

## Abstract of Theses

hybrids were planted in randomized block design (RBD), replicated thrice along with KBSH-1 and DSH-1 as check hybrids. The characters considered for the study were days to 50 per cent flowering, plant height, head diameter, 100 seed weight, volume weight, hull content, seed yield, oil content, self fertility and leaf area.

The TWC hybrids recorded high mid parent and average heterosis for seed yield, oil content and 100 seed weight. The average heterosis for seed yield was as high as 58.71 per cent. All the hybrids exhibited negative heterosis for days to 50 per cent flowering indicating earliness. Mean performance of lines was high for seed yield, oil content and hull content. Testers showed better performance for plant height, 100 seed weight, volume weight and leaf area.

The female line [(VRF X NDOL3) 4546B] recorded high gca effect for seed yield, seed weight, plant height and oil content. The tester RLC2 was a good general combiner for seed yield and seed weight. For plant height, R297 was a good combiner while V146 was a good combiner for oil content and seed yield.

In general, parents involving low x low or low x high combinations produced hybrids with superior performance for seed yield and component traits. Positive and significant sca effect for seed yield was observed in hybrids viz., [(VRF x NDOL3) 4546B x V20] and [(VRF x DSF2) 234B x IV41]. The latter also exhibited highest seed yield and hence, needs further evaluation. Based on the results of the study, it was concluded that TWC hybrids though recorded marginal increase in seed yield did not differ significantly over the two checks hybrids viz., KBSH-1 and DSH-1.

### Genetic Divergence Studies in Sesame (*Sesamum indicum* L.)

P. RAMESHKUMAR

1998

MAJOR ADVISOR : Dr. D. S. NAIK

A field experiment was conducted at the Agricultural College Farm, Raichur during rabi summer 1997-98, to study the genetic divergence among 49 genotypes and to find out the suitability of these genotypes to rabi summer season.

The experiment was laid out in 7 x 7 simple lattice design with two replications. Observation was made on 14 quantitative characters. The correlation study revealed that seed yield was significant and positively correlated with number of capsules per plant, number of productive nodes per plant, number of branches per plant, height to first capsule and plant height.

Path analysis indicated that number of capsules per plant was the single major character, which exhibited highest positive direct effect on seed yield followed by plant height and 1000 seed weight. However height to first capsule, number of branches per plant and number of productive nodes per plant although exhibited significant positive correlation, their direct contribution was negative.

The clustering of genotypes indicated moderate variability over a set of characters among the genotypes studied. Oil yield per plant was major contributing character towards divergence. It was inferred from D<sup>2</sup> statistic technique that varieties G7 and G10 were most divergent among the genotypes studied as they were separated by high D<sup>2</sup> value.

The variety G10 exhibited high mean performance and had highly resistant reaction against three diseases screened viz., Powdery mildew, Alternaria Blight and Phylody. However, Co.1 and RT-274 were found to be moderately resistant to these diseases and also high yielders.

As such there is no recommended variety available in sesame for rabi/summer season. These genotypes namely G10, Co.1 and RT-274 could be used directly as varieties for rabi/summer season and also they can be used as base materials for further breeding programme.

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

ANURADHA BASEGANI

1998

MAJOR ADVISOR : Dr. S. S. PATIL

The investigation was undertaken to elicit information on nature of gene action, heterosis, inbreeding and depression genetic components of variance with respect to nine quantitative characters. The material included non-segregating (P<sub>1</sub>, P<sub>2</sub> F<sub>1</sub>) and segregating (F<sub>2</sub>, F<sub>3</sub>, B<sub>1</sub> and B<sub>2</sub>) populations of compact crosses CH1, CH2 and CH3. Seven generation mean analysis was done to test goodness of fit of six parameter model. With respect to gene effects, non-additive gene effects were prominent in determining inheritance of plant height, plant diameter,

number of sympodia, inter boll distance, number of bolls, seed cotton yield boll weight and also length. Exploitation of heterosis is the appropriate method of breeding as yield and yield components are governed by non-additive factors.

As regards heterosis, all the three crosses in general showed heterosis (over mid parent) in F<sub>1</sub>'s for different characters, followed by steady decline in F<sub>2</sub> and F<sub>3</sub> generations and also inbreeding depression over F<sub>1</sub>, for

seed cotton yield, boll number of etc. The crosses showed differences in heterosis for other traits. The components of variance estimated for most of traits revealed, the magnitude of variance due to additive effect was higher than the magnitude of variance due to dominance effects.

Three way cross  $F_1$  population were evaluated in terms of predicted and observed performances, variability

for exploitation etc., with respect to seed cotton yield, the observed performance was almost matching the predicted performance. CH1 x C1 was the most productive three way cross  $F_1$  populations but, it was not superior over the best single cross CH2. However, variability available in these three way  $F_1$  populations can be used for exploiting recombinational variability, through selection in subsequent selfing generations obtained from three way crosses.

#### Combining Ability Studies in Rabi Sorghum, *Sorghum bicolor* (L.) Moench

S. SIDDESH

1998

MAJOR ADVISOR : Dr. B. Y. KULLAISWAMY

The study was undertaken to assess the *per se* performance, magnitude of heterosis and combining ability in respect of grain yield and its components in sorghum. A line x tester set was obtained by crossing four lines with eight diverse testers. Thirty two  $F_1$ 's along with their parents and two commercial checks (M 35-1 and CSH 13 K/R) were planted in a randomised block design during Rabi season of 1997-98 at Regional Research Station, Raichur.

Hybrids showed highly significant differences for all the characters except of number of leaves per plant. Significant *per se* performance and standard heterosis in desirable direction were recorded in several crosses. The crosses 104A x BJR403, 104A x BRJ187 and 104A x BRJ415 expressed heterosis to the extent of 37.70, 18.03 and 15.30 per cent over commercial check (CSH 13K/R)

for grain yield. These were found suitable for commercial exploitation. The estimated components of general and specific combining ability (GCA and SCA) variances showed the preponderance of additive gene action for plant height, panicle weight, days to maturity and grain yield per plant. Where as the preponderance of non additive gene action for days to 50 per cent flowering, number of leaves per plant, number of nodes per plant, fodder yield plant, 1000 seed weight and shootfly incidence.

The parents 104A and BRJ403 were the best general combiners for grain yield, fodder yield and other important yield attributing characters. The cross 104A x BRJ403 exhibited desirable sca effects and higher *per se* value for grain yield and fodder yield. This cross can be recommended for further exploitation.

#### Combining Induced and Recombinational Variability to Generate Wide Variability in Safflower

I. I. BAGAWAN

1998

MAJOR ADVISOR : Dr. R. L. RAVIKUMAR

An experiment on safflower was conducted at M.R.S., Dharwad during rabi 1996, to know the effect of mutagens on homozygous parental lines and heterozygous hybrids. About 100 seeds of two parental lines viz., 90-16 (high oil) and A1 (high yield) and two  $F_1$ 's viz., 425-6 x 90-16 and A1 x 576-40 were treated with EMS (0.3%) and gamma rays (10 KR). These were advanced to respective  $F_2$ ,  $F_2$ ,  $M_2$  and  $M_2$  generations. A large population of each of the above 10 segregating populations along with their parents were grown during rabi 1996. All the plants of each population were observed for chlorophyll mutations at the seedling stage. About 140 plants from each segregating population and 20 plants from each parent were randomly selected for recording observations on quantitative characters.

It was observed that treating seeds of homozygous parents and heterozygous hybrids produced mutants for leaf type, plant type, branching habit and chlorophyll types. The treatment of homozygous or heterozygous genotypes with the mutagens shifted the mean and distribution of

quantitative characters in both the directions compared to  $F_2$  population. It is evident from the present study, the combined effect of hybridization of characters were observed in all the segregating population which may help to overcome the negative association between yield and oil components. Such genotypes were observed in a low frequency and may not have noticeable effect on the mean, variance and character association of the population.

Although a definite trend could not be established, the results indicated certain changes in undesirable association either in magnitude or direction between several important characters which can be exploited in advance generations. The irradiation of thick and thin hull genotypes had pronounced effect on shoot length than root length. It had drastic effect on field establishment. Gamma ray radiation had pronounced effect on the thin hull (502-244) genotypes compared to thick hull (A1) genotype.

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### Evaluation and Genetic Characterization of Early Vigour Related Traits in Rainfed Upland Rice (*Oryza sativa* L.)

R. RAMADEVI

1998

MAJOR ADVISOR : Dr. V. V. SHENOY

The present study included 44 diverse rice genotypes representing most traditional and some high yielding cultivars adapted to the northern Karnataka region. The genotypes were evaluated for seed and seedling vigour related parameters under laboratory and field conditions. Results indicated the highest genetic variability for total dehydrogenase activity, final count of field emergence, first count of field emergence, rate of field emergence and tiller number per seedling. Broad sense heritability for all the traits except leaf expansion rate, leaf area and seedling height were very high and therefore very high expected genetic advance as per cent of emergence, tiller number per seedling and vigour index by selection. Correlation studies revealed strong positive association of first count, seedling dry weight, shoot length and vigour

index and negative correlation of time for root and shoot growth and root shoot ratio, with the vigour measured as first count of field emergence. Isozyme pattern showed positive association of higher or medium mobility zones with shoot length and vigour index and negative association with time for shoot growth. D<sup>2</sup> analysis grouped the 44 genotypes into seven clusters. Clusters VII and III were distinctly different for mean performance of vigour related traits. Cluster VII ranking first included traditional cultivars which are good sources for most seed and seedling vigour related traits. Study identified IR 64, PTB-24, Y<sub>4</sub>, DO diga and Tellavadu as potential genotypes for exploitation in breeding for improved rainfed upland rice cultivars.

### Identification and Evaluation of Native Rice Genotypes for Hybrid Rice Production

MANOJ MADHAVA KULKARNI

1999

MAJOR ADVISOR: Dr. V. V. SHENOY

An investigation was carried out at ARS, Mugad involving 25 native and improved genotypes of rice to estimate the extent of fertility restoration by different genotypes and to identify maintainers and restorers for the two CMS lines viz., IR58025A and IR62829A. An assessment of heterosis for yield and yield attributing characters in the hybrid combinations involving effective restorers as one of the male parents was done.

A wide range was observed for the extent of restoration in both the CMS lines, assessed in terms of pollen and spikelet fertility. A highly significant correlation was observed between pollen fertility and spikelet fertility. The ability of fertility restoration differed in a given genotype with the CMS lines, indicating change in the penetrance and expressivity of fertility restoring genes according to the nuclear background of male sterile parent. However, a restorer and three maintainers did not exhibit this type of nuclear-cytoplasmic interaction.

Out of the 25 native and improved rice genotypes

screened against 'WA' type CMS lines, for IR58025A, Antarsali and Champakali restored the fertility effectively and in case of IR62829A, Beeraga, Champakali and Jeerasali were the effective restorers. Three genotypes viz., Gopaldoddiga, Huggibhatta and Ptb-7 were effective maintainers of both the CMS lines.

Most of the hybrids studied involving effective restorers as one of the parents exhibited positive heterobeltiosis for long duration, tallness, productive tiller number and length of panicle. But in certain hybrid combinations due to different degree of spikelet sterility in the hybrids, these characters do not reflect as increase in yield per plant.

All hybrids studied showed significantly positive standard heterosis considering Amrut as the standard check variety. This indicates the potentiality of the hybrids for possible commercial utilization. Among the five hybrids studied, IR 2829A/Beeraga, IR62829A / Jeerasali and IR658025A / Antarsali were found to be promising.

### Studies on Performance of Peanut Bud Necrosis Disease Tolerant Progenies In *Arachis hypogea* L.

M. RESHMA

1999

MAJOR ADVISOR: P. S. DHARMARAJ

Investigation was carried out to know the association of yield and yield components with disease tolerance / resistance, the genetic distance between the groups and to select parents based on genetic distance for

future breeding programme. The material comprising of twelve advanced lines of groundnut, two susceptible check varieties (JL-24 and KRG-1) and one tolerant check (R-8808).

The lines R-9214 and ICGV-91053 have good yield contributing attributes, wider adaptability and less PBND incidence. Hence, these lines were considered as potential material for the hot-spot of PBND in the north-eastern Karnataka, while ICGV 94232, KRG-1 and JL-24 were highly susceptible to PBND.

The entries viz., ICGV 86598, ICGV 90013, ICGV 9000, ICGV 94259, R-9214, ICGV-91053 and the resistant check R-8808 showed consistent resistant reaction with less than 10 per cent disease incidence in both kharif and rabi / summer seasons. These entries also have good productive attributes, these lines could be tested extensively for commercial cultivation and also considered as promising source of resistance to be used in future resistance breeding

programme.

No correlation existed between thrips number and disease incidence. The PBND incidence at different intervals of crop growth was found to be more in rabi / summer than in kharif, indicating predominance of disease in dry conditions. The association between yield and yield components indicated that total yield per plot can be improved by selecting the lines with more number of branches, matures pods, pod width, days to 50 per cent flowering, 100 kernel weight and 100 pod weight.

Based on the divergence study, R-9214 could be used as potential parent to reduce PBND and improve other quantitative characters of groundnut in future breeding programme.

#### Induction of Genetic Variability Through Mutations for Quantitative Characters in Cotton (*Gossypium* spp.)

ASHOK M. BADIGANNAVAR

1999

MAJOR ADVISOR: Dr. I. S. KATAGERI

In cotton, mutation breeding has been successfully applied to generate enormous genetic variability for different characters. Thus the present study was aimed to induce genetic variability for yield and yield contributing characters and fibre quality parameters in two popularly cultivating genotypes like Abadhita (*G. hirsutum*) and Jayadhar (*G. herbaceum*) using physical (gamma rays) and chemical (EMS) mutagens at different levels. The study was carried out during rabi/summer, 1997-98 and kharif-rabi, 1998-99 at Agricultural Research Station, Dharwad.

The study in  $M_1$  and  $M_2$  generations revealed that in both the genotypes, there was a dose dependent decrease in the germination and survivability. The higher  $LD_{50}$  dose for Abadhita over Jayadhar clearly indicates the buffering capacity of the tetraploid against chromosomal aberrations. Among eight treatments including check, combination of physical and chemical mutagens (10 KR + 0.2%) was able to induce an extreme but desirable mutants for earliness, male sterility, dwarf and tall types. In addition,

it also recorded higher number of sympodia, boll weight, seed cotton yield, GOT, fibre length, strength and fineness.

Irradiation at 5 KR helped to isolate extreme but desirable Jayadhar mutants for number of sympodia, boll weight and seed cotton yield. Whereas, EMS at 0.4% induced desirable mutants for number of bolls, boll weight, seed cotton yield, fibre strength, length and fineness. Double mutagens at 5 KR + 0.1% was able to induce very extreme but desirable mutants for GOT, fibre length and fibre strength. These Jayadhar mutants are useful to spin for more than 20's counts which is however very difficult with present day Jayadhar.

Desirable mutants for yield and yield contributing characters are useful to increase the productivity of cotton. Mutants with high fibre strength in Abadhita are useful for spinning at 30-40s counts. Similarly, mutants with high fibre strength and length in Jayadhar are useful for spinning at 20's count. Thus, the mutation breeding can be applied as an effective method of breeding in cotton improvement.

#### Genetic Variability and Character Association Analysis in Confectionery Groundnut (*Arachis hypogaea* L.) Genotypes

K. SHOBHA KRUPA RANI

1999

MAJOR ADVISOR: K. G. PARAMESHWARAPPA

Investigations were carried out in confectionery groundnut genotypes at the Main Research Station, University of Agricultural Sciences, Dharwad during summer and kharif 1998 to know the extent of genetic variability and nature of associations among various morphological and agronomical characters including few confectionery attributes. In the study 48 genotypes including seven checks were evaluated for days to 50 per cent flowering, plant height, number of primary branches, number of pods, pod yield per plant, shelling per cent, kernel yield, sound mature

kernels, 100 kernel weight, seed size, oil content and protein content. The results revealed that the number of primary branches followed by kernel yield, pod yield per plant, seed size, 100 kernel weight and protein content were highly variable. Very low variability was observed for oil content and sound mature kernels.

The characters number of pods, oil content, shelling per cent, days to 50 per cent flowering and sound mature kernels found to be positively associated with pod yield.

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Among the yield components kernel yield with sound mature kernels and oil content; sound mature kernels with 100 kernel weight and seed size; seed size with protein content exhibited positive and significant associations. There was negative relationship between protein and oil content, so also protein and pod yield. Among the

characters studied the highest direct contribution towards pod yield was noticed in case of number of pods, followed by sound mature kernels and oil content. The genotypes possessing desirable confectionery qualities were TGLPS-3 and ICGV-93041 where 50 per cent of the seeds of a lot qualified for stipulated seed weight, besides, they were high yielding.

### Reaction of Interspecific Lines to *Alternaria* Leaf and Stem Blight in Sunflower

T. SHOBHARANI

1999

MAJOR ADVISOR: Dr. R. L. RAVIKUMAR

A study was undertaken at University of Agricultural Sciences, Dharwad during kharif season of 1998 with a view to identify better sources of resistance to *Alternaria* leaf and stem blight. In the first experiment, 51 genotypes consisting of lines derived from three moderately tolerant populations (Acc Nos. 180, 873, 1229) and susceptible checks and in the second experiment, 35 genotypes comprising of 32 interspecific germplasm lines derived from different wild and cultivated species were evaluated in a randomized block design with three and two replications, respectively.

High level of resistance to disease was not observed in any of the genotypes tested in both experiments. However, genotypes showed differential reaction to *Alternaria* leaf and stem blight. Among 51 genotypes in first experiment Acc Nos. 1229-32, 1229-23, 873-22, 180-120 and the population 180 had significantly lower PDI values with high seed yield and oil content compared to L-101. Among interspecific lines, none of the

line had significantly less PDI, more yield and oil content than the checks. All the interspecific lines were highly susceptible to this disease.

The analysis of variance indicated significant variability in the genotypes for all the ten characters studied. High heritability with high genetic advance for total number of filled seeds and plant height whereas, high heritability with moderate genetic advance for hundred seed weight, days to 50 per cent flowering, seed yield and oil content were observed indicating presence of additive gene action and response to selection. Low to moderate heritability with low to moderate genetic advance for disease characteristics, indicating low response to selection. Hence, recurrent selection to improve the level of resistance is proposed. Correlation and path analysis revealed that PDI at physiological maturity followed by peak flowering had high negative correlation with seed yield, plant height, hundred seed weight and total number of filled seeds.

### Genetic Variability, Correlation and Path Analysis in a Germplasm Collection of Sudan Grass (*Sorghum sudansense* (Piper) Stapf)

K. G. ANUP

1999

MAJOR ADVISOR: Dr. S. VIJAYAKUMAR

Field experiment was conducted at the Regional Research Station, Raichur during rabi / summer seasons of 1997-98 and 1998-99 to study the genetic variability and character association in 79 accessions of sudan grass germplasm. The experiment was laid out in 9 x 9 simple lattice design with two replications. Observations on various quantitative characters were taken in main and two ratoon crops. Analysis of data of both the seasons individually and pooled were carried out and it revealed significant differences among genotypes for all the characters studied.

Over the two seasons, six accessions gave significantly higher total green fodder yield than the best check DFJ-1. The accession IS-3191 was the best for green as well as dry fodder yields and other related characters followed by accession IS-6014. In general, values of various genetic variability parameters for individual seasons were higher than the those for pooled values. Higher values

of GCV, heritability and genetic advance were obtained for leaf area, green and dry fodder yields in main crop and green and dry fodder yields in ratoon crops. However, lower values were observed for days to 50 per cent flowering, number of nodes, number of leaves, leaf : stem ratio and number of tillers. Correlation studies revealed very strong positive association of green and dry fodder yields with plant height and leaf area. Yield was also positively associated with number of leaves, number of nodes and crude protein and these characters were positively associated among themselves. Path analysis revealed that leaf area was the single major character which exhibited highest positive direct effect on each of the three dependent characters viz., green fodder yield, total green fodder yield and crude protein. All other independent characters had maximum indirect contribution through leaf area.

**Stability Analysis of Experimental Hybrids for Seed Yield and Its Component Characters in Sunflower (*Helianthus annuus* L.)**

LAXMAN S. KALLENNAVAR

1999

MAJOR ADVISOR: Dr. K. GIRIRAJ

The investigation was undertaken to analyse the stability of 15 experimental hybrids and four checks for seed yield and its component characters over three locations, viz., Bheemarayanagudi, Bagalkot and Dharwad during kharif 1998. Stability analysis was carried out by adopting the model of Eberhart and Russel (1966).

Two-way analysis of variance revealed significant differences between genotypes and also environments for all the characters except 100 seed weight indicating G x E interactions which was further confirmed by significant variance due to G x E interactions for all the characters. The variance due to genotype x environment (linear) were non-significant for all the characters studied. The mean sum of squares due to pooled deviations were found to be highly significant for all the seven characters, indicating predominance of unpredictable portion of G x E interaction.

The overall performance of hybrids over locations revealed that Dharwad location was the most favourable

environment for the expression of plant height, head diameter and seed yield, while Bagalkot location was favourable for the expression of characters like 100 seed weight, volume weight and oil content. Bheemarayanagudi location was favourable for the expression of early flowering of genotypes.

Taking into consideration the three stability parameters viz., mean performance over three locations, regression coefficient (b) and deviation from regression ( $S^2d$ ), the single-cross hybrid (VRF-21) was rated as the best for earliness and oil content. PAC-36 ranked first for plant height over three locations. The single-cross hybrid DSH-255 was found to be the best for seed yield and head diameter. The hybrid RSH-1 had maximum 100 seed weight, while MSFH-17 recorded maximum volume weight. Considering mean performance over three locations, DSH-255 was the most promising hybrid for seed yield and oil content.

**Inheritance of Paranodulation Trait in Rainfed Upland Rice (*Oryza sativa* L.)**

GURUDUTT B. V.

1999

MAJOR ADVISOR: Dr. V. V. SHENOY

An investigation was carried out to study the inheritance of paranodulation in rainfed upland rice. The genotypes Hakkalasali and Gopal Dodiga were used as high paranodulating parents and Rasi was the low paranodulating parent in two low x high paranodulation crosses, viz., Rasi x Hakkalasali and Rasi x Gopal Dodiga. The  $F_1$ ,  $F_2$  and parents were studied for paranodes per seedling, root length, shoot length, root : shoot ratio, seedling length and seedling dry weight. The high paranodulating parents had significantly higher mean paranodulation over the low paranodulating parent indicating that the parents were distinct for the trait. There were no perceptible differences for isozymes GDH and POX between the parents. Positive heterosis was observed for all the observed traits. The paranodulation in  $F_2$  showed discrete distribution exhibiting a significant goodness of fit with 9 low: 7 high paranodulating types indicating operation of digenic complementary interaction (duplicate recessive

epistasis) in the genetic regulation of paranodulation. At the individual loci, low paranodulation was dominant over the high paranodulation whereas, between the loci, high paranodulation was epistatic over the low. It is proposed to designate the loci as *Pnod1* and *Pnod2*, exhibiting complementary digenic interaction. The variable pattern of association of seedling traits with paranodulation in the low crosses indicated that the traits can not be used as markers for paranodulation, except for root : shoot ratio. The low root : shoot ratio resulted in higher paranodulation. The study involving seven high paranodulating genotypes indicated that *Azospirillum* strain ACD15 was superior to ACD20 for colonisation of paranodes, because it colonised in all the seven genotypes, but the latter colonised in only five. The *Rhizobium* strain NC92 showed colonisation in genotypes Champakali and Hakkasali, also indicating that rhizobia can succeed in colonisation of rice paranodes in a genotype dependent manner.

**Genetic Variability and Association Analysis for Cane Yield, Quality and Their Component Traits in Sugarcane (*Saccharum officinarum* L.)**

S. THIPPESWAMY

1999

MAJOR ADVISOR: Dr. S. T. KAJJDONI

Investigation was carried out at the Karnataka Institute of Applied Agricultural Research (KIAAR), Sameerwadi, during January 1998 to January 1999 to know

the extent of genetic variability, character associations and path coefficient analysis in sugarcane (*Saccharum officinarum* L.) genotypes. The study involved a total of 60

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genotypes including check variety CoC 671 and were evaluated for 20 characters viz., germination per cent, cane formed shoots, plant height, leaf area, dry matter, leaf angle, number of internodes, stem diameter, single cane weight, cane yield per plot, number of millable canes per plot, brix per cent, sucrose per cent, commercial cane sugar per cent at three stages i.e. at 10th month, 11th month and harvesting, purity per cent at three stages i.e., at 10th month, 11th month and harvesting and commercial cane sugar per plot. The analysis of varinace revealed significant differences among the genotypes for all the 20 characters. High variability was observed for leaf area, cane formed shoots, germination per cent and dry matter. Germination per cent, leaf area, dry matter and leaf angle had high heritability coupled with high genetic advance as per cent

of mean.

Among 20 characters, single cane weight, number of millable canes per plot, leaf area and germination per cent had positive and highly significant association with cane yield as well as with commercial cane sugar yield. Path coefficient analysis of cane yield per plot revealed that commercial cane sugar per plot and commercial cane sugar per cent at harvest along with dry matter and number of internodes were the large contributors to cane yield per plot. Whereas, sugar yield largely depends on both cane yield and sucrose per cent.

The genotypes Co 90008, Co 87025 and the check variety, CoC 671 proved their superiority among sixty genotypes for both cane and sugar yields.

## PLANT PATHOLOGY

### Further Studies on Papaya Ringspot Virus

PRAKASH HEGDE

1997

MAJOR ADVISOR : Dr. A. S. BYADGI

Papaya ringspot virus (PRSV) is one of the serious diseases causing severe yield loss in papaya and present in almost all parts of Belgaum and some parts of Haveri and North Kanara districts. The PRSV slowly spreading to souther parts of the state.

The aphids *Apis gossypii* was predominant vector of PRSV prevailing in the tract. Both alate and apterous aphids were equally efficient transmitters but alate aphids were found responsible for the spread of the disease. The preacquisition fasting increased the transmission capacity of the vector. A short acquisition access (10 min) and inoculation feeding (15 min) was sufficient to obtain optimum transmission indicating non persistent nature of the virus. Even a single aphid transmitted the virus but optimum transmission was obtained when 10-15 aphids were used for inoculation.

Affected papaya plants developed abnormal fruits.

The PRSV derastically reduced the TSS, sugar, ascorbic acid contents and keeping quality of the fruits. Per cent decrease in TSS, sugar and ascorbic acid was to a tune of 25.00, 30.38 and 13.04, respectively. The PRSV also reduced the papin content of the fruits and viability of the seeds.

The PRSV drastically reduced the various yield components like length, girth, weight of the fruits and number of fruits per plant which ultimately resulted in the yield loss to a tune of 66.69 per cent. Early seedling infection resulted in complete yield loss as compared to late infection.

The protection of nursery with insect proof net was very effective in preventing infection of PRSV during early seedling stage. The regular insecticide spraying delayed the disease spread as compared to unsprayed control. Spraying of plant extract of *Nerium oderum* was also not effective but delayed the infection by 15 days.

### Studies on Grey Mildew (*Ramularia areola* Atk.) of Cotton in Karnataka

K. N. PONNANNA

1997

MAJOR ADVISOR : Dr. S. S. ADIVER

Cotton is one of the most ancient and important commercial crops next only to food grains. The crop suffers from many fungal diseases of these grey mildew caused by *Ramularia areola* Atk. is of great concern. The survey work revealed that maximum per cent of incidence of disease was noticed in Agricultural Research Station, Dharwad Farm (78%) during kharif 1996.

The optimum growth of the fungus was obtained in Modified Kirchoffs Medium. The 26° C temperature, pH 7

and 90 per cent relative humidity were found to favour its growth. Histopathological studies revealed the reduction of laminar thickness in the diseased leaf. Polysaccharides, proteins were degenerated and high RNA content was also observed in these leaves.

Among the 101 cotton cultivars screened for resistance against grey mildew under fed conditions, 30814, 30815, G-135-49 and AC-631, were immune to the disease. *Gossypium arboreum* and *Gossypium barbadense* varieties

were resistant, whereas, *Gossypium herbaceum*, *Gossypium hirsutum* and in hybrids tested were susceptible to grey mildew.

The correlation studied with weather factors and disease incidence over two seasons (kharif 1996-97 and 1997-98) indicated positive correlation with maximum temperature and negative correlation with minimum temperature, relative humidity (morning and evening), rainfall and number of rainy days. *In vitro* evaluation of fungicides showed that carbendazim, tridemorph,

penconazole, propiconazole and defenoconazole and wettable sulphur each @ 250 and 500 ppm were most effective against *Ramularia areola*. Plant extracts (nimbidin, onion and garlic at 5%) were less effective in inhibiting the conidial germination.

In field evaluation carbendazim (0.05%), defenoconazole (0.1%), propiconazole (0.1%), penconazole (0.1%), tridemorph (0.05%) and wettable sulphur (0.3%) were effective in controlling of the disease. The plants products were next to fungicides in controlling the disease.

#### Studies on Powdery Mildew of Rose (*Rosa* Spp.) Caused by *Sphaerotheca pannosa* var. *Rosae* (Wallr.) Lev.

B. P. RAVIKUMAR

1997

MAJOR ADVISOR : Dr. M. R. KACHAPUR

Among several diseases affecting rose crop, powdery mildews, caused by *Sphaerotheca pannosa* var. *rosae* (Wallr.) Lev. is important in winter season and becomes a major constraint in rose cultivation. Therefore, this disease has been studied in detail with different objectives aiming at the control.

Based on survey work which is done in seven gardens, maximum per cent disease index was noticed in Mummigatti garden (74.85%) of Dharwad taluk and Chabbi garden (62.56%) of Hubli taluk. Maximum conidial germination was observed at 20° C and 90 per cent relative humidity. Among eight weed hosts tested against *S. pannosa* except *Rosa indica*, others were infected. Among 67 genotypes screened for resistance to disease, Landora, Peace, Granada, Oklahoma showed resistant reaction. In biochemical analysis of healthy and diseased leaves and

calyx, content of total sugars and reducing sugars were high in diseased samples when compared to healthy.

In case of *In vitro* evaluation of fungicides, triademefon, tridemorph, penconazole and defenconazole at both the concentrations (0.05 and 0.1%) gave maximum per cent reduction of germination of conidia. The plant extracts tested were moderately effective. The biocontrol agents were least effective.

In field (under high disease pressure) Tridemorph, penconazole and difenconazole were effective at 0.1 per cent. Among plant extracts, nimbidin, neemark and *Allium sativum* extract were effective. Under low disease pressure, all the test fungicides were effective. Plant extracts were moderately effective whereas, biocontrol agents were least effective.

#### Studies on Some of the Forest Fungal Flora of Parts of Western Ghats

RAJESH

1999

MAJOR ADVISOR: KESHAV S. NAIK

In Karnataka, not much work has been done in the field of forest pathology except a few records of fungi. During the present investigation (1997-99), a survey was under taken in the Forest areas of Dandeli, Prabhunagar, Haliyal and Sirsi. Diseased leaves were collected periodically and studied for their symptoms and causal nature. The obligatory fungi were studied taking thin sections of infected tissues. While, facultative organisms were isolated on artificial media and their characters were studied both on culture and host. Assessment of severity of the disease were also undertaken. Thirty one species of fungal pathogens belonging to twenty genera causing thirty nine disease in thirty one different forest species were studied. Leaf blight of *Pongamia pinnata* recorded maximum disease intensity (71-82 per cent) while leaf spot of *Polyalthia longifolia* recorded a minimum (4.3 per cent). The most common pathogen, *Colletotrichum gloeosporioides* was observed on seven hosts.

*Alternaria alternata* on *Terminalia bellerica*,

*Cercospora lagerstromiae* on *Lagerstromia lanceolata*, *Colletotrichum gloeosporioides* on *Cassia fistula*; *Entyloma* sp. on *Gliricidia maculata*, *Erysiphe polygoni* on *Albizia lebbbeck*, *Bauhinia malabarica* and *Sesbania grandiflora*; *Glomerularia* sp. on *Gmelina arborea*; *Pestalotia* sp. on *Artocarpus heterophyllus*, *Bassia latifolia* and *Cassia fistula*; *Trichothecium* sp. *Holoptelia intignifolia* and *Sapindus emarginatus* constitute new records from India. Similarly, *Alternaria alternata* on *Terminalia bellerica*; *Cercospora adinae* on *Adina cardifolia*; *Cercospora leucosticta* on *Azadirachta indica*; *Cercospora lagstromiae* on *Lagerstromia lanceolata*; *Colletotrichum gloeosporioides* on *Cassia fistula*; *Entyloma* sp. on *Gliricidia maculata*; *Erysiphe polygoni* on *Albizia lebbbeck*, *Bauhinia malabarica* and *Sesbania grandiflora*; *Glomerularia* sp. on *Gmelina arborea*; *Pestalotia* sp. on *Artocarpus heterophyllus*, *Bassia latifolia* and *Cassia fistula*, *Trichothecium* sp. on *Holoptelia intignifolia* and *Sapindus emarginatus* constitute new records from Karnataka.



## Abstract of Theses

### Studies on Leaf Blight of Onion (*Allium cepa* Var. *cepa* Linn.) Caused by *Alternaria porri* (Ellis) Clif.

G. B. SHIVAKUMARA

1999

MAJOR ADVISOR: KESHAV S. NAIK

The investigation was carried out to know the morphological, cultural, nutritional, physiological characters and host range of the pathogen, production of toxic metabolite by the pathogen, susceptible stage of the host, reaction of host genotypes, botanical fungicides against the pathogen and economical spray schedule of the recommended fungicide.

Conidia were straight or curved, ellipsoidal tapering towards the beak which is commonly about the same length as the body, but may be shorter or longer, pale to mid golden brown, measured 105-295  $\mu$  length and 14-18  $\mu$  thick in the broadest part, with 6-12 transverse and 0-several longitudinal septa. On the basis of the above description the pathogen was identified as *Alternaria porri* (Ellis) Clif. Potassium dextrose agar and Czapek's broth were found the best solid and liquid media respectively for the growth of the fungus. The mycelial growth reached its peak on 12th day after incubation.

Sucrose and potassium nitrate were found the best carbon and nitrogen sources, respectively, for the growth

of the fungus. Temperature of 25°C was found to be optimum for the growth. The presence and effect of toxic metabolite in the culture filtrate of the fungus was observed through the wilting of tomato cuttings.

The pathogen infected 14 different plant species. The manifestation of symptoms also varied in different plant species. Susceptibility increased with the increase in the age of the host plant. None of the genotypes were found immune to the disease. However, genotype Arka-Kalyan found moderately resistant.

Out of 3 commercially available botanical fungicides, four plant extracts and one chemical fungicide tested, mancozeb was found best in controlling the disease. Nimbiocidin was found to be superior among the botanical fungicides tested. Among four different sets of spray tested, four sprays and three sprays were on par in reducing the disease and increasing the yield. The relationship between the PDI and bulb yield was linear and negatively correlated. One per cent increase in the disease intensity, decreased the yield by 0.465 q/ha.

### Studies on Gray Leaf Spot of Coconut Caused by *Pestalotia palmarum* Cooke

R. PRAVEEN

1999

MAJOR ADVISOR: Dr. M. R. KACHAPUR

An investigation was undertaken to study the different aspects of grey leaf spot of coconut caused by *Pestalotia palmarum* Cooke. The fungus was found to survive in the infected debris in the ground for two months and serve as the primary source of infection. Oil palm was found to act as a collateral host for the survival of the fungus.

The pathogen was found to be a wound parasite. In older leaves early infection and symptom development were observed. Alternate cycles of light play a major role on disease development. The fungus produced maximum mycelial growth on exposure of 12 hours light first followed by 12 hours darkness. Sporulation was found to be excellent under 12 hours darkness first then 12 hours light and good under continuous darkness.

The disease manifests during cool and dry months and intensive blighting occurs in summer months. Per cent disease index was found to be negatively correlated with

weather parameters viz., maximum and minimum temperature, rainfall and relative humidity.

*Parthenium* and *Ocimum* leaf extracts showed high fungitoxic value against the fungus. The fungus *Trichoderma viride* produced 82.70% inhibition of mycelial growth of *Pestalotia palmarum*. The bacterium *Pseudomonas fluorescens* also inhibited the growth of the fungus.

Of the nine fungicides evaluated against the fungus, Carbendazim (0.1%), Triadimefon (0.1%), Tridemorph (0.1%), Hexaconazole (0.1%), Propiconazole (0.1%) and Mancozeb (0.2%) showed complete inhibition of the fungal growth. Under *in vitro* conditions systemic chemicals were found to be most effective against the pathogen followed by plant extracts. Out of the six varieties and two hybrids screened, the dwarf varieties viz., Chowghat Dwarf Orange, Chowghat Dwarf Green and Malayan Dwarf Yellow showed resistant reaction.

## SEED SCIENCE AND TECHNOLOGY

### Effect of Stages of Harvesting and Drying Methods on Seed Yield and Quality of Paprika Chilli (*Capsicum annuum* L.)

VINOD KUMAR

1998

MAJOR ADVISOR : S. D. SHASHIDHARA

An experiment was carried out at the Department of Seed Science and Technology, University of Agricultural Sciences, Dharwad during 1997-98 to study the effect of stages of harvesting and drying methods on seed yield and quality of paprika chilli. The experiment consisted of eight stages of harvest (20, 30, 40, 50, 60, 70, 80 and 90 days after flowering) and eight methods of drying (sun drying, shade drying, hot air drying at 30, 35, 40 and 45° C, dehumidified air drying without cooling the air and dehumidified air drying with cooling the air)

Harvesting of paprika chilli fruits at 60 days after flowering (DAF) recorded highest fresh weight of fruit, dry weight of fruit, fresh weight of seed, dry weight of seed, test weight, seed yield per plant and seed yield per hectare, along with higher seed quality in terms of laboratory germination (96.50%), field emergence (90.50%), shoot length (7.68 cm), root length (5.68 cm) and seedling vigour

index (1288).

Total drying time recorded in sun drying, shade drying, hot air drying at 30°C, 35°C, 40°C and 45°C air temperatures, dehumidified air drying without cooling the air and dehumidified air drying with cooling the air required was 14, 30, 18, 10, 8, 7, 5 and 10 hours, respectively.

Seeds dried at 40°C air temperature resulted in increased seed quality in terms of laboratory germination (94.33%), field emergence (90.66%), germination rate index (28.30), shoot length (8.13 cm), root length (5.84 cm) and seedling vigour index (1318) followed by seeds dried under shade. Therefore, it is concluded that the paprika chilli fruits of variety Kt-Pl-19 could be harvested at 60 DAF for better seed yield and quality. The chilli seeds could be dried either by hot air drying at 40°C or in shade to obtain better seed quality.

### Influence of Seed Size and Mother Plant Nutrition on Seed Yield and Quality in Sesame (*Sesamum indicum* L.)

K. K. CHAVAN

1998

MAJOR ADVISOR : Dr. M. SHEKHARGOUDA

An attempt was made to study the influence of seed size and mother plant nutrition on seed yield and quality in sesame Cv. DS-1, with randomised factorial block design with three replications during kharif 1997-98 at Main Research Station, University of Agricultural Sciences, Dharwad. The Experiment I consisted of two factors i.e., seed size Bold seeds (retained over 2.0 mm round hole screen), Medium seeds (passed through 2.0 mm round hole screen and retained over 1.85 mm round hole screen) and small seeds (passed through 1.85 mm round hole screen) and four fertilizer doses  $F_1$  - 35:25:25 kg NPK/ha (control),  $F_2$  - 43.75:35:35 kg NPK/ha;  $F_3$  - 52.50:40:40 kg NPK/ha and  $F_4$  - 61.25:45:45 kg NPK/ha, with 12 treatment combinations. Bold seeds recorded significantly higher values for growth, yield and seed quality parameters, which was followed by medium and small seeds. Amongst the fertilizer doses,  $F_4$  dose recorded higher values for growth, yield and seed quality parameters but lesser number of

days to 50 per cent flowering and crop maturity. Amongst interaction effects better seed yield and quality characters were obtained with bold seeds and  $F_4$  fertilizer dose. The harvested seeds of Experiment-I were further size graded to obtain grade-I (Bold), grade-II (medium) and grade-III (small) seeds. These grades were used in laboratory to study the seed recovery percentage, yield and seed quality parameters with 36 treatment combinations with four replications. Seed recovery, seed yield and quality parameters differed significantly among the seed sizes. These were significantly maximum with lesser EC values in grade I and minimum with higher EC values in grade III seeds. Amongst the fertilizer doses significantly maximum in seed recovery, seed yield and quality was obtained  $F_4$  fertilizer dose and they were significantly minimum in  $F_1$  fertilizer dose. The combined three way interaction between seed size, fertilizer dose and seed grade was not significant for seed yield and quality characters.

### Influence of Nitrogen Levels and Planting Dates on Branching Behaviour in CMS-234A and 234B of Sunflower (*Helianthus annuus* L.)

M. BHASKAR REDDY

1998

MAJOR ADVISOR : Dr. A. NAGARAJA

Field experiments were conducted during 1997-98 to study the inheritance of branching habit and the effect of

nitrogen nutrition and planting dates on the branching behaviour, field performance and seed quality in female