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

DOCTORAL PROGRAMME

AGRONOMY

Effect of Planting Density, Skipping Irrigation at Critical Stages and Staggered and Simultaneous Planting of Intercrops on *Rabi Maize*

R.G. GOLLAR 1996 MAJOR ADVISOR : Dr. V.C. PATIL

Three field experiments were conducted to study(1) response of maize genotypes to planting density; (2) effect of skipping irrigation at critical stages of crop growth on maize and (3) performance of maize under staggered and simultaneous planting of intercrops at Agriculture Development Centre. Konnur (Dharwad district) and Main Research Station, Dharwad during *Rabi* 1990-91 and 1991-92. The design of the experiments was randomised complete block design and the treatments were replicated four times.

Deccan-103 maize produced 16 per cent higher yield than G-25. Planting densities of 74,074 (45 cm X 30 cm), 83,333 (60 cm X 20 cm) and 1,11,111 (30 cm X 30 cm) and 1,11,111 plants ha^{-1} (60 cm X 30 cm). Increase in planting density led to reduced growth and yield attributes, whereas LAI, LAD, CGR and per cent barrenness increased. Increased light interception, leaf temperature and diffustive resistance and decreased transpiration rarte indicated competition among plants at higher densities. Deccan-103 gave higher net income than G-25 and high and medium densities registered higher net returns than low planting density.

Skipping irrigation silking, grain development, tasseling, grand growth and early growth stages reduced maize yield by 26, 21,18, 13 and 8 per cent over irrigation at all stages (5640 kg ha^{-1}) Skipping irrigation at silking and grain development resulted in reduction of yield components markedly.

Intercropped maize recorded 10 per cent higher yield than sole maize (4491 kg ha^{-1}). Growth and yield components of maize were improved or nor adversely affected in association with frenchbean and soybean, while cowpea and sunflower had adverse effect on maize. Staggered planting of intercrops reduced maize yield, while it improved yield of intercrops. Light interception, leaf temperature and diffustive resistance increased, while transpiration rate declined due to intercropping as compared to sole maize. Maize+soybean staggered was found to be efficient intercropping system with higher land equivalent ratio and system productivity index. However, maize+frenchbean (staggered) system recorded the highest maize equivalent yield (6914 kg ha^{-1}) and returns.

AGRICULTURAL CHEMISTRY AND SOIL SCIENCE

Studies on Copper in Red and Lateritic Soils and Effect of Copper Ore Waste and Copper Sulphate on Groundnut (*Arachis hypogaea*L.) in Red Soils of North Karnataka

S S. GUNDLUR 1997 MAJOR ADVISOR : Dr. H.M. MANJUNATHAIAH

Studies made on forms and distribution of copper in red and lateritic soils of North Karnataka indicates that the total and available copper content of red soils was in the range from 37.0 to 83.0 and 0.29 to 3.38 pp, where as in lateritic soils the range was from 35.0 to 54.0 and 0.29 to 4.30 ppm, respectively. The pH and organic matter contents of soils are found to influence the total and available Cu content of soil. The magnitude of different fractions of Cu in both the soil types are found to be followed the order, residual copper > organically bound copper > concluded copper > inorganically bound copper > water soluble and exchangeable copper.

Field experiments were conducted on red soils at Manoli, Hanumanamatti and Kulkageri during summer 1995 and 1996 under irrigated condition, to study the response of groundnut (TMV-2) to copper sulphate and copper ore tailings (COT). Application of COT and $CuSO_4$ (at different levels, respectively) significantly increased the concentration and uptake of all the nutrients except Ca^{++} and Mg^{++}. Pooled data of two years of all three locations indicated that application of $CuSO_4$ @ 30 kg/ha significantly increased the groundnut pod yield (21 14 q/ha), haulm yield (27.71 q/ha) and oil yield (6.50 q/ha). Similarly application of COT @ 1000 kg/ha produced highest groundnut pod yield (24.03 q/ha), haulm yield (29.95 q/ha) and oil yield (7.56 q/ha). Between $CuSO_4$ and COT treatments the pod yield, haulm yield and oil yield were superior with application of COT over $CuSO_4$ application. This is due to combined effect of Zn, Fe, Cu and sulphur present in the COT.

Further, the COT left over considerable amount of residual Zn, Cu, Fe and S which will enhance the soil fertility level and useful for succeeding crop.

AGRICULTURAL ENTOMOLOGY

Biological Methods of Managing Bollworm, *Helicoverpa armigera* (Hubner) on Cotton

A.G. SREENIVASA 1997 MAJOR ADVISOR : Dr. B.V. PATIL

Studies undertaken at R.R.S. Raichur during 1994 and 1995 seasons indicated that *Heliothis* NPV at 500 LE per ha was found to be optimum dosage against H. *armigera* on cotton. Combined use of HaNPV+endosulfan 35 EC at 500 LE+525 g a.i. proved best in reducing bollworm damage Application of HaNPV @ 500 LE per ha with boric acid, jaggery, teepol, buttermilk and cotton seed oil adjuvants at 0.1 per cent are supeior in enhancing the efficacy of Ha NPV. Field evaluation of B. *thuringiensis* commercial products indicated that Dipel @ 2.0 l and BTK-II @ 2.0 kg/ha were supperior in protecting the cotton crop from bollworm damage and all *B.t* products proved deterimental to all stages of silkworm larvae. They also induced mortality of silkworms upto 40 days. Dipel spray drift was recorded to a distance of 20 m and 5 m with power and knapsack sprayers, respectively.

Combined use of nematodes, HaNPV and *B.t* are better then their individual application as it recorded lower bollworm damage and higher cotton yield equivalent to use of nematodes + half dose of endosulfan 35 EC and endosulfan 35 EC alone @ 1050 g a.i. per ha. Individual application of pathogens took more time to cause complete mortality of both early and late instar larvae of *H. armigera*. Two releases of parasitoid, *Trichogramma* spp. (@ 2.50 lakhs/ha) from 50 days after sowing at seven and ten days interval with monocrotophos spray at the end seems to be the best integration against cotton insect pests. Among the neem products, Limnool and Rakshak @ 5.0 l per ha was as effective as endosulfan 35 EC in reducing bollworm damage. Rakshak proved to be safe to egg parasitoid, *Trichogramma* spp. Redgram (ICPL-87) and bhendi as trap crops in cotton ecosystem recorded more egg and larval population of *H. armigera* which reduced bollworm damage to a greater extent on cotton.

Among the integrated pest management modules tested, Raichur IPM module involving bioagents and selective insecticides was found to be effective and resulted higher net profit. Sole reliance on biocontrol agents cannot ensure satisfactory protection to cotton from insect pests.

AGRICULTURAL MICROBIOLOGY

Seed Borne Nature of *Azotobacter chroococcum* in Chilli (*Capsicum annum* L.) and its Role in Plant Growth

JAYALAKSHMI S. SHARMA 1997 MAJOR ADVISOR : Dr. A.R. ALAGAWADI

Investigations were carried out on seed borne nature of *Azotobacter* in chilli and their role in plant growth at the Department of Agril. Microbiology, Universities of Agricultural Sciences, Dharwad.

Azortobacter sp were isolated from both the surface sterilized and unsterilized seeds of 14 varieties of chilli at different stages of fruit maturity. The occurrence of *Azotobactyer* in surface sterilized seeds was lower than that of unsterile seeds. The representative isolates were indentified as A. *chroococcum*. A significant difference in per cent seeds yielding *Azotobactyer*, respectively. The two varieties also had highest and lowest ascorbic acid content, respectively. Ascorbic acid was found to stimulate the growth and nitrogen fixation by seed isolates.

The competitive survival ability of seed borne *Azotobacter* in soil was poor as compared to soil isolates. Interaction studies of seed borne *Azotobacter* isolates with soil bacteria indicated that all the isolates were inhibited by *Pseudomonas* sp but were stimulated by *Bacillus subtilis*. However, *Serratia marcescens* stimulated nine and inhibited two isolates.

The presence of seed borne *Azotobacter* in different plant parts of aseptically growth chilli seedlings was also detectged and their movement from seed to other plant parts was confirmed by inoculating antibiotic resistant marker strains to surface sterilized seeds and reisolating them from different parts of aseptically grown chilli seedlings on antibiotic containing medium. Pesticides like dimethoate and methyl parathion inhibited the growth of seed isolates at higher concentration but phosphomidon had no inhibitory effect.

Seed borne *Azotobacter* isolates were found to produce IAA, GA and several amino acids, besides fixing atmospheric germination, root and shoot length and total dry matter content of chilli plants signififcantly in both sterilized and unsterilised soil.

CROP PHYSIOLOGY

Physiological Changes in *Rabi* Sorghum [*Sorghum bicolor* (L.) Moench] Under Receeding Soil Moisture Conditions

C.D. SINGH 1997 MAJOR ADVISOR : Dr. M.B. CHETTI

Field experiments were conducted during *rabi* 1986, 1987, 1988 and 1989 to identify conceptual plant types suited under receding soil moisture conditions at Regional Research Station, Bijapur, University of Agricultural Sciences, Dharwad. The first experiment consisted of sixty genotypes having a wide variation in various morpho-physiological and growth characters laid out in randomised block design with three replications. The second experiment consisted of eighteen genotypes grouped under three distinct categories viz., high leaf area (LA)/high dry matter (DM), low LA/DM and low LA/ low DM types laid out in split plot design the three replications.

Results revealed a significant variation in leaf area (LA), total dry matter production (TDM), stomatal frequency, yield and yield parameters among the genotypes. A high positive significant correlation was observed between LA and TDM, stomatal number per plant and TDM, TDM and grain yield, grain number and grain yield. Based on the results obtained with sixty genotypes, 18 genotypes belonging to three distinct groups i.e., high LA/high DM, low LA/high DM and low LA/low DM were selected and raised under the two dates of sowing to induce terminal stress.

It was observed that there was a reduction in all the morpho-physiological, growth and yield parameters at later sowing date in all the genotypes. However, high LA/high DM did not differ much with low LA/high DM types. The genotypes M35-1 and Lakkadi belonging to low LA/high DM type indicated lesser reduction in leaf area, biomass and yield under delayed sowing as compared to other genotypes. These genotypes also maintained higher stem reserves and showed higher remobilisation efficiency of stem reserves under receeding soil moisture conditions indicating better adoptability.

Influence of Seasons on Phenology, Reproductive Efficiency and Physiological Indices in Soybean Genotypes

R.V. KOTI 1997 MAJOR ADVISOR : Dr. M.B. CHETTI

Field experiments were conducted during *kharif*, *rabi* and summer seasons of 1995-96 and 1996-97 to study the influence of seasons on phenology, reproductive efficiency and physiological indices in 24 soybean genotypes belonging to different yield potential at Agriculture College Farm, University of Agricultural Sciences, Dharwad. Results indicated that morphological, physiological, biochemical, biophysical parameters and yield components differed significantly due to seasons and genotypes and showed higher values during *kharif* followed by summer and the least in *rabi* season. The seed yield was significantly higher in *kharif* followed by summer and less in *rabi*. The higher yield in *kharif* was mainly attributed to least differences between maximum and minimum temperature during crop growth, longer seed filling period, higher seed number per plant and test weight as compared to *rabi* and summer seasons.

The rate of photosynthesis and nitrate reductase (NR) activity were more in summer followed by *kharif* and *rabi*. Higher temperature during summer increased the oil and decreased the protein contents, whereas, it was reverse in *kharif*. JS-80-21, Pusa-16 and KB-81 (high yielding) in *kharif*. Hardee and KB-92 (low yielding) in *rabi* and NRC-2 (medium yielding and PK-472 (high yielding) in summer gave higher yields as compared to other genotypes. The high yielding genotypes, irrespective of seasons had significantly higher pod growth rate (PDGR), photosynthetic rate (60 DAS) and NR activity.

The parameters associated with maximisation of seed yield in *kharif* were found to be phytosynthetic rate, NAR (30-60 DAS), pod set per cent, pod dry weight, number of seeds per plant and harvest index. Whereas, during *rabi*, number of branches (75 DAS), photosynthetic rate (60 DAS), LWR (30, 75 DAS), SLW (30, 75 DAS), AGR (60-75 DAS), pod set per cent, BMD (60-75 DAS), number of seeds per plant, test weight and HI were found to be important. However, in summer, only few parameters viz., NRA (60 DAS), number of pods per plant, number of seeds per plant and harvest index were found to be important in yield determination.

GENETICS AND PLANT BREEDING

Studies on Pollen Competition in Parents, F_1's Derived from Pollen Mixtures and Hybrid Blends for Seed Characters and Yield in Sunflower (*Helianthus annuus* L.)

I. SHANKER GOUD 1997 MAJOR ADVISOR : Dr. K. GIRIRAJ

The study was carried out in sunflower with three male sterile lines (CMS), three respective maintainer lines and ten restorer lines at Regional Research Station, Raichur, during the period from 1994 to 1996, to derive information on effect of pollen and its competitive influence at gametophytic and sporophytic phases and the practical utility of hybrids derived from pollen mixtures and hybrid blends.

In the study of thirty F_0 and F_1 hybrids, the pollen parents R X 13, R 857, R 6D-1, RLC 2Br and RHA 274 were in general, had positive influence on most of the seed characters in F_0 generation are governed by non-additive gene action. The ovule parent CMS DSF 15 was good general combiner for all the characters except volume weight. Among pollen parents R X 13 was the best general combiner for oil content and hull per cent, hile R 6D-1, R 857, RLC 2Br and R IV 83 had highest general combining ability for 1000 seed weight, seed density, volume weight and K/H ratio, respectively. The specific combining ability studies showed that the CMS 4546 x R 6D-1 was best for 1000 seed weight, seed density, volume weight and K/H ratio, respectively. The specific combining ability studies showed that the CMS 4546 x R 6D-1 was best for 1000 seed weight, CMS 234 x R IV83 for oil content, CMS DSF 15 x R X13 for seed density, CMS DSF 15 x R 6D-1 for volume weight, CMS DSF 15 x RLC 2 Br for K/h ratio and CMS 234 x RHA 274 for hull per cent. Histological studies on seventh day after pollination showed increase in

cell size in F_0 of crosses compared to their respective maintainer lines, although the number of cells were same On 21st day after pollination, the crosses had longer and broder cotyledons compared to their maintainer lines. The hull content of F_0 seed (Metaxenia) in the ovule parent CMS 234 was significantly influenced by the pollen parents R 8997, R 857, RLC 2Br, R 6D-1, R V 34 and R VI 78, while the other two ovule parents were influenced by RHA 274. All the seed characters in F_0 and F_1 generation showed positive and significant correlation

In the study of pollen competition, three parents R X 13, R IV 83 and R 857 were highly competitive with high pollen germination and quick tube growth at gametophytic level and also showed high fertility in hybrids.

In the study of pollen mixed hybrids, they were found better for all the seed characters, when compared with component hybrids. Two pollen mixture hybrids were found to be better than three or four pollen mixture hybrids and the hybrid 'AB' (CMS DSF 15 x R 857 + R X 13) was the best with 20 per cent superiority over expected yield.

The study of hybrid blends revealed superiority of blends over the component hybrids for most of the seed characters. Two component hybrid mixtures were good and among them 'ab' (CMS DSF 15 x R 857 + CMS DSF 15 x R x 13) was the best, yielding 32 per cent more than the expected. Alghough pollen mixture hybrids gave slightly less yield compared to respective hybrid blends, their plus point is that they can be produced easily with less cost.

HORTICULTURE

Investigations on Genetic Improvement and Production Practices in Processing Tomatoes (*Lycopersicon esculentum* Mill).

MAHANTH GOWDA PATIL 1996 MAJOR ADVISOR : Dr. B.B. MADALAGERI

Field experiments were conducted at Main Research Station, University of Agricultural Sciences, Dharwad during 1994-96, to study genetic variability, stability, heterosis and combining ability along with production practices in processing tomatoes.

The genetic variability study revealed that significant differences among 76 genotypes for all the 24 characters studied. High genotypic co-efficient of variation, high heritability as well as high genetic advance over mean were observed for number of flowers per cluster, weight of green fruit, core size and lycolpene content. Based on genetic variability study 40 genotypes selected were subjected to stability analysis. The selection 36 (DWD-IX79B1390-29-2-sp2-2) was found to be the most stable genotype for yield (61.76t/ha across evironments), total soluble solids, total acidity, pH, lycopene and viscosity. The next best was selection 33 (DWD-IX79B1390-35-4).

The heterosis study indicated that F_1s DWD-1XDWD-2-10b-4XDWD-1X79B1390-29-2-sp2-2 (4X6) and DWD-1X79B1390-33-2XDDWD-1X79B1390-29-sp2-2 (5X6) as the best processing hybrids as they fullfill the requirements of quality and morphological traits required for processing along with heterotic yield levels of 87/94 and 82 05 tonnes per hectare, respectively. The parent 6 (DWD-1X79B1390-29-2-sp2-2) showed good general combining ability for all quality traits, concentrated ripening and yield. The best cross combination for concentrated ripening, yield and yield components was 4X6.

The results on standardization of production practices in stable tomato genotype, DWD-1X79B1390-29-2 revealed that the spacing of 75X30cm with a fertilizer dose of 145:125:75 kg NPK per hectare as optimum for registering an yield of 71.11 tonne per hecatre of red-ripe fruits and 91.50 per cent of concentrated ripening.

From overall, it can be inferred that two tomato genotypes viz., DWD-1X79B1390-29-2sp-2-2 and DWD-1X79B1390-35-4 and two F_1 hybrids DWD-1XDWD-2-10b-4XDWD-1X79B1390-29-2-sp2-2(4X6) and DWD-1X79B1390-33-2XDWD-1X79B1390-29-2-sp2-2(5X6) as the best with several superior processing quality and morphological traits coupled with high yields. Hence, these may be further confirmed for their commercialixation by multilocation trails along with check.

Influence of Spacing, Nitrogen and Growth Regulators on Growth, Flower Yield and Seed Yield in Gaillardia (*Gaillardia pulchella* var. *picta* Fouger)

A.H. HUGAR 1997 MAJOR ADVISOR : Dr. U.G. NALAWADI

A study on the effect of spacing, nirogen and growth regulators on growth, flower yield and seed yield was conducted on red soils at the Regional Research Station, Raichur during *rabi* and summer seasons of 1992-93 and 1993-94.

Spacing of 30 x 20 cm at 75 kg N/ha recorded higher flower yield (19.62 and 17.97 t/ha in *rabi* and summer seasons, respectively) and net returns (Rs.78,433/ha and Rs.69,115/ ha in *rabi* and summer season, respectively). The same spacing at 100 kg N/ha recorded higher seed yield (7.0 and 6.8 q/ha in *rabi* and summer season, respectively). Better quality of flower and seed was obtained under wider spacing (30 x 30 cm) at 75 kg N/ha).

Among growth regulator treatments, TIBA at 100 ppm and CCC at 750 ppm recorded increased flower yield (24.93 and 22.87 t/ha for TIBA and 24.45 and 22.45 t/ha for CCC in *rabi* and summer seasons, respectively) and net returns (Rs.90,843 and Rs.79,764 for TIBA and Rs.90,555 and Rs.79,755 for CCC in *rabi* and summer seasons, respectively). Higher seed yield was obtained in CCC 750 ppm treatment (9.61 and 8.41 q/ha in *rabi* and summer seasons, respectively).

Higher flower and seed yield was noticed in *rabi* season as compared to summer season.

Shelf life of flowers was enhanced when kept in the polythene bags compared to open under room conditions.

PLANT PATHOLOGY

Studies on Sunflower Rust Caused by *Puccinia helianthi* Schw

PRAKASHGOUDA V. PATIL 1996 MAJOR ADVISOR : Dr. M.R. KACHAPUR

Studies on sunflower rust caused by *Puccinia helianthi* Schw have revealed that the disease was wide spread and appeared in very severe from (>40% PDI) in many taluks of major sunflower growing areas of Karnataka. The seed yield loss due to rust was estimated to be 27.02 per cent. Area under disease progress curve (AUDPC) was the better explinable parameter for yield loss assessment then rate of infection ("r"). The model for per cent loss assessment using input variable AUDPC was in the form of

$$Y=3.49-0.558(AUDPC)$$

The genotypes PH-1, PH-2, PH-3, PH-4, PH-7, PH-8 and ICI-306 were indentified as slow rusters. The leaf dip inoculation technique was found more convenient for mass multiplication of uredial inoculum on Morden seeedlings under glass house conditions. The uredospores found viable for 98 days when the screw cap glass test tubes containing rust infected leaves were kept at 4 to 5° c.

Reaction of *P. helianthi* isolates of 1993-94 and 1994-95 on standard differentials revealed the presence of standard physiologic races 1,3 and 4. Standard race 3(>80%) and sub races 3-2 and 3-0 (>30%) were identified in highest frequency during both the years.

Some of the phyllosphere microorganisms isolated from the sunflower leaves showed antagonistic effect against *P.helianthi* in *vitro* and in *vivo*. Many of the plant extracts at 10 per cent level showed higher fungitoxic values against *P. helianthi*. The disease can be managed effectively with the spray schedule of propiconazole (0.1%) at 30 and 60 DAS and green amaranthus leaf extract or neem kernel extract five per cent at 45 DAS with higher C:B ratio.

Factors of Multiple Resistance to Foliar Diseases in Sorghum

ISHWAR K. KALAPPANAVAR 1996 MAJOR ADVISOR : Dr. R.V. HIREMATH

A study was conducted to know the multiple disease resistance factors (biochemical, morpho-physiological and histological components) to sooty stripe, zonate leaf spot and anthracnose which are the major foliar diseases of sorghum.

Sooty stripe was noticed upto 75 DAS, while zonate leaf spot and anthracnose appeared late and increased till maturity of the crop. IS 8185, IS 8607, IS 18494, IS 18728, IS 25132 and SPV 462 were found to be multiple resistant genotypes. Multiple resistant genotypes recorded high content of sugars, phenols, O-dihydroxy phenols, proteins, amino acids, HCN and epicuticulr wax comparded to susceptible ones. Even higher Rm values at all the stages and production of two isozyme bands both in peroxidase and polyphenol oxidase against one in susceptible and three catalase bands against two in susceptible ones at 80 DAS were noticed in resistant genotypes.

Further, small and less number of stomata on both the surface of leaf, thicker cuticle and lamina and reduction in photosynthetic rate were observed in resistant genotypes as compared to susceptible ones. Epicuticular wax, phenols, soluble proteins, sugars, cuticular wax and laminar thickness had negative direct effect. Breadth, aperture length and length of stomata had positive direct effect on all the three diseases.

Overall studies, revealed that higher wax, phenols, proteins, sugars, cuticular and laminar thickness and lesser length, broadth and aperture length of stomata are the possible factors for multiple disease resistance to sooty stripe, zonate leaf spot and anthracnose diseases.

FOODS AND NUTRITION

Nutritional Status and Occurrence of Fluorosis in Selected Villages of Mundargi Taluka in Dharwad District

PUSHPA BHARATI 1996 MAJOR ADVISOR : Dr. MEERA RAO

The investigation focused on the nutritional status and occurrence of fluorosis in selected endemic villages in Dharwad district, during 1994-95. Knowledge and awareness about fluorosis was also assessed. The subjects incuded in the study were 532 from fluorotic village and 110 from non fluorotic village.

The height, weight and arm circumference of children were below the NCHS standard. The adults from nonfluorotic village weighed significantly higher (84.40 kg) than adults from fluorotic villages (44.25 kg). Body Mass Index classification indicated that the adults belonging to Chronic Energy Deficit grade I, II and III were more in fluorotic villages (16.88%) than nonfluorotic villages (13.85%).

The intake of protein and calcium among the adults of fluorotic and nonfluorotic villages did not differ significantly. The Cu/Mo ratio was found to be higher in the diets of adults from fluorotic villages, Lysine was the first limiting aminoacid in the diets from Hesarur (Control) recorded minimum fluroide (0.67 mg/100 g).

Of the total subjects examined, 25 per cent suffered from dental, 5.45 per cent from skeletal and 31.20 per cent from both dental and skeletal fluorosis. Among fluorotic patients 65 per cent were males and 57.94 per cent were females, with a mean fluorotic score of 9.04 and 5.85, respectively. As the age, and period of stay in fluorotic villages increased, prevalence of fluorosis also increased reaching 100 per cent after 61 years.

The fluorotic score was minimum in sedentary workers (4.49) and maximum in heavy workers (12.13). Major symptoms of dental fluorosis were browning of teeth, pain and pus in teeth. Skeletal fluorosis symptoms observed among females were bending, bowing of legs, pain in neck, back and shoulder. The symptoms of joint pain, pain and stiffness in limbs, knots on legs were common among males.

Respondents having knowledge about the preventive foods and defluoridation methods were only 44 per cent and 30 per cent, respectively.

Nutrient Composition, Antinutrients and Protein Quality of Winged Bean [*Psophocarpus tetragonolobus* (L) DC] Seeds

BHARATI V. CHIMMAD 1997 MAJOR ADVISOR : Dr. MEERA RAO

Winged bean (*Psophocarpus tetragonolobus* (L) DC) is an under exploited multipurpose crop. Winged bean seeds of 59 genotypes grown at ARS, Siruguppa, UAS, Dharwad were studied for their physioco-chemical characteristics and nutrient composition. Thirteen genotypes were processed by soaking, decortication and pressure cooking and changes in nutrients and antinutrients assessed. Protein quality of presoaked pressure cooked broth retained (PPCB) seeds was assayed by protein efficiency ratio (PER), digestibility co-efficient (DC), biological value (BV), net protein utilization (NPU) and net dietary protein calories (NDP Cal%). Significant varietal differences in physico-chemical characteristics and nutrient composition existed. Seedcoat colour varied from cream, brown, grey, mixed colours to black. Seed weight and volume positively influenced the physico-chemical characteristics. Hardseeds influenced them inversely. Mean crude protein content was 33.70%, fat 17.74, crud fiber 5.97, carbohydrate 27.75, calcium 0.24 and iron 0.14. Dhal recovery by domestic method was 59.72%. Decortication decreased the levels of crude fiber (to 0.24%), carbohydrates (27.36%) and calcium (56.64 mg) while the crude protein 37.70%), fat (22.55%), iron 4.01 mg) and calorific values (463 K Cal) increased. Concentration of antinutrients such as tannins, total free phenols, phytic acid and trypsin inhibitors varied among the genotypes and domestic processing techniques altered them. Tannins and phytic acid content increased with seed weight. Maximum reduction of rannins (46.26%) and trypsin inhibitors (59.27%) was in PPCB samples. Total free phenols were reduced maximum by decortication (57.66%) and phytates by presoaked pressure cooked broth rejected seeds (27.00%). Tannins inversely influenced the physico-chemical characteristics, while trypsin inhibitor levels did not affect them. Food intake, PER, DC, BV, NPU and NDP cal% of rats fed and spleen weights. Thus, physioco-chemical characteristics, nutrients, antinutrients varied. Pressure cooked seeds promoted rat growth.

AGRICULTURAL ECOMOMICS

Growth Dimensions of Horticulture in Karnataka - An Econometric analysis

U.M. VEENA MAJOR ADVISOR : Dr. K.N. RANGANATHA SASTRY

Agriculture in India is undergoing a major transformation in which entry of horticulture on a large scale is considered as major break through resulting in much needed diversification in land use.

Karnataka State is known as "miniature India" with different agro-climatic settings and offers greater scope for horticulture development. The present study analysed the growth dimensions of horticulture in the State in a more comprehensive way.

The study considered both primary and secondary data for a period of 1975-1994. Eight leading fruit and vegetable processing units and 12 cold storage units were considered. 360 respondents spread over 4 regions were interviewed. Different techniques like regression, correlation, different indices, culster analysis, markov analysis, Hazell's decomposition analysis and factor analysis were adapted.

Growth analyses showed that the State has achieved high growth in area and production of horticultural crops. It also indicated that the change in yield variance has accounted for larger share in increased variability which calls for policies to stablise yields to register increased horticultural production. However, incase of pineapple, papya and jack, area-variance has contributed for larger share.

Results of the factor analysis indicated that the districts of moderate rainfall with well developed infrastructure have become more versatile and started growing large number of crops in recent years. This emphasises the importance of infrastructure like transportation, cold storage, processing,

better markets and communication for horticulture development.

Comparative economics of processing of fruits and vegetables indicated that only private units, with popular brands have managed to earn profits. Both public and co-operative units are running under losses. Efficient and effective utilisation of machinery and manpower is necessary to render them profitable.

Most of the public and co-operative cold storage units are performing badly because of under utilisation of their installed capacity. They can utilise their capacity better by providing services like transportation and advance payments.

Consumer survey indicated that the need for adequate consumer education is to widen the market for fresh and processed horticultural products.

AGRICULTURAL EXTENSION

Effectiveness of Teaching Methods in Communicating Nutritional Knowledge to Rural Women - An Experimental Study

NAGARATHA B. BIRADAR 1997 MAJOR ADVISOR : Dr. B. SUNDARASWAMY

Experiment was carried out by using "pre-test, post-test, post-delay" design. "Importance of food for human nourishment" was the subject matter selected to develop videoshow, pamphlet, lecture and knowledge test. Treatment pamphlet + videoshow emerged as most effective method. Treatments videoshow, vidoshow + discussion, pamphlet + lecture + discussion were uniform in their effectiveness. Lecture alone was least effective for knowledge gain and the treatments Pamphlet + lecture + discussion and lecture alone were statistically similar in their effectiveness and least effective for knowledge retention. Maximum knowledge gain was due to pamphlet + videoshow and minimum was due to lecture along. Loss of gained knowledge was maximum due to lecture and minimum due to videoshow + discussion.

Majority of the respondents were young, married, literates and had large family. Almost all were aware of services of Anganwadi workers, Auxiliary Nurse Midwives and training programmes. Good number of respondents owned and listened to radio regularly. Television was owned by one in ten and negligible per cent of respondents subscribed to newspapers/magzines.

Respondent's education exihibited positive significant relation with knowledge gain by all treatments except videoshow + pamphlet. Knowledge gain by lecture, lecture + pamphlet + discussion and videoshow had positive significant relation with extension participation. Some relation was observed between videoshow, annual income, lecture + pamphlet + discussion and extension contact. Age exhibited negative significant relation with knowledge gain by videoshow + discussion.

Respondent's education and knowledge retention by all methods were significantly and positively related. Extension participation exhibited positive significant relation with knowledge retention by lecture and videoshow at both intervals and only after four weeks in pamphlet + lecture + discussion. Positive significant relation observed between mass media participation and knowledge retention by pamphlet + lecture + discussion, videoshow, videoshow + discussion; age and knowledge retention by pamphlet + lecture + discussion, extension contact and knowledge retention by videoshow + discussion.

MASTERS' PROGRAMME

AGRONOMY

Integrated Weed Management in Garlic (*Allium sativum* L.) in Northern Transition Tract of Karnataka

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A field experiment was conducted at the Agricultural College Farm, Dharwad during *kharif* 1995 to study the weed management practices in garlic under rainfed conditions. There were ten treatments viz., alachlor, atrazine, diuron, metolachlor, clomazone, pendimethalin each at the rate of 1.0kg a.i./ha and oxidiazon at the rate of 0.5kg a.i./ha. Each chemicals was supplemented with one intercultivation and handweeding at 30 DAS, weedy check, weedfree check and one intercultivation and handweeding at 30 DAS and two handweedings at 45 and 60 DAS.

Pendimethalin 1.0kg a.i./ha + one intercultivation and handweeding at 30 DAS recorded significantly lower weed population and dry weight of weeds. The treatment having received intercultivation and handweeding at 30 DAS and two handweedings at 45 and 60 DAS recorded significantly lower dry weight of weeds compared to unweeded control.

Weedfree check recorded significantly higher bulb yield (4512 kg/ha) as compared to all other treatments. Pendimethalin 1.0kg a.i./ha + one intercultivation and handweeding at 30 DAS (3823 kg/ha) and one intercultivation and handweeding at 30 DAS and two handweedings at 45 and 60 DAS (4003 kg/ha) recorded significantly higher garlic bulb yield among weed control methods and were on par with each other. All the weed control treatments recorded higher garlic yield than unweeded control (1718 kg/ha) except clomazone (1.0 kg a.i./ha) + one intercultivation and handweeding at 30 DAS.

Highest net income was recorded in weedfree check followed by one intercultivation and handweeding at 30 DAS and two handweedings at 45 and 60 DAS and pendimethalin at (1.0kg a.i./ha) + one intercultivation and handweeding at 30 DAS.

The phytotoxic effect to the crop was observed as the herbicides were sprayed with clomazone (1.0 kg a.i./ha) and atrazine (1.0 kg a.i./ha).

Response of Greengram (*Vigna radiata* L. Wilczek) to Nitrogen and Phosphorus Levels in Paddy-Fallows

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A field experiment was conducted at A.R.S.,Mugad, near Dharwad during *rabi* / summer season of 1995-96 to study the effect of nitrogen and phosphorus levels and their interaction effect on growth, yield and economics of greengram in paddy-follows. The treaments consisted of three levels of nitrogen(0,12.5 and 25.0 kg/ha). The experiment was laid out in randomised block design with factorial concept in three replications.

Applications of 12.5 kg N per ha recorded significantly higher grain yield(764 kg/ha) which was 47 per cent higher over control(519 kg/ha), but on par with 25 kg N per ha (777 kg/ha). Higher yield was attributed to higher total drymatter production per plant(8.0g), LAI(1.50),pods per plant(10.3), seeds per pod (9.9), grain yield per plant(3.17g) and N uptake (72.13 kg/ha).

Significantly higher grain yield of 55 per cent (752 kg/ha) was recorded with application of 25 kg P2O5 per ha over control(485 kg/ha). But further increase in phosphorus levels upto 75 kg P_2O_5 per ha did not increase the yield significantly. Higher yield with application of 25 kg P_2O_5 per ha was due to higher total drymatter production per plant (7.92g), LAI (1.48), pods per plant (10.4), seeds per pod (9.8),