Significantly higher net returns (Rs.12,308.67 ha^{-1}) and B:C ratio (1.827) were recorded with the application of poultry manure when compared to rest of the organic manure treatments. Among the fertilizer levels application of 150 per cent RDF was found economically superior, which recorded significantly higher net returns (Rs.11,003 ha^{-1}) and B:C ratio (1.043) than other fertilizer levels except with the application of 125 per cent RDF.

Performance of Wheat (*Triticum aestivum* L. and *T. durum Desf*,) Genojtypes to Staggered Sowing under Irrigation in North Eastern Dry Zone

B. N. PRABHAKAR 2001 MAJOR ADVISOR: A. S. HALEPYATI

A field experiment was conducted at Agriculture College Farm, Raichur During rabi of 2000-2001 to know the performance of wheat (*Trificum aestivum* L. And *T. durum* Desf.) genotypes to staggered sowing under irrigation in North Eastern Dry Zone. There were 16 treatments comprising combinations of four dates of sowing (I F.N. November, II F.N. November, I F.N. December and 11 F.N. December) and four genotypes (DWR-162, DWR-195, DWR-185 and DWR-1013). The experiment was laid out in a split plot design with three replications.

The growth and yield of wheat genotypes sown on different dates differed significantly. Wheat sown during I F.N. of November recorded significantly higher grain yield (3261 kg ha^{-1}) and it decreased in order for each delayed sowing viz., II F.N.of November (2884 kg ha^{-1}), I F.N. December (2677 kg ha^{-1}) and II F.N of December (2462 kg ha^{-1}). The higher grain yield of wheat sown during I F.N. of November was attributed to significantly higher growth (dry matter production, effective tillers m^{-1} row length, LAI, LAD) and yield components (ear length, ear weight, grain weight per ear and 1000-grain weight) when compared to rest of the delayed sowings.

The genotype DWR-195 recorded significantly higher grain yield (3104 kg ha^{-1}) when compared to rest of the genotypes viz., DWR-162 (2867 kg ha^{-1}), DWR - 185 (27 14 kg ha^{-1}) and DWR- 1013 (2598 kg ha^{-1}). The higher grain yield of DWR-195 was attributed to higher yield components viz., ear length, ear weight and grain weight per ear.

The wheat sown during I F. N. of November recorded sigrifficantly higher net returns (Rs. 24965 ha^{-1}) and B:C ratio (3.22) when compared to remaining delayed sowings. The genotype DWR-195 recorded significantly higher net returns (Rs. 23736 ha^{-1}) and B:C ratio (3.15) than the rest of the genotypes.

Role of Orgainics and Inorganics in Yield Maximisation of Hybrid Maize (*Zea mays* L.)

T.C.JAYAPRAKASH 2001 MAJOR ADVISOR: Dr. V.P.NAGALIKAR

A field experiment was conducted at Regional Research Station, Raichur, during kharif 2000 to study the role of organics and inorganics in yield maximization of hybrid maize. There were 15 treatment combinations comprising of three main plots (organics and five sub plot (Inorganics) levels. The experiment was laid out in split-plot design with three replications.

Application of organic manures exerted significant influence on growth and yield of maize. Significantly higher grain yield of maize was recorded due to application of organics (Vermicompost @ 2 t/ha and FYM @ 10 t/ha) which were on par (67.47 and 65.22 q/ha, respectively) in comparision with no organics (52.35q/ha). The higher grain yield of maize due to application of organics was attributed to significantly higher growth and yield components.

Grain yield of hybrid maize increased significantly with increase in the levels of NPK up to 150 per cent RDF (63.82 q/ha). Further, increase in the inorganic levels up to 200 per cent RDF (68.00 q/ha) did not influence the grain yield of maize significantly. The lowest grain yield was recorded with 100 per cent recommended NPK (52.34 q/ ha).

Application of organics and inorganics significantly influenced the available N, P_2O_5 and K_2O content of soil after the harvest of maize.

Application of FYM @ 10 t/ha recorded higher net returns (Rs.20515.00 /ha) and B:C ratio (2.72) compared to other treatments.

Effect of Maize Plant Geometry, Row Proportion and Time of Planting on Maize- Lucerne Intercropping system

M.G. RAJSHEKHAR 2001 MAJOR ADVISOR: Dr. Y.B.PALLED

A field experiment was conducted to study the effect of maize plant geometry, row proportion and time of planting on maize-lucerne intercropping system at Main Research Station, Dharwad during kharif 2000. The experiment was laid out in randomized complete block design with three replications.

Paired row planting of intercropped maize recorded significantly higher grain yield (56.81 q ha^{-1}) over 60cm x 30 cm spacing of intercropped maize. Sole maize with paired row planting recorded maximum grain yield (62.00 q ha^{-1}). Simultaneous planting of maize with lucerne recorded significantly higher grain yield (53.32 q ha^{-1}) over staggered planting of maize (44.70 q ha^{-1}).

Significantly higher nutrient uptake was founc in intercropped paired row maize (166.90, 32.04 and 139.02 kgs ha^{-1} of N, P_2O_5,and K_2O respectively) over normal planting of intercropped maize (60cmx30cm). Simultaneous planting of maize along with lucerne registered significantly higher nutrient uptake over staggered planting.

Maximum total green forage yield of lucerne (87.15 q ha^{-1}) was obtained in 60cmx30 cm spacing of maize at 1:2 row proportion with staggered planting.

Paired row planting of maize simultaneously with lucerne at 1:1 row proportion gave higher net returns and B:C ratio (Rs. 23,637 ha^{-1} and 2.99, respectively) compared to sole maize with 60cmx30 cm spacing (Rs. 22,123 ha^{-1} and 2.85, respectively).

Intercropping of paired row maize simultaneously with one row of lucerne gave maize grain yield of 62.50q ha^{-1} and additional lucerne green forage yield of 19.57q ha^{-1}.

Integrated Agronomic Practices in Pigeonpea (*Cajanus cajan* L. Millsp.) for Yield Maximisation

K.R.LOKESHA 2001 MAJOR ADVISOR : Dr. B. T. PUJARI

A field experiment was conducted at Agricultural College Farm, Raichur during kharif season of 2000-2001 to study the effect of integrated agronomic practices on yield maximisation of pigeonpea. There were seven treatments comprising the combination of different agronomic practices. The experiment was laid out in a Randomized Block Design with four replications.

At all the crop growth stages, the plant height, number of leaves, primary branches, secondary branches per plant and dry matter production (g $plant^{-1}$) were significantly higher in recommended package of practices i.e., Sowing after the receipt of normal rainfall with broadcasting of FYM and application of RDF.

The grain yield of pigeonpea was significantly higher by adopting the recommended package of practices i.e., Sowing after the receipt of normal rainfall with broadcasting of FYM and application of RDF (18.92 q ha^{-1}) as compared to rest of the treatments except with the grain yield of pigeonpea dry sown in furrows in combination with FYM Ca 500 kg per ha^{-1} seed hardened with 2 per cent CaCl2, application of RDF, sulphur @ 20 kg per ha through gypsum and zinc sulphate @ 15 kg per ha associated with nipping of terminal shoots at 50 DAS and planofix spray @ 20 ppm at peak flowering stage (18.09 q ha^{-1}). The significantly higher grain yield under recommended package of practices was mainly attributed to higher number of pods per plant, number of grains per plant, 100 seed weight and grain weight per plant.

The maximum net return was obtained with recommended package of practices i.e., sowing after the receipt of normal rainfall with broadcasting of FYM and application of RDF (Rs. 22822 ha^{-1}). Dry sowing in furrows in combination with FYM @, 500 kg per ha, seed hardened

with 2 per cent $CaCl_2$ application RDF, sulphur @ 20 kg per ha through gypsum and zinc sulphate @ 15 kg per ha associated with nipping of terminal shoots at 50DAS and planofix spray, @, 20 ppm at peak flowering stage recorded significantly, higher B:C ratio (2.07) as compared to rest of the treatments except recommended package of practices i.e. sowing after the receipt of normal rainfall with broad casting of FYM and application of RDF (2.04).

Influence of Plant Densities and Phosphorus Management of Growth and Seed Yield of *Sesbania aculeata* (wills) Poir.

SAHADEVA D. YARAGOPPA 2001 MAJOR ADVISOR : Dr. B. K. DESAI

A field experiment was conducted during Kharif 2000 at the Agricultural College Farm, Raichur to study the influence of plant densities and phosphorus management on growth and seed yield of *Sesbania aculeata*. There were 21 treatment combinations, comprising of three plant densities in main plots. In sub plots four phosphorus levels without VAM and three phosphorus levels with VAM inoculation were used. Treatments were replicated three times and laid out in split-plot design.

Plant densities exerted significant influence on growth and seed yield of *Sesbania aculeata*. High plant density recorded significantly higher seed yield (9.53q ha^{-1}) as compared to medium (8.25 q ha^{-1}) and low (6.96 q ha^{-1}) plant densities.

Application of 60 kg P_2O_5 ha^{-1}+ VAM recorded significantly higher seed yield (9.55 q ha^{-1}) than rest of the treatments. However, it was on par with the treatments which received P_2O_5 80 kg and 100 kg ha^{-1} both in combination with VAM inoculation.

High plant density recorded significantly higher net returns (Rs. 18461 ha^{-1}) and B: C ratio (2.90) when compared to medium and low plant densities. Application of P_2O_5 @ 60 kg P_2O_5 ha^{-1} + VAM recorded significantly higher net returns (Rs. 18870 ha^{-1}) and B:C ratio (3.10) over rest of the treatments, except the treatment which received 80 kg P_2O_5 ha^{-1} + VAM and 100 kg P_2O_5 ha^{-1} + VAM.

Response of Fieldbean (*Dolichos lablab* L.) to Seed Rate, Row Spacing and Fertility Levels for Fodder Production

AMARNATH S. KARIGOUDAR 2001 MAJOR ADVISOR : Dr. S.S. ANGADI

A field experiment was conducted at Saidapur farm, on red sandy loam soil, near main campus of the University of Agricultural Sciences, Dharwad, during kharif 2000 to study the response of fieldbean (*Dolichos lablab* L.) To seedrate, row spacing and fertility levels for fodder production. The treatments consisted of three seed rates (75, 100 and 125 kg ha^{-1}), two row spacings (30 and 45 cm) and three fertility levels (15:30:15, 25:50:25 and 35:70:35 kg $N:P_2O_5:K_2O$ ha^{-1}). The experiment was laid out in split-split plot design with three replications.

Higher seed rate (125 kg ha^{-1}),recorded significantly higher green forage yield (19.94 t ha^{-1}), growth and yield attributes.However, seedrate differed nonsignificantly with respect to forage quality. Higher seedrate had higher nitrogen (2.24%), crude protein (14.01%), phosphorus and calcium content as compared to lower seedrate. Similarly, significantly higher crude protein yield (478.87 kg ha^{-1}), total ash yield and ether extract yield were obtained at higher seed rate. Crude fibre content was significantly higher at lower seed rate (34.59%) as compared to higher seed rate.

The row spacing had significant effect on all the growth and yield attributes. Row spacing of 30 cm recorded the higher green (19.48 t ha^{-1}), dry forage yield (3.30 t ha^{-1}) and growth attributes. Similarly, quality characters like, nitrogen (2.24%) crude protein (14.00%), calcium and crude fibre content (34.22%) were higher with 45 cm row spacing. Whereas, crude protein yield, crude fibre yield, total ash yield and ether extract yield were significantly higher at closer row spacing of 30 cm.

Application of 35:70:35 kg,$N:P_2O_5:K_2O$ per ha recorded significantly higher green forage (19.63 t ha^{-1}) and dry forage yield (3.33 t ha^{-1}), which was on par with the application of 25:50:25 kg $N:P_2O_5:K_2O$ ha^{-1}. The increased fertility levels significantly improved all the growth and yield attributes. The nitrogen (2.29%), crude protein (14.22%), crude protein yield (473.73 kg ha^{-1}) phosphorus, calcium content, crude fibre yield and ether extract yield increased significantly with increased fertility levels but, decreased

the crude fibre content significantly by increased fertility levels.

Hence sowing of fieldbean in 30 cm rows using seedrate of 125 kg/ha and fertilizing with 35:70:35 kg $N:P_2O_5:K_2O$ ha^{-1}, for realizing its maximum fodder production in intensive dairy farming areas of Karnataka. Besides, under resource limited conditions farmer can apply 15:30: 15 kg $N:P_2O_5:K_2O$ ha^{-1}, at 75 kg seeds per ha with row spacing of 30 cm.

Integrated Nitrogen Management in Direct Seeded Rainfed Lowland Rice Through Leaf Colour Chart (LCC)

B.R. PREMALATHA 2001 MAJOR ADVISOR : Dr. V. V. ANGADI

A field experiment was conducted at the Agricultural Research Station, Mugad, during kharif season of 2000 to study the effect of integrated nitrogen management in direct seeded rainfed lowland rice through leaf colour chart (LCC).

Treatments included three organic nutrient sources such as FYM @ 10 t ha^{-1}, *in situ* green manuring with eupatorium sunnhemp@ 10 kg seed ha^{-1} and green leaf manuring with eupatorium @ 5 t ha^{-1} and no organic control as first factor. Three Nitrogen management practices such as, that at LCC threshold values of 3 and 4 and recommended practice were in the second factor. Farmers' practice with the application of FYM @ 5 t ha^{-1} once in two years and N and P @ 100 and 50 kg ha^{-1}, respectively was included as check treatment for comparison.The factorial experiment was laid out in RBD with single control and was replicated four times.

The results revealed that green manuring with sunnhemp or eupatorium with N management at LCC-3 recorded higher grain yield than all other treatment combinations (15-17% higher compared to check). Chemical fertilizers could be saved to an extent of 20-40 per cent with the incorporation of green manures without significant reduction in grain yield.

The grain yield was greatly influenced by growth attributing characters like LAI and dry matter production and distribution and yield attributes like panicles per meter row length and filled grains per panicle.Higher N uptake was observed with green manuring of sunnhemp and eupatorium and FYM incorporation at LCC-3 than recommended practice and check. At all the stages, maximum availability of N in soil and leaf N content were observed with N-management LCC threshold value of 4. Green manuring with sunnhemp or eupatorium along with N -management at LCC-3 gave higher net returns (Rs. 14,020 and 13,730 respectively) and B: C ratio(1.41 and 1.30 respectively).

Thus, the result indicate that the N-management with sunnhemp greeenmanuring seems to be promising with respect to nitrogen use efficiency and grain yield.

Effect of Green Manuring and Levels of Nitrogen on the Performance of Chilli + Cotton Intercropping System

MANJUNATH M. HONGAL 2001 MAJOR ADVISOR : B. M. CHITTAPUR

A field experiment was conducted to study the Effect of green manuring and levels of nitrogen on the performance of chilli (cv. Byadagi kaddi) + cotton (cv. Jayadhar) intercropping system" at Main Research Station, University of Agricultural Sciences, Dharwad under rainfed condition on black clay loam soil during 2000-2001.The experiment consisting of four levels each of green manures (no green manure, sunnhemp, cowpea and greengram) and nitrogen (0, 50, 100 and 150 kg ha^{-1}) was laidout using RCBD with three replications. Green manures were sown 40 days before transplanting of chilli and incorporated 20 days after transplanting.

Sunnhemp recorded higher phytomass (25.58 t ha^{-1}) followed by cowpea (22.44 t ha^{-1}) and greengram (14.40 t ha^{-1}). Similar trend was observed in biomass production and N-accumulation. However, green manuring did not influence the growth, yield attributes and yield of chilli significantly. Application of 100 or 1 50 kg N ha^{-1} produced higher yields and were on par with each other. Unlike chilli, growth, yield attributes and yield in cotton were significantly higher due to green manuring compared to fallow. Seed cotton yield was significantly higher with sunnhemp (932 kg ha^{-1}) than with other green manures. Among nitrogen levels, 100 or 150 kg N ha^{-1} recorded higher seed cotton

yield and these levels were on par with each other. Sunnhemp + 100 kg N ha^{-1} (1069 kg ha^{-1}) produced significantly higher seed cotton yield over fallow + 150 kg N ha^{-1}.

In chilli, green manuring increased the capsaicin content (%) and reduced per cent discoloured fruits. However, nitrogen levels increased both capsaicin content and per cent discoloured fruits. In cotton, green manure + 100 kg N ha^{-1} improved fibre fineness and Maturity coefficient.

Besides improving crop quality, green manures recorded higher soil organic carbon content and available N status at various growth stages. The economic analysis of the system revealed higher gross returns and net returns with sunnhemp + 100 kg ha^{-1} over fallow or other green manures in combination with 100 kg ha^{-1}.

Influence of Plant Growth Regulators, Chemicals and Nutrients in Greengram (*Vigna radiata* (L.) Wilczek)

S. SAI SANKAR 2001 MAJOR ADVISOR : Dr. S.M. HIREMATH

A field experiment was conducted at Main Research Station, University of Agricultural Sciences, Dharwad during kharif 2000 to study the influence of different growth regulators, chemicals and nutrients on various morpho-physiological, biochemical traits, yield and yield components in two greengram genotypes. The experiment was laidout in factorial randomized block design with three growth regulators (NAA, miraculan and cycocel) and two chemicals (salicylic acid and β-napthol) and two nutrients ($FeSO_4$ and KNO_3) with three replications. Significant differences were observed for various morpho-physiological, biochemical and yield and yield attributes due to the application of growth regulators, chemicals and nutrients.

The plant height increased significantly due to the application of NAA (40 ppm) and miraculan (2000 ppm). The morpho-physiological traits viz., Number of branches, nodes, number of trifoliates, dry matter in leaf, stem and reproductive parts and total dry matter increased significantly,due to the application of plant growth regulators, chemicals and nutrients. The growth parameters viz., Leaf area, LAI, RGR, CGR, NAR, SLW, LAD and BMD increased significantly with the application of NAA (40 ppm) and miraculan (2000 ppm). The biochemical parameters viz., Chlorophyll 'a', chlorophyll 'b', total chlorophyll content and NRA improved significantly due to the application of growth regulators (NAA and miraculan).

The seed yield was significantly higher with NAA (40 ppm) followed by miraculan (2000 ppm) and cycocel (500 ppm) and the increased yield was due to higher number of seeds per plant, pod length, number of pods per plant, pod weight, test weight and harvest index. The correlation studies indicated a significant positive association between seed yield and number of trifoliates, number of green leaves, chlorophyll content, nitrate reductase activity, leaf dry weight, TDM, RGR, CGR, NAR, LAD, BMD and SLW. From the point of economics the application of NAA (40 ppm) was more economical.

CROP PHYSIOLOGY

Effect of Plant Growth Regulators on Morph-Physiological Traits and Yield Attributes in Hybrid Cotton (*Gossypium hirsutum* L.)

K.A. KIRAN KUMAR 2001 MAJOR ADVISOR : Dr. B.C. PATIL

A field experiment was conducted during kharif 2000 at Agricultural Research Station, Dharwad to study the effect of growth regulators on morpho-physiological traits and yield attributes in hybrid cotton (DHH-11). The experiment was laid out in randomized block design with twelve treatments comprising of three growth regulators (Chamatkar, Lihocin and NAA) at different concentrations with three replications.

Application of NAA increased the plant height while, Chamatkar and Lihocin decreased the same as compared to control. Higher number of sympodial branches were recorded in NAA 20 ppm sprayed at 90 DAS as compared to control, while it was least in Lihocin 1000 ppm sprayed at 45 DAS.

Application of NAA 20 ppm sprayed at 90 DAS recorded higher dry matter in different plant parts, where

as, it was least in Lihocin 1000 ppm sprayed at 45 DAS. Application of NAA 20 ppm sprayed at 90 DAS increased the leaf area, leaf area index and leaf area duration significantly over other treatments. Application of growth regulators significantly increased AGR, CGR, RGR and NAR as compared to control. The SLW showed a significant positive correlation with seed yield.

The treatment NAA 20 ppm sprayed at 90 DAS recorded significantly higher seed cotton yield followed by Chamatkar 1000 ppm sprayed at 90 DAS and Chamatkar 750 ppm sprayed at 90 DAS as compared to control. Application of NAA 20 ppm sprayed at 90 DAS recorded significantly higher boll weight, number of bolls per plant and harvest index while, it was least in Lihocin 1000 ppm sprayed at 45 DAS and these parameters showed a significant positive correlation with seed cotton yield.

In conclusion, the application of NAA 20 ppm followed by Chamatkar 1000 ppm sprayed at 90 DAS was more economical as compared to control by recording maximum benefit cost ratio.

Influence of Nutrients of Physiology, Yield and Quality Improvement in Groundnut (*Arachis hypogaea* L)

VIRUPAXAPPA S. SHANTAGERI 2001 MAJOR ADVISOR : Dr. S.J. PATIL

A field experiment was conducted at Main Research Station, University of Agricultural Sciences, Dharwad on medium black soil during kharif 2000, under rainfed conditions to study the influence of nutrients (S, Mg, Fe and Zn) on physiological and biochemical aspects of yield and quality improvement in groundnut. The treatments differed significantly among themselves with respect to various morphological characters. Application of S (elemental) @ 40 kg ha^{-1} recorded maximum plant height (44.67 cm) and leaf area (17.36 dm^{-1} $plant^{-1}$). Application of S (elemental) @ 40 kg ha^{-1} recorded the maximum leaf, stem and total drymatter content. Application of S (elemental) @ 40 kg ha^{-1} significantly increased the LAI, CGR, RGR and NAR. The application of nutrients enhanced the chlorophyll content and was more with $MgSO_4$ @ 30 kg ha^{-1} followed by S (elemental) @ 40 kg ha^{-1} and $FeSO_4$ @ 40 kg ha^{-1}. Among the different levels of S (elemental): the application of (elemental) @ 40 kg ha^{-1} recorded maximum shelling percentage (70.39), pod yield (27.04 q ha^{-1}) and test weight (28.11). Similarly $FeSO_4$ @ 40 kg ha^{-1} and $ZnSO_4$ @ 30 kg ha^{-1} recorded 25.01q ha^{-1} and 22.9 q ha^{-1} pod yield respectively. Application of S (elemental) @ 40 kg ha^{-1} at recorded maximum oil content in kernels (41.99%) and Nitrate reductase activity. Application of Gypsum @ 50 kg ha^{-1} at peg initiation stage recorded significantly higher pod yield (19.84 q ha^{-1}), kernel yield (4.07 q ha^{-1}), shelling percentage (68.43), test weight (27.48 g) and harvest index (0.42) as compared to control (0.38).

Thus, it is inferred that the soil application of S (elemental) @ 40 kg ha^{-1} as basal dose and also application of Gypsum @ 500 kg ha^{-1} at peg initiation stage increased the pod yield and quality in groundnut.

Physiological Studies on Weed Control Efficiency in Garlic (*Allium sativum* L.)

VENKATESH KENCHANAGOUDAR 2001 MAJOR ADVISOR : Dr. B.B. CHANNAPPAGOUDAR

A field experiment was conducted at Main Research Station, University of Agricultural Sciences, Dharwad during kharif 2000 to study the influence of herbicides and crop weed competition on weed control efficiency in garlic (local white). The experiment consisted of five herbicides each at two concentrations and treatments with weed free and weedy check and was laid out in randomized block design with three replications.

Results revealed that the application of oxyfluorfen was phytotoxic while, Butachlor @ 1.0 kg a.i. ha^{-1} was not phytotoxic. The monocot, dicot and total number of weed and total dry weight of weeds were found to be maximum in weedy check and the herbicide treatments Butachlor @ 1.0 kg a.i. ha^{-1} and Alachlor @ 1.0 kg a.i. ha^{-1} decreased these parameters. The weed control efficiency was maximum with Butachlor @1.0 kg a.i. ha^{-1}.

The morpho-physiological traits viz., leaf dry weight, bulb dry weight and total dry weight were lowest in weedy check and the application of Butachlor @ 1.0 kg a.i. ha^{-1} and Alachlor @ 1.0 kg, a.i. ha^{-1} increased these

parameters. The growth parameters viz., Leaf area, RGR, CGR, NAR, SLW, LAD and BMD were significantly lower in weedy check and application of Butachlor @ 1.0 kg a.i. ha^{-1} was very effective and increased these parameters.

The bulb yield decreased significantly due to weed competition and among the herbicides, bulb yield was significantly higher in Butachlor @ 1.0 kg a.i. ha^{-1} followed by Alachlor @ 1.0 kg a.i. ha^{-1} and these treatments recorded significantly, lower values for weed index. The total chlorophyll content and NR activity was significantly lower in weedy check and the application of Butachlor @ 1.0 kg a.i. ha^{-1} significantly, increased chlorophyll content and NR activity. The benefit : cost ratio was highest with Butachlor @ 1.0 kg a.i. ha^{-1} followed by Alachlor @ 1.0 kg a.i. ha^{-1}.

GENETICS AND PLANT BREEDING

Strategies for Increasing Variability for Yield and Its Attributes in Cowpea (*Vigna unguiculata* (L.) Walp.)

SHREESHAIL B. HADAPAD 2001 MAJOR ADVISOR : Dr. P.M. SALIMATH

An investigation was carried out to compare the variability generated through hybridization, mutation and combination of both. One locally adopted cultivar C-152 was crossed with selected genotypes excelling in seed weight (C-13), pod length (KM-3) and pods per plant (KM-5). The F_1 seeds of these three crosses and those of C-152 were treated with gamma rays (20 KR). The segregating populations thus obtained viz., Three F_2'S, three F_2M_2's and one M_2 of C-152 were evaluated for nine quantitative traits. There was reduction in mean and variance in F_2M_2 for plant height and number of primary branches per plant as compared to F_2. But high mean and variance values were observed in F_2M_2 populations for other characters. Generally a wider range and high range value in the positive direction were observed in F_2M_2 compared to their corresponding F_2 populations.

The GCV, heritability and GAM values were less in F_2M_2's compared to their corresponding F_2'S for plant height, number of primary branches per plant, number of pods per cluster and seed yield per plant. For other traits GCV, heritability and GAM values were higher in F_2M_2's compared to their corresponding F_2's.

Highly significant positive correlation of seed yield was observed with pods per plant and clusters per plant in all the populations. The nature and degree of association among different traits were changed in favourable direction in F_2M_2 populations compared to F_2 populations. Path analysis revealed the importance of pods per plant as the most important yield contributing trait. The direct effect of pods per plant on seed yield was increased from F_2 to F_2M_2 in two populations. In M_2 population of C-152 the direct effect of pods per plant on seed yield was less.

More number of transgressive segregants were recorded in F_2M_2's compared to their corresponding F_2's indicating the ability of mutation on heterozygolis genotype to create rare types of transgressive segregants.

Inheritance of Seed Size in Cowpea (*Vigna unguiculata* L. Walp.)

SUMA S. BIRADAR 2001 MAJOR ADVISOR : Dr. P. M. SALIMATH

A study was conducted to findout the inheritance pattern of seed size in cowpea using Goa local, an extra bold seeded variety and three other genotypes (C-152, KM-1, V-11 8) with small to medium seed size. Experimental material was generated by crossing Goa local with each one of the three small seeded genotypes and further developing a set of six generations (P_1, P_2 F_1, F_2BC,&BC$_2$) for each of the cross. Heterosis for physiological traits as well as for yield and its components was studied during kharif 2000 while, gene effects for seed size and other related traits including seed yield were estimated during summer 2001.

The magnitude of heterosis for seed yield was high in the cross KM -1 x Goa local followed by C-152x Goa local. Heterosis for pods per cluster, pods per plant, test weight contributed considerably to yield heterosis. Heterosis for physiological parameters also had a major role in yield heterosis. The above mentioned hybrids showed higher magnitude of inbreeding depression for grain yield and hundred seed weight.

The extent of variability generated was high for grain yield per plant, pods per plant, clusters per plant, pods per cluster and test weight. KM-1 x Goa local F_2 population was the potential population for improvement of seed size

and grain yield, whereas C-152 x Goa local was the potential population for improvement of pods per plant, clusters per plant and branches per plant.

For seed size, the main character of interest, influence of additive gene effect was evident in all the three crosses. The cross C-152 x Goa local revealed the importance of additive and dominance effects along with their interactions. The cross KM-1 x Goa local showed predominance of additive gene action.

Association analysis showed high positive correlation of test weight with yield per plant, pod length, number of pods and plant height irrespective of crosses. Frequency of transgressive segregants in respect of hundred seed weight was higher in BC_2 population as compared to F_2 and BC_1 generations.

The investigation revealed that Goa local was a potential donor line to improve seed size and consequently yield per plant. It has been suggested to introgress KM-1 x Goa local and C-152 x Goa local segregating populations possibility for further increasing scope of genetic improvement of cowpea.

Variation for Drought Tolerance and Isozymes at Seedling Stage in Rainfed Upland Rice (*Oryza sativa* L.)

JEELANI MAKHASI 2001 MAJOR ADVISOR : Dr. V. V. SHENOY

An experiment was conducted to observe the variation for drought tolerance in the rainfed upland rice genotypes based on physiological and biochemical characters. The seeds were first subjected to moisture stress to study the effect of drought on seed germination and seedling growth. Two levels of moisture stress (-5.0, -7.5 bar) treatments were given using PEG6000. The per cent germination decreased under stress (-5 bar) compared to the control, with no germination at -7.5 bar stress. The genotypes were classified into five categories based on germination response under the -5 bar stress. Though the root length, shoot length and seedling vigour index decreased significantly under the stress, tolerant cultivate performed better under stress showing increased-root:shoot ratio. The cultivars also differed in respect of proteins and isozymes (a-amylase, Catalase, Peroxidase and Super oxide dismutase) intensity and pattern under the stressed and non-stressed conditions. Further, eight tolerant and a susceptible genotypes were subjected to different levels of moisture stress (100%, 75% and 50% Field capacity) in pot culture and observations were recorded at different durations (11th and 18th day). The per cent germination, root length, shoot length, seedling vigour index, leaf length, seedling dry weight and relative water content decreased with increase in the intensity of the stress. Root: shoot ratio increased increased levels of stres. The tolerant genotypes performed better under increased levels of stress compared to the (GCV), phenolypic coefficient of variation (PCV), Heritability and genetic advance as percentage mean (GAM) were also variable for different characters recorded.

Evaluation of Sudan Grass (*Sorghum sudanense* (Piper) Stapf.) Germplasm for Combining Ability

MALLIKARJUN S. BISANKOPP 2001 MAJOR ADVISOR : Dr. S. VIJAYAKUMAR

The study was undertaken to evaluate sudan grass germplasm cultures for combining ability in respect of forage yield and its components and also to assess the *per se* performance and magnitude of heterosis in sorghum x sudan grass hybrids. Forty eight F_1's in line x tester fashion involving two sorghum male sterile lines and 24 cultures of sudan grass germplasm as testers, their parents and four checks (DFJ-1, SSV-74, SSG 59-3 and SSG 898) were planted in a randomized block design during Rabi-summer season of 2000-2001 at Regional Research Station, Raichur.

Parents and hybrids showed highly significant differences for all the characters. Significant *per se* performance and standard heterosis in desirable direction were recorded in several crosses. The crosses M31-2A x IS 3238, M31-2A x IS 3237 and M31-2A x IS 722 showed significantly superior *per se* performance and standard heterosis considering the three important characters, total forage yield (both green and dry) and crude protein.

The ratio of general and specific combining ability variances showed the predominance of non-additive gene action for forage yield and quality characters, Among the

male sterile lines M31-2A and among sudan grass germplasm cultures IS 3237, IS 3238, IS 3289, IS 3316 and IS 3378 were the best general combiners. The study of sca effects revealed that the performance of the hybrids for all the characters was higher when parents having high gca effects. The crosses M31-2A x IS 3238, M31-2A x IS 3237, M31-2A x IS 722, M31-2A x IS 720 and M31-2A x IS 3316 for total fodder yield (both green and dry) and the crosses SB401A x IS 3328 and M31-2A x IS 2887 for crude protein exhibited higher *per se* performance and desirable sca effects. Considering all the important traits, M31-2A x IS 3238 was the best hybrid.

In vitro and *In vivo* Studies on Development of Fibre and Fibre Colour in Naturally Coloured Cotton (*Gossypium* spp)

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In vitro ovule culture experiments were conducted to know the effected to know the effect of plant growth regulators and energy sources on fibre development. Portable microflash 200d spectrophotometer studies were carried out to know the effect of sunlight on fibre colour development.

Higher *in vitro* fibre induction and fibre accumulation was observed in GA_3 supplimented medium tha IAA, NAA and kinetin at 4 mg^{-1}. Fertilized ovules of 3 day old gave more fibre induction reponse interms of number of ovules and total fibre accumulation. Both the Dharwad Brown Arboreum and Dharwad Brown Hirsutum genotypes responded equally for per cent fibre induction response and fibre accumulation.

Glucose in preference to sucrose produced more per cent fibre induction response and fibre production on dry weight basis.

Ovules incubated under 24 hour darkness produced highest per cent fibre induction response and fibre accumulation compared to alternation of 12 hour light and dark periods.

Brown colour in DBA and DBH and green colour in DGH genotype developed after 30th day of incubation in cultures maintained under alternation of 12 hour light and dark periods, while the fibre colour in cultures maintained under 24 hour darkness remained white till 60th days of incubation. The fibre colour in ovule culture shifted from 24 hour darkness to alternation of 12 hour light and dark period on 30th day of incubation turned brown in DBA and DBH and green in DGH genotype immediately the next day. On the contrary fibre colour in cultures shifted from alternation of 12 hour light and dark periods to 24 hour darkness ramained white till the 60th day of incubation.

Colour intensity measurements obtained from all the four brown linted genotypes revealed that brown colour development starts prior to 30th day of anthesis. The increase in colour intensity per day was observed in all the genotypes from 30-60 days after anthesis. In case of green linted genotype colour accumulation was noticed up to two weeks after boll burst followed by decrease in colour intensity in successive weeks.

Heterosis, Combining Ability and Gene Action for Morpho-Physiological Traits in Greengram (*Vigna radiata* (L.) Wilczek)

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A study on line x tester. Analysis was carried out to estimate extent of heterosis, to assess combining ability of parents chosen and to know nature of gene action for morpho-physiological traits influencing seed yield in greengram. The experiment comprising of selected two female and ten male parents with their 2x10F_1, were evaluated during kharif 2000.

The extent of better parent heterosis for seed yield ranged from 2.41 to 51.41 per cent. The highest seed yield per plant was recorded by Selection-4 x TM 98-50 followed by Selection-4 x M-446 and Selection-4 X M -1 and further these crosses exhibited significant better parent heterosis for seed yield. It was observed that the degree of heterosis for seed yield was associated with better parent heterosis for physiological traits like total dry matter (TDM),biomass duration (BMD) from 45 days to harvest and harvest index (HI) indicating the close intimacy between seed yield with physiological traits particularly maintenance of high biomass from flowering to maturity and partitioning ability of photosynthates.

Based on ability to transfer desirable genes to their progenies, TM 98-50 was good general combiner for seed yield, 100-seed weight and harvest index. TARM-12 appears to possess desirable genes for early flowering. From physiological point of view, TARM-18 and M-446 were good general combiners for leaf area (LA) and leaf area index (LAI). Similarly TM 97-52 was good combiner for harvest index.

Among the crosses which exhibited significant better parent heterosis for seed yield, Selection-4 x TM 98-50 exhibited significant sca effects for seed yield and HI while for physiological traits such as TDM at 45 days and BMD, Selection 4 xM-446 exhibited significant sca effects. .

Most of the traits studied were predominantly under the control of additive gene action while epistatic gene action also played a role. Based on the magnitude of additive component pedigree selection method can be used for imporvement of days to 50 per cent flowering, LAI, BMD and HI.

Stability Analysis for Yield and Confectionary Caracteristics in Large Seeded Groundnut (*Arachis hypogaea* L.)Genotypes

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Investigation was carried out in 13 large seeded groundnut genotypes at the Main Research Station, University of Agricultural Sciences, Dharwad to assess the stability for yield and confectionery characteristics over three seasons by adopting Eberhart and Russells (1966) model. The experiment was carried out during kharif 1999, kharif 2000 and summer 2001 and the observations were recorded on 10 yield, yield related and 4 confectionery characteristics.

The two way analysis revealed significant differences between genotypes and the genotype x environmental interactions for all the 14 characters studied. The unpredictable component of environment was predominant over the predictable component.

From the stability parameters, the genotype TGLPS-7 exhibited stability for pod yield per plant, hundred kernel weight, oil content and protein content followed by TGLPS-3 which was stable for plant height, number of pods per plant, whereas M-13 was stable for hundred kernel weight, oil content and total sugars. The check TAG-24 was fairly stable for days to 50 per cent flowering, plant height and oil content.

Genetic variability and correlation studies were carried out during summer 2001 for confectionery characters. Wide variability has been noticed for blanching, protein content, total sugars and O/L ratio. Pod yield was positive correlated with shelling per cent, sound mature kernels, 100 kernel weight and O/L ratio, whereas it was negatively correlated with oil content ' protein content and total sugars. *In vitro* seed colonization with A. Flovus was also studied. The genotypes M-13, TGLPS-3 and JCGV - 86564 were found to be less severely colonized compared to others.

In the seed grading carried out for two seasons viz., Kharif 2000 and summer 2001, only one genotype TGLPS-7 was found to possess higher proportion of extra large and large kernels meeting the requirement while no genotype had requisite extra large kernels during kharif 1999.

Heterosis and Combinng Ability Studies and Their Relationship with Genetic Diversity in Sunflower (*Helianthus annuus* L.)

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In the present study, the sunflower hybrids were evaluated for the extent of heterosis and combining ability for seed yield, component characters and the extent of heterosis in relation to genetic diversity was assessed. The base material consisted of six male sterile and six restorer lines crossed in all possible combinations. A total of 12 parents and 36 hybrids along with KBSH 1 and DSH1 as check hybrids were planted in randomized block design replicated thrice. The characters viz., Days to 50% flowering, plant height, number of leaves/plant, head diameter, seed yield per plant, 100 seed weight, % filled seeds, days to maturity, oil content and hull content were recorded.

The hybrids recorded high mid-parent and average heterosis for seed yield and 100 seed weight. The average heterosis for seed yield was (97.07%). All the hybrids exhibited negative heterosis for days to 50% flowering and maturity.