

A) Agriculture Entomology

1. Faunistic studies on termites (Isoptera) of Shivamogga district and evaluation of new insecticides

G.S. SATHISHA

ABSTRACT

A total of 25 termite species belonging to 11 genera, 6 subfamilies under two families viz., Rhinotermitidae and Termitidae were recorded in Shivamogga district. Rhinotermitinae was represented by two subfamilies viz., Coptotermetinae and Heterotermetinae. *Coptotermes ceylonicus* was the only one species under Coptotermetinae whereas, *Heterotermes indicola* and *H. malabaricus* two species under Heterotermetinae. Termitidae was the dominant family with 22 species which were belonging to nine genera and four subfamilies viz., Amitermitinae, Macrotermitinae, Nasutitermitinae and Termitinae. Amitermitinae had four species, namely, *Eurytermes budda*, *Microcerotermes fletcheri*, *M. pakistanicus* and *Speculitermes sinhalensis*. Macrotermitinae had the highest number of species belonging (12) two genera, namely *Microtermes* and *Odontotermes*. *Microtermes* genus was with only one species i.e., *Microtermes obesi*. The genus *Odontotermes* was represented by the highest number of species (11), namely, *O.adampurensis*, *O. anamallensis*, *O. assmuthi*, *O. bellahunisensis*, *O. bhagwathi*, *O. boveni*, *O. feae*, *O. horni*, *O. microdentatus*, *O. obesus* and *O. redemanni*. Nasutitermitinae was represented by four species, namely *Nasutitermes anamalaiensis*, *N. krishna*, *N. indicola* and *Trinervitermes biformis*. Termitinae subfamily was represented by two species, namely *Labiocapritermes distortus* and *Pericapritermes* sp. Illustrated key was prepared for all the collected families, genera and species for easy and accurate identification based on the morphology of head and thorax of soldiers caste. The present study also revealed that the differences in the species composition and richness among three different habitats (Western Ghats (11 species and Shannon's index (H) - 1.56), semi-malnad (11 species and H - 1.37) maidan (4 species and H - 0.89). Among the different insecticides tested, lowest termite density was recorded in bifenthrin @ 2ml per litre upto 21 days after insecticide application in soil. The next best effective insecticides were imidacloprid @ 0.5ml and fipronil @ 2ml per litre.

June, 2015

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Dr. KALLESHWRA SWAMY, C. M
Major Advisor

2. Evaluation of Different Intercrops, Organic Manures and Biopesticides against Stem Borers in Maize (*Zea Mays* L.)

KAVITAHEGDE

ABSTRACT

The present investigation was carried out against important maize stem borers, *Chilopartellus* (Swinhoe) and *Sesamiainferens* (Walker) at College of Agriculture, Shivamogga during *kharif*, 2014-15. The different intercropping systems *viz.*, maize + cowpea, maize + field bean, maize + coriander, maize sole crop and different organic manures *viz.*, FYM, neem cake, poultry manure and rice hull ash were evaluated against these stem borers in maize.

Among the different intercropping systems maize + cowpea (1:1) recorded lowest percentage of plants showing pinholes (12.80%), lowest number of pinholes per plant (19.60), lowest per cent dead hearts (5.65%) and cob damage (4.33%) with highest grain (48.53 q ha⁻¹) and fodder yield (93.97 q ha⁻¹). Among the different organic manures neem cake @ 0.2 t ha⁻¹ resulted in lowest percentage of plants showing pinholes (16.74%), lowest number of pinholes per plant (21.19), lowest per cent dead hearts (6.32%) and cob damage (4.70%) with highest grain (46.31 q ha⁻¹) and fodder yield (85.45 q ha⁻¹). Interaction effect between different combinations of intercropping systems and organic manures showed that maize intercropped with cowpea along with application of neem cake found superior among the treatments by recording lowest percentage of plants showing pinholes (6.71%), lowest number of pinholes per plant (12.91), lowest per cent dead hearts (3.34%) and cob damage (2.98%) with highest grain (53.40 q ha⁻¹) and fodder yield (97.86 q ha⁻¹).

Among the different bio pesticides and insecticides evaluated, seed treatment (2ml/kg of seed) and foliar application of chlorpyrifos (2ml/l) at 40 DAS recorded lowest damage in terms of percentage of plants showing pinholes (21.15%), per cent dead hearts (8.78%) and number of larvae per plant (2.57) with highest grain (30.47 q ha⁻¹) and fodder yield (42.06 q ha⁻¹).

June 2015

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3. Studies on insect Pest Complex on Traditional Varieties of Brinjal (*Solanum melongena* L.) Cultivars

SOWMYA, E

ABSTRACT

Thirty four traditional brinjal cultivars were screened against shoot and fruit borer *Leucinodes orbonalis* Guen, Hadda beetle *Henosepilacna vigintioctopunctata*, Leaf folder *Antoba olivacea* and leaf hopper *Amrasca biguttulla biguttulla*. Maximum shoot infestation was noticed in dodda badane (42.63 per cent) and minimum in holesalu badane (27.52 per cent). The maximum number of leaf hopper was noticed in hassiru udda badane (12.81) and minimum in Kanakapura badane (2.54). Screening of cultivars against hadda beetle revealed that the maximum number of hadda beetle reported in hasiru udda badane (24.25) and minimum in 40-A badane (0.50). The maximum leaf damage caused by leaf folder was noticed in Heddaragulla badane (25.47 per cent) and minimum 40-A badane (11.75). An attempt was made to study the relationship between shoot and fruit borer infestation with morphological and biochemical characters of both shoot and fruit. The results were highly significant and gave a very strong significant negative correlation between shoot infestation with leaf trichomes (-0.391*) phenol content in shoot (-0.710**), fruit weight (-0.455**), mesocarp thickness (-0.389*), number of seeds (-0.740**), phenol content in fruit (-0.357*) and fruit yield (-0.825**). Among the different chemicals used to manage the shoot and fruit borer higher larval reduction of 56.01 per cent recorded with spinosad which was on par with flubendi amide (55.66 per cent) followed by indoxacarb (51.22 per cent). The lower larval reduction of 10.53 per cent recorded with *Metarhizium anisopliae* which differed significantly from the control. The higher benefit cost ratio was obtained in spinosad 45 EC (4.58) which was on par with flubendiamide 480 EC (4.44) followed by chlorantraniliprole 18.5 SC (3.71), indoxcarb 14.5 SC (3.61) and chlorpyrifos 20 EC (3.59). Lower B:C ratio was observed in treatment untreated check i.e., 1.56 which was on par with *Metarhizium anisopliae* 2g/L (1.57) followed by 2.1 for NSKE (4%).

June, 2014

Department of Agricultural Entomology

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Dr. PRADEEP, S

Major Advisor

4. Comparative development, infestation behavior and management of rice weevil, *Sitophilus oryzae* (L.) (Curculionidae: Coleoptera) in different split legumes

DEEPTHI N.

ABSTRACT

Experiment on comparative development, infestation behavior and management of rice weevil, *Sitophilus oryzae* (L.) in different split legumes was undertaken at Department of Entomology, College of Agriculture, Shimoga during 2011-12. Study was conducted to understand the development of *Sitophilus oryzae* on different split legumes green gram, Bengal gram, field bean and sorghum.

In study the comparative development of *S. oryzae* factors such as fecundity, fertility, developmental period, adult longevity and the progeny production were compared. The highest fecundity of *S. oryzae* was in sorghum and lowest in green gram. The highest fertility was recorded in sorghum and low fertility in green gram. The developmental period of *S. oryzae* in green gram was highest and lowest in sorghum followed by field bean and Bengal gram. Adult longevity and progeny production was highest in sorghum followed by field bean and Bengal gram and lowest in green gram. Females weighed heavier than males. Based on results, it can be concluded that, there is a chance *S. oryzae* extending host range to split legumes. Infestation behavior of *S. oryzae* three moisture levels (10%, 12% & 14%) was evaluated. In sorghum and split legumes, the highest seed weight loss was recorded at 14 % moisture level and the lowest weight loss at 10 %. Eight plant products were tested against *S. oryzae*. Of them, sweet flag powder (1%) afforded maximum protection. Zanduparad (2%), ginger rhizome powder (2%) and neem leaf powder (5%) were next in the order of efficacy.

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Dr. MANJUNATH, M.
Major advisor

5. Bio-Ecology and Management of *Phyllocoptruta oleivora* (Ashmead) (Eriophyidae: Acari) on Italian Lemon *Citrus limon* (L.) Burm.f."

Manjunath D.K

ABSTRACT

Studies on seasonal incidence of *Phyllocoptruta oleivora* (Ashmead) and their natural enemies carried out at college of Agriculture, Shimoga during 2013 - 2014. Studies revealed that the incidence of mite was associated with rise in temperature and they were considerably high in the month of March and April and lower incidence was recorded in the month of July, August and from December to second fortnight of February. The maximum and minimum temperature had significantly positive correlation with the population of mites, but a negative correlation with relative humidity was observed. However, rainfall showed non-significant positive correlation with mite population.

Studies on bio- ecology of mite *P. oleivora* on lemon carried out during and revealed that in summer developmental period from egg to adult was $8.63 + 2.13$, 9.83 ± 1.79 days for male and female respectively on leaf, similarly $7.57 + 1.52$, $8.98 + 1.61$ days for male and female respectively on fruits. However, during winter, it was $17.67 + 1.85$, $19.03 + 2.11$ days for male and female respectively on leaf, similarly $14.43 + 1.94$ and $15.06 + 1.99$ days for male and female respectively on fruits.

Further studies on efficacy of *Fusarium semitectum* Berk and Ravenel and *Hirsutella thompsonii* Fisher along with new acaricides were carried out in laboratory conditions. The highest adult mortality was recorded at a concentration of 4.6×10^8 spores/ml of *H. thompsonii* and 2.3×10^9 spores/ml of *F. semitectum* with per cent mortality of 90.33 and 81.33, respectively. The nine treatments of fungi along with acaricides evaluated in laboratory conditions showed the highest mortality in fenazaquin followed by propergite with 96.30, 94.70 and 93.70, 94.30 per cent mortality on leaves and fruits respectively. *F. semitectum* and *H. thompsonii* showed 79.30, 78.70 and 82.30, 80.70 per cent in reduction of mite population at 2.3×10^9 and 4.6×10^8 spores/ ml on leaves and fruits, respectively. Among the nine treatments evaluated against the *P. oleivora* under field conditions, the highest mortality of 90.89, 90.79 was recorded in fenazaquin on leaves and fruits respectively. Propergite and diafenthiuron were next best showing 86.32, 90.39 and 87.79, 83.28 per cent mortality on leaves and fruits, respectively. The treatment *F. semitectum* at 2.6×10^{15} spores/ ml showed 49.84 and 42.36 per cent mortality on leaves and fruits respectively being least effective. *F. semitectum* + dicofol (0.02%) and *H. thompsonii* at 4.1×10^{14} spores/ ml recorded 54.04, 43.70 and 50.43, 49.21 per cent mortality on leaves and fruits respectively.

June, 2014

Department of Entomology

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6. Spatial Distribution, Adult Emergence Pattern and Field Evaluation of Insecticides Against Areca Nut White Grubs, *Leucopholis lepidophora* (Blanchard) (Coleoptera: Scarabaeidae)

ADARSHA, S.K.

ABSTRACT

Studies on spatial distribution, adult emergence pattern and field evaluation of insecticides against areca nut white grubs were conducted under the field conditions during 2013-2014. Spatial distributions of root grubs were examined in between the palms (BP) and around the palm (AP) in new and old traditional gardens at Kabbinamane and Bheemanakone, Sagara taluk and Kesere, Thirthahalli taluk (Shimoga District) revealed that the I and II instar root grubs were distributed in random to aggregated manner in new and old gardens at both the locations. The early instars were found to be distributed throughout the gardens during July to October in both the type of gardens. No later instar larval population was recorded in old traditional garden from November onwards. Vertical distribution of larval population was in top surface (0-15 cm) during rainy season and up to 60 cm in summer season. Flooding of entire garden for eight days brought the larvae from deeper layer to surface layer up to 15 cm depth. The pattern of adult emergence of *L. lepidophora* and *L. burmeisteri* was observed during emergence periods. Peak emergence of adult beetles of both species was noticed at 7.00 to 7.30 PM. No beetles where rain occurred between 6.00 to 9.00 PM no emergence of adult beetles. The sex ratio of *L. lepidophora* was male biased in Harakere, Shimoga taluk and Gulukoppa, Hosanagara taluk (female:male; 1:1.46 and 1:2.46) respectively. Whereas, in female dominance was observed in *L. burmeisteri* in Aladka, Udupi taluk (1:0.02). When freshly emerged females were placed in small nylon mesh trap, they attracted males. Adult beetles of both the species were feeding on different host plants belonging to family Anacardiaceae and Dipterocarpaceae after emergence under field condition. Among the different insecticides treated imidacloprid 17.8 SL 1 l/ha (75 %) gave good reduction over the untreated check in Gulukoppa. Whereas, in Harakere imidacloprid 17.8 SL 1 l/ha, fipronil 5 SC 2.5 l/ha and chlorantraniliprole 18.5% SC 658ml/ha gave 100 per cent reduction of larval population. Some insecticides viz., chloropyriphos 20 EC 10 l/ha, chlorantraniliprole 18.5% SC 658ml/ha, imidacloprid 17.8 SL 1 l/ha and Phorate 10G 25Kg/ha also had negative effect on soil arthropod and earth worms.

June, 2014

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7. Bio-Ecology And Management of Turmeric Shoot Borer, *Conogethes punctiferalis* Guenee (Lepidoptera: Pyralidae)

CHETHAN, K. S

ABSTRACT

The nine genotypes of turmeric were screened against insect pests viz., leaf eating caterpillar (*Spodoptera litura*), shoot borer (*C. punctiferalis*), leaf folder (*Udaspes folus*) and thrips (*Panchaetothrips indicus*) during 2013- 14 at College of Agriculture UAHS, Shimoga. Maximum leaf damage caused by leaf eating caterpillar was noticed in Prathiba (19.75 per cent) and minimum leaf damage was noticed in Belgam local (2.21 per cent). The genotypes Salem, Alleppy supreme, PTS-24 and Bidar-4 were moderately resistant whereas, Rajapuri and Kadapa were susceptible to shoot borer. The maximum leaf damage caused by leaf folder was noticed in Alleppy supreme (14.03 per cent) and minimum leaf damage was noticed in PTS-24 (7.89 per cent). Screening of genotypes against thrips revealed that, the Rajapuri, PTS-24, Salem, Alleppy supreme and Belgam local were highly resistant to thrips while, the genotypes CLI-325, Kadapa, Prathiba and Bidar-4 were resistant to thrips. An attempt was made to study the relationship between weather parameters with incidence of shoot borer revealed that per cent dead heart has significant positive correlation with maximum temperature (0.791'). Whereas, significant negative correlation with rainfall (-0.815') and afternoon relative humidity (-0.798). Biology of *C. punctiferalis* studied in laboratory conditions revealed that, the incubation period of egg was 5.15 ± 0.36 days and total larval period was 17.80 ± 3.42 days. The pupal period was 9.50 ± 0.51 days in male, whereas in female, 9.90 ± 0.55 days. The total life cycle from egg to the death of adult in male was 36.45 ± 5.38 days, whereas in female 39.05 ± 5.24 days. Among the different insecticide tested against shoot borer, highest mean per cent larval mortality over check was recorded in the treatment lamda cyhalothrin 2.5% EC (59.30 per cent) followed by carbofuron 3G (56.63 per cent) and chlorpyrifos 20% EC (53.19 per cent). However, the B:C ratio was higher in lamda cyhalothrin 2.5% EC treated plots (2.38) followed by plots treated with chlorpyrifos 20 EC (2.07) and carbofuron 3G (2.04).

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Dr. HANUMANTHA SWAMY B C
Major Advisor

8. Survey and management of Arecanut Rootgrub

SHABBIR K

ABSTRACT

Studies on the survey and management of arecanut root grubs in Shimoga district (Sagara, Hosanagara and Thirthahalli), during 2012-13 revealed that, Thirthahalli talluk showed higher grub count (3.38 grubs per palm) compared to Sagara, Hasanagara taluks. *Leucopholis lepidophora* was the predominant species in all the root grub infested areas of shimoga district. In all the three taluk as the grub population was highly significant and negatively correlated with rain fall. The activity of scolid wasp was more during April and May and was found to decline during other months. It was confirmed that *Colpacampsomeris nr.indica* (Saussura) is the species that has been observed as an ectoparasite of rootgrubs. Among the indegenious practices mechanical digging and removal of grubs coupled with application of insecticides (Chlorpyriphos) was the best method in reducing the grub population. However, application of gravel (Garchu mannu) to the garden affects the rootgrub biology and thereby the adult will not lay the eggs and the larva will move away from garden. Among the different treatments tested against the rootgrubs rynaxypur @ 0.18 mL/L had given maximum mortality (74.95%) followed by rynaxypur @ 0.12 mL/L (73.33%). The bioagents *Metarrhizium anisopliae* performance was not satisfactory even after 60 days of application.

Department of Agriculture Entomology
College of Agriculture, Shimoga

Dr. B.K. SHIVANNA
Major Advisor

9. Bio-Ecology and Management of Cut Worm, *Spodoptera litura*(Fabricius) on Chewing Tobacco

LATHA, M.

ABSTRACT

Studies on the Bio-ecology and management of cut worm, *Spodoptera litura* on chewing tobacco were carried out under laboratory and field conditions at Agriculture college, Shimoga during 2011-12.

Under laboratory conditions, the average incubation period, larval period and pupal period of cut worm were 4.10 ± 0.32 , 19.90 ± 2.33 and 13.00 ± 0.82 days, respectively. The total developmental periods of male and female were 45.50 ± 1.58 and 48.20 ± 2.10 days, respectively. The size and life span of female is comparatively more than male.

Freshly laid eggs were hemispherical in shape with pale green in colour and turned yellow on second day. The insect possessed six larval instars. There was a remarkable variation in the colour pattern of the larvae at different instars which varied from translucent green to brown with longitudinal gray and yellow stripes.

The fully grown sixth instar larvae measured an average length of 39.45 ± 1.14 mm. The average wing span of male and female adult moth was 35.80 ± 1.92 mm and 39.20 ± 1.92 mm, respectively.

Investigation on population dynamics of *Spodoptera* using pheromone traps indicated the maximum activity of moths from 29th to 35th standard week. However, peak number of moths was noticed up to the 39th standard week (September). Rainfall, maximum and minimum temperature had positive and non significant correlation with trap catches. Whereas, negative and non significant correlation was observed with relative humidity.

Studies on the efficacy of new molecules and biopesticides against tobacco cut worm showed that all the treatments were significantly superior over control. Hundred per cent larval control was observed at seven and fifteen days after application of spinosad (112.5 g a.i./ha) and fluebendiamide (98.36 g a.i./ha) respectively. Maximum per cent larval reduction was observed in novaluron-100 g a.i./ha (91.15%). Further chlorpyrifos-500 g a.i./ha (87.17%), Bt Dipel-35 g a.i./ha (85.00%), SINPV-250LE (84.96%), *Nomuraea rileyi*-350 g a.i./ha (82.63%) and NSKE 2% (66.6%) were also effective in controlling the pest and are significantly better than control.

July, 2012

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10. Bio-ecology and management of *Calepitrimerus azadirachtae* ChannaBasavanna (Eriophyidae: Acari) on neem

Navik, O. S

ABSTRACT

Studies on seasonal incidence of *Calepitrimerus azadirachtae* ChannaBasavanna and their natural enemies carried out at college of Agriculture, Shimoga during 2010 – 2011. Studies revealed that the incidence of mite was associated with rise in temperature and they were considerably high in the month of April and May and lower incidence was recorded in the month of July, September, October and from December to first fortnight of January. The maximum and minimum temperature was significantly positive correlation with the population of mites, but a negative correlation with relative humidity was observed. However, rainfall showed non-significant positive correlation with mite population.

Studies on bio- ecology of mite *Calepitrimerus azadirachtae* on neem carried out during and revealed that developmental period was 7.65 ± 0.65 and 8.03 ± 0.81 days in male and female of *C. azadirachtae*, respectively.

Further studies on efficacy of *Fusarium semitectum* Berk and Ravenel and *Hirsutella thompsonii* Fisher along with new acaricides were carried out in laboratory conditions. The highest adult mortality was recorded at a concentration of 4.6×10^8 spores/ml of *H. thompsonii* and 2.3×10^9 spores/ml of *F. semitectum* with per cent mortality of 89.90 and 83.33, respectively. The nine treatments of fungi along with acaricides evaluated in laboratory conditions showed the highest mortality in difenthruron followed by propargite with 95.33 and 93.33 per cent mortality. *F. semitectum* and *H. thompsonii* showed 82 and 86 per cent in reduction of mite population at 2.3×10^9 and 4.6×10^8 spores/ ml, respectively. Among the nine treatments evaluated against the *C. azadirachtae* under field conditions, the highest mortality of 91.96 was recorded in difenthruron. Propargite and fenazaquin were next best showing 84.50 and 87.31 per cent mortality of mites. The treatment *F. semitectum* at 2.6×10^{15} spores/ ml showed 46.09 per cent mortality being least effective. *F. semitectum* + dicofol (0.02%) and *H. thompsonii* at 4.1×10^{14} spores/ ml recorded 55.49 and 54.85 per cent mortality. Treatments dicofol and wettable sulphur registered mortality of 78.35 and 68.99 per cent, respectively.

Department of Entomology, Aug, 2011
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Dr. M. MANJUNATHA
Major Advisor

11. Studies on insect pest complex of promising traditional paddy cultivars and their management using organics

PRASHANTA KUMAR, G. K.

ABSTRACT

The investigation on occurrence of insect pests on promising traditional paddy cultivars and their natural enemies in organic farming situation and management of insect pests using organics were undertaken at Organic Farming Research Center and College of Agriculture, Navile, Shimoga during *kharif* 2010.

In the present study it was found that among the promising traditional paddy cultivars Ratnachudi recorded significantly lowest mean damage of sucking pests *viz.*, thrips, green leaf hopper and ear head bug with 0.47 damage score, 0.64 damage score and 1.94% respectively. Significantly less mean damage of dead heart and white ear head due to yellow stem borer was recorded in *Selum sanna* with 9.38% and 13.70% respectively. Minimum leaf damage due to leaf folder was recorded in *Selum sanna* (1.90%). There was no significant difference among promising traditional paddy cultivars with respect to case worm damage and were below the economic threshold level (35% leaf damage). However *Selum sanna* (0.65%) recorded significantly least mean damage. Among the promising traditional paddy cultivars significantly higher grain yield was recorded in *Selum sanna* (42.55 q/ha.)

The most common and dominant highest mean number of predators in the promising traditional paddy cultivars were spiders (1.37/hill), coccinellids (1.01/hill), damselflies (1.12/m² area) and dragonflies (0.87/ m² area) was noticed in Ratnachudi, *Selum sanna*, respectively.

Among the different organic management practices against green leaf hopper and ear head bug population, significantly lowest in tobacco decoction (1%), neem seed kernel extract (5%), chilli garlic extract (3%), azadirachtin 10,000 ppm and cow urine (1:5 ratio) treatment. While the case worm and leaf folder population was lowest in spinosad (0.02%) spray. Spinosad (0.02%) was more effective in reducing the stem borer dead heart and white ear head infestation, while significantly highest grain yield (49.07 q/ha.) was noticed in spinosad (0.02%) treated plots.

August, 2011

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Dr. S. PRADEEP
Major Advisor

12. Survey on the incidence and management of pink bollworm, *Pectinophora gossypiella* (Saunders) on Bt cotton

SANTHOSH KUMAR, K.

ABSTRACT

Investigations on survey of pink bollworm (PBW) at Shimoga, Shikaripura and Honnali taluks and its incidence and management were carried out at Agriculture College Shimoga during 2010-11. In the survey work, minimum larval population and per cent green boll damage was recorded at Agaswalli (2.00 larvae/20 green bolls and 9.00%, respectively) as against maximum larval population and per cent green boll damage at Basavanandihalli (3.10 larvae/20 green bolls and 14.00%, respectively).

Studies on population dynamics of PBW moths through pheromone traps indicated the activity throughout the study period with four peaks viz., 37th, 50th, 2nd and 8th standard week. Maximum temperature had negative and significant association with trap catches of PBW, while minimum temperature, morning and afternoon relative humidity were partially correlated with trap catches. Whereas, total rainfall had non-significant negative influence on PBW trap catches. *Goniozus* sp. (Hymenoptera: Bethyridae), a larval parasitoid of PBW was recorded in the month of October and November.

Insecticide treated plots performed significantly better than control for all the parameters against PBW. Three days after treatment, minimum number of larvae on bolls was recorded in novaluron, thiodicarb and spinosad as against the higher number of larvae registered in NSKE. Significantly the highest number of larvae/20 bolls was observed in control. Same trend was also followed even at seven days after treatment. Three days after treatment minimum green boll damage was recorded in thiodicarb, spinosad and lambda cyhalothrin as against highest green boll damage registered in control and NSKE. Seven days after treatment, the same trend was also followed. Significantly higher number of good opened bolls (GOBs) was recorded in spinosad, novaluron, indoxacarb, thiodicarb and lambda cyhalothrin than NSKE and control. Among the treatments minimum BOBs/plant were recorded in spinosad, novaluron and thiodicarb as against the higher number of BOBs/plant recorded in control and NSKE. Locule damage due to PBW was significantly less in spinosad, thiodicarb and indoxacarb treated plots. Maximum locule damage was registered in NSKE but significantly different over control. Significantly higher seed cotton yield was recorded in spinosad (1935.20 kg/ha), indoxacarb (1909.83 kg/ha), thiodicarb (1890.10 Kg/ha), novaluron (1866.73 kg/ha) and lambda cyhalothrin (1802.17 kg/ha). Whereas, control (968.60 kg/ha) and NSKE (1507.27 kg/ha) recorded lower seed cotton yield.

Department of Agri. Entomology, June, 2011
College of Agriculture, Shimoga

Dr. B. K. SHIVANNA
Major Advisor

13. Biology and management of bud worm, *Helicoverpa armigera* (Hubner) on Tobacco

GIRISH, M. R

ABSTRACT

Studies on the Biology and management of bud worm, *Helicoverpa armigera* on tobacco were carried out under laboratory and field condition at agricultural college, shimoga during 2010-11. Under laboratory condition the average incubation period, larval period and pupal period of bud worm were 4.02 ± 0.64 , 23.94 ± 1.21 and 10.70 ± 1.26 days, respectively. The total developmental periods of male and female were 47.40 ± 0.80 and 50.13 ± 1.23 days, respectively. The size and life span of female is comparatively more than male.

Freshly laid eggs were spherical having flattened base, cream coloured which later turned dark. The insect possessed six larval instars. There was a remarkable variation in the colour pattern of the larvae which varied from greenish brown to brown with longitudinal stripes.

The fully grown sixth instar larvae measured a average length of 41.88 ± 2.11 mm. the average wing span of male and female adult moth was 34.61 ± 1.42 mm and 37.01 ± 1.64 mm, respectively.

Investigation on population dynamics of bud worm using pheromone traps indicated the scattered activity of moth throughout the year. However, maximum number of moth activity was observed from 35th to 43rd standard week *i. e.* during September up to end of October. Rainfall and minimum temperature had positive and significant association with trap catches. Whereas, negative and non significant correlation was observed with maximum temperature and relative humidity.

Studies on the efficacy of new molecules and botanicals against tobacco bud worm showed that all the treatments significantly superior over control. Novaluran application yielded better result by controlling cent per cent larval population within seven days, followed by chlorpyriphos (90.0 %) and indaxocarb (87.59 %) application. The insecticides *viz.* azadirachtin (71.67 %), Nomurea (71.67%), HaNPV (80.0 %) and NSKE (83.0 %) were also effective in controlling the pest and are recorded significantly lower larval population over control.

June, 2011
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14. Management of POD Borers on Field Bean with Entomopathogenic Fungus *Nomuraea rileyi* (Farlow) Samson and Insecticides

LOLAKSHI, H. K.

ABSTRACT

Investigations on the status and management of pod borer complex in field bean were carried out under field conditions during 2009-10 at the College of Agriculture, Shimoga. During the investigation, as many as 21 species of insect pests have been recorded on the crop. The important sucking pests constituted *Riptortus pedestris* F. and *Nezara viridula* Linn. The important pod borers included *Helicoverpa armigera* Hübner and *Sphenarches caffer* Zeller.

The maximum damage due to pod borers throughout cropping period was 30.03 per cent. The maximum damage was done by *H. armigera* (20.27%) as its incidence was in higher level than other species. *S. caffer* contribution was next to *H. armigera* towards crop damage (9%) having medium level of incidence on crop.

Among the natural enemies of pod borers, the parasitoids *Campoletis chlorideae* Uchida and Tachinid parasite were more predominant on *H. armigera*. The predators include spiders and carabids.

In the bio efficacy study, the maximum mortality of 92.59 per cent was obtained in first instar larvae of *H. armigera* followed by 83.33 per cent in second instar at 3.20×10^9 spores per ml concentration of *Nomuraea rileyi* indicating that early instars were more susceptible to fungus than later instars at known period after spraying.

Among the insecticides, indoxacarb (36.57%) recorded very high larval mortality followed by *N. rileyi* + fenvalerate (34.73%) and *N. rileyi* + neem (31.02%) with a pod yield of 42.36q per ha, 41.98 qper ha and 36.11q per ha, respectively. However, the *N. rileyi* + fenvalerate application resulted in highest B:C ratio (2.31) followed by indoxacarb (1.99) and *N. rileyi* + neem (1.80).

Department of Agricultural Entomology
College of Agriculture, Shimoga
Place: Shimoga
Date: 16/08/2011

Dr. M. MANJUNATHA
Major Advisor

15. Effect of Organic Manures and Chemical Fertilizers on the Abundance and Diversity of Above and Below Ground Arthropods in Field Bean Ecosystem

MADHU, M.

ABSTRACT

Studies on effect of organic manures and chemical fertilizers on the abundance and diversity of above and below ground arthropods in field bean ecosystem were carried out at Organic Farming Research Centre (OFRC), Navile, Shimoga, Karnataka during 2010-11. The studies revealed that among the different intervals of observations, the plots treated with organic manure and chemical fertilizer + mulching recorded significantly higher abundance of soil arthropods compared to the rest of the treatments (29.33, 31.00, 28.67, 27.67, 26.67, 21.33 arthropods per 400 gm of soil) and diversity of soil arthropods was also higher in above mentioned treatment (0.91, 0.93, 0.90, 0.89, 0.80, 0.81). Abundance of collembolans, mesostigmata, and cryptostigmata was also higher in above mentioned treatment. With respect to above ground arthropods abundance (10.67, 34.67, 60.33, 65.00, 42.67, 38.67 insects per plant) and diversity (0.33, 0.40, 0.64, 0.87, 0.56, 0.49) was also higher in the plots treated with organic manure and chemical fertilizer + mulching.

The abundance of soil arthropods had a positive relationship with the soil moisture and a negative relationship to soil temperature. The plot which received recommended FYM and recommended fertilizers, FYM equivalent to N and FYM equivalent to N supplemented with P and K through inorganic fertilizers with and without mulching (T₁, T₂, T₃, T₇, T₈ & T₉) recorded significant positive relationship of soil arthropods abundance with available N, P, and K. The plot which did not receive any fertilizers with mulching (T₁₃) recorded a negative correlation with available P and K but had positive non significant relationship with available nitrogen. The plot which did not receive any fertilizers without mulching (T₁₄) showed a non significant positive relationship with available nitrogen and phosphorus but negative with available potassium. The abundance of soil arthropod showed significant positive correlation with the yield of field bean. The impact of abundance of soil arthropods on the yield of field bean was 86 per cent.

July, 2011
Department of Agricultural Entomology
College of Agriculture, Shivamogga

Dr. S. PRADEEP
Major Advisor

16. Effect of organic manures on incidence of pests of pigeon pea and their natural enemies

BOMMESH, B.

ABSTRACT

A field investigation on “Effect of organic manures on incidence of pests of pigeon pea and their natural enemies” was carried out at College of Agriculture, Shimoga during *kharif* 2009. In the present study the lowest population of leaf hopper (0.11 hopper/three trifoliolate/pl) and leaf roller (0.55 larvae/pl) were recorded in NC and PM+NC (Poultry manure+Neem cake) applied plots respectively. The lowest population of spotted pod borer, plume moth, gram pod borer were recorded (0.39, 0.99, 0.45 larvae/pl, respectively) in NC applied plots, while blue butter fly was low (0.19 larvae/pl) in standard check. Similarly, significantly lowest blister beetle (0.20 adults/pl) and pod fly (0.50 maggots/10 pods) were recorded in NC, while pod bugs (0.32 adults/pl) in PM applied plots. Significantly higher numbers of coccinellids (0.42 grubs and adults/pl) and spiders (0.52 spiders/pl) were recorded in untreated check.

The application of NC has resulted lower chlorophyll (1.8291, 1903 mg/g), reducing sugars (1.20, 1.71%) and total sugar (1.77, 2.35%) and highest phenol content (4.49, 5.21 mg/g) in leaves at 45 and 75 days after sowing. While, PM+NC (10.46, 11.27%) plot had lower protein. Whereas, in green pods application of NC had highest phenol (7.97 mg/g), lowest protein, reducing and total sugars of 21.60, 1.42, and 3.42 per cent, respectively. The correlation was positively significant between spotted pod borer ($r=0.60^*$), gram pod borer (0.63^*), blue butter fly (0.63^*) with protein and spotted pod borer (0.63^*) and gram pod borer (0.59^*) with reducing sugars and spotted pod borer ($r=-0.73^{**}$), blue butter fly (-0.67^*), gram pod borer (-0.77^{**}), plume moth (-0.68^*) tur pod fly (-0.68^*) had significantly negative relationship with phenol. Among organics FYM+VC (Farm yard manure+Vermicompost) had highest net returns (Rs.12448 per ha) with ICBR of 2.85, followed by VC (Rs.11302 per ha) with ICBR of 2.26.

July, 2010

Department of Agricultural Entomology
College of Agriculture, Shimoga

Dr. MOHAN I.NAIK
Major Advisor

17. Biology and Management of Pulse Beetles, *Callosobruchus maculatus* (Fab.) and *C. analis* (Fab.)

RAMAMURTHY, B.N.

ABSTRACT

Investigations on the biology and management of pulse beetles, *Callosobruchus maculatus* (Fab.) and *C. analis* (Fab.) were carried out under laboratory conditions in the Department of Agricultural Entomology, Shimoga during 2009-2010.

On cowpea, the incubation period, pupal period and total developmental period were 5 ± 0.24 , 9.90 ± 0.94 and 27 ± 2.79 days, respectively for *C. maculatus*. While the corresponding figures for *C. analis* were 6 ± 0.62 , 9.0 ± 1.02 and 30 ± 2.65 days. Similarly on green gram, the figures for *C. maculatus* were 4 ± 0.59 , 10.55 ± 0.76 and 29 ± 1.48 and for *C. analis* it was 5 ± 0.36 , 8.80 ± 1.42 and 30 ± 1.55 days. The size and life span of female is comparatively more than male in both the species of pulse beetle. Sizes of male and female *C. maculatus* were bigger than *C. analis*.

Among the tested pulses, field bean (GL-66) and red gram (BRG-1) were least preferred for both the species. Cowpea and green gram were most preferred hosts for *C. maculatus* and *C. analis*, respectively.

Among the cowpea varieties, CP-17 and IT-38956 were least preferred for oviposition in both the species. Prolonged developmental period, least per cent adult survival and grain weight loss were observed in these varieties. On the contrary C-152 and local variety of cowpea were highly preferred for both the species.

Among the indigenous materials [sand layer (2" over the grains), neem seed powder (5%) and asafeotida powder (0.2%)] and plant oils [neem oil (1%) and ground nut oil (1%)] gave better protection upto three months for both the species of pulse beetles on cowpea. Red earth coating (5%), rice hull ash (5%), wood ash (5%), sunflower oil (1%) and neem leaf dust (5%) recorded the highest population build up, per cent grain damage and per cent weight loss. Neem oil showed cent per cent adult mortality at 2 DAT when compared to neem seed powder and asafeotida powder which caused cent per cent mortality at 4 DAT in the both the species.

JULY, 2010, Department of Entomology
College of Agriculture, Navile, Shimoga

Dr. B.K SHIVANNA
Major Advisor

17. Performance of inter specific Bt cotton hybrids against major insect pests

MANJUNATHA, R

ABSTRACT

The investigations on interspecific Bt and non-Bt cotton hybrids were under taken at Agriculture Research Station, Honnaville, Shivamogga, during *Kharif* 2008.

In the present study it was found that, there was no differential susceptibility between Bt and non-Bt cotton genotypes against sucking pests *viz.*, thrips, aphids, white flies and leaf hopper. Among all the genotypes MRC-7201 Bt and its non-Bt counterpart recorded significantly lower population of sucking pests. However, red cotton bugs and Dusky cotton bugs were comparatively more in Bt cotton than in non-Bt cotton.

The larval population of *Helicoverpa armigera* and *Earias vittella* was almost nil on all the Bt cotton hybrids as against non-Bt cotton hybrids which allowed the larvae to cross the ETL (more than one larvae /plant). Significantly lower per cent of fruiting body damage due to *H. armigera* (1.44-3.67 per cent), *E. vittella* (2.31-5.19 %), rosette flowers (0.01-1.57 per cent) due to pink bollworm was noticed in Bt cotton hybrids. Similarly significantly higher seed cotton yield (16.71-21.16 q/ha) were recorded in Bt cotton hybrids.

The seasonal decline in expression of *Cry I Ac* differed among Bt cotton genotypes and the expression was variable among plant parts. The highest concentration of *Cry I Ac* expression was noticed in leaves (16.34) followed by squares (11.95) and bolls (11.57 µg/g) of JK CH-99 Bt hybrid. The expression in other hybrids (MRC-7201, MRC-6918, Rasi XL-708, NCBH-990 and SP-911) ranged between 5.15-7.30, 2.98-6.58 and 3.78-4.68 µg/g in leaves, squares and bolls respectively.

Economics of Bt cotton hybrids revealed that, although over all cost of cultivation of Bt cotton was more, it recorded higher net returns of Rs. 20920.65 per acre with maximum BC ratio of 3.31 as compared to non-Bt cotton. Adoption level of Bt cotton was highest (91.16 per cent) in Davangere, followed by Chitradurga (87.17 per cent) and Shivamogga (84.59 per cent) districts of Karnataka.

Department of Agriculture Entomology
College of Agriculture, Shivamogga
Date: September, 2009

Dr. PRADEEP S,
Major Advisor

18. Seasonal Incidences of Cowpea Pests and Their Management

NAVEEN.V.

ABSTRACT

Investigations on seasonal incidence of cowpea pests and their management in cowpea were carried out under field conditions during 2008-09 at the College of Agriculture, Shimoga. During the investigation, 20 species of insect pests have been recorded on the crop. The important constituted *Aphis crassivora* Koch among sucking pests and among borers *Maruca testulalis* Geyer and *Cydia ptychora* Meyrick. The incidence of *Aphis crassivora* was noticed throughout the year. The incidence of pod borers was noticed from May II fortnight to March I fortnight.

Studies on the bioecology of *Maruca testulalis* revealed the total developmental period of 22.36 ± 1.45 days with a fecundity ranging from 90-201 eggs per female. Studies on the bioecology of cowpea aphid revealed that it had a complex life cycle, wherein both alate and apterous forms were reproduced by parthenogenetic viviparity. Aphids laid on an average of 24.02 ± 7.55 nymphs and took 16.99 ± 0.91 days to complete its life cycle.

An highest yield of 13.02 q per ha grain yield was obtained from supervisory control (EIL based) plot followed by the treatments which received three sprays of spinosad (12.10 q/ha) at 45, 55 and 65 DAS and two sprays of spinosad (9.88 q/ha) at 45 and 55 DAS.

Among the newer insecticide molecule combinations, the combination sequence of clothianidin, NSKE and spinosad which were sprayed at different crop growth stages resulted in the high aphid population reduction (47.55%) and high larval population reduction (48.58%). The next to follow was the sequence of thiamethoxam, NSKE and spinosad which resulted in per cent aphid population reduction of 46.20 and per cent larval population reduction of 47.80. However, sequence of clothianidin, NSKE and spinosad resulted in highest B:C ratio of 1.65 followed by spray sequence of thiamethoxam, NSKE and spinosad with B:C ratio of 1.51.

Department of Agricultural Entomology
College of Agriculture, Shimoga
Place: Shimoga
Date: September 2009

Dr. MOHAN I. NAIK
Major Advisor

19. Bio- ecology and management of sucking pests in Bt cotton

NAGARAJA, D. N

ABSTRACT

Studies on seasonal incidence of sucking pests of Bt cotton were carried out at Agriculture College Shimoga during 2008-09. The studies revealed higher incidence of aphids (48.11 per three leaves) during second fortnight of May and zero incidence in Second fortnight of July and first fortnight of August. The higher incidence of leafhopper (19.20) during May second fortnight and zero incidence in August. Higher incidence of whitefly (29.50) during second fortnight of April and zero in July, August and September months. Where as, the higher incidence of thrips population (26.81) was noticed during April second fortnight and zero incidence in July, August, September and October months. The incidence of all these sucking pests were correlated positively with maximum temperature. The peak population red cotton bug (0.80/ Plant) and ducky cotton bug (8.60/boll) was noticed during second fortnight of November (150 DAS) and second fortnight of December (190 DAS), respectively. The most commonly recorded natural enemies on sucking pests were coccinellids, spiders and chrysopa were positively correlated with increasing pest population.

The life cycle of cotton aphid revealed that the average total nymphal period was 5.24 ± 0.74 days. The aphid was found to reproduce parthenogenitically viviparous. The pre-reproductive, reproductive and post-reproductive periods were found to be 0.88 ± 0.24 , 10.33 ± 1.25 and 4.10 ± 0.51 days, respectively. The number of young ones produced by an adult aphid was 11.10 ± 3.47 .

The average incubation period and the total nymphal period of leafhopper was 6.53 ± 0.58 and 11.68 ± 3.74 days, respectively. The pre-oviposition, oviposition and post-oviposition periods were found to be 3.30 ± 0.35 , 9.53 ± 1.11 and 3.80 ± 0.63 days, respectively. The fecundity of leafhopper varied with a mean of 20.33 ± 2.65 eggs per female. The longevity of adult leafhopper was 16.38 ± 1.83 and 15.90 ± 1.58 for female and male respectively.

Among the treatments one day after spraying Fenprothrin showed superior efficacy in bringing down all the sucking pest population followed by Dimethoate, Imidacloprid and Acetamiprid. Dimethoate and Imidacloprid were most effective against aphid and Dimethoate alone was most effective on leafhopper, whitefly and thrips at three days after spraying. The similar trend was maintained even at seven days after treatment also.

July, 2009
Department of Agril. Entomology,
College of Agriculture, Shimoga-577 204

Dr. B. K., Shivanna
Major Advisor

20. Influence of soil amendments on the incidence of sucking pests infesting Bt cotton

Prasanna, S. O.

ABSTRACT

A field investigation on “Influence of soil amendments on the incidence of sucking pests infesting Bt cotton” was carried out at College of Agriculture, Shimoga during *kharif* 2008. In the present study it was found that the lowest mean population of aphids, whiteflies and thrips (1.69, 0.19 and 0.32/3 leaves/plant, respectively) were recorded in PM+NC (poultry manure + neem cake) treated plots. While, the leafhopper, red cotton bug and dusky cotton bug (1.77/3 leaves/plant, 0.40/plant and 4.93/boll, respectively) were least in FYM+PM (farm yard manure + poultry manure) treated plots, whereas, red spider mite was lower in NC (0.04 cm² leaf area/plant). Application of VC (vermicompost) recorded highest mean coccinellids and chrysopids (0.34 and 0.47/plant, respectively) however, higher mean population of spiders and anthocorids (0.44 and 0.29/plant, respectively) were noticed in NC+VC treatment.

Application of NC (0.713, 1.613 and 3.603 mg/g leaves) had significantly higher phenol content, FYM+VC (0.410, 0.640 and 2.217 mg/g) had higher chlorophyll content, FYM+NC(2.250), FYM+VC(4.917) and NC+VC(7.147) recorded highest total sugars at 30, 60 and 90 DAS, respectively. However, PM (0.910 and 3.267 mg/g at 30 and 60DAS, respectively) and VC (5.070 mg at 90 DAS) recorded highest protein content. Aphids had significant positive correlation with chlorophyll ($r=0.57^*$ and 0.70^*) at 30 and 60 DAS and protein ($r=0.58^*$) at 30 DAS, significant negative correlation ($r=-0.61^*$) with phenol at 90 DAS. Leafhoppers had significant positive correlation ($r=0.62^*$) with chlorophyll at 60 DAS and mites had significantly negative correlation ($r=-0.61^*$) with phenol at 90 DAS.

The organic carbon in soil was more in PM+NC treated plot, highest amount of N, P and K were recorded in RDF and standard check but on par between the treatments except untreated check. While, OC had significant negative correlation ($r=-0.65^*$) with mites at 90 DAS. N had significant positive with aphid ($r=0.62^*$) and leafhopper ($r=0.57^*$) at 30 DAS, aphid, whitefly and leafhopper ($r=0.60^*$, 0.69^* and 0.64^* , respectively) at 60 DAS, while P had significant positive correlation ($r=0.66^*$) with aphid at 30 DAS. The K had significantly negative ($r=-0.64^*$) with aphids at 30 DAS while, S had significant positive correlation ($r=0.66^*$) with leafhoppers at 90 DAS and among organic amendments B:C ratio was high (1.78) in FYM+PM treated plot followed by FYM+NC (1.61).

Department of Agricultural Entomology
College of agriculture, Shimoga

Dr. MOHAN I. NAIK
Major Advisor

21. Utilization of Bioagents in the Management of the Castor Semilooper, *Achaea janata* Linnaeus (Lepidoptera: Noctuidae)

AJITH KUMAR. M. A.
ABSTRACT

Investigations on the status of castor pests, natural enemies of semilooper and management of castor semilooper in castor were carried out under field conditions during 2007-08 at Shikaripur, Honnali and Channagiri taluks and at the College of Agriculture, Shimoga. During the investigation, as many as 16 species of insect pests have been recorded on the crop. The important pests recorded are *Achaea janata* Linn., *Spodoptera litura* F., *Helicoverpa armigera* Hub., *Ergolis merione* Cramer, *Euproctis fraterna* Moore, *Liriomyza trifolii* (Burgess), *Trialeurodes ricini* Misra, *Empoasca flavescens* F. and *Conognethes punctiferalis* (Guenn.).

Among the natural enemies of *Achaea janata*, the egg parasitoid, *Trichogramma chilonis* Ishii and a larval parasitoid, *Microplitis maculipennis* Szepligate were more predominant. The incidence of *T. chilonis* was noticed throughout the crop period along with the pest activity. Parasitisation by *T. chilonis* showed significant positive correlation with minimum temperature and rainfall. While, larval population exhibited significant positive correlation with parasitisation (%) by *M. maculipennis*. Per cent parasitisation by *M. maculipennis* exhibited significant negative and positive correlation with maximum temperature and total rainfall, respectively.

Among different aged eggs, one day old eggs were highly (85.2%) preferred by *T. chilonis*. Among the different larval instars tested, maximum of 72.30 per cent parasitisation was noticed in second instar larvae of *A. janata* by *M. maculipennis*. The total life cycle of *T. chilonis* ranged from 8.62 to 9.04 days on the eggs of *A. janata*. The egg, larval, pupal and adult periods of *M. maculipennis* lasted for 1.70 ± 0.07 , 11.64 ± 0.27 , 2.22 ± 0.02 and 3.52 ± 0.37 days, respectively.

Among the various IPM modules tried, module-3 (*T. achaea* @ 1.5 lakh per ha @ 30DAS + fenvalerate 20EC @ 45 DAS + *T. achaea* @ 60 DAS) showed superiority in the suppression of the pest, safety to natural enemies, higher yield (15.6 q/ha) and benefit cost ratio (2.08) followed by module-5 (*T. achaea* @ 1.5 lakh per ha @ 30 DAS + profenophos (20EC) @ 45 DAS + Agroneem @ 60 DAS) compared to recommended module-9 (methyl parathion @ 30 DAS + methyl parathion @ 45 DAS + methyl parathion @ 60 DAS) with seed yield of 13.6 q per ha and B:C ratio of 1.70.

Department of Agricultural Entomology
College of Agriculture, Shimoga
Place: Shimoga, Date : 19/06/2008

Dr. MOHAN I. NAIK
Major Advisor

22. Bio-ecology of aphid, *Aphis craccivora* Koch and Evaluation of fungal pathogen *Fusarium semitectum* Berk and Ravenel against aphid on cowpea

RoopaRani, V.

ABSTRACT

Studies on seasonal incidence of cowpea aphid, *Aphis craccivora* Koch were carried out at Agriculture College Shimoga during 2007- 2008. The studies revealed an higher incidence of the aphid during June, October, November, December, February and March and a lower incidence from July to September, January and April. The correlation between the aphid population and weather parameters revealed that, the population of cowpea aphid increases with an increase in temperature.

The natural enemies recorded on aphid were coccinellid predators, *Menochilus sexmaculatus* Fab. and *Coccinella transversalis* Fab.

The bio-ecology of cowpea aphid revealed that it had a complex life cycle where in both alate and apterous forms were reproduced by parthenogenetic viviparity without sexual reproduction. Total nymphal duration of the aphid occupied 4.86 ± 0.51 days in the laboratory. Pre-reproduction period was 1.01 ± 0.10 days, reproduction period was 10.31 ± 0.31 days and post-reproduction period was 0.70 ± 0.05 days. Adult longevity took an average of 11.82 ± 0.43 days. Aphids laid an average of 23.37 ± 7.67 nymphs and 16.75 ± 0.91 days to complete its life cycle.

Studies on the efficacy of *F. semitectum* under laboratory conditions indicated the highest mortality at 4.20×10^9 spores per ml with a mortality of 89.20 per cent nymphs, 64.66 per cent adults, respectively. The earlier instars were more susceptible to fungal infection than the later stages. Among ten treatments evaluated under green house conditions, the combination of *F. semitectum* 4.20×10^9 spores per ml and oxydemeton methyl (0.018%) registered the highest mortality of 85.70 per cent which was superior next to oxydemeton methyl (0.037%). Under field conditions the highest mortality was recorded in combination of *F. semitectum* 4.70×10^{14} spores per ml + oxydemeton methyl (0.018 %) with 79.01 per cent mortality, which was superior next to oxydemeton methyl (0.037%).

August 2008

Department of Agri. Entomology
College of Agriculture
Shimoga- 577204.

Dr. M. MANJUNATHA
Major Advisor

23. Studies on utilization of *Micromus igorotus* Banks (Neuroptera : Hemerobiidae) for management of sugarcane woolly aphid *Ceratovacuna lanigera* Zehntner (Homoptera : Aphididae)

Praveen M.P.

ABSTRACT

Studies on seasonal incidence of *M. igorotus* revealed that incidence ranged from 0.00 (NovII-FebII) to 8.00(SepII) larvae/plant, 0.00 (NovI-FebI) to 7.25 (JuneII) larvae/plant and 0.00 (DecI-JanII) to 13.90 (AugII) larvae/plant at ARS, Honnavile, SRDI, Karehalli and ARS, Kattalagere respectively.

The biology of *M. igorotus* was studied in the laboratory condition at ARS, Honnavile from August to September, 2006. The total life cycle ranged from 25 to 28 days in case of male and 33-35 days in case of female. The incubation, larva, pupa and adult periods ranged from 3.00 to 4.00, 5.00 to 7.50, 6.00 to 8.00 and 7.00 to 15.00 days respectively. Adult female laid 165-188 eggs. The total feeding potential of *M. igorotus* was 161.76 ? 13.09 aphids.

The studies on impact of *M. igorotus* on population dynamics of sugarcane woolly aphid indicated that higher sugarcane woolly aphid population was noticed in treatment with heavy infestation of SWA without *M. igorotus* with 106.85 aphids/ 2.5 cm² leaf area, whereas least population in treatment with initial infestation of SWA with out *M. igorotus* and subsequent release of *M. igorotus* with 3.42 aphids/ 2.5 cm² leaf area due to predation activity of *M. igorotus*.

Studies on standardization of mass production techniques under laboratory conditions revealed that the multivoltine silken thread was superior to other substrates for oviposition. Corrugated paper strips were best suited as pupation substrate compare to other substrates and density of 65-70 first instar larvae in insect rearing box (22cm dia) are the best standardized methods for mass rearing. Above methods are adopted for mass rearing starting with 20 pairs of adults and it yields around 750 pupae in a period of one month.

Department of Agril. Entomology,
College of Agriculture, Shimoga
Place : Shimoga
Date : 24-8-2007

Dr. B. SHIVAYOGISHWARA
Major advisor

24. Studies on Population Dynamics of Pest Complex of Field Bean (*Lablab Purpureus L.*) with Special Reference to Pod Borers

THEJASWLL.

ABSTRACT

Investigations on the status and management of pod borer complex in field bean were carried out under field conditions during 2005-06 at the College of Agriculture, Shimoga. During the investigation, as many as 22 species of insect pests have been recorded on the crop. The important sucking pests constituted *Riptortus pedestris*, and *Aphis crassivora*. The important pod borers included *Helicoverpa armigera*, *Adisura atkinsoni*, *Cydia ptychora* and *Sphenarches caffer*.

The incidence of pod borers was noticed from May II fortnight to February I fortnight. Significant negative correlation was established between pod borers population and minimum temperature. However, the relationship was non-significant with maximum temperature, relative humidity and rainfall. Among the natural enemies of pod borers, the parasitoids *Campoletis chlorideae* and *Bracon* sp. nr. *greeni* (Ashmead) were more predominant. The predators included ladybird beetles and mirids.

The economic injury level for pod borers was determined as 0.44 larva per plant. An highest yield of 42.50 q per ha pod yield could be obtained from supervisory control (EIL based) plot followed by the treatments which received three sprays of indoxacarb (41.37 q/ha) at 45, 55 and 65 DAS and two sprays of indoxacarb (36.65 q/ha) at 45 and 65 DAS.

Among the newer insecticide molecules, spinosad (36.44%) recorded very high larval reduction followed by thiodicarb (36.68%) and lambda cyhalothrin (27.82%) with a pod yield of 44.02 q per ha, 43.88 q per ha and 41.08 q per ha, respectively. However, the spinosad application resulted in highest B:C ratio (2.13) followed by thiodicarb (1.98) and lambda cyhalothrin (1.86).

Department of Agricultural Entomology

College of Agriculture, Shimoga

Place: Shimoga

Date: 14/08/2007

Dr. MOHAN I. NAIK

Major Advisor

25. Bio-Ecology and Management of Yellow Stem Borer, *Scirpophaga Incertulas* Walker (Lepidoptera : Pyraustidae) in Aerobic Rice

SHIDDALINGAPPA V. HIUGAR

ABSTRACT

Field experiments were conducted at College of Agriculture, Shimoga during 2005-06 on bio-ecology and management of yellow stem borer (YSB) in aerobic rice. Biology of *S. incertulas* studied revealed that the average incubation, larval, pupal, pre-oviposition, oviposition, post oviposition periods and fecundity were 6.8 ± 0.20 , 28.7 ± 1.10 , 11.1 ± 0.83 days, 25.6 ± 1.2 , 23.0 ± 1.0 , 20.3 ± 0.87 hours and 159.3 ± 37.74 eggs/female, respectively from the larva reared on transplanted paddy and 6.5 ± 0.50 , 28.4 ± 1.47 , 8.6 ± 0.49 days, 25.2 ± 0.83 , 22.0 ± 0.71 , 20.2 ± 0.52 hours and 152.2 ± 31.58 eggs/female, respectively from the larva reared on aerobic paddy.

Per cent dead hearts or white ear heads had significant negative correlation with minimum temperature and afternoon relative humidity during *kharif* and with morning and afternoon relative humidity during *rabi* and significant positive correlation with sunshine hours per day during *kharif* and with minimum and maximum temperature during *rabi*.

During *kharif* effect of dates of sowing on infestation by YSB showed that the increase in the incidence of infestation was observed as the dates of transplanting and sowing was delayed. But aerobic paddy had lower infestation. During *rabi* season, in aerobic paddy 30th November sown crop yielded higher with 49.86 q/ha with lower infestation. Similar trend was followed on transplanted paddy but with higher incidence of YSB than on aerobic paddy.

Efficacy of new insecticide molecules on YSB infestation in aerobic paddy revealed that among spray formulations beta-cyfluthrin 25 EC @ 12.5 g a.i/ha recorded lower incidence of YSB and gave higher grain yield of 38.67 q/ha and among granular formulations, fipronil 0.3G @ 7.5 g a.i/ha recorded lower incidence of per cent DH or WH and gave highest grain yield of 42.97 q/ha. The cost benefit ratio was maximum for beta cyfluthrin (1:20.39) and minimum for carbofuran (1:3.12).

January 2007
Department of Agril. Entomology, College of Agriculture,
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Dr. MOHAN I. NAIK
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26. Evaluation of Fungal Pathogen, *Fusarium Semitectum* Berk. and Ravenel against Sugarcane Woolly Aphid, *Ceratovacuna Lanigera* Zehntner (Homoptera: Aphididae)

Aswini, G. V.

ABSTRACT

Survey for the fungal pathogens on sugarcane woolly aphid in Bhadra command area revealed that woolly aphid was infected with *Fusarium* sp. and *Aspergillus wentii*. Both the fungi isolated proved to be pathogenic to woolly aphid *Ceratovacuna lanigera*, LC₅₀ value of the fungal isolates *Fusarium* sp. and *Aspergillus wentii* were at 2.21×10^7 spores/ml and 6.21×10^7 spores/ml, respectively, indicating more virulence nature of *Fusarium* sp. than *Aspergillus wentii*.

Studies on the effect of temperature and relative humidity on growth of *Fusarium semitectum* revealed that maximum growth of (87.00 mm diameter) occurred at temperature of $35 \pm C$ and 90% relative humidity. Maximum sporulation (9.1×10^7 spores/ml) was seen with $35^\circ C$ temperature and 90% RH at 14 days after inoculation followed by temperatures at 30, 25 and $20^\circ C$. There was steep fall in growth and sporulation of *F. semitectum* at $40^\circ C$.

Studies on efficacy of *F. semitectum* under laboratory conditions. Highest mortality was recorded at 2.7×10^9 spores/ml of *F. semitectum* with mortality of 87.27 per cent nymphs, 59.32 per cent adults, respectively. The earlier instars were more susceptible to fungal infection than the later stages. Among the eight treatments evaluated under greenhouse conditions, the combination of *F. semitectum* 2.7×10^9 spores/ml and chlorpyrifos (0.02%) registered highest mortality of 84.12 per cent which was superior next to chlorpyrifos (0.04%). Under field conditions highest mortality was found in combination of *F. semitectum* 3.7×10^{14} spores/ml+ chlorpyrifos (0.02%) with 75.32 per cent mortality, which was superior next to chlorpyrifos (0.04%).

November 2006

Department of Agril. Entomology ,
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Dr. M. MANJUNATHA
Major Advisor

27. Bio-ecology of Spiralling whitefly *Aleurodicus dispersus* Russell and its management using fungal pathogens on guava

Aiswariya. K.K.

ABSTRACT

Studies on the bio-ecology of Spiralling whitefly *Aleurodicus dispersus* Russell on guava carried out at Agricultural College, Shimoga during 2004-05 revealed that the egg period ranged from 5.54-10.02 days. The four nymphal instars took 4.74-6.5, 3.56-6.22, 6.02-8.96 and 7.52-10.1 days respectively during different seasons. During the survey, 99 host plants belonging to 38 families were recorded from Shimoga taluka, of which 19 were new records from Karnataka, 11 of which were new host records. A study on natural enemies, revealed seven natural enemies, which included six predators and a parasitoid.

Studies on seasonal incidence indicated that the peak population of spiralling whitefly was associated with rise in temperature and the different stages of whitefly were considerably low during June and first fortnight of July. The total whitefly population showed positive correlation with maximum and minimum temperature, but a negative correlation with relative humidity, rainfall and wind velocity. Further, studies on efficacy of *Fusarium semitectum* Berk. and Ravenel and *Verticillium lecanii* (Zimm.) Viegas were carried out under laboratory conditions. Highest mortality was recorded at concentration of 4.2×10^9 spores/ml of *F. semitectum* and 3.6×10^9 spores/ml of *V. lecanii* with per cent mortality of 75.21, 89.97 (nymphs) and 64.40, 79.90 (adults), respectively. The earlier instars showed higher susceptibility to fungal infection than the later stages. Among 12 treatments evaluated under greenhouse conditions, *F. semitectum* 4.2×10^9 + *V. lecanii* 3.6×10^9 + 0.06% Triazophos registered highest mortality of 85.80, 86.81 and 83.30 per cent on eggs, nymphs and adults, respectively. Under field conditions, highest mortality was found in *F. semitectum* 6.2×10^{15} + *V. lecanii* 4.6×10^{14} + Triazophos 0.03%, with 84.44, 1.02 and 79.45 percent mortality in case of eggs, nymphs and adults, respectively. However, Triazophos 40 EC @ 0.06% was highly effective in controlling all the stages of spiralling whitefly.

Shimoga – 577 204
October 2005

Dr. M. Manjunatha
Major Advisor

28. Bio-ecology and management of arecanut inflorescence caterpillar, *Batrachedra arenosella* (Walker) using entomopathogenic fungus, *Nomuraea rileyi* (farlow) Samson.

Naveen Kumar. V.

ABSTRACT

The investigations on the Bio-ecology and management of arecanut inflorescence caterpillar were carried out at Department of Agricultural Entomology, College Agriculture, Shimoga, Karnataka. Studies on the seasonal incidence of arecanut inflorescence caterpillar, *Batrachedra arenosella* from July 2003 to June 2004 revealed an incidence ranging from 0.00 to 21.75 larvae / rachis. The highest incidence of 21.75 larvae was observed during July first fortnight, while the lowest incidence of 0.42 mean number of larvae/rachis was observed during February. The simple correlation with the weather parameters and larval population showed weak positive correlation with temperature, where as with relative humidity and rainfall it showed strong positive correlation.

The biology of *B. arenosella* was studied in the laboratory during August to October 2004. The total life cycle took an average of 29.0 ± 2.56 days, where in the egg, larval and pupal period lasted for 3.80 ± 0.40 , 18.2 ± 1.76 , 7.00 ± 0.40 , respectively during August – September, whereas during September – October the life cycle took an average of 32.8 ± 2.90 days, where in the egg, larval and pupal period lasted for 4.20 ± 0.74 , 20.2 ± 1.36 , 8.40 ± 0.80 , respectively. The pupa measured 3.81 ± 0.05 mm in length and 0.99 ± 0.08 mm in width. The adult is small with filiform antenna. The female has a total wingspan of 8.18 ± 0.04 mm and that of male is 7.86 ± 0.04 mm.

The incidence of different concentrations of *N. rileyi* on mortality of different instars of *B. arenosella* under laboratory conditions from three to five days after spraying indicated the maximum mortality at a concentration 3.2×10^9 spores /ml. The mortality on I, II, III, IV and V instar was 93.00, 85.00, 56.00, 49.00 and 44.00 per cent, respectively. The efficacy of the same fungus in combination with chemical and botanicals on *B. arenosella* under field conditions and observations recorded at 15 days after spraying indicated the maximum mortality of 76.56 per cent in 4.1×10^{15} spores / ml. + chlorpyrifos followed by 4.1×10^{15} spores / ml + malathion with 67.41 per cent, exclusive chlorpyrifos gave 60.83 per cent and least mortality of 3.98 per cent was observed in untreated check.

July, 2005

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29. Survey of Stem Borer Complex in Maize (*Zea mays* L.) and Their Management

NAGARJUNA, B

ABSTRACT

The present study entitled “Survey of stem borer complex in maize (*Zea mays* L.) and their management” revealed that *Chilo partellus* (Swinhoe) and *Sesamia inferens* (Walker) were the common species debilitating the crop and their incidence ranging from 14.82 to 20.20, 17.30 to 19.33 and 20.78 to 23.75 per cent at Shimoga, Shikaripur and Honnali talukas respectively.

The stem borer (*Sesamia inferens*) completed its life cycle in 35 to 57 days. The incubation period ranged from 5 to 6 days. The larval stage passed through six instars, ranged from 23 to 39 days. The adult male and female lived for 4.40 ± 0.75 and 6.10 ± 0.78 days, respectively with a fecundity of 96- 208 eggs. Whereas, the stem borer (*Chilo partellus*) completed its life cycle in 38 to 64 days. The incubation period ranged from 5 to 7 days. The larval stage passed through six instars, ranged from 26 to 48 days. The adult male and female lived for 5.30 ± 1.35 and 45 ± 1.14 days, respectively with a fecundity of 198-348 eggs. Nine hybrids screened against maize stem borer revealed that the hybrids CP-828, NAH- 2049 and CP-818 were tolerant. While, the hybrids Bioseed-9544, Rajkumar and Allrounder were susceptible. Among the insecticides, Carbofuran 3G and phorate 10G whorl applications showed higher efficacy in suppressing the stem borer. The seed treatment with chlorpyrifos 3ml per kg had given good control upto 42 days. Hence, the ruling unrecommended farmer's practice of chlorpyrifos seed treatment in and around Shimoga and Davangere districts can be fortified from the present findings.

July, 2005

Department of Agril. Entomology ,
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Dr. M. MANJUNATHA
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30. Bioecology and Management of Sugarcane Woolly Aphid (Swa), *Ceratovacuna lanigera* Zehntner (Aphididae: Homoptera)

Niranjana.B

ABSTRACT

Studies on seasonal incidence of SWA, *Ceratovacuna lanigera* Zehntner from June 2004 to May 2005 revealed an incidence ranging from 26.07 to 64.34, 21.33 to 66.33 and 0.00 to 57.47 aphids per 2.5 cm² leaf area at ARS Honnavile, Karehalli (representing Bhadra command area) and Gajanur (representing Thunga command area) of Shimoga district, respectively. The highest incidence of *C. lanigera* was observed during September in all the localities but the lowest incidence was observed during April at Honnavile; Karehalli and February–March at Gajanur. Further simple correlation between the aphid population and weather parameters revealed that, the woolly aphid incidence was negatively correlated with maximum temperature and minimum temperature but positively correlated with relative humidity and rainfall in all the localities.

The natural enemies recorded at ARS Honnavile, Karehalli and Gajanur include *Dipha aphidivora* (pyralid), *Micromus igorotus* (hemerobiid), *Eupeodes confrater* (syrphid) and *Cheilomenes sexmaculata*, *Coccinellatransversalis* (Coccinellids). In addition to this two more species of Coccinellids viz., *Synonycha grandis* and *Hormoniaoctomaculata* were recorded at Karehalli and one more species of Coccinellid, *Coelophora bipalgiata* was recorded at Gajanur. Among these predators, *D. aphidivora* was predominant followed by hemerobiid, syrphid and coccinellids.

The bioecology of SWA studied both in laboratory and field condition revealed that it had an anoholocyclic life cycle, where in both alate and apterous forms were reproduced by parthenogenetic viviparity and no sexual reproduction was found. The woolly matter developed only on third and fourth instar nymphs in case of apterous form. Life cycle, fecundity and longevity of woolly aphid was maximum during January–February, while the minimum was observed during April-May under field condition.

All insecticides tested were quite effective in controlling SWA, except azadirachtin 5 % treatment. The reappearance of aphid was 77.77 and 5.76 aphids (per 2.5cm² leaf area) in azadirachtin and endosulfan treatments, respectively at seven days after application. However, as compared to other treatments tested, Thiamethoxam (6.27), imidacloprid (7.37), phosphomidon (9.87), acephate (12.13) and monocrotophos (13.06) recorded less number of aphid (reappearance) at 21 days after application. Thus indicating the possibility of their selective use in the management of sugarcane woolly aphid.

July, 2005

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31. Biocenology and Management of Giant African Snail, *Achatina fulica* Bowdich (Achatinidae: Gastropoda) in Areca Ecosystem

Ravikumara

ABSTRACT

The study on incidence of *Achatina fulica* Bowdich from June, 2004 to June, 2005 revealed that the population ranging from 1.00 to 91.25 snails per 10 m² area. The lowest and highest populations were observed during first fortnight of February, 2005 and second fortnight of September, 2004, respectively. Snail population had highly significant negative and positive correlation with the maximum temperature and relative humidity, respectively.

Snails laid creamy white to yellowish bright eggs measuring 5.09×0.79 mm in length and 4.18 ± 0.45 mm in width. The average fecundity was 90 ± 15.87 and 126 ± 61.5 during July-August, 2004 and June-July, 2005, respectively. Incubation period lasted for 13.85 ± 5.52 and 12.53 ± 5.31 days during July-August, 2004 and June-July, 2005, respectively. Hatching percentage was 93.40 ± 11.5 and 94.12 ± 4.43 during July-August, 2004 and June-July, 2005, respectively. The snails hibernated from October, 2004 to April, 2005 at a depth of 8.01 cm, 5.17 cm, 4.52 cm, 4.25 cm and 3.96 cm in red soil, red soil mixed with organic matter, sandy soil, red loamy soil and laterite soil, respectively.

In medium sized snails highest night time feeding rate was recorded in pepper (11.32 sq. cm.) followed by vanilla (5.68 sq. cm.), while day time feeding rate was highest in pepper (1.67 sq. cm.) followed by banana (1.25 sq. cm.). In big sized snail the highest night time feeding rate of 30.13 sq. cm. found in pepper followed by banana (12.78 sq. cm.) while highest day time feeding rate of 1.76 sq. cm. recorded in areca followed by betel vine (1.68 sq. cm.). Banana was the most preferred host for small sized snails while pepper was the most preferred host for medium and big sized snails. The highest number of snails was attracted in papaya stem waste followed by vegetable waste and fishmeal waste. Of the different chemicals and baits tested along with papaya stem waste, the highest mortality (87.67%) was observed at 6 kg metaldehyde bait per acre on second day which was on par with 2 and 4 kg metaldehyde bait per acre. Similar findings were observed even on fourth and the sixth day after application of metaldehyde. Hence 2 Kg metaldehyde bait per acre can be recommended to manage the snails.

July, 2005
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32. Studies on bio-ecology and management of paddy earhead bug, *Leptocorisa oratorius* (Fabricius) (Hemiptera: Alydidae)

Venkatesh Hosamani

ABSTRACT

Study conducted on biology of *Leptocorisa oratorius* under green house and field conditions revealed that, The *Leptocorisa oratorius* took an average of 25.76 ± 2.73 and 26.00 ± 3.91 days to complete life cycle from egg to adult under green house and field conditions respectively. Fecundity was 98.30 ± 27.59 and 92.90 ± 19.99 in greenhouse and field conditions respectively, with an ovipositional period of 19.00 ± 5.89 days and 13.10 ± 3.67 days respectively. The longevity of adult male and female was 30.30 ± 5.21 and 71.00 ± 11.48 respectively under greenhouse condition and it was 47.70 ± 10.85 and 65.70 ± 12.96 days in field conditions respectively.

The mean occurrence of bugs per hill ranged from 1.31-2.26 and 2.39-4.02 during *kharif* and 1.49-2.52 and 2.81-3.86 during summer in Shimoga and Bhadravathi taluks respectively. Whereas it was 0.21-1.62 bugs per hill during *kharif* in Shikaripura taluk. Light trap studies (6.00 pm to 6.00 am) indicated 96 per cent of attraction of bugs upto 2.00 am while it was 27.85 per cent between 11 and 12 pm being peak attraction.

During present investigation eight alternate hosts were identified, out of which *Echinochloa crusagalli* and *E. colona* were found to be the most preferred alternate hosts. In addition to these hosts, bugs were found to congregate on arecanut, banana, carambola, papaya, maize and cinnamom for shelter during sunny hours.

The study conducted on percent damage due to earhead bug revealed that the average per cent damage to paddy due to earhead bug was 5.79 and 4.08 during *kharif* and 5.57 and 3.84 during summer in Bhadravathi and Shimoga respectively, which represents command areas and 1.96 per cent during *kharif* in Shikaripura taluk, which represents tank fed area. The average germination percentage of bug infested grains at 5th and 14th day was 70.07 and 74.02, 37.49 and 54.45 and 54.44 and 64.96 per cent in Shikaripura, Bhadravathi and Shimoga taluks respectively. The study conducted on bio efficacy of dust and EC formulations against earhead bug revealed that, among the six treatments, the maximum of 90.49 per cent and 94.45 per cent reduction in bug population was noticed in malathion 5 per cent dust during *kharif* and summer respectively. Remaining insecticides showed either moderate or least effectiveness against earhead bug.

July, 2005

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Dr. S. PRADEEP

Major Advisor

33. Studies on Insect Pests of Maize (*Zea Mays* Linn.) with Special Reference to the Bio-Ecology and Management of Maize Stem Borer, *Chilo Partellus* (Swinhoe) (LEPIDOPTERA: PYRALIDAE)

SIDDALINGAPPA

ABSTRACT

The study conducted to know the insect pests of maize at College of Agriculture Shimoga, revealed that *Chilo partellus*, *Sesamia inferens*, *Helicoverpa armigera*, *Marasmia trapezalis*, *Mythimnaseparata*, *Rhopalosiphum maidis*, *Cicadulina bipunctella* and *Myllocerous* sp. were common.

The study conducted on seasonal incidence of maize stem borer revealed an incidence ranging from 4.0 to 18 per cent, 10.0 to 22.0 per cent and 8.5 to 20.0 per cent at College of Agriculture Shimoga, Attibele village of Shikaripur taluk and Abbalgere village of Shimoga taluk respectively. The highest incidence was observed during I fortnight of September, 2007 in all the three localities while the lowest incidence was noticed during I fortnight of December, 2007 at College of Agriculture Shimoga. Similarly, in Attibele and Abbalgere village lowest incidence was noticed during I fortnight of June, 2007. Further the simple correlation between the percentage stem borer incidence and weather parameter revealed that, the per cent incidence of stem borer had the significant positive correlation with minimum temperature, relative humidity and rainfall.

The biology of maize stem borer was studied under laboratory conditions from June to August, 2007. The stem borer completes its life cycle in 30 to 69 days. The incubation period ranged from 3 to 6 days. The larval stage passed through six instars. The mean duration of I, II, III, IV, V and VI instar was 4.80 ± 0.78 , 4.40 ± 1.89 , 5.30 ± 1.88 , 5.90 ± 2.28 , 6.10 ± 2.37 and 8.30 ± 2.21 days respectively. The total larval period ranged from 20 to 51 days. The pre-mating and mating period occupied 9.15 ± 1.40 and 5.04 ± 0.70 hours respectively, oviposition period occupied 4.2 ± 0.63 days. The stem borer had the fecundity rate of 262-657 eggs. The adult male and female lived for 3 to 8 days and 3 to 7 days with a mean of 6.20 ± 1.75 and 5.00 ± 1.49 days, respectively.

The study on efficacy of insecticides against maize stem borer showed that, all the insecticides tested were effective in suppressing the stem borer. Indoxacarb 0.0145, lambda cyhalothrin 0.005, cypermethrin 0.01 per cent spray showed higher efficacy in suppressing the stem borer. All other chemicals showed moderate to least effectiveness but they are significantly superior to untreated control.

Dr. C.THIPPESWAMY

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34. Bio-ecology of leaf hopper, *Amrasca biguttula biguttula* Ishida and aphid, *Aphis gossypii* Glover and evaluation of fungal pathogen, *Fusarium semitectum* Berk and Ravenel on them in Okra.

Jayasimha.G.T

ABSTRACT

Studies on seasonal incidence of leaf hopper *Amrasca biguttula biguttula* Ishida and aphid *Aphis gossypii* Glover on okra were carried out at Agricultural College, Shimoga during 2007-08. The results revealed a higher incidence of leaf hopper (16.44 to 0.25 per leaf) during March I fortnight and a lower incidence in December II fortnight. Leaf hopper population was positively correlated with temperature. The incidence of aphid ranged from 24.23 to 0.29 per sq cm leaf its population was correlated positively with temperature.

A study on biology of leaf hopper and aphid revealed a total development period of 28.30 to 34.00 days and for leaf hopper 12.00 to 22.00 days for aphid.

The studies on the efficacy of *Fusarium semitectum* Berk and Ravenel and *Verticillium lecanii* Zimmerman were evaluated against leaf hopper and aphid under laboratory conditions, *F. semitectum* @ 3.60×10^9 spores/ml recorded a mortality of 83.34 per cent for nymphs and 75.21 per cent for adults of leaf hopper and for aphid *F. semitectum* @ 4.60×10^9 recorded mortality of 79.90 per cent for nymphs and 64.40 per cent for adults. While *V. lecanii* @ 2.50×10^9 spores/ml on leaf hopper recorded mortality of 87.27 per cent for nymphs and 78.20 per cent for adults and for aphid on *V. lecanii* @ 2.10×10^9 spores/ml recorded mortality of 87.27 per cent for nymphs and 92.31 per cent for adults. Under the field conditions against leaf hopper dimethoate (0.06%), *V. lecanii* @ 4.90×10^{14} spore/ml + dimethoate (0.03%), *V. lecanii* @ 4.90×10^{14} spores/ml and *F. semitectum* 2.50×10^{15} + dimethoate (0.03%) recorded mortality of 82.12, 75.23, 60.26 and 57.08 per cent at 15 days after spray respectively. While for the aphid dimethoate (0.06%), *V. lecanii* 5.20×10^{14} spore/ml + dimethoate (0.03%), *V. lecanii* 5.20×10^{14} spores/ml alone and *F. semitectum* 3.60×10^{15} + dimethoate (0.03%) recorded mortality of 83.76, 72.59, 69.26 and 55.32 per cent respectively at 15 days after spray.

Dr. M.MANJUNATHA

Major Advisor

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35. Effect of Organic Manures and Biopesticides on the Incidence of Insect Pests of Moth Bean and Their Natural Enemies

KUMARA SWAMY, M.C

ABSTRACT

A field investigation on “Effect of organic manures and biopesticides on incidence of insect pests of Moth bean and their natural enemies” was carried out at College of Agriculture, Shimoga during *khari* 2011. In the present study the lowest population of aphid, *Aphis craccivora* (Koch) (1.77 aphids/ three trifoliolate leaves/plant) and leaf hopper *Exitianus indicus* (Distant) (0.12/ three trifoliolate leaves/plant) were recorded in neem cake (NC) applied plots.

The lowest population of beetle *Maladara* sp. was recorded in NC (0.09 adults/plant) while it was low (0.10 adults/plant) in recommended dose of fertilizers (RDF) + *F. semitectum*+*N. releyi*+NSKE. Similarly, the lowest bug, [*Riptortus pedestris* (Fabricius)] population (0.10 nymphs and adults/plant) and lowest population of leaf folder *Omiodes indicata* (Fab.) (0.09/plant) was recorded in NC. Similarly lowest pod borer damage [*Cydia ptychora* (Meyrick)] (11.3 damaged pods/plant) was recorded in NC, while pod borer damage of 13.0 pods/plant was recorded in RDF + *F. semitectum*+*N. releyi* + NSKE sprayed plots. Significantly higher numbers of coccinellid, *Coccinella transversalis* (Fab.) (0.38 grubs and adults/plant) were recorded in RDF.

The highest organic carbon content was recorded in farm yard manure (FYM) treated plots at 30, 45 and 60 days after sowing (DAS) (0.45%, 0.47% and 0.49%) respectively. Similarly, highest available nitrogen (162.67, 165.44 and 167.74 Kg/ha) phosphorous (56.58, 59.29 and 59.15 Kg/ha) and potassium (187, 184 and 185 Kg/ha) were recorded at 30, 45 and 60 DAS in RDF and poultry manure (PM) treatment plots respectively.

The lowest population of aphid (2.42/ three trifoliolate leaves/plant) and leaf hopper (0.11/ three trifoliolate leaves/plant) were recorded in GMO-01-09 and Shikaripura-2 respectively, while 0.18 beetle per plant were recorded in GMO-01-09. Similarly lowest number of bug (0.11 nymphs and adults/plant) were recorded in GMO-01-09, while a reasonable population of leaf folder (0.13 larvae/plant) and pod borer (11.4 damaged pod/plant) were recorded in Local-2 and GMO-01-09, respectively. Among organics, FYM had highest net returns (Rs.16960.00 per ha) with B:C ratio of 6.78 followed by vermi compost (VC) (Rs.14260.00 per ha) with B:C ratio of 5.94.

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36. Seasonal incidence and management of scarlet mite *Raoiellaindica* Hirst (Tenuipalpidae: acari) using *Fusarium semitectum* Berk and Ravanel on arecanut

Ragunatha

ABSTRACT

Studies on seasonal incidence of *Raoiellaindica* Hirst and its management using *Fusarium semitectum* Berk and Ravanel on arecanut was carried out at college of Agriculture, Shimoga during 2011-12. The higher incidence of the mite was noticed in April and May and lower incidence was recorded in the months of July to January. The incidence of mite was observed more on lower portion of the frond. The mite population was positively correlated with temperature and negatively with relative humidity, whereas with rainfall the relation was non-significant. Studies on host preference of *Raoiellaindicato* different areca cultivars revealed that cv. Thirthalli was severely affected and colonized by more mites compared to other cultivars. Whereas, cv. Sreemangala recorded lowest mite population. Further studies on efficacy of fungi *Fusarium semitectum* and *Hirsutella thompsonii* on different stages of *R. indica* was carried out under laboratory conditions. The highest adult mortality was recorded at a concentration of 4.6×10^8 spores/ml of *H. thompsonii* and 2.3×10^9 spores/ml of *F. semitectum* with per cent mortality 84 and 80 respectively. Eight treatments evaluated under laboratory conditions showed highest mortality in propergite followed by dicofol with 91.30 and 84.00 per cent mortality. Among eight treatments evaluated against the *R. indica* under field conditions, the highest mortality of 83.44 was recorded in propergite. Dicofol and azadiractin were next best showing 76.35 and 59.30 per cent mortality of mites. The treatment *F. semitectum* at 2.6×10^5 spores/ml showed 44.37 per cent mortality being least effective. *F. semitectum* + dicofol and *H. thompsonii* 4.1×10^4 spores/ml recorded 53.32 and 54.75 per cent mortality

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37. Studies on the effect of herbicides on the soil fauna in soybean ecosystem

Pradeep kumar C. S

ABSTRACT

A field experiment entitled “Effect of herbicides on the soil fauna in soybean ecosystem” was conducted during kharif 2011 at ZARS, Navile, Shimoga. The experiment was laid out in randomized complete block design with three replications.

The studies revealed that among the different intervals of observations, post emergent application of fluzifop butyl @ 50 g a.i./ha recorded significantly lower soil arthropod population at 80 DAS as compared to the rest of the treatments (20.00 arthropods per 400 gm of soil) an diversity of soil arthropods was also lower (0.62). Abundance of collembolans, mesostigmata and cryptostigmata was lower at 80 DAS (0.67, 0.33 and 0.67 per 400 g of soil, respectively). Fluzifop butyl at recommended dosage recorded higher conidial inhibition of *Metarrhiziumanisopliae* (34.43 per cent) and application of recommended dose of trifluralin recorded lower (15.06 per cent) inhibition. Application of chlorimuron ethyl recorded higher inhibition (34.42 per cent) at recommended dosage and lower inhibition (15.51 per cent) of conidial germination *Beauvaria bassiana* with a n application of recommended dose of clethodim.

Among the herbicidal treatments significantly higher soybean seed yield and haulm yield (26.00 q/ha and 3880 kg/ha respectively) was recorded with pre-emergent application of pendimithalin at 1 kg a.i./ha. Abundance of arthropods showed significant negative correlation with the yield if soybean. Soil arthropods population significantly influenced the yield of soybean.

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1. Study on Technological Gap and Adoption Level of Improved Cultivation Practices by Arecanut Growers of Bhadra Command Area

Deepika K. R.

ABSTRACT

A study on technological gap and adoption level of improved cultivation practices by arecanut growers was carried out in Bhadra command area during 2014-15. The number of respondents selected for the study was 120. The data was collected by personal interview method.

Majority of arecanut growers were middle aged (60.00 %), 25.83 per cent of respondents studied up to middle school, 29.17 per cent had low farming experience in arecanut cultivation, 61.66 per cent of the respondents belonged to medium level of annual income category. Considerable percent of the respondents belonged to high innovativeness category, medium risk orientation, high economic motivation and high achievement motivation. Variables such as education, extension participation, innovativeness, mass media utilization and achievement motivation were negatively and significantly related with technological gap of arecanut growers.

45.84 per cent of the respondents belonged to medium category of technological gap. Nearly 47.50 per cent of arecanut growers belonged to medium adoption level category.

Majority of arecanut growers expressed their training needs on the practices like identification of pests and diseases (83.40 %), control of pests and diseases (95.80 %), processing of arecanut (75.00%). Majority of the respondents expressed that non availability of labour at right time (76.67%), High incidence of pests and diseases (74.16 %) are the major constraints in arecanut cultivation.

2015

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Dr. S. CHANDRA NAIK
Major Advisor

2. A Comparative study on men and women self-help groups in Shivamogga district

Chinmayi, V.

ABSTRACT

Self help group is a group of people having a common goal of socio-economic sustainable development discussing their problems and resolving it through appropriate participation decision making. The study was conducted during the year 2015, in Shivamogga district. Main objective of the study was to compare the performance of men and women SHGs, the motivational factors in the formation of Self help groups, various activity undertaken by SHG members, relationship between personal and socio-economic characteristics with performance, suggestions and constraints faced by the members of SHG members. Total of 30 SHGs and 150 respondents were interviewed from three taluks of Shivamogga district.

The findings of the study revealed that, majority of respondents from men SHGs (57.33%) and women (58.67%) SHGs had medium level of social participation. Majority of the respondents from both men (36%) and women groups (37.33%) were having medium level of awareness about developmental programmes. Majority of the respondents from both men SHGs (40%) and women (38.67%) SHGs had medium level of extension participation. Majority of the respondents from both men (42.67%) and women (37.33%) had medium level of extension contact.

With respect to motivational factors, men were formed into self help groups to reduce financial problems (54.67%) and women groups are formed to increase the future savings (74.67%). Majority of both men (73.33%) and women (46.67%) self help groups belongs to medium performance level category.

Major constraint faced by the both men (42.67%) and women (36%) respondents were lack of technical guidance. Majority of the respondents (80%) suggested that training programmes should be conducted based on the needs.

June, 2015
Dept .of Agricultural Extension
U.A.H.S Shivamogga

Dr. Basavaraj Beerannavar
Major Advisor

3. Impact of Intercrops in Cashew Based Cropping System Followed by the Farmers of Shivamogga District of Karnataka State

AKSHATH, K. V.

ABSTRACT

The study was conducted in the year 2014-15 in Shivamogga district of Karnataka state with a sample size of randomly selected 120 farmers. The data was collected with the help of structured interview schedule. The socio-economic profile of the respondents in the study revealed that, majority of the respondents belong to young age group (50.00 %), high school education (41.67 %), medium family size category (41.67 %), small land holding category (40.83 %) and medium income level (81.17 %). Whereas, majority of the respondents had low mass media exposure (38.33 %), extension participation category (51.67 %), medium extension agency contact (50.83 %) and medium social participation category (45.83 %). With respect to the intercrops followed in Cashew majority of the farmers (61.67 %) adopted maize as the intercrop in cashew followed by paddy (16.67 %), pineapple (7.50 %) and ginger (6.67 %) in Cashew based cropping system. The cultivation of intercrops in cashew provides the employment opportunity of an average of 25 man days per acre and it provides the average income of Rs. 53,086.62/- per acre. With respect to adoption level of cashew production technologies most of the farmers (38.33 %) were found in medium adoption category followed by low (35.83 %) and high adoption category (25.83 %). The variables like age, education, farming experience, social participation and extension participation had positive and significant relationship with adoption level at 0.01 levels. Whereas, extension agency contact had negative and significant relationship with adoption level. The major constraints faced by the cashew growers were lack of processing unit (90.96 %), incidence of pest and diseases (85.52 %) and price fluctuation in the market (76.86 %).

June, 2015
Dept .of Agricultural Extension
U.A.H.S Shivamogga

Dr. DHANANJAYA
Major Advisor

4. Study on Entrepreneurial Behavior of Mango Growers of Karnataka

MANJUNATH

ABSTRACT

A study on entrepreneurial behaviour of mango growers was carried out in Kolar and Ramanagar districts of Karnataka stateduring 2014-15. The number of respondents selected for the study was 120. The data were collected by personal interview method.

The results showed thatmore than half (55.83%) of the respondents had medium entrepreneurial behavior. A majority of the respondents had medium level ofrisk orientation (63.33%), achievement motivation(59.17%), innovativeness (53.33%), decision making ability (52.00%), management orientation(50.00%),scientific orientation (45.83%) and economic motivation (42.50%)

Majority of the mango growers (60.00%) were middle aged. 25.00 per cent of the respondents were educated up to high school, 61.66 per cent were had agriculture as main occupation, 32.50 per cent were belonged to small farmers category and 36.67 per cent were had medium experience in mango cultivation. Variables such as education, land holding, annual income, mass media exposure, extension participation and extension contact positively and significantly correlated with entrepreneurial behaviour of mango growers.

Nearly half (49.16%) of the respondents leased their orchard to the pre harvest contractors.Majority of the mango growers most needed training with respect to “marketing of mango and mango products”(37.00%) followed by “irrigation management in mango (33.33%), and entrepreneurial activities”(30.00%).The major constraints faced by mango growers were“lack of storage facility for fruits and processed products”(100%), followed by “fluctuation of prices in mangos” (100%)and “lack of knowledge on processing”(92.50%).

Department of Agricultural Extension
UAHS, Shivamogga
June, 2015

Dr. K. AMARESH KUMAR
Major Advisor

1. Growth Analysis, Yield and Quality of Guar Genotypes as Influenced by Planting Density

NANDINI, K.M.

ABSTRACT

A field experiment was conducted at University of Agricultural and Horticultural Sciences, Navile, Shivamogga during *khari*f2014 on red sandy clay soil to study the growth analysis, yield and quality of guar genotypes as influenced by planting density.

The experiment was laid out in factorial randomized complete block design with three replications. There were twelve treatment combinations comprised of four spacing (45cmx15cm, 30cmx15cm, 45cmx10cm and 30cmx10cm) and three genotypes (RGC-I003, RGC-936 and HG-365). Among the spacing, significantly higher grain yield (743.89 kg ha⁻¹), stover yield (1629.94 kg ha⁻¹), RUE (1.32 Mj m⁻²), HUE (1.53 x 10⁻²), PTUE (2.29 x 10⁻²) and quality parameters like gum per cent (30.36), protein percent (30.94) and endosperm percent (33.49), viscosity (236.47 cps) were recorded in plants grown at 30cmx10cm. Among the genotypes, significantly higher total dry matter (23.38 g plant⁻¹), grain yield (898.18 kg ha⁻¹), stover yield (1931.39 kg ha⁻¹), RUE (1.26 Mj m⁻²), HUE (1.60 x 10⁻²), PTUE (2.39 x 10⁻²) and quality parameters like gum per cent (31.09), protein per cent (31.68) and endosperm per cent (33.96) viscosity RGC-I003 (245.75 CpS) were recorded with the RGC-I003. This could be due to genetic potentiality of the genotypes.

The interaction of spacing and genotypes were found to be statistically non significant. The functional growth models like Logistic, Gompertz and Richards shows the pattern of dry matter accumulation of guar genotypes at different spacing.

May, 2015
Department of Agronomy
UAHS, Shivamogga

2. Studies on Performance of Traditional Paddy (*Oryza Sativa* L.) Varieties Under Different Nutrient Management Practices

GAGANDEEP, H.N.

ABSTRACT

A field experiment was conducted during 2014 at AHRS, Honnavile, UAHS, Shivamogga. The experiment was laid out in a Randomized Complete Block Design (Factorial concept) with four varieties and four different nutrient management practices with three replications. The cultivars used were Chinnaponni, Mysore mallige, Coimbatore sanna and JGL – 1798 and different nutrient sources were Rec. FYM + 100 % Rec. N equivalent through organics, 100 % Rec. NPK through inorganics (100:50:50 NPK kg ha⁻¹), Rec. FYM + 50 % N equivalent through organics + 50 % NPK through inorganics (100:50:50 NPK kg ha⁻¹) and Rec. FYM + 100 % Rec. NPK through inorganics.

The results revealed that among the traditional paddy varieties Chinnaponni recorded higher plant height (76.1 cm), leaf area (914.0 cm² hill⁻¹), number of effective tillers (26.4 hill⁻¹), total dry matter accumulation (82.92 g hill⁻¹), grain yield (3610 kg ha⁻¹) and 1000- grain weight (22.2 g) compared to all traditional varieties. The high yielding paddy variety JGL-1798 recorded significantly higher plant height (81.6 cm), leaf area (919.9 cm² hill⁻¹), number of effective tillers (29.0 hill⁻¹) and total dry matter accumulation (91.48 g hill⁻¹), grain yield (4997 kg ha⁻¹) and 1000- grain weight (24.1 g) compared to all traditional varieties.

Among the different nutrient management practices Rec. FYM + 100 % Rec. N equivalent through organics recorded significantly taller plants (74.8 cm), leaf area (942.4 cm² hill⁻¹), number of effective tillers (26.3 hill⁻¹) and total dry matter accumulation (83.05 g hill⁻¹), grain yield (3580 kg ha⁻¹) and 1000- grain weight (22.2 g). However, it was on par with application of Rec. FYM + 100 % Rec. NPK through inorganics and Rec. FYM + 50 % N equivalent through organics + 50 % NPK through inorganics as compared to application of 100 % NPK through inorganics.

Department of Agronomy
College of Agriculture, UAHS, Shivamogga
July, 2015

Dr. C. SUNIL
Major Advisor

3. Effect of Zinc Application through Soil and Foliar Means on Biofortification of Zinc in Maize (*Zea Mays* L.)

SHIVANAND PATIL

ABSTRACT

A field experiment entitled 'Effect of zinc application through soil and foliar means on biofortification of zinc in maize (*Zea mays* L.)' was conducted at Agriculture College, Navile, UAHS, Shivamogga during *khariif* 2014. The experiment consisted of 12 treatments with three replication was laid out in randomized complete block design (RCBD). The treatments comprise of zinc fertilization through zinc enriched maize residue compost, FYM, soil and foliar means were compared with recommended dose of fertilizer alone and recommend package of practice.

Maize residue compost applied @ 7.5 t ha⁻¹ enriched with 15 kg ZnSO₄ recorded significantly higher grain (60.9 q ha⁻¹) and stover yields (62.57 q ha⁻¹). The superiority of former treatment was traced back to the significant improvement in growth attributes *viz.*, plant height (172.63 cm), leaf area (45.57 dm²), leaf area index (3.38), leaf area duration (113.84 days), total dry matter production (326.38 g plant⁻¹) and crop growth rate (44.61 g m⁻² day⁻¹) and yield attributes such as cob diameter (5.05 cm), test weight (31.51 g) and grain yield per plant (137.4 g). The significant improvement in growth and yield parameters with maize residue compost applied @ 7.5 t ha⁻¹ enriched with 15 kg ZnSO₄ was due to higher total nutrient uptake (124.11, 24.87, 149.36 kg N, P₂O₅, K₂O and 451.51 g zinc ha⁻¹, respectively) by the crop.

The quality parameters of maize *viz.*, grain zinc content (46.67 mg kg⁻¹), soluble protein (5.39 mg g⁻¹), crude protein in grain (12.67 %) and protein yield (760.14 kg ha⁻¹) were also higher with application ZnSO₄ @ 15 kg ha⁻¹ through enriched MRC (@ 7.5 t ha⁻¹).

July, 2015

Department of Agronomy

UAHS, Shivamogga

Dr. G. K. GIRIJESH

Major Advisor

4. Effect of Integrated Nutrient Management on Growth and Yield of Aerobic Rice (*Oryza Sativa* L.)

KIRAN KUMAR

ABSTRACT

A field experiment was conducted during *Kharif* 2014 at agriculture and Horticulture Research Station (AHRS), Bavikere to know the combined effect of organic and inorganic fertilizers on growth and yield of aerobic rice. The experiment was laid out in a randomized complete block design (RCBD) with eleven treatments replicated thrice.

Application of RDF + Vermicompost + PSB + 25% Nitrogen through glyricidia recorded higher plant height (65.10 cm), number of leaves (103.32 plant⁻¹), leaf area (2323.60 cm² plant⁻¹), leaf area index (3.72), number of tillers (31.63 plant⁻¹), total dry matter accumulation (96.46 g plant⁻¹), grain yield (4241 kg ha⁻¹) and straw yield (5487 kg ha⁻¹) which was on par with the application of RDF + FYM + PSB + 25% Nitrogen through glyricidia grain yield (4111 kg ha⁻¹) straw yield of (5248 kg ha⁻¹), respectively.

Application of RDF + Vermicompost + PSB + 25% Nitrogen through Glyricidia resulted in higher total nitrogen, phosphorus and potassium uptake by aerobic rice (131.32, 26.95 and 113.07 kg ha⁻¹, respectively) which was on par with the application of RDF + FYM + PSB + 25% Nitrogen through glyricidia (125.54, 25.28 and 111.97 kg ha⁻¹, respectively). Lower uptake of nitrogen, phosphorus and potassium (86.93, 13.26 and 85.46 kg ha⁻¹, respectively) was observed with application recommended dose of fertilizer (RDF) alone.

The available nitrogen, phosphorus and potassium (272.62, 86.95 and 221.30 kg ha⁻¹, respectively) after the crop harvest were observed with the application of RDF + Vermicompost + PSB + 25% Nitrogen through glyricidia which was on par with application of RDF + FYM + PSB + 25% Nitrogen through glyricidia (271.30, 85.69, and 201.25 kg ha⁻¹, respectively). Lower available nitrogen, phosphorus and potassium (265.14, 76.81 and 164.82 kg ha⁻¹, respectively) were observed with application of recommended dose of fertilizer (RDF) alone.

Department of Agronomy
UAHS, Shivamogga
July, 2015

Dr. C. J. Sridhara
Major advisor

5. Integrated Use of Conventional and Foliar Fertilizers with Effective Microbial Consortia on Productivity of Paddy (*Oryza Sativa* L.) in Southern Transition Zone (STZ) of Karnataka

Vishwanath Patil

ABSTRACT

A field experiment was conducted during Kharif season of 2014 at Agronomy field unit, University of Agricultural and Horticultural Sciences, Navile, Shivamogga. The experiment was laid out in Randomized Complete Block Design with thirteen treatments replicated thrice. Treatments consisted of two levels of recommended dose of fertilizers (75 and 100%) supplemented with foliar fertilizers application *viz.*, 19:19:19 and 13:0:45 at different stages and bioinoculation of effective microbial consortia. The paddy variety used was JGL-1798.

The results revealed that among the different treatments, application of 100 per cent recommended dose of NPK with one per cent each foliar spray of 19:19:19 and 13:0:45 at maximum tillering and grain filling stages, respectively with bioinoculation of effective microbial consortia (*Azospirillum* + *Bacillus megaterium* + *Fratureuria aurantia*) recorded significantly higher plant height (98.13 cm), number of leaves (65.36), number of tillers (18.10), leaf area (1097.83 cm²) and total dry matter production hill⁻¹ (61.28 g). Yield contributing characters like number of productive tillers hill⁻¹ (16.10), panicle length (23.30 cm), panicle weight (3.58 g), 1000 grain weight (23.10 g) and number of filled grains panicle⁻¹ (151.33) were also significantly higher in the above said treatment with least chaffiness (4.99 %) which ultimately resulted in significantly higher grain (75.56q ha⁻¹) and straw yield of paddy (78.05 q ha⁻¹). The quantum of yield increase was 21.62 per cent as compared to recommended dose of NPK (62.13 q ha⁻¹). Nutrient uptake by the crop also registered similar trend as that of growth and yield parameters with statistically higher uptake of N (85.82 kg ha⁻¹), P₂O₅ (30.51 kg ha⁻¹) and K₂O (50.58 kg ha⁻¹). In terms of economics also, numerically higher gross returns (Rs. 110181.33 ha⁻¹), net returns (Rs. 79410.08 ha⁻¹) and B:C ratio of 2.58 is noticed in the same treatment.

Department of Agronomy
UAHS, Shivamogga
July, 2015

Dr. H. K. Veeranna
Major Advisor

6. Effect of Liquid fertilizers on rainfed hybrid maize (*Zea mays* L.) in Southern Transition Zone of Karnataka

Chaithanya

ABSTRACT

A field experiment entitled Effect of liquid fertilizers on rainfed hybrid maize (*Zea mays* L.) in Southern Transition Zone of Karnataka was conducted during *Kharif* 2014 at Agricultural and Horticultural Research Station, Bavikere, UAHS, Shivamogga. On red clay loam soil which was low in available nitrogen, medium in available phosphorus and potassium. There were 11 treatment combination consisting of two water soluble fertilizers along with Package of practice *i.e.* (only RDF, 0.5 % 18:18:18, 1.0 % 18:18:18, 1.5 % 18:18:18, 0.5 % Multi-K, 1.0 % Multi-K, 1.5 % Multi-K, 1.0 % 18:18:18 + 0.5 % Multi-K, 1.0 % 18:18:18 + 1.0 % Multi-K and 1.0 % 18:18:18 + 1.5 % Multi-K) and two stages of foliar application of Water Soluble Fertilizers at 30 DAS and 60 DAS. The experiment was laid out in RCBD with replicated thrice.

The results revealed that Package of Practice + 18:18:18 @ 1.0 % + Multi-K @1.5 % recorded significantly higher plant height (218.7 cm), leaf area ($62.8 \text{ cm}^2 \text{ plant}^{-1}$), total dry weight (335 g plant^{-1}), cob length (18.5 cm), thousand grain weight (236 g), shelling percentage (82.9 %), number of grain per cob (435), grain rows per cob (12.9), grain weight per plant (179 g), Grain yield (83.99 q ha^{-1}), stover yield (183.38 t ha^{-1}) and harvest index (0.46) compared to other of treatments. Similarly, available nutrients (286.2, 30.4 and 191.8 N, P_2O_5 and K_2O kg ha^{-1} , respectively) nutrient uptake (240.2, 299.4 and 307.8 kg ha^{-1} NPK, respectively), apparent crop recovery efficiency (12.32, 13.18 and 99.99 % NPK, respectively) and agronomic use efficiency (9.78, 18.64 and 18.69 % NPK, respectively) were higher besides higher gross return (Rs. 1,09,957.0 ha^{-1}). However, due to higher unit cost of WSF and higher ICBR (23.86) over control was recorded in POP +18:18:18 @ 1.0 % + Multi-K @ 0.5 %. It is also concluded that Package of Practice + 18:18:18 @ 1.0 % + Multi-K @1.5 % foliar application at 30 DAS and 45DAS found higher yield and returns.

July, 2015

Department of Agronomy
Collage of Agriculture, Shivamogga
UAHS, Shivamogga

Dr. NARAYANA S. MAVARKAR
Major Adviser

7. Nutrient management for target yield concept in rice under transplanted condition in southern transition zone

HARI HARA MURTHY, N.

ABSTRACT

A field experiment was conducted during 2014 at Agricultural and Horticultural Research station, Bhavikere, UAHS, Shivamogga to study the effect of Nutrient management for target yield concept in rice under transplanted condition in southern transition zone. The experiment was laid out in a RCBD. (Factorial concept) with two genotypes and four different nutrient levels with three replications. The genotypes used were KRH-4 and JGL-1798 and different nutrient levels were RDF (100:50:50 kg NPK ha⁻¹), fertilizer requirement for target yield of 7.5 t ha⁻¹, fertilizer requirement for target yield of 10 t ha⁻¹, fertilizer requirement for target yield of 12.5 t ha⁻¹.

Among the genotypes, KRH-4 recorded higher plant height (107.13 cm), number of effective tillers (15.08 hill⁻¹), total dry matter accumulation (80.28 g hill⁻¹), straw yield (104.08 q ha⁻¹) and grain yield (82.42 q ha⁻¹) compared to JGL-1798.

Among the nutrient levels, target yield of 12.5 t ha⁻¹ recorded significantly higher plant height (110.50 cm), number of effective tillers (17.93 hill⁻¹) and total dry matter accumulation (84.50 g hill⁻¹), straw yield (118.71) and grain yield (97.13 kg ha⁻¹) than other nutrient levels.

Among the interactions, KRH-4 with target yield of 12.5 t ha⁻¹ recorded significantly higher straw yield (122.0 q ha⁻¹) and grain yield (102.90 kg ha⁻¹) than other interactions.

Similarly higher uptake of nitrogen (117.01 kg ha⁻¹), phosphorous (22.81 kg ha⁻¹) and potassium (104.50 kg ha⁻¹) was recorded in KRH-4. Among the nutrient levels, higher uptake of nitrogen (125.59 kg ha⁻¹), phosphorous (30.43 kg ha⁻¹) and potassium (116.45 kg ha⁻¹) was recorded in target yield of 12.5 t ha⁻¹ than other nutrient levels.

Higher cost of cultivation (Rs.37865 ha⁻¹) and net returns (Rs.104756 ha⁻¹) was seen in the treatment KRH-4 with target yield of 12.5 t ha⁻¹. However higher B: C ratio (2.95) was seen in KRH-4 with target yield of 10 t ha⁻¹.

Department of Agronomy
UAHS, Shivamogga
July, 2015.

Dr. BASAVARAJ NAIK, T.
Major Advisor

8. Effect of Integrated Nutrient Management on Growth and Yield of Rainfed Finger millet (*Eleusine coracana* (L.) Gaertn.)

THIMMAIAH, M.

ABSTRACT

A field experiment was conducted during 2014 at field unit of Agronomy department, UAHS, Shivamogga. The experiment was laid out in a Randomized Complete Block Design (RCBD) with twelve treatments having three replications. The treatments comprised of farm yard manure (FYM), frond compost and vermicompost combinations along with PGPR and recommended NPK tested against farmers practice and recommended NPK alone.

Among the different nutrient management practices, Recd. NPK+FYM at 7.5 t ha⁻¹+PGPR at 2 kg ha⁻¹+Vermicompost and Frond compost both at 3.75 t ha⁻¹ as top dress at 25 DAT recorded significantly taller plants (145.27 cm), leaf area (1177.30 cm² plant⁻¹), number of tillers (4.07 plant⁻¹), total dry matter accumulation (59.13 g plant⁻¹), 1000 grain weight (3.76 g), grain yield (63.50 q ha⁻¹) and straw yield (86.67 q ha⁻¹). It registered 119 and 87 per cent higher yield respectively over farmers practice and recd.NPK alone. It also recorded higher uptake of NPK in both grain and straw.

The nutrient use and agronomic use efficiency was found highest in Recd. NPK+FYM at 7.5 t ha⁻¹+PGPR at 2 kg ha⁻¹+Frond compost at 3.75 t ha⁻¹ as top dress at 25 DAT. The highest available NPK and physiological use efficiency was recorded in Recd. NPK+FYM at 7.5 t ha⁻¹+PGPR at 2 kg ha⁻¹+Vermicompost at 3.75 t ha⁻¹ as top dress at 25 DAT. The highest partial factor productivity was recorded in Recd. NPK+FYM at 7.5 t ha⁻¹+PGPR at 2 kg ha⁻¹. Similarly, higher net returns (Rs. 66,728 ha⁻¹) was recorded in recommended NPK + FYM at 7.5 t ha⁻¹ + PGPR at 2 kg ha⁻¹ + Frond compost at 3.75 t ha⁻¹ as top dress at 25 DAT.

Department of Agronomy
College of Agriculture Navile, Shivamogga
July, 2015

Dr. M. DINESH KUMAR
Major advisor

9. Effect of Enriched FYM and Fertilizer Levels on Growth and Yield of Aerobic Rice (*Oryza Sativa* L.)

ASHWINI, M.

ABSTRACT

A field experiment was conducted during 2013 at Agronomy field unit, ZAHRS, University of Agricultural and Horticultural Sciences, Navile, Shimoga. The experiment was laid out in factorial randomized complete block design with three fertilizer level viz., 125:62.5:62.5 NPK.kg ha⁻¹, 100:50:50 NPK kg ha⁻¹ and 75:37.5:37.5 NPK kg ha⁻¹ with four methods of application viz., separate application of manure and fertilizer, spot application of manure and fertilizer, broadcasting of enriched manure and spot application of enriched manure.

Application of 125:62.5:62.5 NPK kg ha⁻¹ recorded higher plant height (66.07 cm), leaf area (1737.4 cm² plant⁻¹), number of tillers plant⁻¹ (37.94), total dry matter accumulation (103.27 g plant⁻¹), water use efficiency (46.33 kg ha⁻¹cnr⁻¹), grain yield (53.54 q ha⁻¹) and filled grain (111.86 panicle⁻¹) but less unfilled grains (12.83 panicle⁻¹) recorded in application 75:37.5:37.5 NPK kg ha⁻¹ which was on par with level 100:50:50 NPK kg ha⁻¹ (12.26 panicle⁻¹). Significantly higher 1000 grain weight (23.37 g) recorded in application of 100:50:50 NPK kg'ha⁻¹ which was on par with level 75:37.5:37.5 NPK kg ha⁻¹ (22.78 g).

Among the methods of application spot application of enriched manure recorded significantly higher plant height (66.12 cm), total dry matter accumulation (97.10 g plant⁻¹), number of tillers (37.06 panicle⁻¹), 1000 grain weight (24.24 g) and grain yield (54.03 q ha⁻¹) due to timely available of nutrients.

Interaction of spot application of enriched manure with 125:62.5:62.5 NPK kg ha⁻¹ has registered higher grain yield (60.58 q ha⁻¹) and filled grains panicle⁻¹ (128.75 panicle⁻¹). Significantly higher 1000 grain weight (25.80 g) in spot application of enriched manure with 100:50:50 NPK kg ha⁻¹. Higher gross returns (Rs. 90,870 ha⁻¹), net returns (Rs. 65, 319.74 ha⁻¹) and B: C ratio (1: 2.56) was observed in spot application of enriched manure with fertilizer level 125:62.5:62.5 NPK kg ha⁻¹.

Department of Agronomy
June, 2014
College of Agriculture,
UAHS, Shimoga

Dr. C J SRIDHARA
Major Advisor

10. Comparative Evaluation of Pre and Post Emergent Herbicides For Control of Weeds in Maize (*Zea Mays* L.)

UMESHAC

ABSTRACT

An experiment entitled "Comparative evaluation of pre and post emergent herbicides for control of weeds in maize (*Zea Mays* L.) was conducted during *kharif*, 2013 at College of Agriculture, UAHS, Shimoga. Ten treatments [Tembotrione 42 SC at 100 g a. i. ha⁻¹, Tembotrione 42 SC at 110 g a. i. ha⁻¹, Atrazine 50 WP at 1000 g a. i. ha⁻¹, 2, 4-D Na salt 80% WP at 1000 g a. i. ha⁻¹, Tembotrione 42 SC at 100 g a. i. ha⁻¹ + atrazine 50 WP at 1000 g a. i. ha⁻¹, Atrazine 50 WP at 1000 g + 2, 4-D Na salt 80% WP at 1000 g a. i. ha⁻¹, Atrazine 50 WP at 1000 g a. i. ha⁻¹ + Tembotrione 42 SC at 100 g a. i. ha⁻¹, Atrazine 50 WP at 1000 g a. i. ha⁻¹ + inter-cultivation, Weedy check and Weed free check] were replicated thrice in RCBD.

Major weeds observed were *Cyperus rotundus*, *Cyperu sesculantus* (sedges), *Cynodon dactylon*, *Elusina indica* (grasses) and *Commelina benghalensis*, Cleome if is cosa, *Celosia argentia* and *Acanthospermum hispidumaxnong* broad leaved weeds. Significantly higher grain yield, water use efficiency and nitrogen use efficiency, phosphorus use efficiency and potassium use efficiency were recorded in application of Tembotrione 42 SC at 100 g a.i. ha⁻¹ + Atrazine 50 WP at 1000 g a.i. ha⁻¹ (58.81 q ha⁻¹ 9.16 and 39.20, 178.28, 176.44, respectively), Atrazine 50 WP at 1000 g a.i. ha⁻¹ (58.47 q ha and 38.98, 177.17, 175.42, respectively), Atrazine 50 WP at 1000 g + 2, 4-D Na salt 80 % WP at 1000 g a.i. ha⁻¹ (58.03 q ha⁻¹, 9.04 and 38.69, 175.80, 174.12, respectively) and Atrazine 50 WP at 1000 g a.i. ha⁻¹ + Tembotrione 42 SC at 100 g a.i. ha⁻¹ (57.67 q ha⁻¹, 8.98 and 38.45, 174.77, 173.04, respectively) and without any residual effect on succeeding Green grain Crop.

2014

Department of Agronomy
UAHS, Shimoga

Dr. S SRIDHAR
Major Advisor

1. Assessment of Genetic Variability, Diversity for Yield and Yield Components and Morphological Characterization of Traditional Rice (*Oryza sativa* L.) Genotypes

SRIDHAR T C

ABSTRACT

Rice (*Oryza sativa* L.) is one of the most important food crop grown worldwide. It is the staple food for half of the world's population, being primary centre of origin it posses huge diversity of rice genotypes of both wild and cultivated. The present study was undertaken to evaluate sixty four traditional rice genotypes for variability and diversity in yield and its components and morphologically characterise the genotypes according to DUS guidelines. ANOVA revealed significant difference among the genotypes studied for all the characters. High range of variation, PCV, GCV and high heritability coupled with high GAM was observed for number of tillers per plant, number of spikelets, grains per panicle, straw yield per plant, harvest index and grain yield per plant. Yield components such as plant height and test weight exhibited highly significant association with grain yield at phenotypic level. Days to maturity followed by harvest index and number of tillers per plant had the highest positive direct effect on grain yield. Using Mahalanobis' D^2 statistic, genotypes were grouped into fourteen clusters. Based on cluster distance, highest inter cluster distance between cluster X and XIV. Among all the characters, days to maturity followed by straw yield per plant had highest contribution towards the genetic diversity. Morphological characterization inferred the existence of distinct and uniform genotypes for the characters specified for rice by DUS guidelines, viz., anthocynin coloration, intensity and its distribution on coleoptile, basal leaf sheath, leaves, nodes, internodes and spikelets. Angular characters like attitude of flag leaf, culm and panicle. Grain characters viz., awns, length, breadth, grain colour, and shape of both hulled and non hulled grains. Quantitative characters like days to flowering and maturity, length and breadth of leaf blade, plant height and test weight. Two genotypes (Naare kela and Navile sanna) were found entirely distinct by presence of multi spikelets per pedicel. This present study identified five promising genotypes viz., Kempakki, Navara, Chammpakali, Solari and Kaase bhai over check variety (Jyothi and JGL-1798) for yield and its components. Thus these local genotypes may be utilised in further crop improvement programme.

May, 2015

Dept. of Genetics and Plant Breeding

C. O. A., U. A. H. S, Shivamogga

Dr. DUSHYANTHA KUMAR, B. M

Major Advisor

2. Genetic Investigation of Yield and its Attributing Characters in Okra [*Abelmosches* *Esulentus* (L.) Moench]

ASHA. I. S

ABSTRACT

The genetic variability is the pre-requisite for any plant breeding programme. Forty nine Okra germplasm accessions were evaluated in a simple lattice design with two replications during *kharif* 2014 at College of Agriculture, UAHS, Shivamogga. Data were collected on 13 quantitative traits and were subjected to variability, association and diversity studies. The results of the investigation revealed that, there were significant variation among the lines for yield and yield contributing traits. Broad sense heritability as well as expected GAM was higher for plant height, inter-nodal length, first flowering node, number of branches per plant, number of flowering nodes on main stem, fruit length, fruit diameter, number of fruits per plant, average fruit weight and fruit yield per plant.

Plant height, intermodal length, first flowering nodes, number of branches per plant, number of flowering nodes in main stem, fruit length, number of fruits per plant and average fruit weight had high significant positive association with fruit yield per plant. Direct and indirect association analysis revealed that number of fruits per plant had highest direct effect followed by average fruit weight on fruit yield per plant.

Based on Mahalanobis' D^2 values these genotypes were grouped into 8 clusters. Cluster I had maximum number of 35 genotypes followed by Cluster IV with 5 genotypes. Fruit diameter contributed maximum towards genetic divergence followed by number of flowering nodes on main stem. Pusa Makhmalli, EC 693224 and VRO-109 genotypes which are most diverse could be involved in hybridization among promising combinations to develop productive segregants.

May 2015
Dept. of Genetics and Plant Breeding
U.A.H.S-Shivamogga

Dr. GANGA PRASAD, S.
Major Advisor

3. Assessment of Genetic Variability, Association and Diversity in French Bean (*Phaseolus Vulgaris*L.)

BHAGANNA HARALAYYA

ABSTRACT

Success of any crop improvement programme depends on the extent of genetic variability present in the population for the traits for which the improvement is aimed at breeding. Thirty six germplasm collections were evaluated in a simple lattice design with two replications during summer 2014 at College of Agriculture, UAH, Shivamogga. Data were collected on 13 quantitative traits and were subjected to variability, association and diversity studies. The genotypes revealed that high significant variability for all the tested characters such as green pod yield, plant height, number of primary branches, number of secondary branches, number of pods per plant, pod length, number of seeds per pod and 100 seed weight. The high PCV and GCV values were recorded by number of pods per plant, plant height, number of secondary branches and test weight. Heritability in broad sense and genetic advance as per cent mean were higher for plant height, number of primary branches, number of secondary branches, number of pods per plant, number of seeds per pod, pod length and 100 seed weight. Association analysis revealed significant positive correlation of green pod yield with plant height, number of pods per plant, number of seeds per pod and pod length (cm). Positive direct effects were recorded by pod length, plant height, days to 50 per cent flowering and flower to pod set ratio to green pod yield. The number of seeds per pod, number of pods per plant and plant height recorded high positive indirect effect with green pod yield. Based on D₂ values thirty six genotypes were grouped into 6 clusters. Cluster I was the biggest with 19 genotypes followed by cluster VI and Cluster II&III. The maximum contribution for the diversity was observed in green pod yield followed by plant height. The genotypes like, IIHR-47, Arka Komal, IIHR-99, IIHR-90, IIHR-81A, IIHR-23 and IIHR-I03 are identified as high yielding and most diverse genotypes. These genotypes could be involved in hybridization among promising combinations to develop productive segregants.

May 2015
Dept. of Genetics and Plant Breeding
U.A.H.S-Shivamogga

Dr. GANGA PRASAD, S.
Major Advisor

4. Studies on genetic variability in eggplant (*Solanum melongena* L.) genotypes for drought tolerance and yield

GOBU R

ABSTRACT

The present investigation was initiated by conducting a survey among eggplant growers of central dry zone (Zone-4) and southern transitional zone (Zone-7) of Karnataka to know their varietal preference and then a study was conducted in eggplant genotypes to assess the genetic variability for drought tolerance and yield under three experiments by imposing water stress at germination stage (73 genotypes), seedling stage (65 genotypes) and reproductive stage (62 genotypes). The survey results revealed that farmers in Zone-4 prefer local cultivars followed by private varieties/hybrids. Whereas in Zone-7, private varieties are more preferred than local cultivars. The analysis of variation revealed the existence of highly significant differences among the genotypes for all the traits recorded under moisture stressed and non-stressed condition. A high range of variation and high heritability coupled with high genetic advance was recorded for most of the traits. The association studies revealed that fruit yield per plant showed significant positive association with plant height, number of fruits per plant, fruit circumference and average fruit weight. Path analysis revealed that average fruit weight had highest direct positive effect on fruit yield, while fruit circumference showed high indirect positive effect on fruit yield through average fruit weight. Based on Mahalanobis' D^2 analysis, the genotypes were grouped into 11 clusters. Based on cluster mean scoring, cluster II ranked first, which includes Punjab Barsati, IC104083, IVBL-9, Lal Gulab, IC90785, IC333527, Arka Abilash, IIHR-7 and Arka Kranti. Out of twelve characters studied, number of primary branches per plant contributed maximum towards total genetic divergence. Based on the results of each experiment, better drought tolerant and susceptible genotypes for moisture stress at different growth stages were identified. The genotype, Jawahar Brinjal-69 has been identified as drought tolerant line at all the three stages *viz.*, germination, seedling and reproductive stage.

June, 2015
UAHS, Shivamogga

Dr. HARISH BABU B.N.
Major Advisor

5. Genetic Divergence and Correlation Studies For Yield And Yield Traits In Rice (*Oryza Sativa* L.) Germplasm Lines

IRAPPA B MAMADAPUR

ABSTRACT

A field investigation was carried out involving 150 germplasm of rice at Zonal Agricultural and Horticultural Research Station, Mudigere, during *kharif* 2014, to assess genetic variability and divergence of different yield and yield contributing traits, to estimate correlation coefficients of yield attributes on yield and to estimate direct and indirect effects of yield attributes on yield. The analysis of variance revealed highly significant variability among the lines for different traits. The estimates of PCV and GCV were high for panicle exertion, number of spikelet's per panicle and number of grains per panicle.

The difference between PCV and GCV were less for these characters, indicated low environmental influence. The characters *viz.*, plant height, panicle exertion, number of spikelet per panicle, number of grains per panicle, test weight, L/B ratio and grain yield per plant exhibited high heritability coupled with high predicted genetic advance as per cent of mean. The characters like days to 50 per cent flowering, days to maturity, plant height and test weight showed highly significant positive correlation with grain yield at both genotypic and phenotypic level. Plant height had highest positive direct effect on grain yield followed by number of grains per panicle and 1000-grain weight. In order to assess the divergence among 150 lines, Mahalanobis' D^2 statistics and Tocher method was applied.

The 150 lines were grouped into 8 clusters, where cluster III and IV were the largest containing fourteen and seventeen lines respectively, were the most divergent group with maximum inter-cluster distance (26389.99). Among the thirteen characters studied number of spikelet's per panicle and number of grains per panicle contributed most towards divergence. Nine different grain colour groups were observed among 150 germplasm lines. In the study 10 germplasm were found superior over two checks namely, Tunga and KHP-2 with respect to yield and yield characters.

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June, 2015

Dr. LAKSHMANA D
Major Advisor

6. Assessment of genetic variability and diversity analysis for yield and yield components in traditional rice (*Oryza sativa* L.) genotypes.

VIDYACHARAN D.N

ABSTRACT

Rice (*Oryza sativa*. L) is the prime, most essential and important food crop of the world. Land race plays an important role in the local food security and sustainable development in agriculture. The present study was undertaken to evaluate 100 traditional genotypes for variability and genetic divergence. The investigation was carried out at Agricultural and Horticultural Research Station (AHRS), Kathalagere. The crop for the present investigation was raised during *Kharif* of 2014.

Genotypes were evaluated for extent of variability, character association, path analysis, genetic divergence for 12 traits and variability studies in 100 traditional rice genotypes for the reaction to blast disease. ANOVA revealed highly significant difference among the genotypes for all the quantitative traits. High PCV and GCV estimates for all the characters except days to 50 per cent flowering and days to maturity showed low values, High heritability and high genetic advance were recorded for all the 12 characters. Yield component characters number of grains per panicle and test weight exhibited highly significant association with grain yield. Phenotypic path coefficient analysis revealed that Number of grains per panicle had the highest positive direct effect on grain yield. Using Mahalanobis' D^2 statistic, 100 traditional rice genotypes were grouped into twelve divergent clusters. Wide genetic variability was indicated by the intra and inter cluster distances. Based on cluster means, cluster XI ranked first. It was also found that among all the characters, Days to 50 per cent flowering had highest contribution towards the genetic diversity. Screening of the traditional rice genotypes for field resistance against leaf blast disease revealed that the disease has not been affected severely, compared with the Susceptible genotype Intan, in four out of 100 genotypes were resistant, 67 genotypes showed moderately resistant and 28 genotypes are moderately susceptible.

July, 2015
Dept. of Genetics and Plant Breeding
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Dr. T.H. GOWDA
Major Advisor

7. Genetic variability, *per se* performance and combining ability study in maize (*Zea mays* L.)

Rekha

ABSTRACT

The present investigation was carried out to elucidate the information on genetic variability and diversity, character association and path analysis among the inbred lines, and to estimate the combining ability in forty five single cross hybrids.

Forty three inbred lines of maize were evaluated at ZAHRS, Shivamogga during *khariif* 2014, observations were recorded for twenty one characters. Analysis of variance revealed significant differences among all inbred lines. High PCV, GCV, high heritability coupled with high genetic advance was noticed for leaf area at 40 days after sowing, cob weight, grain yield per plant and 100 grain weight. Mahalanobis D^2 analysis revealed that 43 inbred lines were grouped into 10 clusters, indicating the presence of diversity. The maximum inter cluster distance was observed between clusters VI and X (838.65) and highest intra cluster distance was in cluster VI. Cob weight, leaf area index and days to 50 per cent brown husk maturity contributed more towards genetic divergence. Correlation studies revealed significant association of grain yield with most of the characters under study. The maximum positive direct effect on grain yield was exhibited by cob weight followed by 100 grain weight, shelling percentage, cob length, cob girth and number of rows per cob.

In the second experiment forty five hybrids were evaluated at ZAHRS, Shivamogga during late *rabi* 2014-15. The Observations were recorded for twenty one characters. There was higher dominance variance than additive variance for most of the characters. Among five females, 18704, 18832 and 18838 were the best general combiners for all characters except number of rows per cob. Among nine testers 18328, 18337, 18342, 18627 and 18850 were the best general combiners for all characters. Out of forty five hybrids, hybrids 18838x18850, 18838x18627, 18495x18337, 18838x18342 and 18495x18494 with desirable significant sca effects were identified as best hybrids in respect of grain yield.

June, 2015
Department of Genetics and Plant breeding
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Shivamogga

Dr. H. D. Mohan Kumar
Major Advisor

8. Assessment of Genetic Variability and Diversity in Tomato (*Lycopersicon Esculentum* Mill.) Germplasm

Shweta

ABSTRACT

Present investigation was carried out during Summer and Late *kharif* seasons of 2014 at College of Agriculture, University of Agricultural and Horticultural Sciences, Shivamogga to study the genetic variability, correlation, path coefficient analysis and genetic diversity for quantitative traits in tomato (*Lycopersicon esculentum* Mill.) with 36 genotypes in randomized block design. Considerable amount of variability was noticed for the sixteen and nineteen quantitative characters in summer and late *kharif* seasons respectively as indicated by the analysis of variance. High GCV and PCV, high heritability with high genetic advance as per cent mean was observed for most of the yield attributing characters in both seasons. Fruit yield per plant had highly significant positive association with fruit length, fruit equatorial diameter, fruit volume and average fruit weight in both summer and late *kharif* seasons and number. Similarly, path coefficient analysis revealed that number of clusters per plant, number of flowers per plant and average fruit weight had high direct and indirect effect on fruit yield per plant in both summer and late *kharif* seasons. Apart from these fruit length, fruit volume, number of fruits per plant and Total soluble solids had high effect in late *kharif* season. Mahalanobis D^2 analysis revealed that thirty six genotypes are divided into seven groups in both seasons. In summer cluster-I (21 genotypes) and in late *kharif* Cluster-II had highest number of genotypes. Fruit volume and lycopene content contributed more towards total genetic divergence in summer and late *kharif* seasons respectively. Maximum score was recorded by Cluster V with two genotypes (AR-50 and AR-14) and Cluster VI with single genotype respectively in both the seasons. It appears to be containing most potential genotypes and these can be utilized in further crop improvement programme.

June 2015
Department of Genetics and Plant breeding
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Dr. DHUSHYANTHAKUMAR B. M
Major Advisor

9. Analysis of Genetic Divergence in Groundnut (*Arachis Hypogaea* L.) Genotypes

Sanjeevakumar Patil

ABSTRACT

The genetic variability is the pre-requisite for any plant breeding programme. Forty nine groundnut genotypes accessions were evaluated in a Simple Lattice Design with two replications during *Kharif* 2014 at college of Agriculture, UAHS, Shivamogga. Data were collected on 15 quantitative traits and subjected to variability, association and diversity studies. The results of the investigation revealed that, there were significant variation among the genotypes for yield and yield contributing traits.

The high PCV and GCV values were recorded by secondary branches per plant, immature pods per plant, mature pods per plant, pod bearing nodes per plant and pod yield per plant. Broad sense heritability as well as expected GAM was higher for matured pods per plant, days to 50 per cent flowering, kernel weight per plant, 100 kernel weight, pod bearing nodes, immature pods per plant, plant height and secondary branches per plant. Association analysis revealed significant positive correlation of pod yield per plant with number of pod bearing nodes, number of matured pods per plant, kernel weight per plant and days to 50 per cent flowering. Positive direct effects were recorded by number of matured pods per plant, pod yield per plant, kernel weight per plant, 100 kernel weight, number of secondary branches and number of primary branches per plant.

Based on D^2 values forty nine genotypes were grouped into fourteen clusters. Cluster I was the biggest with 21 genotypes followed by cluster IV, VI and III. The maximum contribution for the diversity was observed in pod yield per plant followed by days to 50 per cent flowering. The genotypes like GPBD-5, SB-T₁, SB-T₂₁ and VB-T₃₅ are identified as high yielding and most diverse genotypes, the genotypes SB-T₁ and VB-T₁₄ are identified as resistant to root knot nematode disease. These genotypes could be utilizing in hybridization among promising combinations to develop productive segregants.

Department of GPB
UAHS, Shivamogga
August, 2015

Dr. SHIVANNA. S
Major Advisor

E) PLANT PATHOLOGY

1. Studies on Anthracnose of French Bean (*Phaseolus vulgaris* L.) Caused by *Colletotrichum lindemuthianum* (Sacc. & Magn.) Sacc.

Bhagavathi Devi, D.

ABSTRACT

French bean (*Phaseolus vulgaris* L.) is also called as dwarf kidney bean where in immature bean pods are eaten as a 'vegetable' or as 'dry seeds' (Rajmah). It is an important food legume crop and provides an essential part of the daily diet. This crop is affected by several diseases among them Anthracnose is one of the most important disease caused by *Colletotrichum lindemuthianum* (Sacc. & Magn.) Sacc. During the survey highest disease severity was recorded in Shivamogga district (26.2%) followed by Davangere district (15.03%). The fungus collected from different locations were categorized into four groups viz., Cl-1, Cl-2, Cl-3 and Cl-4 based on their morphological characters.

Among them Hosanagara isolate produced maximum radial growth (81.00 mm) followed by Savalanga (79.00 mm) isolate with brownish white mycelial colony on Potato Dextrose Agar Medium. The results obtained during screening of various genotypes of French bean revealed that, among thirty one genotypes screening eight lines were resistant, ten were moderately resistant, seven were susceptible and six of the genotypes were found to be highly susceptible category. *In vitro* evaluation of fungicides revealed that, mancozeb inhibited cent per cent mycelial growth at 400 and 800 ppm. Among the systemic fungicides, azoxystrobin recorded cent per cent (100%) mycelial inhibition at all the concentrations of 50, 100, 200 and 400 ppm. Among the biocontrol agents, the maximum inhibition of *C. lindemuthianum* was observed in *T. harzianum* (72.44 %). Among fungicides and bio-agents tested under field conditions revealed that captan + azoxystrobin at 0.05 per cent, azoxystrobin alone spray at 0.05 per cent, were found to be the most effective chemicals in managing the disease which helps to increase in the yield of the crop.

June, 2015
Department of plant pathology
UAHS, Navile, Shivamogga.

Dr. H. NARAYANA SWAMY
Major advisor

2. Studies on Epidemiology and Management of Coffee Leaf Rust Caused by *Hemileia vastatrix* (Berkeley And Broome)

Shrinidhibharathisha Navilekar

ABSTRACT

In India, coffee is cultivated as an important commercial crop which is cultivated in an area of 4,15,341 ha. The major disease threatening the coffee cultivation is leaf rust caused by *Hemileia vastatrix* (Berk. and Br.). The roving survey on coffee leaf rust carried out during November-December 2014 revealed that, the disease occurrence varied from moderate to severe infection with the disease severity ranging from 9.40 to 47.83 per cent. The highest mean disease severity was recorded in Kodagu district (22.44 PDI). However, the lowest disease severity of 13.82 PDI was observed in Shivamogga district. The epidemiological studies revealed that, lower disease severity was recorded during the month of April to June. Whereas, peak disease severity was recorded during the month of December 2014. The mean minimum temperature had significant ($P=0.01$) negative correlation with disease incidence. Screening of varieties against coffee leaf rust revealed that, out of six *Coffea arabica* genotypes, three genotypes (Sln 5b, Sln 9 and Sln 13) were found to have resistance against *Hemileia vastatrix* (Berk. and Br.) whereas, Sln 3, Sln 6 and Sln 12 were found to be susceptible. The studies on variability of the pathogen indicated that, the isolates CHKM-1 and CHKM-2 were yellow in color remaining all the isolates were orange in color. All the isolates observed were reniform in shape and were echinulated. Evaluation of bacterial antagonists against *Hemileia vastatrix* (Berk. and Br.) under *in vitro* condition revealed that, treatment with *Bacillus subtilis* recorded less uredospore germination (20.03%) compared to *Pseudomonas fluorescens* (22.41%) at the higher concentrations (1×10^9 cfu/ml) tested. Among the different fungicides used against coffee leaf rust, Thifluzamide 24 SC at 1 ml/litre concentration was found to be more effective in managing the disease and found on par with Bayleton at 1 gm/litre and Oxycarboxin at 1 gm/litre.

Department of Plant Pathology
UAHS, Shivamogga - 577225
July, 2015

Dr. H. NARAYANASWAMY
Major Advisor

3. Studies on Pathogenicity and Management of Stem rot of tomato (*Lycopersicon esculentum* Mill.) caused by *Sclerotium rolfsii* Sacc.

Nandashree, R.

ABSTRACT

Tomato (*Lycopersicon esculentum* Mill.) is one of the most popular and widely grown vegetable crops of both tropics and subtropics of the world, belonging to the family Solanaceae. Stem rot disease, caused by *Sclerotium rolfsii* has become severe threat for successful tomato production. The pathogen isolated from the stem of the diseased tomato plant was identified as *Sclerotium rolfsii* based on its mycelial and brown coloured sclerotial bodies formation in PDA media. The pathogenicity was confirmed by inoculating the pathogen on healthy plant under *in vivo*. During survey, maximum disease incidence of 27.5 per cent was recorded in Mallapura village of Shivamogga whereas, minimum disease incidence of 9.80 per cent was recorded in Karalahalli village of Davanagere district. Among the cultivars screened against *S. rolfsii* in sick pot, most of the cultivars showed highly susceptible reaction. Whereas few of them showed moderately susceptible and resistant reaction. In case of inoculum density studies all the inoculum levels was found to cause disease in plants. Maximum percent disease was recorded in the plants inoculated with 5 sclerotial bodies. Among the systemic fungicides, Hexaconazole was found to be effective in inhibiting mycelial growth of *Sclerotium rolfsii* at all the concentrations (100, 150, 200 and 250 ppm) tested. Combi products viz., Avatar and Nativo were found effective at all the concentrations, whereas, the contact fungicide, Mancozeb was found to be effective only at higher concentrations (500 and 1000 ppm). Among the bio-agents, *Trichoderma harzianum* was found to be most effective in inhibiting mycelial growth of *S. rolfsii*. Among the plant extracts, *Azadirachta indica* both at 5 and 10 per cent concentration showed significant inhibition of mycelial growth of *Sclerotium rolfsii* under *in vitro* condition. Under field conditions, least incidence of the disease was observed with soil application of enriched *P. fluorescens* + *T. harzianum* + Neem cake along with higher yield.

June 2015
Department of Plant Pathology, Shivamogga
UAHS

Dr. B. GANGADHARANAİK
Major Advisor

4. Studies on Root-Knot and Wilt Complex in Black Pepper (*Piper Nigrum* L.) Caused By *Meloidogyne Incognita* (Kofoid And White) Chitwood and *Fusarium Solani* (Mart.) Sacc.

SOUMYA, D.M.

ABSTRACT

Black pepper (*Piper nigrum* L.) is the major spice crop in agricultural commodities of commerce and trade in India. The major constraint for the cultivation of black pepper is by root knot nematode and wilt complex diseases are severe one. The disease was noticed in all the surveyed locations of Shivamogga district during 2014-15. The severity of disease complex was more in Hosanagara taluk followed by Soraba and Thirthahalli taluk and minimum disease incidence was recorded in Shivamogga taluk. The present survey results also indicated that high frequency of occurrence of both the pathogens from soil and root samples collected from Hosanagara taluk. Pathogenicity of nematode was proved by using different inoculum levels under glass house condition. Inoculation of 10,000 juveniles per plant recorded least plant growth parameters and maximum number of galls (150.4), egg mass per plant (90.20) eggs per egg mass (352.20) and Root knot index (4.40). It was observed that, there was reduction in the plant growth as the inoculum density increased. In the interaction studies, *Meloidogyne incognita* was the most aggressive pathogen compared to *Fusarium solani*. However, plants receiving *Meloidogyne incognita* seven days prior to inoculation of *Fusarium solani* recorded least growth and more disease incidence followed by simultaneous inoculation of *M. incognita* and *F. solani* over untreated control. These results indicate that the nematode can predispose black pepper to infection by *F. solani* and can aggravate the disease. Nine black pepper varieties were considered for their resistant reaction against *M. incognita* and *F. solani* under field condition. Among nine varieties Panniyur-1 grafted on *Piper colubrinum* recorded least number of galls (0.00), RKI (1.00), nematode population (115.33) and *Fusarium* population (6.33) and showed higher resistance reaction against the disease complex. 'Pournami' showed resistant reaction against wilt complex whereas, 'Panchami' and 'Karimunda' varieties showed moderately resistant reaction.

July, 2015
Department of Plant Pathology
UAHS, Navile, Shivamogga, 577225

Dr. H. RAVINDRA
Major advisor

5. Studies on sheath blight of rice (*Oryza sativa* L.) caused by *Rhizoctonia solani* Kuhn.

Kishor Umesh Kamatagi

ABSTRACT

Rice is the staple diet of over 60 per cent of the world's population. Sheath blight of rice once a minor disease now has been considered as one of the major constraint in all most all rice growing areas. Survey conducted during 2013-14 revealed that maximum sheath blight incidence was recorded at Bhadravati (28.74%) and least incidence was recorded at Soraba (7.11%). *In vitro* studies revealed that amongst different solid and liquid media used, the fungus grew rapidly on PDA and potato dextrose broth (PDB) respectively. The maximum dry mycelial weight was observed on PDB on 13th DAI. Temperature of 25° C was best for the growth of *R. solani*, least growth was observed at temperature 15 C and 30° C was found favourable for production of sclerotia. *In vivo* screening of 49 rice germplasm against *R. solani*, of which three germplasm were found resistant with grade 1. Among 24 paddy cultivars screened against *R. solani*, none of the cultivars were immune or resistant. *In vitro* evaluation of bio-agents and botanicals against *R. solani* revealed that *Trichoderma viride* (IIHR, strain) (70.83%) and *Pseudomonas fluorescens* (IIHR strain) (56.00 %) and *Gliricidia maculata* (27.04%) respectively found most effective. *In vitro* evaluation of eight fungicides against *R. solani* revealed that, hundred per cent inhibition was seen in carbendazim, propiconazole, hexaconazole, thiophanate methyl, carbendazim 12% + mancozeb 63%. *In vivo* integrated disease management revealed that among different treatments used, least disease severity (18.52 PDI) was recorded in hexaconazole treated plot with highest yield of 4375.00 kg ha⁻¹ and maximum disease severity (40.74 PDI) was observed in vermicompost treated plot yield of 3765 kg ha⁻¹ compared to untreated control plot yield of 3666.67 kg ha⁻¹.

June, 2014
Department of Plant Pathology
College of Agriculture, UAHS, Shimoga

Dr. GANESHA NAIK, R.
Major Advisor

6. Studies on Alternaria Leaf Blight of Sunflower Caused by *Alternaria Helianthi* (Hansf.) Tubaki and Nishihara

Mahadevaswamy, G.

ABSTRACT

Sunflower is one of the important oilseed crop grown in India. This crop is affected by several diseases among them Alternaria leaf blight is one of the most important disease caused by *A. helianthi*. During the survey highest disease severity was recorded in Chithradurga (43.75%) followed by Davanagere (39.25%). The different isolates were categorized into four groups viz., *Ah-1*, *Ah-2*, *Ah-3* and *Ah-4* based on their morphological characters. Among them Hiriyur isolate produced maximum radial growth followed by Challakere isolate, with grayish black to light brown mycelial colony on Potato Dextrose Agar medium. During cultural studies Carrot medium supported maximum mycelial growth of all the isolates both on solid as well as on liquid medium. During nutritional studies maltose as a carbon source and Asparagine as a nitrogen source supported the maximum dry mycelial weight. During physiological studies the temperature of 30° C and pH 5 has favoured good growth and development of all the isolates. The epidemiological studies revealed that among the weather parameters, maximum temperature and maximum relative humidity (morning) showed positive correlation with disease development. *In vitro* evaluation of fungicides revealed that Hexaconazole and Propiconazole at 600 ppm showed 100 per cent inhibition of mycelial growth whereas among the bio pesticides NSKE at 10 per cent, and *T. halianum* were induced maximum reduction in colony growth. Fungicides and bio-pesticides tested under field condition revealed that Hexaconazole at 0.1 per cent and a combi product Carbendazim+Mancozeb at 0.1 per cent were found to be the most effective chemical in managing the disease as well as in increasing the yield.

Department of plant pathology
UAHS, Navile, Shimoga.
June 2014

Dr. B. GANGADHAR NAIK
Major advisor

7. Studies on stern rot of tuberose (*Polianthes tuberosa* L.) caused by *Sclerotium rolfsii* Sacc.

Divya Bharathi, A.R.

ABSTRACT

Tuberose (*Polianthes tuberosa* L.) is a leading commercial flower crop, because of its multipurpose uses. Stem rot disease caused by *Sclerotium rolfsii* Sacc. has become threat for successful flower production, under severe condition the losses go up to 50-60 per cent. In present investigation attempts were made to study the symptoms of the disease, identification of the pathogen, survey on disease incidence, cultural, physiological and nutritional studies of pathogen, in vitro evaluation of different fungicides and integrated disease management practices against stem rot.

The pathogen isolated from stem of diseased tuberose plant and was identified as *Sclerotium rolfsii* based on its cottony white radiating mycelium and formation of brown colour sclerotial bodies in petri dish. The pathogenicity of the fungus was confirmed on healthy plant under in vivo. Maximum per cent disease incidence (35.2) was recorded in Harnalli village of Shimoga. Among solid media tested maximum growth was observed on Oat meal agar and Potato dextrose agar (90 mm.), among liquid media tested dry mycelial weight was maximum on Corn meal broth (224.33 mg.), the fungus attained maximum growth on 10th day after inoculation in Potato dextrose broth (213.13 mg). Continuous light favoured maximum dry mycelial weight, temperature range of 25°C to 30°C was found to be optimum; maximum growth of the fungus was obtained at pH 5.0. Sucrose recorded maximum dry mycelial weight among different carbon sources and potassium nitrate among different nitrogen sources tested. Among systemic fungicides Hexaconazole found effective at all the concentrations, Mancozeb was found effective among contact fungicides. Under field condition least disease incidence (10.66%) was recorded on plants treated with treatment combinations of *Trichoderma viride*, Press mud and Carbendazim with maximum plant height (127.18 cm), more number of flowers per plant (50), weight of flowers (17.20 g.) and maximum yield (7858.8 kg/ha.).

Department of plant pathology
UAHS, Navile, Shimoga.
June 2014

Dr. H. NARAYANA SWAMY
Major advisor

8. Investigations on Root-Knot Nematode (*Meloidogyne graminicola* Golden And Birchfield, 1965) of Rice (*Oryza sativa* L.)

NARASIMHAMURTHY

ABSTRACT

Of late, *Meloidogyne graminicola* is a serious menace in all types of rice situations and causes yield loss of 16-32 per cent. Investigations were carried out during 2013-14 on survey for the incidence of *M. graminicola* in rice growing areas of Shimoga and Davanagere districts, invasion studies, screening of 20 germplasm against *M. graminicola* and integrated management of *M. graminicola* using bioagents viz., *Trichoderma viride*, *Paecilomyces lilacinus*, *Pseudomonas fluorescens* and *Pochonia chlamydosporia*, organic amendements viz., neem cake and poultry manure, combination of nematicide with bio-agent viz., carbofuran+ *Trichoderma viride*, carbofuran+ *Pseudomonas fluorescens* and nematicide carbofuran alone under field conditions. The survey revealed maximum nematode population both in soil and root samples in Shimoga, Bhadravathi, Sagara, Davanagere and Honnali taluks with root-knot index ranging between 3 and 4. In invasion studies, 2nd stage juveniles were attracted to roots and moved towards the root tip within 24 hrs after inoculation and within 48 hrs, entered into the root system and started feeding. Among twenty germplasm tested against *M. graminicola*, the entry KMP-179 recorded least root-knot index of 1.6 indicating that the disease intensity was very mild to mild thus, it was resistant to *M. graminicola*. Among various treatments tested, the maximum plant height, better root length, root volume, root weight and maximum yields were observed in *P. fluorescens* + carbofuran treated plots followed by *T. viride* + carbofuran and carbofuran alone. The maximum reduction in nematode population of soil as well as roots, number of galls per root system and least number of egg masses per root system were noticed in *P. fluorescens* + carbofuran compared to other treatments.

June 2014
Department of Plant Pathology
UAHS, Shimoga

Dr. H. RAVINDRA
Major Advisor

1. Studies on stem rot of groundnut(*Arachis hypogaea*L.) caused by *Sclerotium rolfsii* Sacc.

Sunilkumar

ABSTRACT

Groundnut[*Arachis hypogaea*L.] is an important oilseed crop of India and is cultivated in both tropical and sub tropical regions of the world. Stem rot of groundnut caused by *Sclerotium rolfsii* Sacc has become a major constraint in groundnut production. Survey for stem rot disease incidence revealed that, maximum disease incidence (37.52%) was recorded in Shivamogga, whereas least incidence (35.82%) was observed in Davanagere district. After isolation and characterization of pathogen isolates, the isolates were categorized into five groups viz., SrS, SrH, SrHA, SrHR and SrSH based on their location of occurrence. Among them, SrH isolates produced maximum mycelial growth (80.00mm) and least was recorded by SrHA isolate (60.60mm) with white cottony growth on potato dextrose agar medium. During cultural studies, potato dextrose agar supported maximum mycelial growth of all the isolates both on solid as well as on liquid medium. Development of sclerotial bodies per plate was ranged from 243.70 to 306.00, whereas sclerotial bodies colour was ranged from light to dark brown.

Among the systemic fungicides, hexaconazole, propiconazole, difenconazole and combi products viz., Avatar, Nativo and Companion were found to inhibit the mycelial growth upto 100% at all the concentration tested, whereas among the contact fungicides, mancozeb was found to be effective only at higher concentrations (600 ppm). Among the bio-agents tested, *Trichoderma harzianum* was found to be most effective in inhibiting the mycelial growth of *S.rolfsii* (63.81%). Among botanicals, *Ageva americana* extract was completely inhibited the mycelial growth of *S.rolfsii*. Under field conditions, least disease incidence (13.43%) was observed in soil application of neem cake + *T. harzianum* with higher pod yield (1438.16 kg/ha) followed by neem cake + *P.fluorescens* (13.81%) with a pod yield of 1397.74 kg/ha respectively.

June, 2015
Department of Plant Pathology
UAHS, Shivamogga

Dr. GANESHANAIK. R
Major advisor

1. Impact of organic farming practices on micronutrient status and biological properties of soils

DENILA.D

ABSTRACT

An investigation was under taken at College of Agricultural, Shivamogga during the period of 2013-15 in order to study the impact of organic farming practices on micronutrients status and biological properties of soils. Surface soil samples were collected from selected organic and conventional farms covering paddy and arecanut crops of seven taluks in Shivamogga district. The collected soil samples were processed and analyzed for chemical properties, available micronutrients status and biological properties. The results of the investigation indicated that soils coming under organic farming practices of paddy and arecanut covers, recorded higher range in pH, organic carbon and CEC compared to the soils managed with conventional farming practices.

Organically managed soils of both paddy and arecanut covers recorded higher values in DTPA extractable copper (2.33 and 4.17 mg kg⁻¹), iron (77.33 and 44.81 mg kg⁻¹) and manganese (22.92 and 22.91 mg kg⁻¹) compared to the soils managed with conventional farming practices and were found to be sufficient with respect to the above nutrients availability. But, 14 and 67 per cent of soils coming under conventional farms of paddy and arecanut covers recorded zinc and boron deficiencies, respectively compared to the soils managed with organic farming practices where no deficiency of zinc and boron was observed.

Further, it was observed that total microbial counts (bacteria, fungi and actinomycetes), enzyme activity *viz.*, dehydrogenase, acid phosphatase and urease, free living N-fixing bacteria recorded at higher level in soils managed with organic farming practices of both paddy and arecanut land use cover. But, phosphorus solubilizing bacteria were not detected in soils coming under both conventional and organic farming practices probably because of acidic pH of the soils.

Dept. of Soil Science and Agricultural Chemistry
College of Agriculture,
Shivamogga

Dr. H.M CHIDANANDAPPA
Major Advisor

2. Soil properties as influenced by organic farming practices in shivamogga district, karnataka

BHARATH Y. PATEL

ABSTRACT

A study was conducted in the UAHS, Shivamogga to know the effect of organic farming practices on soil physico-chemical properties and NPK fractions in Paddy and Arecanut growing soils of Shivamogga district. The 84 surface soil samples were collected from all taluks of Shivamogga district where farmers are practicing organic farming for more than five years and the soil samples from neighboring conventional farms under the same crop were also collected to compare the changes in soil properties.

Practicing of organic farming reduced the bulk density of soil but increased the maximum water holding capacity. The soil pH was slightly increased in soils under organic farming. But there was no appreciable change in soil texture and EC of the soils. The soils under organic farms recorded higher SOC, CEC, higher amount of available N,P,K,S and exchangeable Ca and Mg than the soil under conventional farming in both Paddy and Arecanut growing farms.

Organic farming increased the total N and available N in soil. The contents of inorganic N fractions of soil *viz.*, NH_4^+ -N and NO_3^- -N as well as organic fractions *viz.*, hydrolysable-N, hexamine-N, amino acid-N and total hydrolysable-N recorded higher in organically managed soils. Among them amino acid N was dominant fraction contributing to total N. All phosphorus fractions recorded higher in organically managed soils compared to inorganic farming soils. Al-P, Fe-P and Org-P were the major contributor to total P and recorded higher in organic farming soils in both Paddy and Arecanut growing soils compared to inorganically managed farms. The soils under organic farming recorded higher soil K fractions than the soils under conventional farming. Higher water soluble K, exchangeable K, lattice K was recorded in soils of organic farming over soils of conventional farming, but non exchangeable soil K content was found higher in inorganic farming farms.

July, 2015
Department of Soil Science and Agricultural Chemistry
College of Agriculture
Shivamogga

Dr. GANAPATHI
Major Advisor

3. Effect of soil salinity on performance of different Rice varieties

Nanda G. S

Abstract

An experiment was conducted in ZAHRS, Navile, Shivamogga during 2012 in order to know the effect of soil salinity on performance of different rice varieties. The experiment was tried in factorial CRD design with factor one consisting of four salt tolerant rice varieties and one ruling check and factor two consisting of two amendments and control. The different varieties used were BPT 5204 (check), CSR 22, GNV-05-01, IR 30864 and Vikas. The amendments used were gypsum and sulfur compared with control replicated three times. The highest grain yield (18.9 and 18.7 g hill⁻¹), straw yield (35.8 and 39.2 g hill⁻¹) and NPK uptake was recorded by the varieties GNV-05-01 and CSR 22. Among the amendments, gypsum recorded highest grain and straw yield (21.6 and 40 g hill⁻¹, respectively) followed by sulfur (19.1 and 39.2 g hill⁻¹, respectively). This could be due to better growth with gypsum provided by favorable soil condition for crop growth. Control recorded lowest grain and straw yield. K : Na ratio in both grain and straw was highest with variety CSR 22 (245.8 and 16.7, respectively). The higher K : Na ratio in grain and straw was recorded in gypsum and sulfur applied soil (223.5, 120.5 in grain and 20.8, 9.9 in straw, respectively). Application of gypsum significantly decreased pH, EC, exchangeable sodium and ESP of soil at different growth stages of rice over control. The per cent decrease in ESP over control was 60.9 and 43.4 with gypsum and sulfur respectively, indicating the importance of gypsum in reducing the sodicity hazard of soil. The K : Na ratio in the shoot was significantly and positively correlated with the grain and straw yield ($r=0.615^*$ and 0.652^{**} , respectively).

UAHS, Shivamogga
Place: Shivamogga
Date: 27-06-2015

Dr. T. S. Vageesh
Major Advisor

4. Distribution of carbon pools in soils under different land use cover in Bhadravathi taluk of Shivamogga district, Karnataka

RUDRESH M D

ABSTRACT

A study was conducted at UAHS, Shivamogga to know the distribution of carbon pools in soils under different land use cover in Bhadravathi taluk of Shivamogga district, Karnataka. Soil samples were collected from major land use cover *viz.*, paddy, maize, sugarcane, arecanut, banana and forest cover. The results revealed that pH of different land use cover ranged from 4.72-6.82, BD ranged from 1.24-1.35 Mg m⁻³, CEC ranged from 3.51-5.73 c mol (p⁺) kg⁻¹ and per cent CaCO₃ ranged from 0.80-3.77 per cent.

Carbon fractions *viz.*, potassium dichromate oxidizable organic carbon ranged from 3.91-10.66 g kg⁻¹, potassium permanganate oxidizable organic carbon from 228.98-1328.63 mg kg⁻¹, cold water extractable carbon from 218.02-339.00 mg kg⁻¹, total carbon from 14.56-25.68 g kg⁻¹, total organic carbon from 14.40-25.51 g kg⁻¹ and total inorganic carbon ranged from 0.147-0.303 g kg⁻¹ under different land use cover.

Among different land use cover E₄/E₆ values were lower than 5. Soils under paddy (4.68), arecanut (4.50) and forest (4.44) recorded higher humic acid and arecanut (4.34), maize (4.09) and sugarcane (3.98) soils recorded higher fulvic acid.

Microbial biomass carbon, microbial biomass nitrogen and microbial biomass phosphorus under different land use cover ranged from 221.66-432.33 mg kg⁻¹, 21.14-40.15 mg kg⁻¹ and 9.61-19.26 mg kg⁻¹, respectively.

The correlation between PDOC with PPOC (r=0.287*), TC (r=0.830**), TOC (r=0.831**), MBC (r=0.386**) was positive and significant. PPOC showed positive and significant correlation with TC (r=0.437**), TIC (r=0.353**) and TOC (r=0.432**). MBC showed positive and significant correlation with MBP (r=0.557**) and MBN (r=0.518**). TOC and TIC showed positive and significant correlation with MBC (r=0.348**) and TOC (r=0.338*), respectively.

Department of Soil Science & Agril. Chemistry
UAHS, Shivamogga
July, 2015

Dr. B. C. DHANANJAYA
Major Advisor

5. Studies on fertilizer use efficiency in ragi (*Elusine corcana L.*) under rainfed condition

Saraswathi

ABSTRACT

A field experiment was conducted on alfisols during 2013 of Zonal Agricultural and Horticultural Research station, college of Agricultural, Navile, shimoga. To study the fertilizer use efficiency in ragi (*Elusine coracona L.*) under rainfed condition. A total of nine treatments were tried in a Randomized Complete Block Design (RCBD) with three replication. The treatments comprise of RDF + compost 10 t ha⁻¹, RDF + 50 % NK + compost 10 t ha⁻¹, STCR based NPK + compost 10 t ha⁻¹, STL based NPK + compost 10 t ha⁻¹ RDF through enriched compost, RDF + 50% NK through enriched compost, STCR based through enriched compost, STL based through enriched compost, with a control.

The results revealed that application of STCR based NPK and compost 10 t ha⁻¹ for targeted yield 40 q ha⁻¹ recorded a highest grain yield (3238.00 kg ha⁻¹) and straw yield (8926.00 kg ha⁻¹). The per cent deviation for targated yield of 40 q ha⁻¹ (19.05%).

Similarly higher uptake was recorded in STCR based NPK + compost 10 t ha⁻¹ both in grain and straw. However, the NUE and AUE was highest in STCR based NPK and compost 10 t ha⁻¹ for targeted yield 40 q ha⁻¹. The highest physiological use efficiency was recorded in control plot (no fertilizer).

The highest partial factor productivity was recorded in STCR based NPK + compost 10 t ha⁻¹. However the available NPK and exchangeable Ca, Mg and available sulphur were highest in STCR based NPK + compost 10 t ha⁻¹. The STCR approach was better for achieving the higher yield and higher nutrient use efficiency.

2014

Department of soil science and
Agriculture chemistry
College of Agriculture Navile, Shimoga

Dr.Y. VISHWANATHSHETTY
Major advisor

6. Effect of Phosphorus Levels with or without PSB Seed Treatment on Dynamics of P in Soil and Productivity of Groundnut (*Arachis hypogaea* L.)

ANJALI, M.C.

ABSTRACT

A field experiment was conducted on a sandy loam soil at UAHS, Shimoga during kharif of 2013 to know the effect of phosphorus levels with or without PSB seed treatment on dynamics of P in soil and productivity of groundnut. The levels of phosphorus @ 0, 25, 37.5 and 50 kg P₂O₅ as DAP per ha⁻⁴ with or without PSB seed treatment were tried in a randomized complete block design (RCBD) with three replications and eight treatments.

Results of the field experiment indicated that application of 50 kg PaOs ha⁻¹ with PSB seed treatment significantly increased the growth, yield and yield attributes of groundnut. Highest pod yield of groundnut (24.29 q ha⁻¹) was noticed in with 50 kg P₂O₅ ha⁻¹ with PSB seed treatment. The nutrient content and uptake by groundnut like N, P, K, Ca, Mg and S were highest in the treatment that received 50 kg PaOs ha⁻¹ with PSB seed treatment.

Higher values of saloid - P, Ca - P and available P status in soil were recorded with 50 kg P₂O₅ ha⁻⁴ with PSB seed treatment at different crop growth stages. Higher values of Al - P, Fe - P, reductant - P, occluded - P, organic - P and total - P fractions were recorded in treatments involving 1^o levels without PSB seed treatment compared to only P levels with PSB seed treatment. Treatment 50 kg P₂O₅ ha⁻¹ recorded higher Al-P, Fe - P reductant - P, occluded - P, organic - P and total - P values.

Dept. of Soil Science and Agril. Chemistry
College of Agriculture, Shimoga
Place: Shimoga Date:
30.06.2014

Dr. B.C. DHANANJAYA
Major Advisor

7. Studies on Effect of Different Sources of Nitrogen on Nitrogen Dynamics in Soil Under Aerobic Rice (*Oryza sativa* L.) Cultivation

KOWSALYA.P

ABSTRACT

A field experiment was conducted during *khari* 2014 on a sandy clay loam soil belongs to the soil taxonomy of Typic Haplustalf, located at Agricultural and Horticultural Research station (AHRs), Kathalgere, Channagiri taluk, Davangere district to study the effect of different sources of nitrogen on nitrogen dynamics in soil under aerobic rice cultivation (*Oryza sativa* L.). Five sources of nitrogen applied through organics (FYM, Poultry manure, vermicompost, sunhemp, eupatorium) and inorganics involving eight treatment combinations were tried in a RCBD with three replications. Among the treatments, significantly higher grain and straw yields were obtained with the application of 50 per cent recommended N + 50 per cent N through FYM (44.73 q ha⁻¹ and 53.73 q ha⁻¹ respectively). The total uptake of N, P and K significantly increased with application of different sources of nitrogen.

Available nitrogen recorded was high in the treatment with 50 per cent recommended N + 50 per cent N through FYM (332.3 kg ha⁻¹) as compared to control (205.6 kg ha⁻¹). Inorganic nitrogen fractions, total nitrogen, nitrogen use efficiency were recorded high in treatments which received combine application of organic and inorganic sources of nitrogen compared to the treatments which received only NPK fertilizers.

The higher B: cost ratio recorded in treatment which received combine application of 50 per cent recommended N + 50 per cent recommended N through FYM compare to other treatments. It can be concluded that combine application of organic and inorganic was better than the application of inorganic fertilizers alone.

2014
Department of Soil Science &
Agricultural Chemistry
College of Agriculture, Navile,
Shimoga.

Dr. K.T.GURUMURTHY
Major Advisor

8. Maize (*Zea Mays L.*) Productivity and Zinc Status in Soil as Influenced by Different Methods of Zinc Application

ASHA, L.

ABSTRACT

A field experiment was conducted on a sandy loam soil (Typic Haplustalf), located at Agricultural College Shivamogga during *Kharif* 2010 in order to know the effect of different methods of zinc application *viz.*, soil application of zinc sulphate @ 10 kg ha⁻¹, 0.2% zinc solution as foliar spray at different growth stages (30 and 60 days after sowing), seed priming with 1% zinc solution for 8 hours on yield and nutrients uptake by maize (*Zea mays.L*) and also their effects on available zinc status and distribution of its fractions in soil. Results of the experiment indicated that yield and nutrients uptake by maize significantly increased due to different methods of zinc application compared to that of control. However, the treatment which received zinc through soil (zinc sulphate @ 10 kg ha⁻¹) recorded a maximum yield of stover (7.52 t ha⁻¹) and grain (6.96 t ha⁻¹) and total uptake of zinc (551.92 g ha⁻¹) and NPK by maize compared to other treatments.

The DTP A- Zn in post harvest soil significantly increased due to different methods of zinc application except seed priming method over that of control (0.70 mg kg). Among the different methods of zinc application, soil application of zinc sulphate @ 10 kg ha⁻¹ recorded a maximum of 1.1.6 mg kg⁻¹ DTPA-Zn in soil due to the direct addition of more quantity of zinc to the soil compared to other treatments. Further, it was noticed that application of zinc through soil significantly increased the water soluble and sorbed zinc fractions in soil compared to that of control and the remaining fractions of zinc *viz.*, easily reducible manganese bound, carbonate bound, organic bound, Fe and Al oxides bound and residual zinc in addition to total zinc, did not influenced by different methods of zinc application.

Department of Soil Science and
Agricultural Chemistry College of Agriculture.
Place : Shimoga

Dr. H.M. CHIDANANDAPPA
Major Advisor

9. Studies on tobacco stem based composts and their evaluation as soil amendments

Preetha, S.

ABSTRACT

A study on tobacco stem based composts was conducted in ZAHRS, Navile, Shimoga in 2013. The experiment on standardization of composting technique in tobacco stem waste was tried in factorial CRD design with factor A at four levels [green leaves (pongamia), poultry manure, pressmud and no green waste] and factor B at two levels (with and without lime) replicated three times. Consortium of four decomposing fungal cultures, urea and zinc sulphate was common to all the treatments. The second experiment, a laboratory incubation study was conducted to know rate of ammonification and nitrification in soils amended with varying levels of composts. Two best composts selected from study-I based on physical qualities like texture, colour and odour were used with and without calcium ammonium nitrate (CAN). Green leaves based compost @ 25 % showed higher microbial activity (79.10 mg 100g⁻¹ compost) than no green waste (74.15 mg 100g⁻¹ compost). Total carbon content was much lower in poultry manure (19.77%) and press mud (19.42%) based composts compared to that of no green waste (24.00%) with lime application. The highest reduction in cellulose, hemicellulose and lignin content was recorded with poultry manure based compost @ 25% (10.66, 11.96 and 14.45% respectively), due to narrow C:N ratio of poultry manure. Poultry manure based compost (PMC) and green leaves based compost (GLMC) were found to be best two composts from the first experimentation. Further, application of two best composts to soil increased maximum water holding capacity of soil from 20.13 per cent at control i.e. no compost to 23.16 and 22.47 per cent in PMC and undecomposed tobacco stem (UTS) @ 25 t ha⁻¹ with CAN respectively. An increase of 21.16 per cent in organic carbon was recorded in PMC over control. The NH⁴-N levels increased up to 15 days and then after it decreased. (NO₂+NC)-N levels recorded in soils amended with tobacco stem based composts indicate that there was a significant influence of PMC, GLMC and UTS on rate of nitrification. Thus, use of tobacco stem as GLMC and PMC, improved the soil properties related to crop production.

2014

Department of Soil Science and Agricultural Chemistry
UAHS, Shimoga

Dr. T S VAGEESH
Major Advisor

10. Micronutrients Status in Soils of Krishnarajpet Taluk, Mandya District, Karnataka

BHAVITH N.C.

Abstract

A study was conducted at Agricultural College, Shimoga in order to characterize the soils coming under Krishnarajpet taluk of Mandya district with respect to available micronutrients status. After selecting four to five villages from each hobli of the taluk. Five surface soil samples were collected from each village and were analyzed for physico-chemical properties and micronutrients status.

Results indicated that the clay content in these soils varied from 3.80 to 28.70 percent and 62 percent of the soils had a sandy loam texture. The soils were acidic to alkaline in nature (4.01 to 8.47), organic carbon status ranged from low to medium and CEC (3.12 to 14.80 cmol (p+)kg⁻¹) and C_aCO₃ equivalent was found to be low.

DTPA - extractable copper (0.382 to 4.634 mg Kg⁻¹) was found to be sufficient in these soils. DTPA- extractable zinc was in the range of 0.66 to 0.85 mg Kg⁻¹ and 85 percent of the soils recorded the available zinc status below 0.60 mg kg⁻¹ (deficient). In respect of available boron status, all soils recorded the values in deficient range (0.007 to 0.166 mg Kg⁻¹). Available Fe and Mn status were in the range of 1.40 to 87.51 mg Kg⁻¹ and 0.124 to 28.44 mg Kg⁻¹, respectively. Only about 5 and 8 percent of the soils were deficient in iron and manganese, respectively. Further, it was observed that available copper and zinc showed a positive and significant correlation with organic carbon and clay contents in soils. But a poor correlation was observed between the soil properties (pH, OC, Clay and C_aCO₃) and available Mn, Fe and boron status in soils.

2013
Department of Soil Science and Agricultural
Chemistry College of Agriculture
Navile, Shimoga

Dr. H. M. CHIDANANDAPPA
Major Advisor

11. Study of Micronutrients Status in Soils of Sagar Taluk, Shimoga District

SAVITHA. M. S.

Abstract

To assess the micronutrients status of soils of Sagar taluk, Shimoga district a study was undertaken during 2012-13, in which 120 surface soil samples (0-15cm) were collected and analyzed for various physico-chemical parameters and available micronutrients. The texture of the surface soil varied from loamy sand to sandy clay loam. The soils were found to be acidic in reaction whereas the EC was found normal range. The organic carbon content of the soils were low to high (2.77-27.81g kg⁻¹). The CEC of soils were varied from 11.21 to 16.81 cmol(p+)kg⁻¹. Sesquioxide of soils varied from 13.00 to 22.28 percent.

The result of investigation indicated that, most of surface soils were found to be low to high in available nitrogen. Available phosphorus were found to be low to medium and available potassium were found to be medium to high. The available iron, manganese, copper, zinc and boron were found to be 30.43 to 96.15 mg kg⁻¹, 30.84 to 150.09 mg kg⁻¹, 1.24 mg kg⁻¹, 0.24 to 1.24 mg kg⁻¹ 0.10 to 0.72 mg kg⁻¹ respectively. Available iron, copper and manganese was found sufficient in all soil samples while zinc was sufficient in 31 percent and deficient in 69 percent samples and available boron was found sufficient in 19 percent and deficient in 81 percent soil samples. All available micronutrients (Fe, Mn, Cu, Zn and B) significant positive correlation with organic carbon and available boron was significant positive correlation with clay, CEC and CaCO₃.

2013

Department of Soil Science and Agricultural Chemistry
College of Agriculture, Navile, Shimoga

Dr. K.T. GURUMURTHY
Major Advisor

12. Effect of Different Organic Manures on the Release Pattern of Nitrogen and Productivity of Maize (*Zea mays* L.)

Virendra Singh Tan war

Abstract

Field and laboratory studies on effect of different organic manures on the release pattern of nitrogen and productivity of maize were conducted at Zonal Agricultural Research Station, Navile, Shimoga during *Kharif* 2012. The experimental soil was sandy loam. There were nine treatment combinations laid in three replications. Treatments comprise of three types of manures viz., FYM, Vermicompost and Poultry manure with fertilizers and Neem coated urea.

Laboratory incubation studies revealed that among different treatment, $\text{NH}_4^+\text{-N}$ was significantly increased (30 days after incubation) in 100% RD N+ 2 times of N- equivalent of RD-FYM through Poultry manure treated soil. In case of $\text{NO}_3\text{-N}$ highest value was recorded in 100% RD-N (no organic manure). As number of incubation days increased, release pattern increased up to 6- days there after it was decreased due to volatilization loss.

The highest grain and stover yield were recorded by 100% RD-N through Neem coated urea (4ml neem oil/100g urea). This could be due to steady increase in the supply of nitrogen by Neem oil coated urea. The macronutrients concentration and uptake in grain and stover of maize were significantly higher in the treatment 100% RD-N through Neem coated urea (4ml neem oil/100g urea) over the others treatments.

The highest available N in soil was recorded in 100% RD-N through Neem coated urea (4ml neem oil /100g urea) treatment at 60 days after sowing and harvest. The correlation study revealed that the grain and stover yield were positively correlated with available nitrogen in soil.

2013

Department of Soil Science and Agricultural Chemistry
College of Agriculture, Navile, Shimoga

Dr. Y. VISHWANATHSHETTY

Major Advisor

13. Productivity and NPK Use Efficiency in Maize (*Zea mays* L.) as Influenced by Fertilizer Enrichment of Compost

Sanjay V.V.

ABSTRACT

A field experiment was conducted in ZARS, Navile, Shimoga during *khariif* 2011 in order to know the impact of different compost enrichment methods on productivity and NPK use efficiency in maize. The experiment was tried in factorial RED design with factor A at two levels (with and without red earth enrichment) and factor B at five levels (different compost enrichment methods) replicated three times. The different compost enrichment methods adopted were compost enriched with NPK fertilizers, compost enriched with neemoil coated urea (NOCU) + PK fertilizers and compost enriched with neemcake+PK fertilizers compared with only compost and recommended package of practice (POP). The highest grain yield (8626 kg ha⁻¹), stover yield (11033 kg ha⁻¹) and NPK uptake was recorded by compost + NPCU + PK fertilizers. The grain yield was on par with recommended POP (7924 kg ha⁻¹) although 20kg ha⁻¹ less N was used through fertilizer. This could be due to steady increase in the supply of nitrogen by NOCU by reducing the leaching and volatilization losses. Only compost recorded lowest grain and stover yield. The highest N, P and K use efficiency of 34.5, 59.9 and 118.1 kg grain per kg of NPK applied, respectively, was recorded in compost + NOCU + PK fertilizers treatment. The crop recovery of applied nitrogen was also highest with compost + NOCU + PK fertilizers (89.9%) indicating the importance of NOCU as slow release source of N. This was followed by compost + neemcake + PK fertilizers enrichment method. Similarly crop recovery of applied phosphorus (35.2%) and potassium (309.4%) was highest with compost+NOCU+PK fertilizers treatments.

Place: Shimoga

Date: 16-11-2012

Soil Science, College of Agriculture, Navile, Shimoga

Dr. T.S.VAGEESH

Major Advisor

14. Effect of Different Sources and Levels of Sulphur on Yield and Uptake of Nutrients by Soybean (*Glycine max* L.)

Yatheesh G.

Abstract

A field experiment was conducted at Zonal Agricultural Research Station, College of Agriculture, Navile, Shivamogga during *kharif* 2011 to study the effect of different sources and levels of sulphur on yield and uptake of nutrients by soybean. Two sulphur sources with four levels of sulphur *viz.*, 10, 20, 30 and 40 kg ha⁻¹ as single super phosphate and gypsum were tried in a randomized complete block design with three replications and nine treatments.

Results of the field experiment indicated that the application of 40 kg sulphur ha⁻¹ as single super phosphate significantly increased the growth parameters and yield attributes. Highest grain (10.20 q ha⁻¹) and stover yield (20.55 q ha⁻¹) were recorded in the treatment that received 40 kg sulphur ha⁻¹ as single super phosphate.

The nitrogen, phosphorus, potassium, magnesium and sulphur content in seed, leaf and stem was highest in the treatment that received 40 kg sulphur ha⁻¹ as single super phosphate. Whereas calcium concentration was highest in the treatment that received 40 kg sulphur ha⁻¹ as gypsum. Uptake of nitrogen (227.50kg ha⁻¹), phosphorus (34.13kg ha⁻¹), potassium (118.11kg ha⁻¹), calcium (60.59 kg ha⁻¹), magnesium (34.74 kg ha⁻¹) and sulphur (19.68 kg ha⁻¹) was highest in the treatment that received 40 kg sulphur ha⁻¹ as single super phosphate. Quality parameters like crude protein content (35.42%), crude protein yield (360.26 kg ha⁻¹), oil content (19.07%) and oil yield (194.51kg ha⁻¹) and also highest net return (16819.00 Rs/ha) was recorded in the treatment.

2012

Department of Soil Science & Agricultural Chemistry
College of Agriculture, Navile, Shimoga

Dr. K.T. GURUMURTHY

Major Advisor

15. Effect of Different Sources and Levels of Sulphur on Productivity and Quality of Maize (*Zea mays* L.)

Abhiram G.J.

Abstract

A field experiment on effect of different sources and levels of sulphur was conducted at Zonal Agricultural Research Station and College of Agriculture, Navile, Shimoga during kharif 2011. The soil in the experimental site was sandy loam with acidic pH. There were ten treatment combinations and three replications laid with randomized completely block design. Treatments comprises of three different sulphur sources *viz.*, elemental sulphur, ammonium sulphate and gypsum at 10,20 and 30 kg sulphur ha⁻¹ tested against control (no sulphur).

Results of the field experiment indicated that among the treatments, application of sulphur at 30 kg ha⁻¹ as ammonium sulphate recorded significantly higher growth parameters. Highest grain (74.80 q ha⁻¹) and stover yield (86.91 q ha⁻¹) were recorded in the treatment receiving sulphur at 30 kg ha⁻¹ as ammonium sulphate followed by sulphur at 30 kg ha⁻¹ as gypsum. The correlation studies revealed that the sources of sulphur were positively and significantly correlated with soil chemical properties, nutrients uptake and yield.

Primary nutrient status of soil was significantly highest with the application of sulphur at 30 kg ha⁻¹ as ammonium sulphate at different stages of crop growth. Exchangeable calcium and magnesium status of soil was significantly highest in treatment, sulphur at 30 kg ha⁻¹ as ammonium sulphate. The primary nutrient concentration in grain and stover of maize were significantly higher in the treatment sulphur at 30 kg ha⁻¹ as ammonium sulphate followed by sulphur at 30 kg ha⁻¹ as gypsum. The calcium and magnesium concentration in grain and stover of maize were significantly higher in the treatment sulphur at 30 kg ha⁻¹ as gypsum followed by sulphur at 30 kg ha⁻¹ as ammonium sulphate. The sulphur concentration in grain and stover of maize were significantly higher in the treatment, sulphur at 30 kg ha⁻¹ sulphate recorded significantly highest uptake of primary nutrients in grain and stover followed by sulphur at 30 kg ha⁻¹ as gypsum. The crude protein content and oil content of maize was higher in the treatment sulphur at 30 kg ha⁻¹ as ammonium sulphate. The ratios of N:S and P:S decreases with increasing levels of sulphur. The highest net return was recorded in the treatment receiving sulphur at 30 kg ha⁻¹ as ammonium sulphate.

2012

Department of SS&AC
College of Agriculture , Navile, Shimoga

Dr. Y. VISHWANATH SHETTY
Major Advisor

16. Nitrogen Fractions, Nitrogen Use Efficiency and Productivity of Maize (*Zea mays* L.) as Influenced by Integrated Nutrient Management Practices.

SHILPASHREE V.M.

Abstract

A field experiment was conducted during kfaarif 2009 on a sandy loam soil belongs to the soil taxonomy of Typic Haplustalf, located at College of Agriculture, Navile, Shimoga to study "The effect of integrated nutrient management practices on nitrogen fractions, nitrogen use efficiency and productivity of maize (*Zea mays* L.)". Two levels of nitrogen applied through organics (FYM and Vermicompost) and inorganics involving nine treatment combinations were tried in a RCBD with three replications. The results of the experiment indicated that significantly higher grain (9.50 t ha^{-1}) and stover (11.00 t ha^{-1}) yield and total uptake of N, P and K by maize (249.30 , 56.50 and $268.00 \text{ kg ha}^{-1}$, respectively) were recorded by the treatment involving package of practices compared to the treatments which received nitrogen levels in the form of inorganic and organics. However, the integrated treatments did not differ significantly with each other in respect of yield and uptake of NPK by maize.

Significantly lower available nitrogen status was recorded in the treatments which received nitrogen only through fertilizers and without any organic matter application (196.00 - $200.50 \text{ kg ha}^{-1}$) including absolute control compared to all other treatments (238.00 - $243.60 \text{ kg ha}^{-1}$). Except inorganic nitrogen fractions, organic nitrogen fractions were recorded high in integrated treatments compared to the treatment which received nitrogen only in the form of fertilizers. Further, an agronomic nitrogen use efficiency was found highest (73.00) in the treatments involving package of practices compared to other treatments. However, nitrogen use efficiency was found to be more at lower level of nitrogen application and also in the integrated treatments compared to the treatments which received only NPK fertilizers.

Place: Shivamogga
Date: 10.02.2011

Dr. H.M. CHIDANANDAPPA
Major Advisor

17. Effect of Different Sources and Levels of Liming Materials on Soil Properties and Yield of Maize (*Zea mays L.*) in Acid Soil

Ravi N.C.

Abstract

Field and laboratory studies on effect of different sources and levels of liming materials were conducted at Zonal Agricultural Research Station, College of Agriculture, Navile, Shimoga during *kharif 2010*. The experimental soil was sandy loam with acidic pH. There were seven treatment combinations laid in four replications. Treatments comprises of three different liming materials viz., lime sludge, agricultural lime and calcium silicate at 45 and 50 per cent calcium saturation levels tested against package of practices (POP).

Laboratory incubation studies revealed that among three sources of liming materials, the calcium saturation was earliest (21 days after incubation) in lime sludge treated soil. It was followed by agricultural lime and calcium silicate respectively as they took 30 and 40 days after incubation.

In general improvement in soil pH, OC and CEC was observed with different sources of liming materials. Among the treatments application of POP+ calcium silicate @ 50 per cent calcium saturation recorded significantly higher pH and CEC while POP+ lime sludge @ 45 and 50 per cent calcium saturation and POP+lime sludge @ 45 per cent calcium saturation at different stages of crop growth. Secondary nutrient status of soil was also significantly higher, in treatments POP+ calcium silicate @ 50 per cent calcium saturation and POP+ lime sludge @ 50 per cent calcium saturation. The macronutrients concentration in grain and stover of maize were significantly higher in the treatment POP+ calcium silicate @ 45 per cent calcium saturation followed by POP + lime sludge @ 45 per cent calcium saturation. The treatment supplied with POP+calcium silicate @ 45 per cent calcium saturation recorded significantly highest uptake of macronutrients in grain and stover followed by POP+ lime sludge @ 45 per cent calcium saturation.

As a consequence of above results, application of POP + calcium silicate @ 45 per cent calcium saturation recorded significantly higher growth parameters, yield attributes and maximum grain (69.75 q ha^{-1}) and stover yield (64.15 q ha^{-1}) followed by POP+ lime sludge @45 per cent calcium saturation (66.73 and 53.33 q ha^{-1} of grain and stover yield respectively). The correlation studies revealed that the sources of liming materials were positively and significantly correlated with soil chemical properties, nutrients uptake and as well yield.

2011

Department of SS&AC
College of Agriculture
Navile, Shimoga

Dr. Y. VISHWANATHSHETTY
Major Adviser

18. Studies on Fe and Zn Nutrition for Improving Productivity and Seed Quality of Groundnut in Light Textured Red Soils

Sachin A.S.

Abstract

A field investigation was undertaken during *khariif*, 2009 at ZARS, Navile, Shimoga to study the effect of Fe and Zn nutrition for improving productivity and seed quality of groundnut in light textured red soils. There were nine treatments of Fe and Zn application both as soil and foliar application along with recommended dose of NPK fertilizers. The experiment was laid out in randomized complete block design and replicated thrice. Although the pod yield of groundnut improved significantly when both iron and zinc were applied, there was no significant improvement in pod yield when iron or zinc were applied individually. Highest productivity level of 1685 kg ha⁻¹ of pod yield was obtained when FeSO₄ +ZnSO₄ were applied to soil @ 10 kg ha⁻¹ each along with FYM as compared to 1140 kg ha⁻¹ recorded at control. There was a significant increase in the shelling percentage of groundnut also from 66.3 percent at control to 72.0 percent when FeSO₄+ ZnSO₄ were applied to soil @ 10 kg ha⁻¹ each along with FYM. Similarly, seed quality parameters like seedling length and seedling vigour index also increased significantly. Seedling vigour index was higher when FeSO₄ were applied to soil @ 10 kg ha⁻¹ each along with FYM. There was a significant increase in available Fe and Zn content in soil particularly when FeSO₄+ZnSO₄ were applied to soil at 10kg ha⁻¹ each along with FYM. Highest Fe levels of 11.87, 13.45 and 11.33 mg kg⁻¹ were recorded at 30, 60 days and after harvest respectively with this treatment. The available Zn content at 30, 60 days after sowing and after harvest were positively and significantly correlated with pod yield. However available Fe was significantly correlated with pod yield only at 60 days after sowing. It can be concluded from the present investigation that application of FeSO₄ and ZnSO₄ significantly influences the growth, pod yield, seed quality of groundnut in light textured red soils.

Place : Shivamogga

Dr. T.S. VAGEESH

Date: 08-04-2011

Major Advisor

College Navile, Shivamogga

19. Influence of Nitrogen Levels and Micronutrient Enriched Compost on Soil Properties, Yield and Uptake of Nutrients by Rice (*Oryza sativa*.L.)

Harisha H.S.

Abstract

A field investigation was undertaken during *kharif 2010* at College of Agriculture, Navile, Shivamogga to study the influence of nitrogen levels and micronutrient enriched compost on soil properties, yield and uptake of nutrients by rice (*Oryza sativa*, L.). There were thirteen treatments combinations, which comprised of two levels of nitrogen along with ZnSO₄ enriched composts. Experiment was laid out in RCBD and replicated thrice. Application of 125kg N+Zn enriched compost @15 kg ha⁻¹ recorded significantly higher available N,P,K in soil. Higher DTPA extractable zinc was recorded in treatment 100 kg N+Fe enriched compost @15kg ha⁻¹. Higher growth and yield attributes were recorded in 125kg N+Zn enriched compost @15 kg ha⁻¹, followed by 125 kg N+Zn enriched compost @ 10kg ha⁻¹. Grain and straw yields were also recorded superior in the same treatments.

Significantly higher concentration and uptake of nutrients (N, P, K, Zn, Cu, Mn) were recorded in treatment 125kg N+Zn enriched compost @15kg ha⁻¹ as compared to control. Maximum concentration of Fe was recorded in treatment 125 kg N+ Fe enriched compost @15 kg ha⁻¹ and maximum uptake of Fe was recorded in treatment 125 kg N+ Zn+Fe enriched compost @ 15kg each ha⁻¹. Soil chemical properties (available N,P, K, DTPA extractable Zn, Mn, Cu) were positively and significantly correlated with yield and yield parameters. DTPA extractable Fe was negatively and significantly correlated with yield and yield parameters. Uptake of macro and micronutrients were positive with significantly correlated with grain yield. The treatment 125kg N+Zn enriched compost @ 15kg ha⁻¹ recorded highest net returns and cost benefit ratio.

Place: Shimoga

Date: 12-11-2011

Department of Soil Science & Agril. Chemistry

Dr. H.C. PRAKASHA

Major advisor

20. Effect of Zinc Enriched Compost and Deferent Levels of Nitrogen on Soil Properties, Yield and Uptake of Nutrients by Rice (*Oryza sativa* L.)

Sathisha C.

Abstract

A field investigation was undertaken during *kharif2009* at College of Agriculture, Navile, Shivamogga to study the effect of zinc enriched compost and different levels of Nitrogen on soil properties, yield and uptake of nutrients by rice (*Oryza sativa* L.). There were nine treatment combinations of different levels of nitrogen along with Zinc sulphate and two levels of zinc enriched compost. The experiment was laid out in randomized complete block design and replicated thrice. Enrichment of compost with zinc and different levels of nitrogen have improved the soil chemical properties, growth yield attributes and yield of rice. Application of zinc sulphate and zinc enriched compost with higher level of nitrogen recorded significantly higher values of available N,P,K,S and DTPA extractable Zn in soil at tillering, panicle initiation and at harvest stages. Significantly higher growth and yield attributes were recorded in 150% N + Zinc sulphate @ 20kg ha⁻¹, followed by 150% N+ Zinc Enriched Compost @ 15 kg ha⁻¹. Grain and straw yields were also superior in the same treatments compared to other treatments. It is also observed that the concentration and uptake of (N,P,K,S and Zn) were significantly increased with the application of 150% N + Zinc sulphate @ 20 kg hf⁻¹, followed by 150% N + Zinc Enriched Compost @ 15 kg ha⁻¹as compared to other treatments.

Soil chemical properties (OC, available N,P,K,S and DTPA extractable Zn) were positively and significantly correlated with grain yield of rice. Yield and zinc fractions were correlated positively with significance. Uptake of nutrients (N,P,K,S and Zn) were also correlated positively and significantly with yield.

Place: Shimoga

Date: 19-11-2010

Department of Soil Science & Agril. Chemistry

Dr. H.C. PRAKASHA

Major advisor

21. Dynamics of Phosphorus In Soils Under Different Land Use Systemes

Deepak K.T.

Abstract

An investigation was carried out to study the forms and distribution of phosphorus under different land use systems during 2009-2010 at College of Agriculture, Navile, Shimoga. Five soil profiles under different land use systems *viz.*, agri system -rice, Tobacco, horti system-Arecanut, silvi system -subabul and current fallow and - Control were selected for the study. In each systems of the soil profiles, soil samples were collected depth wise, in addition to profile soil samples, twenty five surface soil samples (Five soil samples in each land use system) at 0-20cm depth were also collected for the characterization of surface soils.

The phosphorus status under different land use systems were ranging from medium to high. The texture of the surface soils were varied from sand to sandy clay. Total P content of soils from different land use systems ranged from 387.25 to 686.36 mg kg⁻¹ and decreased down with the depth. Total mineral and organic P contents of soils ranged from 175.46 to 362.11 mg kg⁻¹ and 142.20 to 386.36 mg kg⁻¹, respectively. Al-P and Fe-P were the most dominant mineral fractions constituting towards inorganically bound P. The relative abundance of different inorganic P fractions were in the order of: Al-P>Fe-P>Red-P>Occl-P>Ca-P>Saloid-P.

Available P content of surface soils from different land use systems varied from 47.08 (agri system-Tobacco) to 68.69 (agri system-Rice) kg ha⁻¹ and that of profile soils ranged from 13.29 (current fallow land - Control) to 69.24 (horti system-Arecanut) kg ha⁻¹ and decreased with depth. Significant and positive correlation was observed with available P with saloid P (r=0.455**), Al-P (r=0.491**) and Ca-P (r=0.448**).

The P fixation capacity revealed that the soils under different land use systems have high P fixation capacity with its values ranging from 61.91mg kg⁻¹ (current fallow land - Control) to 77.60 mg kg⁻¹ (silvi system - Subabul). Significant and positive correlation of phosphorus fixation capacity was observed with pH (r=0.414**), iron (r=0.379**), aluminium (r=0.576) and sesquioxide (r=0.684**) content of the soil.

2010

Department of Soil Science & Agril. Chemistry
College of Agriculture, Shimoga

Dr. K.T. GURUMURTHY
Major Advisor

22. Characterization of Soils Under Different Land Use Systems of Horticultural Research Station (Areca), Sebenakere, Thirthahalli (Tq.), Shivamogga (Dist.)

Mohamed Saqeebulla, H.

ABSTRACT

An investigation was carried out to characterize the soils under different land use systems of the Horticultural Research Station (Areca), Thirthahalli. The experimental sites were selected based on land use systems namely forest, arecanut, mango, cashew, sapota and paddy land use systems of horticultural research station, Sebinakere, Thirthahalli (Tq.), Shivamogga (Dist.). The present investigation indicated that texture varied from sandy loam to sandy clay loam in texture. The bulk density and particle density were increased with depth, higher BD (1.48 Mg m^{-3}) and PD (2.65 Mg m^{-3}) contents were noticed in arecanut and forest systems. The pH was moderately acidic in all soils under investigation. The organic carbon content was (193.6 g kg^{-1}) observed in forest land use system as compared to other land use systems and was moderate in surface soils and decreased with depth. Calcium carbonate equivalent and free iron oxides were higher (0.48 % and 4.55 %) under forest system and lowest (0.18 % and 2.51 %) under sapota system and it decreased with depth in all the land use systems.

Available nitrogen was varied from 125.54 to 426.50 kg ha^{-1} under different land use systems, available phosphorus was higher (22.86 kg ha^{-1}) in areca systems and lowest (11.83 kg ha^{-1}) in sapota system and available potassium was highest (775 kg ha^{-1}) in forest land use system. All primary nutrients were decreased with depth. The exchangeable calcium and magnesium were higher (6.10 and 4.50 $\text{cmol (P}^+) \text{ kg}^{-1}$) in forest system. Whereas the sulphur status was higher than critical limits in all the land use systems. The DTPA extractable Fe and Zn were higher (61.12 and 1.94 mg kg^{-1}) in areca system, highest manganese was noticed in mango-cashew systems, where as copper was highest (3.25 mg kg^{-1}) in paddy land use system. All the micronutrients were decreasing with depth.

The data on the available nitrogen status indicated that 50.00 per cent of the soil samples were low, 32.00 per cent were medium and 18.00 per cent were high. For available phosphorous, 84.00 per cent were low and 16.00 per cent were medium whereas potassium 10.00, 42.00 and 48.00 per cent were low medium and high respectively under different land use systems of Horticultural Research Station, Sebinakere, Thirthahalli.

2009
Department of SS & AC
College of Agriculture, Shivamogga.

Dr. K. T. GURUMURTHY
Major Advisor

23. Effect of zinc enriched compost on soil properties, yield and uptake of nutrients by rice (*Oryza sativa* L.)

Veeranagappa, P.

ABSTRACT

A field investigation was undertaken during Khari-2008 at College of Agriculture, Navile, Shivamogga to study the effect of zinc enriched compost on soil properties, yield and uptake of nutrients by rice (*Oryza sativa* L.). there were eight treatment combinations comprising of recommended dose of compost, NPK fertilizers, ZnSO₄ and zinc enriched compost in different levels . The experiment was laid out in randomized complete block design and replicated thrice. Application of nutrients as per package of practice and different levels of zinc enriched compost treated plots recorded significantly higher values of primary, secondary and micronutrients in soil at tillering, panicle initiation and at harvest stages. A slight improvement in soil pH, electrical conductivity and organic carbon content noticed higher Values in NPK + zinc enriched levels followed by package of practice.

Significantly higher growth and yield attributes were recorded in package of practice, followed by NPK + Zn-E compost at 15 kg ha⁻¹ and 10 kg ha⁻¹. Grain and straw yields were also superior in the same treatments Compared to other treatments. The concentration and uptake of primary, secondary and micronutrients were significantly increased with the application of nutrients us per package of practice, followed by NPK + Zn-E compost at 15 and 10 kg ha⁻¹ as compared to rest of the treatments. Soil chemical properties viz., pH, EC, OC, available N, P, K, exchangeable Ca, Mg, available S, DTPA Zn, Cu, Mn and Fe were positively and significantly correlated with the zinc fractions,

Uptake of nutrients (N, P, K, Ca, Mg, S, Cu, Zn, Mn and Fe), yield were correlated positively with zinc fractions. Path coefficient analysis indicated that major zinc fractions available to rice are crystalline sesquioxide bound Zn, Res Zn, water soluble plus exchangeable Zn, Organically bound Zn fractions. Net returns were maximum by adopting package of practice followed by NPK + Zn-E compost at 10 kg ha⁻¹ and 15 kg ha⁻¹ gave the highest net returns as compared to other treatments

2009

Department of Soil Science
and Agricultural Chemistry
College of Agriculture Navile, Shivamogga.

Dr. H. C PRAKASHA

Major advisor

24. Behaviour of Potassium in Soils Under Different Land Use Systems

Kiran Kumar. M

ABSTRACT

An investigation was carried out to study the Behaviour of potassium in soils under different land use systems, namely, agri system (Rice and Tobacco), horti system (Arecanut), silvi system (Eucalyptus) and current fallow land use system at Zonal Agricultural Research Station, Shimoga. In surface soils of different land use systems the mean water soluble potassium was highest in horti system - Arecanut (14.86 mg kg^{-1}) and lowest in current fallow land (11.94 mg kg^{-1}), while mean exchangeable potassium was highest in agri system - Rice ($137.51 \text{ mg kg}^{-1}$) and lowest in current fallow land (64.43 mg kg^{-1}) and the mean non exchangeable potassium was highest in horti system -Arecanut ($303.45 \text{ mg kg}^{-1}$) and lowest in current fallow land ($168.10 \text{ mg kg}^{-1}$). Similarly, the mean mineral K and total K were highest in agri system - Tobacco (1.36 and 1.39 per cent) and lowest in horti system - Arecanut (0.99 and 1.04 per cent) respectively. The potassium fixation of added K was ranged from 0.22 to 0.76 cmol (p+) kg under different land use systems, potassium fixation was positively and significantly correlated with clay ($r = 0.620^{**}$).

The water soluble, exchangeable and non exchangeable K content of the profiles under different land use systems were ranged from 6.70 to 17.51, 32.16 to 146.66 and 138.00 to 341.90 mg kg^{-1} respectively, while, the mineral and total potassium was ranging from 0.81 to 1.92 and 0.86 to 1.97 per cent respectively. Among the forms of potassium, water soluble potassium contributed lowest and mineral potassium contributed highest to the total potassium. Water soluble K was positively correlated with all the forms of K and also with coarse sand, fine sand, silt, EC, OC, CEC while, Exchangeable K was positively and significantly correlated with clay ($r = 0.401^*$), whereas, a significant positive correlation was observed between non exchangeable K and clay ($r = 0.565^{**}$) and CEC ($r = 0.418^*$). 2008

2008

Dept. of Soil Science and Agril. Chemistry
College of Agriculture

Dr. K. T. Gurumuthy
Major Advisor

25. Impact of Different Farming Methods on Yield and Nutrient Uptake by Maize (*Zea mays* L.) and on Soil Properties

VIJAYA.N

ABSTRACT

In order to know the impact of different farming methods viz., zero budget farming (Subash Palekar method), organic farming, inorganic farming, package of practices, zero budget plus inorganic farming methods and control on yield and uptake of nutrient by maize, available nutrient status and biological properties of soil, field and laboratory studies were conducted on sandy loamy soil (Typic Haplustalf), College of Agriculture, Navile, Shivamogga, UAS, Bangalore during the kharif of 2007. Result of the studies indicated that the highest grain (12.24 t ha⁻¹) and stover 8.90 t ha⁻¹) yield and uptake of nutrients by maize were recorded by package of practices. Whereas, Subash Palekar method registered the lowest grain (2.07 t ha⁻¹) and stover (3.73 t ha⁻¹) yield and uptake of nutrients by maize compared to other methods.

The availability of macro and micronutrients in soil increased under the package of practices and organic farming methods, respectively. Similarly, a maximum number of bacteria, fungi and actinomycetes in soil were observed under package of practices and minimum numbers were found under inorganic farming method. Further, the laboratory incubation study indicated that the rate of CO₂ evolution decreased with time of incubation in zero budget farming (Subash Palekar method) and the treatment which received both Subash Palekar method plus inorganic farming methods. But, it showed an increasing trend up to 54th days in package of practices and 48th days in case of organic farming method which indicates high biological activity in soil under package of practices and organic farming methods due to more availability of substrates compared to other methods of cultivation.

College of agriculture

Place: Shivamogga, Date: 06.09.2008

Dr. H.M CHIDANANDAPPA

Major Advisor

26. Zinc status and its Distribution in Traditional Arecanut Growing Soils of Karnataka.

JYOTHI T.V.

ABSTRACT

An investigation was carried out to study the zinc status in 0-20 cm and 20-40cm depth and vertical distribution of different fractions of zinc in soil profiles of Sagar, Thirthahalli, Koppa and Sringeri and Kundapur taluks of traditional arecanut growing soils of Karnataka. They were sandy loam to sandy clay loam in texture, strong to slightly acidic in reaction (4.62 to 6.23 and 4.69 to 6.23), low in salts, low to medium in CEC, medium to high in organic carbon (5.21 to 27.82 and 4.50 to 29.20 g kg⁻¹) in 0-20 cm and 20-40 cm depth soils respectively.

Available Zn content of different taluks ranged from 0.69 (Kundapur) to 2.24 (Sringeri) mg kg⁻¹ in 0-20 cm and 0.65 (Sagar and Kundapur) to 2.04 (Sringeri) mg kg⁻¹ in 20-40 cm depth respectively. In profile soils, it ranged from 0.49 (Sagar) to 1.55 (Sringeri) mg kg⁻¹ and decreased with depth. Significant and positive correlation of available Zn was established with water soluble plus exchangeable Zn ($r= 0.83^{**}$), organically bound Zn ($r=0.88^{**}$) and manganese oxide bound Zn ($r=0.62^{**}$).

In profile sample study, among the different fractions, residual Zn was the most dominant over the locations (51.19 to 104.71 mg kg⁻¹). It was followed by amorphous, and crystalline sesquioxides bound Zn constituting on an average 1 to 7 per cent of the total Zn. It was followed by manganese oxide bound Zn and organically bound Zn. Water soluble plus exchangeable Zn was the least (1-2 percent) dominant fraction among all the fractions studied. The relative abundance of different Zn fractions followed the order - residual Zn > amorphous sesquioxides bound Zn > crystalline sesquioxides bound Zn > manganese oxide bound Zn > organically bound Zn > water soluble plus exchangeable Zn.

Department of SS&AC,
College of Agriculture, Shivamogga

Dr. Y. VISHWANATHA SHETTY
Major Advisor

27. Investigation on silica in Rice growing soils of Tunga command area

POORNIMA, B.A.

ABSTRACT

An investigation was carried out on the status of available silica and its relationship with properties of soils of Tunga command area. A pot culture experiment was conducted with different kinds and levels of silicon application to know the effect of on growth, yield and nutrient uptake of rice.

The available silica status of soils of Shimoga and Honnali taluks fall under deficiency while soils of Hirekerur taluk fall under sufficiency category indicating the soils of both Shimoga and Honnali taluk belong to class I, which respond profitably for silica application, while soils of Hirekerur taluk belong to class III (non responsive for silica application). Available silica was positively and significantly correlated with clay, pH, CEC and available phosphorus, and negatively correlated with iron oxides and exchange acidity

The study on response of rice to silicon application indicated that the application of silicon at increasing rate significantly influenced the plant growth and yield irrespective of sources *Viz*; sodium silicate or Rice hull ash (RHA). But sodium silicate was superior with respect to yield and nutrient uptake over RHA at the same level of silicon application. Among the treatments T₄ (0.2g of SiO₂ kg⁻¹ of soil as sodium silicate) recorded highest grain and straw yield followed by T₇ (0.2g of SiO₂ kg⁻¹ of soil as RHA) of same level of silicon application, over the control.

Slight increase in soil pH, and organic carbon noticed due to silicon application. The available phosphorous, potassium, Ca, Mg and silica were also increased due to increased level of silicon application. RHA treatments were superior in micronutrient uptake compared to sodium silicate. The results of pot culture study revealed that both sodium silicate and RHA applied as a source of silicon was found to have encouraging results on yield and uptake of nutrients by rice.

Date: 07.06.2007

Dept. of Soil Science & Agricultural Chemistry,
Agricultural College, Shimoga

28. Seeds and Oil Yield Potential of Chewing Tobacco as Influenced By Graded Levels of NPK and S

DYAVAPPA.G.K

ABSTRACT

Research on exploitation of tobacco as a source of edible oil and phytochemicals has attained prominence all over the world in view of the economic potential also due to the growing awareness of health risks associated with tobacco consumption. In the light of this, an investigation was carried out to study the seed and oil yield potential of chewing tobacco as influenced by graded levels of NPK and S. The objective was to assess the influence of graded levels of NPK and S on growth, seed yield, oil content and its quality. A field experiment was conducted at the ZARS, Agricultural College, Navile, Shimoga during kharif 2006. Combination of all three levels of NPK (100, 125 and 150 % NPK) and four levels of S (0, 15, 30 and 40 kg/ha) through gypsum were tried.

The results of the work revealed that yield of chewing tobacco significantly increased with increasing levels of sulphur application. The highest seed yield (1226 kg/ha) was recorded in the treatment receiving 30 kg S/ha. Application of sulphur in the form of gypsum significantly influenced the crude oil content in seed. The crude oil content increased from 39.9 per cent at control to 41.1 per cent at 30 kg/ha. The highest crude oil content (41.5%) of chewing tobacco seed was recorded at 125% NPK along with 30 kg S/ha. The crude oil yield ranged from 407 kg/ha at control to 510 kg/ha at 30 kg S/ha. The crude oil yield in seed obtained up to 509 kg/ha indicates that chewing tobacco is comparable to any other oil seed crops under rain fed conditions. There was significant improvement in quality of oil due to sulphur application in terms of peroxide value. The lowest peroxide value (9.4) was recorded in the treatment receiving 45 kg S/ha.

Over all, the seed yield of up to 880 kg/ha could be harvested with chewing tobacco variety A-145. The yield could be further enhanced up to 1200 kg by better nutrient management through application of 30 kg S/ha.

Department of Soil Science and
Agril. Chemistry
College of Agriculture, Shimoga

Dr. T.S. VAGEESH
Major Advisor

29. Effect of Different Sources of Zinc on the Behaviour of Zinc in Soil Under Maize Crop (*Zea mays* L.)

ANIL KUMAR. S

ABSTRACT

A field experiment was conducted on a Typic Haplustalf with unndy loam texture to study the effect of different sources of zinc ($ZnSO_4$, $ZnCb$, ZnO , FYM, vermicompost and pressmud compost) on the behaviour of zinc in soil under maize. Results of the experiment indicated that application of different sources of zinc significantly increased the DTPA-Zn in post harvest soil compared to that of absolute control (0.47ppm), and the treatment which received recommended NPK fertilizers alone (0.39ppm). Among the sources of zinc, FYM recorded a maximum of 0.84ppm DTPA-Zn in soil. The DTPA-Zn significantly and positively correlated with pH (0.87**), OC (0.79**) and CEC (0.85**) of the soil.

Addition of above sources of zinc increased the zinc content in all the fractions of zinc except residual zinc fraction, which found to be compared to the absolute control and the treatment that received only NPK fertilizers. Further, all the fractions of zinc correlated with each other indicating existence of dynamic equilibrium between them

Stover and grain yield of maize were also significantly increased due to application of above zinc sources compared to that of absolute control and the treatment which received only NPK fertilizers. However, the treatment, which received zinc through pressmud compost recorded a maximum yield of 5.96 and 6.85 t ha⁻¹ of stover and grain respectively. Similarly, zinc uptake by maize significantly increased due to applied zinc sources except zinc oxide. Further, path analysis relating to zinc fractions and uptake of zinc by maize indicated that the major fractions through which zinc is made available to maize as water soluble, easily reducible manganese bound and carbonate bound fractions. Zinc present in residual was found to be unavailable to plants because of strong bonding nature.

Department of Soil Science and Agril. Chemistry
College of Agriculture, Shimoga.

Place: Shimoga

Date: 25.09.2007

Dr. H M CHIDANADAPPA
Major Advisor

30. Effect of Zinc and Boron on Soil Properties, Yield and Uptake of Nutrients by Groundnut (*Arachis hypogaea* L.)

SAYYADSAHED A NADAF

ABSTRACT

In order to study the effect of zinc and boron on soil properties, yield and uptake of nutrients by groundnut (*Arachis hypogaea* L.), a field experiment was conducted on a sandy loam soil (Typic Haplustalf) with deficient in available zinc (0.46 mg kg^{-1}) and boron (0.43 mg kg^{-1}). Results of the experiment indicated that pod and haulm yield, shelling per cent, kernel yield, oil content and oil yield of groundnut significantly increased over the control due to application of borax @ 5 kg ha^{-1} and zinc sulphate at three levels ($5, 10$ and 20 kg ha^{-1}) either alone or in combination with borax. Application of borax had no effect on the content and uptake of zinc by groundnut. But, a significant increase in the content and uptake of boron by haulm and kernels was noticed due to the addition of borax. Similarly, application of zinc sulphate significantly increased the content and uptake of zinc by groundnut.

Increase in the levels of zinc sulphate from 5 to 20 kg ha^{-1} significantly increased DTPA-Zn status from 0.57 to 0.71 mg kg^{-1} without any effect on available boron status in soil. Whereas, application of borax significantly increased available boron status in soil (0.41 mg kg^{-1}). All fractions of zinc except residual fraction significantly increased over control due to the application of zinc sulphate particularly at higher levels (10 and 20 kg ha^{-1}) with or without borax. Further, it was observed that all fractions of zinc correlated with each other indicating existence of dynamic equilibrium between them. A path analysis relating to zinc fractions and uptake of zinc by groundnut indicated that the major fractions of zinc through which zinc is made available to groundnut were water-soluble, sorbed, easily reducible manganese bound and organic bound fractions. Whereas, residual fraction of zinc was found to be unavailable to plants because of its insoluble nature.

Department of Soil Science
and Agricultural Chemistry
College of Agriculture Navile, Shimoga
Place: Shivamogga, Date: 23.11.2007

Dr. H M CHIDANADAPPA
Major Advisor

31. Dynamics of Phosphorus in Traditional Arecanut Growing Soils of Karnataka

KAUSHIK BATBYAL

ABSTRACT

The distribution of different fractions of phosphorus, their contribution to available P pool, as well as phosphorus fixation capacity as influenced by soil physico-chemical properties was studied in the soil profiles from five taluks (viz., Sagar, Thirthally, Koppa, Sringeri and Kundapura) of traditional arecanut growing areas of Karnataka.

Distribution of P fractions varied greatly with sand, silt, clay, pH, CEC, iron and aluminium oxides and organic carbon content of the soil. Total P content of soils from different taluks ranged from 246 to 679 ppm (average 428 ppm) and decreased down the depth. Total mineral and organic P contents of soils ranged from 138 to 348 ppm (mean 232 ppm) and 46 to 386 ppm (mean 203 ppm), respectively, which on an average accounted for 54 per cent and 47 per cent of total P, respectively. Al-P and Fe-P were the most dominant mineral fractions constituting on an average 23 per cent and 21 per cent of total inorganically bound P, respectively. The relative abundance of different inorganic P fractions followed the order: Al-P (53 ppm)>Fe-P(50 ppm)>Red.-P(44 ppm)> Occl.-P(39 ppm) > Ca-P(27 ppm)>Saloid P(12 ppm).

Available P content of surface soils from different taluks ranged from 6.68 mg kg⁻¹ (Kundapura Taluk) to 18.58 mg kg⁻¹ (Sagar Taluk) and that of profile soils ranged from 7.23 mg kg⁻¹ (Kundapura Taluk) to 15.50 mg kg⁻¹ (Sagar Taluk) and decreased with depth. Significant and positive correlation of available P with saloid ($r=0.563^{**}$), Al-P($r=0.492^{*}$), Ca-P($r=0.448^{*}$) and organic P($r=0.561^{*}$) indicates that these P fractions contribute greatly towards available P pool.

Study on the P fixation capacity revealed that the arecanut growing acid soils of Karnataka have high P fixing capacity with its values ranging from 61.54 mg kg⁻¹ (Sagar Taluk) to 79.93 mg kg⁻¹ (Kundapura Taluk) and the P fixation capacity tends to increase down the profile due to decrease in organic carbon content and increase in the content of Fe and Al oxides with increasing depths.

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32. Evaluation of FCV Tobacco Grown Under Organic, Chemical and Integrated Crop Management Systems.

INGUDAM BHUPENCHANDRA

ABSTRACT

Of late, tobacco quality has been deteriorating due to the imbalanced and incessant use of chemical fertilizers, pesticides and other extraneous factors in the sole pursuit of reaping maximum yield. In view of this, organic farming is sometimes restored to in lieu of other crop management systems. The present investigation was carried out to study the yield and leaf quality of FCV tobacco grown under organic, chemical and integrated crop management systems. A field experiment was conducted at ZARS, Navile, Shimoga during the kharif 2007. Three different organic systems involving FYM, pressmud and green leaf manuring were compared with two integrated systems comprising of chemical fertilizers with organics and the fpmended package of practices.

From the experimental results, it was observed that the cured leaf yield varied significantly, the highest yield (1086 kg ha^{-1}) being observed with the recommended packages of practices . Being the first year of investigation the productivity levels recorded with all the three organic systems were far below the level recorded by the recommended package of practices. However, among the organic systems studied the nutrients system involving green manuring and crop residues were found to be the best. Similar trend was observed with respect to quality if of FCV tobacco in terms of top grade equivalent (TGE). The highest value of TGE (625 kg ha^{-1}) was observed with the recommended package of practices .The nicotine content of cured leaf both at X and L position was found to vary significantly. The highest nicotine content were recorded in chemical farming with cent per cent fertilizers for cured leaf at X(1.82 %) and L(1.87 %) position . The highest reducing sugar content in cured leaf at X (18.4 %) and L (17.4 %) position was observed in recommended package of practices with cent per cent chemical fertilizer along with FYM. The highest chloride content were recorded with chemical farming with cent per cent fertilizers for cured leaf both at X (0.41 %) and L (0.34 %) position . There was significant variation in leaf burn. The highest leaf burn was recorded with the recommended packages of practices for both the cured leaf at X (5.1 sees) and L (5.3 sees) position, respectively. There was significant variation in the value of EMC. At X position of cured leaf the highest EMC value (13.5 %) was recorded with cent per cent chemical farming. In case of cured leaf at L position the highest EMC value (15.6 %) was observed in packages of practices with cent per cent fertilizers and FYM manures. Overall, the recommended package of practices gave better yield and improved both the physical and chemical quality constituents in FCV tobacco.

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33. Effect of Basal and Split Application of Potassium Levels on Ihut (*Arachis hypogaea L.*) Productivity and Status of Potassium in Soil

RADHIKA K.

ABSTRACT

A field experiment was conducted at Zonal Agricultural Research Station and College of Agriculture, Navile, Shivamogga during the kharif season of 2008. Different levels of potassium @ 12.5, 18.75, 25 and 31.25 kg K₂O ha⁻¹ were tried as basal and also in splits with eight treatments combination along with recommended dose of N, P fertilizers and FYM in a with 3 replications using groundnut (*Arachis hypogaea L.*) as test crop, Results of the experiment indicated that application of potassium @ kg K₂O ha⁻¹ in two splits (12.5 kg K₂O⁻¹ as basal + 12.5 kg K₂O ha⁻¹ at flowering stage) significantly increased pod yield (20.47 q ha⁻¹), haulm yield of 32.85 q ha⁻¹, kernel yield (14.87 q ha⁻¹), crude protein (18.74%) and oil yield (697.99 kg ha⁻¹) compared to all other treatments except the treatment (which received 31.25 kg K₂O ha⁻¹ in splits. The uptake of nutrients were recorded significantly higher in the treatment which received the potassium level (25 kg K₂O ha⁻¹) in two splits compared to all treatments except the treatment which received the potassium level of 31.25 kg ha⁻¹ in splits.

An increase in the level of potassium application (12.5 to 31.25 kg ha⁻¹) either as basal or in two splits increased the available, water soluble and exchangeable potassium in soil at harvest of the crop. Whereas fixed (Non exchangeable) and lattice potassium decreased with increase in the level of potassium application

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34. Effect of INM approach on soil properties, yield and uptake of nutrient by rice crop (*Oryza sativa* L.) in Bhadra command, Karnataka.

SUNITHA, B.P.

ABSTRACT

A field experiment was conducted during the kharief of 2007 at Agricultural research Station, Honnavile, Shivamogga to study the effect of INM approach on soil properties yield and uptake of nutrient by rice crop (*Oryza sativa* L.) in Bhadra command Karnataka. There were eleven treatment combinations comprising of dose of nitrogen applied through urea green leaf manure, FYM with or without Azospirillum. The experiment laid out in randomised complete block design with three replication. Application of 50% nitrogen through urea + 25% nitrogen through GLM+25% nitrogen through FYM + Azospirillum recorded significantly higher CEC value, secondary and micronutrients content in rice soil at tillering, panicle initiation and harvest stages. Whereas pH, EC, and OC status increased in organic alone treated plots.

There was significant increase in the root biomass, thousand grains weight, number of panicle m^{-2} , grain and straw yield of rice crop in 50% nitrogen through urea + 25% nitrogen through GLM + 25% nitrogen through FYM + Azospirillum plot. However plant height number of tillers per hill higher value was recorded in farmer's practice at all the stages of crop growth. The concentration of major, secondary and micronutrients and uptake of all the nutrients significantly increased in grains and straw with the application of 50% nitrogen through urea + 25% nitrogen through GLM + 25% nitrogen through FYM + Azospirillum as compared plot to control.

The soil chemical properties like OC, CEC, available N, P, K, exchangeable Ca, Mg, available sulphur, DTPA Zn, Cu, Mn and Fe and uptake of nutrients in gram were positively and significantly correlated with grain yield of rice. In the present investigation net return was maximum by adopting integrated nutrient management practices as to 100 percent nitrogen applied plot and farmer's practice

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35. Calcium and Magnesium Dynamics in Nutrient Carriers, Soil and Plant Continuum

DEEPTHI PATIL

ABSTRACT

A field experiment was conducted at College of Agriculture, located within the Zonal Agricultural and Horticultural Research Station, Navile, Shimoga, during the kharif, 2012 on soybean crop to study the "Calcium and magnesium dynamics in nutrient carriers, soil and plant continuum". The experiment was laid out in a randomized block design with three replications and 8 treatments combinations, comprising NPK application along with nutrient carriers such as FYM @ 6.25 t ha⁻¹, poultry manure @ 3 t ha⁻¹, vermicompost @ 3 t ha⁻¹ with gypsum @ 100 kg ha⁻¹. The application of NPK + poultry manure @ 3 t ha⁻¹ + gypsum @ 100 kg ha⁻¹ recorded significantly higher number of pod per plant (96.50 pod per plant), branches per plant (4.81), which was on par with treatment NPK + FYM @ 6.25 t ha⁻¹, NPK + FYM @ 6.25 t ha⁻¹ + gypsum @ 100 kg ha⁻¹ and NPK + vermicompost @ 3 t ha⁻¹ + gypsum 100 kg ha⁻¹. Highest pod yield, grain yield and haulm yield is recorded in treatment receiving application of NPK + FYM @ 6.25 t ha⁻¹ + gypsum @ 100 kg ha⁻¹.

The concentration of major and secondary nutrients and their uptake by grain and haulm of soybean significantly increased with the application NPK + poultry manure @ 3 t ha⁻¹ + gypsum @ 100 kg ha⁻¹ compared to only NPK applied treatment whereas P, Ca, Mg, is higher with application of NPK + poultry manure @ 3 t ha⁻¹ + gypsum 100 kg ha⁻¹. Exchangeable Ca and Mg and major nutrient status in soil is significantly higher in treatment supplied with NPK + poultry manure @ 3 t ha⁻¹ + gypsum @ 100 kg ha⁻¹ compared to all other treatments.

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36. Effect of FYM Levels With or Without Fertilizers on Zinc and Copper Dynamics in Soil Under Ragi (*Eleusine coracana* L.) Crop

MAHASWETA CHAKRABORTY

ABSTRACT

Field and laboratory studies were conducted at College of Agriculture, Navile, Shimoga during *khariif*, 2013, in order to know the effect of FYM levels with or without fertilizer on soil properties, available zinc and copper status in soil and productivity of ragi. Results of the experiments indicated that application of FYM @ 22.5 t ha⁻¹ with or without fertilizers, significantly increased soil pH, organic carbon, DTPA-Zn (0.97 mg kg⁻¹) and DTPA-Cu (0.9 mg kg⁻¹) and zinc and copper content in all fractions (water soluble, sorbed, easily reducible manganese bound, carbonate bound and organic bound) except Fe and Al bound residual fractions in soil compared to the control in soil after harvest of the ragi. Further, all fractions except residual fraction had a positive and significant correlation with each other indicating the existence of a dynamic equilibrium among themselves. The maximum CO₂ evolution rate throughout the incubation period was recorded in the treatment that received FYM @ 22.5 t ha⁻¹ and minimum was recorded in the treatment that received only recommended dose of fertilizers (RDF).

Similarly, the treatment receiving FYM @ 22.5 t ha⁻¹ + RDF was found to be significantly superior in respect of grain (30.28 q ha⁻¹) and straw yield (18.90 q ha⁻¹), content and uptake of zinc and copper by grain and straw of ragi. Hence, application of FYM at higher level with or without fertilizers can be thought of as an approach towards bio fortification of zinc in plant and plant products to overcome zinc malnutrition in human beings.

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37. Yield and nutrient uptake by maize as influenced by graded levels of applied nitrogen under varying soil Nitrogen status

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ABSTRACT

A field experiment was conducted in two stages under rain fed conditions at Zonal Agricultural Research Station, Navile, Shivamogga in 2010 to determine the optimum fertilizer dose of nitrogen for maize under varying soil N status. This was done by studying the response of maize in terms of yield and nitrogen uptake to graded levels of applied nitrogen (0, 50,100,150,200 and 250kg ha⁻¹) under varying nitrogen fertility strips (very low, low, medium, high and very high). The technique of field experimentation involving creation of wide soil fertility variation in one and the same field was adopted in this study following the STCR approach. The experiment comprised of two stages. A fertility gradient experiment in the pre-kharif season and the main experiment on nitrogen response studies in the kharif season. The varying soil fertility strips were created by applying N levels ranging from 0 to 450kg N ha⁻¹and by growing an exhaustive crop of fodder maize. The results of the main experiment indicated the in low and medium level of the N applied (250 kg N ha⁻¹) However in the high soil fertility strip we could see a plateau in the response curve beyond 225 kg ha⁻¹ of applied N. The N applied at levels greater than 200 kg ha⁻¹ resulted in no additional response in terms of actual grain yield, but increased the grain N content and therefore the protein content of the grain. From the study, it was also inferred that 142 kg ha⁻¹is the optimum N take level to produce a maximum grain yield of 6835 kg ha⁻¹beyond which there was no response to further increase with increase in the level of the applied N under high soil fertility strip. Optimum N doses were also calculated for maize and it was found to be 250 kg N ha⁻¹in the low fertility situations, 240 kg ha⁻¹of N fertilizer in medium fertility situations and a dose of 218 kg ha⁻¹of fertilizer N in the high fertility soils, under assured rainfall situations.
