

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

**DOCTOR OF PHILOSOPHY**

**AGRONOMY**

**Integrated Nutrient Management for Chilli (*Capsicum annuum* L.) in  
Alfisols of Northern Transitional Zone of Karnataka**

G. B. SHASHIDHARA

2000

MAJOR ADVISOR : Dr. V. B. NADAGOUDA

Field experiments were conducted at Agricultural Research Station, Hanumanamatti, University of Agricultural Sciences, Dharwad during 1996 and 1997 in a fixed site to study the effect of integrated nutrient management on growth, yield and quality of chilli under rainfed condition. The treatments comprised of organics (FYM, Vermicompost, Biogas spent slurry, redgram stalk, *in situ* green manure), inorganics (N, P, O and K, O) and biofertilizers (VAM, P-solubilizers and Free nitrogen fixers).

Application of organics viz., FYM (794.08 kg ha<sup>-1</sup>), redgram stalk (781.60 kg ha<sup>-1</sup>) and BSS (738.61 kg ha<sup>-1</sup>), along with 100 per cent RDF increased the fruit yield by 26.14, 24.12 and 17.31 per cent with an additional income of Rs 5110, 4350, and 1670 ha<sup>-1</sup> respectively over 100 per cent RDF alone. The growth and yield components, N, P, K, Fe, Cu, Mn and Zn uptake both at flowering and harvest increased significantly with application of organics (FYM/redgram stalk/BSS) and inorganics (100% RDF > 50% RDF). The microbial population (Mycorrhizal spore count, rhizosphere population of P solubilizer, FNF, TBC, TFC) increased by two to three folds due to application of organics. The incidence of *Murda* and

leaf curl index (LCI), the per cent and weight of discoloured fruits reduced significantly due to application of organics. The quality parameters viz., ascorbic acid, capsaicin and per cent oleoresin content increased with application of organics and inorganics.

Inoculation of VAM + P solubilizer along with 50 per cent MRP + 50% SSP (883.02 kg ha<sup>-1</sup>) increased fruit yield by 21.63 per cent, with a net returns of Rs. 20,990 ha<sup>-1</sup> as compared to 100% SSP alone (725.97 kg ha<sup>-1</sup> with net returns Rs. 14,960 ha<sup>-1</sup>). The growth and yield components, uptake of N, P, K, Fe, Cu, Mn, Zn both at flowering and at harvest, the microbial parameters like mycorrhizal spore count, PRC, rhizosphere population, P solubilizers FNF, TBC, TFC increased significantly with dual inoculation of VAM + P solubilizer with 50% MRP + 50% SSP. The per cent and weight of discoloured fruits, incidence of *Murda* and LCI were minimum. The quality parameters like, ascorbic acid, capsaicin and oleoresin yield (91.64 to 131.00 kg ha<sup>-1</sup>) increased with application of VAM + P solubilizer in combination with 50% MRP + 50% SSP.

**Investigations on Agri-Silvi and Silvi-Pastoral Systems in Vertisols of Northern Dry Zone of Karnataka**

S. B. KALAGHATAGI

2000

MAJOR ADVISOR : Dr. B. S. NADAGAUDAR

Field experiments were carried out at Regional Research Station, Bijapur during 1997-99 to study the effects of NFTs on growth and yield of arable crops and evaluation of silvi-pastoral systems on vertisols. A trial consisted of two NFTs (nine year old) planted at 7.2 and 12.6m row spacing, four test crops (Bengalgram, Sorghum, Safflower and Sunflower) and three distances viz., 1, 2 and 3m away from NFTs. In another experiment, four pastures were evaluated in silvi-pastoral

system consisting of 12 trees of seven year old planted at 2x2m spacing under dryland conditions.

The results revealed that, growth and yield components of test crops were significantly higher with *Faidherbia albida* than *Hardwickia binata*. Grain yield of bengalgram, sorghum, safflower and sunflower was higher with *F. albida* by 18, 35, 19 and 56 per cent, respectively as

compared to *H. binata*. Growing of test crops with *H. binata* at wider row spacing (12.6m) and with *F. albida* at closer row spacing (7.2 m) was found superior. Soil fertility and soil moisture status was higher in closer row spacing (7.2 m) of *F. albida*.

The BC ratio (2.25) and internal rate of returns were higher (30%) with *H. binata* at 7.2m than 12.6m row spacing. The NFTs + sunflower system recorded higher net present value. The tree height was significantly higher (7.63 m) with

*H. binata* and DBH did not differ significantly between two NFTS.

In silvi-pastoral systems, among the twelve trees, *L. leucocephala* recorded significantly higher tree height (8.64 m) followed by *Eucalyptus* (7.98 m). Tree DBH was highest in *A. lebbeck* (25.73 cm). Among the four pastures, *C. ciliaris* produced significantly higher total biomass yield (213.81 q ha<sup>-1</sup>) and was followed by *S. hamata* (154.67 q ha<sup>-1</sup>). Silvi-pastoral system involving *H. binata* + *C. ciliaris* produced higher total biomass yield (287.50 q ha<sup>-1</sup>). Whereas, the IRR, NPV and BCR were higher from *Eucalyptus* + pasture system.

## SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

### Studies on Ternary Exchange (Na-Ca-Mg) and Magnesium Hazards in Vertisols of TBP and UKP Commands

S.M. PRASANNA

2000

MAJOR ADVISOR : Dr.S.G. PATIL

Studies on ternary exchange (Na-Ca-Mg) was carried out in soils of Tungabhadra Project (TBP) and Upper Krishna Project (UKP), Karnataka state. Two soils each representing granite-gneiss, limestone and basalt were equilibrated with waters of varying SAR and Ca/Mg ratio. An increase in SAR increased sodication in all the soils but limestone derived soils appeared more susceptible (12.7%) than others (10.6%) as evidenced by higher selectivity of Na against Ca and Mg. An increase in Mg concentration interestingly also favoured Na exchange at the expense of Mg itself indicating Mg is less competitive against Na unlike Ca owing to precipitation of Mg in these soils. Limestone derived soils attained 8.0 ESP at much lower SAR (20 m mol l<sup>-1/2</sup>) than granite-gneiss (40 m mol l<sup>-1/2</sup>) and basalt (40 m mol l<sup>-1/2</sup>). However, granite-gneiss derived soils remained safer to sodic water provided Mg is lower.

SAR increased dispersion (51.0%), decreased diffusivity (55.0%) and capillarity (26.0%) in limestone derived soils, while Mg effect was more pronounced in granite-gneiss derived soils altering dispersion (72.0%) with more specific effect (11.6%). However, basalt derived soils were relatively unaffected with changes in SAR and Ca/Mg ratio.

In the simulation study Ca charged waters (Ca : Mg :: 4:1) of SAR 10 m mol l<sup>-1/2</sup> were safer for irrigation up to 20 years, while Mg charged waters (Ca : Mg :: 1:4) had limited utility since Mg appeared detrimental for soils. Further, waters of higher SAR (>10 m mol l<sup>-1/2</sup>) and Ca/Mg ratio (> 1:4) favoured increased sodication and use of such water became limiting.

## AGRICULTURAL ENTOMOLOGY

### Studies on the Management of serpentine Leaf Miner, *Liriomyza trifolii* (Burgess) (Diptera : Agromyzidae) on Cotton

SUSHILA NADGOUDA

2000

MAJOR ADVISOR : Dr.B.V. PATIL

Studies undertaken on the management of serpentine leaf miner *Liriomyza trifolii* on cotton during 1997-98 and 1998-99 season revealed that cotton plants infested from sowing time and plants exposed for infestation from 10 and

20 DAS recorded significantly higher percentage of infestation which resulted in vegetative and reproductive growth loss. Early stage (upto 20 days) infestation of SLM resulted in a loss of 45.75 per cent. Studies on host plant resistance revealed that

## Abstract of Theses

*G. arboreum* and *G. herbaceum* genotypes recorded significantly lower incidence and maggot population of SLM compared to *G. hirsutum*, *G. Barbadence* and hybrids. Less preference of some genotypes was because of presence of small thin lobed leaves, higher number of trichomes, less amount of proteins and reducing sugars. Sensitivity studies indicated that among the four locations the maggots collected from kasbe camp (high pesticide imposed area) were less sensitive to all the insecticides. Imidacloprid was superior over all the insecticides in inducing the mortality of maggots. The  $LC_{50}$  value was highest in maggots collected from kasbe camp for all the insecticides which varied from 0.2356 to 0.5463 g per litre in cotton being highest to endosulfan and lowest to cypermethrin. Highest resistance ratio of 25.72 and 18.17 folds was recorded in Kasbe camp and RRS cultures respectively

to cypermethrin. The  $LC_{50}$  of adult *L. trifolii* collected from Kasbe camp varied from 0.39456 to 2.10670 mPer ml.

All the treatments with castor trap crop recorded significantly lower incidence of SLM and among them castor sown inbetween two cotton plants recorded significantly lowest incidence and highest seed cotton yield. Seed treatment with imidacloprid 70 WS at 15g/kg of seeds resulted in significant reduction in incidence and maggot population upto 17 DAS. Incidence of SLM was significantly lower in biointensive IPM module (M-1) and after 10 DAS it performed on par with adoptable IPM module (M-2) & it was highest in RPP module (M-3). All the three modules did not exhibit any significant difference in recording the seed cotton yield. Analysis of cost effectiveness of modules revealed higher benefits from adoptable IPM module followed by biointensive IPM module and it was least in recommended package of practices.

### Insecticide Resistance in Diamondback moth, *Plutella xylostella* (Linnaeus) and its Management

A.S. VASTRAD

2000

MAJOR ADVISOR : Dr.S. LINGAPPA

Diamondback moth larvae were least sensitive to monocrotophos, endosulfan and deltamethrin, followed by dichlorvos, malathion, cypermethrin, and methomyl. Organophosphates were the most commonly used insecticides followed by synthetic pyrethroids. Sole sprays constituted 84.23 per cent, while tank mixes accounted for 15.77% of the total sprays used on crucifers. Cartap hydrochloride and acephate were the most commonly used constituents for tank mixing. The Number of sprays ranged from 3-10 with an average of six sprays crop<sup>-1</sup>.

A sample of 50 larvae was sufficient for monitoring resistance. Leaf dip method was most suitable for monitoring resistance. Resistance to different insecticides was in the following order: fenvalerate > monocrotophos > methomyl > endosulfan > cartap hydrochloride > *Bacillus thuringiensis*. Resistance Level was high during winter and rainy seasons than during summer. Resistance to endosulfan, monocrotophos, methomyl and fenvalerate was stable.

Sesamum and honge oil (0.2%) synergised fenvalerate greatly than linseed, cottonseed, pundi or safflower oils. Two *B. thuringiensis* var. *kurstaki* formulations caused maximum larval mortality at all the dosages and intervals. Mortality caused by neem seed kernel extract, neem oil and *B. bassiana* ranged from 50 to 69 per cent. All the novel insecticides (fipronil, spinosad, carbosulfan, MPO 62, diafenthiuron, cartap hydrochloride, novaluron, polytrin C 44, thiodicarb, methofenozide, lufenuron and acetamiprid) evaluated under laboratory conditions at the recommended dosages gave 70.37 to 99.99 per cent mortality of DBM larvae. Profenophos, combinations of fenvalerate with honge and sesamum oil, lufenuron, thiodicarb and methomyl exhibited considerable ovicidal activity.

During two field trials, thiodicarb and lufenuron emerged as the most promising insecticides for managing resistant field populations of DBM. These two insecticides also performed exceedingly well in a large-scale field trial compared to farmer's method of control.

AGRICULTURAL MICROBIOLOGY

**Selection of Rhizobacteria Antagonistic to *Ralstonia Solanacearum* E.F. Smith  
Causing Bacterial wilt in Tomato and Their Biocontrol Mechanisms**

K.S. JAGADEESH

2000

MAJOR ADVISOR : Dr. J. H. KULKARNI

As many as 431 native rhizobacterial isolates of tomato were screened *in vitro* on KB medium for the inhibition of *Ralstonia solanacearum* causing bacterial wilt disease. Of them, 38 strains were found to be potent antagonists with the zone of inhibition of the pathogen varying from 8-20 mm dia., and 23 of them were fluorescent pseudomonads. When assessed for mechanism of biocontrol, all the potent antagonists produced at least one antibacterial metabolite: antibiotics, siderophores, or HCN. Twenty five strains were found to be antibiotic producers, 23 (only fluorescent pseudomonads) were siderophore producers, 12 were HCN producers, 13 were both antibiotic and siderophore producers, nine were both antibiotic and HCN producers, 12 were both siderophore and HCN producers and nine strains produced all the three metabolites. In the green house experiment, Sid and Sid<sup>d</sup> mutants obtained by the Tn5 mutagenesis of fluorescent *Pseudomonas* strains RBL 101 and RSI 125,

failed to control the disease as much as their wild type did, thus confirming fluorescent siderophore production as the mechanism of biocontrol in these strains. The green house experiments revealed that 27 antagonistic strains were found to be plant growth promoting (PGPR). The PGPR strains produced copious amounts of plant growth promoting substances viz., IAA and GA. Thirteen  $\gamma$ -p-1 rhizobacterial strains were found to be deleterious (DRB), producing unidentified gaseous metabolites. The unusual poor growth and biomass of tomato in the UIC plants was due to the predominance of two deleterious rhizosphere bacteria (DHB). However, the PGPR strain fluorescent *Pseudomonas* RDV 108 inhibited DHB and nullified its inhibitory effect. The fluorescent *Pseudomonas* strain RDV 107 was found to be the best biocontrol agent, with a per cent disease control of 77.30 besides exhibiting good root colonization ability, plant growth promotion and siderophore and antibiotic production.

SEED SCIENCE AND TECHNOLOGY

**Seed Technological Investigations in dicoccum Wheat (*Triticum dicoccum* (Schrank.) Suhulb.) Varieties**

D.S. UPPAR

2000

MAJOR ADVISOR : Dr.M.B. KURDIKERI

Field experiments were conducted at the Main Research Station, Dharwad during rabi seasons of 1997-98 and 1998-99 to determine the physiological maturity in dicoccum wheat varieties by adopting randomised block design with five replications. The laboratory experiments were conducted on various aspects viz., standardisation of requirement of temperature and substrates, storability studies with the use of halogens, dehushing methods on seed quality parameters, estimation of total phenols in the husk of dicoccum wheat varieties. Observations were recorded on germination, speed of germination, root length, shoot length, seedling length, vigour index, electrical conductivity of seed leachates and field emergence.

The physiological maturity indices viz., dry weight, germination per cent, seedling length and vigour index were maximum at 35 days after anthesis (DAA) in DDK-1001 and DDK-1009, 40 DAA in DDK-1013 and 45 DAA in NP-200 and

decreased thereafter. The moisture content of seeds decreased from 5 to 50 DAA. The husked seeds tested in between paper at 20°C recorded significantly higher values for all the seed quality parameters, except the speed of germination. During storage, the effect of halogen treatments was found more pronounced from 2<sup>nd</sup> month onwards and recorded significantly higher seed quality attributes with lower EC values. The husked seeds treated with iodine and stored in polythene bag registered higher values for germination (> 85%) during 12 months of storage.

Dehushing by hand recorded significantly higher values for seed quality parameters. The total phenol content in the husk was significantly higher in DDK-1001 followed by NP-200, DDK-1009 and DDK-1013. Increasing the husk extracts from 2-8 per cent decreased all the seed quality parameters and the inhibition of germination was highest in DDK-1001, while it was lowest in DDK-1013.

## MASTER OF SCIENCE

### AGRONOMY

#### Effect of Nitrogen and Phosphorus Levels and Ratios on Growth and Yield of Sunflower Hybrid (DSH-1)

N. THAVAPRAKASH

2000 MAJOR ADVISOR : Dr. LOKANATH H. MALLIGAWAD

A field experiment was conducted on black clayey soil during kharif 1999 to study the "Effect of nitrogen and phosphorus levels and ratios on growth and yield of sunflower hybrid (DSH-1)" at Main Research Station, University of Agricultural Sciences (UAS), Dharwad. The experiment was laid out in Randomized Complete Block Design with four replications. The experiment consisted of nine treatments i.e., N/P ratio ( $P_2O_5$  referred as P) with two treatments are having N/P ratio of  $<1.0$ , two treatments with N/P ratio of 1.0 and four treatments with N/P ratio of  $>1.0$  including control (no nitrogen and phosphorus) as keeping potassium level ( $60 \text{ kg } K_2O \text{ ha}^{-1}$ ) as constant.

The results showed that the treatments receiving N/P ratio of 1.0 and  $>1.0$  produced higher seed yields (3009 to

$3554 \text{ kg ha}^{-1}$  and 2875 to  $3397 \text{ kg ha}^{-1}$  respectively) as compared to N/P ratio of  $<1.0$  and control ( $2761$  to  $2800 \text{ kg ha}^{-1}$  and  $1949 \text{ kg ha}^{-1}$ , respectively). Further, nitrogen and phosphorus applied in N/P ratio of 1.0 with  $2.00:2.00:1.00$  ( $120 \text{ kg N}$ ,  $120 \text{ kg } P_2O_5$  and  $60 \text{ kg } K_2O \text{ ha}^{-1}$ ) fertilizer level and N/P ratio of  $>1.0$  with  $2.00:1.25:1.00$  ( $120 \text{ kg } 75 \text{ key } P_2O_5$  and  $60 \text{ kg } K_2O \text{ ha}^{-1}$ ) fertilizer level produced 27 and 21 per cent higher seed yield over UAS, Dharwad fertilizer recommendation i.e., N/P ( $60 \text{ kg N}$ ,  $75 \text{ kg } P_2O_5$  and  $60 \text{ kg } K_2O \text{ ha}^{-1}$ ) fertilizer level ( $2800 \text{ kg ha}^{-1}$ ).

Economic analyses based on benefit : cost (B:C) ratio revealed that the treatment receiving N/P ratio of  $>1.0$  with  $2.00:1.25:1.00$  ( $120 \text{ kg N}$ ,  $75 \text{ kg } P_2O_5$  and  $60 \text{ kg } K_2O \text{ ha}^{-1}$ ) fertilizer level was the most economical with B:C ratio of 3.19.

#### Effect of Crop Geometry, Date of Planting and Levels of Nitrogen on Growth and Yield of Potato

BASAVARAJ S. YENAGI

2000

MAJOR ADVISOR : Dr. S.S.MELI

A field experiment was conducted at Main Research Station, U.A.S., Dharwad during kharif 1999 to study the effect of crop geometry (60 cm row spacing and 45 cm row spacing), date of planting (June 18<sup>th</sup>, June 25<sup>th</sup> and July 10<sup>th</sup>) and levels of nitrogen (0, 50, 100 and  $150 \text{ kg N/ha}$ ) on growth and yield of potato. The experiment was laid out in a split-split plot design with three replications.

Planting of potato with 45cm row spacing had recorded significantly higher yield of  $12.21 \text{ t/ha}$  over 60 cm row spacing. The higher yield with 45 cm row spacing was due to more plants per unit area.

The data on yield and yield parameters indicated that

planting on June 18<sup>th</sup> was found most promising followed by other planting dates. The higher tuber yield with planting on June 18<sup>th</sup> was mainly attributed to yield parameters.

Application of  $150 \text{ kg N per ha}$  recorded significantly higher yield of  $15.68 \text{ t per ha}$  over 100, 50 and  $0 \text{ kg N per ha}$ . The higher yield was due to the higher number of tubers per plant and higher tuber weight per plant. The growth components were also increased with increase in fertilizer N levels.

The best treatment combination for obtaining maximum tuber yield was 45 cm row spacing X Early planting (June 18<sup>th</sup>) X  $150 \text{ kg N/ha}$ .

**Response of Sunflower (*Helianthus annuus* L.) to Organic Manures, Biofertilizers and Micronutrients under Irrigation**

SHYAMARAO S. KULKARNI

2000

MAJOR ADVISOR : Dr. RAMESH BABU

A field experiment was conducted during rabi season of 1999-2000 under irrigation at Agriculture College Farm, Raichur to study response of sunflower to organic manures, biofertilizers and micronutrients. There were 24 treatment combinations with three replications laid out in factorial randomized block design. A common dose of 60-75-60 kg of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per hectare respectively, was applied to all the treatment combinations.

Among the different organic manures, application of Poultry manure (5 t/ha) recorded significantly higher grain yield (1877 kg/ha) as compared to application of FYM (1659 kg/ha) and no organic manure (1413 kg/ha). The increase in grain yield by application of Poultry manure was mainly due to significant increase in plant height, number of leaves per plant, leaf area, LAI, dry matter production and its distribution and yield parameters like greater head diameter, number of filled grains, 1000 grain weight and increased uptake of N, P and

K. The higher oil yield and net returns were also recorded with the application of Poultry manure.

Seed treatment with *Azospirillum* did not significantly influence on growth, yield and yield parameters of sunflower.

Among the different micronutrients, Boron spray recorded significantly higher grain yield (1722 kg/ha) as compared to MgSO<sub>4</sub> spray (1655 kg/ha), FeSO<sub>4</sub> spray (1641 kg/ha) and no micronutrient spray (1580 kg/ha).

In treatment combinations, combined application of Poultry manure foliar spray of Boron and seed treatment with *Azospirillum* along with RDF recorded higher grain yield (1971 kg/ha) and higher net returns (Rs.13186) as compared to all other treatment combinations. Grain yield (1335 kg/ha) and net returns (Rs.8205) were significantly lower with the application of only RDF.

**Response of Pigeonpea (*Cajanus cajan* L. Millsp.) Genotypes to Different Dates of Sowing under Late Rabi/Summer Condition**

SURYAKANTH BIRADAR

2000

MAJOR ADVISOR : Dr. B.T.PUJARI

A field experiment was conducted at Agriculture College Farm, Raichur, to study the response of pigeonpea genotypes to different dates of sowing under late rabi/summer condition of 1999-2000. There were 18 treatments comprising combinations of three dates of sowing (25<sup>th</sup> November, 10 December and 25<sup>th</sup> December) and six genotypes (Bahar, BSMR-736, TS-3, S-1, Hy-3C and ICPL-87119). The experiment was laid out in a split plot design with three replications.

Different dates of pigeonpea sowing influenced the growth and yield of pigeonpea significantly. Pigeonpea sown on 25<sup>th</sup> November recorded significantly higher grain yield (12.12 t ha<sup>-1</sup>) than pigeonpea sown on 10<sup>th</sup> December (10.92 t ha<sup>-1</sup>) and 25<sup>th</sup> December (8.83 t ha<sup>-1</sup>). The higher grain yield of pigeonpea sown on 25<sup>th</sup> November was attributed to

significantly higher number of pods, grain weight plant ha<sup>-1</sup>, number of grains and 100-grain weight, than yield components recorded under late sown pigeonpea.

The variety ICPL-87119 recorded significantly higher grain yield (14.30 t ha<sup>-1</sup>) than other genotypes tested. The higher grain yield of ICPL-87119 was attributed to significantly higher yield components viz., number of grains and grain weight plant<sup>-1</sup> as compared to other genotypes.

The pigeonpea sown on 25<sup>th</sup> November recorded significantly higher net returns (Rs.15908 ha<sup>-1</sup>) and benefit cost ratio (2.434) compared to rest of the sowing dates. Genotypes ICPL-87119 recorded significantly higher net returns (Rs.19794 ha<sup>-1</sup>) and benefit cost ratio (2.998) than rest of the genotypes.

## Abstract of Theses

### Influence of Organics and Inorganics on Growth and Yield of Maize (*Zea mays* L.) under irrigation

NAGARAJ G. KATARAKI

2000

MAJOR ADVISOR : Dr. B.K. DESAI

A field experiment was conducted at Agriculture College Farm, Raichur, during kharif 1999 to study the influence of organics and inorganics on growth and yield of maize under irrigation. There were 15 treatment combinations comprising of five organics and three inorganics levels. The experiment was laid out in split plot design with three replications.

Application of different organic manures exerted significant influence on growth and yield of maize. Addition of poultry manure @ 5t ha<sup>-1</sup> recorded significantly higher grain yield (51.52 q ha<sup>-1</sup>) as compared to application of FYM @ 10t ha<sup>-1</sup> (45.73 q ha<sup>-1</sup>), green leaf manure @ 5t ha<sup>-1</sup> (44.82 q ha<sup>-1</sup>), cotton stalks @ 5t ha<sup>-1</sup> (41.01 q ha<sup>-1</sup>) and no organics treatment (40.47 q ha<sup>-1</sup>). The higher grain yield of maize due to poultry manure application was attributed to significantly higher growth and yield components.

The significant increase in grain yield of maize due to application of RDF (49.19 q ha<sup>-1</sup>) over 75 per cent (44.74 q ha<sup>-1</sup>) and 50 per cent RDF (40.20 q ha<sup>-1</sup>) was attributed to significant increase in growth and yield components.

Application of poultry manure recorded higher gross returns (Rs.25,692 ha<sup>-1</sup>) and net returns (Rs.17,055 ha<sup>-1</sup>) when compared to other organics. Application of organics and inorganics influenced the available N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O content of soil after the harvest of maize significantly.

Combined application of poultry manure @ 5t ha<sup>-1</sup> and RDF recorded maximum energy input (19109 MJ ha<sup>-1</sup>) and output (173057 MJ ha<sup>-1</sup>) whereas minimum energy input (5088 MJ ha<sup>-1</sup>) and output (127647 MJ ha<sup>-1</sup>) was observed in the treatment combination of no organics + 50 per cent RDF.

### Studies on Weed Management in Pigeonpea (*Cajanus cajan* (L) Millsp.)

MACHENDRANATH VADDI

2000

MAJOR ADVISOR : Dr. B.T. PUJARI

A field experiment was conducted at the Agricultural College Farm, Raichur during Kharif season of 1999-2000 to study the weed management practices in pigeonpea. There were 12 treatment combinations comprising of cultural and chemical methods of weed control. The experiment was laid out in randomized block design with three replications.

Weed control treatment differed significantly for weed population and dry weight of weeds. The treatments which received pendimethalin @ 1.0 kg ai ha<sup>-1</sup> as pre-emergence application supplemented with cultural practices recorded significantly lower weed population and weed dry weight.

At all the crop growth stages, the plant height, number of leaves, number of primary branches and secondary branches per plant were significantly higher in weed free check.

Weed free check recorded significantly highest grain yield (22.50 q ha<sup>-1</sup>), stalk yield (41.91 q ha<sup>-1</sup>) and husk yield

(11.86 q ha<sup>-1</sup>) than all other treatments. Pre-emergence application of pendimethalin @ 1.0 kg ai ha<sup>-1</sup> combined with two intercultural operations at 30 and 60 DAS resulted in a highest grain yield (19.25 q ha<sup>-1</sup>), stalk yield (38.20 q ha<sup>-1</sup>) and husk yield (9.52 q ha<sup>-1</sup>) only after weed free check. The significantly higher grain yield under weed free check was mainly attributed to the absence of weed competition for growth resources especially for moisture, nutrient and light.

The maximum net income was obtained with weed free check (Rs.23,842). The net gain per rupee spent on weed control was highest in pre-emergence application of pendimethalin @ 1.0 kg ha<sup>-1</sup> with one intercultural operation (9.45). Combination of pre-emergence application of pendimethalin @ 1.0 kg ai ha<sup>-1</sup> with two intercultural operations recorded significantly higher B:C ratio (1.95) compared to weed free check (1.53).

**Bio-Efficacy of Chlorimuron-Ethyl for Weed Control in Soybean (*Glycine max* (L.) Merrill)**

G.H. YOGESH

2000

MAJOR ADVISOR : Dr. M.N.SHEELAVANTAR

A field experiment was conducted at Main Research Station, University of Agricultural Sciences, Dharwad on *Vertisols* during kharif 1999 to study the bio-efficacy of chlorimuron-ethyl for weed control in soybean. The experiment was laid out in randomized complete block design with 16 treatments comprising chlorimuron @ 6, 9 and 12 g ai ha<sup>-1</sup> applied as pre-emergence (PE) and at 4, 8 and 12 DAS, alachlor @ 1250 g ai ha<sup>-1</sup>, one handweeding + two intercultivations and weed free and weedy checks. The treatments were replicated thrice.

Chlorimuron did not cause any phytotoxicity on soybean. Chlorimuron @ 12 g ai ha<sup>-1</sup> irrespective of time of application and chlorimuron @ 9 g ai ha<sup>-1</sup> applied as PE and at 4 DAS were found effective in reducing both population and dry weight of weeds. These treatments also recorded higher weed control efficiencies.

There was an improvement in growth and yield components of soybean with the application of chlorimuron.

Chlorimuron @ 9 and 12 g ai ha<sup>-1</sup> recorded significantly higher seed yield as compared to chlorimuron @ 6 g ai ha<sup>-1</sup>. Weedy check recorded significantly lower seed yield. Application of chlorimuron @ 9 and 12 g ai ha<sup>-1</sup> also recorded significantly higher nutrients uptake by crop compared to chlorimuron @ 6 g ai ha<sup>-1</sup> and vice-versa with uptake of nutrients by weeds.

Significantly higher net returns were realized with chlorimuron @ 9 and 12 g ai ha<sup>-1</sup> compared to chlorimuron @ 6 g ai ha<sup>-1</sup> irrespective of time of application and alachlor. While, higher increment benefit ratio was recorded with chlorimuron @ 9 g ai ha<sup>-1</sup> applied as PE and at 4 and 8 DAS.

Application of chlorimuron @ 6 to 12 g ai ha<sup>-1</sup> had no adverse effect on soil urease and dehydrogenase activities at 20 days after sowing.

Based on the results it could be concluded that chlorimuron @ 9 g ai ha<sup>-1</sup> applied as PE and upto 8 DAS as post-emergence were economically feasible for effective weed control in soybean.

**Integrated Nutrient Management in Irrigated Wheat (*Triticum aestivum* L.)**

BEKELE HAILE

2000

MAJOR ADVISOR : Dr. V. C. PATIL

A field experiment was conducted to study the effect of integrated nutrient management in irrigated wheat (*Triticum aestivum* L.) at the Main Research Station, University of Agricultural Sciences, Dharwad during the post-rainy season of 1999-2000. The experiment was laid out in a completely randomized block design with four replications.

All growth parameters observed at different growth stages were significantly influenced by the treatments except plant height and dry matter accumulation in stem at 30 DAS. Application of 75 and 50 per cent of RDF along with organics resulted in similar plant height, effective tillers and ear dry matter accumulation as obtained with 100 per cent RDF + FYM + Z SO<sub>4</sub>. At 30 and 60 DAS, LAI and number of shoots did not differ due to treatments except control and organics alone. However, at later stages application of 100 per cent RDF + FYM + Z SO<sub>4</sub> resulted in higher LAI than other treatments except 75 per cent RDF + organics (0.85) at

harvest. Significantly higher total dry matter accumulation (20.18) was observed with addition of 100 per cent RDF + FYM + Z SO<sub>4</sub> at 30 DAS and it was at par with 75 per cent RDF + organics at later stages.

Grain yield, number of grains and grain weight per ear did not differ among treatments that received 100 per cent RDF + FYM + Z SO<sub>4</sub>, 75 and 50 per cent of RDF + organics. Substitution of 25 to 75 per cent of RDF with organics resulted in similar ear length, 1000 grain weight, straw yield, grain to straw ratio and harvest index as with 100 per cent RDF + FYM + Z SO<sub>4</sub>.

Significantly higher grain N (1.97%) and protein content (12.3%) than other treatments was observed with application of 100 per cent RDF + FYM + ZnSO<sub>4</sub> and it was at par with 75 and 50 per cent of RDF + organics. Grain fat and crude fibre content did not differ significantly due to



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treatments. The treatments that received 100 per cent RDF + FYM + Z SO<sub>4</sub> and 75, 50 and 25 per cent of RDF with organics were at par with respect to N uptake. Substitution of 25 to 50 per cent of RDF with organics and 100 per cent RDF + FYM + Z SO<sub>4</sub> (26.1 kg/ha) resulted in similar P uptake and significantly higher than control (18.0 kg/ha). Potassium uptake in all treatments was significantly higher than control (101.3 kg/ha) although the treatments were at par.

Application of organics alone or in combination with

fertilizers improved infiltration rate, water stable aggregates, organic carbon, available nitrogen and phosphorus over their initial values. Bulk density, soil pH and available potassium were not significantly influenced by the treatments.

The net returns with 100 per cent RDF + FYM + Z SO<sub>4</sub> (Rs.25365.34), 75 and 50 per cent RDF with organics (Rs.24561.94 and Rs.20682.35, respectively) were on par with each other and significantly superior to other treatments.

## SOIL SCIENCE AND AGRICULTURAL CHEMISTRY

### Effect of Integrated Nutrient Management on Yield and Certain Quality Parameters of Tomato (*Lycopersicon esculentum* Mill).

B.L. HARIKRISHNA

2000

MAJOR ADVISOR : Dr.H.T. CHANNAL

A field experiment was conducted at New Orchard, Olericulture Unit, Division of Horticulture, College of Agriculture, University of Agricultural Sciences, Dharwad during winter season of 1999-2000 to study the effect of integrated nutrient management on yield and quality of tomato in a red sandy clay soil. The experiment was laid out in randomized block design with 14 treatment combinations, comprising of 25, 50, 75 and 100 per cent of RDN, RDP and 100 per cent RDK along with or without FYM and biofertilizer such as *Azospirillum brasilense* and *Pseudomonas fluorescens*.

The treatment receiving FYM + 75% RDN and RDP (P as SSP) + RDK + *Azospirillum* recorded significantly highest yield (54.32 t/ha), yield attributes such as number of fruits per plant and average fruit weight and quality parameters such as TSS, ascorbic acid, acidity, total sugar, pericarp thickness,

number of locules per fruits and shelf life studies over other treatments.

Significantly higher available nutrients (N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O and their uptake by the crops was recorded in treatments receiving FYM + 75% RDN and RDP (P as RP + PSB) + RDK + *Azospirillum* (T<sub>13</sub>) and FYM + 75% RDN and RDP (P as SSP) + RDK + *Azospirillum* (T<sub>14</sub>) over RDF and FYM treated plots.

Application of FYM + 50% RDN and RDP (P as RP + PSB) + RDK + *Azospirillum* registered significantly higher dehydrogenase activity as compared to other treatments.

The economic analysis clearly indicated that, net returns and B:C ratio of FYM + 75% RDN and RDP (P as RP + PSB) + RDK + *Azospirillum* treated plot was the highest (Rs.78566.10 and 2.72 respectively) and this finding can be used in making the tomato production more profitable.

## AGRICULTURAL ENTOMOLOGY

### Studies on the natural enemies of Diamondback moth, *Plutella xylostella* (Linnaeus) in cabbage

REENA

2000

MAJOR ADVISOR : Dr. K. BASAVANA GOUD

Investigations were undertaken to study the seasonal occurrence of natural enemy complex of diamondback moth

(DBM) in relation to pesticide usage pattern, toxicity of commonly used insecticides against *Cotesia plutellae* Kurdj.

adults as well as immature stages at different periods of their development and refinement of rearing technique of *C. plutellae*.

Organophosphates were the most commonly used insecticides in all the three districts viz., Dharwad, Belgaum and Haveri followed by synthetic pyrethroids. Studies on the pest incidence revealed significantly higher population level during winter as compared to rainy and summer season. The dominant natural enemy, *C. plutellae* was more prevalent in rainy season as compared to cold season; while the population of *Tetrastichus sokolowskii* Kurdj. was higher in the cold season. A significant negative correlation was found between the per cent parasitism by *C. plutellae* and *T. sokolowskii*. However, no correlation was found between average number

of sprays and the DBM population, per cent parasitism by *C. plutellae* and *T. sokolowskii*.

NSKE followed by neemmark and acephate was found to be safe, while cartap hydrochloride, quinalphos, methomyl, endosulfan, monocrotophos, fipronil, thiodicarb, spinosad, lufenuron and fenvalerate were highly toxic to both the adults as well as the immature stages of *C. plutellae*.

Irrespective of relative humidity, 30°C was found to be the optimum temperature for mass multiplication of *C. plutellae*. Second instar DBM larva was the most preferred stage for parasitization, followed by third and first instar. Optimum host density for the production of *C. plutellae* was 100 larvae per *C. plutellae* female.

#### Studies on *Parachrysocaris javensis* (Girault), an Egg Parasitoid of *Pyrilla perpusilla* Walker on Sugarcane

HANUMANATH N. YALEHADALAGI

2000

MAJOR ADVISOR: Dr. P. S. HUGAR

The egg load and nymphal incidence of *Pyrilla perpusilla* was noticed from June to December while adult activity was seen throughout the year. The population was peak in September II fortnight with 4.08 egg masses 26.10 nymphs and 22.07 adults per clump. Egg parasitisation by *Parachrysocaris javensis* was higher during October-I fortnight (29.41%) while activity of *Epiricania melanoleuca* during I fortnight of November with 30.82 cocoons per clump.

Mean duration of total life cycle, fecundity, adult emergence of *P. javensis* were 9-12 days, 22.04 eggs per female, 58.22 per cent in rainy season and 14.56-19.52 days, 11.51 eggs and 89.24 per cent, in winter season, respectively. Average longevity was 2.65 and 3.65 days (male) and 3.92 and 5.35 days (female) with food and 1.07 and 2.26 days (male) and 1.97 to 2.90 days (females) without food during rainy and

winter season, respectively. Male showed its potentiality to mate maximum of 3 females.

Release of 2.0 lakh parasitoids per ha proved efficient by recording highest egg and egg mass parasitisation (85.93 and 86.26%, respectively). Other two doses viz., 1.0 and 1.5 lakh per ha recorded 84.92 and 80.59 per cent and 89.49 and 86.09 per cent, respectively.

Endosulfan proved detrimental to the parasitoid by recording 17.17 per cent egg mass and 20.07 per cent egg parasitisation at 15 days after 11 spray as against untreated control. From the point of release, the egg parasitoid, *P. javensis* was able to move effectively up to 10 m distance in 120 days old and 8 m distance in 180 days old sugarcane crop. Among the recommended chemicals tested viz., endosulfan, monocrotophos fenvalerate, malathion and carbaryl none of them were found to be safer to the parasitoid under laboratory conditions.

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### AGRICULTURAL MICROBIOLOGY

#### Effect of Foliar Insecticides on Soil Micro-Organisms and their Bio-Chemical Process in Soils of Gulbarga

H.C. LAKSHMIKANTHA

2000

MAJOR ADVISOR : Dr.J.H. KULKARNI

A study was undertaken to investigate the effects of foliar insecticides namely fenvalerate, quinalphos and endosulfan on soil micro-organisms, ammonification, nitrification and also urease and dehydrogenase activities both under soil incubation and field application on pigeonpea crop in black soil of Gulbarga region. The study also included the residual effect of insecticides on nodulation and N-uptake in pigeonpea.

Under the soil incubation conditions, the insecticide application at field recommended concentration had innocuous effect on the soil micro-organisms, viz., bacteria, fungi, actinomycetes, free living nitrogen fixing micro-organisms and phosphate solubilizing micro-organisms. The higher concentrations however, had a deleterious effect on soil microbial activity, but with increasing incubation period a gradual recovery in microbial population was observed. Fenvalerate application at recommended concentration had stimulatory effect on the micro-organisms. Similar to the above observations, the enzyme namely urease and dehydrogenase were also sensitive to higher concentrations. Ammonification however, was found insensitive to higher concentrations of

insecticides. The process of nitrification and nitrifying micro-organisms in the soil incubated with higher concentrations were sensitive resulting in low nitrate-nitrogen in the soil. At field recommended concentration the above processes were not highly variable. Fenvalerate once again encouraged the above processes.

In the field application of above insecticides on the pigeonpea crop however, affected the micro-organisms and their biochemical parameters only at higher concentrations. The recommended concentration had no effect on soil micro-organisms and their activities. Fenvalerate stimulated the soil micro-organisms and their biochemical processes when applied at recommended and double the recommended concentrations. Endosulfan was found highly toxic to soil micro-organisms compared to quinalphos and fenvalerate.

The residual effect of the three insecticides at recommended concentration did not have any adverse effect on nodulation and N-uptake in pigeonpea. At the higher concentration, endosulfan was found more toxic to nodulation.

### CROP PHYSIOLOGY

#### Influence of Plant Growth Regulators and Micronutrients in Blackgram (*Vigna mungo* L.) Hepper)

D. PRABHU

2000

MAJOR ADVISOR : Dr.S.M. HIREMATH

A field experiment was conducted during kharif 1999 at Main Research Station, University of Agricultural Sciences, Dharwad to study the effect of growth regulators and micronutrients in blackgram (cv. T-9). The experiment was laid out in randomized block design with seventeen treatments comprising three growth regulators (NAA, miraculan and mepiquat chloride); four micronutrients ( $\text{FeSO}_4$ ,  $\text{ZnSO}_4$ , Mo and  $\text{Co}(\text{NO}_3)_2$ ) and basal application of copper ore tailings (COT mixture) at two different concentrations with three replications.

Application of NAA and miraculan significantly increased the plant height while, mepiquat chloride decreased the same. Application of mepiquat chloride (500 and 1000 ppm) recorded significantly higher number of trifoliate, number of branches and nodes per plant followed by NAA (20 and 40 ppm).

The application of growth regulator treatments significantly increased the leaf dry weight, reproductive dry weight and total dry weight and these parameters showed a positive correlation with seed yield.

The treatment with growth parameters NAA (20 and 40 ppm) and miraculan (1000 and 2000 ppm) significantly increased the leaf area, LAI, SLW, LWR, LAR, BMD and LAD. The application of growth regulators and micronutrients significantly increased RGR and CGR. The leaf area LAI, CGR, NAR, SLW, LAD, BMD showed a significant positive correlation with seed yield.

The application of NAA @ 40 ppm was more effective and significantly increased the seed yield followed by NAA @

20 ppm, miraculan @ 2000 ppm, miraculan @ 1000 ppm, mepiquat chloride @ 1000 ppm, mepiquat chloride @ 500 ppm and COT mixture @ 1500 kg ha<sup>-1</sup> as compared to control. The application of growth regulators and micronutrients significantly increased the number of seeds per plant, number of pods per plant, pod weight, pod wall dry weight, pod length, shelling per cent and harvest index and these parameters showed a significant positive correlation with seed yield. Among the treatments the application of NAA (20 and 40 ppm) was more economical.

#### Influence of Plant Growth Regulators on Growth and Yield of Cotton (*Gossypium hirsutum* L.)

VAIBHAV D. LOHOT

2000

MAJOR ADVISOR : Dr.B.C. PATIL

A field experiment was conducted during 1999-2000 at Agricultural Research Station, Dharwad to study the effect of growth regulators in hybrid cotton DHB-105. The experiment was laid out in randomized block design with twelve treatments comprising six growth regulators (NAA, Miraculan, Cytozyme, TIBA, Mepiquat chloride and Rimon) at two concentrations with three replications.

Application of NAA increased the plant height while, Mepiquat chloride decreased the same as compared to control. Application of NAA (10 PPM and 20 PPM) recorded significantly higher number of sympodial branches where as Mepiquat chloride recorded the lowest number of sympodial branches.

Application of growth regulators increased leaf dry weight, reproductive dry weight and total dry weight significantly and total dry weight showed a positive correlation with seed yield. Application of NAA (10 and 20 ppm) increased the leaf

area and leaf area index significantly. The application of growth regulators significantly increased AGR, CGR, RGR and NAR. The LAI showed a significant positive correlation with seed yield.

Application of NAA (10 ppm) increased the seed cotton yield significantly followed by NAA 20 ppm, TIBA 10 ppm and TIBA 5 ppm as compared to control. Application of growth regulators increased number of bolls per plant, boll weight and harvest index significantly and these parameters showed a significant positive correlation with seed yield.

The fibre quality parameters did not show significant effect of growth regulators.

In conclusion, the application of NAA (10 and 20 ppm) was more economical as compared to control by recording maximum benefit cost ratio.

#### Morpho-Physiological Traits Associated with Productivity in Cowpea (*Vigna unguiculata* L.) Walp)

M. KALPANA

1999

MAJOR ADVISOR : Dr.M.B. CHETTI

A field experiment was conducted at College of Agricultural Farm, University of Agricultural Sciences, Dharwad, during kharif 1999 to elicit information on relative performance of cowpea genotypes belonging to different

growth habits with respect to various morphological, growth, physiological and biochemical indices. It was also intended to find out the relationship between these parameters and their relation with yield to assign reasons for differential productivity in the genotypes.

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Results revealed that plant height, number of branches and canopy spread were more in indeterminate genotypes as compared to determinate genotypes. The genotype C-152 belonging to indeterminate type was found to be taller and KM-5 belonging to determinate type was found to be shorter over other genotypes. The leaf characters viz., leaf area, leaf weight, LAI and LAD differed significantly between the genotypes and these values are higher in the genotypes belonging to indeterminate types as compared to determinate types. Whereas SLW was significantly higher in determinate types. The high yielding genotypes irrespective of growth habit maintained higher LAD as compared to low yielding genotypes. Indeterminate genotypes recorded higher stem dry weight over determinate types. However, dry weight of reproductive parts, nodule dry weight and TDM were higher in the genotypes belonging to determinate type. NAR was found to have significant positive relationship with seed yield, plant height

and the number of nodules. Similarly, BMD and CGR had significant positive relationship with all the yield components, TDM and NAR.

The biochemical parameters viz. chlorophyll content and NRA were found to be more in determinate types as compared to indeterminate types. The genotypes which had higher values NRA and chlorophyll contents also had higher seed yield. The stomatal index was found to be more on lower surface as compared to upper surface in all the genotypes. The genotypes KM-5 followed by KM-6 under determinate and C-44 followed by C-22 under indeterminate type recorded the maximum seed yield. While, KM-2 under determinate and C-152 under indeterminate had minimum seed yield. The yield components such as number of pods/plant, number of seeds/pod, 100 seed weight and HI were higher in high yielding genotypes in their respective groups.

## GENETICS AND PLANT BREEDING

### Protein and Isozyme Variation and its Relation to Stress Response In Groundnut (*Arachis hypogaea* L.) Genotypes

SALIM JAVED

2000

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

The potential of protein and isozyme polymorphism for varietal identification and to monitor abiotic stress resistance in *Arachis hypogaea* L., was explored in the present investigation. Thirteen genotypes, comprising eleven cultivars and two potential genotypes under adoptive trials and ten mutants encompassing foliar disease resistant mutants and their susceptible counterparts were evaluated for protein and isozyme polymorphism. These genotypes were also subjected to various abiotic stresses and response in terms of growth and protein and isozyme variation was studied.

Of four enzymes assayed, only Glutamate Oxaloacetate Transaminase was polymorphic. It could differentiate up to subspecies level only. For Peroxidase and Super Oxide Dismutase only tissue specific variation was observed. However, protein profiles were more variable. Seed, root and hypocotyl protein profiles had three, three and four electrophoretic phenotypes, respectively. All the three protein profiles were used in combination for varietal identification. This could uniquely identify seven out of thirteen cultivars. The other three groups comprised of two cultivars each.

The genotypes were subjected to moisture stress using PEG. In case of temperature and salt stress, induction studies were carried out. Genotypic differences were clearly seen under temperature stress but only limited variation was noticed under salt stress. In cultivars, two protein bands (Rf value 0.19 and 0.23) were polymorphic under moisture and temperature stressed conditions. They were present in resistant cultivars even under stress but absent in susceptible cultivars.

In case of mutants, the resistant counter parts performed better under both moisture and temperature stresses. The two polymorphic bands (Rf 0.19 and 0.23) were absent in some mutants under moisture stress. Under temperature stress, only one band (0.19) was absent. Two bands of Peroxidase (Rf value 0.628 and 0.686) were induced under stress. These bands were constitutively present in I 15e, an interspecific derivative, which has performed better under temperature stress. The precise identity of these protein bands and regulation of Peroxidases need to be elucidated so that these could be used as potential markers for abiotic stress tolerance.

**Genetic Diversity and Stability for Yield and its Components in Mungbean  
(*Vigna radiata* L. Wilczek) Genotypes Tolerant to Different Stresses**

B.L. PATIL

2000

MAJOR ADVISOR : Dr. V.S. HEGDE.

The experiment was conducted during kharif 1999, at College of Agriculture, Dharwad, involving 36 diverse genotypes under three environments viz., E<sub>1</sub> (Rainfed + recommended doses of fertilizers + plant protection chemicals), E<sub>2</sub> (Rainfed + recommended doses of fertilizers) and E<sub>3</sub> (Rainfed but fertilizer and pesticide free condition) with the objectives of studying the comparative performance of different genotypes and identification of traits for enhanced yields under favourable and unfavourable environments, to study the nature and magnitude of genetic diversity and to select genotypes(s) for yield stability and multiple stress resistance.

The genotypes showed significant variability for all the 17 characters studied in all the three environments. High variability (PCV and GCV), heritability and genetic advance was observed for 100 seed weight, harvest index and all pathological (Powdery mildew & MYMV) traits.

Seed yield showed strong positive association with clusters/plant, pods/plant and harvest index in E<sub>1</sub> (favourable environment), whereas in E<sub>2</sub> and E<sub>3</sub> (unfavourable environments), in addition to traits mentioned in E<sub>1</sub>, biological yield also showed positive association, thus, revealing the

greater importance of biological yield in stress compared to nonstress environments.

The pathological traits contributed maximum to divergence, while that of other traits varied with environment. In E<sub>1</sub> cluster I (LM 608 and LM 5-12) and cluster VIII (K 851) where the most diverse groups, whereas, cluster VI (K 851) and cluster X (LM 5-12) in E<sub>2</sub> and cluster II (K 851) and cluster IV (LM 608, LM 5-12 and M 229-P54) in E<sub>3</sub>. Thus the genotypes K 851, Lm 608 and LM 5-12 have occupied divergent clusters in different environments.

Seed yield, biological yield, HI, days to flower initiation and 50 % flowering and all pathological traits showed significant G x E interaction. Stability analysis (Eberhart and Russell, 1966) for seed yield, biological yield & HI revealed that, M 266 was the most stable genotypes. However, M 53 B and Lm 377 showed specific adaptation for optimum environmental conditions, while LM 249 for unfavourable conditions.

LM 5-12 showed moderate resistance to powdery mildew and nutrient stress, where as, Pusa Baisaki, S 8, M 446, M 266, M 382, M 468, M 482 B, LM 263 and LM 249 to MYMV and nutrient stress.

**Evaluation of Sunflower (*Helianthus annuus*) Genotypes for Self-Fertility Over Seasons**

S. SUMANGALA

2000

MAJOR ADVISOR : Dr.K. GIRIRAJ

A total of 22 sunflower genotypes comprising of 4 hybrids, 17 inbreds and one open pollinated variety were evaluated for self-fertility during rainy season (1999) and summer season (2000) at Main Research Station, University of Agricultural Sciences, Dharwad. The four treatments viz., clothbag (autonomous pollination), clothbag + assisted pollination, clothbag + pollination with bulk pollen of sister lines and open pollination were imposed at the time of flowering. Genotypes were considered as main plots and pollination methods were treated as subplots.

These 22 sunflower genotypes were evaluated for 12 characters. All genotypes in general, recorded higher seed yield, number of filled seeds, seed filling percentage, test weight, oil content, kernel percentage, autogamy percentage and self-compatibility during summer season as compared to rainy season.

In both seasons hybrids were comparatively more self-compatible than inbreds. The genotypes which had low autogamy per cent recorded higher estimates of self-

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compatibility. It implied that a genotype which was incompatible will exhibit higher self-compatibility when pollen is made available by way of manual pollination.

The genotypes recorded significant increase in seed yield, number of filled seeds, seed filling percentage, oil content, kernel percentage, autogamy percentage and self compatibility under open pollination as compared to other three bagging treatments. For all these characters values were highest under open pollination followed by clothbag with bulk

pollen pollination, cloth bag with assisted pollination and the lowest under clothbag.

Based on the results of two seasons KBSH-1, MSFH-17 and DSF-255 amongst hybrids and RLC-4, IV-55, NDOL-3, TS-42-2-8, and DSF-2 amongst inbreds were found to be more self-compatible over other genotypes.

Importance of evaluating the lines for self-compatibility in sunflower breeding has been discussed.

### Identification of Crossability Barriers in Interspecific Crosses of Sesame

RAMESH TARIHAL

2000

MAJOR ADVISOR : Dr. O. SRIDEVI

Sesame is the most ancient crop grown worldwide mainly for its high quality edible oil. It is susceptible to number of diseases like *Alternaria* leaf spot, *Cercospora* leaf spot and phyllody and insect pest like sesame shoot webber (*Antigastra catalaunalis*). Some of the wild species of *Sesamum* are potential donors of disease and pest resistant genes. However, it has been difficult to produce interspecific hybrids because there exists incompatibility barriers. Knowledge of type of barriers and methods to overcome the same is therefore important to produce viable hybrids.

Reciprocal crosses were made between cultivated species *S. indicum* cv. DS-1 and E-8 and three wild species viz., *S. occidentale*, *S. radiatum* (CO), *S. radiatum* (KUD) and *S. muleyanum*. Based on field pollination studies and studies on pollen germination, pollen tube growth in papillae and style and micropylar penetration, reciprocal crosses involving *S. muleyanum* and *S. indicum* were found to be free from barriers

to hybridization. In the crosses DS-1 x *S. occidentale*, E-8 x *S. occidentale*, DS-1 x *S. radiatum* (CO), E-8 x *S. radiatum* (CO) DS-1 x *S. radiatum* (KUD) and E-8 x *S. radiatum* (KUD), the barriers to hybridization were classified as pre-fertilization and in the reciprocal crosses, the barriers were classified as post-fertilization. Bud pollination and mentor pollen technique were effective in overcoming pre-fertilization barriers. However, hybrids could not be obtained. Therefore, bud pollination or mentor pollen technique followed by use of sequential ovary-ovule culture in crosses showing pre-fertilization barriers and ovary-ovule culture alone in crosses showing post-fertilization barriers could help in obtaining interspecific hybrids in these crosses.

Further, the role of enzymes such as esterase and peroxidase and total starch was established in cross-(in) compatibility.

### Performance of Interspecific Derivatives of Sunflower for Alternaria Leaf Blight Resistance, Yield and Yield Components

SHABANA M. SHAIKH

2000

MAJOR ADVISOR : Dr. R.L. RAVIKUMAR

In the present study 34 inter specific derivatives of different wild species and 28 promising genotypes were evaluated for resistance to *Alternaria* leaf blight, yield and yield components during kharif 1999. All the 62 genotypes showed moderate level of infection at stage-I and high at stage-II with the mean susceptibility of PDI 30.65 and 74.51 respectively.

None of the genotypes recorded significantly lower PDI values than Modern. However, PESS-01F, SARS-06F, EC413060, EC413090 and 873-5 had lower values than Modern. The interspecific lines also recorded high PDI values indicating that the resistant alleles have been eliminated during back crossing. Wide range of variability for yield and yield

components viz., plant height, days to 50 per cent flowering, days to maturity, head diameter, test weight, number of seeds per head, seed weight, oil content and seed yield were also observed among the genotypes. High heritability coupled with high genetic advance was observed for total number of seeds per head, test weight and head diameter suggesting the role of additive gene action for these traits. The correlation and path analysis indicated that the characters head diameter, seeds per head and oil content are important for seed yield.

Inhibition of seed germination and seedling growth of all the genotypes was observed by the application of pathogen

culture filtrate. But the reduction was not uniform. The genotypes were tested for infected leaf area using detached leaf techniques. The association between *in vitro* disease parameters and field reaction showed negative association of seed germination and root length with PDI (Stage-II) and positive association of infected leaf area suggesting their dependability. However, the negative association between PDI (Stage-I) and infected leaf area and positive association between PDI (Stage-II) and shoot length contradict the above results. It is required to test a large number of genotypes to confirm the results.

#### Genetic Studies on Compact Cotton (*Gossypium hirsutum* L.)

MALLAYYA C. KORAVANAVAR

2000

MAJOR ADVISOR : Dr. S. S. PATIL

Cotton is the principal fibre crop which has become a highly agro-industrial crop. Existing robust genotypes have inaccessibility for plant protection. Compact cotton genotypes have advantages of plant protection efficiency, short duration and suitability for machine picking. Present study was formulated involving compact crosses and lines to assess their relative potentiality. Compact and ultra compact lines developed through recombination breeding and compact F<sub>2</sub>s developed through 6 x 6 diallel mating design were evaluated.

Compact genotypes exhibited significant variability for all the characters except number of monopodia among compact lines. High heritability and genetic was observed for most of the characters.

Most of the compact crosses expressed significant heterosis over mid parent and commercial check for all the characters. GCA variance was found to be significant and higher in magnitude than significant SCA variance for all the characters except seed index. Significant gca effects were

recorded for all the characters. There were potential crosses involving both parents with high gca effects for yield and yield component characters in desirable direction which implies the advantage in selecting desirable isolates from segregating generations of these crosses. These crosses also expressed significant sca effects for all the characters which gives scope for exploitation of these characters through hybrid development.

In simple analysis of combining ability, there is disadvantage associated with unit of measurement and relative weightage of different characters. This was over come by pooled score analysis of gca status. Compact parents CP 6, CP 3 and CP 2 were identified as best general combiners through this pooled score analysis. Some of the compact and ultra compact lines recorded high potentiality. Some lines identified and selected as compacts revealed ultra compact stature. Hence, these compact and ultra compact lines need to be evaluated further for different agronomic manipulations to exploit their full potentiality.

#### Evaluation of Selected Early Generation Progenies of Safflower for Yield and Yield Component Characters

S. M. MALLESHAPPA

2000

MAJOR ADVISOR : Dr. R. L. RAVIKUMAR

In the present study 189 F<sub>4</sub> and selected 40 F<sub>5</sub> progenies were tested for yield and yield component traits

during 1998 and 1999 rabi respectively at MRS Dharwad. The progenies of Safflower were obtained through hybridization of



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diverse genotypes. mutations of homozygous parental lines and hybrids.

The mean squares due to genotypes were significant for majority of the characters studied in both the generations. The highest GCV and PCV were observed for number of seeds per capitulum in both the generations. The seed number, seed yield and test weight showed moderate to high genetic advance coupled with high heritability suggesting additive gene action for these traits.

The capitula number and test weight showed strong positive association with seed yield whereas, these traits in turn were negatively associated with seed number and capitulum diameter which are important components of oil content. Hence, it is desirable to constitute these four traits in optimum proportion to achieve high oil yield per plant. The number of

branches was associated strongly and positively with capitula number. Thus, selection for this trait influences the capitula number, which has a strong positive relation with seed yield. The path coefficient analysis in both the generations confirm that the characters viz., capitula number, seed number and test weight were reliable components influencing seed yield directly in both the generations.

Intergeneration correlation indicated high positive correlation between  $F_3$ - $F_4$  and  $F_4$ - $F_5$  generations for important traits viz., test weight, capitula number, capitulum diameter and oil content. However narrow sense heritability estimates were low for all the characters studied. A good number of progenies recorded significantly higher values than national check A-1 for seed yield, oil content and oil yield per plant. These promising genotypes are being tested for locations in large scale trials to confirm their superiority.

## Evaluation of Genetic Stocks for Formulation of Selection Indices in Bidi Tobacco (*Nicotiana tabacum* L.)

R. K. RAMACHANDRA

2000

MAJOR ADVISOR : Dr.B.N. BHAT

A study was undertaken at the Agricultural Research Station, Nipani during kharif 1999 to study genetic variability, character association, path analysis and selection indices in bidi tobacco (*Nicotiana tabacum* L.) genotypes. One hundred genotypes were evaluated for eleven quantitative characters viz., days to flower, plant height (topped), plant height (untopped), number of leaves (topped), number of leaves (untopped), leaf area, internodal length (topped), internodal length (untopped), total fresh weight, total dry weight and leaf yield. The analysis of variance was significant for all the eleven characters studied. Genotypic coefficient of variation was high for total dry weight, total fresh weight, leaf area, plant height and number of leaves per plant. Heritability estimates for these characters were also relatively high which indicated that there was scope for selection for these characters to improve the leaf yield as evidenced by strong correlation and high expected genetic advance of these two traits with leaf yield. Correlation studies revealed that the leaf yield was positively and significant correlated with plant height, number of leaves, leaf area,

internodal length and total fresh weight, both at genotypic and phenotypic levels. Path analysis revealed that direct effect of number of leaves, leaf area, internodal length on dry leaf yield was comparatively higher at both genotypic and phenotypic levels. This indicated that these two traits could be given emphasis during selection of genotypes for improved leaf yield. Selection indices revealed that the combination of characters involving plant height (topped), number of leaves (topped), leaf area and internodal length was the best which exhibited the highest relative genetic advance followed by the combination number of leaves (topped), internodal length (topped) and total dry weight (1035.85) and number of leaves (topped), internodal length, total fresh weight (1018.16) so simultaneous selection for plant height (topped), number of leaves (topped), leaf area, internodal length (topped) in combination would give maximum genetic advance and suggested for further evaluation and use in breeding programmes.

**Comparison of Mating and Selection Schemes in Breeding for Higher Productivity in Chickpea (*Cicer arietinum* L.)**

NAGARAJ KAMPLI

2000

MAJOR ADVISOR : Dr P.M.SALIMATH

An investigation was carried out to compare the mating and selection schemes in breeding for higher productivity in the cross ICCV-10 x BG-256 of chickpea. For this purpose biparental mating (BIP) was attempted in  $F_2$  of this cross to generate BIP population. At the same time, with selfing two breeding bulks viz., selected bulk (SB) and random bulk (RB) were created by applying appropriate standard selection procedures. Parents,  $F_1$ , BIP, SB, RB and check Annigeri were evaluated for yield and its important component traits in the Botany garden of Agriculture College, Dharwad.

The mean values of BIP were higher than those of SB and RB for all the characters under study. Mean value of BIP even exceeded the mean of  $F_1$  for all the characters except plant height and 100-seed weight. In general, BIP showed wider range in desirable direction. The magnitudes of genotypic and phenotypic variations were enhanced in BIP for all the characters except secondary branches. Similarly, estimates of heritability and genetic advance were also high in BIP for all the characters followed by that of SB and RB.

Biparental mating also resulted in shifts in the

magnitude as well as the direction of correlation coefficients. Negative association of 100-seed weight with seed yield was observed in SB and RB while it was positive and significant in BIP. Similarly, negative association was observed between plant height and 100-seed weight and pods per plant and 100-seed weight in SB and RB which became positive though non-significant in BIP. Altered correlations indicated that intermating in  $F_2$  was effective in breaking some undesirable linkages. The direct effects of pods per plant and 100-seed weight as well as indirect effects of other traits through these two traits were positive but low in selfs while they were higher in BIP.

In general, BIP population showed higher frequency of transgressive segregants followed by SB and RB for individual traits as well as for combination of important component characters.

Though the study has clearly highlighted the distinct advantage of BIP over selfing series, in a self-pollinated crop like chickpea, it can be used only sparingly. However, the results have shown that, SB is the next better choice rather than RB in the selfing series for improving yield.

**Genetic Studies Involving Milo and Maldandi Sources of Cytoplasmic-Genetic Male Sterility in Sorghum (*Sorghum bicolor* (L.) Moench)**

SANTOSH K. PATTANASHETTI

2000

MAJOR ADVISOR : Dr. B.D.BIRADAR

Two diverse sources of cytoplasmic genetic male sterility, milo (104A) and maldandi (M31-2A) were crossed with 27 genotypes to study the restoration pattern and also to identify the stable restorers across two locations. The study has revealed that, proportion of restorers on milo (92.5%) was more than that on maldandi (11.1%) cytoplasm. Six of the 27 genotypes have been identified as stable and high restorers on milo cytoplasm and none on maldandi cytoplasm across two locations. Mean seed set at Dharwad was comparatively lower than at Bijapur because of cold temperature stress at Dharwad causing sterility of hybrids.

Line x tester experiment was conducted at two locations involving 3 lines (M31-2A, 104A and 116A) and 9 testers, to have the information on heterosis and combining ability. None of the heterotic crosses figured as most productive crosses at Dharwad, while at Bijapur many of the crosses figured as most productive as well as most heterotic. Milo based hybrids have performed well at both Dharwad and Bijapur. Whereas, maldandi hybrids have performed better only at Bijapur. Present study revealed that heterotic hybrids could be obtained through combinations of gca like H x H, H x L and L x H. Association between sca and heterosis, sca and crosses *per se* was positive and significant whereas, no association was observed between gca and *per se*.

## Abstract of Theses

### PLANT BIOTECHNOLOGY

#### Characterization of cry Genes in Native *Bacillus thuringiensis* Isolates

DATTATRAYA BHAT

2000

MAJOR ADVISOR : Dr. M.S. KURUVINASHETTI

The present study was conducted to isolate *Bacillus thuringiensis* from soils of Western Ghat region in Uttara Kannada district of Karnataka, India, to assess their insecticidal activity, molecular diversity and to identify specific *cry* genes in them. Out of the initial 41 isolates, only ten isolates had endospores and crystals. Three isolates i.e., D1, D3 and D21 were toxic to diamond back moth (*Plutella xylostella*) larvae. Among these isolates D1 caused the highest mortality (90%) followed by D3 (80%) and D21 (70%).

The isolates varied in sensitivity to antibiotics. All the three isolates, reference strain Bt-42 and reference isolate P1 were sensitive to tetracycline, chloramphenicol and kanamycin. D1, D3 and D21 were resistant to ampicillin (150 ppm) and spectinomycin. In addition, D3 was also resistant to nalidixic

acid (50 ppm). SDS-PAGE protein profile indicated the presence of 130 kDa and 65 kDa bands in D1, D3, Bt-42 and P1. In D21, a 26 kDa protein was present. The genetic distance (%) based on protein profile indicated the minimum genetic distance of 16.67% between P1 and D1 and the maximum genetic distance of 80.00% between D1 and D21. All the isolates had only one plasmid of about 15 kb.

The presence of *cry* genes in the isolates was detected based on the nature of the PCR amplification products. With *cry* specific primers it was found that gene *cry* I/C was present in all the three isolates D1, D3 and D21, *cry* I/A(c) gene was present in P1 and D1 and the nematode active *cry* gene was detected in P1, D1 and D3.

### PLANT PATHOLOGY

#### Studies on Blast Disease of Rice (*Oryza sativa* L.) Caused by *Pyricularia grisea* (Cooke) Secc. In Upland Areas

MD MIJAN HOSSAIN

2000

MAJOR ADVISOR : Dr. SRIKANT KULKARNI

Rice blast caused by *Pyricularia grisea* (Cooke) Sacc. is very important since it plays a major role in the loss of yield. Different aspects of blast disease and its pathogen were carried out in the present investigation.

During survey in three districts, higher disease incidence and severity were noticed in Haliyal and Mundgod talukas of Uttara Kannada district. Crop loss assessment studies indicated that yield loss in case of highly susceptible variety viz., HR-12 and moderately susceptible variety viz., Intan were estimated to the extent of 51.54 and 24.89 per cent respectively. Potato dextrose agar was found best to support linear growth of *P. grisea*. The fungus reached maximum growth on 14th day of incubation. Richards's medium was the best synthetic medium to support maximum mycelial growth of the fungus. The temperature of 30°C and pH 6.5 were found to be best for the fungal growth. Starch and asparagine

were found to be best carbon and nitrogen sources for the growth of the fungus respectively. The fungus is heterotroph and requires biotin and thiamine for the growth and sporulation.

Of 153 genotypes screened, none of them showed immune reaction to blast, eight genotypes viz., Vikas, M-81, Hy-246-13-1, Shankarpoornam, Kavya, IR-66, Co-43 and Pusa 834 were moderately resistant to leaf blast as well as neck blast. Nitrogen studies indicated that, a dosage of 70 kg N/ha was found optimum dose to reduce the incidence of blast without significant yield losses. *In vitro* evaluation studies indicated that, iprobenfos, propiconazole and carbendazim were most effective-systemic fungicides, whereas, mancozeb, wanis and *Trichoderma koningii* were found to be best non-systemic fungicide, neem based formulation and bioagent respectively. *In vivo* studies revealed that, tricyclazole was found best to reduce disease incidence and increase the yield.

**Studies on Chlorotic Spot Virus Disease of Jasmine (*Jasminum* spp.) in Karnataka**

M.V.S. RAMA KRISHNA

2000

MAJOR ADVISOR : Dr.M.S. KULKARNI

Jasmine chlorotic spot virus (JCSV) disease, is present in almost all fields of *J. sambac* of North Karnataka, and causing considerable damage. The incidence ranged from 3.00 to 95.00 per cent.

The JCSV caused chlorosis of the plant, chlorotic spots and malformations of leaves on *J. sambac* whereas symptoms were different viz., chlorosis extending along the veins sometimes with rough circular shape on *J. multiflorum*. The other two species *J. auriculatum* and *J. grandiflorum* never exhibited symptoms indicating their resistance.

The leaf samples of both *J. sambac* and *J. multiflorum* showed negative reaction with TSWV, CMV and PVY tested through ELISA.

The electron microscopic observations with infected *J. sambac* leaves revealed presence of elongated flexuous particles of approximately 630 nm size. These particles were not reacting with any of twelve antisera of other known viruses belonging to Poty, Potex, Carla and Clostero virus groups in ISEM test.

Ultrathin microtomy revealed the presence of some laminated rings of virus inclusion bodies in leaf sample sections from *J. multiflorum* only.

The Jasmine chlorotic spot causing virus was not sap transmissible, also not transmissible by insects and soil. But this was transmissible through approach grafting and through vegetative cuttings using infected material in the nurseries.

Based on Symptoms, Electron microscopy, Serology, Transmission studies and Host range the virus associated with the Jasmine chlorotic spot disease in Karnataka has been concluded to be a probable member or strain of Carla virus group.

Hot water treatment was not effective for Management of JCSV of *J. sambac* as the temperatures necessary for therapy had deleterious effect on survival of vegetative cuttings. Dipping cuttings in leaf extracts of coconut, maize and mirabilis (5%) showed promising results in inhibiting the JCSV infecting both *J. sambac* and *J. multiflorum*.

**SEED SCIENCE AND TECHNOLOGY**

**Standardization of Germination Test Procedure in Medicinal Plant Species**

ISHWAR C. POOJAR

2000

MAJOR ADVISOR : Dr. B.S. VYAKARANAHAL

Studies on four medicinal plant species viz., *Ammi majus*, *Phyllanthus emblica*, *Plantago ovata* and *Psorelia corylifolia* was undertaken to standardize media and temperature required to test for germination in the laboratory. The experiment was comprised of nine temperature ranges involving four constant ( $20^{\circ}$ ,  $25^{\circ}$ ,  $30^{\circ}$ ,  $35^{\circ}$  C) and four alternate ( $20-30^{\circ}$ ,  $25-35^{\circ}$ ,  $20-35^{\circ}$ ,  $15-25^{\circ}$  C) temperatures along with one ambient temperature. The three media were Between Paper (BP), Top of Paper (TP) and Sand (S).

Among the different temperatures and media studied, the maximum germination (95.50%) was observed in *Ammi*

*majus* at  $20^{\circ}$  C temperature in BP method. The first and final count were fixed on 6<sup>th</sup> and 10<sup>th</sup> day, respectively. In sand medium at alternate temperature of  $20-30^{\circ}$  C *Phyllanthus emblica* recorded maximum germination (95.00%). This was found on par with  $25-35^{\circ}$  C temperature. The first and final count can be fixed on 5<sup>th</sup> and 10<sup>th</sup> day, respectively. The alternate temperature of  $15-25^{\circ}$  C in BP method recorded highest germination (96.00%) in *Plantago ovata*. The first and final count can be fixed on 2<sup>nd</sup> and 5<sup>th</sup> day, respectively in BP method. In *Psorelia corylifolia* highest germination (95.00%) was observed in sand medium at  $15-25^{\circ}$  C. The first and final count can be fixed on 2<sup>nd</sup> and 5<sup>th</sup> day, respectively.

**Effect of Dates of Sowing and Chemicals on Seed Yield and Quality of  
Male Parent SB (YF) -425 Cotton (*Gossypium barbadense* L.)**

M.S. ULLAGADDI

2000

MAJOR ADVISOR : Dr. P.N. UMAPATHY

A field experiment was conducted at Main Research Station, University of Agricultural Sciences, Dharwad during kharif 1999-2000 to find out the effect of dates of sowing and chemicals on seed yield and quality of *barbadense* cotton cultivar SB(YF)-425. The experiment consists of two dates of sowing (main plots) and nine treatments (sub plots) comprising of two plant growth regulators and two micronutrients at different concentrations and different combinations. The experiment was laid out in split plot design with three replications.

The data indicate that the May sowing was found to be best to produce higher yields and high quality seeds as compared to June sowing. Plant height and number of leaves increased significantly due to foliar application of  $ZnSO_4$  (0.1%) and boron (0.1%) in combination with GA3 (50 ppm). The

application of growth regulators and nutrients significantly increased the number of squares, flowers and matured bolls per plant except acetyl salicylic acid which resulted in significantly higher values for these parameters.

The yield and yield components were significantly influenced due to growth regulators and nutrients. Among the treatments, the highest yield and yield components were recorded in RDF + foliar spray of  $ZnSO_4$  (0.1%) + Boron (0.1%) in combination with GA3 (50 ppm) followed by  $ZnSO_4$  (10 kg/ha) + Boron (5 kg/ha) + GA3 (50 ppm).

The seed quality parameters were significantly improved by the use of growth regulators and nutrients. Significantly higher germination, shoot length, root length and vigour index were observed in plants sprayed with  $ZnSO_4$  (0.1%) + Boron (0.1%) + GA3 (50 ppm).

**HORTICULTURE**

**Genetic Variability and Diversity Studies of Dry Chilli (*Capsicum annum* L.) Genotypes**

GIREESH N. BISTANAGOUDAR

2000

MAJOR ADVISOR : Dr. M.G. PATIL

The study was undertaken to elicit information on genetic variability and diversity in dry chilli genotypes. The experiment was carried out on medium black soils at Regional Research Station, Raichur during 1997-98.

Thirty four genotypes were used for the study with three replications laid out in randomised block design and were observed for 14 characters.

Considering various genetic parameters, selection for number of branches per plant, number of fruits per plant, fruit weight, fruit length, pericarp weight and number of seeds per fruit would result in greater improvement in the present material.

Average fruit weight, number of seeds per fruit and pericarp weight per fruit had very high degree of positive association with yield. Path analysis showed that number of

fruits per plant, number of seeds per fruit and average fruit length had high direct effect on yield. Although number of fruits per plant had highest direct effect on yield, its correlation was not significant because of its negative influences through other characters.

Considerable amount of genetic diversity was noted in the material representing diverse ecogeographical regions. The 34 genotypes were grouped into 10 clusters. Cluster-I was the largest comprising of 14 genotypes while, clusters VII, VIII, IX and X were solitary ones. Inter-cluster distance showed a wide range from 36.0 between cluster-I and IV to 150.1 between cluster-V and IX. Cluster IX is the most diverse genotype which is indicated by maximum inter-cluster distance with eight clusters out of total ten clusters. Cluster mean analysis revealed that the genotypes Byadagi Dabbi (Gudageri) and G-4 were found superior for important characters.

**Survey, Evaluation of Seedling Progenies and Standardization of Clonal Propagation in Jamun**

SANTOSH R. INAMDAR

2000

MAJOR ADVISOR : Dr.N.C. HULAMANI

A survey was carried out to evaluate promising jamun strains in Gokak taluk, covering 70 plants in three villages namely Dhupadhal, Gilihosur and Kolavi.

Of these seventy strains, most of the strains were found dwarf. Strain KLV-5 recorded largest leaf length (21.75 cm) and largest breadth (9.55 cm). leaf length and petiole length ratio (L:P) was maximum in the strain GLH-6 (10.00).

The shape of the fruits was oval except DPD-10, 13 and 21 which were round in shape. Longest fruit length (3.82 cm), highest fruit size (9.75 cm), pulp weight (10.82 g), pulp per cent (86.7%) and pulp:seed ratio (6.55) was recorded in the strain GLH-5. Strain KLV-9 had highest fruit breadth (2.64 cm). Maximum fruit weight was recorded in the strain DPD-45 (13.20 g).

The maximum TSS was noticed in the strain GLH-11 (17.45%) and acidity per cent was highest in the strains KLV-10, GLH-18, GLH-36 with 1.45 per cent.

At location Dhupadhal, length, size, weight and volume of fruit, pulp weight and thickness, size, weight and volume of seed, leaf breadth, leaf area, petiole length and yield were found to have coefficient of variation of more than 15 per cent.

Fruit volume, seed volume, fruit length, fruit breadth, pulp thickness and fruit size were the parameters which had direct correlation for pulp weight.

Pulp weight, seed weight, fruit volume and P:S ratio had positive effect on fruit weight.

Highest overall acceptability was, registered by the strain DPD-30 (8.67) which had higher scores of taste and flavour, colour and appearance, while strain GLH-22 recorded maximum score for texture of the pulp (8.30).

Highest soft wood graft take percentage was noticed in the strain DPD-30 (86.67%) during the month of August.

**Integrated Weed Management in China aster (*Callistephus chinensis* Nees) cv. Kamini**

MAHANTESH I. MURGOD

1999

MAJOR ADVISOR : Dr.B.SATHYANARAYANA REDDY

A field experiment was carried out to study the effects of different weed control treatments in China aster (*Callistephus chinensis* Nees) cv. Kamini, at the experimental field of Department of Floriculture and Landscape Gardening, Kittur Rani Channamma College of Horticulture, Arabhavi during 1999-2000. The experiment consisted of twenty treatments, consisting of two herbicides (pendimethalin and alachlor), hand weeding and Wheat husk as mulch. These were considered alone or in various combinations and were compared with unweeded control. The experiment was laid out in randomised block design (RBD) with three replications.

Growth parameters, viz., plant height, number of leaves, number of branches and dry weight of plant were higher in weed free treatment throughout the crop period and in integrated weed management treatments having either pendimethalin 1.50 kg a.e. ha<sup>-1</sup> or alachlor 2.00 kg a.e. ha<sup>-1</sup> along with wheat husk as mulch or manual weeding at 30 DAT.

The highest yield of quality flowers were recorded in weed free treatment throughout the crop period and in integrated weed management treatments having either pendimethalin 1.50 kg a.e. ha<sup>-1</sup> or alachlor 2.00 kg a.e. ha<sup>-1</sup> along with wheat husk as mulch or manual weeding at 30 DAT.

Weed control efficiency was high in weed free treatment throughout the crop period and with application of pendimethalin 1.5 kg a.e. ha<sup>-1</sup> + wheat husk and alachlor 2.0 kg a.e. ha<sup>-1</sup> + wheat husk. But application of pendimethalin 1.5 kg a.e. ha<sup>-1</sup> and alachlor 1.00 and 2.00 kg a.e. ha<sup>-1</sup> showed slight to moderate toxicity on China aster.

Net returns and marginal returns were maximum in weed free treatment throughout the crop period. Among the treatments having herbicides, integrated weed management treatments having either pendimethalin 1.50 kg a.e. ha<sup>-1</sup> or alachlor 2.00 kg a.e. ha<sup>-1</sup> along with wheat husk as mulch or manual weeding at 30 DAT resulted in the highest net and marginal returns.

## Abstract of Theses

### Studies on performance of China aster (*Callistephus chinensis* Nees.) Cultivars

MANJUNATHA S. ANGADI

2000 MAJOR ADVISOR : Dr.B.SATHYANARAYANA REDDY

China aster is an half hardy annual commercial flower crop grown for its flowers. The flowers of aster are used for flower arrangement, interior decoration, garland making, worshipping. It can be grown in herbaceous borders, in flower beds, in garden decoration and also as potted plants.

A field experiment was conducted at the Floriculture and Landscape Gardening department, Kittur Rani Channamma College of Horticulture, Arabhavi during the rabi season of 1999-2000 with ten China aster cultivars for evaluating their performance and to find out the promising cultivars for maximising the production of quality flowers.

All the cultivars performed with wide and significant difference for growth and flowering characters and also for their response to the insect pest and diseases.

The 'Phule Ganesh' series and the cultivar 'Violet Cushion' were vigorous in growth. Other 'IIHR' series and

cultivar 'Ostrich Plume Mixed' were medium in growth, while the cultivar 'Giant Branching Comet' was dwarf in growth habit.

The cultivars 'Giant Branching Comet' and 'Ostrich Plume Mixed' were early in flowering. The cultivar 'Phule Ganesh White' produced the largest flowers, longest stalk length, maximum flower yield and seed yield with extended vase life. The semidouble flower type are suitable for garland making.

Cultivars 'Poornima', 'Phule Ganesh Purple' and 'Violet Cushion' produced more developed florets. The cultivars 'Violet Cushion' and 'Shashank' which are fully double are more suitable for cut flower production.

Except the cultivars 'Poomima', 'Kamini' and 'Ostrich Plume Mixed', all other cultivars were moderately resistant to *Helicoverpe* pest and *Alternaria* leaf spot disease.

### Evaluation of Different Cultivars of Turmeric (*Curcuma longa* L.) under Ghataprabha Left Bank Command area

RAVEENDRA B. HAKATI

2000

MAJOR ADVISOR : Dr.S.I. HANAMASHETTI

An attempt has been made to evaluate sixteen cultivars of turmeric at Agricultural Research Station, Arabhavi during 1999-2000. The trial was laid out in a randomised block design with three replications. The plot size was 2.47 m x 3.15 m. Five plants per plot were selected randomly for recording morphological features, rhizome yield and curcumin content. The observation on growth parameters were recorded at five stages of crop growth, viz., 30, 60, 90, 120 and 150 days after planting, yield and curcumin content were recorded after harvest. Among the cultivars tried, CLI-315, Cuddapah, Krishna, CLI-327 and Salem recorded higher yield under Arabhavi conditions.

Among the different cultivars studied, Cuddapah, CLI-327 and CLI-315 were tallest in stature (51.26, 49.86 and 47.76 cm, respectively), while BSR-1 was recorded lower height (30.73).

The cultivar CLI-315 produced maximum leaf area (50.74 dm<sup>2</sup>) and lowest leaf area (23.87 dm<sup>2</sup>) recorded in Bidar-1.

The cultivar PCT-8 was found to be short duration type. The cultivars Amalapuram, Tekurpeta and PCT-14 were found to be medium duration type, while Cuddapah, CLI-327, Rajapuri, CLI-315, Bidar-4, PTS-24, CO-1, BSR-1, Bidar-1, Krishna and CLI-62 were found to be long duration type.

The curing percentage was higher (25.39%) in PCT-8 followed by BSR-1 (22.30%) and Krishna (20.47%) and least (18.25%) in Bidar-1.

Cured rhizome yield was highest (6.29 t/ha) in CLI-315 followed by Cuddapah (5.25 t/ha) and CLI-327 (5.12 t/ha).

The curcumin content was maximum (9.29%) in PTS-24 followed by PCT-8 (8.45%) and PCT-14 (7.80%). Among different cultivars studied, the maximum fresh yield (32.19 t/ha) was observed in CLI-315 followed by CLI-327 (26.77 t/ha), Cuddapah (26.13 t/ha), Krishna (24.42 t/ha) and Salem (22.80 t/ha).

**Production Potential of Tomato (*Lycopersicon esculentum* Mill.) in Leucaena Based Alley Cropping System**

HINDURAO D. KOLEKAR

2000

MAJOR ADVISOR : Dr.T.B. ALLOLLI

An experiment was undertaken to know the production potential of tomato in leucaena based alley cropping system for irrigated command area of Tungabhadra Project, particularly for red sandy loam soil region. Different treatments consisting of leucaena loppings (@ 5 t/ha) and varying levels of nitrogen (25% to 150%) were assessed on the performance of tomato during rabi 1999-2000 at horticulture garden, Regional Research Station, Raichur.

The highest yield potential of tomato was realised in leucaena based alley cropping when it was supplied with 5 tonnes per hectare of loppings and 100 per cent recommended dose of nitrogen. Though significant difference was observed between the yield of sole tomato supplied with recommended dose of fertilizer and sole tomato supplied with only incorporation of leucaena loppings, but the difference was very

less on economic evaluation of the results obtained. The yield was least in control plots without fertilizer and loppings. Alley cropping with leucaena can reduce fertilizer requirement for vegetable production. Cost of return analysis using existing prices indicated that alley cropping with vegetable crops can be profitable. Besides increasing the productivity alley cropping also improved soil physical and chemical properties on sustained basis.

Allelopathic effect of different parts of leucaena plant extracts on germination and seedling growth of tomato was also studied. Among all sources, bark extract of leucaena imparted deleterious effect on germination per cent, shoot and root elongation. It was also observed that irrespective of the source, the germination per cent was reduced with linear increase in concentration of solution from one to ten per cent

**Influence of Arbuscular Mycorrhizae on Acclimatization of Micropropagated Banana Plantlets**

DALIA MATHEWS

2000

MAJOR ADVISOR : Dr. RAMAKRISHNA V. HEGDE

Studies on the influence of arbuscular mycorrhizae (AM) on acclimatization of micropropagated banana plantlets were carried out in the tissue culture laboratory and Kumbhapur farm of the Department of Horticulture, University of Agricultural Sciences, Dharwad during 1998-2000. The investigation was aimed at evaluating the influence of AM fungi on growth of tissue cultured plantlets of banana, comparing the efficiency of the different AM fungi in influencing growth and survival of the banana plantlets and determining the best stage of AM fungal inoculation.

Micropropagated plantlets of banana cultivars Dwarf Cavendish and Robusta were inoculated with mycorrhizal fungi at primary and secondary stages of hardening. Plantlets of Dwarf Cavendish were found to be more receptive to mycorrhizal inoculation compared to those of Robusta and the former harnessed significantly greater benefits in terms of growth and survival.

Among three AM fungi, *Glomus fasciculatum* was

more effective in improving the plantlet height, pseudostem girth, leaf area, shoot and root biomass, length of the root system and the survival percentage. This was concomitant with a better colonization of the root system of the plantlets.

Plantlets of Dwarf Cavendish colonized by *G. fasciculatum* proved to be the best host-endophyte combination. *Gigaspora margarita* proved to be superior to *Acaulospora laevis* in augmenting the growth parameters of Dwarf Cavendish, while the reverse was found to be beneficial for Robusta plantlets.

Comparison of the time of inoculation revealed that a better plant response was produced when the inoculation was carried out at the secondary hardening stage.

It is thus evident that AM inoculation can have a positive influence on the banana plantlets, however, selection of the right fungal partner and the right time of inoculation goes a long way towards realizing maximum benefits.



## Abstract of Theses

### AGRICULTURAL ENGINEERING

#### Design, Development and Evaluation of Biogas Plant using Donkey Dung and Selected Biomaterials as Feed Stock

N. KANNAN

2000

MAJOR ADVISOR : Dr.T. GURUSWAMY

The experiments were conducted to evaluate the characteristics of three feed stocks namely; poultry droppings, parthenium and eucalyptus leaves and to optimise these feed stocks with donkey dung combination for quality and quantity of biogas production. The experiments were conducted in two stages. In the first stage of investigation, the prototype digesters of 75 litre capacity of three different height to diameter ratios of 1:0.5, 1:1 and 1:1.7 were designed and fed with above feed stocks at 3:1 proportion (donkey dung : substrate) and compared with three digesters of equal size (1:0.5, 1:1 and 1:1.7) fed with 100 per cent donkey dung as control for a retention period of 56 days under batch fed system. The results revealed that a total gas production of 400.61, 350.99 and 320.35 litres were recorded in 1:1.7, 1:1 and 1:0.5 size (H/D) digesters fed with poultry droppings. In parthenium, these values were 242.57, 232.68 and 216.39 litres and 254.61, 230.71 and 217.96 litres respectively in eucalyptus leaves.

While in control treatment of donkey dung, these values were 261.11, 244.47 and 233.10 litres respectively. The average percentage of methane content in 1:0.5, 1:1 and 1:1.7 size (H/D) digesters fed with poultry droppings were 58.13, 49.61 and 54.28 and 43.95, 43.35 and 44.88 respectively in parthenium. The corresponding values in eucalyptus leaves were 43.60, 48.70 and 51.69 per cent and 47.44, 46.21 and 47.78 per cent respectively in control treatment of donkey dung. In the second stage of experiment, a pilot size floating drum type biogas plant of 0.5 m<sup>3</sup> capacity was designed, developed and evaluated for the optimised feed stock of poultry droppings and donkey dung combination. A total gas production of 9341.2 litres (3754 m<sup>3</sup>/m<sup>3</sup>) and N, P, K values of 2.43, 0.85 and 0.72 per cent respectively were observed in digested slurry during 42 days of retention period. The average percentage of methane content was 61.52. The benefit cost ratio of pilot size biogas plant worked out to 1.45:1.

### AGRICULTURAL ECONOMICS

#### Production and Marketing of Wheat in Northern Karnataka - An Economic Analysis

DAWIT LEGESSE

2000

MAJOR ADVISOR : Dr. H.BASAVARAJA

The growth and instability of wheat production were examined in Karnataka state. The cost of production, resource productivity and marketing aspects of wheat were analysed for Dharwad district.

Exponential growth model, coefficient of variation, decomposition analysis and tabular analysis were employed to analyse the data.

The results showed that the higher negative growth rate in area (-3.82%) was mainly responsible for the decrease in production during 1980's but during the 1990's, the reverse was happened due to high growth in area (3.47%) and a modest growth in yield (1.2%). The change in mean yield was found to be a major contributor to the change in mean production at the state level. The variance in wheat production during the recent years has been brought by the change in mean productivity (133.48%). The change in yield variance

(-58.19%) and change in mean area (-24.65%) were found to reduce the wheat production variance. The analysis of the cost and returns showed that the major item of cost incurred by the farmers was the expenditure made on labour (27.76%). The economics of scale observed in the use of inputs in the case of large farmers. The resource productivity analysis indicated that bullock labour, land and fertilizer showed relatively significant contribution to crop output. Marketing analysis revealed that transportation cost was the major component of the total marketing cost. The producer's share in consumers rupee was more when the produce was disposed through regulated markets.

Hence, production and marketing performance of wheat could be improved by evolving wheat varieties resistance to drought condition, providing better Prices to Wheat, educating the producers on the optimal use of inputs, Intervention of the co-operative marketing societies or regulated markets.

**Economics of Sorghum Production in North Karnataka**

MENTESNOT LEGESSE

2000

MAJOR ADVISOR : Dr.G.K. HIREMATH

The present study investigated the pattern of growth, instability, resource productivity and the economic benefits of sorghum production in Karnataka state. This study was mainly concerned with a quantitative assessment of the farm economic performance of rainfed sorghum under different technologies during kharif season of 1999-2000 in Dharwad and Bellary districts of north Karnataka .

The study period was divided in to two: period-I (1961-62 to 1976-77) and period-II (1977-78 to 1996-97). In the first period the growth rate of yield was substantially higher which offset the decline in area while both area and yield showed a modest increase in the second period. The increase in average production in the State as a whole was predominantly due to the change in mean yield. The changes in yield variance and area variance were the two main components of total change in the variance of sorghum production in the state in which the former contributed to instability while the latter was component for stability.

The study revealed that hybrid sorghum growers incurred a total cost of cultivation of about Rs.10,043 per hectare which was higher by about 8.8 per cent than that of traditional sorghum growers. The gross returns realized per hectare from hybrid sorghum was more by 16.8 per cent than that from traditional varieties. Moreover, this hybrid growing farmers realised about 36 per cent more net return per hectare than farmers growing traditional varieties. The net return per quintal of output was higher by 21.4 per cent in traditional category farms than hybrid farms.

The predicted technical efficiencies using stochastic frontier for hybrid farms ranged from 0.433 to 1.000, with mean technical efficiency of 0.774 whereas for the farmers growing traditional varieties the range was from 0.356 to 0.997, with the mean estimated to be 0.726. Hybrid farms had higher technical efficiency than traditional variety farms, relative to their respective frontiers associated with the different technologies.

**Economic Impact of Irrigation on Crop Production in Malprabha Command Area - A Temporal Analysis**

ZENEBE ABRAHA

2000

MAJOR ADVISOR : Dr. L. B. KUNNAL

The present study aims at evaluating the economic impact of irrigation on crop production at two points of time and in different locations of the canal command of Malprabha Irrigation Project in Karnataka. The results of the study are compared with those found by Koppad for the agriculture year 1991-92. The data were collected for the agriculture year 1998-99 through survey method from 120 farmers, 40 each from head, mid and tail reaches. The techniques of tabular analysis, concordance coefficient test and functional analyses were employed for analysis of the data. The overall growth rate of irrigated area under maize, wheat and chickpea turned out to be significant in all the four taluks (except for wheat in Hubli) ranging from 7.82 to 46.6 per cent. The growth of irrigated area under cotton had declined over the years but growth of total area under the crop was positive. There was no significant shift in the cropping pattern during the two periods

and the overall period as indicated by the values of the coefficient of concordance. The overall cropping intensity-II declined from 172.36 per cent in 1991-92 to 137.83 per cent in 1998-99. The gap was wider in the mid and tail reaches. It was observed that in all the locations of the canal command there was decline in yield between the two years. The overall benefit-cost ratios, during 1991-92, for cotton (2.65) and maize-wheat (2.06) systems were significantly higher than those during 1998-99 (1.40 and 1.48, respectively). Resources such as land, seed, fertilizers and manures were used less efficiently during 1998-99 compared to 1991-92. The results for technical efficiency showed that there existed a scope to expand production if farmers could efficiently utilize their available resources with the given technology. Inadequate water availability was the major problem faced by the farmers especially at the tail reach.

## *Abstract of Theses*

### **Growth and Instability of Oilseeds Production in Karnataka (India)**

**ADDISU TADEGE**

**2000**

**MAJOR ADVISOR : Dr. S. M. MUNDINAMANI**

The growth performance of major oilseed crops viz., groundnut, sunflower, safflower and sesamum were examined in terms of area, productivity and production in major oilseed producing districts of Karnataka State. The production instability and the factors determining the area and yield of these crops were analysed.

The study utilized time series data. The statistical techniques namely, exponential growth function, decomposition analysis and regression analysis were employed.

The results revealed that in case of groundnut Tumkur, Kolar and Chitradurga districts registered significant growth both in area and production, whereas, productivity performance of this crop was not encouraging in all the cases except Dharwad. Kolar and Belgaum districts which recorded a growth rate of more than one per cent during the overall period. Safflower and sesamum experienced an impressive growth in all variables in the first period through there was a deceleration

in recent years. Sunflower registered a galloping growth of area and production across all the study districts whereas, its productivity has been decelerating rapidly. Groundnut and safflower production was destabilized mainly due to changes in area variance whereas, for sunflower and sesamum the change in yield variance was the major source of instability. Among the price and non-price factors irrigation, relative prices, rainfall and labour wages showed significant impact on area and yield of oilseeds.

Based on the findings of the study it would be concluded that the productivity of oilseeds should be stepped up through appropriate yield raising measures. The attain growth and stability on oilseeds production, area and yield variables have to be controlled through appropriate corrective measures. Special incentives and measures should also be adopted to increase irrigated area under oilseeds.

### **Supply Response of Maize in Karnataka State – An Econometric Analysis**

**MESFIN AREGA**

**2000**

**MAJOR ADVISOR : Dr. S.B. HOSAMANI**

The supply response of maize in Karnataka State was studied to evaluate the impact of relative price and selected non-price factors and to analyse the short and long-run price elasticities.

Six major maize growing districts of the State namely, Belgaum, Bellary, Bijapur, Chitradurga, Dharwad and Mysore were selected. The Nerlovian Price Expectation-cum-Area Adjustment Model was adopted.

The results indicated that relative price factor had positive and significant bearing on hectareage of maize in none of the selected districts but at the State level. Districts viz., Belgaum and Bijapur evidenced significant negative impact of price on hectareage of maize. There was a side difference between the magnitudes of short and long-run price elasticities except in the case of Bijapur district. The estimated price elasticities of hectareage generally showed inelastic nature of hectareage response of maize.

The parameter of the relative price variable was positive and significant in Bijapur district, but had negative

impact on yield of maize in Dharwad district and at the State level. The price elasticities of yield in the selected districts and in the State as a whole are low in magnitude and inelastic in nature.

A positive and significant impact of price factor on maize production was observed in Bijapur district while exactly opposite phenomenon was found in Belgaum district. In all other cases the impact of this variable emerged to be non-significant. The short-run elasticities of production of maize showed positive price response of farmers in Bellary, Bijapur and Chitadurga districts as well as State as a whole.

The maize growing farmers of the State in general were more responsive to the non-price factors viz., irrigation and rainfall variables compared to the price factor.

Hence, the on-going policy measures should be directed towards assuring appropriate remunerative prices to the maize producers of the State so as to commercialize the crop.

**AGRICULTURAL MARKETING AND AGRI BUSINESS MANAGEMENT**

**Management of Fertilizer Distribution A Case of KAIC Dharwad District**

K.M. DAKHANI

2000

MAJOR ADVISOR : Dr. H.S. VIJAYKUMAR

To analyse the efficiency of procurement of agricultural inputs in terms of cost and distribution and to suggest the ways to improve the performance of the organisation, Karnataka Agro-industries Corporation (Agro-input division) in Dharwad district was selected for the study. Primary and secondary sources of data were utilised for the study. The data pertains to the period 1995-96 to 1996-97.

KAIC procures 6767 tonnes of fertilizer by incurring a cost of Rs.4.86,659 in procurement but it can adopt the minimum cost routes as suggested in suggested procurement schedule and save about Rs.37,128. The sensitivity analysis was carried out by assuming that KAIC is going to supply the whole demand for fertilizer of a district.

The storage cost was found to be highest at Haveri and lowest at Navalgund agrokindra, because Navalgund agrokindra was actively engaged in sale of seeds and PPC. The lowest unit storage cost of fertilizer of Rs.15.28 per tonne was seen at Haveri and the highest of Rs.28.12 per tonne at Mundargi because of the turnover that agrokindra could achieve.

In organisation structure it was found that there is a need for one assistant to be posted at agrokindra and delegation of power to purchase directly from input supply firm.

Among the taluks Haveri agrokindra had lion share of 79.02 per cent in the sale of fertilizer followed by Dharwad (57.30 per cent). Navalgund agrokindra ranked first in the sale of seeds while Shiggaon stood first in the sale of PPC among the agrokindras.

The total margin earned amounted to of Rs.1.911 Lakhs and Rs.1.586 Lakhs at Hubli and Haveri agrokindras respectively, while the lowest margin of Rs.0.537 Lakhs was found at Hangal. The gross profit earned by Navalgund agrokindra was highest (Rs.0.891 Lakhs), followed by Hubli agrokindra (Rs.0.793 Lakhs). Gross profit was earned at six agrokindras namely Navalgund, Hubli, Dharwad, Mundargi, Haveri and Shiggaon while the four agrokindra namely Ranebennur, Hanagal, Naragund and Gadag incurred losses in the distribution of inputs.

**Business Performance Evaluation of Karnataka Horticultural Producers' Co-operative Marketing and Export Society Limited, Hubli**

RAJU NAIK

2000

MAJOR ADVISOR : Dr. L. K. WADER

The Karnataka Horticultural Producers Co-operative Marketing and Export Society was established in 1995 and it has increased its area of operation and volume of business. Both primary and secondary data were collected through annual reports of society for the period 1995-96 to 1997-98. The data collected were analysed by financial ratios, correlation, price spread and tabular analyses.

The membership of society and financial indicators showed increasing trend over the years. Whereas purchases and sales increased in the first two years, decreased during 1997-98 Net profit was found to be negative and inventory was nil during initial 2 Years.

The solvency ratios such as total liabilities to owned funds was greater than unity over the year. The ratio of fixed assets to owned fund increased over the years due to rise in owned funds. The debt equity ratio fluctuated over the years. The liquid ratio increased from first Year to second and declined in third year. The increase in liquid assets to total assets is healthy sign where as current ratio declined over the year. The profitability ratio was negative. The turnover in relation to working capital has registered decreasing trend. Other indicators, efficiency of capital ratio showed fluctuating trend, whereas networth was positive in the initial year and it was negative subsequent years.

## *Abstract of Theses*

Eyesight grading was followed for grading of fruits and vegetables. The grade price relationship showed that higher the quality greater the price and vice-versa. In channel-I there were more intermediaries in selling the commodity.

whereas in channel-II and channel-III only society acted as intermediary between producer and consumer. and the price spread of fruits and vegetables was 40 and 10 per respectively.

### **A Study on Marketing Management in Edible Oil in Regional Oilseeds Growers Co-operative Societies Union Limited, Raichur**

MOHAMMED YUSUF

2000

MAJOR ADVISOR : Dr L.K. WADER

Investigation was conducted to study the marketing management in edible oil of the union. The primary data were collected by discussion with personnels and personal observations. Secondary data were obtained from the annual reports and records of the union. The data were analysed using tabular and various statistical techniques.

The quantity of sunflower seeds procured by the union in the project area was maximum (54.89%) followed by groundnut and safflower seeds. The union crushed only 51.35 per cent of oilseeds over the study period. The average share of oil seeds procurement by the union over the study period was just 0.85 per cent to the total quantity of oil seeds produced / marketed surplus in the project area. The capacity utilization of oil mills/expellers, solvent extraction and refinery plants were used to a maximum of 22.32 per cent, 13.34 per cent and 6.25 per cent, respectively. The groundnut oil alone constituted 94.87 per cent of the total oil consumption. As per 1991 census, 78.27 per cent of the total population, consumed only 24.73 per cent of oil by the rural market and the urban market which consisted of only 21.73 per cent of the total population consumed 75.27 per cent of oil to the total oil consumption.

The groundnut oil positioned at higher quality and at higher price by the union and vice versa in sunflower oil than competitors.

It is implied that if strictly cost reduction measures followed by the Union at least at par with the competitors in over heads in pricing system for a quintal of oilseeds, can quote more price Rs.18.76 in tender at APMC yard than Competitor-II and less Rs.8.19 than Competitor-I. If proposed Union gate procurement concept, is introduced by the Union shall announce Rs.143.25 comparatively more than existing pricing system without affecting the percentage of its margin. The seasonal indices of either groundnut and sunflower prices were found to be maximum in the month of August. The sales promotion measures adopted by the union did not increase the sales realization. The institutional channel was not followed by the Union. The Union is dealing through divisional offices in rural areas. Stockists' commission was not paid by the Union at par with Competitors. The main problems faced by the union were lack of working capital, strong competition in procurement of oilseeds and geographical disadvantages.

### **Evaluation of Ayurvedic Medicine Processing Units in Uttara Kannada District (Karnataka)**

K. KAVITHA

2000

MAJOR ADVISOR : Dr.H.S.S. KHAN

In the present day context, it can be stated that Ayurveda is very much alive and is a unique system of medicine widely practiced in Hindustan peninsula. In recent years, it has attracted much attention in the economically developed countries such as (of) Europe, USA and Japan.

The present study was aimed to assess the performance of Ayurvedic medicine processing units in Uttara

Kannada district (Karnataka). The objectives were to document the agro-processing units/industries in Uttara Kannada district, to study the investment pattern organisation structure, procurement and processing cost, cost and return structure, marketing channels and costs, business performance and the problems faced by the Ayurvedic medicine processing industry. Tabular analysis, business ratios and comparative rating method were employed to analyse the above objective. The

fixed capital investment was high on buildings and land. The quantity of raw materials procured by all the three units was more through pattern-II (dealers i.e., 2,255.50 kg, 2,654.50 kg and 4,572.91 kg, respectively) and the transport and handling charges were higher (63.07 per cent in unit-I and 66.75 per cent in unit-III). All the three units revealed the higher requirement for packing material cost (85.48 per cent in unit-I, 67.33 per cent in unit-II and 78.12 per cent in unit-III). The cost of production of Ayurvedic medicines was high in unit-I (Rs.46,801.83) followed by unit-III (Rs.40,736.2) and unit-II (Rs.21,296.70), in which the cost of processing per batch of each product was observed to be high. The profit

gained at an overall level by unit-I, unit-II and unit III was in the order of Rs.0.76, Rs.0.90 and Rs.0.56 respectively on an every rupee of investment. Except Unit-I, other two units marketed their products through their hospitals. The cost of marketing through dealers was highest due to the high commission charges (5%) and sales tax paid by the units.

The competition that exists in the market and the tax levied on the raw materials and finished products were considered to be the prioritized problems in Ayurvedic medicine processing industry.

### **Management of Cotton Ginning and Pressing Industries in Bellary District**

S. SHIVAKUMAR

2000

MAJOR ADVISOR : J. S. SONNAD

Cotton is the most important fibre crop in the world. India currently produces 132.80 lakh bales (1998-99) of cotton and the demand in 2020 is expected to be around 240 lakh bales. The Ginning and Pressing of cotton is important for value addition to the produce, as the spinning mills accept cotton only after ginning and pressing.

Indian ginning industry is very large in size and is spread over a large area in cotton growing states. A number of surveys and improvement plans have been chalked out for the improvement of ginning industry, but owing to its size and nature, the implementation has not been materialised. So a critical study will be of immense use in knowing the strong and weak points in processing and marketing. Therefore, this study intended to examine managerial aspects of cotton processing units.

Fifteen ginning units and fifteen ginning and pressing units in Bellary district of Karnataka were selected. Further, they were categorised into small and large based on their

installed capacity. The primary data was collected for the year 1998-99.

The investment in both category of ginning and ginning and pressing units is financially feasible and economically viable. The average per quintal total cost of ginning, ginning and pressing was Rs.2631.62 and Rs.2639.79 respectively. The average value added by ginning activity was Rs.753.74 per quintal of cotton ginned and that by ginning and pressing activity was Rs.859.28 per quintal of cotton ginned and pressed. The marketing cost per quintal of ginned cotton was high when the produce was sold through channel-II (Rs.374.82) and it was also true for ginned and pressed cotton (Rs.384.77). Taxes and transport charges accounted for Rs.275.10 and Rs.102.17 each in the total cost of marketing.

The analysis of financial ratios revealed that the large units in both the types were more efficient than small units. Problems regarding repairs and maintenance was the major problem as revealed by most of the processors (86.60%).

## Abstract of Theses

### VETERINARY SCIENCE

#### Study on Common Affections of Eye in Large Ruminants in Relation of Eye in Large Ruminants in Relation to There Treatment

CHANDRASHEKHARAGOURA V. DHARANAPPA

2000

MAJOR ADVISOR : Dr. SHIRVASHENKAR M. USTURAGE

A clinical study was undertaken in ruminants to find out an overall incidence of eye disorders, incidence of specific eye disorders and to evaluate etiology, clinical signs, diagnosis and effective surgical technique for commonly occurring eye disorders. As a first part of the study, the incidence of eye disorders in ruminants was studied by analysing total surgical disorders presented at surgical clinic of Veterinary Hospital, Veterinary College, Bidar during the year 1995-1999. The Overall incidence of eye disorders was found to be 5.36 % when compared with total surgical disorders presented during the period of five years. The incidence of eye disorders in bovines (4.88 %) was comparatively higher than caprines (0.32%) and ovines (0.16 %). The incidence of specific eye disorders was found to be 18.02% for corneal opacity, 17.16% for neoplasms of eye and 17.17% for miscellaneous conditions.

In the second part, a total of 76 clinical cases of eye disorders were studied during December 1997 to December 1999. These included neoplasms of eye (22 animals), corneal

opacity (22 animals), corneal ulcer (9 animals), corneal rupture (9 animals) and sub conjunctival abscess (14 animals). The growths on eye ranged from small lesions to extensive invasions. The smaller growths were effectively treated by surgical excision and cauterization followed by immunotherapy to protect the vision as normal as possible. The large and invasive growth which the blindness was complete, extirpation of eye undertaken without any problems of infection or reoccurrence. For corneal ulcers, cauterization followed by eye lid flap was found suitable. For corneal opacity sub conjunctival injections of gentamicin and dexamethazone were found useful. For corneal rupture, chromic catgut no.5.0 was found as a satisfactory suture material. Vision was also restored in few animals following the treatment of corneal rupture. In sub conjunctival abscess, *streptococci*, *E.coli* were predominant and responded well to gentamycin and ciprofloxacin administration followed by surgical drainage.

#### Therapeutic Management of Repeat Breeding in Bovines Using Gonadotrophin Releasing Hormone

MAHESH S. DODAMANI

2000

MAJOR ADVISOR : SURESH S. HONNAPPAGOL

Thirty HF X JR cross bred repeat breeder cows were randomly allocated into 5 groups of six each. The animals of groups I, II, III and IV were injected with 250 µg of a synthetic analogue of Gn RH (Receptal®) on two occasions once on estrus and at days 10, 12, 14 and 16, respectively following breeding at 12 and 24 hours of the detected estrus, while the animals of groups V served as control that received the placebo injection of normal saline similar to that of treatment groups.

Among the physical characters of estrual cervico-vaginal mucus, typical arborization pattern (80.95 percent in pregnant vs 55.56 percent in non-pregnant animals) and marginally high spinnbarkeit readings ( $24.67 \pm 2.7$  cms in pregnant and  $22.21 \pm 1.32$  cms in non-pregnant animals)

favoured better fertility, although the differences between the groups were statistically insignificant. However, the pH of estrual cervico-vaginal mucus did not indicate any bearing on fertility and it ranged between 8.00 to 9.00

The animals of treatment groups I, II and III registered a considerably higher conception rate of 83.33 percent each, while the treatment group IV exhibited a conception rate of 66.67 per cent and the placebo control group animals had only 33.33 per cent conception rate. The Gn RH therapy irrespective of the groups resulted in an overall conception rate of 79.17 per cent as against 33.33 per cent in control group of animals

AGRICULTURAL STATISTICS

Development of Empirical Crop Loss Models in Groundnut (*Arachis hypogaea* L.)  
Affected by Late Leafspot and Rust

K.P. CHANDRAN

2000

MAJOR ADVISOR : K.V. ASHALATHA

In the present study, an attempt was made to have an insight into the yield loss mechanism in groundnut (*Arachis hypogaea* L.) in presence of the fungal diseases viz., late leafspot and rust. Analysis of variance of yield and disease variables, revealed that there existed significant variations among the genotypes under study, both for yield potential and response to diseases. Moreover, disease severity was more in late sown trial and thus low yield, as compared to the early sown trial.

Simple linear regression models of yield loss on disease variable at each stage, revealed that in early sown trial for pod, kernel and fodder loss, disease at 85<sup>th</sup> day after sowing (DAS) was having more explanatory value compared to other stages, while it was 65<sup>th</sup> DAS for oil loss (based on  $r^2$ ). In late sown trial, explanatory value of the models were low, comparatively and better results were obtained with

disease at 95<sup>th</sup> DAS for all yield loss variables. AUDPC models, polynomial and non linear models could not explain the variations in yield loss more precisely than the models with single point disease variables. Multiple point linear regression models of yield loss on disease at different stages taken together, improved the explanatory value, but could not explain the variation precisely.

Stepwise regression analysis on disease variable and physiological traits like leaf area index, harvest index, partitioning coefficient and growth rates improved the  $R^2$  value of the models considerably, both in early and late sown trials. Grouping of genotypes with pod loss and disease variables using Mahalanobis  $D^2$  showed similar results in both trials, where variety TAG 24, which show moderate yield loss even at high disease severity, was grouped separately.

FORESTRY

Provenance Variation for Fruit, Seed and Seedling Traits in *Albizia lebbek* L. (Benth.) from Karnataka

M.A. HASEEB

2000

MAJOR ADVISOR : R. VASUDEVA

Twelve sources of *Albizia lebbek* from diverse bioclimatic zones of Karnataka, were evaluated for pod, seed and seedling parameters. Geographic sources differed significantly for all pod, seed, and seedling traits. Pods of Mysore provenance were longest, widest and had higher mass but seeds showed lowest germination (6.66%). Maximum germination (30.67%) and shoot length (5.85 cm) were found in Bidar collections. Seedlings from Dharwad source exhibited higher number of leaves, higher shoot dry weight and moderate Shoot Vigour Index (SVI).

The CV was highest for germination value (129.16%), and lowest for test weight (16.48%). Among seedling traits, CV was highest for RVI (46.80%). Broad sense heritability was highest for number of leaves / plant (0.795) and lowest for root dry weight per plant (0.20), the genetic gain was highest for peak germination value (65.93%).

Pods with longer length, width and weight possessed higher test weight and weight of good seeds. Genotypes with higher germination possessed higher root length, shoot length and more number of leaves. Similarly, the seed sources with higher test weight produced longer roots, more number of leaves and higher shoot mass. This suggests that vigour expressed during seed germination may translate into higher biomass. Hence germination percentage can be relayed for selection of seedling height.

Many pod traits strongly responded to rainfall than to any other geoclimatic feature. Seed germination, collar diameter and shoot dry weights were positively associated with mean annual rainfall. Principal Component Analysis identified that SVI, per cent seed germination and RVI contributed maximum to the divergence of the populations (66.53%). Based upon the fruit, seed and seedlings traits seven broad provenances of *Albizia lebbek* were identified, perhaps for the first time in Karnataka.



## Abstract of Theses

### Clonal Variation for Reproductive Traits in a Teak (*Tectona grandis* Linn. F.) Seed Orchard

M. HANUMANTHA

2000

MAJOR ADVISOR : Dr.R. VASUDEVA

Three rametes each of eight teak clones derived from two provenances were evaluated for floral, fecundity and fruit traits in a clonal seed orchard established at Manchikere in Yellapura forest division to elucidate genetic reasons, if any, for the lower fruit production among clonal seed orchards. For all the reproductive traits considered, inter-clonal variation was found significant suggesting a strong genetic basis. The intra-clonal variation was negligible except for seed to ovule ratio in fruits. Clones from southern provenance had larger flowers and produced larger pollen grains compared to those from north. The coefficient of variation was highest for number of pollen grains per stigma (42.24%) and lowest for pollen diameter (1.89%). Broad sense heritability was highest for flower stalk length, number of fruits/ inflorescence (0.99) and lowest for late ovule abortion (0.163). The genetic gain was highest for flower stalk length (104.26%).

Significant positive association between floral diameter and fruit set per cent indicated that selection for larger flowers may result in higher fruit production. Negative association between age of the ortet and pollen viability of the rametes derived from them, supported the genetic load hypothesis. This strongly indicated that while establishing a clonal seed orchard, the clonal material should be derived from relatively young-aged plus trees. Among fecundity traits, pre-emergent reproductive success was significantly and positively associated with number of fruits/inflorescence. Differences in pollen viability, vigour and seed production among the clones may contribute to non-random mating in the seed orchard and skew the parental balance thereby altering the genetic gain. Perhaps this is the first evidence among the teak orchards of India, which suggests fact that yearly evaluation of pollen viability and fruit production are most important in order to estimate the genetic gain more robustly.

## HOME SCIENCE EXTENSION EDUCATION

### A Study on Impact of Training on Selected Home Science Technologies

NIRMALA CHIKKANNAVAR

2000

MAJOR ADVISOR : UMA S. GAVIMATH

A study on impact of training on selected home science technologies was conducted in the year 1999-2000 in five villages of Dharwad taluk with a sample of 125 rural women who had undergone training on tailoring, agarbatti-making and candle making conducted by the College of Rural Home Science, Dharwad, during 1998-99 were personally interviewed and collected data on their knowledge level, extent of adoption and constraints in adoption of these technologies by using pretested schedule.

Results revealed that majority of the respondents of tailoring (42.85%) belonged to high level knowledge category. They had appropriate knowledge about drafting on wrong side (91.43%) and washing the cotton fabrics before drafting (88.57%). In case of agarbatti-making 43.75 per cent of respondents belonged to high level knowledge category and had appropriate knowledge about use of bamboo sticks (89.58%) and drying of agarbatti in shade (87.80%). More than

fifty per cent of the respondents of candle making belonged to medium level of knowledge category and they had appropriate knowledge about the use of metal mould for candle making (97.62%) and smearing of the mould with coconut and groundnut oil (88.10%).

A higher per cent of respondents of tailoring (42.82%) belonged to high level of adoption category and adopted construction of cloth in warpwise (71.43%). Majority of respondents (56.25%) of agarbatti-making belonged to low level adoption category. In case of candle-making adoption was nil.

Age, annual income and occupation of the respondents were significantly associated with the knowledge of tailoring, whereas extension contact was significantly associated with the knowledge of candle making. None of the

variables studied were associated with the knowledge of agarbatti-making. Adoption of tailoring was significantly associated with family income. Family type, occupation and extension contact of the respondents exhibited significant association with adoption of agarbatti-making.

Majority of rural women expressed lack of financial assistance as major constraint in adoption of tailoring. Non-availability of raw materials, marketing facilities, financial assistance, lack of human resource were the major constraints in adoption of agarbatti and candle-making.

## **TEXTILE AND CLOTHING**

### **Hand Woven Tufted Carpets of Mundgod**

SANDHYA P. BHAT

2000

MAJOR ADVISOR : Dr. GEETA MAHALE

The present investigation was undertaken during the year 2000 in Tibetan settlement of Mundgod taluk of Uttara Kannada district with the objectives to study the origin of Tibetan carpets, to enumerate the technique of making tufted carpets, their special features and economic analysis of production of tufted carpets. The whole population was taken as sample i.e. 30 women, 15 each (Tibetans and Non-tibetans) were purposively selected, who employed in two carpet weaving centres run by Tibetan co-operative society. The respondents were interviewed personally. The results revealed that nearly eighty per cent of the Tibetan weavers belonged to middle age group. Majority of Tibetan weavers were belonged to high

income group and Non-tibetan weavers belonged to low income group. Tibetan and Non-tibetan weavers derived their income from Agriculture. Both the co-operative societies purchased raw materials from producers on cash payment. Two co-operative societies produced carpets of different dimensions with animal, bird, floral and religious motifs having different colour combinations. Lack of publicity and advertisement was the major problem faced by the societies while merchandising the products. In the total cost of production, the contribution of variable cost was highest and net profits in hand woven tufted carpets were found to be very low.

### **Handloom Cotton Textiles of Dharwad District**

SUNITA G. SHEJWADKAR

2000

MAJOR ADVISOR : Dr. GEETA MAHALE

The present study was conducted in Dharwad district of Karnataka state during 2000 with the objectives to know the origin of different handloom cotton textiles, to identify prevailing weaving techniques, to work out economics of weaving and to study the marketing channels for handloom cotton textiles. The sample comprised of 120 weavers selected randomly from four villages of Dharwad district namely, Garag, Hebballi, Hebatur and Uppin Betageri. The respondents were interviewed personally. The results revealed that about 75 per cent of the weavers were working in co-operative societies and 25 per cent of the weavers were working independently. Majority of the weavers had education up to primary level and belonged to nuclear family having medium annual income. About 61.62 per cent of weavers selected weaving due to lack of job opportunities. All the co-operative societies purchased

raw material from KVIC and independent weavers purchased from local dealers. Majority of the independent weavers engaged in the production of chawali. Most of the independent weavers obtained their designs from elder people and two co-operative societies obtained their designs from KVIC. All the co-operative societies and independent weavers faced the problem of delay in transportation while procuring raw material and they sold their product in show room and outside state. Most of the independent weavers sold their goods in their own residence and doing door to door service. It was observed that all the three co-operative societies sold their product monthly. About 80.00 per cent of the independent weavers sold their product on market day. All the three co-operative societies sold their goods to wholesalers. None of them sold to middlemen.