

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

DOCTOR OF PHILOSOPHY

AGRONOMY

**Agronomic Investigations on Cover Cropping in Hybrid Cotton Under Rainfed Vertosols of Northern
Transitional Zone of Karnataka**

I.B. BIRADAR

2000

MAJOR ADVISOR: Dr. Y.B. PALLED

Two field experiments were carried out from 1997-98 to 1999-2000 on medium black soils of Main Research Station, University of Agricultural Sciences, Dharwad. The objectives included the evaluation of green manuring cover crops for their suitability as year long field covers in hybrid cotton and to find the effect of plant geometry and fertility level in hybrid cotton with a common cover crop. *Stylosanthes hamata* at 1:2 row proportion with 45 days cutting interval registered significantly higher seed cotton yield (10.02 q/ha) and it was followed by lucerne at 1:2 row proportion (8.98q/ha) and 1:1 row proportion (8.85 q/ha) with 30 days cutting interval and sole cotton (9.68 q/ha). Lucerne at 1:2 row proportion with 30 days cutting interval recorded significantly higher fresh and dry weight of lucerne and nitrogen accumulation (22.89 t/ha, 9.81 t/ha and 239 kg/ha respectively) over other treatment combinations. Significantly lower weed count and weed dry weight were recorded at all the stages of crop growth

with lucerne cover cropping over sole cotton. The cover cropped treatments recorded significantly higher soil moisture content and higher soil organic carbon content over sole cotton.

A plant geometry of 120 cm x 60 cm with 100 per cent RDF+GM recorded significantly higher seed cotton yield (22.80 q/ha), fresh and dry weight of lucerne (20.15 t/ha and 9.22 t/ha) and nitrogen accumulation (265.75 kg/ha) over other treatment combinations. All the cover cropped treatments registered significantly higher soil moisture content, soil organic carbon, infiltration rate and increased microbial activity over sole cotton. Maximum net income (Rs. 55,149/ha) and B:C ratio (6.49) were recorded with a plant geometry of 120 cm x 60 cm with 100 per cent RDF+GM over other treatment combinations and sole cotton.

**Response of Foxtail Millet (*Setaria italica* L.) To Tillage Practices, Organics, Nitrogen Levels and its
Performance in the Intercropping Systems in Shallow Alfisols**

R. BASAVARAJAPPA

2000

MAJOR ADVISOR: Dr. A.S. PRABHAKAR

Investigations to study the " Response of foxtail millet to tillage practices, organics and nitrogen levels and its performance in the intercropping systems in shallow alfisols" were carried out during 1997-98 and 1998-99 at Agricultural Research Station, Hanumanamatti.

Among the different tillage practices, medium tillage and ridging recorded significantly higher grain yield (1307 kg ha⁻¹) of foxtail millet grown in kharif which was 8.60, 17.21 and 27.38 per cent higher over medium tillage flat bed sowing, respectively. Increase in depth of tillage increased the growth and yield components and major nutrient's availability and uptake. Enriched FYM application @ 2.5 t ha⁻¹+Azospirillum @ 10.0kg ha⁻¹ recorded significantly higher grain yield (1395 kg ha⁻¹) which was 3.71 and 21.10 per cent higher over application of *Glyricidia* @ 5.0 t ha⁻¹ and enriched FYM alone, respectively and improved the nutrient uptake over other organics. Application of 60kg N ha⁻¹ recorded significantly higher grain yield (1407 kg ha⁻¹) over 30 and 0 kg N ha⁻¹.

Medium tillage and ridging with enriched FYM +

Azospirillum + 60 kg N ha⁻¹ recorded significantly higher grain yield (2044 kg ha⁻¹) followed by medium tillage and ridging with *Glyricidia* green manuring + 60kg N ha⁻¹ (1569kg ha⁻¹). Medium tillage and ridging with enriched FYM + Azospirillum + 60 kg N ha⁻¹ recorded significantly higher production potential in terms of foxtail millet equivalent yield, net returns and B:C ratio in foxtail millet-castor and foxtail millet-horsegram sequences.

In intercropping system, foxtail millet grain yield was not significantly affected with the intercrop population of either 50 or 100 per cent. While, the yields of intercrops viz. pigeonpea, sesamum, cotton, castor and mesta were significantly higher at 100 per cent than 50 per cent population. Intercropping of foxtail millet + castor 100 per cent realized significantly higher yield advantage in terms of LER (1.49) and ATER (1.282) over sole foxtail millet. The net returns were significantly higher with intercropping of foxtail millet + pigeonpea 100 per cent population (Rs.21574 ha⁻¹).

Abstract of Theses

GENETICS AND PLANT BREEDING

Studies on Diversity, Heterosis and Combining Ability for Plant Type, Productivity and Fibre Quality Traits in Cotton

VIJAYENDRA S. SANGAM

2000

MAJOR ADVISOR: Dr. S.A. PATIL

Twelve cotton genotypes of *Gossypium hirsutum* and four of *G. barbadense* representing different plant type classes were selected and comparative studies on diversity, combining ability and heterosis for plant type, productivity and fibre traits were made through 12x12 diallels (intraspecific) and 12x4, line x tester (interspecific) experiments.

Genetic diversity study revealed that clustering for plant type traits were different from yield traits. The major contributor to plant type diversity among intrahirsutum crosses was plant height and sympodial length while leaf area and internodal distance on sympodia contributed much among interspecific crosses. Among yield traits GOT, lint index, seed index and boll number contributed to diversity. Unlike interspecific crosses the intrahirsutum crosses did not show relationship between genetic diversity and heterosis. RASP-38 (Medium compact) found to possess high overall gca status for yield and fibre traits. CPD-446, CPD-448 (compact) and RASP-38 (Medium compact) were found to possess high negative gca status for plant type traits indicating general reduction in the plant size suggesting their use in future compact plant type breeding. The

intrahirsutum crosses CPD 446 x JK 276 (compact x Bushy) and RASP-38 x RASP-46 (medium compact x Tall) and interspecific crosses RAMPBS-155 x BCS-23-7 and JK- 276 x BCS-23-7 with reduced plant stature recorded high sca status for yield and field and fibre traits and were suggested for hybrid vigour exploitation. Present study revealed that heterotic hybrids for yield and fibre traits could be obtained by using High x High High x Low and Low x Low general combiner parents while, positive x positive and negative x negative combiner parents were found to be important for compact plant type breeding.

The Potential intrahirsutum crosses of the study included RAMPBS-155 x JK-276 (Tall x Tall) CPD-448 x RASP 38 (compact x Medium compact) and Anjali x RASP 38 (Compact Medium compact) and interspecific crosses included Anjali x BCS-9-95, JK 276 x BCS-9-95 and JK-276 x BIS-23-7. The ideal cotton plant type for irrigated conditions would be medium tall, open with 1-2 monopodia with high boll number, boll weight, lint index, GOT and good fibre properties.

SEED SCIENCE AND TECHNOLOGY

Investigations on Seed Production Techniques and Storability of Chickpea (*Cicer arietinum* L.)

M.N. MEHARWADE

2000

MAJOR ADVISOR: Dr. M.B. KURDIKERI

Field experiments were conducted at Main Research Station, Dharwad and laboratory experiments were conducted in the laboratory of Department of Seed Science and Technology, University of Agricultural Sciences, Dharwad during rabi 1997-98 and 1998-99 on seed production techniques and storability of chickpea genotypes. Seed yield was significantly higher with better morpho-physiological growth and quality characteristics in A-1 (43.27 q ha⁻¹), BG-256 (41.92 q ha⁻¹) and ICCV-2 (41.98 q ha⁻¹) genotypes sown during October 3rd week and in K-850 (38.45 q ha⁻¹) sown during October 1st week with 37.5 N: 75 P₂O₅ kg ha⁻¹ fertilizer level. The decreased seed yield was noticed in A-1, K-850 and ICCV-2 sown during November 1st week and in BG-256 sown during October 1st week with 25 N: 50 P₂O₅ kg ha⁻¹ spraying of growth regulators at flower initiation stage in A-1 and ICCV-2 genotypes resulted in better morpho-physiological growth and higher seed yield besides having better quality with 50 ppm TIBA (37.98 q ha⁻¹), 100 ppm NAA (36.40 q ha⁻¹), 1000 ppm Lichocin (36.14 q ha⁻¹), 75 ppm TIBA (34.57 q ha⁻¹), 150 ppm NAA (34.14 q ha⁻¹) and 1000 ppm Mepiquat chloride (34.04 q ha⁻¹) compared to other growth regulators

and control (no growth regulator spray). Based on seed recovery (96 to 98%), germination (90 to 93%), test weight and vigour index, a 6.0 mm (R) sieve size was found optimum for seed processing of seven *desi* and *kabuli* chickpea genotypes studied. Application of endosulfan @ 2 g l⁻¹ or carbaryl @ 4 g l⁻¹ at pod milky and crop maturity stages as pre-harvest sprays and at seed storing stage @ 2 or 4 g kg⁻¹ of seeds as post harvest treatment was found beneficial in maintaining higher 100 seed weight, germination and seedling vigour index with lower seed infestation, moisture content and seed leachates compared to control during ten months ambient storage period of chickpea A-1 seeds in cloth bags. Endosulfan maintained higher seed storability compared to carbaryl irrespective of stages of insecticidal applications. Among various seed protectants, castor and neem oils @ 5 ml kg⁻¹ and lakke leaf power @ 10 g kg⁻¹ with or without captan @ 2.5 g kg⁻¹ of seeds were found as the best seed protectants for maintaining better seed quality with lower seed infestation during ten months ambient storage period of chickpea A-1 seeds in cloth bags.

PLANT PATHOLOGY

Epidemiology and Management of Alternaria Leaf Blight and Rust of Sunflower (*Helianthus annuus* L.)

Y S. AMARESH

2000

MAJOR ADVISOR: Dr V.B. NARGUND

Alternaria leaf blight caused by *Alternaria helianthi* and rust caused by *Puccinia helianthi* are two major foliar diseases of sunflower. The yield loss due to Alternaria leaf blight and rust was estimated to be 43.90 and 32.85 per cent during 1998-99 and 1999-2000 respectively. AUDPC value was found to be a better parameter for yield loss assessment and epidemiological model was developed.

Autoregressive method of seventh order was used for estimating both uredospore and conidia load in terms of previous successive seven days. The disease development was predicted by first order autoregressive model and logistic model. The toxin produced by *A. helianthi* was purified and identified as 3 propyl 14 hydroxy -2oxy dihydro furone. The toxin produced typical brown necrotic spots without yellow halo on susceptible sunflower cv. Morden. PAC-35, PAC-304 and DSH-34 were identified as slow blighters and PAC-36, PAC-304 GK-2002 and GAUSUF-15 as slow rusters. Sugars and phenols were

more in diseased leaves than healthy leaves. The isozyme studies on catalase, peroxidase and polyphenol oxidase revealed their role in disease development. The higher incidence of Alternaria leaf blight and rust was noticed in kharif and rabi sown crop respectively.

Among 30 plants screened, *Allium sativum*, *A. cepa*, *Amaranthus viridis*, *Ocimum sanctum*, *Tridax procumbens* and *Melia azedarach* were found effective against both pathogens. Chlorothalonil, mancozeb, propiconazole and hexaconazole were most effective against both and pathogens. *Pseudomonas fluorescens* was found to be a better bioagent in the management of both diseases. Among 140 sunflower genotype ACC, No. 405, 1583, PAC-36 and PAC-336 were found resistant to both Alternaria leaf blight and rust. In integrated disease management of Alternaria leaf blight the treatment fungicide followed by Pongamia and *P. fluorescens* was found to be effective in reducing the disease.

AGRICULTURAL ECONOMICS

Economic Performance of Production, Marketing and Export of Vegetables in North Karnataka

BALAPPA SHIVARAYA

2000

MAJOR ADVISOR: Dr. L.B. HUGAR

India is the second largest vegetable producer in the world next to China. The total vegetable production in India (72.83 million tonnes) accounts for 6.74 per cent of the world production. Vegetable cultivation forms a supplementary cash crop for the farmers. The present study was conducted in North Karnataka during 1999-2000.

A positive growth in vegetable production over the period of 1977-96 at all the locations was mainly due to increase in mean area, while it was due to mean yield in Belgaum, Dharwad and country as a whole. Correspondingly, the change in area variance and yield variance have contributed to the variability of vegetable production in respective locations. The extent of inputs use and cost of cultivation in brinjal (Rs. 70345.41/ha) and tomato (Rs. 24400.38/ha). Further, majority of the farmers were operating at medium level efficiency as they used 28 to 84 per cent of excessive inputs to achieve the existing level of output. However, the benefit cost ratio was higher in onion (2.08) and potato (1.71), compared to tomato (1.68) and brinjal (1.47) mainly because of lower level of inputs

used in these enterprises.

In general, farmers realised returns less than 70 per cent of the consumers rupee. However, the magnitude of price spread in tomato (48.85%) and brinjal (47.93%) was higher than for onion (31.49%) and potato (31.43%). Strong price integrations between the selected markets for onion and potato were noticed (above 0.8).

Growth in terms of quantity and value of fresh vegetables exports was significant during the study period (1979-98). However, during post liberalisation period, the growth in quantity exports was higher than growth in value for all vegetables, while growth in value exceeded growth in quantity for onion. The vegetables were competitive for their export. UAE and Malaysia for onion, Sri Lanka and Nepal for potato and Bangladesh and Nepal for tomato were the loyal markets for India. Export earnings from fresh onion, potato and tomato were estimated to touch Rs. 1110.15 crores, Rs. 60.77 crores and Rs. 1.16 crores respectively by 2004-2005.

MASTER OF SCIENCE

AGRONOMY

Integrated Nutrient Management in Soybean and its Residual Effect on Wheat Under Rainfed Condition

K.S. GANESHAPPA

2000

MAJOR ADVISOR: Dr. A.S. PRABHAKAR

Field Experiment was conducted at the Agricultural College Farm, Dharwad, during both Kharif and rabi seasons of 1999-2000 to study the effect of integrated nutrient management in soybean and its residual effect on wheat under rainfed condition on vertisols. The treatments composed of the RDF along with FYM and micronutrients (Zn, B, Mo and their combinations). The experiment was laid out in a randomised block design with three replications.

Integrated application of RDF+FYM+Zn recorded significantly higher seed yield (2385 Kg ha⁻¹) and stover yield (2793 Kg ha⁻¹) of soybean. Similarly, it also showed significant improvement in yield components viz., number of pods per plant, number of seeds per plant, seed weight per plant and 100 seed weight as compared to application of RDF alone. The next best treatment was RDF+Zn. The growth parameters, growth functions and nutrient uptake (NPK and Zn) by soybean crop was significantly higher with the application of RDF+FYM+Zn. Nodulation was found superior with application of RDF+Seed treatment with sodium molybdate 4 g per kg seeds + FYM as compared to

RDF alone. Protein yield and oil yield was recorded significantly higher with application of RDF+FYM+Zn. The combined application of RDF along with FYM and micronutrients during Kharif season for soybean exerted significant residual effect on succeeding wheat crop during rabi rather than applying RDF alone. Wheat grain yield (1595 kg ha⁻¹), yield components, protein yield, nutrient uptake were significantly higher with application of RDF+FYM+Zn. Significantly higher net returns in soybean - wheat sequence was obtained with application of RDF+FYM+Zn (Rs. 25,083 ha⁻¹) and RDF+Zn (Rs. 23,175 ha⁻¹) which were 38 and 27 per cent higher than RDF alone (Rs. 18,239 ha⁻¹), respectively.

The combined application of RDF, FYM and micronutrients showed significant higher available nutrients at harvest of the crop as compared to application of RDF alone. The data clearly indicated that integrated nutrient management practices in soybean-wheat cropping sequence was found more profitable and also help to maintain the productivity of soil.

Effect of Mulches and Nutrient Management on Growth and Yield of Chilli (*Capsicum annuum* L.)

RACHAPPA B. SUTAGUNDI

2000

MAJOR ADVISOR: Dr. C. J. ITNAL

An investigation was carried out to study the effect of mulches and nutrient management on growth and yield of chilli (*Capsicum annuum* L.) at Main Research Station, University of Agricultural Sciences, Dharwad, during Kharif season of 1999. The experiment was laid out in split plot design with different mulches as main plots and manurial treatments as sub plots in three replications.

Among the mulches, application of black polythene mulch conserved more soil moisture, increased soil temperature and reduced number of weeds and dry weight of weeds. Higher plant height (102.60 cm) number of branches (196.76) and total dry matter production /plant (111.21g) recorded in the treatment of black polythene mulch followed by sand mulch. The yield components viz., number of fruits/plant (73.03), dry weight of fruits/plant (36.15g) and 100 fruit weight (50.61g) and yield of dry chilli (11.67 q/ha) were higher in black polythene mulch treatment followed by sand mulch treatment.

Among manurial treatments, application of FYM (10

t/ha) alone or in combination with RDF recorded higher soil moisture and temperature. Organic carbon (0.62%), available nitrogen (261.8 kg/ha), phosphorus (48.0 kg/ha) and potassium (364.9 kg/ha) were higher in RDF+FYM applied treatment. Growth components viz., plant height (107.88 cm), number of branches (21.32), and total dry matter production (116.94 g/plant), yield components like number of fruits/plant (76.78) and fruit weight/plant (37.93g) and yield of dry chilli (12.37 q/ha) were also higher in treatment receiving RDF+FYM. In same treatment ascorbic acid content was higher (172.57 mg/100g green chilli).

Application of black polythene mulch with RDF+FYM recorded highest gross income (Rs. 53,200/ha) followed by sand mulch with RDF+FYM (Rs. 53,026/ha). It is due to higher chilli yield recorded in these treatments. The treatment receiving straw mulch and RDF+FYM recorded higher net returns (Rs. 30,894/ha) and B:C ratio (1.803) compared to other treatment combinations.

Effect of Seed Rate and Nitrogen Levels on Forage Yield and Quality of Oat (*Avena sativa* L.) Under Irrigation

NINGAPPA B. KAKOL

2000

MAJOR ADVISOR: S.C. ALAGUNDAGI

A field experiment was conducted at main Research Station, University of Agricultural Sciences, Dharwad on red soils to study the effect of seed rate and nitrogen levels on growth, yield and quality of forage oat (var. Kent) under irrigation during rabi season of 1999-2000. The experiment consisted of 12 treatment combinations with three seed rates (75, 100 and 125 kg/ha) and four levels of nitrogen (60, 90, 120 and 150 kg/ha) and was laid out in split plot design with three replications.

The green forage yield was significantly higher (17.40 t/ha) with 125 kg per ha seed rate during first harvest while during second harvest and for total of two harvests, seed rate of 100 kg per ha produced higher green forage (14.69 and 30.98 t/ha, at second harvest and for total respectively) compared to other levels of seed rates.

Seed rates did not influence significantly the content and yields of crude protein, total ash and ether extract at both harvests while crude fibre content decreased significantly with increased seed rates.

The green forage and dry matter yields increased

significantly with successive increase in nitrogen level upto 150 kg per ha in both harvest and also for total of two harvest (37.05 t/ha total green forage and 7.01 t/ha total dry matter). The increased nitrogen application significantly improved all the growth and yield attributes (viz., plant height, number of shoots per metre row length, fresh weight per shoot) but decreased the leaf to stem ratio at both harvests.

The crude protein, total ash and ether extract content and yields increased significantly with increased nitrogen level upto 150 kg per ha but decreased the crude fibre content significantly upto 150 kg per ha.

Oat (Kent) grown for forage under double cut system with irrigation in combination with 100 kg per ha seed rate and 150 kg nitrogen per ha produces higher green tonnage (38.13 t/ha) with higher net returns (Rs. 10,266/ha) and B:C ratio (1:16) followed by 75 kg per ha seed rate with 150 kg nitrogen per ha with 36.66 tonnes per ha of green forage, Rs. 9,832 per ha net returns and 1:15 B:C ratio.

Effect of Plant Density and Growth Retardant on Growth and Yield in Cotton

PRAKASH S. KATTIMANI

2001

MAJOR ADVISOR: Prof. V.S. GIDNAVAR

A field experiment was conducted at Agricultural Research Station, Dharwad during kharif 1991-92 to study the effect of plant density and growth retardant on growth and yield of cotton under rainfed conditions. The cultivar AH-107 produced significantly higher seed cotton yield (1289 kg/ha) than cv. Jayadhar (712 kg/ha). AH-107 also recorded significantly higher number of leaves, leaf area, leaf area index, RGR, CGR and BGR as compared to Jayadhar. AH-107 was found to be early (190 days) and 81.00 per cent higher yield as compared to Jayadhar (250 days).

A spacing of 60x15 cm (1,11,111 plants/ha) gave significantly higher yield without CCC in both the varieties, this was due to higher plant density and higher number of total harvested bolls per unit area. Application of CCC at 60 ml per hectare at 60 and 90 days after sowing resulted in modifying the plant architecture by decreasing plant

height and lateral spread. The 60x15 cm spacing with CCC gave significantly higher yield over all other spacings except 60x15 cm without CCC have 9.50 per cent higher yield. Application of CCC resulted in decrease in plant height and lateral spread but increased number of squares, green bolls, fruiting parts dry matter, boll weight, total number of harvested bolls per plant and per unit area and yield per hectare numerically in all the spacings which however, failed to compensate higher population in 60x15 cm. Within the same spacing CCC improved yield and yield attributes marginally. In all the spacings tried, application of CCC resulted in higher soil moisture content indicating more economical use of soil moisture.

Variety AH-107 with a spacing of 60x15 cm produced significantly higher yield (1359 kg/ha) and suitable for transitional belt of Dharwad.

Abstract of Theses

CROP PHYSIOLOGY

Physiological Basis of Yield Variation Among Different Plant Types in Cotton

KUMAR C. HALLI

2000

MAJOR ADVISOR: Dr. B. C. PATIL

A field experiment was conducted during 1999-2000 under rainfed conditions at the Agricultural Research Station, Dharwad to study the productivity potential, physiological and biophysical basis of yield variation of different plant types in cotton genotypes. The experiment consisted twenty genotypes laidout in a randomised block design with three replications on medium black soil. Hybrids, robust and compact genotypes were selected based on growth and morphological characters like, plant height, number of leaves, number of nodes, sympodia and monopodia.

Hybrids produced higher seed cotton yield as compared to robust and compact genotypes. Among the genotypes, DHH-542 produced significantly higher seed cotton yield (2112.4 kg ha⁻¹), which was mainly attributed to its close association with yield components and other characters such as boll number ($r=0.793$), harvest index

($r=0.538$) and photosynthetic rate ($r=0.461$). Genotypes showed significant differences in their growth pattern, phenological charactrs and physiological parameters. Hybrids possessed higher dry matter at all the stages mainly because of higher AGR, NAR and number of leaves per plant as compared to robust and compact genotypes. Correlation studies indicated highly significantly positive association of yield with TDM ($r=0.613$), AGR ($r=0.793$) and NAR ($r=0.864$). With regard to biophysical characters, hybrids possessed higher photosynthetic rate and moderate respiration rate as compared to robust and compact genotypes.

It is inferred that hybrids were morpho-physiologically efficient interms of growth and yield components and biophysical characters due to which they were able to escape drought and produced higher seed cotton yield.

Physiological Basis of Fruit Discolouration in Chilli (*Capsicum annum* L.)

A. B. BASAVARAJ

2001

MAJOR ADVISOR: Dr. C. M. NAWALAGATTI

A field experiment was conducted at College of Agriculture, University of Agricultural Sciences, Dharwad during kharif season of 1999 to findout the physiological and biochemical basis of fruit discolouration in Byadagi chilli. The result revealed that the number of red coloured fruits harvested from the middle canopy during second picking were significantly higher as compared to the fruits harvested from top and bottom canopy levels. The per cent of discoloured fruits were significantly more during third picking irrespective of canopy levels. The increase in the number of fruits was due to increase in fruit dry weight and seeds weight.

The dry matter content of both leaf and stem was significantly higher from the middle canopy at 60 to 90

days after transplanting as compared to top and bottom canopy levels. The total chlorophyll content in the leaves and fruits of bottom canopy was significantly higher. However, the total chlorophyll content was less in fruits as compared to leaf. Irrespective of the extent of fruit colouration, the total colouring matter of fruits from middle canopy during second picking had higher values as compared to top and bottom canopy levels.

The nitrogen, phosphorous and potassium contents in the fruits from the middle canopy during second picking indicated significantly higher values as compared to top and bottom canopy fruits. The fruits having higher discolouration had very low content of nitrogen, phosphorous and potassium.

GENETICS AND PLANT BREEDING

Callus Induction and Regeneration Studies in Cotton (*Gossypium* spp.)

M.V. SURESH KUMAR

2001

MAJOR ADVISOR: Dr. I. S. KATAGERI

The present experiments were undertaken to study callus induction and regeneration in cultivated *Gossypium* spp. Fifteen genotypes of cotton (*Gossypium* spp.) belonging to all four cultivated species and of diverse origin were included in the study. Hypocotyls and cotyledons were cultured on MS medium supplemented with auxins (NAA and 2,4-D) and cytokinins (BA, Kinetin and TDZ) at different concentrations and combinations. Genotypes differed significantly in callus induction response. Diploid species (*G. hirsutum* and *G. arboreum*) showed higher response than tetraploid species (*G. hirsutum* and *G. barbadense*). Out of the two explants studied hypocotyls showed higher response than cotyledons. Highest response for callus induction was noticed in medium containing 1.0 mg/l NAA + 0.1 mg/l kin, followed by 0.1 mg/l NAA - 0.1 mg/l kin. The results clearly indicate that different genotypes responded differently in different treatments, which is mainly due to the interaction of genotypes, explant and growth regulator. Treatments containing high level of auxin to cytokinin ratio (20:1, 40:1)

produced rooting from explants in all the genotypes. Diploids produced loose and friable callus, while tetraploids produced hard and compact callus. NAA and 2,4-D green in NAA. Treatments containing high concentrations of auxins increased the friability of the callus. TDZ also have influence on increasing the friability of callus.

2-3 celled structures/proembryos were observed in Coker 300 and Abadhita genotypes belonging to *G. hirsutum*. Response was observed only when loose, friable callus was used in very low concentrations of auxins and cytokinins. (MS+0.1 mg/l kin, MS+0.1 mg/l NAA+0.1 mg/l kin and MS +0.1 mg/l kin +0.1 mg/l 2,4-D). 7-8 days after initiation of suspension, but there was no further development.

Suspension cultures with high concentrations of cytokinins turned dark quickly. But use of PVP, ascorbic acid and activated charcoal in media decreased the phenolic content of media and reduced the blackening of the media.

SEED SCIENCE AND TECHNOLOGY

Effect of Stages of Harvesting, Drying Methods and Grading on Seed Quality in French Bean (*P. vulgaris* L.)

PRAVEENAKUMAR

2001

MAJOR ADVISOR: Dr. S.D. SHASHIDHAR

Studies were conducted to know the effect of stages of harvesting, drying methods and seed grading on seed quality in french bean at Main Research Station, University of Agricultural Sciences, Dharwad during kharif 1999. The experiment consisted of eight stages of harvest (7, 14, 21, 28, 35, 42, 49 and 56 days after flowering), eight methods of drying (sun drying, shade drying, hot air drying 35, 40, 45°C dehumidified air drying dehumidified air drying with cooling the air and drying by using a desiccant and grading seed into four grades on size basis (seed retained on round sieve size of 5.00, 4.75, 4.50 mm and ungraded control) and each of these were further graded into three grades based on specific gravity (heavy, medium and light).

Harvesting of french bean at 42 days after flowering (DAF) recorded highest fresh and dry weight of pod, seed and higher 100 seed weight, along with higher seed germination (89.66%), field emergence (85.00%), shoot length (18.85 cm), root length (15.23 cm)

and seedling vigour index (3047).

Total drying time recorded to reduce the moisture level to around 9 per cent from initial moisture content of 40 per cent in sun drying, shade drying, hot air drying at 35, 40, 45°C, dehumidified air drying, dehumidified air drying with cooling the air and drying by using desiccant were 14, 30, 10, 8, 7, 7, 10 and 40, hours respectively.

Seed dried under shade drying recorded highest seed germination (91.23%) field emergence (86.00%) germination rate index (42.21), shoot length (20.93 cm), root length (15.01 cm) and seedling vigour index (3289) followed by seed dried at 40°C air temperature.

Seed retained on 5.00 mm sieves (S1) performed better with most of the quality parameters as seed were bigger and had more stored food products. Similarly heavier seed (D1) gave higher seed quality parameters, but protein content was not influenced by seed density.