

**Abstracts of Theses Accepted for the Award of Post-Graduate Degree in
The University of Agricultural Sciences, Dharwad**

DOCTORAL PROGRAMME

AGRONOMY

Performance of *Sesbania grandiflora* L. (Poir) under Irrigation and its Suitability in Alley Cropping

B. K. DESAI

1998

MAJOR ADVISOR : Dr. A. S. PRABHAKAR

Field experiments and a green house study were conducted under irrigated red sandy clay loam soils of Regional Research Station, Raichur (16°15'N and 77°20'E) during 1994-1996. Green house experiment was conducted on early growth response of *Sesbania grandiflora* to phosphorus and VAM inoculation. In a field experiment the response of *S. grandiflora* was studied for two years with four tree densities (10,000, 20,000, 40,000 and 50,000 plants/ha) and three phosphorus levels (0.60 and 120 kg/ha) with and without VAM inoculation. Field experiment was conducted to study the performance of groundnut (*rabii*/summer) in association with *S. grandiflora* hedge rows. In another study, pruning treatments were imposed and alley cropping response was evaluated with *kharif* maize and *rabii* summer groundnut. Application of phosphorus @ 60 kg P_2O_5 per ha coupled with VAM inoculation recorded higher total drymatter of *S. grandiflora* (29.11g) at 90 DAS compared to uninoculated control. Nodulation characteristics viz., nodule number and nodule dry weight were favourably influenced by VAM inoculation. Mycorrhizal colonization (78.20%) was found superior to uninoculated control.

Maximum biomass yields were obtained at a plant

density of 50,000 plants per ha. Total biomass production was 81.78 t per ha after second year of planting. Application of phosphorus @ 120 kg P_2O_5 per ha produced higher biomass (64.92 t/ha) yields compared to 60 kg P_2O_5 and no phosphorus. Similarly VAM inoculation recorded higher biomass (60.83 t/ha) than uninoculated control at the end of two years. VAM inoculated and P applied plots produced significantly higher biomass yields than uninoculated plots. In agroforestry studies, the effect of proximity of sesbania rows in associated maize and groundnut increased with the advance in age of sesbania and was more severe in the vicinity of tree line. In alley cropping system with maize, application of sesbania prunings along with RDF recorded higher grain yield (52.18 q/ha) and stover yield (68.80 q/ha) which was on par with sole maize. Similarly, highest pod and haulm yields of 29.25 and 36.05 q per ha, respectively were observed in the treatment receiving addition of prunings plus RDF and was on par with AP + 75% RDF. Economics of alley cropping system indicated a possibility of saving 25 per cent RDF to both the crops in the system. Soil environment changed favourably under sole sesbania and also in the alley cropping system.

AGRICULTURAL ENTOMOLOGY

Studies on *Chrysoperla carnea* (Stephens) and Its Evaluation Under Cotton Ecosystem

MAHABALESHWAR HEGDE

1997

MAJOR ADVISOR : Dr. K.A. KULKARNI

Investigation on *Chrysoperla carnea* (Stephens) Viz., standardization of mass rearing method, inbreeding studies in mass culture, response to kairomone, attraction, conservation, release method in cotton ecosystem and impact of neem based pesticides under field condition were carried out for two seasons during 1995-97.

Mass rearing of *C. carnea* larvae in groups by using wood shavings proved to be the best by recording 88.00 per cent pupation, on par with individual rearing in injection vials (93%) and plastic louvers (91%). The mass rearing

of 100 larvae per basin of size 35 cm diameter and 7 cm height was found to be optimum. Among the *Corcyra* egg dose combinations evaluated for mass rearing of *C. carnea* larvae with wood shavings as filler material, the provision of 5 cc of *Corcyra* eggs in two instalments of 1.25+3.75 cc was proved to be the best based on cost economics (Rs. 1.13/adult), growth and fecundity of the predator. Evaluation of cheaper source of food for *C. carnea* adults indicated that blackgram powder can be substituted for proteinex without affecting their fecundity (353.00 eggs/female). There was slow decline in characters especially

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per cent hatchability and fecundity of mass reared *C. carnea* from first generation (90.66 and 363.33) to 24th generation (77.67 and 235.00). Crossing of inbred progeny of laboratory colony after 5th generation did not result into marked improvement in vigour of hybrid progeny. The response of *C. carnea* third instar larvae starved for four hours was maximum (1.22 min) when exposed to wax droplets coated with *H. armigera* scale extract. Among the food attractants tried, tryptophan (0.01%) proteinex (2%) mixture concentration was found to be promising in attraction of *C. carnea* adults on cotton crop. Among the

intercrops tried with cotton, lucerne favoured more natural enemies while, natural enemy population was least on cotton intercropped with soybean. Among the *C. carnea* release methods tested on cotton, larval brushing proved to be the best followed by larval dusting, larval tapping and egg stapling. *C. carnea* egg load and larval population were significantly low in all the neem based pesticides sprayed plots compared to control. The recovery of the predatory larvae were high when release was made after spray than before spray.

GENETICS AND PLANT BREEDING

Somacalonal Variation and Interspecific Hybridization for Improving Fodder Yield and Quality in Hybrid Pennisetum [*Pennisetum americanum* (L.) K. Schum. x *P. purpureum* Schum.]

RAMESH BHAT

1998

MAJOR ADVISOR: Dr. M. S. KURUVINASHETTI

NB 21, a commonly grown cultivar of hybrid *pennisetum* [*Pennisetum americanum* (L.) K. Schum. x *P. purpureum* Schum.] was investigated for somacalonal variation through phenotypic, cytological, biochemical and molecular approaches. Newly produced interspecific hybrids between three bajra lines (891 1 1A, 901 1 1A and 93333A) and a napier grass (Thick napier) were also studied.

Frequency of callus induction from young inflorescence explants was high (100%) on modified MS medium with kinetin (1.25 mg l⁻¹) and 2, 4-D (1.25 mg l⁻¹). Majority (>95 %) of the callus induced was embryogenic. Lower levels of 2,4-D (1.00 and 1.25 mg l⁻¹) along with selective subculture of organized sectors was found effective for long term maintenance of totipotent callus. Plant regeneration from organized sectors was frequent (>92 %) on basal MS. Histological studies revealed that plant regeneration occurred via somatic embryogenesis. Profuse rooting was induced on MS medium with NAA (1.00 mg l⁻¹).

Field evaluation of vegetative progenies of

somacalones (272) along with donor (NB 21) showed widespread variation for many morphological, fodder yield and quality parameters. Comparatively, high frequency of variants was noticed for quality parameters (77% for crude protein) than quantitative characters (19% for plant height and stem thickness). Available variation indicated usefulness of somacalones in isolating genotypes with better fodder yield and quality. Cytological, biochemical (isozyme) and molecular (Random Amplified Polymorphic DNA - RAPD) analyses of somacalones indicated the possibility of linkage alterations through chromosomal rearrangements resulting into superior somacalones possessing a combination of desirable growth attributes of napier grass with better fodder quality of bajra.

Variation among the F₁ plants of individual interspecific crosses was very high for many vegetative characters especially, for clump morphology, number of tillers, leafiness and plant height. Eight new hybrid clones were identified as superior over NB 21 (adapted cultivar) and IGFR 7 (national check) for fodder yield. The best clone with glabrous leaves had 80 and 87.5 per cent increased fodder yield over IGFR 7 and NB 21, respectively.

PLANT PATHOLOGY

Variability In *Fusarium undum* Butler Causing Wilt of Pigeonpea

A. R. SATARADDI

1997

MAJOR ADVISOR: Dr. K. H. ANAHOSUR

Fourty diseased samples were collected to know the variation in *Fusarium undum* and each sample was considered as an isolate. Cultural and morphological characters studied on potato sucrose agar revealed,

considerable variation among fourty isolates. Based on the cultural and morphological characters isolates of *F. undum* clustered into six groups. Isolates also exhibited considerable variation with respect to utilisation of various

nutrient substances on which they were cultured. Among the carbon sources mannitol recorded significantly maximum growth of isolates. While, rest of the carbon sources supported fairly good growth. Peptone was the best nitrogen source to all the isolates followed by L-asparagine. Luxurious growth of the isolates was recorded at pH 6.0 and 6.5 while, it decreased significantly at pH 5.0 and 7.0.

Most suitable temperature for the production of maximum dry mycelial weight was 30°C. The growth of all the isolates increased from 20°C to 30°C whereas at 40°C the growth was reduced drastically. Based on mean dry mycelial weight isolates of *F.undum* were categorised into eight groups. Isolates varied significantly with respect to banding pattern of peroxidase, catalase and

polyphenoloxidase isozyme. Based on isozyme banding pattern of peroxidase, catalase and polyphenoloxidase isolates were categorised into nine groups, thirteen groups and ten groups, respectively.

Serological studies indicated that all the six sera possessed a proper titre (1:320 to 1:2560). Varying degree of agglutination observed in this study established serological variation among the isolates. On the bases of agglutination and double diffusion test all the isolates were classified into four groups. All the isolates of *F.undum* showed virulence reaction on cultivar ICP-2376 whereas, none showed virulence on ICP-8863. Based on reaction on differentials these isolates were categorised into three groups.

AGRICULTURAL ECONOMICS

Ground Water use in Karnataka - An Economic Analysis

G.M.HIREMATH

1998 MAJOR ADVISOR: Dr. K. N. RANGANATHA SASTRY

Ground water is the important renewable natural resource for irrigation and domestic purposes. However, its renewability depends on many factors. The present study was taken up in Karnataka state and main issues covered are the development and regionalisation in different sources of water, utilization of ground water, formal efforts, behaviour of water table and factors influencing it and investment required for commissioning borewell. The data were collected from both primary and secondary sources. Growth rate, cluster, percentage and ratio, regression, tabular and financial analysis were employed.

The results revealed the positive and significant growth with respect to ground water and canal sources and declining trend in tank irrigation. The parameters like density of dugwells and borewells, stage of development and shift in crops indicated the increased exploitation of ground water in the state. The increase in number of critical blocks from mere seven during 1983 to 93 in 1994 also indicated the increasing burden on ground water resource. The level of water table decline in 13 districts and in six

districts the upward trend was observed. The semi-log functional analysis revealed that rainfall, gross area irrigated by canals, area under ground water irrigation, number of tanks, number of ground water structures and area under forest as the important factors influencing the level of water table. Nalabund, checkdam and vented dam had the beneficial effect on ground water in watershed areas of Raichur, Daksina Kannada, Belari and Belgaum districts. The total investment required per borewell worked out to Rs.45,200 in Khanapur (high rainfall) and Rs.55,800 in Ranebennur (plain and low rainfall) taluk. The cropping intensity on borewell forms was 271.45 per cent in Khanapur and 238.50 per cent in Ranebennur taluk. The feasibility measures viz., NPW, BCR, IRR and PBP indicated the viability of investment on borewell in both the taluks.

Further, the study focussed the need for adhering to spacing norms, adoption of improved methods (drip, sprinkler) of irrigation and enhancing the recharge through watershed development to ensure sustained availability of ground water.

AGRICULTURAL EXTENSION EDUCATION

Performance of non Governmental Organisations in Rural Development and Peoples' Attitude Towards NGOs in Karnataka : A Diagnostic Study

S. SHASHIKUMAR

1998 MAJOR ADVISOR : Dr. B. SUNDARASWAMY

The present study was conducted to assess the performance of NGOs in rural development focussing on agriculture development, peoples' attitude, methodology followed in programme formulation and execution, extent of coordination with development departments, impact on

beneficiaries and non-beneficiaries and personal, socio-economic characteristics of the beneficiaries. The information from 4 NGOs of northern districts, 250 beneficiaries and 50 non-beneficiaries was collected during 1997-98.

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The major findings were, IDS and SPV carried out less agricultural programmes and more welfare programmes. However, BIRDS and LORDS concentrated equally on agricultural and welfare programmes. In the programme formulation and execution, maximum involvement of beneficiaries was found in the process of identification of problem, fixing priorities, search of alternate solution, preparation of plan of action, arranging materials and resources and in the final execution of programmes. NGOs, development departments and UAS staff provided the technical guidance. The financial support was ensured by sponsoring agencies and the government. External agencies and local bodies took the responsibility of evaluation and follow-up activities.

Majority (78.4%) of the beneficiaries and (54.0%) non-beneficiaries had favourable attitude towards NGOs.

Knowledge level of beneficiaries was found on par with knowledge level of non-beneficiaries. Majority (80%) of the beneficiaries realised maximum benefits and less percentage of non-beneficiaries got minimum benefits indirectly through beneficiaries. All the NGOs were found to have coordination with development departments for technical advice, material inputs and for financial support sometimes during all the steps of programme execution.

Majority (66.0%) of the beneficiaries were of middle age, about 70 per cent belonged to joint family, most (60%) of them were from forward castes. Negligible percentage possessed improved implements, livestock and had less contacts with extension agencies with less extension participation. Majority (72.4%) possessed radio followed by (33.6%) television and less per cent (24.0%) subscribed to news paper.

MASTER OF SCIENCE

AGRONOMY

Response of Chickpea to Inoculation of Phosphate Solubilizer, Sources and Levels of Phosphorus Under Untreated Urban Sewage Irrigation

P.K.MANTUR

1998

MAJOR ADVISOR: Dr. C.S. HUNSHAL

An investigation was carried out to study the performance of chickpea to inoculation of phosphate solubilizing bacteria in combination with different sources and levels of phosphorus under untreated urban sewage irrigation on farmer's field in Dharwad during rabi season of 1996-97. Experiment was laid out in split-split plot design with inoculation of *Pseudomonas striata* as main plot, sources of P (DAP, SSP and MRP) as sub plot and levels of P (50, 75 and 100 per cent RDP) as sub-sub plot in three replications.

Inoculation recorded significantly higher grain yield (2954 kg/ha) which was 7.0 per cent higher than no inoculation. It also recorded significantly higher total dry matter, number of pods and grains per plant and grain yield per plant. The increase in yield and yield components was due to increased availability of P in soil and P uptake. SSP

application was significantly superior to DAP and MRP in increasing yield by 5.5 and 10.3 per cent, respectively. This was due to the supply of extra Ca and S and increased availability of P. Higher grain yield was recorded by application of 75 per cent (2920 kg/ha) and 100 per cent RDP (2995 kg/ha) which were significantly superior to 50 per cent RDP. This was due to increased total dry matter production and yield parameters by increased availability of P.

Inoculation with SSP at 75 per cent RDP recorded higher grain yield (3159 kg/ha) and net returns (Rs. 20333/ha). The B:C was higher (3.17) with application of MRP at 100 per cent RDP along with inoculation. By inoculation we could save about 25 per cent of RDP and also could substitute the costly phosphatic fertilizers by cheapest source of P.

Influence of Sunnhemp Applied With Phosphorus on the Succeeding Crop of Rabi Sorghum

SHREESHAIL S. TATTIMANI

1998

MAJOR ADVISOR: Dr. M.B. GULED

An investigation was carried out to study the influence of sunnhemp applied with phosphorus on the succeeding crop of Rabi sorghum at Regional Research Station, Bijapur during Kharif and Rabi sorghum at Regional Research Station, Bijapur during Kharif and Rabi seasons of 1996-97. Experiment was laid out in split-split plot design with different doses of phosphorus to sunnhemp for green

manuring as main plot, various levels of N to Rabi sorghum (0, 25 and 50 kg/ha) as sub plot and levels of P to Rabi sorghum (0 and 25 kg/ha) as sub-sub plot in three replications.

Application of 50 kg P_2O_5 per ha to sunnhemp has produced numerically higher bio-mass of 5.59 t per ha followed by 25 kg P_2O_5 per ha and no phosphorus

application. It has also recorded higher nutrient content and accumulation. Application of 50 kg P_2O_5 per ha to sunnhemp recorded significantly higher grain yield (16.98 q/ha) which was 10.3 and 40.3 per cent higher than 25 kg P_2O_5 per ha and no phosphorus application, respectively.

Application of 25 kg N per ha gave significantly higher grain yield (16.68 q/ha) over no N but, it was on par with 50 kg N per ha. It has also recorded significantly higher fodder yield, grain weight per plant, number of grains

per ear and 1000 grain weight. The increase in yield and yield components was due to the incorporation of sunnhemp. Significantly higher grain yield was recorded by application of 25 kg P_2O_5 per ha (15.99 q/ha) over no phosphorus to Rabi sorghum. Application of 50 kg P_2O_5 per ha to sunnhemp and its incorporation along with 25 kg N per ha to Rabi sorghum has recorded significantly higher grain yield of 19.22 q per ha. By this combination we could save about 50 per cent of the RDN to succeeding crop of Rabi sorghum.

Effect of *In situ* Incorporation of Legumes Intercropped with Maize (*Zea mays* L.) in Maize-Safflower (*Carthamus tinctorius* L.) Relay Cropping System Under Rainfed Condition

S.V. DASARADDI

1998

MAJOR ADVISOR : Dr. S.M. HIREMATH

A field experiment was conducted at the Agricultural College Farm, Dharwad during *kharif* and *rabi* seasons of 1995-96 to study the effect of *in situ* incorporation of legumes intercropped with maize in maize-safflower relay cropping under rainfed condition. Cowpea, sunnhemp, dhaincha, blacksoya, soybean and horsegram were grown as intercrop in between maize rows. These legumes were incorporated in the standing maize crop (90cm x 20cm) at 50 DAS. Split plot design was adopted with three replications.

Among the legumes, cowpea recorded highest phytomass (19.68 t/ha) followed by sunnhemp (16.87 t/ha) and dhaincha (16.64 t/ha). However, reverse trend was observed with respect to biomass production and N accumulation. Sunnhemp recorded higher biomass and N accumulation. Sunnhemp recorded higher biomass and N accumulation (3.02 t/ha, 93.60 kg/ha) followed by dhaincha (2.75 t/ha, 86.04 kg/ha), respectively. Maize grown in association with legumes did not differ significantly with respect to growth, yield and yield attributes as that of sole crop.

All the legumes had a considerable residual effect

on the succeeding safflower crop. The yield and yield attributes of safflower were significantly higher in sunnhemp, dhaincha and cowpea incorporated plots than non-manured plots. Among the nitrogen levels, application of 40 kg N/ha recorded higher interaction between residual effect of green manures and N levels to safflower, revealed that incorporation of sunnhemp coupled with 40 kg N/ha recorded significantly the highest seed yield (11.26 q/ha). This treatment combination was comparable with sunnhemp with 20 kg N/ha or dhaincha with 20 and 40 kg N/ha or cowpea with 40 kg N/ha. Incorporation of sunnhemp added higher amounts of organic carbon than other legumes and non-green manured treatments. With regard to N status higher available N status was observed in sunnhemp, dhaincha and soybean incorporated plots after harvest of maize and soybean incorporated plots after harvest of maize and safflower.

The economic analysis of system revealed that higher net returns and B:C ratio was with maize + dhaincha, maize + sunnhemp and maize + cowpea intercropping succeeded by safflower with 20 or 40 kg N/ha.

SOIL SCIENCE

Studies on Status and Distribution of Potassium in Orchard Soils of Northern Dry Zone of Karnataka

RAGHUP.

1998

MAJOR ADVISOR : Dr. G.N.DANDAGI

In the present study, ten soilbodies (five each of grape and pomegranate orchards) of Northern dryzone of Karnataka with deccan trap and limestone parent materials were taken up. The investigations were carried out for the distribution of different forms of potassium in soil bodies; potassium fixation capacity of surface soils; release pattern of step potassium and constant rate potassium were studied. The possibility of a better extractant for the

estimation of available K than that of 1N NH_4OAc was also investigated.

The potassium fixation capacity of surface soils of grape orchards was in the range of 0.62 - 1.13 cmol (p^+) kg^{-1} with an average of 0.89 cmol (p^+) kg^{-1} and of pomegranate orchards in the range of 0.66 - 1.24 cmol (p^+) kg^{-1} with an average of 0.94 cmol (p^+) kg^{-1} . The total step K of grape orchard soils was of higher order as compared

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to pomegranate orchards but pattern of release of step K was comparable to each of grape as well as pomegranate orchards. There was also similarity in constant rate K in soils of each of grape and pomegranate orchard soils. The

investigation also revealed that 0.1 N HNO_3 extractant was found superior over the traditional extractant (neutral N NH_4OAc) as an index of available potassium.

AGRICULTURAL ENTOMOLOGY

Biology and Management of Shoot and Capsule Borer, *Conogethes punctiferalis* Guen. on Castor

G. B. THIPPESWAMY

1998

MAJOR ADVISOR : SOMASEKHAR

Studies under taken at the College of Agriculture and Regional Research Station, Raichur during 1996-97 on various aspects of *Conogethes punctiferalis* Guen. On castor indicated that the translucent pale white, flattish oval eggs were laid singly or either in groups of 2 to 3 between the warts of capsules. The insect had five larval instars in its development with a mean larval duration of 16.80 ± 1.90 days. The final instar larva had pale greenish body with a pinkish wash dorsally and all the stages of the larvae feed under concealment. The pupa was obdect type, reddish-brown and was found inside bored capsules or seeds or between capsules with a mean duration of 10.32 ± 0.61 days. Adult is a medium sized bright yellow moth with small black spots on upper surface of wings and abdomen. The females are found to live longer than males. The studies were also made on fecundity, ovipositional period and sex ratio. The total life cycle occupied 34.45 ± 4.29 days at room temperature.

The peak incidence of capsule borer on off season

castor was during last week of June (26.00%) and continued till second week of August where as on normal sown crop, infestation reached its peak during December-January (20.40 to 36.8%) and continued till harvest. The incidence had significant negative relationship with maximum, minimum temperature and number of rainy days. The incidence of shoot and capsule borer was noticed on mango inflorescence during December - January months while on grapes during February with an incidence of 16.67 per cent. Two unidentified species of Ichneumonidae, *Xanthopimpla* sp. and *Brachymeria* sp. as larval, larval-pupal and pupal parasitoids, respectively were recorded on capsule borer with peak activity during November.

Two sprayings at flowering (70 DAE) and capsule formation stages were considered as critical for effective management of pest with higher yield. Among different insecticides evaluated fenvalerate 20 EC at 0.375 litre per hectare and methyl parathion 2D @ 25 kg per hectare were found most effective and economical.

CROP PHYSIOLOGY

Physiological Investigations on Synergetic Effects of Herbicide Mixtures in Sunflower (*Helianthus annuus* L.)

N. S. RENUKASWAMY

1998

MAJOR ADVISOR : Dr. V.P. CHIMMAD

In an attempt to find out the synergetic effects of herbicide mixtures in sunflower, a field experiment was conducted during *kharif* 1996 at College of Agriculture Farm, University of Agricultural Sciences, Dharwad. The experiment consisted of four pre-emergent herbicides alachlor (2.00 t ha^{-1}), metolachlor (1.50 t ha^{-1}), clomazone (1.00 t ha^{-1}) and pendimethalin (1.50 t ha^{-1}) and mixtures of these herbicides with half of their concentrations. In addition, weed free check and unweeded check were also included for comparison.

Results indicated that in unweeded check, weed population and weed dry weight were significantly higher and reduced with the application of herbicides. The morphological characters viz., plant height, leaf area, dry weight of leaves, stem, head and TDM, growth parameters like LAI, LAD, SLA, AGR, CGR, RGR and NAR were significantly higher in weed free check as compared to

unweeded check and all the herbicides improved these parameters and the increase was more with alachlor and metolachlor combinations.

Physiological parameters viz., rate of photosynthesis and stomatal conductance were significantly higher in weed free check followed by alachlor and metolachlor combinations. However, among the herbicide treatments, clomazone resulted in reduction of these traits. Chlorophyll contents (Chla', Chl b' and total Chl) were also lowest in clomazone and its combinations with other herbicides, due to phytotoxic effects. Yield components like head diameter, number of seeds per head, test weight and HI were highest in weed free check, while these parameters were adversely affected in unweeded check. Among the herbicides, alachlor and metolachlor showed higher values for these traits. From the results it is inferred that morphological characters, growth parameters,

physiological traits and yield components determining the final yield and this may be achieved by reducing the weed

competition at the critical stages of crop growth (Four to six weeks after sowing) in sunflower.

GENETICS AND PLANT BREEDING

Evaluation of F₃ and F₄ Generations in Durum Wheat (*Triticum durum* Desf.)

SADASHIV B. HALLOLI

1998

MAJOR ADVISOR : Dr. R.R. HANCHINAL

Investigations were undertaken during rabi 1996-97 at AICVIP, UAS, Dharwad to elucidate the information on genetic variability, the pattern of correlation between different quantitative characters, direct and indirect effects of component characters on grain yield and to identify the superior segregants from experimental material. The study included F₃ and F₄ generations of three crosses viz., Bijaga yellow x HD-4502, Raj-1555 x Sham-1 and Celta x Sham-1 which were generated from five genotypes selected based on heat stress tolerance. The trial was conducted in two environments namely irrigated and rainfed.

Analysis of variance clearly indicated significant differences for all the characters except harvest index and 1000-grain weight. The PCV and GCV were more for grain yield followed by plant height, tillers per plant and total biomass per plant. The heritability estimates were higher for all the characters except harvest index and 1000-grain weight under both environments and grains per spike under rainfed environment. The genetic advance

as per cent over mean was moderate to high for plant height, tillers per plant, total biomass per plant and grain yield under both environments and grains per spike only under irrigated environment.

Grain yield showed positive correlation with plant height, tillers per plant, grains per spike, total biomass per plant, harvest index and 1000-grain weight. Among interse correlations, significant positive correlation was observed for tillers per plant with total biomass per plant, days to flowering per plant with days to maturity and harvest index with 1000-grain weight. Only tillers per plant and 1000-grain weight had indicated consistent positive direct effect on grain yield in both generations of all crosses under both environments. Based on performance of progeny lines with respect to grain yield in comparison with check varieties, twelve superior lines from irrigated and six lines from rainfed environment were selected for further improvement with respect to disease resistance and quality parameters.

Studies on Phenotypic Variability for Floral Traits, Reproductive Success and Fitness Components in *Tamarindus indica* L.

RAJU CHAVAN

1998

MAJOR ADVISOR : Dr. R. LOKESHA

Phenotypic variability for floral traits, reproductive success and fitness components in *Tamarindus indica* was studied. The pulp has an export potential. But productivity is low and it is entirely due to low fruit set and is due to self-incompatibility and protogynous nature ignoring plant pollinator interaction. It is adopted strictly for entomophily with no chance of natural selfing.

Blooming was seen between the last week of March and mid June. Fruits began to ripe from the fortnight of February. Anthesis was between 8.15 to 11.00 am. Pistil is oblique and bent (to right or left) towards one of the wing petals and encourage pistils to gather pollen when a bee lands on wing petal. The bending of pistil is at random across trees. In Tamarind pollination is possible only by bees (*Apis dorsata*, *A. cerana*, *Megachile* sp and carpenter bees). Bees land on the wing petals and landing was also at random. These two levels of randomization (pistil bending

and bee landing) limits male success to 50 per cent. A wide variation was observed for floral traits. Test weight and pulp to seed ratio recorded a wide variation among fitness components. CV for fruit width and tartaric acid after fruit ripening was narrow. Floral dry weight was correlated strongly with fruit set Number of floral buds/ inflorescence had maximum direct positive effect while inflorescence length had direct negative effect on fruit set.

Degree of self-incompatibility varied between trees. T-1 and T-2 trees were high and regular fruit yielders. Although T-35 tree was self compatible (>80 per cent success following selfing) could not retain pods owing to high predation. T-32 tree was moderately self-compatible and bears curved pods with better fruit quality, however was not a regular bearer. T-1, T-2, T-32 and T-50 trees can be exploited further.

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Evaluation of Variability for Combining Ability in F_4 Lines of Cotton (*Gossypium hirsutum* L.)

SHIVAPUTRA TANGA

1998

MAJOR ADVISOR : Dr. S.S.PATIL

The study was aimed at evaluating variability for combining ability in F_4 lines and identifying lines (with high breeding value or combining ability) and their F_1 combinations with high potentiality. Twenty random F_4 lines of a cross (RAH 110 X 108) were utilised for evaluating combining ability with the help of hirsutum (RAH 13 and RAH 11) and barbadense (RAB 15) tester. Of these, Thirteen F_4 lines were commonly crossed to three testers and hence, they and the straight crosses (parental lines X testers) were included to form a Line x Tester (15 x 3) analysis.

In this derived F_4 s revealed substantially higher variability for *per se* performance and higher degree of positive heterosis for seed cotton yield. The *gca* effect of many F_4 lines was higher than the effects of their parental

lines involved in generating these F_4 lines. The contribution of each line to *sca* effect or non-additivity was inferred about by considering the three *sca* effects (ignoring sign) and the lines F_4 -51, 48 and 47 had revealed higher magnitude of *sca* effect.

Information obtained on crosses of 20 random F_4 lines with a tester was used to distinguish testers for their efficiency in evaluating combining ability. The overall mean of 20 derived F_4 s and the variance was worked out for each tester. On the basis of high mean and high variance among derived F_4 s, the tester RAH 11 was found to be more efficient in distinguishing F_4 lines for combining ability with respect to yield traits, while for mean halo length RAB 15 was more efficient.

AGRICULTURAL ENGINEERING

Techno-Economic Feasibility of Drip Irrigation for Kagzi Lime for Raichur Region

SUBHAS BALAGANVI

1998

MAJOR ADVISOR : S. S. KUMATHE

An investigation to study the techno-economic feasibility of drip irrigation for kagzi lime crop for Raichur region was carried out in the Regional Research station farm under the Department of irrigation and drainage Engineering, College of Agricultural Engineering Raichur during January to June 1997. The experiment consisted of three levels of drip irrigation namely water applied daily at 60% of ET, 80% of ET, 100% of ET to the crop and three levels of fertilizer application namely 50%, 75% and 100% of recommended dose of fertiliser. The drip irrigation treatments were compared with check basin (control) method of irrigation. There were three replications and the experiment was laid out under split plot design, with irrigation levels as main treatments and fertilizer levels as sub treatments.

The maximum water saving of 64.40% was

observed in drip irrigation applied at 60% of ET, over check basin irrigation. Under drip irrigation the soil moisture in the effective root zone ranged from 72% to 100% which is adequate for crop growth. All the drip irrigation treatments were significantly superior over check basin irrigation method in respect of growth and yield parameters, but were on par with each other. However the highest TSS was observed in check basin treatments. The highest water use efficiency of 6.561kg fruit/m³ of water was observed in treatments drip irrigated at 60% of ET. It was estimated that if land availability was not constraint and the water used for check basin irrigation of one hectare was used for drip irrigation at 60% of ET and 100% of RDF, an income of Rs. 49457 can be obtained by irrigating 1.644 hectare of kagzi lime crop, as against 1.0 hectare of the same crop under check basin irrigation which yields an income of Rs. 20626.

HORTICULTURE

Effect of Nitrogen and Phosphorus on Growth, Yield and Quality of Green Chilli (*Capsicum annuum* L.) cv. Pusa Jwala

H. Y. SINGEGO

1997

MAJOR ADVISOR : Dr. H.B. PATIL

A field experiment was conducted on medium black soil in a farmer's field near College of Agriculture, Bijapur during Kharif season of 1997. The main objective was to study the effect of nitrogen and phosphorus on

growth, yield and quality of green chilli (*Capsicum annuum* L.) cv. Pusa Jwala. The experiment was laidout in factorial randomised block design with 16 treatments and three replications. Four levels of 0, 50, 100 and 150 kg of nitrogen

and four levels of 0, 25, 50 and 75 kg of phosphorus were supplied at a different combinations.

Among the nitrogen levels studied 150 kg per hectare was significantly better with respect to growth parameters like plant spread, number of primary and secondary branches per plant and root length along with fresh weight, dry matter accumulation and nutrient uptake as well as yield attributing characters like number of fruits per plant and average fruit weight which is determined by fruit per hectare. Besides there was improvement in quality parameters like ascorbic acid and fruit length to stalk length ratio. Similar was the response of most of the characters

to higher phosphorus application (75 kg/ha) resulting in higher yield while, the combination of these nutrients failed to register significant gain in respect to most of the characters studied as well as fruit yield per hectare.

Of the levels of nutrients studied in this present investigation, the nitrogen and phosphorus at the rate of 150 kg and 75 kg per ha recorded higher fruit yield of 120.56 q per hectare and net returns of Rs. 28122.70 per hectare compared to other doses. Though net returns realised with 150 kg N and 75 kg P was higher, the cost benefit ratio was marginally lower.

Investigation on Propagation of some Important Ornamental Shrubs Under Mist

PRABHULINGG.

1998

MAJOR ADVISOR : P.B. PATIL

A pot experiment on the propagation of important ornamental shrubs by cutting under mist was conducted at the 'Kumbapur Farm' of University of Agricultural Sciences, Dharwad during the year 1996-97.

Four shrubs consisting of *Artabotrys odoratissima*, *Euphorbia leucocephala*, *Ixora singaporensis* and *Nerium oleander* were selected to know the effect of growth regulators on rooting of different types of cuttings, to find out suitable concentration of growth regulators required for better rooting and also to know the biochemical causes for poor rooting of cuttings of difficult-to-root shrubs. Eleven treatments consisting of IBA and NAA at concentrations of 2000, 3000 and 4000 ppm either alone or in combination along with untreated control and soaking of cuttings in water for 24 hours, were randomized in Factorial Completely Randomized Block Design with three replications.

In general growth regulators either alone or in

combinations increased the rooting percentage and improved root characters in cuttings. However, treatments IBA 3000 ppm in terminal cuttings of *Euphorbia leucocephala*, IBA 2000 ppm in soft-wood and IBA + NAA 3000 ppm in hard-wood cuttings of *Ixora singaporensis* and IBA + NAA 2000 ppm in soft-wood and IBA 3000 ppm in hard-wood cutting of *Nerium oleander* were found to be best recording maximum rooting percentage. The cuttings of *Artabotrys odoratissima* failed to initiate roots with any treatments.

The application of IBA, NAA and their combinations ranging from 2000-4000 ppm led to maximum utilization of sugars, starch and phenols in different cuttings of selected shrubs. The mobilization and utilization of reserve food material was more under the treatments which recorded maximum rooting percentage and good number of roots.

AGRICULTURAL MARKETING

Management of Credit Distribution to Agriculture Sector By KCC Bank

KASHINATH N. PALLERI

1998

MAJOR ADVISOR : Dr. H.S. VIJAYAKUMAR

Institutional credit being a powerful means to improve agriculture, in modern agriculture, credit is a crucial input. Among the various financial institutions the co-operatives have emerged as a major source for agricultural credit. In Karnataka most of the DCCBs are operationally sick and suffering from inefficient and ineffective credit management. The management of credit distribution to Agriculture sector by KCC bank has been studied as it is one of the largest lending institutions in Dharwad district. The study is based on the secondary data for 10 years (1986-87 to 1996-97). Tabular analysis and compound growth rate were used for analyses of the data.

The deposit mobilization of KCC bank indicated a three fold increase and the rate of growth in total deposits indicated an increase by 13.88 per cent the total cost incurred in mobilizing deposits was Rs. 11.03 per Rs.100 which included both non-interest cost (Rs. 0.48) and interest cost (Rs. 10.55). There was substantial increase in the total funds for lending. The study showed that proportion of agricultural advances in the total bank lending had increased during study period. The total number of beneficiaries also showed increasing trend. The non-interest cost incurred in lending Rs. 100 by the bank was Rs. 1.07. The percentage of overdues of loans was more

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than 50 per cent in 7 years out of 10 years and the growth rate of recovery was 23.68 per cent. The cost of recovery of loans was Rs. 0.68 on recovery of every Rs. 100 it has lent. On an average, the bank spends Rs. 10.43 on every Rs. 100 lent and the average interest earned from lending

was Rs. 12.46. Thus there was a profit margin of Rs. 2.02 per Rs. 100 lent. The bank incurred a loss of 0.53 per cent for Rs. 100 lent in the category of loans of less than Rs. 25000. The poor recovery performance and lending in the category below Rs. 25000 of the bank need to be revitalized.

VETERINARY GYNECOLOGY AND OBSTETRICS

Study on the Efficacy of Buserelin Acetate (GNRH - Analogue) to Induce Oestrus in Post-Partum Anoestrus Murrah Buffaloes

M. SURESH

1997

MAJOR ADVISOR : Dr. V. K. SUNDARAVADANAN

Fifty percent of buffaloes treated with 5 ml Receptal (Hoechst India Ltd.), exhibited oestrus in 8.5 ± 2.33 days with a conception rate of 60% in Group-I (n=10). In Group-III (n=9) 22.20% of buffaloes treated with 2.5 ml of Receptal exhibited oestrus in 5 days with '0' percent of conception rate. None of the placebo controls (Group-II and IV, n=6 each) exhibited oestrus during the period of observation. Pre-injection (0 day) values of serum protein, cholesterol, calcium, inorganic phosphorus levels and calcium-phosphorus ratio and that of 6th, 12th and 18th day post treatment were compared between groups and within the group.

The serum cholesterol and inorganic phosphorus were significantly ($p < 0.05$) higher in Group-I than Group-II, whereas, it was lower in Group-III than Group-IV throughout the period of observation. Serum protein did not differ significantly between Group-I and II but was significantly ($p < 0.05$) lower in Group-III than Group-IV. Serum calcium and calcium-phosphorus ratio were significantly ($p < 0.05$) lower at pre-injection (0 day) than 18th day post-injection in Group-I and II whereas, these values did not differ significantly during these periods in Group-III and IV.

Estrus Synchronisation and Fertility in Deoni Cows Using Different Prostaglandin F₂ Alpha Preparations

S.C. CHOUDRI

1998

MAJOR ADVISOR : Dr. SURESH S. HONNAPPAGOL

Thirty regularly cycling Deoni cows were randomly allocated to five groups of six each. The Group I, II, III and IV constituted the treatment groups which received prostaglandin F₂ alpha preparations viz., Carboprost tromethamine, Dinoprost, *luprostiol* and *Cioprosteno*, I respectively at the recommended dose level by the manufacturer for estrus synchronisation. The injection was given deep intra muscularly on 11 th day of their natural estrous cycle. The animals of Group V were kept as untreated control. There was 100% of estrus synchrony in all the four treated groups with the estrus occurring at an interval of 27 to 144 hours.

Among the physical character of cervico-vaginal mucus, alkaline pH, high spinnbarkeit readings and typical arborization patterns favoured better fertility, although the difference between the groups was not significant. The animals that subsequently conceived irrespective of the groups had significantly higher spinnbarkeit value (14.85 ± 0.76 cms.) as against non conceived animals ($10.52 \pm$

0.37 cms.).

Among the two blood biochemical parameters, the plasma ascorbic acid was low on the day of natural and synchronised estrus while the levels were elevated on day 11 of the cycle (Luteal phase). There was hypercholesterolemia on day of natural and synchronised estrus with resultant fall on day 11 of the cycle (Luteal phase). The animals that conceived registered significantly higher plasma ascorbic acid level (1.27 ± 0.15 mg%) as against non conceived (0.587 ± 0.01 mg%) on day 11 of estrous cycle.

Among the four prostaglandin F₂ alpha preparations employed for estrus synchronisation group 1 where Carboprost tromethamine was injected revealed conception rate of 50.00% as against 33.33% noticed in other three prostaglandin F₂ alpha treated groups. The conception rates in the untreated control group was 16.66%.

Comparative Efficacy of some Antimicrobial Drugs In Relation to Fertility in Repeat Breeder Cross Bred Deoni Cows

SUBHASCHANDRA B. PADAGANNAVAR

1998

MAJOR ADVISOR: Dr. SURESH S. HONNAPPAGOL

The cervico vaginal mucus samples were collected from 50 repeat breeder cross bred Deoni cows on the day of estrus. The mucus samples were subjected for isolation, identification and characterisation of organisms along with *invitro* antibiogram sensitivity tests.

Out of the 50 mucus samples screened, 44(88%) samples were found to be positive for bacterial growth and out of these, 34(77.27%) had single and 10(22.73%) had mixed bacterial growth. The various types of organisms isolated were *Escherichia coli*-10(29.42%), *Pseudomonas* species-4(11.76%), *Streptococcus* species-4(11.76%), and *Staphylococcus* species-2(5.88%). It was clear from the above findings that *Escherichia coli* and

Pseudomonas species were highest (29.42%) where *Saphylococcus* species were lowest (5.88%).

The *invitro* antibiogram sensitivity pattern of the isolates was Chlorophenicol (95.00%) followed by Ofloxacin (90.00%), Gentamicin (85.00%), Pefloxacin (80.00%), Nitrofurantion (15.00%) and Ampicillin (0.00%). Based on the *invitro* antibiogram results the respective antimicrobial drugs were infused intrauterine following the breeding of experimental animals. The success of intra-uterine therapy in repeat breeder cows was 80% with Chloromphenicol, Ofloxacin and Pefloxacin, while it was only 57.06% with Gentamicin. The over all conception rate in treated group of cows was 72.72%.

Efficacy of Lime Water and Ostocalcium Treatment in Advanced Pregnant Murrah Buffaloes with Regard to Placental Expulsion or Retention

YADAHALLI S.H.

1997

MAJOR ADVISOR: Dr. V. K. SUNDARAVADANAN

Eighteen advanced pregnant and hypocalcaemic Murrah buffaloes were selected and allocated into 3 groups of 6 buffaloes each. Group-I consisted of untreated control, Group-II consisted of lime water treated and Group-III consisted of Ostocalcium treated buffaloes. First blood sample was collected 1 week after treatment in groups II and III only and third sample was collected within 18 hours after parturition in all the three groups. Blood biochemical parameters like serum calcium, serum inorganic phosphorus, blood glucose, total serum proteins and serum

lactate dehydrogenase were estimated and compared between the groups and within the groups. In group II 83.33% of buffaloes expected their placenta within 4 hours as against 50% and 16.66% in group III and I respectively. None of the buffaloes in the two treated groups retained placenta > 8 hours as against 83.33% in the control group. Lime water supplementation in hypocalcaemic Murrah buffaloes in late gestation was more efficient than Ostocalcium supplementation.

Oestrous Synchronization in Sheep using GnRH - PGF_{2a} - GnRH

SHIVAKUMAR

1998

MAJOR ADVISOR: Dr. V.K.SUNDARAVADANAN

In group I (n=15), the Sheep were given 0.004mg. of Buserelin Acetate (Receptal) on day '0' followed by 100 µg of Cloprostenal on 7th day and a second injection of 0.004 mg. of Buserelin Acetate on exhibition of oestrus and 3 hrs. before breeding. In group II (n=15), two injections of 100 µg Cloprostenal was given 11 days apart.

The percentage of ewes exhibiting oestrus within 48 hrs. was significantly ($P < 0.05$) higher in group I and percentage of ewes exhibiting oestrus after 48 hrs. was higher in group II. Lowered plasma

progesterone level was significant ($P < 0.05$) in group I on the day of oestrus, although there was no significant difference in the oestradiol - 17 b concentration between the two groups.

Conception rate as determined by post-breeding plasma progesterone level and non-return rate was 66% in group I and 53% in group II. Thus the new regimen of GnRH - PGF_{2a} - GnRH was found more effective than the traditional two PGF_{2a} injections given 11 days apart.

VETERINARY MICROBIOLOGY

Detection of Immunoglobulins in Vaccinated Chicken with Particular Reference to IgA in Mucous Secretions

RAMESHV. JAGAPUR

1997

MAJOR ADVISOR : Dr. Y. HARI BABU

The study was aimed to detect the immunoglobulin A (IgA) and haemagglutination inhibition (HI) antibody levels in mucous secretions and serum of chickens vaccinated with two lentogenic strains of NDV i.e. Lasota and F; through different routes viz., Oral, nasal, ocular and nasal-cum-ocular.

The single radial immunodiffusion (SRID) test was used to assess the IgA levels in serum, lacrimal secretion, tracheal and intestinal washings, such samples were collected at intervals after vaccination.

The study has revealed that the local immunity especially IgA is an important immunoglobulin found in the mucous secretions and plays a role in the protection of birds from mucosal infection. The IgA levels in mucous secretions were increased following primary vaccination

and thus the evidence for vaccine induced mucosal immunity was sought.

Among the different routes of vaccination, the nasal cum ocular was found to be a better route on both Lasota and F vaccination for induction both IgA and HI antibody levels. Between the lentogenic vaccines used, Lasota was found to be a better lentogenic vaccine for induction of IgA and HI antibody levels compared to F vaccine.

The IgA levels as well as HI titres were predominantly at high levels between 13 to 29 days post vaccination. The lacrimal secretions showed high levels of IgA when compared to other secretions and serum. In contrast the HI titres were found high in serum followed by lacrimal secretion and least, undetectable levels were found in tracheal and intestinal washings.