and got the accession numbers (OR026465 and OR342386). Among the various botanicals evaluated against *C. fructicola*, neem seed kernel extract showed highest mean mycelial inhibition of 38.71 per cent, followed by garlic extract (36.57 %). *In vitro* evaluation of bioagents using dual culture technique revealed better efficacy of *Trichoderma harzianum* in inhibiting the maximum mycelial growth of 50.74 per cent. *In vitro* evaluation of fungicides showed that, Mancozeb, Tebuconazole, Difenoconazole and Mancozeb+Carbendazim were effective in inhibiting the mycelial growth of the pathogen.

October,2023

(R. Ganesh Naik)
Major Advisor

2. STUDIES ON ANTHRACNOSE OF CHILLI (*Capsicum annum* L.) INCITED BY *Colletotrichum* spp.

(ANAGHA, G.)

ABSTRACT

The Chilli (*Capsicum annum* L.) belongs to the family Solanaceae and is an important spice cum vegetable crop grown worldwide. It is a rich source of vitamins, oleoresin, and minerals such as calcium, phosphorus, ferrous and copper. Anthracnose of chilli caused by *Colletotrichum* spp. is a pre and post-harvest disease with 10-54 per cent yield loss in India. Anthracnose infected green chilli samples were collected from farmer's fields. Infected fruits had water soaked lesions and straw colour, which later became concentric rings with black pin head size acervuli. Among the different solid media evaluated, host leaf extract agar (90 mm) was best for growth and Richard's agar was suitable for maximum sporulation. The conidia of *Colletotrichum* spp. were cylindrical to fusiform, hyaline and aseptate with narrow curved ends with 10.10 to 13.21 µm × 2.69 to 4.49 µm range of length and breadth, respectively. The maximum dry weight of *Colletotrichum* spp. was observed from physiological studies at 25°C (248 mg) and pH at 5.5 (464 mg). Molecular characterization revealed a cent per cent similarity with *Colletotrichum acutatum* for one isolate and another with 98.62 per cent similarity. *In vitro* studies showed that fungicides like Mancozeb 75 % WP, Copper oxychloride 50 % WP, Tebuconazole 45 % SC, Difenoconazole 25 % EC, Propiconazole 13.9% EC + Difenoconazole 13.9 % EC and Fluropyram 200 g/L + Tebuconazole 200 g/L SC were effective in inhibiting the complete growth of pathogen. Among the eight varieties analyzed for seed borne nature of pathogen using the agar plate method and standard blotter method, Arka Tejasvi and WS-2207 showed no seed infection. Among the different organics tested against *Colletotrichum* spp. in Byadgi Dabbi seeds infected with anthracnose disease, vermiwash and cow urine recorded maximum germination percentage and seedling vigour.

November,2023

(Suresha D. Ekabote)
Major Advisor

3. STUDIES ON ANTHRACNOSE OF BETELVINE (*Piper betle* L.*)* INCITED BY *Colletotrichum* spp.

(MOUNA, H. N)

ABSTRACT

An investigation was carried out on *Colletotrichum* spp., which causes "Anthracnose" of betelvine, poses a serious threat for the cultivation of betelvine. Present study was carried out with an aim to survey the betelvine gardens for the incidence of disease, characterizing the pathogen through cultural, morphological, physiological and molecular means, *in-vitro* evaluation of botanicals and fungicides against *Colletotrichum* spp. Among the districts surveyed Davanagere recorded maximum per cent disease incidence (31.83 %) and Chitradurga recorded least disease incidence (28.28 %). Cultural studies showed PDA (90.00 mm) and Czapek's dox agar media (84.00 mm) supported maximum growth of mycelia of the pathogen whereas, pathogen colony found to be oblong or cylindrical, dumbel, aseptate with rounded ends. Fungal hyphae were hyaline, 33.10 – 38.90 µm in length and 10.20-13.70 µm in width. Physiological studies showed that the highest dry mycelial weight was attained when the incubation temperature was set at 30 °C (480 mg) and the highest dry mycelial weight of pathogen was obtained at a pH of 5.5 (650 mg). Molecular characterization revealed the pathogen as *C. gloeosporioides* by polymerase chain reaction (PCR) assay using ITS rDNA. Sequencing and Blast analysis revealed 95-100 per cent nucleotide similarity with Colletotrichum *gloeosporioides* isolates and the isolates were submitted in NCBI Genbank and accession numbers were obtained. *In-vitro* evaluation of botanicals revealed highest mycelial inhibition of 70.70 per cent by *Curcuma longa* followed by *Azadirachta indica* with 58.34 per cent mycelial inhibition. *In-vitro* studies of contact, systemic and combi fungicides, revealed that copper hydroxide, Difenoconazole, Propiconazole + Difenoconazole and by Fluopyram + Tebuconazole recorded maximum mycelial inhibition of *C. gloeosporioides.*

November,2023

(Suresha D. Ekabote)
Major Advisor

4. STUDIES ON SHEATH BLIGHT OF PADDY (*Oryza sativa* L.) INCITED BY *Rhizoctonia solani* KUHN, IN HILLY AND COASTAL ZONES OF KARNATAKA

(RAKESH)

ABSTRACT

Paddy (*Oryza sativa* L.) crop prone to various fungal, bacterial, viral and nematode diseases. Among fungal diseases sheath blight incited by *Rhizoctonia solani* Kuhn is more prominent and causes huge yield loss in hilly and coastal zones of Karnataka. Survey conducted in five districts during *Kharif* 2022-23 revealed the highest disease incidence in the fields of AHRS, Ponnampet (42.02 %) in Kodagu district, whereas least per cent incidence of the disease (5.30 %) was recorded at Bilaki village in Shivamogga district. Among the districts surveyed, Kodagu (23.43 %) recorded maximum mean per cent disease incidence. Cultural and morphological studies revealed that among eight different media tested Potato dextrose agar (89.89 mm) recorded highest mean radial growth followed by Oat meal agar (85.96 mm). All the isolates showed wide cultural and morphological variations in terms of colony colour, colony texture, angle of branching, number of sclerotia/plate, color of sclerotia, nature of sclerotia and days taken for sclerotial body formation. Molecular characterization revealed the pathogen as *Rhizoctonia solani* by polymerase chain reaction (PCR) assay using ITS rDNA. Studies on vegetative compatibility of *Rhizoctonia solani* isolates revealed that all the isolates belongs to same anastomosis group and compatibility with tester strain revealed all isolates belongs to anastomosis group one (AG1). *In vivo* evaluation of fungicides against sheath blight carried out during *Kharif* season at Agricultural and Horticultural Research Station, Ponnampet, Karnataka, revealed that the lowest per cent disease index was noticed in the treatment with Trifloxystrobin 25 per cent + Tebuconazole 50 % WG @ 0.4 gm/L with 15.60 per cent with a highest yield of 52.10 q/ ha.

November,2023

(G. N. Hosagoudar)
Major Advisor

5. BIOASSAY AND MOLECULAR CHARACTERIZATION OF *Trichoderma* ISOLATES FROM WESTERN GHATS ECOSYSTEM OF KARNATAKA

(SINCHANA, K. G.)

ABSTRACT

Trichoderma species are successfully used as biocontrol agents against various phytopathogens. The current study was aimed to understand the efficacy of indigenous isolates against fungal phytopathogens. Rhizosphere soil samples collected from 20 different locations in Shivamogga and Chikkamagaluru districts revealed the presence of six different *Trichoderma* spp., *viz., T. asperelloides, T. asperellum T. afroharzianum, T. harzianum, T. pleuroticola* and *T. erinaceum* upon molecular characterization of *Trichoderma* isolates using *tef1* primers. These *Trichoderma* spp., produced light green to dark green colony color, while reverse colony color of most species varied from white to light green. While the conidial shape varied from globose to ovoid and their color varied from olive green to dark green. *In vitro* bioassay of all the *Trichoderma* isolates showed excellent signs of antagonism against fungal pathogens *viz., Sclerotium rolfsii, Alternaria porri, Phyllosticta zingiberi, Colletotrichum gloeosporioides, Fusarium oxysporum, Sarocladium oryzae, Ganoderma ryvardenii, Phytophthora meadii* and *Pythium* sp. *In vivo* evaluation of biocontrol agents *viz., T. asperelloides* and *T. afroharzianum* with the commercially available talc formulation based *T. harzianum* as check along with two fungicides *viz.*, Metalaxyl 35% WS and Captan 50% WP under pot culture studies revealed that, maximum seed germination (93.33 %) was observed in those treatments treated with Metalaxyl, Seed+Soil treatment with native *T. harzianum* talc formulation (Check) and Seed+Soil treatment with isolate Tr16 (*T. asperelloides*) talc formulation. Minimum per cent of damping-off was observed in treatments *viz.*, Metalaxyl 35% WS (10.71 %) followed by Seed+Soil treatment with isolate Tr16 (*T. asperelloides)* talc formulation (14.29 %) and Seed+Soil treatment with native *T. harzianum* talc formulation (Check) (14.29 %) compared to control (52.00 %). Seed+Soil treatment with *T. asperelloides* and *T. harzianum* were found significantly superior in disease biocontrol efficacy and in enhancing overall plant growth parameters *viz.*, shoot length, root length, fresh and dry weight of shoot and root also fruit yield of tomato plants compared to control.

November,2023

(B Gangadhar Naik)
Major Advisor

6. STUDIES ON BLIGHT OF FOXTAIL PALM (*Wodyetia bifurcata* L.)

(SOUNDARYA, K. Y.)

ABSTRACT

Foxtail palm is a graceful palm species that has popularity in ornamental and landscaping sectors, attributed to its extraordinary beauty, visual appeal and regal look. Regrettably, this palm is susceptible to number of fungal diseases, out of which blight has become potentially destructive disease under field conditions, significantly diminishing its ornamental value. In this context, the present investigation was carried out to identify the causal organism of blight disease. Leaves showing typical symptoms of blight were collected and the pathogen was isolated and maintained on potato dextrose agar (PDA) media. Cultural and morphological characterization was carried out on different media and the results revealed that PDA (87.33 mm) and host leaf extract agar (79.67 mm) supported the growth of pathogen whereas maximum sporulation was found on PDA and oatmeal agar. Pathogen colonies were dull white having salmon buff spore mass. Conidia were slightly dumb-bell, hyaline, single-celled with two oil globules measuring 35.30 - 35.00 µm × 12.70 - 11.00 µm. Molecular characterization revealed 98 per cent nucleotide similarity with *Colletotrichum gloeosporioides* and the obtained sequences were submitted to NCBI Genbank and accession number (OR029273) was obtained. Physiological studies revealed that ideal temperature and pH range for the *C. gloeosporioides* were 25 to 30 °C and 6.0 to 7.0 respectively. Among different botanicals evaluated against *C. gloeosporioides*, *Curcuma longa* (turmeric) at 15 per cent was found effective by inhibiting 72.96 per cent mycelial growth and among different bioagents highest mycelial inhibition of 55.93 per cent was observed with *Trichoderma harzianum*. *In vitro* studies of contact, systemic and combi fungicides revealed that copper oxychloride (250, 500 and 1000 ppm), tebuconazole (100, 150 and 250 ppm) and propiconazole + difenoconazole (150, 250 and 500 ppm) recorded cent per cent mycelial inhibition and were found to be superior in managing *C. gloeosporioides.*

November,2023

(Suresha D. Ekabote)
Major Advisor

7. STUDIES ON UDBATTA DISEASE IN RICE (*Oryza sativa* L.) CAUSED BY *Ephelis oryzae* SYD

(SUPRITHA, R.)

ABSTRACT

Rice (*Oryza sativa* L.) is one of the important cereal crop belonging to the family *Poaceae*. Among the significant diseases affecting rice, the Udbatta disease of paddy caused by *Ephelis oryzae* is on the rise. The present study was carried out with an aim to survey, isolation, identification and proving the pathogenicity; cultural, morphological and physiological characterization; the *in-vitro* evaluation of fungicides; *in vitro* evaluation of seed treatment with fungicides in roll towel method against *E. oryzae.* A roving survey was carried out in Shivamogga, Kodagu and Chikkamagaluru districts of Karnataka revealed the highest PDI was recorded in Kodagu (11.76 %), followed by Shivamogga (10.98 %). Cultural studies showed that the Potato dextrose agar (35.20 mm) and Sabouraud's agar (32.85 mm) supported maximum growth of mycelia of the pathogen, whereas the colony was found to be flat and raised to fluffy with waxy and leathery texture. The conidia are needle-shaped, hyaline and aseptate, measuring about 18.0 - 25 µm x 1.0 - 1.9 µm. Physiological studies revealed that the highest dry mycelial weight of the pathogen was recorded at a temperature of 25 °C (41.55 mg) and pH 7.0 (49.78 mg). *In vitro* studies indicated that, among the contact fungicides evaluated, Copper oxychloride 50 % WP was found to be effective with mean mycelial inhibition of 62.59 per cent. Among systemic and combi product fungicides evaluated, Tebuconazole 45% SC and Carbendazim 12 % + Mancozeb 63 % WP showed a cent per cent mean mycelial inhibition respectively. Among the fungicides tested in the roll towel method, the least mean per cent seed infection (1.00 %), high mean per cent germination (99.00 %) and seedling vigour index of 1967.46 was recorded when seeds treated with Carbendazim 12 % + Mancozeb 63 % WP.

November,2023

(G. N. Hosagoudar)
Major Advisor

Soil Science and Agricultural Chemistry

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Agri.) theses abstracts produced in the Department of Soil Science & Agricultural Chemistry

1. A STUDY OF DIFFERENT LEVELS AND FORMS OF NITROGEN FERTILIZERS EFFECT ON GROWTH AND YIELD OF PADDY IN COASTAL KARNATAKA.

(ARVIND KAMBLE)

ABSTRACT

A field experiment was conducted during *Kharif* 2021 at Zonal Agricultural and Horticultural Research Station, Brahmavar, to study the different levels and forms of nitrogen fertilizers effect on growth and yield of paddy in coastal Karnataka. The experiment was laid out in randomized complete block design with six treatments and replicated four times. Among the different levels of nitrogen and nano urea, the treatments T_1, T_3, and T_5 involved applying three levels of nitrogen (60, 75 and 90 kg ha^{-1}) in equal portions as basal + top dressed at 30 and 60 DAT, whereas T_2, T_4, and T_6 applied one-third of the recommended nitrogen levels (60, 75 and 90 kg ha^{-1}) as basal + top dressed with 4ml L^{-1} of nano urea spray at 30 and 60 DAT, respectively, along with the recommended levels of phosphorus and potassium (30 and 75 kg ha^{-1}). Results revealed that, treatment T_5, application of 90: 30: 75 kg NPK ha^{-1} recorded significantly higher grain and straw yield (6250 and 7375 kg ha^{-1}, respectively) as compared to rest of the treatments. The same treatment recorded significantly higher plant height (100.28 cm), number of tillers m^{-2} (470.67), number of leaves m^{-2} (1587.68), leaf area m^{-2} (15706.40 cm^2) and yield attributing parameters like panicle length (23.95 cm), number of filled grains per panicle (140.29) and recorded higher harvest index (0.46). The total nutrient uptake of nitrogen, phosphorus and potassium (143.09, 55.80 and 155.27 kg ha^{-1}, respectively) with higher benefit cost ratio (2.40) and net returns (₹ 81734 ha^{-1}) were found significantly in the same treatment (90: 30: 75 kg NPK ha^{-1}) as compared to rest of the treatments.

August, 2023

(Jayaprakash S. M)
Major Advisor

2. CHARACTERIZATION OF SOIL ORGANIC MATTER IN MACRO AND MICRO AGGREGATE FRACTIONS IN COFFEE AGROFORESTRY SYSTEMS OF COORG DISTRICT

(NANDITA SINHA)

ABSTRACT

Soil organic carbon is dynamic in nature due to continuous addition of biomass and its loss by decomposition. The interaction of the added organic matter in soil depends on the climate and quality of litter biomass which also determines its accumulation in humus form. Physically the humus is protected as soil aggregates and attains complex form chemically. The coffee based agroforestry systems provide unique opportunity to understand humus formation and its rate of accumulation in different coffee plantations. A study was conducted in coffee plantations of Arabica and Robusta coffee existing under native and exotic shade trees along evergreen and moist deciduous vegetation types in Coorg district during 2022-23. Soil macro and micro aggregates were segregated by wet sieving and subjected to quantitative and qualitative analysis of humus carbon. The quantities of macro and micro-aggregates varied among different coffee plantations. Macro-aggregates (61.33 to 69.48 %) were found higher than micro-aggregates (15.32 to 28.32 %) across coffee agroforestry systems. The macro-aggregates were found higher in coffee plantations with native shade trees (66.08 to 67.89 %) compared to plantations under *Grevillia sps* (61.33 to 65.31 %). On the contrary, micro aggregates were higher in coffee plantations with *Grevillia sps* (17.46 to 28.32 %) compared to plantations under native trees (15.98 to 26.27 %). Among coffee plantations, plots with silver oak had higher soil organic-C than the native trees. The macro-aggregates recorded higher soil organic carbon than micro-aggregates. The humic acid fractions were higher in both macro and micro- aggregate than fulvic acid fractions. The total acidity and E4/E6 ratios were observed to be higher for fulvic acids compared to humic acids. The study clearly demonstrated the role of soil aggregates and quality of humus in protection of soil organic carbon in coffee plantations.

October, 2023

(M. S. Nagaraja)
Major Advisor

3. NUTRIENTS STATUS OF SOILS UNDER ARECANUT (*Areca catechu* L.) CROP IN CHITRADURGA TALUK, KARNATAKA

(ARUN MALAGE)

ABSTRACT

In order to know the nutrients status of soils under arecanut crop in Chitradurga taluk of Karnataka, an investigation was undertaken in the department of Soil Science and Agricultural Chemistry, College of Agriculture, Shivamogga during 2022-23. For the present study 100 Geo-coordinated surface (0-30 cm depth) samples were collected, processed and analyzed for nutrient status. The results of the investigation revealed that, the soils under arecanut crop in Chitradurga taluk had a pH in the range of 6.90 to 8.70, electrical conductivity and organic carbon status of the soils varied from 0.34 to 1.42 dS m^{-1} at 25° C and 2.91 and 8.54 g kg^{-1}, respectively. Available N, P_2O_5 and K_2O status of these soils ranged from 208.43 to 593.61, 14.46 to 35.98 and 71.52 to 572.40 kg ha^{-1}, respectively. The exchangeable calcium, magnesium and available sulphur in these soils ranged from 1.04 to 7.64 cmol (p^+) kg^{-1}, 0.53 to 4.86 cmol (p^+) kg^{-1} and 2.23 to 16.55 mg kg^{-1}, respectively. Similarly, DTPA-extractable micronutrients (Fe, Mn, Cu and Zn) status varied from 1.07 to 7.37, 0.11 to 3.51, 0.03 to 3.13 and 0.02 to 1.93 mg kg^{-1}, respectively indicating that, of 80.00, 82.00, 34.00 and 79.00 percent of samples were deficient in the above micronutrient status, respectively. Further, using GIS techniques the soil fertility maps were prepared for the above macronutrients (NPK) status of soils under arecanut crop of Chitradurga taluk and also based on LMH approach NPK fertilizers were recommended for arecanut crop.

November, 2023

(Jayaprakash, R)
Major Advisor

4. EFFECT OF FOLIAR APPLICATION OF COBALT ON GROWTH, YIELD AND BIOCHEMICAL PARAMETERS IN CHICKPEA (*Cicer arietinum* L.)

(KAVYA, R. L.)

ABSTRACT

An experiment was conducted during the *Rabi* season of 2022-2023 at ZAHRS, Babbur farm, Hiriyur, to study the "Effect of foliar application of cobalt on growth, yield and biochemical parameters in chickpea (*Cicer arietinum* L.)". The experiment was laid out in RCBD with nine treatments and three replications which consists of varying levels of cobalt foliar application (0, 25, 50, 75, 100, 125, 150, 175 and 200 ppm) as cobalt sulphate at 30 and 60 DAS. Among the varying levels of cobalt foliar application, 150 ppm has recorded significantly higher plant height (36.25 cm), number of branches (primary 5.10 and secondary 13.90) per plant, dry matter accumulation per plant (19.84 g), number of nodules (31.41) and effective nodules (23.87) per plant, number of pods per plant (44.93), pod yield per plant (13.79 g), seed (18.43 q ha^{-1}) and haulm yield (26.57 q ha^{-1}). Similarly, higher nutrient content like nitrogen (3.62 and 1.10 %), phosphorous (0.42 and 0.34 %), potassium (1.33 and 1.41 %), sulphur (0.20 and 0.17 %), copper (11.17 and 13.96 mg kg^{-1}) and manganese (31.63 and 55.29 mg kg^{-1}) in seed and haulm, respectively and higher total uptake of nitrogen (95.81 kg ha^{-1}), phosphorous (16.77 kg ha^{-1}), potassium (61.91 kg ha^{-1}), sulphur (8.06 kg ha^{-1}), copper (55.57 g ha^{-1}), manganese (205.24 g ha^{-1}), zinc (207.23 g ha^{-1}) and iron (393.20 g ha^{-1}) was recorded with the foliar application of cobalt at 150 ppm. Crude protein (22.65 %), catalase activity (144.83 µmol min^{-1}), net returns (` 42,705 ha^{-1}) and B: C ratio (2.03) were observed significantly higher with 150 ppm of cobalt foliar spray. The cobalt content (7.01 mg kg^{-1}) and uptake (14.44 g ha^{-1}) were significantly higher with foliar application of cobalt at 200 ppm.

November, 2023

(Parashuram Chandravanshi)
Major Advisor

5. LAND RESOURCE APPRAISAL FOR LAND USE PLANNING IN BETTADAPURA WATERSHED OF LOWER TUNGABHADRA CATCHMENT USING GEOSPATIAL APPROACH

(MANOJ KUMAR, H. S.)

ABSTRACT

The research was carried out to appraise the land resources of Bettadapura micro watershed and to assess the soil erosion risk in it by employing remote sensing and geospatial techniques. Crop suitability assessment was also done using multicriterial decision making techniques involving analytical hierarchy process and weighted overlay technique. Seven master profiles were identified and studied for their characteristics. The depth of the soils varied from moderately shallow to very deep. The soil texture ranged from sandy loam to clay. They belonged to soil orders *Inceptisols* and *Alfisols*. Seven soil series and thirty three soil phases were identified and mapped. The pH of soils ranged from slightly acidic to moderately alkaline (6.00-8.15) and soils were non-saline in nature. Soil organic carbon status was found to be low to high (2.10-12.50 g kg^{-1}) and available nitrogen was low to medium (106.50-291.20 kg ha^{-1}). Available phosphorus (16.14 - 78.48 kg ha^{-1}) and available potassium (48.38 - 457.22 kg ha^{-1}) was found to be low to high in the study area. The available sulphur (13.18 - 53.81 mg kg^{-1}) was medium to high. Among micronutrient, available boron was low to high (0.13 - 1.20 mg kg^{-1}). Available Copper and manganese were sufficient in status. Available zinc and iron were sufficient in majority of the study area. The predicted average annual soil loss of the whole study area was found to be 6.46 t ha^{-1} yr^{-1}. It was also found that soil erosion was highest in current fallow land followed by open scrub land. The crop suitability assessment revealed that the study area was highly suitable to moderate suitable maize, sorghum, finger millet, redgram, soybean, mango, pomegranate, chilli and minor millets.

November, 2023

(Ravikumar D)
Major Advisor

6. EFFECT OF SOIL AND FOLIAR APPLICATION OF SELENIUM ON SELENIUM STATUS IN SOIL AND PRODUCTIVITY OF FODDER MAIZE

(PALEGARI NIHARIKA)

ABSTRACT

An experiment was conducted during the summer of 2023 at College of Agriculture, Navile, Shivamogga to study the impact of various levels of selenium (Se) on Se status in soil under fodder maize. The test crop was the African tall variety of fodder maize. The experiment was conducted in a randomized complete block design with nine treatments and three replications. Treatments included control (no Se application), soil applied Se (20 g ha $^{-1}$ and 40 g ha^{-1}), foliar applied Se (10 ppm and 20 ppm) and combined soil and foliar application. Among varying levels, Se @ 40 g ha^{-1} + 20 ppm recorded significantly higher plant height (271.45 cm), green fodder yield (55.70 t ha^{-1}) and dry fodder yield (15.69 t ha^{-1}). Higher crude protein (8.14 %), total carbohydrates (81.70 %), crude fibre (35.86 %) was recorded with Se @ 40 g ha^{-1} and 20 ppm. At harvest, higher Se content (5.61 mg kg^{-1}) and uptake (92.86 g ha^{-1}) was recorded in T_7 with Se @ 20 g ha^{-1} and 20 ppm. Higher NPK content and uptake was recorded with Se @ 20 g ha^{-1} and 20 ppm. Higher sulphur content was recorded with Se @ 40 g ha^{-1} and 10 ppm. Significantly, higher zinc content was recorded with Se @ 20 g ha^{-1} and 10 ppm. Higher copper content was recorded with Se @ 20 g ha^{-1} and 20 ppm respectively. At harvest, higher soil Se status (0.21 mg kg^{-1}) was recorded with Se @ 40 g ha^{-1} and 20ppm. Higher NPK, zinc and copper status in soil was recorded with no Se application. Higher potassium status in soil was recorded with Se @ 20 g ha^{-1}.

November, 2023

(B. C. Dhananjaya)
Major Advisor

7. COPPER STATUS OF SOILS AND LEAVES UNDER ARECANUT CROP COVER OF CHIKKAMAGALURU DISTRICT

(PREETHAM, H. S.)

ABSTRACT

The survey followed by characterization of soils and leaves were undertaken in arecanut gardens of three taluks of Chikkamagaluru district. Total 162 soil samples and 81 leaf samples were collected from arecanut gardens of three taluks *viz*; NR Pura, Koppa and Sringeri. The soil samples were subjected to analysis for various chemical properties and leaf samples for nutrient composition. The study showed that most of the soils were acidic (pH < 6.5) in nature and electrical conductivity of soils found to be normal, organic carbon status of soils found to be medium to high, available copper status of soils ranged from 0.63-34.70 mg kg^{-1} and 0.40-20.31 mg kg^{-1} with mean values of 9.67 and 3.95 mg kg^{-1} in surface and sub-surface soils respectively. The soils were found low in phosphorous and zinc. Available nitrogen, potassium, sulphur, exchangeable calcium and magnesium found to be medium. Available iron and manganese found to be high. All the nutrients decreased with depth where as calcium and magnesium increased with depth. Forms of copper such as water soluble, sorbed, easily reducible manganese bound, calcium carbonate bound, organic bound, Fe and Al oxide bound and residual copper were found in the range of 0.08-1.02, 2.33-16.32, 0.98-4.93, 0.54-2.24, 0.68-2.80, 1.00-5.32 and 59.32-320.42 mg kg^{-1} in surface and 0.06-0.54, 1.97-9.17, 0.59-3.05, 1.19-2.63, 0.48-2.02, 1.28-6.35 and 26.54-111.06 mg kg^{-1} in sub-surface soils respectively. The copper content in arecanut leaves ranged from 10.70-26.80 ppm with mean value of 18.37 ppm. The total nitrogen, potassium, calcium, magnesium, sulphur, iron, manganese and zinc concentration is found to be optimum and phosphorous concentration was found low in the arecanut leaves. The study revealed that the available copper content in soils and total copper in leaves were found to be high in the arecanut gardens of three taluks.

November, 2023

(G. N. Thippeshappa)
Major Advisor

8. CHARACTERIZATION OF SOIL PROFILES IN CENTRAL DRY, SOUTHERN TRANSITION, HILLY AND COASTAL ZONES OF KARNATAKA

(RAGHAVI, K. B.)

ABSTRACT

An investigation was carried out to characterize the soil profiles of Central Dry, Southern Transition, Hilly and Coastal Zones of Karnataka during the year 2022-23 at Department of Soil Science and Agricultural Chemistry, College of Agriculture, KSNUAHS, Shivamogga. Eight representative profiles, two from each Agro-Climatic Zone based on soil heterogeneity, covering dominant soil types were selected for the study. The study revealed that the soils were dominated with diagnostic ochric surface horizon and argillic subsurface horizons. Soil structure was weak medium subangular blocky to strong medium subangular blocky. Colour of soil profiles was found to be very dark grey (10YR 3/1), dark brown (7.5YR 3/4), reddish brown(2.5YR 4/4), strong brown (7.5YR 5/6) across the profiles. The consistency varied from slightly hard to hard when dry, friable to very friable when moist, slightly sticky to sticky and slightly plastic to plastic when wet. The bulk density of the studied profile samples increased with increasing in depth. The soil texture was sandy clay loam, sandy loam, sandy clay, clay and clay loam across the profiles. Soil pH in the profiles of Central Dry Zone was neutral to alkaline (6.93-8.80) and slightly alkaline to moderately alkaline (7.73-8.35) in Southern Transition Zone. Hilly Zone and Coastal Zone soils were slightly acidic to neutral (5.19-7.50) and moderately acidic to neutral (5.54-6.93), respectively. pH showed an increasing trend with increasing depth. Organic carbon varied from low (1.30 g kg^{-1}) to high(17.00 g kg^{-1}) and decreased with depth in all the profiles. Cation exchange capacity and base saturation followed an indefinite trend with depth. The available N (102.86-531.51 kg ha^{-1}), P_2O_5 (5.27-33.90 kg ha^{-1}), K_2O (64.24-250.66 kg ha^{-1}), sulphur (8.25-36.96 mg kg^{-1}) decreased with depth. Exchangeable calcium and magnesium were deficient to sufficient. DTPA extractable Fe, Mn, Cu, Zn and boron decreased with depth across the profiles.

November, 2023

(Ganapathi)
Major Advisor

9. STUDIES ON SOIL PROPERTIES UNDER MONOCROPPING SYSTEM OF PADDY IN DAVANAGERE DISTRICT

(SUHAS SAJJANAR)

ABSTRACT

A survey-based study was conducted at College of Agriculture, Shivamogga during 2022-23 to assess different physical and chemical properties of paddy growing soils of Davanagere, Harihara, Channagiri and Honnali taluks of Davanagere district. The data on nutrient management practices followed by paddy growing farmers was also collected. The soil samples were grouped into different categories based on the major nutrient status, and fertilizer recommendation for paddy was given. The texture of soils varied from sandy clay loam to clay, bulk density, particle density and porosity varied from 1.20 to 1.52, 2.20 to 2.80 Mg m^{-3} and 36.21 to 53.26 per cent, pH varied from strongly acidic (5.13) to moderately alkaline (8.22) with electrical conductivity ranging between 0.11 and 0.97 dS m^{-1}. Organic carbon, available phosphorus, potash and sulfur content varied from low to high with each ranging from 2.1 to 9.3 g kg^{-1}, 12.05 to 68.0 kg ha^{-1}, 63.12 to 486.60 kg ha^{-1}, 2.80 to 24.00 mg kg^{-1} and available nitrogen varied from low to medium (168.00 to 520.80 kg ha^{-1}). Exchangeable calcium, magnesium, DTPA extractable iron, copper and manganese were found to be sufficient in all soil samples except Zn, where some samples were deficient. The result on nutrient management practices showed that farmers predominantly applied higher quantities of nitrogen, along with varying levels of phosphorus and potassium. Fewer farmers applied organic manures, and none followed soil testing. Recommendation of fertilizers was done by LMH approach. The soil samples having low levels of nitrogen, phosphorus and potassium are advised to add an additional quantity of 12.5 kg, while those with high levels are advised to reduce the application by 12.5 kg of each nitrogen, phosphorus and potassium per hectare. While no modification to recommended dosage is needed for the soil samples belonging to medium categories.

November, 2023

(Sarvajna B. Salimath)
Major Advisor

10. INVESTIGATION ON MICRONUTRIENT STATUS UNDER ARECANUT AND PADDY LAND USE OF THIRTHAHALLI TALUK, SHIVAMOGGA DISTRICT

(SUSHMA, B. N.)

ABSTRACT

An Investigation on micronutrient status under arecanut and paddy land use of Thirthahalli taluk, Shivamogga district was undertaken during the year 2022-2023 at college of agriculture, KSNUAHS, Shivamogga. A total of 100 soil samples were collected from five hoblis of Thirthahalli taluk at two depths (0- 15 cm and 15-30 cm) under arecanut and paddy land use. The collected soil samples were processed and analysed for physical and chemical properties by adopting standard procedures. The results revealed that the texture of the soil samples were varied from sandy loam to sandy clay loam, soil reaction varied from extremely acidic to slightly acidic with non-saline nature, the soil pH and electrical conductivity were increased with increase in depth in both arecanut and paddy land use. The soil organic carbon was found to be low to high (3.80 – 17.70 g kg^{-1}) in status. The available nitrogen and phosphorus contents were low to medium (132.60 – 520.10 N and 11.40 - 30.38 P_2O_5 kg ha^{-1}) and potassium was found to be low to high (110.20 - 408.40 kg ha^{-1}) in status, the higher organic carbon and primary nutrients were observed in surface soils as compared to subsurface soils in both arecanut and paddy land use. The exchangeable calcium and magnesium were sufficient and increased with increase in depth, the available sulphur was found to be medium to high in status and decreased with increase in depth. The DTPA extractable micronutrients such as iron, manganese and copper were sufficient except zinc and available boron. Majority of the soil samples were found to be sufficient in zinc (60 %) and deficient in boron (72 %) in both arecanut and paddy land use. The available micronutrients decreased with increase in soil depth under arecanut and paddy land use of Thirthahalli taluk, Shivamogga district.

November, 2023

(K. T. Gurumurthy)
Major Advisor

11. NUTRIENT STATUS AND MICROBIOLOGICAL PROPERTIES OF SOILS AS INFLUENCED BY ORGANIC FARMING PRACTICES IN UDUPI DISTRICT, KARNATAKA.

(GADILINGAPPA B. C.)

ABSTRACT

A study was conducted during 2022-23 in the Department of Soil Science and Agriculture Chemistry to know the impact of organic farming practices on nutrient status and microbiological properties in soils of Udupi district, Karnataka. Results of the study revealed that an increase in soil pH was noticed with no effect on EC of soils due to organic farming practices. Organic carbon and available nitrogen content increased in soils under organic farming practices and a significant positive correlation was observed between them. Similarly, available phosphorus, potassium, calcium, magnesium and sulphur increased in soils under organic farming practices and these nutrients recorded a positive correlation with soil pH and also available sulphur in soils recorded a significant positive correlation with organic carbon. Further, DTPA extractable micronutrients (Fe, Cu, Zn and Mn) status increased in soils due to organic farming practices and it was evidenced by a positive and significant correlation recorded between the above micronutrients and organic carbon status in soil. An increase in microbial counts (bacteria, fungi, actnimycetes, PSB and *Azotobacter*) were observed in soils under organic farming practices compared to the soils under inorganic farming practices. Similarly, an increase in enzyme activities (urease, acid phosphatase and dehydrogenase) was also recorded in soils under the influence of organic farming practices. An increase in microbial counts and enzyme activities in soil was attributed to the continuous addition of organic matter to the soils through organic farming practices and it was evidenced by a positive correlation recorded between organic carbon status in soils and the above microbial properties.

December, 2023

(H. M. Chidanandappa)
Major Advisor

Horticulture

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Agri.) theses abstracts produced in the Department of Horticulture

1. EFFECT OF SILICA ON ROOTING OF CORMS, PLANT GROWTH, YIELD AND QUALITY OF FLOWERS IN GLADIOLUS (*Gladiolus grandiflorus* L.) UNDER TRANSITIONAL ZONE OF KARNATAKA

(ABDUL MATHEEN, P. A.)

ABSTRACT

Gladiolus is one of the most popular commercial bulbous flower crops grown for its long-lasting spikes with attractive colours. The experiment was conducted to study the effect of silica on rooting of corms, plant growth, yield and quality of flowers in gladiolus at the experimental plot of Department of Horticulture, College of Agriculture, Shivamogga during the year 2021-2022. The experiment was laid out in Randomized Complete Block Design with 13 treatments replicated three times. The results with respect to rooting of corms, plant growth, flowering, yield, flower quality, corm and cormels has shown significant differences among the treatments. The maximum rooting (96.11 %), more number of roots per corm (23.02), longest length of root (8.19 cm), maximum diameter of roots (4.68 mm), fresh weight of roots (0.65 g), dry weight of roots (0.47 g) were recorded in corms treated with RDF + sodium metasilicate at 0.06 % Si (T_{10}). The maximum sprouting of corms (97.67 %), plant height (85.33 cm), number of leaves per plant (12.21), leaf area per plant (1545.24 cm^2), leaf area index (2.58), minimum number of days taken for initiation of inflorescence (75.00 days), early floret opening (80.05 days), days taken for 50 per cent flowering (85.00 days), maximum flowering duration (24.98 days), maximum spikes per plant (2.05) and per hectare (3,41,632), maximum spike length (87.33 cm), girth of spike (9.80 mm), weight of spike (70.78 g), number of florets per spike (15.67), floret length (11.89 cm), floret diameter (9.61 cm), vase life (12.25 days), corm yield per plant (2.25), per hectare (3,74,963), maximum cormels yield per plant (20.17 g), per hectare (3,361.33 kg) lowest bud borer incidence (8.00 %), highest net returns of Rs. 18,64,201/ha and B:C ratio of 2.69 were recorded in plants treated with RDF + sodium metasilicate at 0.06 % Si (T_{10}) under Southern Transitional Zone of Karnataka.

January, 2023

(D. Thippesha)
(Major Advisor)

2. EFFECT OF NITROGEN FIXING BIOFERTILIZERS ON GROWTH, FLOWERING AND FLOWER QUALITY OF LUPINE (*Lupinus perennis* L.) CUT FLOWER AT GRADED LEVELS OF NITROGEN

(AYESHA SIDDIQUA, M.)

ABSTRACT

The investigation entitled "Effect of nitrogen fixing biofertilizers on growth, flowering and flower quality of Lupine (*Lupinus perennis* L.) cut flower at graded levels of nitrogen" was carried out at College of Agriculture, Shivamogga, during 2022-23. Eight treatments were imposed on Lupine with three replications the treatment details are *viz.*, T_1-100 % RDN, T_2-75 % RDN, T_3- 100 % RDN + *Rhizobium*, T_4- 100 % RDN + *Azotobacter*, T_5- 75% RDN + *Rhizobium*, T_6- 75 % RDN + *Azotobacter*, T_7- 100 % RDN + *Rhizobium* + *Azotobacter*, T_8- 75 % RDN + *Rhizobium* + *Azotobacter*, where P, K and FYM are kept constant, *Rhizobium* and *Azotobacter* (625ml/hectare). The vegetative parameters *viz.* plant height (59.36cm), number of branches per plant (25.67), total dry matter (38.25 g/plant) were maximum in treatment (T_7) 100 % RDN + *Rhizobium* + *Azotobacter*. The flowering and yield parameters *viz.* minimum number of days taken for flower bud initiation (46.67 days), flower stalk emergence (49.60 days), $^1/_4{}^{th}$ opening of spike (6.23 days), 50% flowering (22.20 days) and number of florets per stalk (135.20), stalk length (69.51 cm), vase life (5.50 days), number of stalks per plant (6.25), per plot (224.88), per hectare (4.63 Lakhs) were found maximum in T_8 (75 % RDN + *Rhizobium* + *Azotobacter*). The gross returns (Rs.9,25,432), net returns (Rs.7,91,205), BCR (5.89) were also high in T_8. Further, extended flower longevity was observed to be maximum for maximum water uptake (18.53g), water loss (16.50g), fresh weight of flower (18.83g) and vase life (8.89 days) when flowers were treated with 2 % sucrose solution + citric acid (150ppm).

November, 2023

(B. HemlaNaik)
(Major Advisor)

3. EFFECT OF ORGANIC FORMULATIONS ON GROWTH AND YIELD OF INDIAN NONI (*Morinda citrifolia* L.) .UNDER SOUTHERN TRANSITIONAL ZONE OF KARNATAKA

(JAGRUTHI, S.)

ABSTRACT

The experiment entitled "Effect of Organic Formulations on Growth and Yield of Indian Noni (*Morinda citrifolia* L.) Under Southern Transitional Zone of Karnataka" was conducted in the noni plot of Dr. Srinivas Murthy, Ramenakoppa village, Shivamogga taluk by the Department of Horticulture, College of Agriculture, Shivamogga during 2022-2023. The experiment was laid out in RCBD with 11 treatments replicated thrice. The results revealed that, noni plants received 60:30:30 g NPK/plant recorded maximum plant height (3.52 m), plant girth (41.49 cm), canopy spread (4.86 m^2), leaf area (83873.33 cm^2), leaf area index (0.65) and also registered maximum yield parameters *viz.*, fruit length (10.04 cm), fruit breadth (5.38 cm), fruit volume (123.51 cc), pulp recovery (62.16 %), highest number of fruits (438.24), fruit weight (165.38 gm), fruit yield (72.55 kg/plant and 56.04 t/ha), followed by T_8 (54.68 t/ha). Plants treated with 75% NPK through organic manure + panchagavya (2.0 %) sprayed thrice at thirty days interval from flowering stage (T_8) recorded maximum total soluble solids (13.36 ^{0}Brix), total sugars (15.42 %), reducing sugars (5.30 %), shelf life (4.21 days), least physiological loss in weight (8.75 %) and less black flag disease incidence (9.39 %). Maximum soil microbial population was recorded in the plots treated with 100% NPK through organic manure + panchagavya (2.0 %) spray. Maximum gross return (Rs. 13,65, 500 ha^{-1}), net return (Rs. 11, 13,747 ha^{-1}) and benefit cost ratio (4.42) were reported in treatment T_8. Insect pests *viz*., the *Aleurodicus dispersus* and *Acrida exaltata* were found in negligible number. The minimum values of growth, yield and quality parameters were observed in control (T_1- 5 kg FYM/plant). The present findings conclusively proved that, treatment T_8 (75% NPK through organic manure + panchagavya 2.0 % spray) was found to be effective for sustainable production and quality improvement of noni fruits.

November, 2023

(D. Thippesha)
(Major Advisor)

4. EFFECT OF BIOSTIMULANTS ON GROWTH, YIELD AND QUALITY OF GREEN CHILLI (*Capsicum annuum* L.)

(LEKHANA, A. M.)

ABSTRACT

Chilli (*Capsicum annuum* L.) is a major vegetable and spice crop cultivated all over India. An experiment was conducted to evaluate the influence of biostimulants on plant growth, yield and quality of green chilli in the farmer field at Abbalagere, Shivamogga during the year 2022-2023. The experiment was carried out in Randomized Complete Block Design with 13 treatments replicated thrice. The observations were recorded on plant growth attributes, flowering attributes, yield and quality parameters of green chilli. The significantly maximum plant height (70.42 cm), stem girth (10.80 mm), number of leaves per plant (168.55), number of branches per plant (11.50), root length (26.72 cm), root volume (15.17 cc) and leaf area (2513.65 cm^2), minimum number of days taken for 50 per cent flowering (42.48 days), maximum fruit set percentage (44.05 %), number of fruits per plant (231.67), fruit length (16.03 cm), fruit diameter (9.10 mm), average fruit weight (6.17 g), fruit yield per plant (1.44 kg), per plot (78.57 kg) and per hectare (38.80 t/ha), total leaf chlorophyll (1.71 mg/g), total fruit chlorophyll (1.59 mg/g), TSS (6.43 ^{0}B), total sugars (5.63 %), titrable acidity (1.33 %), ascorbic acid (238.33 mg/100g), capsaicin (0.46 %), minimum physiological loss in weight (19.33 %), maximum fruit firmness (1.05 kg/cm^2) and shelf life (16.80 days), maximum total plant nitrogen uptake (256.20 kg/ha), total plant phosphorous uptake (18.20 kg/ha), total plant potassium uptake (144.74 kg/ha), available soil N (264.20 kg/ha), available soil P_2O_5 (59.43 kg/ha), available soil K_2O (162.07 kg/ha), maximum gross returns (` 7,76,000), net returns (` 5,87,336), benefit cost ratio (4.11) and minimum per cent of CLCVD incidence (7.50 %) were given by Biostimulant-III (Seaweed extract 10%) at 1.0 ml/L (T_8). While, the minimum values for growth, yield and quality paramaters were observed in control (T_1) in green chilli during investigation.

November, 2023

(D. Thippesha)
(Major Advisor)

5. PHENOTYPIC EVALUATION OF CHILLI (*Capsicum annuum* L.) HYBRIDS

(POOJA, M. B.)

ABSTRACT

The present investigation was undertaken at AHRS, Bavikere, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga during *rabi* season of 2022-23. The experiment was laid out in RCBD with 3 replications to evaluate 20 chilli hybrids (public and private) for growth, yield and quality traits. The growth, yield and biochemical traits showed significant differences. Highest plant height (83.13 cm), plant girth (1.46 cm), and total number of branches/ plant (11.70) were recorded in Sitara. Siyara recorded early flowering (34.07 days) and took minimum number of days for first fruit harvest (58.60 days). Maximum fruit length observed in Green Thunder (12.10 cm), higher fruit weight observed in Sainik (11.36 g), highest number of fruits per plant observed in Arka Tejaswi (202.33). Highest fruit yield per plant (1.03 kg/ plant) and per hectare (29.36 t/ ha) was observed in Sitara. Highest ascorbic acid (210.53 mg/ 100g) and lowest TSS (2.90 ^{o}B) was noticed in Sitara. D^2 statistics revealed that 20 hybrids of chilli were grouped into 5 clusters. Among 16 traits, fruit yield per plant contributed maximum towards divergence followed by number of fruits per plant. Correlation studies indicated that plant height, girth, number of primary branches per plant, plant spread (N-S), number of fruits per plant, fruit length and ascorbic acid had positive and significant correlation with fruit yield per plant. Path coefficient studies revealed that plant height, plant girth, number of primary branches per plant, days to first flowering, days to 50 % flowering, number of fruits per plant, fruit girth, weight, ascorbic acid had positive direct effect on fruit yield per plant at phenotypic levels. The study concluded that hybrids Sitara, Green Thunder and HPCR 5533 were superior in growth, yield and quality parameters as compared to other hybrids. Hence, these hybrids are commercially suitable for Southern Transitional Zone of Karnataka.

November, 2023

(Nagarajappa Adivappar)
(Major Advisor)

Horticulture

Entomology

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M.Sc. (Hort.) theses abstracts produced in the Department of Entomology

1. BIO-ECOLOGY OF BLACK SOLDIER FLY (*Hermetia illucens* L.) ON COFFEE PULP IN WESTERN GHATS OF MUDIGERE

(LAKSHMIKANTH, H. K.)

ABSTRACT

The research on 'Bio-Ecology of Black Soldier Fly (*Hermetia illucens* L.) on Coffee Pulp in Western Ghats of Mudigere' was conducted at Department of Entomology, College of Horticulture, Mudigere, Zonal Agricultural and Horticultural Research Station, Mudigere and coffee plantations of Mudigere during the period from December 2020 - May2021. Dipteran insects were dominant in coffee pulp pits (33.19 ± 0.56), plastic bins containing coffee pulp (29.67 ± 1.79) and positively related with maximum and minimum relative humidity, maximum temperature whereas, negatively correlated with rainfall. Traps with bait were installed in the field and number of egg masses of *H. illucens* were counted. Number of egg masses (2.67) was more in trap containing fish waste and the lowest (0.47) in pig dung. The peak number of flying adults (27.52 ± 5.91), mating pairs (2.85 ± 1.56), egg-laying adults (0.82 ± 0.44) and feeding adults (18.79 ± 7.03) was at 12 pm in the mesh-house. Among 9 treatments to study food preference, the treatment (T-8) containing the organic waste (25 % coffee pulp with 75 % of 2:1:1:1:1 proportion of weeds crush: Hotel food wastes: Cattle dung: Pig dung: Fruits and vegetable waste) was more preferred by *H. illucens* maggots for its growth. In this treatment, the highest maggot weight (0.17 g), food consumption (3.52 g), body length (15.67 mm) and body width (5.17 mm) was observed. The fecundity, egg incubation was 589.3 ± 4.08 eggs, 6.45 ± 0.60 days, respectively, maggot, pre-pupal, pupal, pre-oviposition and post oviposition period was 26.30 ± 1.22, 2.75 ± 0.64, 35.15 ± 1.50, 3.25 ± 0.44 and 6.30 ± 0.80 days, respectively. The total life cycle of male and female was 78.15 ± 1.69 and 81.85 ± 1.63 days, respectively. It is confirmed that *H. illucens* can be reared on 25 per cent coffee pulp with other organic wastes.

November, 2023

(Revanna Revannavar)
Major Advisor

Floriculture and Landscape Architecture

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M.Sc. (Hort.) theses abstracts produced in the

Department of Floriculture & Landscape Architecture

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1. EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON GAILLARDIA (*Gaillardia pulchella* Foug.) UNDER HILL ZONE OF KARNATAKA

(INDHUMATHI, M.)

ABSTRACT

An experiment entitled "Effect of integrated nutrient management on gaillardia (*Gaillardia pulchella* Foug.) under hill zone of Karnataka" was conducted at the Experimental block of Floriculture and Landscape Architecture, College of Horticulture, Mudigere during 2021-22. The experiment was laid out in Randomized Block Design (RBD) having twelve treatments *viz.*, T_1-75% Recommended Dose of Fertilizers + vermicompost @ 1.25 t/ha T_2-50% RDF + vermicompost @ 2.5 t/ha, T_3 -75% RDF + vermicompost @ 1.25 t/ha + *Azospirillum* @ 2 kg/ha, T_4 -50% RDF+ vermicompost@ 2.5 t/ha + *Azospirillum* @ 2 kg/ha, T_5-75% RDF + *Azospirillum* @ 2 kg/ha + VAM@ 2 kg/ha, T_6 - 50% RDF + *Azospirillum* @ 2 kg/ha + VAM @ 2 kg/ha, T_7-75% RDF+ vermicompost @ 1.25 t/ha + VAM @ 2 kg/ha, T_8-50% RDF+ vermicompost @ 2.5 t /ha + VAM @ 2 kg/ha, T_9-75% RDF + vermicompost @ 1.25 t/ha + *Azospirillum* @ 2 kg/ha + VAM @ 2 kg/ha, T_{10}-50% RDF + vermicompost @ 2.5 t/ha + *Azospirillum* @ 2 kg/ha + VAM @ 2 kg/ha, T_{11}-100% RDF + vermicompost @1.25 t/ha + *Azospirillum* @ 2 kg/ha + VAM @ 2 kg/ha and T_{12}-100% RDF (Control) replicated thrice. The treatment T_9-75% RDF+ vermicompost @ 1.25 t/ha + *Azospirillum* @ 2 kg/ha + VAM @ 2 kg/ha recorded the maximum plant height (92.48 cm), number of leaves (443.12), leaf width (4.74 cm), leaf length (13.21 cm), leaf area (6068.97 cm^2), leaf area index (4.50), stem girth (5.17 cm), number of branches (52.43), dry weight of plant (55.06 g), root length (35.11 cm), minimum days for 50 per cent flowering (78.30), maximum flowering duration (141.67 days), flower head diameter (6.58 cm), flower petiole length (39.20 cm), corolla length (3.09 cm), shelf life (3.13 days), vase life (5.67 days), average flower weight (3.48 g), number of flowers per plant (104.30), flower yield per hectare (22.09 tonnes) and seed yield per hectare (772.59 kg) with maximum B:C ratio (3.77) and it was statistically on par with the treatment comprising of T_{11}-100% RDF + vermicompost @ 1.25 t/ha + *Azospirillum* @ 2 kg/ha + VAM@ 2 kg/ha. Hence, this treatment may be recommended for commercial cultivation of gaillardia under hill zone of Karnataka.

January, 2023

(S. Y. Chandrashekar)

Major Advisor

2. STUDIES ON CHARACTER ASSOCIATION AND PATH ANALYSIS FOR YIELD AND QUALITY PARAMETERS IN STOCK (*Matthiola incana* L.) GENOTYPES

(SANKETH, M. R.)

ABSTRACT

The investigation entitled “Studies on character association and path analysis for yield and quality parameters in stock (*Matthiola incana* L.) genotypes" was conducted at the College of Horticulture, Mudigere under KSNUAHS, Shivamogga, 2022-23. The experiment consisted of 11 genotypes, which were replicated thrice in a Randomized Complete Block Design (RCBD). The result revealed that the genotype Stock Katz Blue recorded the maximum plant height (72.00 cm) and internodal length (2.99 cm). The maximum number of leaves and leaf area was observed in the genotype Stock Katz Ruby (70.73 and 3199.94 cm^2/plant, respectively). The minimum days taken to flower stalk emergence, first visible flower and harvest (43.60, 55.40 and 74.40, respectively) were recorded in Stock Katz Ruby. The maximum stalk length (93.93 cm), florets per stalk (32.07) and vase life (13.47 days) were recorded in Stock Katz Blue. The genotype Arrow White recorded the maximum number of cut flowers per sq. m (25.00) and number of cut flowers per 1000 sq. m (20000). Correlation studies revealed that plant height, leaf area and number of florets per stalk with stalk length; stalk girth with days taken for stalk emergence showed a significant positive correlation, whereas plant height, leaf area, intermodal length and stalk length showed significant negative correlation with days taken for stalk emergence. The number of cut flowers per sq. m exhibited highly positive direct effect of path coefficient analysis with the plant height, leaf area, number of florets per stalk and stalk girth. This suggests that these are the potential traits in improving the stalk quality and marketable flower yield.

October, 2023

(B. Hemla Naik)
Major Advisor

3. EFFECT OF PLANTING DENSITIES ON GROWTH AND YIELD OF CUT CHRYSANTHEMUM (*Dendranthema grandiflora* TZVELEV.) GENOTYPES UNDER PROTECTED CULTIVATION

(ABHISHEK, B.)

ABSTRACT

An experiment entitled "Effect of planting densities on growth and yield of cut chrysanthemum (*Dendranthema grandiflora* Tzvelev.) genotypes under protected cultivation" was conducted at ICAR-ELH polyhouse, Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, KSNUAHS, Iruvakki, Shivamogga, during 2022-23. The experiment was laid out in Factorial Randomized Complete Block Design (FRCBD) having two factors *viz.*, Factor A- G_1 (Big White), G_2 (Champagne Yellow), G_3 (Candore Pink), G_4 (Feeling Dark Green), G_5 (Harley Red) and Factor B- D_1 (36 plants/m^2), D_2 (72 plants/m^2), D_3 (108 plants/m^2) replicated thrice. All five genotypes were planted under three different planting densities. The results indicated that among different interactions, genotype Champagne Yellow under planting density one (G_2D_1) recorded maximum plant height (117.40 cm), plant spread in E-W (23.23 cm) and N-S direction (22.53 cm) and inter nodal length (5.23 cm). However, genotype Feeling Dark Green under planting density one (G_4D_1) recorded maximum stem girth (7.73 mm). Genotype Big White under planting density one (G_1D_1) took minimum days for first flower bud initiation (50.90), first flowering (82.23), 50 per cent flowering (84.60) and maximum duration of flowering (16.67 days). Genotype Big White under planting density one (G_1D_1) recorded maximum flower diameter (7.77 cm) and vase life (18.83 days). Whereas, genotype Feeling Dark Green under planting density one (G_4D_1) recorded maximum fresh weight of flower stalk (96.73 g). Maximum stalk length (102.17 cm) and number of flowers per stalk (8.40) were recorded in genotype Champagne Yellow under planting density one (G_2D_1) and genotype Big White under planting density three (G_1D_3) recorded maximum number of flower stalks per square meter (83.00). Growing of genotype Big White under planting density two (G_1D_2) will result in maximum net income (Rs. 4,06,928) and B:C ratio (3.55). Hence, this treatment may be recommended for commercial cultivation of cut chrysanthemum.

November, 2023

(Hemanth Kumar, P)

Major Advisor

4. EFFECT OF FOLIAR APPLICATION OF BIOSTIMULANTS ON GROWTH, FLOWERING, QUALITY, FLOWER AND SEED YIELD OF ANNUAL CHRYSANTHEMUM (*Chrysanthemum coronarium* L.)

(DEGALA JYOTHI VYSHNAVI)

ABSTRACT

An experiment entitled "Effect of foliar application of biostimulants on growth, flowering, quality, flower and seed yield of annual chrysanthemum (*Chrysanthemum coronarium* L.)" was conducted at the experimental block of Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, under Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga during 2022-2023. The experiment was laid out in Randomized Complete Block Design (RCBD) consisting of ten treatments *viz*., T_1 (Humic acid @ 0.4 %), T_2 (Humic acid @ 0.6 %), T_3 (Humic acid @ 0.8 %), T_4 (Biovita @ 0.4 %), T_5 (Biovita @ 0.6 %), T_6 (Biovita @ 0.8 %), T_7 (Biozyme @ 0.4%), T_8 (Biozyme @ 0.6 %), T_9 (Biozyme @ 0.8 %) and T_{10} (Control- water) replicated thrice. The plants were sprayed with biostimulants at 20, 40 and 60 days of transplanting. The treatment Biovita @ 0.6 % recorded maximum plant height (106.10 cm), plant spread E-W (58.84 cm) and N-S (60.58 cm), number of leaves (900.43), leaf area (16027.65 cm^2/plant), leaf area index (17.81), total dry matter (110.95 g/plant), absolute growth rate (1.43 g/plant/day), crop growth rate (15.89 g/m^2/day), specific leaf area (538.37 cm^2/g), chlorophyll a, b and total chlorophyll content (1.01, 0.54, 1.55 mg/g fresh weight, respectively), minimum days taken for flower bud initiation (35.66), 50 per cent flowering (55.35), maximum duration of flowering (58.66 days), shelf life (3.66 days), number of flowers per plant (189.26), flower yield per hectare (69.18 tons) with maximum B:C ratio of 2.96 and 4.13 for flower and seed yield per hectare, respectively compared to control. The treatment Biozyme @ 0.8 % resulted in maximum quality parameters such as flower diameter (6.19 cm), number of petals per flower (72.28), flower weight (3.44 g) and seed yield per plant (45.02 g) and seed yield per hectare (27.25 quintals). Hence, foliar application of Biovita @ 0.6 % (at 20, 40 and 60 days after transplanting) may be recommended for commercial cultivation of annual chrysanthemum.

November, 2023

(S. Y. Chandrashekar)

Major Advisor

5. EFFECT OF DIFFERENT POSITIONS OF BENDING IN ROSE (*Rosa hybrida* L.) VARIETIES UNDER PROTECTED CULTIVATION

(PUNITH KUMAR, S. D.)

ABSTRACT

An investigation was carried out at Department of Floriculture and Landscape Architecture College of Horticulture, Mudigere during the year 2021-22 on "Effect of Different Positions of Bending in Rose (*Rosa hybrida* L.) Varieties Under Protected Cultivation". The experiment was laid out in Factorial Randomized Complete Block Design with two factors *viz*., Factor A being varieties (V_1-Tajmahal, V_2- Peach Avalanche,V_3-Rockstar, V_4- Nobless Pink,V_5- Golden Strike) and Factor B being bending positions (B_1-At shoot junction bud, B_2-Above the first leaf bud, B_3-Above the second leaf bud, B_4-Above third leaf bud, B_5-No bending), and their interaction (V×B) in four replications varieties, positions of bending and their interaction showed significant results among the parameters studied in rose. Among different interactions observed. V_1B_1 *i.e*., (Tajmahal + At shoot junction bud) recorded maximum plant height (132.38 cm), maximum inter nodal length (6.40 cm), maximum number of shoots per plant (4.31). In case of quality and yield attributes, V_1B_1 showed minimum days for the first flower bud appearance, days taken for harvest from the first bud appearance and days taken for harvest after bending (31.40 days, 15.03 and 50.44 days, respectively), maximum stalk length (73.46 cm), stem girth (7.67), flower bud length (3.82 cm), flower bud diameter (3.22 cm) and vase life (13.30 days) were also observed in V_1B_1. As far as parameter concerned same interaction *i.e*., V_1B_1 recorded maximum flower diameter and petals per flower (8.21 cm and 45.51, respectively). V_1B_1 was found to be high yielder with respect to number of flowers per plant (4.80) and flowers per meter square (46.00). Occurrence of powdery mildew was lesser in V_4B_4(Nobless Pink + Above third leaf bud), whereas incidence of black spot lesser in V_1B_5(Tajmahal + No bending). The infestation of mites was lesser in V_1B_2. Infestation of thrips lesser in V_3B_4 (Rockstar + Above third leaf bud . Among the interactions, V_1B_1 was found superior over all other interactions. Hence, the commercial bending of rose bended at shoot junction bud could be taken up as effective cultural practice in rose.

November, 2023

(Nataraj, S. K.)
Major Advisor

6. ASSESSMENT OF GENETIC VARIABILITY AND DIVERSITY AMONG CUT CHRYSANTHEMUM (*Dendranthema grandiflora* TZVELEV.) GENOTYPES UNDER PROTECTED CULTIVATION

(SHIVANI, V. S.)

ABSTRACT

A study was undertaken on the assessment of genetic variability and diversity among cut chrysanthemum genotypes under protected cultivation in ICAR-ELP polyhouse, Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, during 2022-23. The experiment was laid out in a Randomized Complete Block Design with three replications. The superior performance with respect to growth, flowering, quality and yield characters was recorded in the genotype Arctic Queen, Candor Pink and Champagne Orange. Analysis of variance showed highly significant differences among all the genotypes for all the characters under the study. High heritability coupled with high genetic advance as a per cent of mean was recorded for number of leaves, leaf length, leaf width, plant spread, stem girth, leaf area index, total chlorophyll content, duration of flowering, flower diameter, stalk length, number of flowers per stem, vase life, number of flower stems per m^2 and number of flower stems per 1000 m^2, suggesting that these traits can be improved through direct selection due to additive gene action. Based on D^2 analysis, twenty genotypes of cut chrysanthemum were grouped into five clusters. Among the characters studied, number of flower stems per m^2 contributed maximum (30.00 %) to the genetic diversity followed by vase life (14.74 %) and leaf area (14.60 %). Correlation studies exhibited that number of flower stems per m^2 showed highly significant and positive correlation with plant spread (N-S), leaf length, leaf width, leaf area, flower diameter. Path analysis revealed that number of flower stems per m^2 had a direct and positive effect on plant height, plant spread (N-S), leaf width, leaf area, number of leaves, days for bud initiation, flower diameter and vase life.

November, 2023

(Nataraj, S. K.)
Major Advisor

7. EFFECT OF SPACING AND SOIL PH REGULANTS ON GROWTH AND FLOWERING OF HYDRANGEA (*Hydrangea macrophylla* Thunb.) CUT FLOWER UNDER PROTECTED CULTIVATION

(YASHASWINI, M. P.)

ABSTRACT

The present investigation entitled "Effect of Spacing and Soil pH Regulants on Growth and Flowering of Hydrangea (*Hydrangea macrophylla* Thunb.) Cut Flower under Protected Cultivation'' was conducted in the Naturally Ventilated Polyhouse at College of Horticulture, Mudigere during the year 2022-23. The experiment was laid out in Randomized Complete Block Design (RCBD) comprising of five treatments with four replications. Results revealed that growth, flowering, cut flower quality and yield were significantly influenced by different levels of spacing. Planting at spacing of 45 × 60 cm recorded the maximum plant spread North – South (81.29 cm), stem girth (4.37 cm) and minimum days to flower bud opening (270.33). Whereas, the plants spaced at 45 × 45 cm apart recorded the maximum plant height (102.41 cm), leaf length (22.49 cm), number of leaves (58.12), diameter of inflorescence (25.66 cm), stalk length (115.41 cm), vase life (20.22 days), number of cut flower stems per plant (4.11), gross returns (₹ 34,52,400) with highest B:C ratio of 5.63. Hence, planting at 45 × 45 cm spacing is ideal for commercial cultivation of hydrangea for cut flower purpose. Further, among seven different soil pH regulants, application of Aluminium sulphate @ 120 g/ m^2 intensified to true blue colour (Purple violet group N82 - Strong purple A) from initial light pink colour as observed in RHS colour chart, maximum anthocyanin content (delphinidin) (714.87 mg/ 100 g of fresh sepal) in combination with acidic soil pH (4.23), sepal pH (4.12), vase life (26.25 days), flower colour intensity (4.73), flower colour suitability (2.66), appearance of flower (4.51) and overall acceptability (4.80) with highest B:C ratio of 5.89. Hence, this is promising soil pH regulant for best colour intensification of hydrangea.

November, 2023

(Nataraj, S. K.)

Major Advisor

8. STUDIES ON EFFECTS OF DIFFERENT SOURCES AND LEVELS OF CALCIUM ON GROWTH, FLOWERING, QUALITY AND YIELD IN ASIATIC LILY (*Lilium spp.*)

(KAMALASHREE, S. D.)

ABSTRACT

An experiment entitled "Studies on effects of different sources and levels of calcium on growth, flowering, quality and yield in Asiatic lily (*Lilium spp.*)" was conducted at the experimental block (under naturally ventilated polyhouse) of the Department of Floriculture and Landscape Architecture, College of Horticulture, Mudigere, under Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Iruvakki, Shivamogga during 2022-2023. The experiment was laid out in Randomized Complete Block Design (RCBD) consisting of thirteen treatments *viz*., T_1 (control), T_2 (30 g/m^2 calcium ammonium nitrate), T_3 (40 g/m^2 calcium ammonium nitrate), T_4 (50 g/m^2 calcium ammonium nitrate), T_5 (30 g/m^2 calcium nitrate), T_6 (40 g/m^2 calcium nitrate), T_7 (50 g/m^2 calcium nitrate), T_8 (100 g/m^2 calcium oxide), T_9 (200 g/m^2 calcium oxide), T_{10} (300 g/m^2 calcium oxide), T_{11} (20 g/m^2 dolomite), T_{12} (30 g/m^2 dolomite) and T_{13} (40 g/m^2 dolomite) replicated thrice. The application of dolomite at 40 g/m^2 (T_{13}) recorded minimum days for bulb sprouting (3.73), maximum plant height (73.49 cm), number of leaves (60.47), leaf length (11.64 cm), leaf breadth (1.81 cm), leaf area (852.50 cm^2), leaf area index (4.26), minimum days taken for flower bud initiation (29.80), first floret opening (54.53), 50 per cent flowering (61.33), maximum duration of flowering (17.33), maximum number of buds per spike (3.60), bud length (8.53 cm), bud diameter (21.64 mm), petal length (11.37 cm), petal breadth (4.37 cm), length of the flower stalk (71.85 cm), girth of the flower stalk (6.76 mm), weight of the flower stalk (68.82 g), vase life of flowers with and without anthers (8.17 and 9.55 days, respectively), number of bulbs per plant (3.26), weight of bulb per plant (64.40 g), diameter of bulb (8.60 cm) and number of bulblets per plant (5.80) with maximum B:C ratio of 2.76 compared to control. Hence, the application of dolomite at 40 g/m^2 may be recommended for commercial cultivation of Asiatic lily.

December, 2023

(S. Y. Chandrashekar)

Major Advisor

Fruit Science

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Hort.) theses abstracts produced in the Department of Fruit Science

1. STANDARDIZATION OF HARVESTING STAGE AND PRE-TREATMENT FOR DEHYDRATION OF TENDER JACK

(CHANDANA, B. S.)

ABSTRACT

The experiment was carried out during 2022-23 at College of Horticulture, Mudigere in laboratory condition. The experiment was laid out in Completely Randomized Design with two objectives *viz*., to assess the harvesting stage, 45 days after fruit set (DAFS) and 60 DAFS and pre-treatments with potassium metabisulphite (KMS), citric acid (CA) and potassium sorbate (PS) for dehydration of tender jack and to know the effect of packing materials, high density polyethylene (HDPE), low density polyethylene (LDPE), vacuum packing and aluminium laminated polyethylene (ALPE) for 180 days of storage. Among different harvesting stage and pre-treatments, fruits harvested at 60 DAFS and pretreated with KMS (0.3 %) showed significantly better results with respect to physico-chemical properties *viz*., maximum dry recovery (18.83 %), dehydration ratio (0.24), rehydration ratio (4.93), rehydration moisture (85.05 %), colorimeter value (82.47 *L**), TSS (3.27 $^{\circ}$B), carbohydrate (13.18 %), crude fiber (3.28 %), protein (2.26 %), ash (1.40 %), overall acceptability score (4.75) and the minimum drying duration (9.08 hrs) and phenol content (32.07 mg GAE/g). Based on the results of experiment-1, treatment T_{10} (60 DAFS+KMS 0.3 %) and T_9 (60 DAFS+KMS 0.2 %) were selected and packed in different packing materials for storage studies. In experiment-II, fruits harvested at 60 DAFS+KMS 0.3 per cent and packed in ALPE showed better storage stability which in turn maintained better physico-chemical and overall sensory score with minimum changes *viz*., moisture (7.23-7.32 %), colorimeter value (78.45-74.42 *L**), texture (342.21-342.09 N), carbohydrates (12.92-12.85 %), crude fiber (2.69-2.64 %), protein (2.37-2.29 %), starch (1.70-1.67 %), fat (0.75-0.60 %), phenol content (34.25-34.13 mg GAE/g), overall acceptability (4.72-4.35 %) and without any microbial growth after 180 days of storage. Based on the results treatment P_4 (60 DAFS+KMS 0.3 %+ALPE) is considered as best for dehydration and storage stability of the dehydrated tender jack.

November, 2023

(Kantharaj, Y.)

Major Advisor

2. IMPACT OF HARVESTING MONTH AND PRE-TREATMENT ON PHYSICO-CHEMICAL PROPERTIES OF FROZEN JACKFRUIT BULB

(CHANDANA, S.)

ABSTRACT

The experiment was carried out during 2022-23 at NG Fruits, Sakharayapatna, Chikkamagaluru district. The study was laid out in Factorial Completely Randomised Design with three replications. The experiment consists of two factors *viz.*, Harvesting months (M) and Pre-treatments (P). Among the harvesting months, jackfruit harvested in the last week of April (M_4) had better physico-chemical and sensory properties. Among the pre-treatments, sodium benzoate at 500 ppm (P_2) showed better physical, bio-chemical and sensory characters (flavour and overall acceptability). Among different treatment combinations, fruit harvested in the month of April and pre-treated with sodium benzoate at 500 ppm (M_4P_2) showed better results with respect to physical properties *viz.*, texture (35.18 N) and colour (43.27 *b**) and bio-chemical properties *viz.*, pH (5.09), TSS (25.75^{o} Brix), reducing sugars (9.14%), non-reducing sugars (14.29%), total sugars (23.39%), protein (2.88%), carbohydrates (25.75%) and total carotenoid content (162.93 µg/100g) and with respect to sensory characters like overall acceptability score (4.86) and has highest B:C ratio (4.79). Also, the treatment M_4P_2 had minimum storage changes upto 90 days and has no incidence of micro-organisms. For bio-chemical, physical, sensory quality and cost economics, the treatment M_4P_2 (fruit harvested in end of April month and pre-treated with sodium benzoate at 500ppm) was found significantly superior for frozen jackfruit.

November, 2023

(Shivakumar, B. S)

Major Advisor

3. INFLUENCE OF LIQUID PLANT GROWTH PROMOTING RHIZOMICROBIAL CONSORTIA ON QUALITY ROOTSTOCKS AND GRAFT SUCCESS IN MANGO (*Mangifera indica* L.)

(DIDGI PRADEEPKUMAR)

ABSTRACT

Frateuria aurantia) at 120 days after transplanting. In grafted plants, the maximum sprout success (84.44 %) at 60 days after grafting, survival percentage (84.55), sprout length (9.30 cm), sprout girth (4.76 mm), number of leaves (15.37), leaf length (14.08 cm) and leaf breadth (3.29 cm) at 120 days after An experiment was undertaken at the College of Horticulture, Hiriyur during 2022-2023. The experiment consisted of eight treatments with three replications which were laid out in a completely randomized design under the polyhouse condition, comprising eight treatments *viz*., T_1 (Control), T_2 (*Azotobacter chroococcum*), T_3 (*Bacillus megaterium*), T_4 (*Frateuria aurantia*), T_5 (*Azotobacter chroococcum* + *Bacillus megaterium*), T_6 (*Azotobacter chroococcum* + *Frateuria aurantia*), T_7 (*Azotobacter chroococcum* + *Bacillus megaterium* + *Frateuria aurantia*) applied at 4 ml per each plant at the time of transplanting and VAM 10 g per plant was applied in common to all the treatments. Among different treatments studied, the rootstocks inoculated with *Azotobacter chroococcum* + *Bacillus megaterium* + *Frateuria aurantia* (T_8) recorded maximum plant height (36.50 cm), stem girth (9.03 mm), number of leaves (17.39), leaf length (17.36 cm), leaf breadth (4.59 cm), leaf area (1006.26 cm^2), leaf area index (4.33), fresh weight of shoot (42.46 g/plant), dry weight of shoot (11.51 g/plant), total dry matter production (18.95 g/plant), root length (22.93 cm), root thickness (8.50 mm), fresh weight of root (15.93 g/plant), dry weight of root (7.44 g/plant), root volume (14.67 ml), total chlorophyll content (2.49 mg/g of fresh weight) and total sugar (5.14 %) 120 days after transplanting. Similarly, maximum available nitrogen (232.86 kg/ha), available phosphorous (71.11 kg/ha), available potassium (210.07 kg/ha) in the media, total nitrogen (3.50 %), total phosphorous (0.73 %) and total potassium (3.26 %) in the plants was recorded by T_8 (*Azotobacter chroococcum* + *Bacillus megaterium* + grafting recorded by *Azotobacter chroococum* + *Bacillus megaterium* + *Frateuria aurantia* (T_8). The combined use of liquid PGPRs ascertained the better establishment of mango rootstocks and graft success.

December, 2023

(Sridhar, R.)

Major Advisor

4. EVALUATION OF *Annona muricata* L. GENOTYPES FOR GROWTH, YIELD AND QUALITY ATTRIBUTES

(LATHAMANI, M. K.)

ABSTRACT

Annona muricata L. (Lakshmanphal) is an underutilized fruit crop which is gaining importance due to its potential health benefits. An experiment was conducted to evaluate the *Annona muricata* L. genotypes for growth, yield and quality attributes, during 2022-23 at Muddinakoppa village of Shivamogga district. Analysis of variance showed significant differences concerning growth, yield and quality attributes. The genotype PKN-25 recorded maximum fruit length (29.10 cm), fruit width (16.40 cm), fruit weight (2352.92 g), fruit volume (2262.46 cc) and pulp weight (1624.40 g). The highest number of fruits per tree (34) and highest fruit yield per tree (80.00 kg/tree) were recorded in PKN-25 followed by PKN-20 with 33 fruits per tree and 75.97 kg/tree. The highest values for fruit quality parameters like TSS (PKN-24: 18.23 $^{\circ}$B), titratable acidity (PKN-39: 1.25 %), reducing sugars (PKN-03: 8.87 %), non-reducing sugars (PKN-20: 3.79 %), total sugar (PKN-24: 11.97%), TSS: Acid (PKN-24: 24.64), sugar: acid (PKN-24: 16.18), ascorbic acid (PKN-02: 22.68 mg/100g fruit pulp), antioxidant activity (PKN-03: 70.13 %) and total phenolic content (PKN-02, PKN-24: 126.48 mg GAE/ g dry weight) were also recorded during investigation. High level of genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) coupled with high heritability along with high genetic advance as per cent of mean (GAM) were recorded for most of the traits studied, indicating a high level of variability within genotypes. All the characters have highly significant and positive correlation with the yield except number of seeds per fruit and titratable acidity. Diversity studies revealed that 34 genotypes of *Annona muricata* were grouped into six clusters. The fruit yield per tree contributed more towards total genetic divergence followed by titratable acidity and antioxidant activity. The PKN-25 and PKN-20 found to be superior for fruit and yield parameters whereas, PKN-24 and PKN-03 found to be superior in terms of quality attributes.

December, 2023

(Nagarajappa Adivappar)
Major Advisor

5. EXPLORATION AND IDENTIFICATION OF ELITE ACCESSIONS OF KOKUM (*Garcinia indica* (THOUARS) CHOISY) IN UDUPI DISTRICT OF COASTAL KARNATAKA.

(PRAVEENKUMAR, B.)

ABSTRACT

The exploration study of elite accessions of Kokum was carried out at coastal zone taluks of Udupi district (Bramhavara, Hebri and Kundapura), During *Rabi* and *summer* season 2020-21. The morphological characterization of 17 accessions showed a wide variation for tree, leaf, flower, fruit and seed characteristics. Analysis of variance revealed the significant differences among the 17 accessions for yield and quality attributes. A significantly higher fruit weight (70.63 g), fruit length (6.73 cm), fruit diameter (5.90 cm), fresh weight of rind (29.25 g) and dry weight of rind (5.21 g) was recorded in Acc. 15. While the Acc. 12 recorded significantly higher hydroxy citric acid (22.25 %) and anthocyanin (2.41 mg/100 g). The higher GCV and PCV coupled with higher heritability and the genetic advance was observed for most of the economic traits indicating that these characters are highly heritable and likely to provide high selection response. Correlation studies revealed that the fruit yield per tree had a positive and highly significant correlation with the number of harvest, fresh weight of rind and dry weight of rind at both genotypic and phenotypic levels. Genotypic path co-efficient analysis for yield per tree indicated that, the dry weight of rind (1.033) had the highest positive direct effect followed by the number of harvest (0.802). While, total hydroxy citric acid, the fresh weight of rind (0.717), followed by anthocyanin (0.284) and the fruit length (0.277) had a high positive direct effect. The genetic diversity among the accessions were maximum which results in the formation of six clusters. Among different grafting techniques the softwood grafting with *Garcinia cambogia* as rootstock shows maximum survival percentage.

December, 2023

(Chaitanya, H. S.)

Major Advisor

6. INFLUENCE OF FOLIAR APPLICATION OF SECONDARY NUTRIENTS AND BANANA SPECIAL ON YIELD AND QUALITY OF BANANA CV. NEY POOVAN UNDER HILL ZONE OF KARNATAKA

(SUPRIYA, T. C.)

ABSTRACT

An experiment was conducted in farmer field at Kollibyle village, Mudigere taluk, Chikmagalur district during the year 2022-2023. The experiment was laid out in randomized complete block design (RCBD) comprising of nine treatments replicated thrice. The treatments consist of foliar application *viz.*, sulphate of potash (1 %), calcium nitrate (0.25 %, 0.5 %), magnesium sulphate (0.25 %, 0.5 %) and banana special (0.5 %) at an interval of one month from 7^{th} months after planting and compared with control. Among the treatments, T_9 - Sulphate of Potash (1 %) + Calcium Nitrate (0.25 %) + Magnesium Sulphate (0.25 %) + Banana Special (0.5 %) recorded maximum pseudostem height (279.92 cm), pseudostem girth (62.71 cm), total number of leaves (17.10), total number of functional leaves (15.10) at shooting stage. Finger weight (91.70 g), finger length (14.93 cm), finger circumference (13.07 cm), number of fingers per bunch (163.10), hand weight (1.44 kg), bunch length (74.02 cm), bunch weight (15.51 kg), yield per hectare (38.77 t), green life (5.77 days), shelf life (9.21 days), fruit weight (81.37 g), pulp weight (71.16 g), peel weight (10.21g), pulp to peel ratio (6.96), firmness (1.57 lbs), TSS (21.26 °Brix), reducing sugar (17.57 %), non- reducing sugar (3.42 %), total sugar (20.98 %), sugar to acid ratio (84.77), ash (1.43 %), crude fibre (1.76 %), carbohydrates (85.87 %) were also recorded maximum in the treatment T_9 with minimum days taken from shooting to harvest (121.10 days), acidity (0.24 %) moisture (62.17 %) and physiological loss in weight (11.26 %). The present findings can be commercially used in making banana production more profitable by the application of sulphate of potash, secondary nutrients and banana special under hill zone of Karnataka.

December, 2023

(Yallesh Kumar, H. S.)

Major Advisor

7. STANDARDIZATION OF SUITABLE MONTH, GROWING CONDITIONS AND GROWTH STIMULANTS FOR THE SUCCESS OF SOFTWOOD GRAFTING IN AVOCADO (*Persea americana* MILL.)

(VAISHNAVI KULKARNI)

ABSTRACT

The present investigation was carried out to standardize the suitable month, growing conditions and growth stimulants on the success of softwood grafting in avocado during the year 2022-2023 at Department of Fruit Science, College of Horticulture, Mudigere. The first experiment was conducted using two factors, namely growing conditions and grafting months. The different growing conditions, grafting months and their interaction displayed significant differences on growth parameters. Among the grafting months, grafting performed on second fortnight of February had significantly recorded the highest number of sprouts (4.91), number of leaves (14.17), graft height (35.10 cm) and graft success (85.50%) at 120 days after grafting. With respect to different conditions, the polyhouse condition significantly registered maximum number of sprouts (5.23), number of leaves (13.52), graft height (33.72 cm) and graft success (82.82%) at 120 days after grafting. Among the different treatment combinations, grafting performed on second fortnight of February under the polyhouse condition had significantly maximum number of sprouts (5.52), number of leaves (16.00), graft height (37.50 cm) and graft success (93.60%) at 120 days after grafting. From this study, it was found that grafting during second fortnight of February under the polyhouse condition demonstrated significantly superior results compared to other treatments. The second experiment was conducted to study the influence of growth stimulants on the growth and success of avocado grafts. Among the various growth stimulants, foliar application of GA_3 @ 200 ppm significantly recorded the highest graft height (46.20 cm), sprout length (13.12 cm), number of leaves (28.50) and graft success (96.14%) compared to control. This investigation found that spraying GA_3 @ 200 ppm has significantly improved graft parameters.

December, 2023

(Yallesh Kumar, H. S.)

Major Advisor

Plantation, Spices, Medicinal and Aromatic Crops

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M.Sc. (Hort.) theses abstracts produced in the

Department of Plantation, Spices, Medicinal and Aromatic Crops

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1. NUTRACEUTICAL PROFILING, GENETIC VARIABILITY AND ANTIOXIDANT ACTIVITY OF INDIAN PENNYWORT (*Centella asiatica* L.) ACCESSIONS OF HILL ZONE OF KARNATAKA

(ABHISHEK, J. K.)

ABSTRACT

An experiment was carried out at College of Horticulture, Mudigere, during 2022-23 to know the variation in nutraceutical composition of Indian pennywort (*Centella asiatica* L.) accessions of hill zone of Karnataka (20 accessions with three checks *viz.*, Arka Prabhavi, Arka Divya and Vallabh Medha) using Completely Randomised Design with two replications. At both three and five months after planting, wide variations were observed among the accessions for proximates, minerals, phytochemicals, antinutritional factor (oxalates) and antioxidant activity. An increase in ash, crude fibre, potassium, calcium, iron and zinc content was noticed with the advancement of maturity. While, moisture, fat, protein, total carbohydrates, phosphorus and total carotenoids followed a decreasing trend. The total phenols, total flavonoids and tannins were increased in most of the accessions at five months after planting but, anthocyanin, ascorbic acid, oxalates and antioxidant activity did not show a common trend of increase or decrease. Among the 20 accessions tested, Acc. 22 recorded the significantly maximum total flavonoids (169.66 mg QE/100g), tannins (293.16 mg TAE/100g), antioxidant activity (77.37 %) and minimum oxalates (20.01 mg/100g) compared to other accessions and checks. The results of the variability study revealed that fat, iron, zinc, total carotenoids, anthocyanin, total phenols, oxalates and antioxidant activity had higher GCV and PCV. Heritability and GAM estimates were high for all parameters except moisture. Total flavonoids, zinc and total phenols were ascertained to be the major contributors of antioxidant activity according to correlation and path analysis studies which shall be considered for selecting superior genotypes with better antioxidant activity. The results of the divergence study confirm that, the highest contribution towards genetic divergence was made by iron content followed by antioxidant activity, phosphorus and zinc. The grouping of the accessions resulted in five clusters based on Mahalanobis D^2 analysis which showed the wider divergence among the accessions.

October, 2023

(Ravi, C. S)
Major Advisor

2. INFLUENCE OF GROWTH STIMULANTS ON SEED GERMINATION, GROWTH AND YIELD OF BIRD'S EYE CHILLI (*Capsicum frutescens* L.)

(ANAND KARANAPPA RATHOD)

ABSTRACT

An investigation was conducted at College of Horticulture, Mudigere during the year 2022-23 to study the effect of plant growth stimulants on germination, growth, yield and quality of bird's eye chilli. The statistical design adopted for seed germination study was Completely Randomized Design with fourteen treatments. Whereas, Randomized Complete Block Design with thirteen treatments was employed for the field experiment. Among the different treatments, the seeds treated with GA_3 @ 50 ppm recorded significantly maximum germination percentage (91.65) and seedling vigour index (840.43). While, seeds treated with GA_3 @ 100 ppm recorded significantly maximum shoot length (5.26 cm), root length (5.18 cm), number of primary roots (14.00), fresh weight of shoot (0.24 g) and seedling length (10.44 cm). Foliar application of GA_3 @ 75 ppm recorded significantly maximum plant height (83.59 cm) and plant spread (3014.10 cm^2). Foliar application of Humic acid @ 0.50 per cent recorded maximum number of primary branches per plant (12), number of leaves (477.55), leaf area (8680.57 cm^2), leaf area index (3.12), fruit length (1.72 cm), fruit width (5.97 mm), single fruit weight (0.67 g), fresh fruit yield per plant (244.93 g), dry fruit yield per plant (93.30 g) and estimated dry fruit yield per hectare (34.55 q). Fruit quality attributes namely, ascorbic acid (119.60 mg/100g), oleoresin (8.83 %) and capsaicin (1.89 %) content were also recorded maximum in the same treatment. While, foliar spray of NAA @ 50 ppm has recorded significantly minimum number of days for first flowering (65.50 days) and 50 per cent flowering (77.00 days). The results revealed that soaking of seeds in GA_3 @ 50 ppm for 30 minutes improves seed germination in bird's eye chilli and foliar application of humic acid @ 0.50 per cent at 60, 90 and 120 DAT would help in improving plant growth, yield and quality attributes of bird's eye chilli.

November, 2023

(Bhoomika, H. R)
Major Advisor

3. INFLUENCE OF GROWTH STIMULANTS AND NURSERY MEDIA ON SPROUTING AND ROOTING OF BLACK PEPPER (*Piper nigrum* L.) ORTHOTROPES IN PROTRAYS

(PRAJWAL, S.)

ABSTRACT

An experiment was conducted at College of Horticulture, Mudigere to assess the influence of growth stimulants and nursery media on sprouting, rooting and growth of the orthotropic shoot cuttings using protrays during 2022-23. The growth stimulant experiment consists of eleven treatments and nursery media experiment had eight treatments. All the treatments replicated thrice and laid out in completely randomized design in a naturally ventilated polyhouse. Among different growth stimulants significant differences were found in cuttings treated with tender coconut water with highest values for sprouting, shoot and root parameters *i.e.*, least number of days to first sprout (6.00), 50 per cent sprouting (11.81 days) and complete sprouting (16.58), maximum sprout length (14.67 cm), number of leaves (4.85), total leaf area (427.07 cm^2), leaf area index (7.59), fresh (6.69 g) and dry (1.88 g) weight of shoot, survival (87.04 %), rooting (85.12 %), primary (7.56) and secondary (54.34) roots, root volume (5.00 cc) and thickness (1.78 mm), fresh (2.70 g) and dry (0.46 g) weight of root, total dry matter (2.34 g) and B:C ratio (1.57:1). However, the highest sprouting (96.29 %) was recorded with NAA @ 100 ppm. Among nursery media significant differences were found in the cutting treated with cocopeat + vermicompost + *Pseudomonas fluorescens* which recorded highest values for sprouting, shoot and root parameters *i.e.*, least number of days to first sprouting (9.00), 50 per cent sprouting (18.37) and complete sprouting (19.87), highest sprouting (87.48 %), sprout length (14.50 cm), number of leaves (5.00), total leaf area (449.59 cm^2), leaf area index (7.99), fresh (8.71 g) and dry (3.03 g) of weight shoot, survival (81.83 %), rooting (80.65 %), primary (8.67) and secondary (58.89) roots, root volume (6.84 cc) and thickness (4.26 mm), fresh (4.75 g) and dry (0.68 g) weight of root, total dry matter (3.71 g) and B:C ratio (1.42:1).

November, 2023

(Ravi, C. S)
Major Advisor

4. INFLUENCE OF FOLIAR NUTRITION ON GROWTH AND YIELD OF FRENCH BASIL (*Ocimum basilicum* L.)

(SANGOLGI OMKAR)

ABSTRACT

Field experiment was carried out to study the "Influence of foliar nutrition on growth and yield of French basil (*Ocimum basilicum* L.)" during 2022-2023 at Agricultural and Horticultural Research Station, Thirthahalli. The experiment was laid out in randomized complete block design (RCBD) with fourteen treatments and three replications. Results revealed that among different treatments, plants treated with Urea @ 0.25 % + $MgSO_4$ @ 0.25 % + $ZnSO_4$ @ 0.25 % + Potassium Schoenite @ 0.25 % (T_{14}) recorded significantly higher plant height (79.89 cm), maximum number of primary branches (38.99) and secondary branches (107.05) per plant, plant spread (2932.25 cm^2), number of leaves per plant (518.41), leaf area (4076.73 cm^2/plant), leaf area index (3.02), total dry matter production (99.17 g/plant), higher absolute growth rate (1.63 g/plant/day), crop growth rate (12.06 g/m^2/day), relative growth rate (0.0086 g/g/day) and net assimilation rate (0.00021 g/cm^2/day), chlorophyll-a (2.13 mg/g. fr. wt.), chlorophyll-b (0.85 mg/g. fr. wt.) and total chlorophyll content (2.98 mg/g. fr. wt.), fresh herbage yield per plant (451.50 g), fresh herbage yield per plot (11.29 kg), fresh herbage yield per hectare (33.44 t), dry herbage yield per plant (94.06 g), dry herbage yield per plot (2.35 kg), dry herbage yield per hectare (6.97 t), essential oil content (0.526 %) and essential oil yield (175.86 kg/h). Hence, it is concluded that foliar application of Urea @ 0.25 % + $MgSO_4$ @ 0.25 % + $ZnSO_4$ @ 0.25 % + Potassium schoenite @ 0.25 % (T_{14}) can be suggested for getting higher herbage and oil yield in French basil.

November, 2023

(M. Ravikumar)
Major Advisor

5. EFFECT OF MEDIA AND PGPR ON ROOTING OF CUTTINGS AND SURVIVAL RATE IN BUSH PEPPER (*Piper nigrum* L.)

(YESHWANTH, J.)

ABSTRACT

An experiment was conducted at Agricultural and Horticultural Research Station, Ullal, Mangalore to evaluate the effect of media and PGPRs on rooting of cuttings and survival rate in bush pepper during 2022-23. The experiment included sixteen treatments with three replications in a completely randomized design (CRD). The treatments comprised of three PGPRs *viz.*, *Azotobacter chroococcum*, *Bacillus megaterium* and *Bacillus mucilaginosus* inoculated as a single, dual and combined consortium to two medias such as red soil + sand + FYM (1:1:1) and red soil + sand + vermicompost (1:1:1). The application of all three PGPRs to the media containing red soil + sand + FYM (T_{15}) resulted in early sprouting (12.53 days). Whereas, media consisting of red soil + sand + vermicompost + *A. chroococcum* + *B. megaterium* + *B. mucilaginosus* (T_{16}) resulted in 50 per cent sprouting of the cuttings (42.33 days) and showed maximum sprouting percentage (68.89) at 90 days after planting. The treatment T_{16} also recorded maximum number of leaves (5.13), total chlorophyll content (2.52 mg/g fresh weight), total leaf area per cutting (420.80 cm^2), leaf area (82.01 cm^2), fresh and dry weight of shoots (13.80 and 2.71 g, respectively), number of primary roots (4.67), secondary roots (41.78), root length (25.76 cm), root thickness (1.47 mm), root volume (3.43 cc), fresh and dry weight of roots (1.61 and 0.19 g, respectively), total dry matter (2.90 g) and survival rate (58.89 %) at 180 days after planting and the highest B: C ratio (1.33) was recorded in T_{15}. The combined inoculation of PGPRs with the media containing soil, sand and vermicompost proved to be the best consortium than single and dual inoculation for obtaining better sprouting, growth, rooting and survival of bush pepper cuttings.

November, 2023

(Raviraja Shetty, G)
Major Advisor

6. RESPONSE OF ORTHOTROPIC AND PLAGIOTROPIC SUCKER CUTTINGS TO GROWTH PROMOTERS IN COFFEE (*Coffea canephora* L.)

(YOGESH KUMAR, B.)

ABSTRACT

In coffee cultivation, the propagation of new plants is essential for maintaining and expanding coffee plantation. Clonal propagation is a mean to produce true to type plants of elite mother plants. Coffee demands periodical removal of suckers manually, which otherwise can be utilized as explants for vegetative propagation. Thus, an experiment was conducted during the academic year 2022–23 to study the response of orthotropic and plagiotropic sucker cuttings of robusta coffee (*Coffea canephora* L.) at Adi nursery, Suntikoppa, Kodagu. The experiment was laid out in randomized complete block design (factorial) and replicated thrice. The experiment consisted of 16 treatments comprising of two factors namely shoot cuttings (at two levels S_1- orthotropic and S_2- plagiotropic cuttings) and growth promoters (at eight levels G_1-control, G_2-IBA @1000 ppm, G_3-IBA @2000 ppm, G_4-NAA @200 ppm, G_5-NAA @400 ppm, G_6- *Azospirillum* @10g/bag, G_7-*VAM* @5g/bag and G_8- *Azospirillum* @10g/bag +*VAM* @5g/bag). Regular observations were made on the cuttings and measurements of sprouting and growth were recorded at monthly interval. Significant variations were recorded for shoot growth and root parameters with respect to type of cuttings, growth promoters and their interaction. Orthotropic cuttings consistently outperformed plagiotropic cuttings across all parameters. G_8 (*Azospirillum*@10g/bag +*VAM*@5g/bag) proved to be the most effective growth promoter for sprouting and shoot growth. On the other hand, G_3 (IBA @2000 ppm) exhibited superior results in case of root growth. Among the interactions, S_1G_8 (orthotropic+ *Azospirillum* @10g/bag +*VAM* @5g/bag) recorded highest values for shoot and sprouting parameters *i.e.*, sprouting (98.89%), shoot length (19.11cm), number of leaves (13.76), leaf area (1122.83cm^2) and collar girth (7.45mm). In terms of root parameters, S_1G_3 (orthotropic +IBA @2000 ppm) recorded highest values *i.e.*, longest roots (15.99cm), primary (10.73) and secondary (202.87) roots, root volume (4.27cc), root thickness (1.88mm), fresh (3.95g) and dry (0.40g) weight of roots and survivability (87.78%).

November, 2023

(Bhoomika, H. R)
Major Advisor

Vegetable Science

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Hort.) theses abstracts produced in the

Department of Vegetable Science

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1. NATURE AND MAGNITUDE OF GENETIC VARIABILITY AND DIVERSITY STUDIES IN GARLIC (*Allium sativum* L.) GERMPLASM

(KONEDENA RAJYA LAKSHMI)

ABSTRACT

The current experiment was conducted at the Zonal Agricultural and Horticultural Research Station in Hiriyur, Karnataka during the *Rabi* season of 2022–2023 to evaluate the genetic variability, heritability and genetic advance in twenty- seven different genotypes of garlic. The experiment had two replications and was set up using a Randomized Complete Block Design. The high heritability (> 60 %) along with high genetic advance (> 20 %) as a percent over mean were observed for plant height, number of leaves, leaf length at 30 days after sowing (DAS), leaf width collar thickness at 60 DAS, average weight of bulb, total bulb yield per ha, equatorial and polar diameter, neck thickness, dry weight of bulb, number of cloves per bulb, total soluble sugars and chlorophyll content, indicating that these characters are governed by additive gene action. Therefore, direct selection can be used to enhance these characters. Correlation studies revealed that bulb yield per plot exhibited highly significant and positive association with plant height, leaf length, leaf width and collar thickness at 90 DAS, days to maturity, total bulb yield, number of cloves per bulb, neck thickness of bulb, equatorial bulb diameter and polar bulb diameter at both phenotypic and genotypic levels indicating the importance of these traits in selection. Cluster analysis divided the genotypes into five clusters and bulb yield per ha contributed the maximum (26 %) to the genetic diversity among the characters followed by average weight of bulb, number of cloves, equatorial diameter, polar diameter of the bulb, number of leaves, plant height and total soluble solids. Hence, these traits may be given higher attention while selecting lines for future breeding programmes to generate large variability. The top five best genotypes identified from the present study based on the mean performance were Kodaikanal Local, DOGR- 205, DOGR-540, DOGR- 157 and DOGR-204 for bulb yield.

November, 2023

(Prakash Kerure)
Major Advisor

2. EVALUATION OF ADVANCED BREEDING LINES OF BRINJAL (*Solanum melongena* L.) AGAINST BACTERIAL WILT DISEASE

(MANJUSHREE, B. U.)

ABSTRACT

The present investigation was carried out to assess the performance, genetic variability and to screen against bacterial wilt disease in twenty advanced breeding lines of brinjal along with three checks (Arka Keshav, Arka Neelanchal Shyama and Devanur Local) at College of Horticulture, Mudigere during 2022-23. Analysis of variance showed significant differences among genotypes for all the traits under study. High GCV and PCV was recorded for number of primary branches (60 DAT), days to first flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, number of fruits per plant, fruit length and fruit diameter indicating the presence of wide variability among the genotypes for different traits. High heritability (>60 %) coupled with high genetic advance (>20 %) as per cent over mean was observed for plant height, number of primary branches, days to first flowering , days to fifty per cent flowering, number of flower clusters per plant, number of flowers per cluster, number of fruits per cluster, fruit setting percentage, days taken for first picking, number of fruits per plant, average fruit weight, fruit length, fruit diameter, stalk length, fruit yield per plant, fruit yield per plot, estimated fruit yield, dry matter content and fruit phenol content suggesting that these traits are governed by additive gene action. Hence, direct selection can be followed for improvement of these traits. Among the lines, the least wilting percentage was observed in CHMB-2, CHMB-6, CHMB-9, CHMB-11 and CHMB-23 and maximum in CHMB-21. Based on the performance for growth and yield attributes, the lines CHMB-2, CHMB-6, CHMB-9, CHMB-11 and CHMB-23 were found superior for most of the traits. Hence, these lines can be utilized for further crop improvement programme.

November, 2023

(Devaraju)
Major Advisor

3. GENETIC INVESTIGATION OF RADISH (*Raphanus sativus* L.) GENOTYPES UNDER HILL ZONE OF KARNATAKA

(RAKSHITHA, G.)

ABSTRACT

A study was undertaken on the genetic investigation of radish genotypes in the experimental block of the Department of Vegetable Science, College of Horticulture, Mudigere, Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga during 2022-23. The experiment was laid out in a Randomized Complete Block Design with three replications. Analysis of variance showed highly significant differences among all the genotypes for all the characters under study. High heritability coupled with high genetic advance as a per cent of mean was recorded for plant height at 30 and 45 DAS (Days after sowing), number of leaves at 15 DAS, leaf length at 30 and 45 DAS, leaf width at 15 and 30 DAS, days to harvest, root length, root diameter, root girth, root weight, root volume, root yield per plot and root yield per hectare, suggesting that these traits can be improved through direct selection due to additive gene action. Based on D^2 analysis, 20 genotypes of radish were grouped into five clusters. Among the characters studied, root yield per plot contributed maximum (45.26 %), to the genetic diversity, followed by ascorbic acid (14.74 %) and leaf area index (14.00 %). Correlation studies exhibited that root yield per plot showed a highly significant and positive correlation with plant height, days to harvest, root length and root weight. Path analysis revealed that leaf length, leaf area index, days to harvest, root length and root weight had a direct and positive effect on root yield per plot. Based on the mean performance, genotypes such as Kashi Hans, Kashi Sweta and ORBI- 0527 have been identified as promising for higher yield, which can be exploited for the further crop improvement programme under the hill zone of Karnataka.

November, 2023

(Srinivasa, V.)
Major Advisor

4. EFFECT OF SECONDARY NUTRIENTS AND BIOFERTILIZERS ON GROWTH, YIELD AND QUALITY OF CHILLI (*Capsicum annuum* L.) UNDER HILL ZONE OF KARNATAKA

(RASHMI, H.)

ABSTRACT

An experiment was conducted during 2022-23 at the department of Vegetable Science, College of Horticulture, Mudigere to assess the impact of secondary nutrients and biofertilizers on growth, yield and quality in chilli (*Capsicum annuum* L.) using Randomised Complete Block Design (RCBD) with 11 treatments and 3 replications. Among the treatments, the treatment (T_{11}) comprising 75 % RDNPK + $CaNO_3$@ 0.5 %+ $MgSO_4$ @ 0.4 % +*Azospirillum* + PSB + KSB recorded maximum plant height (84.02 cm), number of leaves per plant (288.58), plant spread North-South (61.58 cm) and East-West (57.66 cm), total branches (31.91), leaf area (8085.43 cm^2), dry weight (185.20 g), absolute growth rate (1.673 g/plant/day), cumulative growth rate (6.29 g/m^2/day), net assimilation rate (0.0817 g/dm^2/day), relative growth rate (0.0309 g/g/day), fruit length (11.53 cm), fruit diameter (1.82 cm), pericarp thickness (2.49 mm), number of fruits per plant (234.98), average fruit weight (6.42 g), fruit yield per plant (796.1 g), fruit yield per hectare (29.50 t/ha), total chlorophyll content (2.24 mg/g), ascorbic acid content (154.69 mg/100 g) and shelf life (16.18 days). However, the minimum physiological loss in weight (6.83 %), rotting (11.97 %), available soil N (305.65 kg/ha), P_2O_5 (45.67 kg/ha), K_2O (117.56 kg/ha), calcium (146.06 mg/kg) and magnesium (109.69 mg/kg) was observed in same treatment. The maximum leaf NPK content (2.76 %, 0.42 % and 2.99 %, respectively), calcium (2.37 %), magnesium (1.23 %), soil microbial population such as bacteria (225.06 cfu g^{-1}), fungi (51.35 cfu g^{-1}), actinomycetes (41.81 cfu g^{-1}), PSB (14.10 cfu g^{-1}) and KSB (7.19 cfu g^{-1}) was observed highest in T_{11}. Economic analysis also indicated that application of T_{11} resulted in maximum net returns of ₹ 446501.68 ha^{-1} and B:C ratio (1:3.11).

November, 2023

(Srinivasa, V.)
Major Advisor

5. EFFECT OF GROWTH STIMULANTS ON GROWTH AND BULB YIELD OF ONION (*Allium cepa* L.) UNDER CENTRAL DRY ZONE OF KARNATAKA

(VINAY KUMAR)

ABSTRACT

An experiment was conducted to assess the effect of growth stimulants on growth and bulb yield of onion under central dry zone of Karnataka. The experiment was set up in a Randomized Complete Block Design (RCBD) comprising thirteen treatments with three replications. The treatments consisted of various concentrations of salicylic acid (100, 200 and 300 ppm), triacontanol, humic acid and seaweed extract (each at 0.2 %, 0.4 % and 0.6 %). Results showed that the foliar application of seaweed extract at 0.6 per cent recorded maximum plant height (72.09 cm), leaf length (69.08 cm) and pseudostem length (5.09 cm). The foliar application of triacontanol at 0.4 per cent recorded maximum number of leaves per plant (11.48), collar thickness (14.85 mm), bulb yield (12.33 kg/plot), total bulb yield (32.61 t/ha) and marketable bulb yield (31.29 t/ha). While, minimum marketable bulb yield (24.95 t/ha) and maximum un-marketable bulb yield (1.72 t/ha) were recorded under control. The triacontanol (0.4 %) also recorded maximum values for A grade bulb yield, number of rings, polar diameter of bulb, equatorial diameter of bulb, bulb volume and total chlorophyll content. The TSS, reducing sugars and total sugars were recorded maximum for seaweed extract (0.6 %). The higher net returns (₹ 3,29,936/ha) and benefit cost ratio (2.37) were recorded with the foliar application of triacontanol at 0.4 per cent. Hence, foliar application of triacontanol (0.4 %) at 30 and 60 DAT may be recommended for higher yield and net returns under central dry zone of Karnataka.

November, 2023

(P. Umamaheswarappa)
Major Advisor

6. GENERATION MEAN ANALYSIS FOR YIELD AND YIELD RELATED TRAITS IN TOMATO (*Solanum lycopersicum* L.)

(YOSHITA SHRIKRISHNA SHASTRI)

ABSTRACT

The study on generation mean analysis for yield and yield related traits was conducted at College of Horticulture, Mudigere during 2022-2023 under protected condition in two tomato crosses *viz.*, EC15127 × EC362941 and EC521069 × EC362941. High PCV and GCV were recorded for fruit yield per plant, plant height, locules per fruit, number of fruits per plant, fruit volume, average fruit weight, days taken to first harvest and days taken from first harvest to last harvest among the F_3 progenies of both the crosses with addition of traits such as number of flowers per cluster and number of fruit clusters per plant in EC521069 × EC362941. Estimates of high heritability coupled with high genetic advance as per cent over mean recorded for most of the studied characters inferring that selection could improve these traits by highlighting the significance of additive gene action. Joint scaling and scaling tests showed significance for all the characters indicating epistasis. Fruit yield per plant documented additive gene action in two crosses in conjunction with additive × additive gene interaction in EC15127 × EC362941 recommending, simple selection and dominance × dominance in EC521069 × EC362941 inferring, complex nature of inheritance. Generation mean analysis revealed the presence of both additive or dominant with additive × additive or dominance × dominance interaction for the characters indicating complex inheritance, one or two cycles of reciprocal recurrent selection followed by selection is required for development of inbred or variety. Heterosis and inbreeding depression revealed the presence of fixable gene action for yield suggesting, simple selection or pedigree selection. The superior segregants identified based on fruit yield and yield attributing characters, in the cross EC15127 × EC362941 and EC521069 × EC362941 could be developed into pure lines by selfing and selection or released as variety after stabilization.

November, 2023

(Srinivasa, V.)
Major Advisor

7. INDUCED MUTATION FOR QUALITY IMPROVEMENT IN OKRA (*Abelmoschus esculentus* L.) CV. ARKA NIKITA

(SOURAB KALYANE)

ABSTRACT

An experiment entitled “Induced Mutation for Quality Improvement in Okra (*Abelmoschus esculentus* L.) Cv. Arka Nikita” was conducted at college of Horticulture, Hiriyur, during 2022-23. The experiment was laid out in randomized complete block design. The seeds of okra Cv. Arka Nikita were treated with gamma irradiation (10 kR - 60 kR) and chemical mutagen ethyl methane sulfonate (0.1 % - 0.6 % EMS). The maximum (98.82) and minimum (6.67) survival per cent was observed in T_1(Control) and T_{13} - 0.6% EMS. Based on survivability, LD_{50} was observed at 60 kR and 0.4 % EMS in gamma irradiation and EMS respectively. The analysis of variance was found to be significant for most of the traits indicating the existence of variability among the mutant population. In case of quality parameters more variations were observed at higher doses especially at LD_{50} value. Moderate PCV, GCV (10 - 20 %) and high heritability (> 60%) was observed for traits like number of nodes, internodal length, number of leaves, number of branches, chlorophyll b, number of fruits per plant, fruit yield per plant, fruit yield per plot, fruit yield per hectare. Correlation studies revealed that fruit yield per plant had positive significant association with plant height (1.200), number of nodes (0.984), number of leaves (1.001), number of branches (0.962), number of fruits per plant (1.021), average fruit weight (1.275), fruit length (0.999) and fruit diameter (1.143), indicating selection of these emerged traits will be effective for further crop improvement. Path coefficient analysis indicating that plant height (0.627), number of nodes (1.518), number of branches (1.820), days taken for first flowering (0.034), number of fruits per plant (4.694), average fruit weight (0.481) and fruit length (3.405) had direct positive association with fruit yield per plant indicating these traits respond to selection in turn improves the yield.

December, 2023

(P. Umamaheswarappa)
Major Advisor

Forestry

Silviculture and Agroforestry

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Forestry) theses abstracts produced in the Department of Silviculture & Agroforestry

1. ASSESSMENT OF GROWTH AND BARK YIELD OF *Litsea chinensis* LAM. IN HUMID REGION OF KARNATAKA

(AKASH)

ABSTRACT

Litsea chinensis is one of the important bark-yielding tree species belonging to the family Lauraceae. The bark of the species is commercially used in the preparation of incense sticks as an adhesive commonly called *Jiggat*. Due to unscientific harvesting techniques, its population and distribution are shrinking. The present field experiment was carried out to study the growth performance of *L. chinensis* and to know the influence of five different bark harvesting methods *viz.*, T_1- One quarter harvesting; T_2- Two opposite quarter harvesting; T_3- Alternate strip harvesting; T_4- Two adjacent quarter harvesting in three months interval; T_5- Two opposite quarter harvesting in three months interval, on bark yield, quality and recovery per cent. The investigation was carried out in the coffee-based agroforestry at three locations *viz.*, Mugatageri (L_1), Besguru (L_2) and Beguru (L_3) of Ponnampet Taluk. The study revealed that growth performance of the species in coffee-based agroforestry varied with locations where L_1 recorded the highest growth parameters such as height (7.91 m), diameter (12.64 cm) and volume (0.021 m^3) followed by L_2 and L_3. The highest total fresh bark yield was found in T_2 (2193.00 g) among the different harvesting methods. Bark recovery per cent after six months of initial harvesting was found to be highest in T_3 (99.04 %) and least in T_5 (47.07 %). The bark quality parameters such as the viscosity and moisture content varied significantly among the different harvesting methods, whereas, the impact on bulk density and ash content was not evident. However, the study concluded that the growth of the species is encouraging and can be introduced as a shade tree in coffee-based agroforestry. Among the different harvesting methods, the bark recovery was maximum in the alternate strip harvesting method in six months. Though the bark yield was different for different methods of harvesting but was not significant in most of the harvesting methods.

January, 2023

(Ramakrishna Hegde)
Major Advisor

2. STUDIES ON REPRODUCTIVE PHENOLOGY OF *Hopea parviflora* BEDD. AND *Kingiodendron pinnatum* (DC.) HARMS. IN WESTERN GHATS

(SANJAY G. R.)

ABSTRACT

Western Ghats are considered as one of the biodiversity hotspots of the world and harbours many endangered and threatened species. Among many of the rare and endangered tree species listed by IUCN, *Hopea parviflora* Bedd. and *Kingiodendron pinnatum* (DC.) Harms. are the two important tree species considered. Reproductive phenology of any tree species renders the events that occurs in time and provide useful information on the periodicity and seasonality of growth and dynamics of flowering and fruiting characters. In this context, the present study was carried out in Makutta territorial range of Kodagu, Karnataka to understand the reproductive phenology, different stages of fruit and seed development, phenological variation in relation to environmental factor. Ten matured trees of both *Hopea parviflora* and *Kingiodendron pinnatum* were selected and tagged to observe the reproductive phenological events once in 15 days. The observation on *Hopea parviflora* and *Kingiodendron pinnatum* indicated that flowering and fruiting periods were from January to July and February to July, respectively which found shift in days for the phenophases. Fruit and seed maturity of the selected species profoundly increases with period of the growth. The fruit length and breadth of *Hopea parviflora* and increased from 5.83 mm to 12.54 mm and 2.84 mm to 7.98 mm, respectively indicating maturity. Observed fruit length and breadth of *Kingiodendron pinnatum* increased from 17.35 mm to 36.41 mm and 12.45 mm to 26.93 mm, from fruit initiation respectively and found increased in seed length and breadth from 11.02 mm to 32.43 mm and 8.10 mm to 25.93 mm. Due to global climate change, the changes in flowering, fruiting, maturity of fruits and seeds, seed germination are found to be strongly influenced by environmental factors such as temperature, precipitation and relative humidity.

July, 2023

(Maheshwarappa V.)

Major Advisor

3. STUDIES ON REPRODUCTIVE PHENOLOGY OF *Dipterocarpus indicus* BEDD. AND *Knema attenuata* (HOOK. F. & TH.) WARB. IN WESTERN GHATS

(NAVEEN KUMAR T. D.)

ABSTRACT

Western Ghats are considered as one of the biodiversity hotspots of the world and harbours many endangered and threatened species. Among many of the rare and endangered tree species listed by IUCN, *Dipterocarpus indicus* Bedd. and *Knema attenuata* (Hook. f. & Th.) Warb. are the two important tree species considered. Reproductive phenology of any tree species renders the events that occurs in time and provide useful information on the periodicity and seasonality of growth and dynamics of flowering and fruiting characters. In this context, the present study was carried out in Makutta territorial range of Kodagu, Karnataka to understand the reproductive phenology, different stages of fruit and seed development, phenological variation in relation to environmental factor of *Dipterocarpus indicus* Bedd. and *Knema attenuata* (Hook. f. & Th.) Warb. Ten matured trees of both *Dipterocarpus indicus* and *Knema attenuata* were selected and tagged to observe the reproductive phenological events once in 15 days. The observation on *Dipterocarpus indicus* and *Knema attenuata* indicated that flowering and fruiting periods were from December to April and January to July, respectively which found shift in days for the phenophases. Fruit and seed maturity of the selected species profoundly increases with the period of growth. The fruit length and breadth of *Dipterocarpus indicus* increased from 12.34 mm to 22.59 mm and 8.98 mm to 15.55 mm, respectively, indicating maturity. Observed fruit length and breadth of *Knema attenuata* increased from 23.99 mm to 47.36 mm and 11.79 mm to 20.25 mm, from fruit initiation respectively, and found an increase in seed length and breadth from 22.04 mm to 30.72 mm and 7.15 mm to 11.53 mm. Due to global climate change, the changes in flowering, fruiting, maturity of fruits and seeds, seed germination are found to be strongly influenced by environmental factors such as temperature, precipitation and relative humidity.

August, 2023

(Maheshwarappa V.)

Major Advisor

4. EFFECT OF PRE-SOWING TREATMENTS ON SEED GERMINATION AND SEEDLING GROWTH IN *Terminalia tomentosa* (ROXB.)

(CHAITRA A)

ABSTRACT

Forest plantations play a vital role in providing timber and various non-timber products as natural forests are under increased pressure due to overexploitation. Rise in population has resulted in increased demand for wood in the country as the area under wood production is less due to various factors. India's round wood production is 48,154 Mm^3 when compared to the world's round wood production of 20,00,179.8 Mm^3. Whereas India's round wood import is 4,815.24 Mm^3 and export is just 7.22 Mm^3 when compared to the world's export of 1,46,435.5 Mm^3 (ITTO, 2021). Hence, it is vital to adopt plantation activities of some economically important timber species in order to meet present and future wood requirements in the country. *Terminalia tomentosa* is one of the important timber species which is having the potential to fulfil wood needs along with providing various tangible and intangible benefits. Since production of quality planting material of the species through seeds is difficult as seeds possess hard seed coat dormancy which resulted in very little exploitation of the species. Thus, seed and seedling performance of the species with the assistance of different pre-sowing seed treatments was determined. Seeds were treated with eight different pre-sowing treatments in order to improve seed germination and seedling quality. Seedling growth parameters were recorded at three stages (30, 60 and 90 days after sowing). Results revealed that, mechanical injury + soaking in 500 ppm GA_3 for 24 hours has enhanced seed germination (72.3 %) and improved seedling growth in terms of plant height, collar diameter, seedling dry weight, sturdiness quotient and vigour index when compared to all other treatments. Thus, the combined effect of treatment (mechanical injury for physical dormancy + action of GA_3 on chemical inhibitors present in the seeds) could improve seed germination and seedling growth performance.

November, 2023

(Vasudev K. L)

Major Advisor

5. SEED STORAGE AND GERMINATION STUDIES IN *Elaeodendron paniculatum* WIGHT AND ARN.

(DHANUSHREE K)

ABSTRACT

Seed storage of endemic tree species is a crucial conservation method. It serves as a genetic reservoir, safeguarding the unique genetic diversity of these species. These individual trees are exclusively confined to this geographical region. *Elaeodendron paniculatum* Wight & Arn., also known as *Cassine paniculate*, is a recalcitrant seed-bearing tree belonging to the Celastraceae family, which is endemic to the Western Ghats. It is used in traditional medicine to treat cancer, and seed oil has antibacterial, analgesic and antioxidant properties. The recalcitrant nature of these seeds made them susceptible to losing their viability in a shorter period. The seed oil supports the deterioration of the seed by oxidation of the reserve food. The present study investigates the effect of seed storage treatments and storage periods on the germination of the seeds and their influence on the performance of the seedlings. The study revealed that among different storage treatments, seeds treated with Carbendazim 1 % exhibit the maximum (50.72 %) germination per cent under freshly sown seeds and the minimum (10.38 %) in Control under the fourth storage period (90 days after collection). Seeds treated with Carbendazim attained maximum shoot length and root length (24.45 cm and 7.53 cm, respectively). The seedling parameters significantly varied with the storage period and freshly sown seeds exhibited vigorous growth with a maximum (1640.49) vigour index.

November, 2023

(Vasudev K. L)

Major Advisor

6. RESPONSE OF *Saraca asoca* (ROXB.) DE WILDE SEEDLINGS TO ELEVATED CARBON DIOXIDE AND FERTILIZER LEVELS IN NURSERY

(MALSAWMDAWNGLIANI)

ABSTRACT

Atmospheric CO_2 levels are currently higher than at any time in the past 800,000 years, with anthropogenic activities being the primary cause of this increase in CO_2 and its associated climate change. The record demonstrates a persistent increase in CO_2 concentration, with levels reaching 415 ppm in 2020 and rising to 424 ppm by 2023. Consequently, understanding how plants respond to increasing atmospheric CO_2 is of great importance, given the predicted continued rise in CO_2 concentrations. Ashoka (*Saraca asoca* (Roxb.) De Wilde) is a significant medicinal tree species native to India and serves as a flagship species for biodiversity conservation in the Western Ghats. Due to its high medicinal value, it has faced over-exploitation in its natural habitat. This study investigated the germination behaviour of Ashoka seeds under different CO_2 concentrations, including control, 500 ppm, 600 ppm, and 700 ppm, within polytunnels. Additionally, different NPK fertilizer levels were applied: T_1 (Control), T_2 (Optimum - N: 375 mg, P: 250 mg, K: 125 mg), T_3 (25% > Optimum level of NPK), and T_4 (50% > Optimum level of NPK). The experiment was conducted using a Split-plot design with four replications. The results of the study indicated that elevated CO_2 significantly enhanced seed germination per cent (87.67%) and reduced time taken for seed germination to initiate (8 days). Elevated CO_2 levels and fertilizer application positively impacted seedling height, leaf production, survival rate, volume index, biomass increment, and overall seedling quality parameters. Therefore, the positive effects observed in the study highlighted the adaptive potential of this important medicinal tree species in the face of changing environmental conditions.

November, 2023

(Maheshwarappa V.)

Major Advisor

7. PERFORMANCE OF DIFFERENT BAMBOO SPECIES AND *Indigofera tinctoria* IN AGROFORESTRY SITUATION

(PRAMOD KUMAR, P.)

ABSTRACT

Bamboos are commercially an important woody perennial grasses that have been recognized as a substitute for timber. In the recent years, owing to its diversified uses, it has drawn attention to mass cultivation. In this regard, to understand the bamboo growth performance, their suitability and the soil nutrient dynamics in bamboo-based agroforestry, a study was conducted in three-year-old plantations consisting of six different bamboo species (*Dendrocalamus brandisii, Bambusa tulda, Bambusa nutans, Bambusa balcooa, Thyrsostachys oliveri and Dendrocalamus latiflorus*) planted with a spacing of 4 m x 4 m in a randomized complete block design (RCBD) with three replications at Iruvakki campus, Shivamogga. Before recording the growth attributes on bamboo, culms in a clump were categorized into first, second and third year culms and observations were recorded accordingly. The interspaces between the bamboo rows were utilized to cultivate *Indigofera tinctoria* as an intercrop. Among the species, *D. latiflorus* had significantly higher values for height (9.47 m) and total number of culms (20.9) and *B. nutans* scored maximum value for clump girth (3.55 m). Significantly higher culm diameter was recorded in *B. tulda* and the values for first, second, and third-year culms were 3.4 cm, 2.5 cm, and 1.5 cm, respectively. In the case of Internodal length, *D. latiflorus* was found to be superior for all age categories of culms, (41.54 cm, 33.4 cm and 27.02 cm). The yield of the intercrop was higher in control (3.43 Mg ha^{-1}) and was found to be on par with Indigo + *B. balcooa* (3.21 Mg ha^{-1}) and Indigo + *B. tulda* (3.02 Mg ha^{-1}). All the soil parameters except soil pH were negatively correlated with the soil depth. The organic carbon and Phosphorus were found higher under *D. latiflorus* and *B. balcooa*, whereas *B. tulda* scored maximum values for Nitrogen and Potassium respectively.

December, 2023

(Ramakrishna Hegde)
Major Advisor

8. ASSESSMENT OF PRODUCTIVITY OF *Dendrocalamus stocksii* AND ASSOCIATED CROPS UNDER AGROFORESTRY SITUATION IN HUMID REGION OF KARNATAKA

(SALMA)

ABSTRACT

Bamboo-based agroforestry is recently recognized as the potential land use system to achieve ecological stability and economic efficiency for the farmer community. In this context, a field experiment was conducted to assess the performance of *Dendrocalamus stocksii* and intercrops within varying bamboo spacing configurations. Additionally, the study aimed to identify appropriate harvesting techniques for *D. stocksii* and evaluate the soil chemical properties in a four year old *D. stocksii* plantation at the Main Agricultural and Horticultural Research Station in Iruvakki, Shivamogga district during 2022-23. The results of the study demonstrated that *D. stocksii* exhibited the highest growth performance when planted at wider spacing T3 (8 m × 8 m) followed by T2 (8 m × 6 m), with the least growth performance observed in closely spaced T1 (8 m × 4 m). Compared to the Horseshoe method of harvesting, the Tunnel method of harvesting proved more effective in reducing the sacrificial harvesting of younger culms. Furthermore, the study revealed variations in crop yields within different bamboo spacing regimes. The highest yields of turmeric and galangal were obtained in the wider spacing T3 (2677 kg ha^{-1}), followed by T2 (2309 kg ha^{-1}), while the lowest yields were observed in the closely spaced T1 (1764 kg ha^{-1}). Additionally, the findings underscored significant differences in soil nutrient content across the various spacing treatments. Specifically, the amounts of available nitrogen (N), phosphorus (P), potassium (K), and soil organic carbon were highest in T3 (8 m × 8 m). In conclusion, this study underscores the importance of optimizing bamboo spacing, selecting appropriate harvesting techniques, and considering intercropping strategies to enhance agroforestry systems' overall productivity and sustainability involving *D. stocksii*.

November, 2023

(Ramakrishna Hegde)
Major Advisor

Forest Biology and Tree Improvement

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Forestry) theses abstracts produced in

Forest Biology and Tree Improvement

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1. IMPACT OF ALIEN INVASIVE SPECIES (*Cassia spectabilis* DC.) ON FLORISTIC DIVERSITY, NATURAL REGENERATION AND SOIL PROPERTIES IN NAGARAHOLE TIGER RESERVE

(AKSHAYAKUMARI, A.)

ABSTRACT

A study was conducted to estimating the impact of *Cassia spectabilis on* floristic diversity and regeneration pattern of *native flora at* D B Kuppe and Anechowkur wildlife range of Nagarahole Tiger Reserve of Karnataka. The intensity of infestation was *categorized into three level viz.*, highly infested, moderately infested and non-infested areas. In each category, 20 quadrates of 20 × 20 m were laid randomly in two ranges to study the floristic diversity and regeneration pattern. Four soil samples were collected at 0-20 cm and 20- 40 cm depths randomly and a composite sample was made and analyzed for moisture content, bulk density, pH, EC and available organic carbon. It has been observed that the species richness, Shannon-Wiener index and Simpson's index of dominance was highest in non-infested areas, followed by moderately and highly infested areas. Similar pattern was also observed in regeneration pattern where regeneration diversity was found to be highest in the non-infested areas followed by moderately infested areas. Both basal area and density varied significantly among the different levels of *C. spectabilis* infestation. The values of density of regenerates were highest in the non-infested areas (554 individuals ha^{-1}) followed by moderately infested areas (540 individuals ha^{-1}) in D B Kuppe. The density of regenerates in the Anechowkur range was found to be maximum in non-infested areas (656 individuals ha^{-1}) followed by moderately infested areas (384 individuals ha^{-1}). Thus, non-infested areas helping in improving regeneration of tree species. Soils within *C. spectabilis* had greater moisture content, higher electric conductivity, higher pH and highest percentage of organic matter than soils from other levels of infestation. But bulk density was highest in non-infested areas of *C. spectabilis*. Correlation analysis for tree regeneration with soil properties revealed that most of the variables were correlated with each other.

January, 2023

(Hareesh, T. S.)

Major Advisor

2. ASSESSMENT OF TREE DIVERSITY, REGENERATION AND MAPPING OF SHOLA FORESTS IN KODAGU DISTRICT

(NALINA S J)

ABSTRACT

Sholas are the most unique vegetation with diverse habitats on the earth; and are endemic to the Southern Western Ghats. The present study was undertaken to assess the tree diversity, regeneration and mapping of Shola Forest in Brahmagiri Wildlife Sanctuary at three elevations: 1300-1400 m, 1400-1500 m and 1500-1600 m. In each of these elevations, 6 belt transacts of 100 m × 5 m were laid. Three sub transacts of 5 m×2 m were laid in each main belt transacts to assess the regeneration status. The Shola forest mapping was done using Sentinel-2 satellite imagery in the latest cloud-based platform, Google Earth Engine. The results demonstrated that the maximum density was achieved at 1300-1400 m elevation. Girth class distribution did not show strict inverse J-shaped pattern. The highest density of growing stock was observed in low elevation (423 stems ha^{-1}) followed by mid elevation (393 stems ha^{-1}) and higher elevation (383 stems ha^{-1}). The highest density of regenerates was also observed in lower elevation. It was noticed that the lower elevation had higher species diversity in comparison to the higher elevations. The NDVI revealed greater frequency of 0.5 to 0.6 range suggesting the healthy vegetation. Out of the 182.57 km^2 total area of Brahmagiri Wildlife Sanctuary, 20.25 km^2 (≥1300 m) of the area was defined as the Shola region based on the generated elevation map. It is clear from the study that the Sholas are currently confined to a very small area in the upper montane regions of India's Western Ghats, and this study offers useful information for decision-making on the protection and conservation of biodiversity by putting appropriate and efficient management plans in place.

April, 2023

(M. Jadeyegowda.)

Major Advisor

3. MITIGATING HUMAN-ELEPHANT CONFLICT BY BIO FENCE OF BEES AND ASSOCIATED BENEFITS

(ARJUN P. M.)

ABSTRACT

Kodagu district produces 2 per cent of the world's coffee, in complex, multistoried agroforestry systems. The forests of the district harbour a large population of Asian elephants (*Elephas maximus*). The combined effects of high elephant density and major landscape changes due to the expansion of coffee cultivation are the cause of human-elephant conflicts (HEC). Mitigation strategies, including the forest department's electric fences and compensation schemes, have met with limited success. The present study was carried out with objectives 1. Study the spatial and temporal pattern of HWC in the Nagarahole range, 2. Test the effectiveness of bees as a biological barrier in the course of wild elephants toward human settlements and reduce HEC, 3. Study the associated benefits of bee fences on coffee. The results indicate that human-wildlife conflicts peak from June to August months of the year and 36 villages are identified to be at high risk of conflict. Beehive fences were installed across the elephant crossings into the plantation to study the interaction between them and it showed that the bees deterred 83.33 per cent of elephants that tried to enter the plantation. Along with these, pollinator diversity and density were estimated as part of studying the associated benefits. Bees comprised 92.97 per cent of all 2448 floral visitors observed, of which 91.95 per cent were social bees and 1.02 per cent were solitary bees. Social bees were the most common visitors and among them, *Apis cerana indica* (48.24% of total floral visitors), *Apis dorsata* (8.46%) and *Tetragonula iridipennis* (32.84%) were prominent. Compared to previous studies, the density of *Apis cerana* indica has increased because the bee hives kept has bio-fence. The study of the efficiency of bee pollination in Robusta coffee showed no significant difference in the initial fruit set between the two treatments: open pollination (81.42%), and wind pollination (78.21%). The average fresh weight of an open-pollinated branch was 19.31 per cent more than wind pollination. The average dry weight and seed weight of the open-pollinated branch was 17.26 per cent and 19.94 per cent more as compared to wind-pollination, respectively. In wind-pollinated branches, pea-berries were 20.63 per cent of the total yield and in open-pollinated branches proportion of pea-berries was 12.29 per cent of the total yield. The proportion of pea-berries increased as the distance from the bee fence increased.

May, 2023

(Kushalappa C. G.)
Major Advisor

4. ASSESSMENT OF WILD ORCHID DIVERSITY IN SACRED GROVES OF KODAGU IN THE CENTRAL WESTERN GHATS

(SUNIL, V. GUNAGA)

ABSTRACT

Central Western Ghats are treasure trove of incredible wonders and biodiversity is the buzz word of the day dealing with environmental issues. Epiphytes are "Keystone resources" that play significant role in maintaining the forest canopies. Orchids, know to jewels of plant kingdom are a unique group of flowering plants belong to Orchidaceae and is one of the most ecologically and morphologically diverse angiosperm families. Kodagu district, harbor about 65 species of wild orchids which include many endangered medicinal as well as aromatic orchid plants. The indigenous Kodava culture of nature worship and the beautiful alpine landscape provide an idyllic area, which is an ideal habitat for wild orchids. Orchids are highly vulnerable group of plants and are sensitive to slight disturbance to their primary habitat. Hence, the present study was carried out in the sacred groves of Virajpet taluk of Kodagu district. A cluster of four villages from semi evergreen and moist deciduous vegetation type were selected for the study.Present study indicates that sacred groves harbor fairly good number of orchid species diversity.A total of 30 orchid species comprising 20 genera have been recorded from the two vegetation types. The maximum number (28) of orchid was found in semi evergreen vegetation type in Kakottu Aiyappa, sacred grove. The least number (11) was recorded in the moist deciduous vegetation type in Badrakali sacred groves. Among different vegetation types we have recorded more number of orchids in semi evergreen vegetation compared to moist deciduous. The orchid distribution was on par in both the vegetation types. The Simpsons (1.563) and Shannon diversity index (0.0535) are higher in the semi evergreen types of sacred groves. With respect to the species diversity, four genera had more number of species; the most abundantly available orchid species are *Dendrobium herbaceum, Pholidota pallida, Rhyncostylis retusa, Bulbophyllum* and *Aerides species* diversity was recorded in both vegetation groves. Present study revealed that there is a greater diversity of orchids seen in sacred groves of both the vegetation types. Highest number of orchid species is present in semi evergreen type of sacred groves. Further, our study indicates that sacred groves provide an ideal habitat for the conservation and protection of wild orchid species for the posterity.

July, 2023

(M. Jadeyegowda)
Major Advisor

5. PERFORMANCE OF *Apis cerana* COLONIES UNDER HIVES OF DIFFERENT WOOD MATERIAL

(VINODKUMAR, P.)

ABSTRACT

Beekeeping is one of the forest-based Industries. In Southern India mainly *Apis cerana* colonies are maintained in standard ISI type hives. But in recent years there are diverse opinions on the use of ISI type of hives and the type of wood used to prepare hives. Hence an investigation, to assess the suitability of different types of hives to the two strains of Indian bees was undertaken at the College of Forestry, Ponnampet, Kodagu during the year 2021-22. The experiment used six types of hives with varying frame strengths for the two strains of bees. Honeybee colonies with uniform strength and with uniform-aged queens were established in these hives. The parameters viz., the area under sealed brood (cm^2), unsealed brood (cm^2), sealed honey (cm^2), unsealed honey (cm^2), pollen storage (cm^2) and temperature and relative humidity in the hives were recorded at fortnightly intervals and honey yield (kg/hive) was estimated at end of the honey flow season. The total area under sealed brood varied significantly among the different types of boxes during the observational periods. In the second fortnight of April, the maximum sealed brood area was recorded under the Jungle wood eight-framed hive with the black strain of bees, followed by the yellow strain of bees in the same hive. Considering the other parameters of the area under honey and pollen storage the black strain performed well in Teak wood hives and the yellow strain in Jungle wood hives. Irrespective of the strains of bees the hives of Lantana recorded the lowest performance in respect of the parameters studied. Teak wood eight-framed hive (T_5) with black strain yielded the maximum honey. The temperature was highest in the Teak wood eight-framed hive (T_5) with black strain and relative humidity was highest in the Lantana hives (T_3) with yellow strain.

August, 2023

(R. N. Kencharaddi)
Major Advisor

6. STAND STRUCTURE, DIVERSITY AND REGENERATION STATUS OF RIPARIAN FOREST ALONG THE CAUVERY RIVER IN KODAGU DISTRICT

(ISIRI, N.P.)

ABSTRACT

Rivers stand as the foundational pillars of human civilization and within their embrace lies the invaluable treasure of riparian forests, offering many ecosystem services. The Cauvery River basin, however, faces a looming threat from decades of commercial planting and various human activities, which endanger these precious riparian landscapes. To address this issue, a comprehensive study was undertaken. This endeavor encompassed different vegetation types, diverse ecosystems and the tree components within the river basin. A total of 32 sampling plots at every four km distance on alternate sides of the river bank were laid. At each point, a belt transects of 100m x 50m, along the slope were laid and subjected to floristic assessment using a quadrat of 20m x 20m. Two sub quadrates of 4m × 4m were laid in each 20m x 20m quadrant to assess the regeneration status. The findings of the study illuminate that the highest density and basal area were recorded in the patches closest to the river, within natural landscapes and evergreen forests. Analysis of girth class distribution unveiled the highest concentration of trees were found within 90-150cm category. Notably, areas proximate to the river, natural landscapes, and evergreen forests exhibited greater species richness and diversity, with diversity indices of 3.95, 3.56 and 3.84, respectively. Furthermore, these same regions showed the highest density of regenerating plants, with counts of 1268±108.71 individuals ha^{-1}, 925±133.98 individuals ha^{-1} and 898±89.09 individuals ha^{-1}, respectively. The dominant species observed along the river banks include *Mangifera indica, Terminalia arjuna, Pongamia pinnata, Hopea parviflora, Grevillea robusta, Ficus racemosa* and *Syzygium cumini.* From this study it is evident that intense biotic pressures have altered the species composition of the riparian zone. Urgent action is required to restore riparian buffers in order to prevent further biodiversity loss and ecosystem degradation.

November, 2023

(M. Jadeyegowda.)

Major Advisor

7. EVALUATION OF TEAK SEED PRODUCTION AREAS FOR GROWTH CHARACTERISTICS AND FRUIT PARAMETERS

(MADHURYA GOWDA, S. R.)

ABSTRACT

A study was conducted to evaluate teak seed production areas of the Madikeri seed zone based on their growth characteristics and fruit parameters. Ten phenotypically superior trees from each seed production area were selected using the comparison or check tree method and marked for fruit collection. Observations on tree and fruit parameters were collected to assess the variation between and within the seed production. The results showed a significant variation for all the growth parameters, such as tree height, clear bole height, girth, bole volume, total tree volume and crown diameter. The Kajoor seed production area trees recorded the highest values for all the parameters considered. The trees within the seed production area also varied in growth characteristics. The highest heritability of 72.57 per cent was recorded for the GBH, along with a moderate genetic advance of 17.52 per cent. A significant variation was observed in all the fruit parameters, such as fruit test weight, length, diameter, and drupe filling percentage. The fruits from the Kajoor seed production area recorded the highest values of 71.48 g, 12.88 mm, 13.21 mm and 87.80 per cent, respectively, for fruit test weight, fruit length, fruit diameter and drupe filling percentage. The fruit test weight recorded the highest heritability of 98.17 per cent and a high genetic advance of 21.49 per cent. The inter-character correlation showed a positive relationship between all the variables. The study reveals that the trees in the Kajoor seed production area were better with respect to all the growth characteristics and fruit parameters than other seed production areas of the Madikeri seed zone. Further, the GBH and fruit weight selection will be effective in this area. Thus, Kajoor SPA is a good potential source for future teak improvement programmes.

November, 2023

(Hareesh, T. S.)

Major Advisor

8. TREE VEGETATION DYNAMICS IN SACRED GROVES OF KODAGU

(SUMAN, M.D.)

ABSTRACT

. Sacred groves, known as "devarakadu" in local vernacular in Kodagu district, have long held a unique and revered place in India's cultural and ecological landscape. This investigation aimed to assess the current status and changes in tree structure, diversity and regeneration, including Rare, Endangered and Threatened (RET) tree species in 19 sacred groves of Kodagu over 20 years. A stratified random sampling method was adopted where study sites were categorized into semi-evergreen and moist deciduous vegetation types and further classified into large with area (≥ 2.5 ha) and small (<2.5 ha). In each sacred grove, 500 individuals with ≥10cm GBH (Girth at breast height) were recorded from the belt transacts of four-meter width and varying length to assess the floristic structure and diversity. Within these belt transacts; quadrats of 4 m × 4m were laid out for determining regeneration status. Results revealed that a total of 143 and 130 tree species were identified in the sacred groves of semi-evergreen and moist deciduous vegetation types, respectively. Over the sampling period, tree species richness decreased by 5.3 per cent in sacred groves of semi-evergreen vegetation. However, increased by 3.17 per cent in groves of moist deciduous vegetation. The mean density of tree species was significantly reduced. However, increase in RET tree species in sacred groves of Kodagu. Basal area of trees and RET tree species increased in all categories except small groves of semi-evergreen vegetation. The mean richness of trees and RET tree regeneration decreased in all the sacred groves of Kodagu. This study provides insights into changes in tree structure, diversity and regeneration, enabling environmental and human impact monitoring. It informs conservation efforts to preserve the region's unique biodiversity and cultural heritage

November, 2023

(Sathish, B. N.)

Major Advisor

9. STUDIES ON SOIL BORNE FUNGAL DISEASES IN FOREST NURSERY AND THEIR CONTROL MEASURES

(YASHWANTH, D. C.)

ABSTRACT

Forest nurseries play a significant role in developing and supplying high-quality planting stocks of important tree species. However, a significant amount of mortality happens during the nursery stages due to disease occurrence, which impacts internal quality regeneration and seedling growth. To better understand the various soil borne fungal infections that affect forest nurseries, the current study was conducted at the College of Forestry, Ponnampet, Kodagu. Different soil borne fungal infections, their symptomatology and Per cent Disease Incidence (PDI) were documented. Ten different species of seedlings were found to be affected by damping off, root rot and wilt disease. Among all those species, the seedlings of *Aquilaria malaccensis*, *Litsea chinensis* and *Garcinia gummi-gutta* displayed severe PDI of 56.67 %, 56 % and 61 % respectively. Pathogens infecting these three seedlings were identified by morphological and molecular characterization. *Diaporthe eres*, *Cerrena unicolor* and *Diaporthe hongkongensis* were found as causal organisms for infecting root rot in *Aquilaria malaccensis*, wilting in *Garcinia gummi-gutta* and wilting in *Litsea chinensis*, respectively. *In vitro* efficacy of ten fungicides and seven bio-agents were employed for these pathogens using the poisoned food technique and dual culture technique, respectively. The results showed that Carbendazim 50 % WP at 250 ppm and Propiconazole 2 % EC at 250 ppm significantly inhibited all three pathogens compared to other treatments. The results also showed that *Trichoderma harzianum*, *Trichoderma asperellum* and *Trichoderma hamatum* significantly inhibited fungus (pathogens) compared to other treatments. This study provides information about soil borne fungal diseases in forest nursery, their causal organisms and the management approach for pathogens in laboratory conditions.

November, 2023

(G. N. Hosagoudar)
Major Advisor

10. INSECT PESTS OF *Dendrocalamus brandisii* AND *Bambusa tulda*, THEIR BIOLOGICAL CONTROL AT NURSERY AND PLANTATION

(MEGHA D. B.)

ABSTRACT

Studies on the insect pests of bamboo in Karnataka are scanty. Hence, the present investigation was conducted in Bamboo nursery and plantation at Forestry College, Ponnmapet on *Dendrocalamus brandisii* and *Bambusa tulda* to study the occurrence and management of major insect pests of bamboo. In the nursery, sap-sucking insect pests (*Melanaphis bambusae* and *Palmicultor lumpurensis*), Leafroller (*Crocidophora ptyophora*) and Grasshoppers (*Chitaura* sp., *Oxya* sp., *Spathosternum prasiniferum*, long-horned grasshopper) were recorded on both the species of bamboo. *Crocidophora ptyophora and Lymantria* sp. were recorded on both the species and Hardscale only on *B. tulda* in the plantation. *Melanaphis bambusae* and *P. lumpurensis* population was medium in October and December and reached peak during November and April to May. Grasshopper infestations remained consistently low throughout the study. *Crocidophora ptyophora* infestation was medium during September, peaked in October, then declined. Hardscale infestation was medium during December and high from January to May, then it showed a declining trend. *Lymantria* sp. infestation was observed in November and December but at low to medium intensity. To manage *M. bambusae* and *P. lumpurensis*, botanical insecticide Azadirachtin was most effective, followed by *Metarhizium anisopliae*, *Lecanicillium lecanii*, and *Beauveria bassiana*. *Bacillus thuringiensis* exhibited the least reduction in pest populations seven days after treatment. After 14 days of treatment, *B. bassiana* achieved the highest reduction, followed by Azadirachtin, *M. anisopliae*, *L. lecanii*, and *B. thuringiensis*. For Hardscale infesting *B. tulda*, Azadirachtin was the most effective treatment, followed by *L. lecanii*, *M. anisopliae*, and *B. thuringiensis* after seven DAT. After 14 days, *B. bassiana* showed the highest reduction, followed by Azadirachtin, *M. anisopliae*, *L. lecanii*, and *B. thuringiensis.*

December, 2023

(R. N. Kencharaddi)

Major Advisor

Natural Resource Management

Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga

M. Sc. (Forestry) theses abstracts produced in Natural Resource Management

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1. ASSESSMENT OF SOIL NUTRIENT STATUS AND CARBON STOCK IN THE NATURAL FOREST OF CENTRAL WESTERN GHATS

(MALLIKARJUNA SWAMY G. P.)

ABSTRACT

Forests are important constituents of ecosystems worldwide and perform a variety of ecosystem services, one of the most vital ones is absorbing carbon dioxide from the atmosphere and converting it into biomass. In this context study on "Assessment of soil nutrient status and carbon stock in the natural forest of Central Western Ghats" was conducted in Kodagu district. In the evergreen and moist deciduous forest, a total of 20 sample plots measuring 20 m × 20 m were laid out for the collection of tree height and girth, as well as a subplot measuring 1 m x 1 m and 5 m x 5 m were laid for collection of herbs and shrubs samples for the estimation of biomass and carbon stock. For assessing soil physical, chemical and nutrient status composite soil samples were collected up to 1m depth in each plot with soil auger. For soil organic carbon mapping extra soil samples were taken around each plot with depth of 0-20cm. The evergreen forest recorded the mean total biomass of 310.60 Mg ha^{-1} and carbon stock of 315.90 Mg ha^{-1} .Whereas the moist deciduous forest recorded a biomass of 248.88 Mg ha^{-1} and carbon stock of 319.29 Mg ha^{-1}. Estimates are made for the physical, chemical and nutrient characteristics of the soil. EC, soil porosity, soil organic carbon (SOC), available N, P, and K showed a decreasing tendency with increasing soil depth, while soil bulk density and pH showed an increasing trend with increasing depth. The Kriging results indicated that the short range spatial dependence was strong with a nugget close to zero. The RMSE of the prediction was 0.82, which indicates that the model generated by Ordinary Kriging was correct up to 82 % in estimating the variability of soil organic carbon in the study area.

September, 2023

(Baliram G Nayak)

Major Advisor

2. ASSESSMENT OF ABOVE-GROUND BIOMASS CARBON USING OPTICAL AND MICROWAVE REMOTE SENSING DATA

(NITHIN, P. S.)

ABSTRACT

Forests are nature's most attractive and versatile renewable resources, providing a wide range of social, economic, environmental services and benefits. The modelling of carbon balance depends heavily on forests, as they are considered as carbon reservoir. Accurate measurements of biomass and other forest biophysical parameters are necessary to better understand the global carbon cycle. Remote sensing (RS) based AGB estimation approaches have become increasingly popular as non-destructive means of biomass estimation but constitute limited applications, since the green felling in natural forests and plantations is prohibited. The primary sources for AGB estimation are optical data, radio detection and ranging (RADAR) and light detection and ranging (LIDAR) systems. In this context the study was carried out in the Dubare forest of moist deciduous vegetation type of Kushalnagar taluk, Kodagu district to assess the above-ground biomass carbon using optical and microwave remote sensing data. Totally 25 field sampling plots were randomly used for field data collection. Previously developed relevant allometric equations were used to estimate above-ground tree biomass (AGTB) using GBH and height in each plot. The results revealed that the AGTB ranged from 129.05 Mg ha^{-1} to 355.54 Mg ha^{-1}, total carbon stocks ranged from 60.65 Mg ha^{-1} to 167.11 Mg ha^{-1}, while CO_2e was found to be ranging from 222.4 Mg ha^{-1} to 612.7 Mg ha^{-1}. The regression model obtained between above-ground tree biomass and Synthetic Aperture Radar (SAR) backscatter value performed well with VH polarization than VV polarization with an R^2 value of 0.69 and RMSE of 31.87 Mg ha^{-1}. The best fit regression model was obtained between above-ground tree biomass and Normalized Difference Vegetation Index (NDVI) with the highest R^2 value of 0.75 and a low RMSE value of 28.20 Mg ha^{-1}.

December, 2023

(G. M. Devagiri)
Major Advisor

3. MODELING AND MAPPING OF ABOVEGROUND TREE BIOMASS USING MACHINE LEARNING ALGORITHMS

(SANJAY M)

ABSTRACT

Forests are one of the most complex and diverse ecosystems that support life on Earth, which are more than just a collection of trees. One of the main ecosystem services of the forest is acting as a carbon sink by storing enormous atmospheric carbon in its soil and biomass. Accurate biomass estimation enables us to assess the impact of deforestation, forest degradation, and land use changes on carbon stocks. The technique of modeling field measured biomass with remote sensing data using conventional statistical methods still lacks satisfactory accuracy. In the present study, Aboveground Tree Biomass (AGTB) was modeled with different Machine Learning (ML) algorithms and spatially mapped using the best-fit algorithm. A stratified random sampling technique was adopted and 40 sample plots of 20m x 20m dimension were laid out in the semi-evergreen forest of Makutta, Virajpet division, Kodagu circle. The field-measured AGTB ranged from 79.42 Mg ha^{-1} to 463.67 Mg ha^{-1}. This AGTB was modeled using spectral bands, band ratios, Grey Level Co-occurrence Matrix (GLCM) variables, and different spectral indices of Sentinel 2 data with ML Algorithms like K-Nearest Neighbour (KNN), Random Forest (RF), XGBoost (XGB), Support Vector Machine (SVM), and Artificial Neural Network (ANN). Among these algorithms, Random Forest performed the best with an R^2 of 0.96, MSE of 394.02 Mg ha^{-1}, RMSE of 19.85 Mg ha^{-1} and percent RMSE of 7.39 %. The Random Forest algorithm was also tuned with hyperparameters like M_{try} and N_{tree}, which were set to 16 and 429, respectively. The AGTB was mapped using this algorithm. The Normalized Ratio Vegetation Index (NRVI) was the most important variable contributing to the correct prediction of AGTB. Kruskal - Wallis test carried out on the 100 samples of AGTB predicted by all five algorithms revealed that prediction between the algorithms significantly differed from each other.

December, 2023

(Baliram G Nayak)

Major Advisor

4. LAND RESOURCE INVENTORY OF MICRO-WATERSHED IN LOWER TUNGABHADRA CATCHMENT USING GEOSPATIAL TECHNIQUES

(SWATHI, B.)

ABSTRACT

The research was carried out to make inventories on the land resources of the Udgeri micro-watershed, to quantify the potential of the carbon pool at the micro-level in major land cover types and to assess the soil erosion risk by employing geospatial techniques. Eight master pedons (series) were selected and studied for their characteristics. The depth of the soils varied from shallow to very deep. The soil texture ranged from sandy loam to sandy clay. They belonged to soil orders *Alfisols* and *Inceptisols*. Twenty-nine soil phases and eight soil series were identified and mapped. The soil reaction of the surface soils ranged from moderately acidic to moderately alkaline in reaction (5.12-8.79) and the soils were nonsaline in nature. Soil organic carbon status was found to be low to high (0.29-1.94%) and available nitrogen was low to medium (81.54-392.21 kg ha^{-1}). Available phosphorous was low to high (11.56-78.32 kg ha^{-1}) and available potassium was found to be low to high (145.12-333.65 kg ha^{-1}) and available sulphur (7.25 -23.25 mg kg^{-1}) was low to high. Exchangeable calcium and magnesium were found to be sufficient. Among micronutrients available boron was low to medium (0.24 to 0.98 mg kg^{-1}). Available Copper, iron and manganese were sufficient in status. Available zinc has the status of has the status of both deficient and sufficient. Carbon pool was highest in the forest (210.81 Mg C ha^{-1}) followed by coconut plantation and agriculture land cover (140.31, 111.21 Mg C ha^{-1}) respectively. The predicted average annual soil erosion rate (A) of the study area was found to be 9.33 t ha^{-1} yr^{-1} and higher rates of soil erosion was observed in current fallows.

December, 2023

(Ravikumar, D)

Major Advisor