

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

Doctor of Philosophy

AGRICULTURAL MICROBIOLOGY

Studies on the Seed Borne Nature of *Azotobacter chroococcum* in Wheat (*Triticum durum* L. and *Triticum aestivum* L.), in relation to its Movement in Plant System, Survival in Soil, Production of Growth Hormones and Biological Nitrogen Fixation

C.M. THIPPANNAVAR

1996

MAJOR ADVISOR : Dr. J.H. KULKARNI

Occurance of *Azotobacter chroococcum* was recorded in seeds of two species of wheat viz., *Triticum durum* L. and *Triticum aestivum* L. It occurred both on the surface of of unsterilized seeds and also within the seeds as demonstrated by the growth around the sterilized seeds in a nitrogen free medium. Variation in the percentage occurrence of seeds harbouring *Azotobacter* ranged between 0.1 to 20.5 per cent. Further seedlings raised aseptically also demonstrated the occurrence of bacterial including *A. chroococcum* in different parts of the plant. The seed born *Azotobacter* was found to migrate to shoot through internodal region. In another experiment movement of seed inoculated with *Azotobacter* indicated that it moved from the seed to different parts of the plant including seed. The

occurrence of antibiotic resistant *Azotobacter* was upto 50 per cent in four genotypes of wheat. The survival ability of *Azotobacter* demonstrated that its population declined with the period of incubation. The study also indicated that seed borne *Azotobacter* could survive better than soil *Azotobacter*. In pure culture studies the different isolates of *A. Chroococcum* fixed nitrogen from 3.92 to 20.26 mg N/g glucose utilized on three weeks of incubation. Similarly, the indole acetic acid produced also ranged 1.20 to 4.53 ug of IAA equivalent/ml of culture filtrate. Inoculation of *Azotobacter* to wheat seeds improved seed germination over uninoculated control. The inoculation also helped in increasing the dry matter and plant height.

AGRICULTURAL CHEMISTRY AND SOIL SCIENCE

Dynamics of Earthworm - Soil - Plant - Relationship in Semiarid Tropics

R.B. PAWAR

1996

MAJOR ADVISOR : Dr. C.V. PATIL

An investigation on the "Dynamics of earthworm (*Eudrilus eugeniae*), soil-plant relationship in semiarid tropics", was carried out at College of Agriculture, Raichur during 1994-95. Laboratory incubation studies were conducted to evaluate the effect of various physico-chemical conditions in the soil environment on the survival and growth of earthworm

and their role in soil biotechnology. Two field experiments were conducted, to assess the fertilizer quality of vermicompost and its effect on growth and yield of hybrid maize (Cv. Deccan-103) and soil properties; to suggest the management strategies that will enable to promote earthworm activity and increase the productivity of maize and improve soil properties.

Both the experiments were laid out in split-plot design with three replications.

The optimum conditions for maximum survival, growth rate and biomass production of earthworm are soil moisture content of 79.59 per cent, pH, of 6.5 to 7.5, soil salinity of 1.75 to 3.00 dSm⁻¹ and soil temperature of 20 to 25° C. Mulching crop residues like sunnhemp stalks/paddy straw served as better sources of energy for the growth, reproduction and activity of earthworms and improved the availability of nutrients in soil.

Application of organic manures in combination with inorganic NPK fertilizers increased the

productivity of maize besides sustaining soil fertility status. The maximum net returns from maize are realized with the application of vermicompost @ 5.0 t ha⁻¹ along with only 50 per cent RDF.

Introduction of earthworms into soil increased the productivity of maize crop besides improving soil physical conditions, nutrient availability and biological activity of soil. The maximum yield of maize could be achieved by practicing *in situ* vermiculture with mulching and addition of 100 per cent RDF. However, the maximum net returns from maize are realized due to *in situ* vermiculture with mulching treatment but receiving only 50 per cent RDF.

AGRICULTURAL ENTOMOLOGY

Ecotoxicology of Tobacco Aphid, *Myzus nicotianae* Blackman

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1996

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Investigations were undertaken at the Agricultural Research Station, Nippani during 1993-94 and 1994-95. Imidacloprid plant hole treatment (PHT) @ g a.i./ ha and acephate (0.075%) proved to be highly effective in suppressing aphid population. Imidacloprid PHT not only increased leaf yield, but also improved the quality of tobacco by increasing nicotine content and thus reducing sugar/nicotine ratio. Among the botanicals, neem oil (1%) was promising followed by cotton seed oil (1%). Highest benefit was reaped from acephate (1:12.09) followed by oxydemeton methyl (1:10.69). Botanicals were relatively safe and among synthetic insecticides, oxydemeton methyl and carbosulfan were relatively less toxic to predatory beetle, *Menochilus sexmaculatus*.

Evaluation of insecticides for their efficacy through seedling root dip and PHT revealed that imidacloprid PHT @ 40 g a.i./ha followed by single spray of acephate (0.075%) at 85 to 90 days was most promising to the target pest. Imidacloprid PHT had a good phytotonic action on tobacco plants.

Residual toxicity studies indicated that imidacloprid PHT was the most persistent to aphids

followed by acephate. Intrinsic toxicity of insecticides to grubs and adults of *M. sexmaculatus* was in the order: imidacloprid > acephate > oxydemeton methyl > endosulfan. Considering selectivity ratio, endosulfan appeared to be more ecofriendly. Oxydemeton methyl was safe to *M. sexmaculatus* after five days while acephate, imidacloprid and carbosulfan proved to be detrimental upto 10 days of application.

Tobacco aphid reared on chilli exhibited greater tolerance to oxydemeton methyl and acephate than on tobacco. Sensitivity assessment revealed that *M. nicotianae* has lost the sensitivity to some extent to oxydemeton methyl and dimethoate in heavy pesticide usage area vis-a-vis low pesticide usage area. After six generations of continuous selection to oxydemeton methyl *M. nicotianae* showed 1.42 fold resistance in the 7th generation.

Studies on IPM revealed that desuckering + imidacloprid PHT afforded best protection to tobacco and registered highest yield. However, release of *Chrysoperla* was found to be ineffective against *M. nicotianae* to tobacco ecosystem.

CROP PHYSIOLOGY

Physiological Indices for High Yield and Improving Yield Potential in *rabi* Sorghum (*Sorghum bicolor* (L.) Moench)

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1996

MAJOR ADVISOR : Dr. M.B. CHETTI

Field experiments were conducted during *rabi* seasons of 1993-94 and 1994-95 to find out the physiological indices contributed for higher productivity and the possibility of increasing yield potential by the foliar application of ethanol in sorghum genotypes. Investigations were carried out at College of Agriculture, University of Agricultural Sciences, Dharwad on medium black soil under rainfed conditions. One experiment was laid out in randomised block design with two genotypes and eight ethanol concentrations and control. The crop was sprayed with ethanol at 75 DAS.

Among the genotypes, RS-29 (62.8 q ha⁻¹) and 9-13 (57.4 q ha⁻¹) recorded significantly higher grain yield and higher dry matter distribution in earhead. The SLA indicted a dominant role as compared to SLW and the grain yield was more dependant on LAR and CGR rather than NAR. Maintenance of higher RWC and low leaf temperature despite high stomatal resistance and

low transpiration rate was observed in RS-29. This genotype also had low inter-veinal distance (IVD) and higher vein thickness. The genotypes having higher grain yield and higher chlorophyll, sugars and proline content under receding soil moisture conditions indicating their importance in osmo regulation.

The dry matter production, leaf area, LAI, LAD, NAR and SLA increased due to ethanol spray. Increase in total chlorophyll, chlorophyll 'a' and chlorophyll 'a/b' ratio but decrease in chlorophyll 'b' content was observed in both the genotypes. Significant increase in total sugars, nitrate reductase activity, stem and leaf crude protein contents was observed in ethanol treated plants, but there was decrease in the epicuticular wax content. However, the proline content was not influenced by ethanol treatment. The foliar application of ethanol increased the grain yield by 25 to 30 per cent and was most economical in 1 to 2 per cent concentrations.

Physiological Basis of Variation in Yield Potential in Chickpea (*Cicer arietinum* L.) Genotypes

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1996

MAJOR ADVISOR : Dr. M.B. CHETTI

Field experiments were conducted during *kharif* (rainy) and *rabi* (post-rainy) seasons of 1992-93 and 1993-94 to study the physiological basis of yield variation in 15 chickpea genotypes at Agricultural Research Station, University of Agricultural Sciences, Dharwad. Rainy season crop had higher soil moisture content and higher night temperature as compared to post rainy season crop and performed better with respect to most of the morphological, biochemical and biophysical parameters at early growth stages. The seed yield was significantly higher during *rabi* as compared to *kharif* season. In general, the performance

of semi-spreading types (K-850, Nagpur and P-1006) was better over the erect types in *kharif* season. Whereas during *rabi*, the genotypes A-1, ICCV-2, K-850 and ICC-42 showed better performance. However, the erect genotypes (BG-376, BG-374, BG-303 and NPT) didn't show much variation between the seasons indicating their stability for both the seasons.

The performance of genotypes with respect to growth parameters viz., AGR, CGR, LAL, LAD and BMD was better in *kharif* season than in *rabi*. But the number of days required for first flowering, 50%

flowering, pod formation and maturity was less in *rabi* season. The GDD reached early in *rabi* season for all the phenological stages except the GDD between first pod formation and flower cessation. Chlorophyll and protein contents in leaves were high at early stages in *rabi* season and the genotypes A-1 and K-850 had the maximum chlorophyll content in leaves and pod walls. However, NRA and sugar content in leaves was more during early stages in *kharif* as compared to *rabi* season. Ideal plant characters differed between the seasons.

For higher productivity during *kharif*, the genotypes should have more number of branches, higher, TDM, extended flowering period, higher pod set per cent, more number of seeds per pod, HI, total chlorophyll, sugar and NR activity in leaves. Whereas in *rabi* season, the genotypes should have more plant height, higher TDM, early flowering, pod information and maturity, higher chlorophyll in leaves and pod walls, higher sugar and protein content in leaves.

HORTICULTURE

Investigations on the True Potato Seed (TPS) Transplants for Potato Production in Rainfed Vertisols

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1996

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Studies on true Potato Seeds (TPS) for Potato production were undertaken at the University of Agricultural Sciences, Dharwad during *kharif* 1992 and 1993 on vertisols.

The results revealed that it was possible to raise a successful potato crop by using TPS as transplants with yields comparable to the traditional tuber planted method. Out of seven TPS genotypes (HPS I/13, HPS II/13, HPS 7/67, MS/82-797, PS/M-43 and JEX/C-166), the highest mean tuber yield (21.9 t/ha) was registered by JEX/C-166 followed by HPS 7/67 (19.1 t/ha) which were on par with the seed tuber planted check varieties Kufri Badashah (22.4 t/ha) and Kufri Chandramukhi (26.0 t/ha). However, the TPS genotypes produced slightly higher proportion of small sized tubers. Raising of crops by these two TPS genotypes was more profitable (net production value 4.2 and 4.1, respectively, for JEX/C-166 and HPS 7/67) than tuber planted check varieties owing to low input cost on seed. Between these two TPS genotypes, HPS 7/67 had produced uniform (3.8 scores) tubers than JEX/C-166 (3.0).

The efficacy of three growth retardants: CCC (400 and 600 ppm), TIBA (200 and 400 ppm) and mapiquat chloride (600 and 800 ppm) tested against unsprayed control on HPS I/13 by spraying at two growth stages (30 and 50 DAT). Spraying of any growth retardants significantly increased the mean yield (17.3 t/ha) over unsprayed control (13.5 t/ha). The highest mean yield (18.2 t/ha) was recorded by spraying mapiquat chloride at 600 ppm 30 days after transplanting and this treatment combination was most cost effective recording the highest net production value (3.59). The treatment also increased the proportion of marketable yield. The efficacy of growth retardants was due to suppression of excessive haulm growth and improvement in harvest index.

The response of HPS I/13 and JEX/C-166 transplants was studied to levels of N and K each at 50, 100 and 150 Kg/ha. The genotypes performed well at lower of N and K with a common dose of 75 kg P/ha. The maximum yield of 24.0 and 15.6 t/ha, respectively from JEX/C-166 and HPS I/13 was recorded at 50:75:50 Kg NPK/ha. The increase in the level of N alone increased the total uptake of all the three elements but not with K.

**Studies on Genetic Diversity and Evaluation of Promising Genotypes in Tamarind
(*Tamarindus indica* L.)**

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1996

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The experiment was conducted to study the genetic diversity and to evaluate the promising genotypes in tamarind (*Tamarindus indica* L.) established at Forest Research centre (Gungaragatti), Dharwad from 1992, to 1995. The growth parameter analysis for different characters at the age of five years, showed significant variation among the 40 genotypes.

The height of the plant varied from 1.47 m (NTI-74) to 2.99 m (NTI-2). Basal diameter ranged from 6.94cm to (NTI-74) to 11.58 cm (S-13). NTI-19, 14, S-13, recorded higher number of shoots per 900 cm² area (6.4 to 7.20) indicated the compact nature of canopy. Crown size ranged from 1.38m to 3.04 m.

Out of 40 genotypes, 23 genotypes exhibited orthotropic, and 17 genotypes exhibited plagiotropic plant type.

The range of flowering varied from 20 to 100 percent among different genotypes (1992 to 1995). NTI-14, 19, 57, 78, 93, 85 and S-4 recorded 100 percent flowering. Three types of pod shape were observed viz., straight, semi-curved and straight and semi-curved.

Significant differences in respect to pod characters were noticed. Pod length varied from 6.50 to 11.48 cm, width from 1.44cm to 2.6cm, thickness from

1.18cm to 1.70cm, pod weight from 4.20g to 14.32g, pulp weight from 0.67g to 4.98g per pod. Percent of pulp varied from 20.51 to 43.57, seeds from 13.53 to 40.67 percent.

Among the promising genotypes NIT-14, and 57 are found to have tendency towards regular bearing nature. The highest yield was recorded in NTI-19 (0.73 kg/plant). Next best genotypes were NTI-5, S-4, NTI, 14, 15, 57, 75 and 62 in which yield ranged between 0.32 to 0.43 kg per plant. Tartaric acid content ranged between 4.00 and 16.7 percent.

Multivariate analysis indicated that, pulp weight alone contributed maximum in discriminating the genotypes. Forty genotypes were grouped into 10 clusters. For pulp weight per pod cluster IV had the highest value (3.15g).

Variability studies in half-sib families indicated that NTI-6 found to be superior among 20 progenies in respect of growth, in all the characters. Phenotypic coefficient of variance (PCV) was higher than genotypic coefficient variance (GCV). Heritability (broad Sense) was medium in respect to plant height, diameter, number of leaves and leaf length.

Among 40 genotypes, except NTI-17 and 80, others were found easy to root through air layering.

PLANT PATHOLOGY

Studies on Bud Necrosis Virus Disease of Groundnut (*Arachis hypogaea* L.) in Karnataka

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1996

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The incidence of groundnut bud necrosis virus (GBNV) disease in Karnataka ranged from 2.4 to 25.4 per cent. Twenty five host species belonged to nine angiospermic families were infected by GBNV and *Carthamus tinctorius* L. and *Ricinus communis* L. were the new additions to the host range of GBNV. GBNV-D

(Dharwad isolate) and GBNV-R (Raichur isolate) could both be successfully mechanically transmitted using 2-mercaptoethanol in potassium phosphate buffer. GBNV had TIP between 44 and 46°C, DEP between 1:300 to 1:400 and LTV of 4 to 5 h at room temperature.

The particles were roughly spherical and

measured 80nm in diameter. The virus protein consisted of three polypeptides viz., 31 KDa, 52 KDa and 54 KDa and were detected using homologous antisera in western blotting. GBNV-D and GBNV-R were serologically related to PBNV-ICRISAT, TSWV-TX, TSWV-USA and TSWV-L (Netherlands) but not to INSV (Netherlands). Serologically, GBNV-D could be categorised under serogroup I and GBNV-R under the proposed serogroup IV of the genus tospovirus. Serology and insect transmission studies confirmed GBNV-D and GBNV-R to be closely related distinct tospovirus isolates.

Spray of sorghum or coconut leaf extracts at 20 and 35 DAP or one spray of sorghum/coconut leaf

extract at 20 DAP and one spray of monocrotophos @ 1.25 ml l⁻¹ of water at 35 DAP significantly reduced bud necrosis disease (BND) incidence and increased pod yield (31.8% BND; 15.1 q ha⁻¹) compared to control (50.2% BND; 9.03 q ha⁻¹). The entries ICG 3587, ICGV 89280, 2192-8(50), 85/203-3-5-1, 85/169-7, (ICGV 86012 x ICGV 86030) T, Sel. 2 (FDRF 6 - 165 x ICGV 86055 x ICGV 86699), Sel. 3 (FDRF 8 - 55 x NCAC 15989 x JL 24), Sel. 39 (ICGV 86517 x GBFDRS 66) and Sel. 53 (FDRF 8-32 x JS 26 - 13 x ICGS 8 - 21) showed resistant reaction against BND under high disease pressure.

AGRICULTURAL ECONOMICS

Economics of Dairying in Assured Rainfall Zone of Maharashtra

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1996

MAJOR ADVISOR : Dr G.K. HIREMATH

Government of Maharashtra has given high priority for development of dairy industry to meet the rising demand for milk and its products. In this direction, it is necessary to evaluate the performance of different milch animals and also to determine which of the districts are more potential for dairy development so as to suggest the appropriate policies to improve the working of the dairy industry in Maharashtra.

Parbhani district as a representative of assured rainfall zone of Maharashtra was chosen for the study. Three stage sampling procedure was adopted for selection of target groups for detailed study.

On an average, compound growth rates for cow, buffalo and goat population were 2.93, 7.49 and 7.70 percent per census, respectively. Among the 30 districts, Ahmednagar, Osmanabad, Solapur and Beed districts were found in the first cluster which were favourable for development of dairy industry. The average grazing land was 8.36 per cent to total holding. In general, percentage composition of milch animals was 16.51 (crossbred cow), 17.93 (local cow), 46.73 (buffalo) and 18.63 (goat) percent to the total dairy herd size and 4.24 (milch animals). Dairy cattle shed like thatched roof and tin roof were observed in 71 and 29 percent of

dairy units, respectively. With regard to financial performance of dairy unit, on an average, the investment on milch animals, equipment and cattle shed was 76.61, 3.05 and 20.34 percent to the total investment (Rs. 22080). The net worth of dairy unit was Rs. 22235, while the net profit was Rs. 5251. Benefit cost ratio was comparatively more (2.037) in small farm followed by 1.925 and 1.827 in landless and large farm dairy units, respectively. According to the principal component analysis, it was revealed that dry fodder, green fodder, concentrate, labour and milk productivity associated with the first component which accounted for 39 percent of the total variation in the performance of HF cross. Likewise, dry fodder, concentrate, housing facilities, education of owner, scheme benefit to owner and grazing land were associated with the first component which accounted for 53.2 percent of the total variation in the performance of murrah buffalo. The trends estimated using orthogonal polynomial, indicated that dry pregnant buffalo scheme, buffalo calf scheme, training programme, management subsidy scheme and special live stock production programme were found to be running satisfactorily for the expansion of dairy industry in Maharashtra.

AGRICULTURAL EXTENSION EDUCATION

**Watershed Development Programme in Mahabubnagar District of Andhra Pradesh -
A Diagnostic Study**

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1996

MAJOR ADVISOR : Dr. M.R. ANSARI

The present study was conducted to know the perception of usefulness of watershed Development Programme and adoption of recommended watershed technologies by the farmers of watershed area and non-watershed area. An attempt was also made to understand the relationship between personal, socio-economic and psychological characteristics of farmers and their level of perception of Watershed Development Programme (WDP) as to its usefulness and adoption of recommended watershed technologies. The constraints involved in the adoption of recommended watershed technologies were also studied.

The study was conducted during 1994-95 in the World Bank aided "Janampet Watershed" in Mahabubnagar district of Andhra Pradesh. The data were collected from the sample of 300 farmers from randomly chosen 12 villages of watershed area including two boundary villages. Out of which 150 from the watershed area and rest from non-watershed area. In order to assess perception of usefulness of watershed area, a comprehensive perception scale was developed.

It is found that majority of the farmers (58 and 56%) from watershed and non-watershed areas belonged to "useful perception" category of WDP. It is also conformed from the study that a majority (54.67 and 58.67%) of farmers from watershed and non watershed areas belonged to medium level adoption group of recommended improved crop production practices. However, variation was noted between farmers of watershed and non watershed areas in adoption of recommended seed, seed treatment and fertilizers application to sorghum and castor crops. The major constraints in adoption of sorghum varieties were threshing problem and low straw yield, while in castor, the major constraints were high cost of hybrid seed and

requires fresh seed every year. Further, the significant variation was also noted in adoption of recommended soil and water conservation measures and dry land horticulture (Mango crop). The major reasons realised by them for non-adoption were involves expenditure and risk in maintenance of works.

The correlation analysis revealed that variables namely education, extension contact, development opportunity, credit orientation, adoption of recommended practices in case of watershed area. While, in non watershed area risk orientation and economic motivation were emerged as most decisive factors with the perception of usefulness of WDP. In case of adoption of recommended improved practices by the watershed farmers. The variables namely education, farm size, development opportunity, employment generation, credit orientation, economic motivation and perception of usefulness of WDP were emerged as decisive variables. Farmer's participation in the water shed was poor, while the participation of officials was highly appreciable. Farmers from watershed and non-watershed areas were indirectly benefited with the drinking water facility to cattle, area water wells increased, productivity increased especially in redgram, castor and jowar realised green grass availability.

The major suggestions made by the officials were, need for effective co-ordination between allied departments, covering entire village in order to ensure peoples' participation and entrusting the post project maintenance to local institutions. While, majority of farmers in watershed and non-watershed areas suggested priority for construction of more number of checkdams, nalabunds, large size bunds, followed by coverage of entire village.

Adoption of Dryland Agricultural Technologies by Farmers of Rangareddy District (A.P.) : A Retrospective Analysis

M.S. PRASAD

1996 MAJOR ADVISOR : Dr. B. SUNDAR SWAMY

The present study was conducted to know the adoption pattern, knowledge and attitude of farmers of towards dryland agricultural technologies. Adoption behaviour of farmers over a period of time as well as the factors which retarded adoption was studied. An attempt was also made to understand the relationship between socio-economic and personal characteristics of farmers and their level of knowledge, attitude and adoption of recommended cultivation practices of crops. The constraints involved in the adoption of improved crop management practices were also studied. The study was conducted during 1994-95 in Rangareddy district of Andhra Pradesh. Information was collected from a sample of 300 farmers randomly chosen from 12 villages of the district. To study knowledge and attitude of farmers, knowledge test and comprehensive attitude scales were developed.

Majority of the respondents possessed medium level of knowledge about dryland agricultural technologies. Majority of the respondents belonged to less favourable attitude category, closely followed by more favourable category. A majority of the respondents had medium level of adoption of recommended cultivation practices of crops. Majority of the respondents had adopted contour cultivation, soil bunding, off-season tillage, variety (castor), sowing time

(sorghum), seed rate and plant protection measures.

There was increased rate of adoption in case of Contour cultivation over a period of time. Non-awareness and non-applicability of the practice, lack of finance and other resources, lack of knowledge and lack of irrigation were identified as important factors which retarded adoption of selected dryland agricultural technologies over a period of time.

The findings revealed that variables viz., land holdings, extension agencies contact and participation, mass media exposure, adoption of recommended cultivation practices of crops, attitude towards dryland agricultural technologies, knowledge about dryland technologies, risk orientation, economic motivation, farm power and farming experience were emerged as the most decisive factors in influencing the knowledge and attitude of farmers towards dryland agricultural technologies as well as their adoption of recommended cultivation practices of crops.

Non-palatability of fodder, non-resistance to drought, susceptibility to pests, low yield, non-availability of quality seed, lack of correct information, lack of conviction, lack of finance and non-availability of inputs in time were identified as major constraints involved in the adoption of recommended cultivation practices of dryland crops.

A study on Leadership Styles and Their Impact on Job Performance of Extension Personnel of Karnataka State Department of Agriculture

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The study was conducted during 1994-95 to identify the kind of leadership styles of superiors of KSDA as perceived by their subordinates and to ascertain their impact on job performance.

Leadership style perception by field extension workers was measured with the help of a scale specifically developed. The other variables were quantified using appropriate scales and scoring

procedures. The data collected from 242 field extension workers was analysed using appropriate statistical tools and techniques.

The scale developed to measure the perception of leadership styles of superiors consisted of 41 items representing nine dimensions namely; programme communication, programme execution, programme organisation, decision making, co-ordinating, directing, supervision and control, reporting and human relations.

In KSDA, half of the field extension workers (50.8%) perceived the leadership style as participative followed by consultative (35.5%), autocratic (8.7%) and only 5 per cent of them perceived their superiors as laissezfaire type. The inter-correlation among the leadership styles revealed that the perception of participative leadership style of superiors was negatively correlated with consultative, autocratic and laissezfaire styles.

There was significant difference in the mean job performance scores of AAs belonging to three categories of leadership style perception. The AAOs of participative and consultative styles of leadership perception did not differ significantly from one another, but they differed significantly with those who perceived the leadership of ADA as non-democratic.

The factors like organisational climate, organisational commitment, job involvement, job satisfaction and job performance of field extension workers had positively significant relationship with their perception of leadership style. While, education, organisational stress and job stress showed negative and significant relationship. All the independent variables together could explain 33.30 per cent of variation in perception of leadership style of superiors.

Job performance emerged as the most discriminating variable towards the total discrimination of subordinates of participative and non-democratic styles of leadership perception categories.

Masters of Science

AGRONOMY

Response of Greengram (*Vigna radiata* L.) Varieties to Plant Densities and NPKS Sprays during Kharif Season

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1995 MAJOR ADVISOR : Dr. M.N. SHEELAVANTAR

A field experiment was conducted during kharif at Agricultural College Farm, Dharwad to identify suitable greengram variety, optimum plant density and the effect of NPKS sprays at pod development stage on growth and yield.

Among the three varieties evaluated, significantly higher seed yield was obtained with TAP-7, which was 21 and 38 per cent higher than KDM-1 and Chinamung, respectively. The higher seed yield in TAP-7 was due to higher harvest index, seed yield, number of pods and number of seeds per plant. The protein yield was significantly higher in TAP-7 than KDM-1 and Chinamung.

Plant density of 4.44 lakhs per hectare (P_2) produced significantly higher seed yield which was on par with 6.66 lakhs per hectare density (P_3) but both were significantly higher than 3.33 lakhs per hectare density (P_1). All the yield components viz., seed yield per plant, 1000 seed weight, number of seeds per plant, number of seeds per pod, number of pods per plant were significantly higher in P_1 . Although individual plant performance was better under lower plant density, the productivity of the plants per unit area was higher at P_2 and P_3 which ultimately decided the seed yield. Significantly higher protein yields were obtained at P_2 and P_3 than P_1 .

NPKS sprays at pod development stage significantly increased the seed yield compared to unsprayed treatment. Higher seed yield with NPKS sprays was due to higher growth components viz., leaf area and LAD and yield components viz., seed yield per plant, number of seeds per plant, 1000 - seed weight

and number of pods per plant. The protein yield was also significantly higher with NPKS sprays.

TAP-7 at 4.44 lakhs per hectare density (P2) recorded the highest seed yield which was significantly higher than all other treatment combinations. The same treatment combination also recorded the highest protein yield.

Response of Soybean (*Glycine max* (L.) Merrill) to Sources of Phosphorus with Microbial Inoculants

R.B. ROOGE

1995

MAJOR ADVISOR : Dr. V.C.PATIL

A field experiment was conducted at Main Research Station, University of Agricultural Sciences, Dharwad during *kharif* season of 1994 to study the response of soybean to sources of phosphorus with microbial inoculants. The experiment was laid out in Randomized Complete Block Design (RCBD) with 12 treatments and three replications. The treatments included application of phosphorus at 50kg P_2O_5 ha⁻¹ in the form of single superphosphate (SSP), Mussoorie rockphosphate (MRP), equal proportions of SSP and MRP, 37.5 kg P_2O_5 ha⁻¹ as SSP + 12.5 kg P_2O_5 ha⁻¹ as MRP with and without inoculation of *Bacillus polymyxa* or Biophos.

Biophos inoculation with P application in equal proportions of SSP and MRP resulted in significantly higher seed yield (2851 kg ha⁻¹) which was 17,56,20 and 42 per cent higher than with application of only P as SSP, MRP, 37.5 kg P_2O_5 ha⁻¹ as SSP + 12.5 kg P_2O_5 ha⁻¹ as MRP and equal proportions of SSP and MRP, respectively. The increase in yield was

due to superior yield components, higher dry matter production and its efficient distribution. Further, oil yield, protein yield, N and P uptake by plant, available P_2O_5 in the soil after harvest, net returns and benefit : cost ratio were also higher with Biophos inoculation and application of P in equal proportions of SSP and MRP than with application of only P as SSP or MRP or 37.5 kg P_2O_5 ha⁻¹ as SSP + 12.5 kg P_2O_5 ha⁻¹ as MRP or equal proportions of SSP and MRP.

Inoculation with *B. polymyxa* and application of P as SSP or equal proportions of SSP and MRP recorded significantly higher seed yield (2915 kg ha⁻¹ and 2768 kg ha⁻¹) than application of only P as SSP or equal proportions of SSP and MRP, respectively. The increase in yield in these treatments was mainly attributed to the superior growth and yield parameters, coupled with higher dry matter production and its accumulation in reproductive parts and higher uptake of nitrogen and phosphorus.

Response of Soybean (*Glycine max* (L.) Merrill) Varieties To Population Levels Under Rainfed Conditions of Dharwad

R.S. ARALIKATTI

1995

MAJOR ADVISOR : Dr. S.S. MELI

An investigation was conducted at Main Research Station, UAS, Dharwad during *kharif* season of 1995 to study the response of soybean varieties (MACS-58, JS-335, KHSB-2 and Monetta) to population levels (3.3, 4.4 and 6.6 lakh plants per ha) under rainfed conditions of Dharwad. Experiment was laid out in split plot design with three replications. The variety JS-335 recorded significantly higher seed yield (28.35 q/ha) and it was obviously due to better growth and yield components viz., higher number of branches per plant, optimum LAI (5.524), pod per plant, seeds per plant, seed weight per plant and dry matter accumulation in pods at physiological maturity. Among the population levels, 6.6 lakh plants per ha recorded significantly

higher seed yield (27.92 q/ha) followed by 4.4 and 3.3 lakh plants per ha. At the same plant population of 4.4 lakh plants per ha, the geometry of 30 x 7.5 cm recorded significantly higher seed yield (25.43 q/ha) than 45 x 5 cm (23.22 q/ha). The interaction effects due to varieties and population levels were significant. The variety JS-335 at 6.6 lakh plants per ha population level recorded significantly with respect to oil and protein content. Significantly higher oil content was noticed at 3.3 lakh plants per ha and decreased with successive increase in population levels. However, the protein content in seed followed reverse trend. Significantly higher oil (5.03 q/ha) and protein yields (11.27 q/ha) were recorded with higher population level due to higher seed yield.

Response of Finger Millet (*Eleusine coracana* Gaertn) Genotypes to Dates of Sowing in Northern Transitional Tract of Karnataka

ASHOKA M.B.

1996

MAJOR ADVISOR : Dr. S.I. HALIKATTI

Field investigations were carried out during *kharif* 1994 on sand loam soils, to study the response of finger millet genotypes to dates of sowing in northern transitional tract of Karnataka, at Kumbapur farm, adjacent to UAS, Dharwad. The experiment was laid out in split-plot design with four sowing dates as main plot and four genotypes as sub-plot in three replications.

The highest grain yield (32.08q ha⁻¹) was recorded in the earliest June -I fortnight (FN) sowing followed by June - II FN (29.71 q ha⁻¹), and lowest in July -II FN (16.53 q ha⁻¹). Also, June-I fortnight sowing recorded significantly the highest values of LAI, effective shoots, total dry matter and ear dry matter and grain yield in 0.5 m row, finger length, single ear weight, grain weight per ear, threshing percentage and HI. These values were decreased with delayed sowings. Straw yield did not differ significantly upto July-I FN sowing but decreased

significantly beyond July - I FN. Fingers per ear and 1000-grain weight were not affected by sowing dates.

The pre-released genotype GPU-26 recorded significantly higher grain yield (30.06q ha⁻¹) compared to another pre-released VL-149 (27.49q ha⁻¹). But genotypes did not differ significantly with respect to straw yield and grain weight per ear. GPU-26 also recorded the highest values of effective shoots, total dry matter and ear dry matter and grain yield in 0.5m, row single ear weight, threshing percentage and HI. While Indaf-8 recorded the highest plant height, days to 50% flowering, physiological maturity and number of fingers per ear. But VL-149 recorded maximum finger length. PR-202 and GPU-26 recorded significantly higher 1000-grain weight.

Among the genotypes, Indaf-8 can be sown upto June-II, GPU-26 and VL-149 up to July -I and PR-202 upto July-II fortnight in northern transitional tract.

Response of Soybean (*Glycine max* (L.) Merrill) to Irrigation Schedules and Phosphorus Levels in Black Soils During Summer

S.S. HARADAGATTI

1996

MAJOR ADVISOR : Dr. A.D. JANAWADE

A field experiment was carried out during summer 1995 at Main Research Station, UAS, Dharwad to study the response of soybean to irrigation schedules and phosphorus levels in black soils. The experiment was laid out in split-plot design with three replications. The treatments comprised of three irrigation schedules (0.6, 0.8 and 1.0 IW/CPE ratio) as main plots and four phosphorus levels (0, 40, 80 and 120 kg P_2O_5 ha⁻¹) as sub plots.

The results indicated that, scheduling irrigation at 1.0 IW/CPE ratio recorded significantly higher grain yield (2218.75 kg ha⁻¹) and yield components compared to 0.6 IW/CPE ratio which was on par with 0.8 IW/CPE. The growth components like plant height, leaf area, leaf area index, leaf area duration and total dry matter production per plant were also higher in 1.0 IW/CPE ratio. Similar trend was observed in oil and protein content.

Application of 80 kg P_2O_5 ha⁻¹ recorded significantly higher grain yield (2258.33 kg ha⁻¹) which was on par with application of 120 kg P_2O_5 ha⁻¹. Similar trend was observed in yield components and phosphorus uptake.

Consumptive use of water was linearly increased with irrigation and phosphorus levels which was higher in 1.0 IW/CPE ratio (367mm) and 120 kg P_2O_5 ha⁻¹ (328 mm) treatments. Water-use-efficiency was higher in 0.8 IW/CPE ratio (6.331 kg ha mm⁻¹) treatments. Moisture extraction pattern was higher from 0-30 cm surface layer in 1.0 IW/CPE ratio and from 30-60 cm layer in 0.6 IW/CPE ratio treatment.

Interaction effect of irrigation schedules and phosphorus levels was not significant for all the parameters studied.

Integrated Weed Management in Potato (*Solanum tuberosum* L.)

VIDYADHAR KANNUR

1996

MAJOR ADVISOR : Dr. S.S. MELI

A field experiment was conducted on vertisols at the Agricultural College farm, Dharwad during *kharif* 1995 to study the weed management practices in potato under rainfed condition.

Observations on weeds, crop growth components, yield and its components and nitrogen, phosphorus and potassium uptake by crop and weeds were studied.

Weed population as well as dry weight of weeds were significantly reduced at all the growth stages by weed control treatments. Among the chemical weed control treatments, pendimethalin (1.0 kg a.i./ha) at pre-emergence coupled with one hoeing (30 DAP) had the lowest weed dry weight (6.75 q/ha) and higher

weed control efficiency (91.97%). Among the cultural methods, two hoeings + two hand weeding (30 and 45 DAP) had lower weed dry weight (11.59 q/ha) and higher weed control efficiency (86.30%). Whereas, in unweeded check, the weed dry weight was 84.89 q/ha.

Results indicated that the growth of crop was severely affected with atrazine application, which proved to be phytotoxic.

Significant yield reduction was observed due to the adverse effect of weeds on potato crop. All weed control treatments recorded significantly higher nitrogen, phosphorus and potassium uptake by crop compared to unweeded check.

Based on the investigation, it can be inferred

that two hoeings + two hand weedings at 30 and 45 DAP can be advocated for satisfactory weed control and higher returns in potato. Where ever manual

weeding is not possible, application of pendimethalin as pre-emergence (1.0 kg a.i/ha) supplemented with hoeing at 30 DAP was more economical for satisfactory weed control in potato.

Response of Midlate Sugarcane Varieties to Different Methods of Planting

KANTESH. GANDOLKAR

1996

MAJOR ADVISOR : R.S. KHOT

A field experiment was conducted at Agricultural Research Station, Sankeshwar during 1994 to study the performance of midlate sugarcane varieties (CoM. 88121, Co. 88028, Co. 740 and Co. 8011) to different planting systems (pit, paired row, ridge and furrow and ladder) under irrigated condition.

Paired row system recorded significantly higher cane and sugar yield (154.06 t/ha and 19.67 t/ha, respectively) over ladder system but was on par with ridge and furrow (149.90 t/ha and 18.88 t/ha) and pit (143.51 t/ha and 18.84 t/ha) systems of planting. Although the total dry matter production did not differ significantly within planting systems, paired row recorded higher yield due to higher NMC. Pit method recorded highest single cane weight (1.41 kg) but yielded lesser cane yield than paired row due to lower NMC.

Brix, Pol % and purity were not influenced by the planting system. However, commercial cane sugar (CCS) per cent was significantly improved under paired row (13.41 %) planting system.

Among the varieties, Co. 88028 produced significantly higher cane (160.91 t/ha) and sugar (21.04 t/ha) yields followed by CoM. 88121. Although NMC were low in this variety but was able to record the highest cane yield due to significantly higher single cane weight (1.35 kg). The dry matter accumulation and leaf area index were significantly higher in Co. 88028 over the other varieties. It recorded higher CCS (13.23) per cent resulting in higher sugar yield (21.04 t/ha).

The economics returns indicated that Co. 88028 registered the highest gross and net returns with benefit cost ratio of 4.12 paired row system.

AGRICULTURE CHEMISTRY AND SOIL SCIENCE

Effect of Organic, Fertilisers and Cellulolytic Organisms on Sorghum Yield in Vertisols

S.G. BIRADAR

1996

MAJOR ADVISOR : V.P. BADANUR

A field experiment was initiated during 1993-1994 by All India Co-ordinated Research Project for Dry land Agriculture, Regional Research Station, Bijapur on Typic chromustlers and the same experiment was continued during 1994-1995 to investigate the effect of

incorporation of crop residues alone and Subabul, nitrogen fertilizer and cellulolytic organisms on soil properties, nutrient uptake and sorghum yield. The experiment consisted of 10 treatments involving incorporation of Sorghum stubbles @ 5 t/ha three

months earlier to sowing in conjunction with Subabul, nitrogen and cellulolytic organisms.

Incorporation of Sorghum stubbles alone or in conjunction with Subabul and cellulolytic organisms improved the infiltration rate of vertisol significantly over fertilizer application. The lowest bulk density was recorded with Sorghum stubbles incorporation in combination with subabul (50:50).

The uptake of N, P and K increased

significantly with incorporation of Sorghum stubbles in conjunction with 30 Kg N/ha. The higher grain yield was obtained with Sorghum stubble in combination with 30 Kg N/ha (1785 Kg/ha) followed by recommended dose of fertilizer (1624 Kg/ha). Incorporation of Sorghum stubbles and Subabul (50:50 or 25:75) was also increased the Sorghum yield significantly over control. Water use efficiency of Sorghum increased significantly with stubbles in combination with Subabul, Nitrogen and cellulolytic organisms over control.

Studies on Soil, Water and Nutrient Losses under Irrigation in Malaprabha Command Area

SANJEEV R. KATTI

MAJOR ADVISOR : Dr. V.S. DODDAMANI

The study on runoff, soil and nutrient losses under different slope and stream sizes was carried out during the rabi 1994-95 in vertisol of Water Management Research Centre, Belvatagi and Alfisol of Kulgeri cross at farmer's field. The main objectives of the investigation were to estimate the loss of water as runoff and soil and nitrogen, phosphorus and potassium losses along with runoff at different slope and stream sizes under irrigation. The levels of slope and stream sizes selected were 0.3, 0.6 and 0.9 per cent and 3.4 and 5 L sec⁻¹ for Vertisol and for Alfisol slopes and stream sizes were 0.4, 0.8 and 1.2 per cent and 2.3 and 4 L sec⁻¹, respectively.

The results showed that at 0.9 per cent slope with 5 L sec⁻¹ stream size in Vertisol and 1.2 per cent slope with 4 L sec⁻¹ stream size in Alfisol, the average runoff loss was to the tune of 50.24 m³ and 148.21 m³, respectively.

The average increase in soil loss with increase in slope (0.3 to 0.9 per cent) and stream size (3 to 5 L sec⁻¹) was 20 to 170.33 kg ha⁻¹ in vertisol and it was 13.3 to 185.6 kg ha⁻¹ in slope (0.4 to 1.2 per cent) with stream size (2 to 4 L sec⁻¹) in alfisol. The average highest soil loss was observed at 1.2 percent slope in 4 L sec⁻¹ was 202.00 kg ha⁻¹ in Alfisol. The average maximum and the minimum nitrogen loss was 2.75 and 4.54 and 0.09 and 0.369 kg ha⁻¹ at 0.9, 1.2, 0.3 and 0.4 per cent slope in stream sizes of 5, 4, 3 and 2 L sec⁻¹ in Vertisol and Alfisol, respectively. The phosphorus loss was 1.14 and 1.8 kg ha⁻¹ in Vertisol and Alfisol. The maximum potassium loss was 1.31 and 2.77 kg ha⁻¹ in Vertisol and Alfisol, respectively. The runoff soil loss and nutrients losses were increased as the slope and stream sizes were increased.

**Studies on Contribution of VAMF to P Nutrition
of Brinjal (*Solanum melongena* L.) in an Alfisol**

PANDITH, B.M.M.K.

1996

MAJOR ADVISOR : Dr.H.T. CHANNAL

A field experiment was conducted at Olericulture section, Division of Horticulture, University of Agricultural Sciences, Dharwad during summer season of 1995-96 to study the contribution of vesicular arbuscular mycorrhizal fungus (VAMF) to phosphorus nutrition of brinjal in an alfisol. The experiment was laid out in factorial randomised block design with eight treatment combinations, comprising of four phosphorus levels (0, 50, 75 and 100 kg P_2O_5 per ha) with and without VAMF inoculation. The treatments were replicated three times.

Inoculated plants produced significantly higher fruit yield of brinjal (57.00 t/ha) than uninoculated plants (46.08 t/ha) as a result of higher growth and yield components, higher drymatter production, higher per cent root colonization, spore count and higher P, Cu, Fe, Zn, and Mn uptake.

Application of 75 kg P_2O_5 per ha recorded higher fruit yield (56.50 t/ha) and it was 26.48 and 5.61

per cent higher over control (44.67 t/ha) and 100 kg P_2O_5 per ha (53.50 t/ha). Higher yield was found to be consequence of higher fruit volume, fruit weight, higher dry matter accumulation and higher P uptake by the plants.

Combined application of VAMF and 75 kg P_2O_5 per ha (M1P75) produced significantly by the highest fruit yield (65.00 t/ha) over any other treatment combination. Not only that it also helped to improve certain quality parameters such as total soluble sugars, free phenols and crude protein content of the fruits. Thus indicating the usefulness of VAMF (*Glomus fasciculatum*) in reducing the phosphorus application to brinjal crop by 25 per cent.

The economic analysis clearly indicated that, net returns and B:C ratio at M₁P₇₅ was the highest (Rs.17250.00 per ha and 3.14, respectively) in making this production practice more profitable.

AGRICULTURAL ENTOMOLOGY

**Bioecological Studies on *Campoletis chlorideae* Uchida and the
Safety of Pesticides to the Parasitoid**

RAJU G. TEGGELLI

1996

MAJOR ADVISOR : K. JAI RAO

An investigation was undertaken to study the seasonal incidence of *Helicoverpa armigera* (Hubner) and its parasitoid, *Campoletis chlorideae* Uchida. Their activity on sorghum and bengalgram on differential sowing dates, toxicity of pesticides to the parasitoid, effect of temperature and relative humidity on parasitoid development, host age and host preference for laboratory multiplication of the parasitoid were studied.

In sorghum, the incidence of *H. armigera* and the parasitism was maximum in early sown crop than in normal and late sown crop. In bengalgram, maximum larvae were recorded from late sown crop and were minimum in early sown crop. The parasitism was maximum in normal sown crop.

The toxicity of pesticide to the developmental stages of *C. chlorideae* followed the order, Achook > Nimbecidine > NPV > Endosulfon > Phosalone > Malathion > Fenvalerate > Methomyl > Chlorpyrifos > Monocrotophos. The toxicity of the chemicals to the cocoons was in ascending order of NPV Nimbecidine - Achook - Endosulfon - Monocrotophos - Fenvalerate - Phosalone Malathion - Methomyl - Chlorpyrifos.

The development of the parasitoid was nil at 35° which was detrimental to the different stages. Studies on the effect of temperature and relative humidity indicated that as temperature was increased larval period decreased. Similar effect was seen in pupal period, however, both temperature and relative humidity

were having no significant effect on pupal period. Increase in temperature decreased the adult emergence, whereas increase in relative humidity increased the adult emergence.

Maximum parasitism was observed when *Helicoverpa* larvae were four days old, however, nine and 10 days old larvae were not parasitised. There was

no difference in developmental period of the parasitoid that emerged from different aged host but the longevity differed.

Host specificity revealed that *C. chloridea* did not prefer *Corcyra cephalonica* for parasitism. Parasitism was observed in all lepidopteran larvae tested and it preferred *H. armigera* larvae followed by *Spodoptera litura*.

Studies on the Bioecology and loss Estimation of Serpentine Leafminer, *liriomyza trifolii* (Burgoss) (Agromyzidae : Diptera)

SUSHILA NADAGOUDA

MAJOR ADVISOR : Dr . B.V. PATIL

The biology of serpentine leaf miner, *Liriomyza trifolii* (Burgess) (Agromyzidae : Diptera) was studied on cotton, castor, cowpea and tomato. The eggs of the leaf miner are creamish white in colour and are deposited mainly on upper surface of leaves. The incubation period ranged from 3.54 to 3.74 days, while the egg size varied from 190 to 196 in length and 103 to 116 in width. The larva is yellow in colour and larval period ranged from 3.93 to 4.5 days. The prepupal period lasted for 2 to 75 minutes. Pupal period varied from 9.82 to 10.65 days and size of the pupa ranged from 1.46 to 1.69 mm in length and 0.59 to 0.81 mm in breadth. Females lived longer compared to males. The longevity of males was 2.56 to 6.96 days and 4.69 to 9.80 days in the case of females. The longevity of adults was prolonged when provided with 10 per cent honey solution (11.16 days) while they lived only for 1.91 days without any food. The range of sex ratio was 1:0.6 to 1:0.8

Fecundity varied from 64.1 to 158 eggs per female. Ten days old cotton plants were more preferred by leaf miner adults for oviposition compared to older

seedlings. The sex is differentiated at the puparia stage based on the size of puparia. Females emerge from larger puparia and males emerge from smaller puparia. Studies on host plant preference indicated that castor is the most preferred host followed by cotton, cowpea, tomato and *Momordica*.

Cotton and castor plants subjected to leaf miner infestation on 10 and 20 days after sowing recorded higher percentage of infestation and more number of maggots thus resulting in reduced plant height and less biomass as compared to the uninfested plant.

The trichome density on leaves had negative impact on percent infestation by *L. trifolii* and the relation was found to be non significant. Total sugars, phenols and tannin content of cotton leaves had a negative impact and the reducing sugars and protein content had a positive impact on the intensity of damage by serpentine leaf miner.

Yellow sticky traps are more attractive to leaf miner adults compared to white. Among the different designs, baffle type proved to attract more adult leaf miners followed by round and flat type.

AGRICULTURAL MICROBIOLOGY

Studies on *Bradyrhizobium* sp. (Vigna) In Greengram
(*Vigna radiata* (L.) Wilczek) Genotypes

RAJESH BELLAD

1996

MAJOR ADVISOR : Dr .J.H. KULKARNI

Isolation and screening of efficient *Bradyrhizobium* sp. (Vigna) for greengram (*Vigna radiata* (L.) Wilczek) and host-*Bradyrhizobium* interaction was carried out for the Agroclimatic zones III and VIII in the northern parts of Karnataka. Ninety two isolated root nodule bacteria were subjected to morphological, biochemical, physiological, and nodulation tests. Out of these isolates, 59 were found to be *Bradyrhizobium* sp. from the above tests. Further, study on the test for efficiency on greengram revealed that strains A 6, A 47, A 33, B 11 and B 7 were effective based on the observations on the nodule numbers, shoot dry weight, N per cent and nitrogen uptake over the check strains and un inoculated control. It was also seen from the study that as many as 32 strains were ineffective and produced lesser nodules than the check strains, and as many as 33 strains exhibited lower nitrogen uptake in shoot when compared to the check strain, indicating that about 60 per cent of the native population in the Agro-climatic zones III and VIII were inefficient, there by indicating necessity of inoculating pre-selected effective strains of *Bradyrhizobium*. Strain X host interaction using the above five effective strains with

released greengram cultivars pusa Baisakhi, China mung and PS 16 indicated superiority of inoculation with *Bradyrhizobium* sp. (Vigna) over un-inoculated control. There was no clear indication of strain-host specificity. Among the strains of *Bradyrhizobium* sp., strain A 6 performed well over the other strains on nodulation, shoot dry weight, Nitrogen uptake, NRA, Ureide content in all the varieties. The grain yield and yield parameters were also superior on inoculation of strain A 6. However, strain GGR 14 performed on par with the other strains. Among the greengram cultivars, Pusa Baisakhi performed better than PS 16 and China mung in terms of nodulation, biomass production and nitrogen fixation. However, CV. PS 16 showed higher yields (10.61 g plant⁻¹) than CV. Pusa Baisakhi or China mung (9.61 and 8.65 g plant⁻¹) due to its bolder seeds. The nitrogen and protein content in seed of plants inoculated with strain A 6 was 3.18 and 19.85 %, respectively when compared to 2.29 and 14.29 %, respectively in the un-inoculated control. Thus, considering the results of this investigation, inoculation with strain A 6 of *Bradyrhizobium* sp. (Vigna) resulted in increased grain yields in all the three genotypes of greengram.

CROP PHYSIOLOGY

Influence of Herbicides and Crop Weed Competition on
Physiological Aspects in Soybean

RAJASHEKHAR G. BADIGER

1995

MAJOR ADVISOR : Dr .S.M. HIREMATH

A field experiment was conducted to study the effect of herbicides and crop weed competition on physiological aspects of soybean (JS-335) at the College of Agriculture, UAS, Dharwad during Kharif, 1994 in randomised block design with four replications. Four pre emergence herbicides, (Clomazone @ 1.0 Kg a.i. /ha Alachlor @ 1.5 Kg a.i. / ha; Metolachlor @ 1.0 Kg a.i. / ha and pendimethalin @ 1.5 Kg a.i. /ha) were used for the study with common interculturing once at 30 DAS.

During the crop growth period, monocot weeds, *Cynodon dactylon*, *Cyperus rotundus*, *Dinebra retroflexa* and dicot weeds, *Ageratum conyzoides*, *Corchorus trilocularis*, *Alternanthera sessilis* and *Digera arvensis* were predominant.

Weed competition reduced important morpho physiological traits in soybean. Plant height and number of branches were increased due to herbicide use as compared to weed competition treatment. The growth

parameter LAI, CGR, AGR, RGR, NAR, RLGR, LWR and LAD decreased with weed competition while LAR increased. The dry matter of leaves, stem, root, nodules and total dry matter also decreased with weed competition.

Weed competition reduced nitrate reductase activity whereas chlorophyll 11-a, chlorophyll 11-b, and total chlorophyll¹¹ content increased. Among herbicide treatments, fluchloralin + IC and alachlor + IC resulted in higher chlorophyll¹¹ content and nitrate reductase activity.

The loss in pod yield in weed control (monocot+dicot) was 63.8 per cent as compared to

weed free treatment. Weed competition significantly reduced pod yield, 100-grain weight, number of grains per pod, grain yield and harvest index. Herbicides improved all these components and the increase was more with fluchloralin + IC and alachlor + IC.

Among the herbicides, fluchloralin @ 1.5 Kg. a.i. /ha + IC at 30 DAS and alachlor @ 1.5 KG a.i. /ha+IC at 30 DAS effectively controlled both monocot and dicot weeds and these enhanced all growth characteristics, Yield and yield components. Whereas, metolachlor was less effective in controlling weeds in soybean.

Effect of Growth Regulators on Growth and Yield of Safflower (*Carthamus tinctorius* L.) Genotypes

SUNEEL R. KAREEKATTI

1996

MAJOR ADVISOR : Dr .B.C. PATIL

A field experiment was conducted during *rabi* 1994 in medium black clay loam soil, at Agricultural College Farm, Dharwad, with a view to study the effect of plant growth regulators on growth and yield of safflower genotypes. The experiment was laid out in a split plot design with two genotypes (Annigeri-1 and 398-9-15) and seven treatments. Treatments were imposed at 40 DAS in both the genotypes.

The genotype, 398-9-15 recorded significantly more stem, leaf and capsule dry weight. The leaf area duration (LAD) at NAA (50 ppm) were also higher in 398-9-15 when compared to Annigeri-1. Further, the genotype, 398-9-15 registered maximum number of branches, capsules per plant, number of seeds per capsule and seed weight (g/plant) with NAA

(50 ppm). While Annigeri-1 had maximum 100 - seed weight at NAA (50 ppm).

Irrespective of treatments, the seed yield per hectare and harvest index (%) were significantly higher in 398-915 as compared to Annigeri-1 with NAA (50 ppm) 15.61 and 15.59 %, respectively), while lowest protein content was observed in control. Between the two genotypes, 398-9-15 had more chlorophyll11-a and chlorophyll 11-b content compared to Annigeri-1 at 95 DAS. The total chlorophyll 11 content increased in both the genotypes in all the treatments up to 95 DAS.

The genotype, 398-915 was found to be superior over Annigeri-1 in almost all the parameters studied,. Among the growth regulator treatments, NAA 50 ppm was found to be superior over the rest.

GENETICS AND PLANT BREEDING

Genetic Variability for Nitrogen Harvest Index in Chickpea (*Cicer arietinum* L.)

N.S. GADED

1996

MAJOR ADVISOR : Dr. P.M. SALIMATH

A field experiment was conducted during *rabi* 1994-95 at the Agricultural Research Station, Annigeri to estimate the genetic variability for nitrogen harvest index and yield related traits of chickpea, their nature of association with seed yield as well as among themselves separately and together for different seed size groups viz., desi bold, desi medium bold, desi small and kabuli. The trial was conducted using 57 advanced generation breeding lines of chickpea laid out in a randomized block design with three replications.

The traits viz., 100 seed weight, leaf size and seed yield showed high genetic variation followed by high heritability and expected genetic advance. Nitrogen harvest index showed considerable variation, heritability and genetic advance.

Biological yield, 100 seed weight, canopy width, pod bearing branches, leaf size, secondary

branches, harvest index and number of pods had high positive correlation with seed yield. Nitrogen harvest index also showed positive association with seed yield. Seed yield showed significant negative association with grain nitrogen content. Path coefficient analysis revealed that biological yield had the highest direct positive effect on seed yield. Nitrogen harvest index had moderate direct positive effect on seed yield. Harvest index had the highest direct positive effect on nitrogen harvest index.

Path analysis indicated that effectiveness of selection for high yield could be enhanced by inclusion of 100 seed weight, canopy width, number of primary and secondary branches, leaf size, number of pods per plant and biological yield along with nitrogen harvest index. Some genotypes viz., BGD-191, BGD-196, BGD-164 and BGD-163 proved to be potential sources for improving nitrogen harvest index in chickpea.

Studies on *in Vitro* Culture for Calus Induction and Plant Regeneration in *Petunia* (*Petunia hybrida* Vilm.)

B.N. PRASAD

1995 MAJOR ADVISOR : Dr. M.S.KURUVINSHETTI

Investigations were conducted to standardize the protocols for the induction and maintenance of callus and regeneration, direct plant regeneration from leaf and stem explants and anther culture for three petunia genotypes viz., 'Super Magic Mix', 'Super Cascade Pink' and 'Super Magic White'. Callus was induced on MS medium supplemented with different levels (0.25, 0.5, 0.75, 1, 2.5 and 5 mg/l) of 2, 4-D along with 0.5 mg/l BA from leaf and stem explants obtained from field grown and *in vitro* plants. Leaf explants from field grown plants produced desirable green embryogenic callus at lower levels of 2,4-D (0.25 and 0.5 mg/l). Regeneration of plants from established callus was better at 2 and 3 mg/l BA than at other concentrations tried viz., 0.25, 0.5 and 1 mg/l.

Direct shoot formation was noticed only in leaf explants whereas in stem segments further development of pre-existing axillary buds was noticed. Of the different concentrations (0.125 to 2 mg/l) of BA tried, 0.5 mg/l was found to be the best for 'SMM' whereas for 'SMW' and 'SCP' maximum plantlet formation was observed at 1.0 and 2.0 mg/l BA. All cultures under light showed better plantlet formation compared to dark conditions. In addition to direct shoot formation, callus induction followed by shoot morphogenesis was noticed in dark.

The shoots rooted readily on medium containing NAA. Of the different levels of NAA (0, 0.25, 0.5 mg/l) tried, rooting was best with 0.25 mg/l.

Anthers cultured on Nitsch and Nitsch medium supplemented with kinetin, BA and NAA at

different concentration either singly or in combination produced callus from tissues other than microspores.

Genotypic differences were observed for every aspect of *in vitro* culture considered in the present study.

**Genetic Studies in Segregating Generation of Single and Multiple Crosses in Cotton
(*Gossypium hirsutum* L.)**

K. NAGARAJ

1995

MAJOR ADVISOR : Dr. S.A. PATIL

The segregating generations of two single crosses (NHH -44, a commercial ruling hybrid and R10 x R8, a potential hybrid developed at Regional Research Station, Raichur) were compared among themselves and also along with their parents and F_1 in respect of mean, variability and transgressive segregation. A three way cross F_3 population based on NHH-44 (NHH-44 x SP - 38), a double cross F_3 population [NHH-44 x (R10 x R8)] and a BC_2 population of R10 x R8 with R10 were also involved to examine the shift in mean, variability, transgressive segregation and change in association resulting from use of more and more parents with respect of yield, yield related and quality traits. Among the two single crosses, R10 x R8 owing to its higher mean for most traits was superior over NHH-44 and also exhibited a higher proportion of segregants of practical utility in its segregating generations. When all the F_3 populations were compared among themselves, double cross and

three way cross F_3 exhibited higher magnitude of variability and frequency of segregants of practical utility for most traits. In all segregating populations, yield was highly and positively correlated with boll number while correlation was weak negative between yield and quality traits. The negative correlation between yield and quality traits observed in single crosses was changed to positive in multiple crosses indicating the chances of breaking undesirable linkage by involving more parents in crosses. Path coefficient analysis revealed that the traits boll number, boll weight and seed index had high direct effects on yield in all the populations and practicing selection for these traits can increase the yield.

It was revealed from this study that the superior commercial hybrids can also give useful segregating populations consisting of many transgressive segregants and also involving more parents in hybridization could enhance the possibility of improvement of yield with quality traits.

Genetic Variability and Divergence Studies in Barley (*Hordeum vulgare* L.)

LEEBU BABU

1996

MAJOR ADVISOR : Dr. R.R. HANCHINAL

A study was conducted to assess variability, character association and genetic diversity in 56 barley genotypes grown during rabi 1994-95. The genotypes representing various ecogeographic regions were

evaluated in RBD with four replications. 13 quantitative characters, three quality and two physiological traits were recorded.

Analysis of variance and other genetic

parameters revealed the presence of considerable genetic variability for different characters among the genotypes studied. The PCV and GCV estimated indicated low variability for character like biomass per plot, spike length, germinative energy at 48 hours, germinative energy at 72 hours, protein percentage, total chlorophyll content, epicuticular content and seed yield per plot. Most of these characters recorded moderately high heritability estimates, grains per spike, spikes per meter square, tillers per meter square, plant height, thousand grain weight and seed yield per meter square. Genotypic correlation of yield with biomass per plot, harvest index, grains per spike, spikes per meter square, tillers per meter square and total chlorophyll content were positive and highly significant.

Path analysis revealed that spikes per meter square will be the best criteria of selection for improving grain yield.

On the basis of Mahalanobis's D^2 analysis, 56 genotypes were grouped into five clusters. The genotypes in cluster IO and UBE-413 in cluster IV were diverse with most of the other genotypes and this should be made use in future breeding programme to obtain high heterotic crosses and superior segregants. No parallelism was observed between genetic diversity and geographic diversity.

Two rowed barley can also yield as much as six rowed types and six rowed types can have equal potential in quality as that of two rowed types.

Studies on *In Vitro* Development of Cotton (*Gossypium* spp.) Fibre

SHIVANAND M. KAWALIKAI

1996

MAJOR ADVISOR : Dr. B.M. KHADI

In vitro ovule culture experiments were conducted to study the preliminary factors like plant growth regulators, inorganic nutrients, energy source, media etc. that affect ovule and fibre development. The selected genotypes representing all the four species and hybrids were used in the present study. Ovules of Abadhita (*G. hirsutum*) were subjected to detailed investigation.

On solid medium limited ovule growth without concomitant fibre development was noticed. Sucrose provided maximum ovule growth, where as glucose provided maximum fibre development. Fibres did not develop on the inundated surfaces of the ovules.

Fertilized ovules cultured on basal BT liquid medium developed fibres. Addition of GA to basal liquid medium induced maximum fibre development followed by IAA and NAA. Kinetin was found to be inhibitory for fibre development. Addition of auxins like NAA and/or IAA was necessary to elicit fibre development on unfertilised ovules. The results indicated that auxin is the major hormone produced in response to the process of fertilization. GA induced maximum ovule growth in both fertilised and unfertilised ovules followed by NAA

and IAA. Kinetin was found to be inhibitory for ovule growth at higher concentrations.

Continuous presence of IAA was found necessary from the day of initiation of culture, for maximum fibre development in case of unfertilised ovules. Studies with preanthesis ovules, indicated that potential for fibre formation is present as early as five days prior to anthesis.

Effects of inorganic nutrients on *in vitro* fibre development and ovule growth was also studied. In the absence of calcium in the culture media, ovules browned and died. Deletion of boron, magnesium, ammonium and copper significantly reduced fibre development. Iron and magnesium had both qualitative and quantitative effect on fibre development. Deletion of Iron, magnesium, manganese, calcium, ammonium and boron reduced ovule growth.

Only genotypes of *G. hirsutum* responded to culture and intra-hirsutum hybrid developed *in vitro* fibre. However, ovules of other species and hybrids did grow in culture without concomitant fibre development. *In vitro* fibre initiation was delayed for various lengths of time compared to *in vivo* growing ovules.

Genetic Potential of Interspecific Derivatives for Improving Resistance to Late Leafspot in Groundnut (*Arachis hypogaea* L.)

PRAKASH H. KUCHANUR

1996 MAJOR ADVISOR : Dr. M.V.CHANNABYRE

An investigation was carried out to assess the genetic potential of interspecific derivatives for improving resistance to late leafspot and productivity in Spanish groundnuts. The trial included three agronomic ruling varieties (KRG 1, DH 40 and JL 24) of the region susceptible to late leafspot and three high yielding late leaf spot resistant interspecific derivatives (VG 101, CS 16 and GBFDS 272) and a land race PI 259747. The material was crossed in LxT design and evaluation of parents along with F_1 and F_2 populations, was made in *kharif* 1994.

The resistant male parents recorded higher remaining green leaf area (RG) and lower defoliation (DF) but matured late. Among hybrids, the crosses involving GBFDS 272 followed by CS 16 were relatively resistant by recording higher RG.

Variability due to combining ability was evident only among males. The variability due to interaction was absent. The combining ability analysis revealed additive and additive x additive type of gene action, but heterosis and inbreeding depression indicated predominance of dominance gene action

indicating inadequacy of LxT analysis to judge the nature of genetic variation. Dh 24 was a good general combiner for pod number and SP while JL 24 was better for TW. GBFDS 272 and CS 16 combined well for all disease resistance parameters. There were not many specific deviations among crosses.

The mean heterosis over mid-parent for resistance parameters was undesirable and it was low for most of the productive parameters. The mean performance of F_2 generation was inferior to female parent for most of the parameters. F_2 populations showed maximum variability for leaf area affected by the disease.

The association between pod yield and other productivity parameters was desirable. The association of resistance with pod yields, SP and sound mature kernel percentage was undesirable. The frequency of desirable segregants, especially with Spanish characters was less. Selection among crosses based on F_1 and F_2 data was not possible. Selective intermating was suggested as a method to break undesirable associations to bring about further improvement.

Genetic Potentiality of Induced Mutants for Foliar Disease Resistance, Productivity, Pod and Kernel Features in Groundnut (*Arachis hypogaea* L.)

A.G.PATIL

1996 MAJOR ADVISOR : Dr. M.V. CHANNABYRE
GOWDA

Eleven induced mutants along with resistant (GBFDS 272, PI 259747, PI 393516) and susceptible (JL 24, K 134, Dh 40) checks were evaluated for resistance to rust and late leafspot besides productivity during 1994 and 1995 *kharif* seasons. Among the mutants, 1-45 and 1-110 combined useful characters of both resistant and susceptible checks. They exhibited high level of resistance, matured early and possessed

desirable pod and kernel features, indicating superiority over existing disease resistant germplasm in groundnut.

Detailed analysis of growth and partitioning of a selected mutant 1-45 besides susceptible (JL 24, K134) and resistant (GBFDS 272, PI 259747, VG 101) checks, under protected and unprotected conditions was undertaken during 1995 *kharif*. Susceptible checks were characterised by rapid vegetative growth in early phase,

early onset of reproductive assimilates to pods but suffered severely due to disease incidence. On the contrary, resistant checks were characterised by slower vegetative growth during early phase, later onset of reproductive growth and lower rates of partitioning. But mutant 1-45 combined high level of resistance with rapid vegetative growth in early phase, early onset of reproductive growth and higher rate of partitioning, revealing superiority over existing resistant germplasm.

Genetic potential of mutant 1-45 was also assessed by evaluating segregating generation of single

and threeway crosses during 1995 *kharif*. Single crosses involving mutant 1-45 as a parent generated high frequency of disease resistant segregants but lower frequency of productive segregants as compared to single crosses involving other resistant germplasm (GBFDS 272, PI 259747). Three way crosses involving mutant 1-45, a resistant germplasm and a susceptible cultivar gave significantly high frequency of disease resistant and productive segregants, indicating scope for utilization of mutant 1-45 in breeding for foliar disease resistance in groundnut.

Nature of Genetic Divergence in Soybean (*Glycine max* (L.) Merrill)

K.N. MAHARADDI

1996

MAJOR ADVISOR : Dr. S.A.PATIL

A study was conducted to assess variability, character association and genetic diversity in 103 soybean genotypes including three cultivated varieties. The genotypes were evaluated in RCBD with three replications during *kharif* 1995. Four qualitative and 12 quantitative characters were recorded.

Analysis of variance and other genetic parameters revealed the presence of considerable genetic variability for different characters among the genotypes studied. Based on mean yield performance, genotypes JS-89-37, MACS-267, EC-118237, IC-34060 and EC-39524 were identified as potential high yielders than the best check.

Highest PCV and GCV were observed for plant height (39.16 and 37.27%). Protein percentage recorded lowest PCV (7.69%) while seeds per pod showed lowest GCV (5.41%). Seeds per pod (34.10%) showed low heritability. High heritability coupled with high genetic advance was noticed for plant height, days to flowering and pods per plant.

Significant positive association of seed yield was observed with pods per plant, pod weight per plant,

100-seed weight and oil percentage at both genotypic and phenotypic levels. Protein percentage on the other hand recorded significantly negative association with seed yield.

Pod weight per plant should be considered as a selection criterion for improving seed yield, as it showed significant positive correlation as well as high direct effect.

Multivariate analysis indicated presence of high diversity in the germplasm studied. Based on D² analysis, 103 genotypes were grouped into 24 clusters. Cluster I was biggest with 15 genotypes. High inter and intra cluster distance ranges were noticed. Thus, indicating sufficient diversity in the germ plasm collection.

Based on divergence and cluster mean analysis, the following crosses have been suggested. Crosses between genotypes of cluster X (G-1171, KB-19 and G-172) with genotype of clusters XXIV (IC-5326) and XVII (IC-49859) and also between genotype of cluster XV (VLS-38) and XVI (Himso-558) with genotype of cluster XXIII (G-978), to obtain high heterotic crosses and superior segregants.

Characterisation of Cotton (*Gossypium* spp) Genotypes Through Electrophoretic Techniques

SHIVANAND S. NARAJJI

1996

MAJOR ADVISOR : Dr. B.M. KHADI

An investigation was carried out to characterise the selected cotton genotypes representing all four cultivated species. The selected genotypes, viz Abadhita (*G. hirsutum*), Suvin (*G. barbadense*), Jayadhar (*G. herbaceum*), Virnar (*G. arboreum*) interspecific hybrids (*G. hirsutum* x *G. barbadense*) DCH 32 and DHB 105 and respective parents were analysed electrophoretically for seed proteins (Tris-HCl soluble, globulins and water soluble proteins). Based on Rm values, a total of 23 in PAGE of Tris HCL soluble proteins, 25 in globulins, 25 in water soluble proteins and 36 bands in SDS-PAGE of Tris-HCL soluble proteins were observed. Tris-HCL soluble proteins were useful in characterisation of genotypes, as these produced unique spectrum of bands. Seed globulin profiles were also found useful in distinguishing all the genotypes.

Water soluble proteins were found useful in the characterisation of genotypes.

The genotypes were analysed for seed peroxidase, alcohol dehydrogenase and glutamate dehydrogenase isozymes. Peroxidase and glutamate dehydrogenase banding patterns were not useful in differentiating the genotypes. However, alcohol dehydrogenase banding pattern was useful.

An electrophoretic analysis was made for leaf peroxidase, glutamate dehydrogenase and esterases. Of these, only esterase was more useful in distinguishing both the hybrids DCH 32 and DHB 105 from their respective female parents.

A study made on the effect of seed age on proteins revealed only quantitative differences. In case of aged seeds, there was no activity of enzymes.

Efficiency of Hybrid Mutagenesis for the Improvement of Productive and Foliar Disease Resistance in Groundnut (*Arachis hypogaea* L.)

EKESHA N. SIDDAPPAGAUDAR

1996

MAJOR ADVISOR : Dr. K. GIRIRAJ

A set of four crosses involving four adapted high yielding but susceptible genotypes (JL-24, Dh-39, Dh-40 and Girnar-1) and a foliar disease resistant germplasm line (PI393516) formed the base material for this study. Half the quantity of F₁ seeds of each of the four crosses were treated with EMS (0.5%) and remaining half quantity was advanced as such for comparison of mutagen treated and untreated populations in each of the four crosses for generation of genetic variability, frequency and potentiality of desirable recombinants. Besides, character association between productivity and disease resistance parameters were also compared in these two populations.

Extent of genetic variability released through hybridization followed by mutagenic treatment was significantly higher than direct hybridization method for pod yield and disease resistance parameters viz., defoliation, remaining green leaf area and percentage

leaf area affected. Mutagen treated population gave relatively higher percentage of superior segregants for pod yield (23.9%), SMK percentage (40%), Shelling percentage (12.21%) and disease resistance (8.3%) as compared to untreated population (19.7%, 38%, 9.79% and 6.63%, respectively). EMS treated population also produced higher proportion of superior recombinants for combination of pod yield, shelling percentage, SMK percentage and disease resistance (0.84%) as compared to untreated population (0.21%) in F₃ generation.

The association of important disease resistance parameter viz., RGLA with shelling percentage and SMK percentage was significantly shifted (in the desired direction) in the mutagen treated population as compared to untreated population (undesirable).

A total of eight desirable recombinant lines for productivity and disease resistance were derived from mutagen treated population as compared to only three desirable recombinant lines in untreated

population. Based on results, it was concluded that combination of hybridization and mutation helps to recover desirable recombinants by disrupting undesirable linkage between disease resistance and pod features.

HORTICULTURE

Effect of Post Harvest Treatments on Keeping Quality of Sapota (*Manilkara achras* (Mill.) Fosberg) cv. Kalipatti Fruits

G. SANJAY

1996 MAJOR ADVISOR : Dr. P. NARAYAN REDDY

An investigation was carried on post harvest treatments on keeping quality of sapota (*Manilkara achras* (Mill.) Fosberg) cv. Kalipatti, fruits at the Division of Horticulture, Raichur during 1994-95. The investigation was made in two separate experiments, first dealing with different growth regulators (GA, Kinetin, NAA and cycocel) at different concentrations, second with different chemicals (CaCl_2 and $\text{Ca}(\text{NO}_3)_2$), plant extracts (starch and *Luffa tuberosa*) and KMnO_4 , ethylene absorbent. (Sachets and spray to cushioning material). The experiments were laid out in completely randomised design.

Under ambient conditions, the fruits dipped in either GA (100 ppm) or kinetin (75 ppm) stored well upto 10 days. These treatments recorded significantly lowest physiological loss in weight (10.15%) when compared to fruits in control (15.17%) the fruits treated with either GA (100 ppm) or kinetin (75 ppm) retained significantly higher TSS, ascorbic acid, total and

reducing sugars and total phenols than rest of treatments and hence had shelf life of 10 days. Fruits with water dip treatment (control) recorded maximum decay loss, PLW and hence had shorter shelf-life of eight days.

Among the calcium compounds tried, calcium nitrate (%) treatment was found to retain significantly higher TSS, ascorbic acid, total titrable acidity, total and reducing sugars than rest of the treatments.

Potassium permanganate (KMnO_4), an ethylene absorbent applied in the form of spray to the cushioning material was quite effective in reducing the PLW, maintaining higher TSS, ascorbic and total and reducing sugars acidity, and phenols on all days of observation.

Influence of plant extracts *Luffa tuberosa* and starch did not show any significant superiority over control with respect to quality parameters and in extending shelf-life.

**Effect of Gibberellic Acid and Berry Thinning on Quality and Yield of Grapes
(*Vitis vinifera* L.) cv. Thompson Seedless**

R.M. SHYLESH

1996 MAJOR ADVISOR : Dr. P. NARAYAN REDDY

An investigation was carried out at the vineyard of Regional Research Station, Raichur during 1994-95 to study the effect of GA and berry thinning on quality and yield of grapes (*Vitis vinifera* L.) cv. Thompson seedless. The study revealed that the unthinned bunches coupled with GA showed a significant increase in length, breadth and weight of the bunch and berry. GA treated bunches were found to have enlarged and elongated berries, thick and elongated rachis and pedicels. The berries were heavier and attractive than untreated berries. Five dippings of GA (10 ppm at bud stage followed by 20 ppm at full bloom; 30, 40 and 50 ppm after 5, 10 and 20 days of 2nd dipping, respectively) without berry thinning

recorded highest yield (2686 t/ha). Berries receiving two dippings of GA (20 ppm at full bloom followed by 50 ppm at fruit set stage) with thinning were found to have maximum reducing sugar (18.03%) content.

Study further revealed that four dippings of GA combined with berry thinning was most beneficial in respect of both quality and returns per rupee spent. GA treated bunches were observed to keep well for more than a week after harvest under ambient conditions without affecting the quality. The treatment of GA though increased the keeping quality of the bunches under room temperature, storage with least PLW (%), the untreated berries were better in quality and recorded more TSS (23.18%) and low acid (0.28%) content.

**Studies on Effect of Chemicals and Growth Regulators on Storage Behaviour of Guava
(*Psidium guajava* L.) Fruits cv. Sardar**

RAVEENDRANATH N. SOPPIN

1996

MAJOR ADVISOR : Dr. A.K. ROKHADE

An investigation was conducted to study the effectiveness of pre-harvest spray of growth regulators (Cycocel and NAA) and chemicals (Calcium nitrate and Calcium Chloride) and post-harvest treatment with waxol on storage behaviour of guava fruits cv. Sardar at Division of Horticulture, UAS, Dharwad during 1994. The pre-harvest spray of calcium nitrate (2%), NAA (100 ppm) and cycocel (1000 ppm) had beneficial effects in enhancing the shelf-life and maintaining the quality of fruits. These treatments reduced the PLW, shrinkage index and maintained good quality of fruits upto 6 days at ambient conditions of storage. The pre-harvest treatment with calcium nitrate (2%) enhanced the

keeping quality of fruits upto 9 days with higher T.S.S. titratable acidity, ascorbic acid, sugars and higher organoleptic scores.

Post-harvest dipping of fruits in waxol (6%) and storing in CFB boxes under ambient conditions was found to significantly reduce the PLW and shrinkage index upto 9 days after storage and retain higher TSS, ascorbic acid, total sugars than the control fruits upto 6 days after storage.

Pre-harvest spray with calcium nitrate (2%) and post-harvest treatment with waxol has enhanced the shelf-life upto 9 days with good quality of fruits and higher organoleptic scores.

Effect of Post Harvest Treatments on Storage Physiology of Banana Cv. Robusta Fruits

S.N. PATIL

1996

MAJOR ADVISOR : Dr. N.C. HULIMANI

An investigation was carried out to evaluate the effectiveness of post-harvest treatments of wax mulsion (Waxol 6%) growth regulator (GA_3 150 ppm), fungicide (Bavistin 450 ppm) and potassium permanganate as an ethylene absorbent with polythene bag ($KMnO_4$ on vermiculite blocks) on storage, physio-chemical changes, organoleptic characters and shelf-life of banana Cv. Robusta fruits under ambient conditions. The experiment was carried out at the Division of Horticulture, Dharwad during 1995-96.

The post-harvest treatments of fruits with waxol (6%), GA_3 (150 ppm), bavistin (450 ppm) and ethylene absorbent with polythene bag recorded higher shelf-life (18.0, 18.0, 20.50 and 18.0 days respectively) as compared to control (16.0 days) fruits. These treatments recorded lower PLW, delay loss, fruit ripening and pulp to peel ratio throughout the storage period, besides retained higher quality parameters like TSS, acidity, TSS to acid ratio, sugars at the end of storage period with acceptable organoleptic characters.

Among different combinations, bavistin + polythene bag with ethylene absorbent recorded significantly lower PLW, delay loss, ripe fruits and pulp to peel ratio when compared to other treatments, followed by GA_3 + bavistin and waxol + bavistin treatments, throughout the storage period. The treatment of fruits with bavistin + polythene bag with ethylene absorbent retained significantly higher quality parameters at the end of storage period, followed by GA_3 + bavistin and waxol + bavistine when compared to other treatments besides, these recorded higher organoleptic values compared to other treatments throughout the storage period.

The post-harvest treatment of bavistin (450 ppm) with ethylene absorbent was found to be the best treatment, followed by bavistin with GA_3 (150 ppm) and bavistin with waxol (6%) for extending the shelf life of banana fruits (22.0, 21.50 and 21.0 days, respectively) with acceptable quality.

Effect of Different Packages and Storage Conditions on Shelf-Life of Ber (*Zizyphus mauritiana* Lamak.) cv. Umran

YALLARADDI B. RADDER

1996

MAJOR ADVISOR : Dr. H.B. PATIL

The investigation was carried out at the College of Agriculture, Bijapur, University of Agricultural Sciences, Dharwad during the year 1994-95, to study the Effect of different packages and storage conditions on shelf-life of ber (*Zizyphus mauritiana* Lamk) cv. Umran with the objective of finding out the suitable packaging material for transportation and extending the shelf-life in storage and to identify the ideal storage conditions for extending the shelf-life by using different packages and different storage conditions in a completely randomized design following factorial concept with 15 treatments and three replications.

For transportation, among the different packages like gunny bag, woven basket, corrugated paper box, corrugated paper box with mesh and wooden box, the corrugated paper box with mesh was found to be better with minimum mechanical damage and physiological loss in weight.

For extending the shelf-life, among the different packages corrugated paper box with mesh was found to be better with minimum percentage of physiological loss in weight, percentage of riped fruits and percentage of decayed fruits whereas, organoleptic characters, ascorbic acid and sugars were found to be maximum throughout the period of storage upto 15 days.

Among the different storage conditions like room-temperature, modified atmosphere and zero energy cool chamber, zero energy cool chamber was found to be better up to 12 days after storage with respect to above mentioned characters except percentage of decay loss. The fruits could be stored upto 15 days in zero energy cool chamber.

Among the different combinations of packages and storage conditions, corrugated paper box with mesh under zero energy cool chamber was found to be better as compared to other packages and storage combinations with respect to physical and bio-chemical characters.

SEED SCIENCE AND TECHNOLOGY

Effect of post harvest operation at different moisture levels on seed quality in Soybean

KASHINATH S. AGASANAL

1996

MAJOR ADVISOR : S.D. SHASHIDHAR

A study was conducted to determine the effect of different post harvest operations and handling at various moisture content on seed quality of soybean cultivars Monetta and JS-335. Seeds processed by gravity separator recorded the highest seed quality characters and lowest seed damage in both the cultivars. It was followed by Air screen cleaner and hand threshing. Auger conveyer, bucket elevator and mechanical threshing recorded higher seed damage, in turn lowering the seed quality.

Irrespective of method of post harvest operations, seeds processed at 14.00 per cent seed moisture content recorded lowest seed damage and highest seed quality parameters in both the genotypes.

To know effect of handling of seed on quality, seed bags were dropped from a height of 1 meter. Among the different drop heights, seeds dropped from 1.0 meter height recorded the highest seed quality

characters in both the cultivars compared to higher drop heights. This height drop of seed was also recorded lowest broken, split, microscopically damaged seeds. It was followed by 1.5 meter drop height. And lowest quality characters were found in 3.00 meter height of drop of seed.

Irrespective of height of drop of seed, seeds dropped at 14.00 per cent moisture content recorded the lowest damage to seeds and highest seed quality character.

The seeds processed by gravity separator at higher moisture content (14.00%) maintained better germination (87.42 and 85.17%) and vigour index (2412.2 and 2016.3) in Monetta and JS-335 genotypes, respectively. It is better to avoid use of screw conveyer and bucket elevators while processing as they cause damage to seed and reduce the seed quality. It is better to avoid dropping of seeds from more than one meter height, especially at lower seed moisture levels.

Influence of Accelerated Aged Seeds of Sunflower Restorer Lines on Growth, Seed Yield and Hybrid Performance

R. BALARAJ

1996

MAJOR ADVISOR : A.S. CHANNAVEERSWAMI

An attempt was made to study the influence of accelerated aged seeds of sunflower restorer lines on growth, seed yield and hybrid performance. The experiment was carried out in both laboratory and field in randomised block design using factorial concept during late rabi 1995-96 at Agricultural College Farm, Dharwad. Four sunflower varieties (restorer lines) RHA-274, RLC-2, IV-83 and VI-78 were subjected to accelerated aging at $42 \pm 2^\circ\text{C}$ temperature and 100 per cent relative humidity for zero day AA, two days AA, four days AA and six days AA periods.

Laboratory studies after aging the seed showed that zero day aged seeds recorded high germination and had greater shoot length, root length, seedling length, seedling dry matter accumulation, vigour indices, speed of germination and field emergence while Electrical Conductivity (EC) of seed leachate was lowest. Significant reduction in all these parameters were observed as the aging period advanced in all the restorer lines and increased EC of seed leachate.

High vigour seed (zero day aged) consistently showed better field performance on plant height, number of leaves, number of branches, days to 50 per cent flowering, maturity, capitulum diameter, number of filled seeds per capitulum, per cent seed set per head, seed test weight, seed yield per plant and seed yield per hectare while, significant reduction in growth parameters, yield and yield components were noticed in six days aging treatment.

The performance of aged restorer lines on hybrid seed set, yield and its seed quality revealed that there was slight reduction in number of filled hybrid seeds per capitulum, per cent seed set per head, seed test weight, hybrid seed yield per plant and hybrid seed yield per hectare with the decrease in vigour levels of restorer lines in all the hybrids. Percentage decrease in germination was of lower magnitude with increase in period of aging of restorer lines in all the hybrids. Higher shoot length, root length, seedling length, seedling dry matter accumulation and vigour indices were recorded in the hybrids crossed with zero day aged restorer lines.

SERICULTURE

Effect of in Situ Vermiculture on Mulberry and Cocoon Yield

REJASHEKHAR C. KOLHAR

1995

MAJOR ADVISOR : Dr. G.M. PATIL

Studies on effect of in situ vermiculture on mulberry and cocoon yield were carried out at Department of Sericulture, U.A.S., Dharwad during 1994-1995. The application of recommended doses of FYM+RDF resulted in significant increase in leaf yield ($9.84 \text{ t ha}^{-1} \text{ crop}^{-1}$) in all the five prunings compared to other treatments except in situ vermiculture @ 50,000 earthworms ha^{-1} and @ 1,00,000 earthworms ha^{-1} (9.72 and 9.78 t ha^{-1} , respectively) released one year before initiation of experiment. Thrips incidence was significantly low in in situ vermiculture @ 50000

earthworms ha^{-1} , @ 1,00,000 earthworms ha^{-1} and recommended doses of FYM+RDF (12.96, 12.67 and 13.01 leaf^{-1} , respectively) compared to other treatments. Highest leaf yield (11.54 t ha^{-1}) and less thrips incidence (10.12 leaf^{-1}) were recorded in May pruning. Maximum amount of available nitrogen, phosphorous, and potassium were recorded in soil samples of recommended doses of FYM+ RDF, in situ vermiculture @ 50,000 and @ 1,00,000 earthworms ha^{-1} treated plots.

Though leaves were rich in crude protein in recommended dose of FYM+RDF, third instar (chawki)

larval weight was less ($1.702 \text{ g } 10 \text{ larvae}^{-1}$). Whereas *in situ* vermiculture @ $50,000 \text{ earthworms ha}^{-1}$ and @ $1,00,000 \text{ earthworms ha}^{-1}$ recorded significantly highest carbohydrate and total sugar resulted in highest third instar larval weight (2.11 g and 2.06 g/10 larvae , respectively). However, recommended dose of FYM + RDF treated leaves resulted in significant improvement in economic trait of silkworm (PM X NB₁₈), effecting highest cocoon yield ($237.46 \text{ g/200 worms}$),

followed by *in situ* vermiculture @ $50,000 \text{ earthworms ha}^{-1}$ and @ $1,00,000 \text{ earthworms ha}^{-1}$, whereas highest C:B ratio of 1:16.5 and 1:16.60 were worked out in *in situ* vermiculture @ $50,000 \text{ earthworms ha}^{-1}$ and $1,00,000 \text{ earthworms ha}^{-1}$, respectively, lowest in recommended does of FYM+RDF(1:3.0). December-January was the most favourable season for rearing silkworm that resulted in lowest incidence of diseases and highest cocoon yield (2620 g/200 worms) than July-August and April-May rearing.

FAMILY RESOURCES MANAGEMENT

Extent of Fuel and Time Saved with the Use of Energy Saving Shields and Cooking Vessels

SUJATA H. SHETTEMMAVAR

1996

MAJOR ADVISOR : Dr. SUHASINI RAO

The study was conducted at Rural Home-Science College, UAS, Dharwad during the year 1994-95. Besides survey method, experimental method at Laboratory and household level was conducted with the following objectives to study the time requirement and fuel consumption for cooking selected food items by using stainless steel, aluminium vessels and pressure cooker on kerosene and LPG stoves, to evaluate the efficiency of tin and mud fuel saving shields on selected stoves and to test the adoptability of fuel saving shields in the selected households. Sample selected for the survey method were 120 households and self structured questionnaire was used for the data collection and for experimental method at household level. Sample selected were 30 households, 15 households having kerosene stove and another 15 households having LPG stove from Dharwad city. To test the above objectives the statistical methods applied were percentage and

frequency distribution, mean, Karl Pearson's correlation coefficient, normal distribution and CRD (Completely Randomized Design). It is clear from the study that cooking food items on LPG stove consumed less fuel and time compared to cooking on kerosene stove. Since the intensity of heat in case of LPG stove is more than kerosene stove. Cooking by using energy saving shields consumed less fuel and time compared to cooking without using shield. Since by using shield the hot gases follow the vertical line of the utensil thereby increasing the heating efficiency of the stoves. Among both shields, mud shield found to be more efficient compared to tin as mud retains heat for a longer time. In the household level experiment on the efficiency of the shields, the adoptability of mud shield was found to be more efficient compared to the tin shield. Finally mud shield found to be more efficient in saving fuel, time and money compared to tin.

FOODS AND NUTRITION

Food Habits and Nutritional Status of Banjara with Special Reference to School Age (6-12 years) Children

S. JYOTHILAKSHMI

1995

MAJOR ADVISOR : Dr. RAMA K. NAIK

A total of 100 Banjara families and 100 school age children were randomly selected from two Tandas of Dharwad district and interviewed for food habits with pre-tested schedule. Nutritional assessment of children was assessed by anthropometry, dietary and clinical methods. The data was statistically analysed by student 't' test. Results revealed that Banjaras were nonvegetarians and consumption of alcohol was culturally accepted. Rawa ganji with sugar and mashed rice were the first supplementary food to infants. Neem paste to breast was the method to wean the child from the breast. Increased intake of normal diet was preferred and "hot foods" perceived were restricted during pregnancy. Special foods like 'kado' Coconut Khara' vermicelli, payasa and green leafy vegetables were included and clod foods perceived were avoided during puberty and lactation. Alcohol was given during lactation

period. Relatives offered meat and alcohol to grievous family during death instances.

All the anthropometric parameters increased with increase in age. Females were taller and heavier than males in 8-10 and 10-12 years, due to pre-pubertal spurt. The mean anthropometric measurements of children were lower than the 50 th percentiles of NCHS standards, except for MAC. Severe weight and height deficit was apparent. Thirty per cent of children were under normally fed with past history of malnutrition followed by currently underfed (15%), currently underfed with past history of malnutrition (6%), currently overfed with past history of malnutrition (5%) and slightly overfed (4%). All the nutrients were inadequate except thiamine and niacin in all the age group. Pale conductive of eyes, dental carries, conjunctival xerosis of eyes, muscle wasting, dull and dry hair, skin infection and angular stomatitis were prevalent.

Composition and Preservation of Oyster Mushrooms (*Pleurotus species*) By Dehydration Methods

KASHIBAI S. KHYADAGI

1996

MAJOR ADVISOR : G.S. SHARADA

An investigation on Oyster mushrooms was carried out during 1994-95 to determine the chemical composition, effect of pretreatments on dehydrated mushrooms, preservation of mushrooms and acceptability of preserved mushrooms.

Six varieties of matured whole Oyster mushrooms cultivated on paddy straw were analysed for proximate principles by standard methods. Among six varieties, three high yielding were selected for preservation. They were dehydrated by hot air even drying, sun drying and artificial drying. Pretreatments given were blanching, blanching plus water soak, blanching plus potassium meta bisulphite 1% and blanching plus Potassium Meta bisulphite 1% plus Citric acid 0.25%. The dehydrated mushrooms sealed in

polyethene bags and stored in airtight aluminium containers for three months under ambient temperature.

Organoleptic evaluation of preserved mushrooms was carried out for quality parameters by 15 panel judges, further mushrooms reconstituted in boiling water and recipe prepared and evaluated for acceptability by five expert panels. The dehydration and rehydration ratio was calculated.

The mean moisture content of mushrooms was 88.86 g%, fat 2.2 g1% protein, 30.94 g%, ash 10.56 g%, fibre 7.84 g% and carbohydrate 48.46 g%, which varied significantly between varieties.

Organoleptic evaluation of preserved mushrooms revealed significant differences for all quality characteristics. Oven dried products were highly

acceptable. The pretreatments significantly influenced the all sensory quality parameters. Blanched plus potassium meta bisulphite 1% plus citric acid 0.25% treated mushrooms produced better quality product. The mean dehydration and rehydration ratio of 10.50 and 3.79 which significantly differed between varieties, drying methods and pretreatments.

Chemically treated over dried mushrooms had all the quality parameters almost similar to the fresh mushrooms after rehydration except leathery texture.

Reconstituted mushrooms recipes found acceptable though blanched and chemically treated mushrooms were leathery in texture.

HUMAN DEVELOPMENT

Effect of Parenting Style on the Social Development of the Children

POORNASHRI BADIGER

1995

MAJOR ADVISOR : Dr. V. GAONKAR

A study on effect of parenting style on the social development of the children was carried out in Dharwad city during 1994. One hundred and ninety eight children were selected from four different randomly selected high schools. The study also included the parents of these children. Thus, the total sample for the study constituted of 396.

Parenting styles and social development were measured using "Parent- child Relationship Scale" (Rao, 1989) and "Vineland Adaptive Behaviour" Scale (Sparrow *et al.*, 1984), respectively. The influence of ordinal position, family size, gender, parental education, occupation and per capita income on parenting style and social development was investigated. Correlation coefficients, multiple regression coefficient and 'Z' test were used for analysing the data.

The result of the present investigation indicated that mothers were more protecting and loving

than fathers. Majority of the children were average and above average in their level of social development, except few in moderately low group. Father's protecting and loving behaviours positively and significantly influenced social development of children, whereas demanding and neglecting behaviours were negatively and significantly influenced. Mother's protecting behaviour positively and significantly influenced social development. Parental education and occupation had positive and significant correlation with social development. Family size was negatively and significantly associated with social development. Family size positively and significantly influenced father's demanding nature. Education of parents was positively and significantly related to their protecting and loving behaviour and negatively related to their demanding and indifference. Occupation of father was positively related to protecting and loving behaviour.

Factors Influencing the Prevalence of Depression Among the Elderly

PREMA B. PATIL

1996

MAJOR ADVISOR : Dr. V. GAONKAR

The present study was carried out in Dharwad city (North Karnataka) from October 1995 to February 1996. The sample comprised of 220 elderly persons including both male and female with the age ranging between 50-70 years. Ramamurti's (1978) scale was used to assess the health status, economic status and social activities of the elderly. Hosmath's (1992) scale was used to elicit information regarding religious activities. The modified form of the items given by David *et al.* (1988) were used to measure family solidarity. The scale constructed and standardized by Karim and Tiwari (1986) was used to measure the level of depression. The results revealed that a larger proportion of the respondents had low level of depression. Age was found

to have positive and significant relationship with depression. The percapita income was found to have a negative and significant relationship with depression. The number of children was found to have a positive and non-significant relationship with depression. A significant difference in the depression level was found in the respondents belonging to different gender, educational level and employment status and a non-significant difference in the respondents belonging to different type of family. A negative and significant relationship of economic status, health status, social status, family background and family solidarity with the depression was found. Lastly, the religious activities was found to be positively and significantly related with the depression of the elderly people.

TEXTILES AND CLOTHING

Effect of Laundering on Physical Parameters and Microbial Load In the Sweat Areas of School Uniform Shirts

BHAVANI KAMMAR

1996

MAJOR ADVISOR : Dr. D.N. SHAILAJA

The study was conducted during the year 1994-95 in Dharwad taluk of Karnataka state. The sample size for the survey comprised of 100 mothers of adolescent boys studying in X standard. Questionnaire was prepared and personal interview method was used to collect the information.

For the experimental study, 10 boys studying in X standard in Co-education english medium high school were selected for wear Trials. Ten uniform shirts were constructed according to their anthropometric measurement, using 76:33 P/C blended material.

After every two wears, the microbial load was analysed in three different seat areas viz., arm pits, centre back and collar. The shirts were laundered after every two wears and after every fifth wash, the shirts were tested for physical parameters.

Majority of the respondents preferred to purchase Surf detergent powder and purchased the cleansing agents monthly. Among different materials available for uniform shirts, majority preferred P/C blended material irrespective of their income group. Results of the survey showed that, the school uniform clothes were washed once in two days and cent percent respondents practiced home laundering.

As the number of wears increased, significant increase in both fungal and bacterial population was observed. Shrinkage enhanced up to four cycles, after which fabric got dimensionally stabilized. Increase in number of threads per inch in both warp and weft direction was observed.

Reduction in the values of weight/ unit area, crease recovery angle, bending length, tensile strength,

tear strength and abrasion resistance were observed. Tensile strength of warp yarns was found to be greater

than that of weft. Where as, warp way tear strength was comparatively lesser than weft way.

AGRICULTURAL ECONOMICS

Economics of Silk Cocoon Production In Dharwad District

SOMASEKHAR D. DABALI

1996

MAJOR ADVISOR : Dr. G.K. HIREMATH

Banking on the evolved improved Sericultural Technology and aided by the World Bank and the Swiss Government, the premier sericultural state of Karnataka, in 1980, embarked on the extension of sericulture into it's northern districts as well, projecting it as a venture capable of generating profitable, year-round employment under reduced-moisture conditions.

As the first part of studying the economics of sericulture in Dharwad, a northern Karnataka district, 50 established sericultureists of Shirahatti taluk which had the district's highest mulberry area starting 1985, were sampled in July 1986. It was observed that mulberry existed only as an irrigated, subsidiary crop completely integrated with cocoon production. An hectare produced 12.88 tonnes of leaf per annum from three crops against a regional potential of 4.2 crops, due to water shortage. 1,556 laying reared there from produced 435 kgs of cocoons utilizing 1,274 man days of labour, 39 percent of which was from family. Hundered layings produced 28 kgs of cocoon feeding 847 kgs of leaf, in the face of rearing equipment shortage, diseases and uzi menace. Cobb-Douglas type regression function results favoured increasing the gross mulberry hectarage and operational rearing costs. Cocoon production required Rs. 25,227 and included

Rs. 694, the value of free chawki input from Sericulture Department. A profit of Rs. 660 was realised by cocoons sold at Rs. 56 per kilogram.

The concluding, second part of the study was conducted in May 1995. Appropos 80 percent of the sample farmers had discontinued, the taluk having lost 76 percent of it's mulberry area. Problems related to rearing, management and labour, profitability accounted for 50, 24 and 11 percent proportions of precipitating reasons therefore. Discontinuations peaked around 1987 due to uzifly and around 1991 due to pebrine-caused layings shortage and low cocoon price. The sample's decadal performance indicated annual cocoon yield to be 431 kgs and extrapolated leaf yield to be 14.93 tonnes and thus couldn't replicate the performances of southern Karnataka and the State's potential. Insufficient technology, incompetent layings supply, indifferent market policy coupled with sub-normal annual rainfalls and irrigation-water shortage had undermined the earlier sericultural area and grass-root effort in the region.

A 1994-95 case-study of an adequately-irrigated, shoot rearing farm demonstrated 842 kgs of cocoon produce per hectare from four crops, selling at Rs. 122 per kg. and profiting by Rs. 47,660 per annum.

Sunflower Based Cropping Sequences Under Rainfed Conditions- An Economic Analysis

J.N. OLEKAR

1996

MAJOR ADVISOR : Dr. L.B. KUNNAL

The present study aimed at evaluating the economics of prevailing sunflower based cropping sequences under rainfed conditions in Belgaum District. A sample of 100 farmers was selected using random sampling method. The data were collected for the agricultural year 1994-95 through survey method. The techniques of tabular and functional Analysis were employed. Sunflower-fallow, sunflower-rabi jowar, groundnut-sunflower, sunflower-satflower, sunflower-bengal gram, sunflower-wheat and sunflower-sunflower were the important cropping sequences followed in the study area. In case of small farms, the per hectare total costs were the highest in groundnut-sunflower cropping sequences (Rs. 12331.87) and lowest in sunflower-fallow sequence (Rs. 5016.27). The gross returns realised by small farms were more from groundnut-sunflower cropping sequences (Rs. 27688.14) when compared to other sequences. The net profits were highest from

groundnut-sunflower cropping sequences (Rs. 15356.27). In case of large farms the per hectare costs were the highest in groundnut-sunflower sequences (Rs. 13498.68) followed by sunflower-sunflower sequences (Rs. 10131.67). The net profit was also the highest in groundnut-sunflower sequences (Rs. 12836.24) and it was lowest in sunflower-fallow sequence (Rs. 6549.84). For over all size group farms, sunflower-bengal gram cropping sequences was the most profitable cropping sequence with a profit of Rs. 12433.05 and a benefit cost ratio of 2.51. Sunflower-wheat sequence was the next best profitable sequence as judged by the benefit cost ratio of 2.32. The functional analysis revealed that in majority of the cases, the ratio of MVP to MFC was greater than one for land, bullock labour, seed, FYM and human labour. Hence there is scope for using additional units of these inputs to increase gross income. Majority of the farmers (70%) faced the problem of price fluctuation which led to uncertainty of income to the producers.

Economics of Silk Cocoon Production in Gulbarga District, Karnataka

M.T. DODMANI

1996

MAJOR ADVISOR : Dr. S.M. MUNDINAMANI

Karnataka is one of the leading states in the country in the production of mulberry silk. An attempt was made in the present study to analyse the economics of mulberry cultivation and silk cocoon production in Jewargi taluk of Gulbarga district. Mainly primary data was used for evaluating the objectives of the study. The required primary data was elicited from 97 sericulturists at random spread over five villages of Jewargi taluk. Tabular analysis was used to compute costs and returns in mulberry cultivation and silk cocoon production. Production function analysis was carried out to assess the resource use efficiency in mulberry cultivation.

The per hectare establishment cost of mulberry garden was Rs. 6,534.17. The total maintenance cost of mulberry cultivation per hectare was Rs. 19,766 of which the operational cost accounted for 70 per cent and rest was fixed cost. The gross and net returns from mulberry cultivation were Rs. 32,858 and Rs. 13,091, respectively. The returns per rupee of investment was Rs. 1.66

The total cost of silk cocoon production was Rs. 36,364 per hectare. The operational cost accounted for over 98 per cent. On an average, 923 kg of silk cocoons was obtained by rearing 2400 layings in one hectare of mulberry crop per annum. The gross and net returns realised from silk cocoon was Rs. 87,952 and Rs. 51,588, respectively.

The major problems encountered by the sericulturists in mulberry cultivation were shortage of irrigation water during summer and attack of pests and diseases for mulberry crop. In silk cocoon production, non-availability of disease free layings, shortage of rearing equipments and attack of uzilly were the major problems.

The problems of water shortage could be reduced by intensive use of available water by adopting drip or sprinkler irrigation systems. The pest and disease problem in sericulture enterprise can be controlled by educating the farmers on timely use of appropriate chemicals and disinfectants.