

804945

Department of Plant Breeding and Genetics  
College of Agriculture  
Vellayani



**A RESUME OF ACTIVITIES**  
**From 1980 to 2005**



*Kerala Agricultural University*  
*Faculty of Agriculture*



804945  
IR  
KAU/UTY

## **PREFACE**

**Twenty five years - A memento** is a concise document of the functioning of Department of Plant Breeding and Genetics, College of Agriculture, Vellayani for the period from 1980 to 2005. The content clearly provides information on the members of teachers who worked during this period in the Department, number of project formulated and implemented, number of students studied for M.Sc. and Ph.D Programme and also the details of the courses offering in the Department of Plant Breeding and Genetics.

The Department's contribution to the release of prominent crop varieties and research findings - during the period is the best content in the memento.

The stalwarts who has retired, contributed much for the development of the department to the present status.

I appreciate the members of the Department for bringing out this valuable documentation.

I wish all success.

Dean

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## FORMER HEADS OF DEPARTMENT

### Department of Agricultural Botany

1. Dr. T.C. Joseph : 1959 – 1960
2. Prof. P. Kumara Pillai : 1960 – 1969
3. Dr.(Mrs.) Mary K George : 1969 – 1982
4. Dr. N. Krishnan Nair : 1.11.1982 – 12.8.1991
5. Prof. K. Gopakumar : 13.8.1991 – 12.4.1992
6. Dr. G. Gopimony : 13.4.1992 – 17.4.1995

### Department of Plant Breeding

1. Dr. V. Gopinathan Nair : 11.5.1979 – 6.12.1993
2. Dr. P.D. Vijayagopal : 7.12.1993 – 17.4.1995

### Department of Plant Breeding & Genetics

1. Dr. R. Gopimony : 18.4.1995 – 22.9.1999
2. Dr. P. Manikantan Nair : 23.9.1999 – 18.1.2002

## PRESENT STAFF COMPLEMENT OF THE DEPARTMENT

Professor and Head	:	Dr. D. Chandramony
Associate Professors	:	Dr. P. Manju
	:	Dr. Maya Devi
	:	Dr. D.S. Radha Devi
	:	Dr. D.I. Suma Bai
	:	Dr. K.M. Abdulkhader
	:	Dr. Sunny K Oommen
	:	Dr. D. Wilson
Assistant Professor	:	Dr. K. Arya
	:	Dr. C. Lekha Rani
	:	Dr. V.G. Jayalekshmi
	:	Mrs. Seeja. G
<b>Technical &amp; Supporting staff</b>		
Farm Supervisor	:	Sri. D. Sulochanan
Farm Assistant	:	Sri. David Dharma Kumar
Laboratory Assistant	:	1. Smt. Kumari Latha
		2. Sri. P. Chandran
Typist	:	Smt. S. Rose Mary

## LIST OF COURSES

### I. UNDER GRADUATE PROGRAMME:

1. Pbgn. 1101	Elements of Genetics and Cytogenetics	2+1
2. Pbgn. 1202	Principles of Plant Breeding	2+1
3. Pbgn. 2203	Breeding of Crops	2+1
4. Pbgn. 3204	Seed Production and Certification	2+1

### II POST GRADUATE PROGRAMME

#### A. 600 Series M.Sc. (Ag.)

1. PB.Gen. 601	Elements of Genetics	2+1
2. PB.Gen. 602	Cytogenetics I	2+1
3. PB.Gen. 603	Cytogenetics II	2+1
4. PB.Gen. 604	Molecular Genetics	2+0
5. PB.Gen. 605	Population Genetics	2+1
6. PB.Gen. 606	Radiation Genetics	1+1
7. PB.Gen. 607	Genetic basis of Plant Breeding	2+1
8. PB.Gen. 608	Methods of Plant Breeding	2+1
9. PB.Gen. 609	Breeding of Self fertilised Crops	2+1
10. PB.Gen. 610	Breeding of Cross fertilized Crops	2+1
11. PB.Gen. 611	Breeding of Asexually Propagated Crops	2+1

12. PB.Gen. 612	Breeding of tree crops	2+1
13. PB.Gen. 613	Seed Production, testing and Certification	2+1
14. PB.Gen. 651	Seminar	0+1

### **B. 700 Series (Ph.D)**

1. PB.Gen. 701	Cytogenetics of Crop Plants	2+0
2. PB.Gen.702	Extranuclear inheritance	2+0
3. PB.Gen. 703	Genetic Engineering	2+0
4. PB.Gen. 704	Biochemical Genetics	2+0
5. PB.Gen. 705	Plant Cell and tissue Culture	2+1
6. PB.Gen. 706	Heterosis Breeding	2+1
7. PB.Gen. 707	Mutation Breeding	2+1
8. PB.Gen. 708	Polyploidy Breeding	2+1
9. PB.Gen. 709	Resistance Breeding	2+1
10.PB.Gen. 710	New frontiers of Crop Breeding	2+1
11.PB.Gen.711	Evolution of crops and plant genetic resources Utilization	2+1
12.PB.Gen.751	Seminar	0+1
13.PB.Gen.752	Seminar	0+1



## LIST OF ONGOING RESEARCH PROJECTS

1. Development of high yielding varieties of Ivy gourd (*Coccinia grandis*) suited to southern region of Kerala  
No. VEG/01-01-11-2004/ACV(9)KAU  
Principal Investigator : Dr.D. Chandramony  
Associates : Dr. D.I. Suma Bai,  
Mrs. Seeja. G.
2. Development of high yielding multiple resistant variety of tomato suited to southern region of Kerala  
No. VEG/01-01-10-2004/ACV  
Principal Investigator : Dr.D. Chandramony  
Associates : Dr.D.I. Suma Bai  
Mrs. Seeja,. G.
3. Development of hybrid varieties of bittergourd  
No. VEG-02-05-04/93ACV(9)KAU  
Principial Investigator : Dr. P. Manju.  
Associate : Dr. K.S. Pramila (Entomology)
4. Development of hybrid varieties of pumpkin  
No. VEG/02-04-05/93ACV(9) KAU  
Principal Investigator : Dr. P Manju  
Associate : Dr. Lekha Rani. C.
5. Development of hybrid varieties of bhindi.  
No. VEG-04-01-09/93ACV(9)KAU  
Principal Investigator : Dr. P. Manju  
Associate : Dr. A. Naseema
6. Development of high yielding hybrid derivatives of rice bean (*Vigna umbellata* (Thumb) Ohawi & Ohashi.  
No. POS/01-00/32/97 ACV(2) KAU  
Principal Investigator : Dr. D.S. Radha Devi

## EXTERNALLY AIDED PROJECTS

### AICRP ON FORAGE CROPS

**Principal Investigator : Dr.D.I. Suma Bai**

1. Germplasm collection, maintenance and evaluation of guinea grass.
2. Germplasm collection and evaluation of *Stylosanthes*.
3. Breeding trials with forage bajra
4. Advanced varietal trial in guinea grass.
5. Identification of fodder rice bean varieties with high fodder yield and adaptability for southern region.
6. Breeding trials with forage maize.
7. Breeding trials with forage cowpea.
8. Development of fodder ricebean varieties with high fodder yield and adaptability for summer rice fallows.
9. Breeder seed production in signal grass and congosignal grass.
10. Development of bajra-napier hybrids.
11. Development of hybrid derivatives in fodder cowpea.

**Collection, evaluation, cataloguing and genetic improvement to tailor better commercial varieties with export potential in *Anthurium spp.***

Period : 1994-97

Principal Investigator : Dr. S.T. Mercy

Funding Agency : I.C.A.R

Completed

### **Breeding for interspecific and intergeneric hybrids of orchids for commercial cultivation**

Period : 1997-2001  
Principal Investigator : Dr. S.T. Mercy  
Funding Agency : D.B.T.  
Financial outlay : 19.84 lakhs  
Completed

### **Breeding for Commercial Orchid Hybrids**

Period : Started in 2002  
Principal Investigator : Dr. C. Lekha Rani  
Funding Agency : D.B.T.  
Financial outlay : 19.66 lakhs  
Ongoing

### **Collection, Evaluation, Morphological and Molecular characterization, Cataloguing and Genetic improvement of Ivy gourd (*Coccinia grandis*)**

Period : Started in 2003  
Principal Investigator : Dr. D. Wilson  
Funding Agency : STED  
Financial outlay :  
Ongoing

### **Breeding leaf curl virus resistant chilli through interspecific hybridization**

Period : Started in 2004  
Principal Investigator : Dr. K.M. Abdul khader  
Funding Agency : STED  
Ongoing :

### **Breeding for novel varieties in ‘Monopodial Orchids’**

Period : Started in 2005  
Principal Investigator : Dr. C. Lekha Rani  
Funding Agency : STED  
Financial outlay : 8.437 lakhs  
Ongoing

### **Cataloguing of cashew germplasm of Kerala with molecular markers and digitizing the morphological data**

Period : Started in 2005 ongoing  
Principal Investigator : Dr. V.G. Jayalekshmi  
Funding Agency : STED  
Financial outlay : 10.23 lakhs  
Ongoing

### **LIST OF M.Sc. (Ag.) DEGREE RECIPIENTS AND THEIR PROJECTS**

1979	Rajeswari Meenattoor	Introduction of autotetraploids in lemon grass
	Prasad G.N.B.R.K	Induction of mutations in guinea grass
	Abdul Khader.K.M.	Evaluation of the productivity of selected sesamum genotypes
1980	Venkitaraman. S.	Reproductive mechanism in cardamom.
	Thomas Mathew	Evaluation of superior motherpalms of coconut by seedling progeny analysis.

nut	Shylaraj. K.S.	Identification of pre-potent mother palm in coco-variety Komadan
	Susamma.P. George	Seedling progeny analysis in selected cashew types
	Alice Antony	Variability and heterosis in intervarietal hybrids of sugarcane
	Bindhu. M.	Progeny studies in West Coast Tall palms in different yield groups
	Ibrahim.K.K.	Genotype environment interaction in selected hybrid lines in sweet potato
	Prasanna Kumari, K. T.	Estimation of genetic parameters in greengram
	D.S. Radha Devi	Effect of varying levels of nitrogen on the comparative growth of panicle and leaves in rice
	V.V. Radhakrishnan	Selection parameters in tapioca
	Sverup John	Genetic analysis of pod characters in <i>Sesamum indicum</i> L.
	Suraiya. D	Selection index in horsegram
	Sunny K. Oommen	Induction of mutation in cowpea
	Radhika. C	Selection parameters in groundnut
	Balachandran.P.V.	Estimation of heterosis in bhindi
	Geetha. P.	Genotype x Environment interaction for yield and its components in sesamum
	Asha. M.S.	Effect of mutagens on the growth response and mutation rate in chillies
	Manju. P.	Mutation breeding in horsegram ( <i>Dolichos biflorus</i> L.)

	Kishore Kumar. K.	Effect of herbicides on cell division, sterility and yield in rice
	Maya Devi. P.	Physiological basis of growth and yield of 3 varieties of green gram ( <i>Vigna radiata</i> )
	D.I. Suma Bai	Effect of growth regulators on growth and yield of green gram
	Kuriakose	Selection index in groundnut
1982	Narayanan. K.K.	Evaluation of intervarietal hybrids of brinjal for yield and resistance to bacterial wilt
	Umnikrishna Pillai	Evaluation of interspecific hybrids of blindi with reference to yellow vein mosaic resistance and heterosis
	Elizabeth Philipose	Evaluation of the productivity of chilli hybrids
	Wilson. D	Diallel analysis in greengram
	Salahudin. V.U.	Trials with 2 chloroethyl phosphoric acid, Naphthalene acetic acid and Gibberellic acid in bittergourd ( <i>Momordica charantia</i> L. ) to increase production
1983	Honey Mathews	Evaluation of the F <sub>2</sub> generation of interspecific hybrids of <i>Abelmoschus</i> with reference to yellow vein mosaic resistance and yield
	Sheela. M.N	Evaluation of bhindi hybrids for yield and its components
	Jameela Thomas	Heterosis for yield and resistance to bacterial wilt in brinjal
	Prabha. P	Cross compatibility between <i>Abelmoschus esculentus</i> and <i>Abelmoschus manihot</i>

	Sheela Cheriyan	Physiological and biochemical basis of degeneration in root wilt affect coconut palms.
	Sreenivasan. E.	Correlation and path analysis in guinea grass ( <i>Panicum maximum</i> Jacq.)
	Padmakumar. A	Incompatibility studies on sweet potato ( <i>Impomoea batatas</i> L.)
	Sudha. V.R.	Photosynthetic contribution of exocarp to the development of the nut in coconut
	George Tharakan	Physiological basis of degeneration in root-wilt affected coconut palm
	Devika. R.	Effect of presoaking on germination, growth and yield of first crop (dry sown) rice varieties of Onattukara
1984	Geetha Philip	Model for selecting black gram varieties for yield and adaptability under partial shade
	Jayalakshmi. V.G.	Gene recombination for resistance to bacterial wilt and yield components in brinjal
	Lali. K.S.	Cross compatibility between <i>Sesamum indicum</i> and <i>Sesamum malabaricum</i>
	Giji K. John	Induced mutagenesis for earliness in ground nut
	Rekha. V.R.	Studies on genetic parameters and associations of yield and its components in short duration tapioca varieties
	Sally V. Joseph	Genetic analysis of open pollinated seed progeny of guinea grass clones
	Asha. M.S.	Effect of mutagens on the growth response and mutation rate in chillies

1985	Mareen Abraham	Genic status in relation to radio sensitivity, mutation frequency and spectrum in bhindi
	Lekha Rani	Estimation of induced variability in chillies
	Pillai Mahalekshmy Krishna	Induced mutations in bhind.
	Thejasi Bai. V	Production potential of guinea gram clones under partial shade in coconut garden
	Rajasree. M.R.	Yield and its components in groundnut under partial shade in coconut garden
	Elizabeth George	Combining ability, gene action and heterosis in sesamum
	Saji T. Abraham	Variability and correlation of blackgram under partially shaded condition in coconut plantations
	Rennie Alex	Progeny studies in interspecific crosses of <i>Abelmoschus</i>
1986	S. Sudha Rani	Potential for drought tolerance in black gram
	Anitha. A.R.	Potential for drought tolerance in greengram
	Magie Mareena	Potential for drought tolerance in cowpea
	Sunil Kumar.A.C.	Analysis of maturity related characters and identification of early maturing ground nut
1987	Arya. K.	In-vitro culture techniques in relation to induced mutations in ground nut
	Gopal Radhakrishnan	Intra and inter-variatal variability analysis in cardamom ( <i>Elettaria cardamomum</i> Maton)
	Benny Joseph	Relative biological effectiveness of gamma rays and Ethyl methane sulphonate on cardamom varieties



1988	Santhipriya. G.	Genetic evaluation of $M_2 V_1$ guinea grass clones under partially shaded condition
	Elizabeth Mathew	Productivity parameters in horsegram.
	Kuriakose Conil	Correlation and path analysis in sesamum under rainfed conditions
1989	Jayarani. L.S.	Combining ability in grain cowpea ( <i>Vigna unguiculata</i> )
	Rejatha. V	Combining ability in vegetable cowpea ( <i>Vigna unguiculata</i> var. <i>sesquipedalis</i> )
	Shajan. V.R.	Genetic variability in guinea gram ( <i>Panicum maximum</i> Jacq)
	Rani. N	Induced variability in guinea grass
	Mini. V.	Induced mutations in cowpea
1990	Raju. K.M.	Radio sensitivity analysis in <i>Cucumis sativus</i>
	Bindu. M.R.	Chromosome behaviour and pollen analysis in Anthurium spp.
	Vanaja. T	Effect of harvesting time on seed nut characters in coconut
	Ganga Rani. B.R.	Ergonomic influence of plant morphology on yield in sesamum
1991	Reeja S Dharan	Morphological effect of gamma rays and EMS on winged bean ( <i>Psophocarpus tetragonolobus</i> L.)
	Sudha Kumari. J.S.	Screening cowpea types for resistance to aphid borne mosaic disease

	Sreekumar. S.	Combining ability and gene action in green gram ( <i>Vigna radiata</i> L. Wilezek)
	Bindu.K.K.	Genetic divergence in bhindi ( <i>Abelmoschus esculentus</i> L. Moench)
	Nelson Lopez	Cytohistological and biochemical analysis in rice varieties adapted to stress conditions
	Uma. B.'	Induced chemical mutagenesis on rose under invitroculture
1992	Deepa. T.O.	Mutagenecity of gamma rays and EMS on winged bean ( <i>Psophocarpus tetragonolobus</i>
	L)	
	Seeja. G.	Combining ability studies in tomato ( <i>Lycopersicon. esculentum</i> Mill)
	Sindhu. K.	Cross compatibility in <i>Anthurium andreamum</i> Linden
	Suresh Kumar. N.S.	Genetic analysis of productivity and quality parameters in rice bean
	Girish Kumar. K.G.	Artificial induction of polyploidy in <i>Cucumis sativus</i> L.
1993	Rejani. B.	Combining ability in bhindi <i>Abelmoschus esculentus</i> L. Moench.
	Smitha. S	Gene action and combining ability in grain cowpea ( <i>Vigna unguiculata</i> (L.) Walp) in relation to aphid borne mosaic virus resistance
	Animon	Induced mutations in interspecific hybrids of <i>Abelmoschus</i> spp.
	Saji Kumar. K.R.	Yield potential and adaptability of black gram genotypes for rice fallows

1994	Sanju Susan Mathew	Evaluation of genetic divergence in snakegourd ( <i>Trichosanthes anguina</i> )
	Beena Thomas	Combining ability for biological nitrogen fixation traits and yield components in black gram
	Suresh. K.	Genetic variability in fodder bajra
	Siby Varghese	Genetic make up of yield and yield attributes in a six parent diallel cross of Tomato ( <i>Lycopersion esculentum</i> Mill.)
1995	Babu.R.	Seedling progeny analysis in selected clones guinea grass ( <i>Panicum maximum</i> Jacq)
	Sophia John	Genetic analysis of segregating generation of irradiated interspecific hybrids in okra ( <i>Abelmoschus</i> spp.)
	Roy Issac Varghese	Combining ability for drought tolerance and yield in black gram ( <i>Vigna mungo</i> L.)
1996	Preethi. S.V.	Diallel analysis in rice bean ( <i>Vigna umbellata</i> Thunb.)
	Anu Mary C Philip	Genetic evaluation of F <sub>4</sub> and F <sub>5</sub> generations of irradiated interspecific hybrids in okra ( <i>Abelmoschus</i> spp)
	A. Rajeswari	Genetic analysis of green gram ( <i>Vigna radiata</i> (L.) Wilczek) genotypes for shade tolerance
	Bhadra. K.	Heterosis and combining ability in green gram ( <i>Vigna radiata</i> (L) Wilczek) for biological nitrogen fixation and yield.
1997	Renu. R.S.	Intervarietal hybridization in <i>Anthurium andreanum</i> Linden

	Radhika. V.S.	Estimation of combining ability and heterosis in snakegourd ( <i>Trichosanthes anguina</i> L)
	Ebenezer Babu Rajan	Genetic analysis of segregating generation of intervarietal crosses in green gram ( <i>Vigna radiata</i> (L.) Wilczek)
	Pournami R. Panicker	Evaluation of vegetable cowpea ( <i>Vigna unguiculata</i> sub sp sesquipedalis (L.) Verd court) for legume pod borer <i>Maruca vitrata</i> (Fab) resistance and yield
1998	Deepthy. R	Heterosis and combining ability in <i>Cucumis melo</i>
	Vidya. C	Legume pod borer resistance and genetic Divergence in domestic germplasm of yard long bean ( <i>Vigna unguiculata</i> ssp. sesquipadalis (L.) Verdic.)
	Preeta Lizkorah	Combining ability for shade tolerance and yield in green gram under coconut
	Iswara Prasad. C.M.	Combining ability and heterosis in bittergourd
	Salu B. Appan	Quantitative variation and genetic divergence in foeder rice bean
1999	Laeya Jose	Genetic variability in chilli ( <i>C. annum</i> ) with greater emphasis to reaction to leaf curl virus
	Leenamol. M.A.	Genetic evaluation of F <sub>2</sub> generation of intervarietal crosses in green gram ( <i>Vigna radiata</i> L. Wilczek)
	Daliya. T	Evaluation of brinjal ( <i>S. melongena</i> L.) genotypes for yield and resistance to shoot and fruit borer ( <i>Leucinodes orbonalis</i> )

	Lovely. B.	Evaluation of genetic difference in ash gourd ( <i>Benincasa hispida</i> Cogn)
	Ajith. P.M.	Variability and path analysis in bunch type vegetable cowpea ( <i>Vigna unguiculata</i> (L.) Walp.
2000	Serene M Das	Heterosis and gene action in bajra – napier hybrids
	Ashish K. Binodh	Genetic variability and character association in <i>Anthurium andreanum</i> Linden
2001	Ninitha Nath	Compatability studies in monopodial orchids
	Deepthy Sivanandan	Inheritance of resistanceto leaf hopper ( <i>Amvasca bigutula bigutula</i> (Ishida) in okra ( <i>Abelmoschus esculentus</i> L. Moench.
Mini. S		Genetic variability and characterization in wax type chilli ( <i>Capsicum annmum</i> L.)
	Premna Varghese	Compatibility studiesof three way crosses in <i>Anthurium andreanum</i> Linden
	Bini. K.	Variability studies in fodder sorghum ( <i>Sorghum bicolor</i> (L) Moench)
2002	Pravin. R.S.	Genetic improvement of C <sub>1</sub> hybrids in <i>Anthurium andreanum</i> Linden)
	Sivamani. S	Micropropagation of <i>Dendrobium</i> hybrids

## LIST OF Ph.D. DEGREE RECIPIENTS

1980	K. Sivan Pillai	Quantitative genetic study of yield and its components in black gram
1981	P. Manikantan Nair	Studies on heterosis and combining ability with respect to important economic traits in <i>Capsicum annuum</i>
1983	Pushkaran	Genetic resources utilization and biometric analysis in groundnut
1983	R. Gopimony	Genetic studies in brinjal with relation to bacterial wilt resistance
1984	D. Chandramony	Cytogenetic studies on inter varietal hybrids of sesamum ( <i>Sesamum indicum</i> L.)
	V.C. Markose	Biometric analysis of yield and certain yield attributes in the Para rubber tree ( <i>Hevea braziliensis</i> Muell. Arg.)
1985	J. Sreekumari Amma	Induced mutations in sesamum
	P.D. Vijayagopal	Genetic studies on induced viable mutants in rice
1986	Sreekumar. S.G.	Genetic variability path analysis and stability parameters in sugarcane
	Sverup John	Genetic variability, path analysis and stability parameters in sugarcane
1988	Rema Bai. N	Genetic analysis in brown plant hopper resistance in rice
1990	D.I. Suma Bai	Genic manipulations in sweet potato adopting induced mutations

1991	M. Ramakrishnan	Genetic analysis of productivity in relation to maturity in bunch groundnut
	D.S. Radha Devi	Induced mutations in banana variety Nendran
1992	Kavitha K Mydin	Genetic divergence, pre-potency and inbreeding depression in para rubber
	P. Manju	Fruit component and seedling progeny analysis of Komadan coconut types
1993	D. Wilson	Induced mutagenesis in rose under in vivo and in vitro culture
1994	Sheela. M.N.	Induction of genetic recombinations in inter specific crosses of <i>Abelmoschus</i>
1995	Sreekumar. K.	Genetic analysis of biological nitrogen fixation and yield components in cowpea ( <i>Vigna unguiculata</i> (Linn) Walp.)
1999	Arya. K.	Induction and evaluation of genetic variability in chethikoduveli ( <i>Plumbago rosea</i> L.)
2001	Jayasree Madhavan	Multivariate analysis of young and mature clones in para rubber
	P. Maya Devi	Genetic divergence in <i>Anthurium andrea-num</i> Linden
2002	R. Devika	Genetic analysis of bacterial blight ( <i>Xanthomonas oryza oryzae</i> Ishiyama) resistance of yield in rice.
	C. Lekha Rani	Intra and interspecific hybridization in <i>Dendrobium spp.</i>
	R.EbenezerBabu Rajan	Gene action and heterosis for yield, quality and fruit borer resistance in tomato ( <i>Lycopersicon esculentum</i> Mill.)

2003	Siby Varghese	Genetic analysis in ivy gourd ( <i>Coccinia grandis</i> Voigt)
	P. Sindhumole	Genetic analysis for yield and resistance to yellow vein mosaic in okra ( <i>Abelmoschus esculentus</i> (L.) Moench)
	Radhika. V.S.	Genetic analysis of yield and quality attributes in fodder cowpea ( <i>Vigna unguiculata</i> (L.) Walp)
	Shajan. V.R.	Genetic basis of seed yield and seed quality in sesame ( <i>Sesamum indicum</i> L.)
2004	Anu Mary C. Philip	Genetic analysis of legume pod borer ( <i>Maruca virta</i> (Fab) resistance and yield in cowpea ( <i>Vigna unguiculata</i> (L.) Walp)
	Muthuswamy	Genetic analysis of yield and leaf curl virus resistance in chilli ( <i>Capsicum annum</i> L)
	Ajith. P.M.	Genetic analysis of yield and resistance to anthracnose in chilli ( <i>Capsicum annum</i> L.)
2005	Bini Philip	Genetic improvement and molecular characterization of paprika ( <i>Capsicum annum</i> L.) genotypes

### **POST GRADUATE STUDENTS IN ROLLS AND THEIR RESEARCH PROGRAMMES**

#### **Ph.D.**

Lovely. B (2001-21-14)	Genetic analysis of yield and mosaic resistance in yard long bean ( <i>Vigna unguiculata</i> ssp. <i>sesquipedalis</i> L.)
Yasin Jeshima (2003-21-12)	In vitro multiplication and DNA finger printing of selected hybrids and their parents in <i>Anthurium andreanum</i> Linden



## **M.Sc.**

- Madhu Kumar (2003-11-31)      Genetic variability for yield and Fusarium wilt resistance in yard long bean (*Vigna unguiculata* sub. sp. sesquipedalis (L) Verl court)
- Nicey Mathew (2003-11-44)      Screening for leaf curl virus disease resistance, genetic evaluation and molecular characterization of bird chilli (*Capsicum fruitencens*)
- Anandhi (2003-11-44)      Genetic divergence in cluster bean (*Cyamopsis tetragonoloba* (L) Taub).

## **JUNIOR POST GRADUATE STUDENTS**

### **Ph.D.**

Haridas (2004-21-09)

### **M.Sc.**

Ayisha. P.P.(2004-11-12)

Renjana G Nair (2004-11-42)

Reshmi Manohar (2004-11-20)

Rahana. S.N. (2004-11-21)

Julie Alex (2004-11-44)

## **MEETINGS AND TRAININGS ORGANISED**

The National Group Meet of AICRP on Forage Crops, Kharif 2003 was held from 9-11 May, 2003. A Technical bulletin on *Forage Research in Kerala* Agricultural University for the period from 1997 to 2002 was released by the Chief guest Dr.G.Kaloo, Deputy Director General, I.C.A.R.

Vocational Training on Orchid and Anthurium cultivation and management were conducted from 16.11.1999 to 20.11.1999, from 14.12.1999 to 18.12.1999 and from 21.1.2000 to 25.1.2000.

## A RESUME OF RESEARCH WORK

### RICE

Genetic analysis of bacterial blight resistance and yield was done in rice through L x T analysis and generation mean analysis. Based on the evaluation of 18 L x T combinations, three superior crosses (Aruna x Bjl, Uma x DV85 and Jyothy x DV85) were identified and utilized for generation mean analysis. Dominance (h) and additive x additive (i) type of gene action was noticed for the yield components while dominance (h) and dominance x dominance (l) interaction was noticed for bacterial blight resistance. The three superior crosses identified can be further selected and advanced by pedigree method of developing high yielding bacterial blight disease resistant varieties.

The influence of N at moderate levels on the partitioning of nutrients between leaves and panicle in four upland rice varieties were studied. Ptb. 42 recorded positive correlation between level of N and leaf area and between level of N and dry weight of filled grains as well as the dry weight of fully filled grains. Nitrogen had no influence on the partitioning of assimilates between panicle and leaves in rice.

The F<sub>1</sub> hybrids of all the 15 crosses between six BPH resistant types MTU-5295, CR-266-407-4, RP-1015-45-114-1, M-66B-45-1, MO-6 and MO 7) were found to be resistant. The F<sub>2</sub> populations of these hybrids did not show any variability for resistance. These results indicated that the above six types have the same dominant gene for resistance H.

### PULSES

#### Black gram

Evaluated the drought tolerance potential of 20 genotypes of black gram under moisture stress situation. Selection index based on yield, yield components and drought tolerant parameters leaf area, grain filling period, root/shoot ratio and proline content of leaves was found to be relatively more efficient. Ideal plant type in black gram for drought prone area should have short duration, moderate leaf area, less number of stomata, short to medium grain filling period, high root length and spread and moderate number of pods having maximum grain number and size.

A study was conducted using five drought tolerant lines, three high yielding testers and their fifteen hybrids to evaluate the combining ability and gene action for drought tolerance, yield and related characters in black gram. Specific combining ability variance was significant for all traits except number of branches per plant. Both additive and non additive gene action

were found to be involved for duration of crop, number of pods/plant and grain yield/plant. However, in all cases non additive gene action was predominant. The lines T9 and Co BG 302 and testers WBG 67 and VB 11 were good general combiners and the crosses PDU 101 x WBG 67, CoBG 302 x CoBG 303 and T9 x VB 11 were good specific combinations for high yield and drought tolerance.

Study of 21 characters of 30 varieties, adopting RBD with 3 replications revealed significant differences among varieties for all characters except no. of pickings. High heritability coupled with high genetic advance and genotypic and phenotypic coefficients of variation were high for rust incidence, plant height, leaf area index, seed yield/plant, No.of pods per plant and stomatal distribution suggesting reliability of characters during selection programme, will result in improvement of grain yield. The six high yielding adaptable genotypes were Co-Bg-309, Co-Bg-9, B-3-8-8-1, WBG-67, Co-Bg-303 and T-9.

Evaluation of 19 varieties of blackgram under partially shaded conditions in coconut plantations revealed that an ideal plant type suited for cultivation under partially shaded condition should have high leaf area index at 50 per cent flowering with more number of longer pods with high dry matter accumulation (Photosynthetic efficacy) resulting in high harvest index. Due consideration must be given for the above characters during selection programmes.

The evaluation of 15 L x T combinations were conducted for assessing the gene action involved in the inheritance of biological nitrogen fixation traits and yield components in blackgram. The study revealed WBG13 x AKU4 as the best combination for biological nitrogen fixation traits and yield components in blackgram.

Selection for a high yielding variety adapted to partial shade should be based on plant height, number of branches, number of nodes and number of pods per plant.

The ideal plant type for drought prone area should have early maturity, moderate leaf area, short to medium grain filling period, long spreading roots and high grain number and size. The variety TAU – 2 exhibited maximum drought tolerance among 20 genotypes tested.

A study on the variability, correlation, and path coefficient analysis was undertaken in 21 varieties of rice bean along with the cooking qualities. High genetic advance with high heritability was observed for haulm yield, root weight and protein content indicating the presence of additive gene action. Path coefficient analysis indicated that number of primary branches, pods/plant, days to maturity, nodule weight and protein content, exerted positive direct effect on seed yield. Cooking quality studies recorded that water uptake ranged between. 0.79 g/g to 1.2 g/g and volume of extraction ranged from 58.33% to 68.42%. Organoleptic studies revealed that the variety 23 LG is the most acceptable.

## Green gram

Drought tolerant varieties should have early maturity, longer grain filling period, larger number of pods per plant and high seed size and weight. The variety PDM-84-139 had high grain yield and potential to tolerate moisture stress among 20 varieties tested.

Combining ability and gene action for yield and drought tolerance under drought condition in green gram was carried out using three lines, five testers and fifteen hybrids. Differences among parents were observed for all characters except root/shoot ratio. Both additive and non additive gene action were significant for root/shoot ratio, root spread, protein content, number of pods per plant, seed yield, biological yield and harvest index. The varieties and cross combinations recommended for further utilization are:- PDM-139, Pusa-103, ML-131, Co-2 and PDM-134 and Pusa 103 x Co-2, Pusa 103 x ML – 131, PDM 139 x Pusa – baisakhi, PDM-146 x PDM – 134 respectively.

Fifteen  $F_2$  progenies of green gram derived from intervarietal crosses were evaluated under partial shade of coconut garden to assess the genetic variability and correlation with respect to yield attributes and shade tolerance. Seventeen characters were studied. Genotypic and phenotypic coefficient of variation were very high for six characters viz grain yield, leaf area index and 100 seed weight. High heritability and genetic advance were observed for the above characters. The characters, leaf area index, photosynthetic efficiency, seeds/pod, 100 seed weight and harvest index exhibited significant positive correlation with grain yield. Path analysis recorded that photosynthetic efficiency and harvest index contributed high direct effect on grain yield. So these two characters can be utilized for selection for better yield in green gram.

Seven parental varieties and  $F_2$  population of green gram were evaluated for GCV, PCV, heritability, genetic correlation and path coefficients. High positive direct effect and high positive correlation were recorded for number of pods/plant and 100 grain weight. A selection index was formulated based on number of pods, 100 grain weight, number of seeds per pod and harvest index.

The study on the physiological bases of growth and yield in green gram was conducted to estimate relative influence of different growth parameters and yield components. Plant height, number of branches, number of pods per plant length of pod, NAR and RGR are the factors that influence growth and yield in green gram.

Evaluated the shade tolerance potential of 25 genotypes of green gram under partially shaded coconut gardens. High GCV was observed for leaf area index followed by number of unfilled pods, pod clusters per plant and pods per plant. High heritability coupled with high

genetic advance was recorded for pods per plant, LAI at flowering and pod clusters per plant. Correlation studies indicated that pods/plant followed by branches/plant, clusters/plant, photosynthesis efficiency and LAI showed strong positive correlation with grain yield where as days to blooming, days to first harvest and grains/pod recorded negative correlation. Path analysis revealed high positive direct contribution to grain yield per plant. A selection index was constructed based on grain yield per plant and 9 yield contributing characters. Five top ranking genotypes viz. II PRM3, MGG 314, RMG 353, Ganga 4 and LGG 460 were identified as suitable for cultivation under partially shaded condition of coconut garden.

### **Horse gram**

A model based on number of branches, number of pods per plant and length of pod should be given due weightage by pulse breeders in making selection for high yielding and adaptable strains in horse gram. The varieties Palayam, CODB-1, Calicut local, PLS 6056 and No.477 were found to fit in this model.

Fourteen characters were observed in fifteen varieties of horse gram. Days to 50% flowering showed high heritability and genetic advance. Pod length exhibited maximum genotypic correlation with seed yield. A selection index based on yield with length of pod or yield with number of seeds per pod is most suitable for yield improvement. Path analysis indicated that pod length is exerting maximum direct effect on seed yield.

Seeds of Co.1 variety of horse gram were subjected to induced mutagenesis using gamma rays and EMS and their effects in M1 and M2 generations were studied. Gamma rays had a stimulatory effect on germination while EMS showed a corresponding decrease in the germination %. Pollen fertility decreased linearly with increase in dose of gamma rays while such a relationship was not observed with EMS treatment. EMS induced a spectrum of chlorophyll mutations with seven types compared to gamma rays where only six types appeared. The frequency of viable mutants showed a similar trend with both the mutagens. On the basis of lethality and injury, 20 krad and on the basis of sterility, 10 krad were the most efficient. With EMS, 0.15%, 0.3% and 0.45% were most efficient on the basis of lethality, injury and sterility respectively. The mutagenic efficiency of gamma rays was higher with injury, while on the basis of lethality and sterility EMS treatment was more efficient than gamma rays.

### **Rice bean**

Diallel analysis in rice bean (*Vigna umbellata* (Thumb.) Ohwi and Ohashi) with six parents were done 8LG x 3LG was the most outstanding cross for yield and yield related characters. The crosses 8LG x 9 LG, 8 LG x 100LG, 6LG x 9LG, 100LG x 8LG and 6LG x 3LG also were better in yield and yield attributing characters. In general hybrids involving 8 LG and 6 LG were found to be heterotic.

The study revealed that high GCV, moderate to high heritability and genetic gain were recorded for the green fodder yield per hill, leaf: stem ratio and leaf area index. Path analysis revealed that green fodder yield per hill had the maximum direct contribution for green fodder yield per plot, followed by leaf: stem ratio on fresh weight basis, number of tillers per hill and plant height. Thus green fodder/hill, leaf: stem ratio on fresh weight basis and leaf area index may be considered in breeding programmes for developing high fodder yielding guinea grass varieties suited to partially shaded conditions of coconut plantations.

### **Bhindi**

Breeding experiment on interspecific hybridization in the genus *Abelmoschus*, revealed that the virus caused yellow vein mosaic disease susceptible bhindi varieties of the cultivated species *esculentus* cross readily with the resistant wild/semi-wild species *manihot*. Recommendations are made in favour of identifying specifically advantageous interspecific parental combinations to generate subsequent progeny population to enable selection for economic desirability and disease resistance.

### **Soy bean**

Sixty five varieties of soy bean were grouped into 13 genetic constellations based on  $D^2$  analysis. Hybrids of certain combinations exhibited heterosis for seed yield, protein and oil content.

### **Cowpea**

Combining ability and gene action studies in cowpea revealed that the lines DPLC-198 and IC-38956 and the testers C-152 and Chharodi-1 were good parents.

The preponderance of non-additive gene action for seed yield and some important yield components indicated that the varieties Chharodi-1, Culture-9, V.26 and GC 82-7 have to be given due consideration while formulating future breeding programme.

A plant type suited to drought conditions should be early flowering with deep and wide spread root system, high root/shoot ratio, high leaf area index, low proline content, large number of pods and high harvest index. The variety UPC-124 was found to have the best drought tolerance among 16 varieties tested.

Fifty three genotypes of cowpea were used for the estimation of genetic variability, correlation and path co-efficient. Eleven biological nitrogen fixation characters viz. number of days to flower, length of primary root, number of secondary roots, nodules in the primary root

and secondary root, total number of nodules, weight of effective nodules in primary and secondary roots, nitrogen content in the plant were studied along with the six yield contributing characters. The protein content also was studied. From the initial evaluation trial ten varieties were selected i.e. high yielding and high nitrogen fixing types (6 numbers) used as lines and low yielding and low nitrogen fixing types (4 numbers) as testers and crosses were made in a line x tester model. Number and weight of nodules in primary and secondary roots, pods/plant and weight of 100 seeds showed high heritability and genetic advance showing the involvement of additive gene action. Genetic correlation recorded that grain yield and nitrogen content per plant are having an antagonistic relationship with nitrogen content in the plant. Total number of nodules per plant had the highest positive direct effect on nitrogen content of plant. Length of pod had highest positive direct effect on grain yield. Combining ability analysis showed that there is predominance for non-additive gene action in the inheritance of all traits. The variety VCP-4 was the best general combiner for most of the biological nitrogen fixing characters. The crosses V27 x C152 and V 322 x C190 were good for seed weight and grain yield while the cross VCP4 x C152 was good for weight of nodules and nitrogen content in the plant. Marked heterosis was observed in the hybrids for weight of nodules, pods per plant and grain yield. There is much scope for combination breeding for crop improvement.

Screening of fifty nine cowpea varieties through sap inoculations for CAMV resistance under field conditions has shown two varieties namely V. 317 and V-276 as highly resistant. Other sixteen varieties were found highly tolerant, seven tolerant and the remaining thirty four susceptible. Mahalsmohis D<sup>2</sup> clustered the 59 cowpea genotypes in eight clusters.

Two cowpea aphid borne mosaic resistant varieties V.317 and V.276 and five promising high yielding varieties viz. Pournami, V 269 Co-4 and Charrodi were used as lines & testers in a line x tester analysis. Ten hybrids were produced and they were evaluated for the gene action involved in the inheritance of yield attributes and CAMV resistance. Ten characters were studied and all showed significant difference among the 17 treatments. Non-additive gene action was predominant for the characters pods/plant, seeds/pod, 100 seed weight, seed yield /plant and aphid borne mosaic resistance. Additive gene action was observed for number of days to flowering days to maturity and branches/plant. The varieties Pournami, V – 317, V- 276 and Charrodi were good general combiners for yield and yield attributes and also for CAMV resistance. The best specific combination was V-276 x Pournami. This hybrid recorded high yield with CAMV resistance.

Fifty varieties of cowpea were evaluated for resistance to legume pod borer and yield. ANOVA revealed significant variability for all the damage measurements of legume pod borer, the related biochemical and morphological traits and yield characters. High heritability coupled with high genetic gain was observed for important yield contributing characters. Crosses, L5 x T2 and L2 x T3 exhibited good sca effects for damage parameters, yield traits and

morphological characters. Crosses contributed maximum towards the total variability for all characters except number of branches for plant and leaf chlorophyll content. Predominance of one or multiple epistatic interactions was observed for all characters. Additive gene effects were significant for days to 50 per cent flowering, number of pods per inflorescence, number of seeds per pod, 100 seed weight, plant height and crude fibre content of plants.

Evaluation of variability, correlation and direct and indirect influence of characters on yield were carried out on twenty genotypes of bush type vegetable cowpea. High phenotypic and genotypic coefficients of variation were observed for length of main stem, number of primary branches and pod weight. High heritability along with high genetic advance was seen for all the characters studied. Pod yield per plant showed high positive genotypic correlation with number of pods per plant, pod weight, number of pods per cluster, number of pod clusters per plant and pod girth. Path analysis revealed that number of pods per plant and pod weight were the main yield contributing characters due to their high direct effect on pod yield.

## **OIL SEEDS**

### **Groundnut**

A maturity index was formulated based on the components of yield and 63 types were classified into three groups viz. extra early, early and medium. Chico was the best general combiner for earliness and TMV-2 was the best general combiner for yield.

In a study involving 12 bunch genotypes, eight types attained physiological maturity at 90 DAS. Two types (ICGS (E) 52 and IES 883) were superior with high yield combined with early maturity.

Eighty divergent varieties were evaluated in uplands during kharif and in rice fallows during summer for the estimation of genetic parameters. Twenty three characters were studied at both the situations. The varieties varied significantly for all the 23 characters in uplands and rice fallows. The characters showed differences in the pattern of variability in the two situations. High heritability combined with high genetic advance and GCV were observed for percentage of pod set and number of branches. Pod yield was highly and positively correlated with fresh weight of pods, number of mature pods, pod set, number of immature pods and dryage percentage of pods at the phenotypic and genotypic levels in uplands. Significant negative correlation was observed between pod yield and plant height on the 50<sup>th</sup> day, height of main shoot and length of top. The path analysis revealed that fresh weight of pods had the highest positive direct effect on dry pod yield followed by 100 pod weight, haulms yield and number of mature pods. In rice fallows, both GCV and PCV were high for number of branches on the 50<sup>th</sup> day and were low for duration upto maturity. As in uplands, fresh weight of pods had the highest direct effect on pod yield in rice fallows. Thirty varieties evaluated in uplands and rice fallows, showed that all the characters except length of top changed in the varieties from one



situation to the other suggesting very high influence of the environment. TG-14 in uplands and TG-3 in rice fallows were the high yielding varieties.

The modified Murashige and Skoog culture medium was found to be the best for groundnut embryos. The best result was attained with a surface sterilization of the embryos with mercuric chloride at 0.1% for three minutes. Treating the embryos at the time of culturing was found to be the most effective technique. The lower concentrations (0.125 and 0.25%) gave a better performance based on days taken for embryo set and tissue differentiation. Mutagenic solution having a strength of 0.75% to 0.50% is recommended for yielding maximum mutagenic events in groundnut. Embryos extracted from seed nuts immediately after harvest gave a better response.

Forty varieties of groundnut belonging to bunch and semi-spreading groups were subjected to preliminary evaluation in summer rice fallows and khariff uplands. Superior, stable varieties for the two locations were identified by fitting simultaneous selection model for the two locations using yield and yield contributing characters like number of primary branches, nature pods per plant and 100 weight. EC 24412, EC 35999, EC 119704, Ah.69515, G-270, TMV-11. TG-14, TG-17, Pollachi-1 and Gangapati recorded stable performance in uplands as well as rice fallows.

Yield and its components in groundnut under partial shade in coconut garden was conducted using 31 genotypic. There were significant differences for all the seventeen characters studied. High genotypes and phenotypic coefficients of variation, heritability and genetic advance were observed for 100 pod weight and mature to immature pod ratio. It was observed that fresh pod yield/plot, fresh and dry pod yield/plant, pod number/plant, haulm yield/plot, harvest index and photosynthetic efficiency during reproductive phase showed high genotypic correlation with dry pod yield. The plant type suitable for partially shaded conditions is the one which is tall, early flowering and vegetatively vigorous.

Induced mutagenesis in groundnut variety EC 119704 using gamma rays produced a wide range of mutants. Early maturing mutant with short compact canopy, dark green leaves, large number of pods and fresh seed dormancy were isolated.

## **Sesamum**

Stability parameters were computed for 20 selected varieties of sesamum for three locations. Two varieties viz. 'Thilak' (S.8) and IC. 284 were promising and stable for seed yield.

The variety "Surya" ranked first among the five varieties identified as superior genotypes in uplands. The variety NPG-3 had the highest amount of proline but none of the varieties could be identified as a "Proline accumulating genotype".

The failure of normal seed set in reciprocal crosses between *Sesamum indicum* and *S. malabaricum* (wild) indicated that these two species are non-compatible. The crossed seeds were inhibited at the early stage of development. Hence hybrid inviability due to early endosperm failure could possibly be the reason for breakdown of this interspecific cross.

Genetic analysis through diallel crosses have indicated that the multicapsuled as well as the multiloculed characters were governed by simple recessive genes which could be recombined. Two independent recessive genes were located for each of the two characters in different varieties.

Significant genetic variability was observed for the 14 characters in sesamum in the study conducted using fifty genotypes. Number of branches, capsules/plant, seed yield/plant and weight of capsules/plant recorded high phenotypic and genotypic coefficient of variation. High heritability and genetic advance were observed for plant height, number of branches, capsules on main axis and capsules/plant. Seeds/capsule and weight of capsules/plant were highly correlated with seed yield. Path analysis showed that number of capsules/plant & seeds/capsule had high and 1000 seed weight had moderate direct effect on seed yield. Genetic divergence was studied and the 50 genotypes were grouped into 9 clusters. Maximum intercluster distance was recorded between cluster VII and cluster VIII. Six divergent parents from six clusters were crossed in half diallel fashion to study heterosis, combining ability and gene action. Morphological and seed quality/characters were studied. Significant heterobeltiosis and standard heterosis were observed for different characters in the hybrids. Plant height upto first capsule, capsules on main axis, capsules/plant, seed/capsule, seed oil percentage and iodine value showed a preponderance of non-additive gene action. Seed yield, weight of capsules/plant and saponification value showed a preponderance of additive gene action. The two hybrids showing significant superiority for the important economic characters were IVTS-5 x AVTS-8 and IVTS-5 x AVTS-16. There is much scope for selection, heterosis breeding and combination breeding for the genetic improvement of the crop.

Fifteen multipoded and multi loculed varieties of sesamum were evaluated to select suitable varieties for summer rice fallows and rabi upland. The genotypes x environment interactions and phenotypic stability of these varieties and the correlation of different characters including seed yield was studied. The varieties P.10-1, P.23-1 and P.28-2 were high yielding in rice fallows as well as in uplands, making them suitable for both the locations. The other important high yielding varieties were P.38-1 & P.28-1 suitable for summer rice fallows and PT. 58-35 and No.42-1 suitable for rabi uplands.

Evaluation of six parents and fifteen hybrids of sesame were undertaken for studying combining ability, gene action and heterosis. The variance due to specific combining ability was significant and higher in magnitude than general combining ability for all the characters. It

was seen that the varieties S.8 and VS. 27 were the good general combiners and the cross combinations Co.1 x VS. 27, VS. 27 x K.1 and Co.1 x S.8 were good specific combinations for yield and yield attributes. Non additive gene action was found to be predominant for all the characters studied. Positive heterosis was noticed for all the characters in general and minimum hybrid vigour was manifested for the characters capsule number/plant and seed yield.

Evaluation of the productivity of 15 selected sesamum genotypes showed that there is significant variability for all the 13 characters studied. All characters except length of pod and 1000 – seed weight were influenced by seasons. Number of locules per pod, number of seeds per pod and 1000 – seed weight have positive association with yield. Contribution of number of pods per plant and length of pod to yield was highly irregular. Multifolucled varieties in general were higher in seed yield, longer in duration and higher in all content than four loculed varieties at both the locations. Among the four loculed varieties TMV-2 and PT 58-35-1 were better in seed yield. Two recommended varieties Kayamkulam-1 and Kayamkulam-2 were poor in seed yield particularly in uplands. These two were medium in oil content also. The highest yielding No.42-1 was tall and comparatively less branching in wet lends. This high yielding may be attributed to larger number of pods per plant (particularly in uplands), longer pods, larger number of locules and seeds per pod and higher 100 seed weight. The variety was medium duration at both the locations. Above all, it has the maximum oil content among the 15 varieties.

In another study genetic variability of 10 characters were analysed in a collection of 44 varieties of sesamum. High genotypic coefficient of variation was recorded for total pods/plant, seed yield and number of primary productive branches. High heritability and genetic advance was recorded for number of primary productive branches. The  $F_1$  and  $F_2$  from the diallel set involving 6 varieties were studied. Total number of pods/plant showed maximum positive correlation with seed yield. Path analysis showed that total number of pods/plant is exerting maximum direct effect on seed yield. Other characters which contribute to seed yield were plant height, productive nodes on main axis and primary productive branches. Oil content showed a negative correlation with total seed yield per plant. Combining ability analysis of  $F_1$  showed that both additive and non additive gene action were there for the expression of plant height, total pods/plant, seed yield and 1000 seed weight. Considering the sca effects, the specific combinations, showing maximum hybrid vigour were V.29 x V.41 and V.13 x V.41 with maximum pod seed yield.

## **Coconut**

Seedling progeny analysis was found to be useful in spotting out genuine super palms. Only one out of 10 super palms selected from the southern districts was a genuine prepotent mother palm.

Komadan coconut palms at Vellayani exhibited variation in respect of several characters. The magnitude of variability was different for the different characters.

In both Komadan and WCT, during February to May (hot weather period), there was higher production of bunches having proportionately more female flowers resulting in higher nut yields. This period was found to be the best for seednut collection in both the varieties.

The nut growth involved two periods of growth with a period of slow or suspended growth in between indicating a double sigmoid curve. The fresh weights of the nut and husk attained a maximum value at the 6<sup>th</sup> month and then declined. The dry weight of the husk continued to increase till maturity. The Chlorophyll content of the exocarp reached a maximum at the 6<sup>th</sup> month and then declined. The dry weight of the endocarp reached a peak at the 8<sup>th</sup> month and declined there after. Maximum fresh weight of the liquid endosperm was attained at the 4<sup>th</sup> month and declined afterwards. The solid endosperm started development between the 4<sup>th</sup> and 6<sup>th</sup> month and its fresh and dry weights increased till maturity. The exocarp makes a 30 percent contribution to dry matter accumulation in the husk which accounts to a 10 percent contribution to the nut. The exocarp, whose area is 1.6 percent and chlorophyll content 41.6 percent of those of the leaves is far more efficient in net photosynthesis per unit area than the leaf. As the exocarp does not interfere with the light environment of the leaf it increases canopy net photosynthesis.

The komadan coconut types showed significant superiority for majority of the mother palm characters especially number of branches and spadices and number of nuts per palm per year. Among the Komadan palms, 33 per cent were of self pollinating nature thereby occupying a position in between NCT and NCD regarding pollination system. Komadan types were superior to WCT and on par with NCD for majority of the seed nut characters. Komadan types occupied an area midway between NCD and NCT based on Niu Kafe – Niu vai introgression hypothesis with a clear progression through generations towards better weight of unhusked nut. Regarding seedling characters, Komadan was superior to NCT and NCD for total leaf area, number of seedlings with split leaves and seedling vigour index. Estimation of prepotency based on recovery of quality seedlings indicated that 40 to 60 per cent of Komadan palms were prepotent where as the same in NCT and NCD were only about 20 per cent. It can be concluded that the Komadan type maintained its genetic identity over generation with respect to economically important characters and also in the recovery of quality seedlings which intum reflects its prepotent nature.

## RESEARCH ACHIVEMENTS IN DIFFERENT CROPS

### VEGETABLES

#### Brinjal

Evaluation of segregating populations from crosses between wilt resistant and susceptible types of brinjal indicated that the disease incidence leads to selection in favour of poor yielders. As such there is very limited scope for evolving high yielding resistant types through selection in early segregating generations.

The type SMI-10 obtained as an induced recombinant through hybrid seed irradiation was resistant to bacterial wilt under artificial inoculation. The hybrids SMI-10 x PPL and SM-6 x PPL were resistant to bacterial wilt. However, these hybrids did not exhibit satisfactory level of resistance under field conditions.

Evaluation for yield and yield contributing characters revealed that the hybrid SMI-10 x PPR is superior for yield per plant while SMI-10 x PPL showed maximum heterosis for number of fruits per plant. The hybrid SM6 x BB produced fruits of superior quality, while SM-6 x PPR proved superior for plant height, number of branches and days to final harvest. These hybrids possessing high yield potential as well as wilt resistance can be recommended for cultivation in bacterial wilt endemic areas for increasing the productivity of brinjal.

In a study conducted on twenty five brinjal genotypes showed that there is high genotypic and phenotypic coefficients of variation, heritability and genetic advance for yield/plant and number of fruits/plant. Yield per plant was highly correlated with number of fruits, fruit weight and number of harvests. Path analysis revealed that the above three characters had high direct effect on yield/plant. All the 25 genotypes showed significant difference for the damage parameters. Cluster analysis based on different damage parameters and yield differentiated the twenty five genotypes into five clusters. The clusters II and III were having less susceptible genotypes and cluster IV had high yielding genotypes. So hybridisation between varieties belonging to these clusters could lead to the production of high yielding resistant types.

#### Bhindi

The interspecific hybrids between *Abelmoschus esculentus* var. anakornban with *A. manihot* and *A. manihot* spp. *Tetraphyllus*, exhibited hybrid sterility. They also exhibited field tolerance to YVM disease.

A preponderance of low yielding yellow vein Mosaic resistant plants similar to the semi wild parent *Abelmoschus manihot* was observed in the F<sub>2</sub> population, suggesting a restriction for free recombination.

Evaluated the  $F_4$  generation of interspecific hybrids between two yellow vein mosaic susceptible cultivar of *Abelmoschus esculentus* and the resistant semi-wildspecies. *A. manihot* for yellow vein mosaic resistance and yield screening for YVM inheritance in the  $F_4$  progeny revealed that plant resembling the wild parent *A. manihot* showed short stature, lesser number of branches, increased fruit girth and number of seeds/fruit were resistant to the disease. Plants resistant to the disease and resembling the cultivated bhindi were selected to carry forward to the next generation.

The  $F_1$  seeds of the cross between *Abelmoschus esculentus* and the semi-wild species, *Abelmoschus manihot* were exposed to four different doses (10, 20, 30 and 40 kR) of gamma rays and their effects in first generation were studied. The survival of plants was found to decrease with increase in dose of the mutagen. The hybrids exhibited significant positive heterosis for number of flowers, number of fruits and weight of fruits. On sterility basis, the 30 kR treatment was the most efficient.

In the genetic analysis of okra for yield and YVM disease resistance, the per se and performance, standard heterosis and sca effects were superior for the hybrid NBPGR/TCR – 1498 x NBPGR/TCR 2060 with respect to yield, YVM resistance and several yield attributes. Predominance of additive and additive x dominance interaction in the above cross for yield and average fruit weight suggests its suitability for direct selection and recombination breeding. The second best hybrid NBPGR/TCR – 985 x parbhani Kranti could be utilized for heterosis breeding and selection, directly or in segregating generations in order to improve yield, average fruit weight and YVM resistance owing to the prevalence of dominance and additive x additive components.

In the  $F_2 M_2$  and  $F_3 M_3$  generations the irradiated plants were late flowering and produced more number of leaves, flowers and fruits per plant. A few recombinants which resembled the cultivated parent with high yield and YVM disease resistance could be isolated from 30 kR, which suggests that 30kR could be ideal radiation dose for evolving high yielding YVM disease resistant lines in okra.

A preponderance of low yielding yellow vein mosaic resistance plants similar to the donor parents were observed among the  $F_2$  and  $F_2 M_2$  population indicating the presence of powerful genetic mechanisms preventing free recombination. As compared to  $F_2$ 's, the proportion of recombinants was higher in the  $F_2 M_2$  population indicating the breakage of undesirable linkages through irradiation. Based on superiority in performance, fifty seven plants were selected, in which six plants recorded an yield greater than 525g per plant. Maximum number of recombinants were identified in the irradiated crosses, *A. caillei* x *Anakomban* and *A. caillei* x *Eauivenda*. These recombinants had higher yield than the check variety 'Punjab Padmini' coupled with YVMD resistance confirmed by graft inoculation. These

lines can be utilized in further breeding programmes for evolving high yielding resistant varieties in bhindi.

A study was conducted on six intervarietal hybrids of bhindi and their six parents. Moderate to high heritability was recorded for the important characters such as weight of fruits per plant, number of fruits/plant, crude fibre content and yellow vein mosaic disease incidence. Long and heavy fruits were found to be of good quality with less crude fibre content. All the hybrids displayed desirable heterosis for the weight of fruits/plant, number of fruits/plant etc. Negative heterosis was exhibited by the hybrids for characters such as crude fibre content, fruit and shoot borer infestation and yellow vein mosaic disease incidence. The two hybrids “Selection 2 x Kilichundan” and “Seventheri x Kilichundan” were identified as high yielders. Both the hybrids produced large number of long heavy fruits with good thickness and low crude fibre content. The hybrid “Selection 2-2 x Kilichundan” was also found to be less susceptible to yellow vein mosaic disease under field conditions.

The extent of variability created by 30 kR, 60 Co gamma rays in quantitative characters was assessed in the segregating generations of  $M_3$  and  $M_4$  of the pure breeds and the hybrids along with the respective controls. Desirable variation was observed in gamma irradiated cross breeds in majority of the characters studied. The variability created was higher in the fourth generation, compared to the third generation. Selection for early flowering types could be more effectively done in the fourth generation due to the occurrence of higher frequency of negative variants. All the genotypes involving Kilichundan showed increased fruit yield due to gamma ray exposure. Higher frequency of desirable phenotypes were observed in the low or medium sterility class, compared to the high sterility class, in majority of the treatments.

Mutation induction in bhindi var. kKR at an interval of 10 kR exposures. There was significant difference between exposures for the pollen and seed sterility percentage. The other characters also showed a declining trend with increasing exposures although the means did not differ significantly. Variants in leaf size, leaf lobes, leaf shape, stem and petiole dichotomy and double fruits also were observed in the  $M_1$  generation. In the  $M_2$  polygenic traits studied did not differ significantly for the mean expression of characters. The phenotypic classes under five  $M_1$  sterility classes showed significant variation in their mean frequencies in all the characters.

The effect of 30 kR 60 Co – gamma rays on different genotypes of bhindi was been studied in detail in  $M_1$  and  $M_2$  generations. Majority of the growth characters showed significant reduction in gamma ray treated population compared to their respective controls. All the genotypes showed increased pollen and seed sterility due to gamma ray exposure. Gamma rays significantly reduced yield potentiality of the plants. Based on seed sterility, the  $M_1$  plants

were grouped as low, medium and high sterile groups. A stable mutant having the wild characteristics of this particular crop variety isolated from  $M_2$  generation is promising as it escapes from the most disastrous disease of bhindi, yellow vein mosaic virus.

Fort rice varieties were evaluated for leaf hopper resistant variation for yield and yield attributes and also for leaf hopper resistance. High heritability and genetic advance were observed for primary branches per plant followed by yield per plant. Line x Tester analysis was done using 5 resistant lines and 3 susceptible testers. GCA and SCA effects were high significant. Most of the traits including leaf hopper resistance indicated predominance of non-additive gene action. So heterosis breeding is a good approach for developing high yielding leaf hopper resistant varieties.

The combining ability analysis revealed that the parent NBPGR/TCR 864 was the best general combiner for yield and a few yield related characters. Among the hybrids, NBPGR/TCR 893 x NBPGR/TCR 864 exhibited outstanding sca effects for yield. The hybrid NBPGR/TCR 861 x NBPGR/TCR 893 was the most outstanding for yield and yield related characters when compared to the mid parent, better parent and standard check and it also exhibited heterosis for tolerance to shoot and fruit borer. The cross NBPGR/TCR 893 x NBPGR/TCR 864 was also heterotic for earliness in flowering. The parents, NBPGR/TCR 893 and NBPGR/TCR 861 either alone or together produced heterotic combinations,

Evaluation of seventy genotypes of bhindi revealed significant differences in most of the characters studied. High heritability coupled with high genetic advance was recorded for length of fruit, leaf area, weight of single fruit, height of the plant and weight of the fruits per plant. The model for selection of high yielding varieties of bhindi should be based on the number of branches. D2 analysis revealed that the 70 genotypes can be grouped into six clusters. Maximum divergence was obtained between clusters II and VI and the minimum between clusters I and IV.

## **Tomato**

Combining ability, gene action and heterosis were studied using three bacterial wilt resistant varieties viz. Sakthi, Arka Alok, Arka Abha and five popular varieties and their fifteen hybrids as half diallel set. Fifteen characters were studied. Analysis of variance revealed highly significant differences among the genotypes for all the characters except locules/fruit. The additive to dominance variance ratio indicated a preponderance of non additive gene action for the characters spread of plant, days for first flowering, days for first harvest and duration of harvest. But additive gene action was indicated for plant height, branches per plant, leaves/plant, single fruit weight, fruit size, fruits/plant, fruit. The varieties, Sakthi and PKM-1 were



good general combiners with respect to fruit yield and other yield attributes. Significant sca and heterosis were observed in the hybrids, Arka Alok x PKM-1, Arka Abha x PKM-1, Sakthi x Arka Alok, Sakthi x Arka Abha and LE 79-5 x LE 373 for fruit yield/plant.

Significant genetic variability was observed in 40 diverse genotypes collected from AVRDC and Indian states for the different morphological characters, insect resistance and quality characters. High heritability and genetic advance were observed for number of fruits/plant, weight of fruits/plant and carotene content of fruits. Fruit yield showed significant positive correlation with plant height, branches/plant, spread of plant, number of fruits and individual fruit weight. A discriminant function was fitted with 17 variables for identifying superior varieties. The top five scores were EC 461070, EC 461018, EC461078, Arka Alok add PKM-1. Using these high yielding genotypes as female lines and three fruit borer resistant varieties MTM local, EC 461035 and EC 461057 as testers, varieties hybridization was conducted and the combining ability was studied. EC 461070, EC 461018 and MTM. local were good general combiners for yield and quality characters. Varieties EC 461070, Arka Alok and MTM. local were good general combiners for fruit borer resistance. Among the hybrids, EC 461070 x MTM local, EC 461018 x EC 461035 and PKM-1 x EC 461057 showed significant sca effects. The hybrid EC 461070 x MTM local showed significant sca effects for fruit yield, No. of fruits, single fruit weight etc. This hybrid recorded significant standard heterosis and heterobeltiosis for number and weight of fruits/plant, carotene content, TSS, pH of juice and shelf life. Generation mean analysis was carried out using six parameter model using the cross EC 461070 x MTM local. It was recorded that additive, dominance and epistatic interactions were present for all the characters studied.

Line x Tester analysis was done using three bacterial wilt resistant varieties Arka Alok, Arka Abha and Sakthi as lines and five popular high yielding varieties viz LE 312 LE 320, LE 373, RPH-1 and PKM-1 as testers. All the three lines were good general combiners with respect to yield and other yield attributes. All the five testers were good general combiners for the different vegetative characters. Among the fifteen hybrid combinations, significant sca and heterosis were observed in 5 hybrids viz Arka Abha x LE 370, Arka Alok x PKM-1, Arka Alok x LE 312, Arka Alok x RFH-1 and Sakthi x RFH – 1 for yield and other yield attributes such as number of fruits/plant, size of fruits and individual fruit weight.

## **Chillies**

The genetic analysis for yield and resistance to anthracnose in chilli brought to light genotypes which could be used as sources of resistance. Two superior crosses with high yield potential and resistance to anthracnose were identified. The nature of gene action underlying yield and yield attributes were found to be additive and dominance x dominance epistatic

interaction which signified the possibility of improvement through recombination breeding. Selection has to be postponed to later generations. For anthracnose resistance, dominance x dominance interaction played a major role thereby suggesting heterosis breeding as the method of improvement.

Five leaf curl virus susceptible high yielding lines, Jawalamukhi, Kottikulam local, Mangalapuram local, Koothali local and Pollakada local were crossed with three leaf curl virus resistant testers, Harpuram local Alampady local and Neyyattinkara local in L x T pattern and 15 F<sub>1</sub> S produced were evaluated along with the parents. Combining ability analysis showed that the line Pollakkada Local and the tester Neyyattinkara local were good general combiners for fruit yield along with leaf curl resistance considering the per se performance, standard herosis and sea effect. Two hybrids, Pollakkada local x Alampady local and Pollakada local x Neyyattinkara local were chosen as and good hybrids General Mean analysis was carried out using six parameter model. Six generations viz. P<sub>1</sub>, P<sub>2</sub>, F<sub>1</sub>, F<sub>2</sub>, B<sub>1</sub>, B<sub>2</sub> were built up among the crosses Pollakkada local x Alampady local and Pollakkada local x Neyyattinkara local. Presence of additive, dominance and epistatic interaction for all the characters indicated that recurrent selection or recombination breeding can be followed for future breeding.

In an evaluation of the productivity of six intervarietal chilli hybrids obtained by crossing four inbreeds in all possible combinations without reciprocals, number of fruits per plot exhibited the maximum phenotypic and genotypic variances in both the evaluations. Maximum PCV and GCV were displayed by number of branches in both the trials. High heritability coupled with high genetic advance was observed for number of fruits per plot. Weight and girth of individual fruit was found to contribute positively total yield. Majority of the hybrids exhibited positive heterosis for the 4 most important traits viz. number and weight of fruits per plant and number and weight of fruits per plot. The study could identify two promising hybrids namely V x PR and PC-1 x PR with high yield potential. Present study pointed out the possibility of augmenting the yield potential in chilli by employing heterosis breeding.

Varietal sensitivity of chillies to the most potent mutagen 60 Co - gamma rays and Ethyl Methane Sulphonate was assessed by using twenty available genotypes. Statistical analysis of M<sub>1</sub> generation clearly demonstrated that in majority of cases the morphological and yield attributing characters showed significant reduction in treated population compared to the control. EMS is more effective in reducing the mean values in growth metrics compared to gamma rays. Delay in germination and growth rate were induced by the mutagens. Lethality and sterility were induced by both the mutagens. Based on this, the varieties were classified as least sensitive, moderately sensitive and sensitive varieties. Analysis of induced variability in M<sub>2</sub> generation showed a significant shift in mean values either in positive or negative direction.

The mutagenic effect of  $^{60}\text{Co}$  gamma rays and ethyl methane sulphonate on three chilli varieties belonging to three sensitivity groups was studied in detail in the  $M_2$  generation. Two moderate doses of gamma rays (20 and 30 kR) and two concentrations of EMS (0.5 per cent) were employed. The presence and extent of chimaras and their relation to induced variability was assessed by raising  $M_1$  branch-wise progeny in  $M_2$ . Maximum frequency of positive variants was observed in the early-formed branches for the chemical mutagen. In the case of gamma rays, this general trend was not observed. Existence of diplontic selection was confirmed and the scope for positive selection for yield attributing characters was established.

### **Vegetable cowpea**

A 6 x 6 diallel analysis was conducted to study combining ability, gene action and heterosis in six vegetable cowpea lines. The variance due to general combining ability was significant and higher in magnitude than specific combining ability for days to flowering, mean weight of pod, mean length of pod, number of seeds/pod, length of internode and seed/pod ratio. The hybrid, selection 145 x selection 129 was the best specific combiner for mean weight of pod and number of seeds/pod. The hybrid, selection 145 x Kurutholapayar was the best specific combiner for earliness.

In the field screening programme for legume pod borer resistance, 51 diverse genotypes were evaluated on the basis of overall plant resistance index (Ipr) constructed using a combination of flower, pod and seed damage measurements. Percentage of pod infestation and pod damage severity showed highly significant positive correlation between them but were uncorrelated with the larval count in flowers. Seed damage was found to be positively correlated with pod damage. Pod width was found to be positively correlated with Ipr, pod damage severity and percentage of pod infestation. Non glandular trichome density on pods recorded significant negative correlation with Ipr and pod damage indicating that plant resistance increase with increase in non glandular trichome density on pods. High heritability and genetic advance were recorded for number of pods per plant, yield of vegetable pods per plant and pod weight.

Fifty diverse genotypes of yard-long bean were evaluated for yield and yield contributing characters and also pod borer resistance. Pod yield per plant showed high positive correlation with number of pods per plant, number of pods per inflorescence, pod weight and length of harvesting period. Path analysis revealed that number of pods per plant and pod weight were the primary yield contributing characters owing to their high direct effect on pod yield. Based on Mahalanobis  $D^2$  statistic, the 50 cultivars were grouped into 4 clusters. Cluster I formed the largest cluster with 28 varieties while cluster IV had only a single cultivar. In the field screening programme for legume pod borer resistance, all the 50 cultivars were evaluated on

the basis of overall plant resistance Index (Ipr) computed using a combination of flower, pod and seed damage parameters. Pod damage showed high positive correlation with seed damage. Cluster analysis based on different damage parameters grouped the varieties into seven different clusters Cluster IV and I were those suffering least flower and pod damage respectively. Studies on relationship between pod damage with pod wall thickness and fibre content of pods indicated that these characters did not influence infestation and damage by legume pod borer. The cultivar VS 42 was identified as a high yielding pod borer resistant variety.

### **Sweet potato**

In a study conducted on the flowering and natural fruit setting in sweet potato 30 varieties were screened for compatibility/incompatibility reaction. Only one variety viz. S 378 was found to be self compatible. Except 2, 4-D treatment and end of season pollination, all the other methods including bud pollination, surgical techniques and application of sugar solution etc. failed completely to break the self incompatibility barrier. The success of 2, 4-D treatment, which resulted in fruit set in 13 varieties might be due to its effect on increasing the flower life by preventing floral abscission. Pollen sterility studies confirmed its role in the low fruit and seed set in sweet potato.

In a study of radio sensitivity analysis of gamma rays it was found that 2 kR level of gamma irradiation reduced sprouting percentage and vine length. No. of branches per vine was found to be comparatively less and the number and weight of tubers per vine were found to be significantly high resulting in the classification of low, medium and high radiation sensitive categories. Induced mutagenesis resulted in decrease in sprouting percentage, vine length, branch No. per vine and increase in lethality, mean tuber weight, length, girth and tuber yield per vine. Two promising types were isolated one in each from S5 and Bhadrakalichuvala which out yielded the control.

### **Cucumber**

Study on the effect of colchicine for inducing polyploidy in seed, seedling and apical bud treatments in the two varieties, Seethal and Delila of *Cucumis Sativus* revealed that seed treatment of colchicine 0.2% for a period of 4 hours recorded maximum survival percentage, vine length and number of leaves and branches/plant. Increase in colchicine concentration and increase in period of treatment adversely affected the survival percentage, vine length and branches/plant. Delay in both male and female first flower opening and reduction in the number of male and female flowers were noticed in higher colchicine concentrations and in lower period of treatments. The fruit characters such as number of fruits, length and girth of fruit and fruit weight were not significantly influenced by the colchicine treatments. The pollen size and

sterility increased considerably with increase in colchicine concentration. Seed treatment recorded minimum pollen size and sterility. Colchicine 0.02% can be used for induction of polyploidy under in vitro condition since it is effective in producing variations with minimum deleterious effects. In embryo culture some abnormal growth effects were noticed in the colchicine treated embryos like lack of leaf formation, premature flowering etc.

The effect of five doses of gamma rays viz. 10, 20, 30, 40 and 50 kR in ten *Cucumis sativus* L. varieties was studied in  $M_1$  generation. Enhanced germination was observed in laboratory condition. But in field condition a reduction in germination and survival percentage was noticed in all the treatments compared to control. Morphological abnormalities such as leaves with short petioles, leaves with half leaf blade and chlorophyll deficient patches were obtained as a result of gamma irradiation. Increased sex ratio as a result of gamma irradiation was noticed in the present study. Variation in fruit morphology reduced fruit weight and mean yield per plant were observed in certain treatments. Gamma irradiation increased pollen sterility. Different varieties showed differential response to gamma rays.

### **Bitter gourd**

The combining ability analysis revealed that both GCA and SCA variances were significant for all the characters indicating the involvement of both additive and non-additive gene action. The parent MC 40 and the hybrid MC 18 x MC 40 were the best general and specific combiners respectively for yield and most of the yield related components. Several hybrids possessed significant relative heterosis, heterobeltiosis and standard heterosis for all the characters except significant standard heterosis for 100 seed weight. The hybrid MC 18 x MC 40 recorded the maximum positive standard heterosis for yield and most of the yield attributes. However, the hybrids MC 17 x MC 40, MC 17 x MC 53 and MC 18 x MC 53 exhibited good performance with regard to yield and related characters.

A field experiment was carried out with 3 growth regulators viz CEPA (50, 100, 200 ppm) NAA (50, 100, 150 ppm) and GA (25,50,100 ppm). CEPA showed an inhibitory effect on the main vine elongation at higher concentrations. The highest level of NAA (150 ppm) was consistently limiting the vine growth, inhibiting branching and reducing the number of nodes on the main vine. The highest concentration of GA showed an inhibitory effect on branch growth at two stages. The two lower concentrations of GA promoted dry matter production all along the growth stages. All the levels of CEPA and NAA delayed the opening of the first male flower. GA at 50 ppm and 100 ppm delayed significantly the first female flower opening. All the 3 levels of CEPA, 2 lower levels of NAA and lowest level of GA were found to increase the number of fruits, fruit yield and harvest index. The highest level of CEPA, the two lower levels of NAA and the lowest level of GA had an effect on producing

heavier fruits. Vitamin-C content increased by all the levels of CEPA and NAA and the two lower levels of GA. All the chemicals were effective in increasing iron content in fruits.

### **Snake gourd**

Mahalanobis  $D^2$  analysis clustered the 34 genotypes of snake gourd into nine group constellations. The clustering pattern indicated that geographic diversity need not be related to genetic diversity. The characters, days to first female flower opening followed by duration of the crop, days to first fruit harvest and 100 seed weight contributed maximum towards genetic divergence.

### **Ash gourd**

A study was carried out on genetic divergence in twenty five genotypes of ash gourd. The high direct effect observed for days to first female flower, fruits per plant, fruit length and fruit girth on yield indicate that selection based on the above components result in the improvement of yield per plant.

### **Ivy gourd**

Fifty genotypes of ivy gourd including male and female lines were grouped into 11 clusters by  $D^2$  analysis. Number of leaves and number of flowers per plant contributed maximum to the divergence. Selection of male and female parents from clusters having maximum distance will yield maximum hybrid potential. In the study the single male genotype in cluster IX in combination with the 3 female genotypes in cluster II can produce vigorous hybrids. The genetic variability studied on the forty female genotypes ( gynocious lines ) indicated that there is significant variability for all the morphological characters and it was maximum for fruit yield. Heritability and genetic advance were high for all the 15 characters except number of days for first flowering which shows that there is much scope for selection. Genotypic correlation coefficients were higher than phenotypic correlation coefficients. Fruit yield showed positive correlation with all the morphological characters except No. of days for flowering. Number of fruits/plant and single fruit weight showed high direct effects for yield. Selection index showed that the local cultivars of Alappuzha, Kanjangad, Thirunelli, Mancheswaram and Nangikadappuram were the five top ranking genetically superior genotypes.

### **Winged bean**

Seeds of winged bean variety PT – 62 were subjected to six doses of gamma rays (100 to 500 Gr) and six doses of EMS (40 to 200 mM) to study the extent of genetic variability that can be induced in the  $M_1$  generation in both the mutagen treatments. Number of days

taken to complete germination was not much affected by either of the mutagens in the field. Chlorophyll chimeras and morphological variations were observed in gamma ray treated population. Earlier flowering was observed in lower doses of gamma rays but higher doses caused delayed flowering. Number of pods per plant and fruit yield per plant were not affected by EMS treatment.

A study on mutagenicity of gamma rays and EMS in the  $M_2$  generation of winged bean with four doses of gamma rays (100, 200, 300 and 400 Gy) and five doses of EMS (40, 80, 120, 160 and 200 mM) was carried out. Twenty one viable mutants with change in characters of leaf, stem, pod and seed were isolated from gamma ray treated population and twenty two from EMS treated population. The efficient doses of gamma rays identified on the basis of injury and lethality or sterility were 100 Gy units and 200 Gy units. In EMS, the efficiency on the basis of sterility, lethality and injury was maximum at 120, 160 and 80 mM respectively.

### **Sugarcane**

Preliminary evaluation of 78 hybrid clones of sugarcane resulted in the identification of 24 promising ones. They were proposed for further evaluation at the S.R.S., Thiruvalla.

Clones Coc. 771 and Co. 7219 were found to be stable among the 15 clones tested at three locations. Clones Coc. 771 and Co. 6907 appeared to be promising for cane yield.

### **Cashew**

Seedling progeny analysis in cashew has indicated the need for practicing a four stage selection procedure for seedling propagation. The stages are selection of superior varieties, identification of prepotent trees, selection of bigger seed nuts and selection of the taller 50 per cent seedlings.

### **Banana**

A study was undertaken to standardise the techniques for induced mutagenesis in vivo and in vivo in Banana var Nendran) and also to analyse the direct effect of  $^{60}\text{Co}$  gamma rays on growth and bunch characters in the  $VM_1$  generation and variations created in productive traits in the  $VM_2$  and  $VM_3$  generations. A decrease was noticed in mean plant height, number of leaves and girth of pseudostem at 90 days after planting and also at harvest with increasing doses of gamma rays, in the  $VM_1$ ,  $VM_2$  &  $VM_3$  generations. Increasing the dose of gamma exposure resulted in decrease in bunch weight, bunch length and number of hands per bunch.

Number of fingers per hand and per bunch and length, girth and weight of fingers also decreased with increase in the dose of gamma irradiation. One, two and three months old suckers of various sizes (after removal of 25 to 75 percent of the pseudostem) were exposed to 1, 1.5, 2, 2.5 and 3 kR gamma rays for in vitro mutagenesis, isolated shoot tips were exposed to 0.5, 0.75, 1.0, 1.25 and 1.50 kR gamma rays for ex vitro analysis. Total sugars and sugar: acid ratio increased with increase in dose of gamma ray exposures) Increasing the dose of gamma exposure resulted in decrease in bunch weight, bunch length, number of hands per bunch, number of fingers per hand and bunch, total soluble solids and acidity though it is higher than control in irradiated population. Weight and girth of finger, total sugar and sugar acid ratio increased with increase in dose of gamma exposures.

## **Rubber**

Considerable genetic diversity was noticed among the 40 clones studied. Likely prepotents were identified from various genetically divergent clusters. No significant inbreeding depression was evident for juvenile vegetative traits and rubber yield. The clones PB 28/83, PB 215, RRII 105, AVT 73, PB 252, Ch 26, PB 242 and PB 5/51 were identified as components of a polyclonal seed garden. Young and mature clones of rubber was studied for variability, correlations, direct and indirect effects, genetic divergence and to examine the extent to which mature yield could be predicted using immature attributes. In both, high genetic variability was observed path analysis at mature phase revealed initial flow rate and bark thickness as selection parameters. At the immature phase, number of latex vessels exerts high direct effect on yield. Similarity was found in the clustering patterns of clones at both stages. The study revealed that immature attributes of two year old plants like immature bark thickness and number of latex vessel/rows showed correlation with mature yield.

## **Cardamom**

Study of reproductive mechanism in cardamom did not reveal any evidence in favour of self sterility. Good capsule and seed setting were obtained through self pollination. There is scope for increasing capsule setting by improving pollination efficiency through the promotion of bee activity in plantations at the time of flowering. Four popular cultivars viz. Malabar, Mysore, Vashukka and PV-1 of two age groups (3 and 6 year old) planted at Cardamom Research Station, were used for the study. Significant variability was observed for the various characters in the third year group and sixth year group. Moderate to high heritability together with high genetic gain was seen for number of productive tillers per plant, 100 capsule weight, fresh and dry weight of capsules/plant in the third year group and for number of panicles/plant, fresh and dry weight of capsules/plant and number of capsules/panicle in the sixth year group. Yield was positively correlated with number of productive tillers/plant number of leaves/tiller, length of panicle, number of nodes/panicle, 100 capsule weight and fresh weight of capsules/plant in the third year group and in the sixth year group yield was strongly and positively



correlated with height of tillers, number of productive tillers per plant, number of panicles/plant, number of capsules/panicle, length of panicle, number of nodes panicle, internodal length in the panicle and fresh weight of capsules/plant. Path analysis revealed that the maximum direct contribution to yield was through fresh weight of capsules/plant in the 3<sup>rd</sup> year group and number of panicles/plant and fresh weight of capsules/plant in the sixth year group.

### **Fodder Rice bean**

Study of 11 characters from 60 accessions adopting RBD with two replication revealed significant differences among the accessions for all characters except duration of crop. High heritability coupled with high genetic advance and phenotypic and genotypic co-efficients of variation were high for plant height, leaf weight per plant, green and dry fodder yield. But leaf area index recorded negative effect on green fodder yield. Based on genetic distance maximum divergence was obtained between C4 and C10 and minimum between C1 and C3. Hence selection of plants from C4 and C10 will be effective for overall improvement of fodder yield.

### **Bajra**

A research programme was carried out with the objective of assessing the genetic variability and the scope of selection for forage yield and quality in bajra. Twenty varieties were evaluated adopting a RBD with three replications and data on twelve characters were subjected to statistical analysis. Analysis of variance revealed significant difference among the varieties for all the characters studied. High heritability coupled with relatively high genetic advance was recorded for leaf weight per plant and internodal length suggesting the reliability of these characters during selection programme. Selection index based on yield contributing characters had enabled to select four high yielding fodder bajra genotypes namely HTGPK – 1993, SSG-59-3, IP-5714 and LSGP-1995.

### **Cowpea**

Study of different characters of fifty one genotypes, replicated twice, revealed high heritability and genetic advance for all characters except number of primary branches per plant. Leaf/stem ratio, leaf area index, dry weight of stem and leaf, plant height etc. showed positive significant correlation with both green fodder field and dry matter yield. Combining ability analysis showed that lines IFC 8401 was a good general combiner for dry matter yield. Positively significant heterosis was exhibited by the hybrids IFC 95102 x EC 241044, HES82 x EC 241044. IFC 8401 x EC 241044, EC 241027 x UPC 953 and IFC 95102 x N 311. The hybrid HES82 x EC 241044 recorded high yield and quality fodder.

### **Guinea grass**

Guinea grass being a vegetatively propagated crop is having limited variability. To induce variability through mutations an attempt was made with the mutagens, gamma ray four

doses ranging from 15 krad to 39 krad and EMS four concentrations ranging from 0.25 to 1.00 per cent.  $M_1$  and  $M_1 V_1$  generation were adversely affected by mutagen treatments of higher doses. High reduction and delayed flowering were recorded in  $M_1$ . Pollen sterility showed a dose dependent correlation. Morphological abnormality included dwarf, semi open and open type of leaf arrangement, inflorescence modifications etc. The doses of 20 krad gamma rays and 0.25 per cent of EMS were found to be effective in producing beneficial variations. Positive shifts in the means of girth at internode and leaf area index and green fodder yield were recorded in the above treatments.

Seeds of 'FR-600' variety of guinea grass were exposed to 5 concentrations of Ethyl methane sulphonate (0.2 – 1.0 per cent, 8 hrs.) and 10 doses of gamma rays (5 – 50 krad) and their effects in the  $M_1$  and  $M_1 V_1$  generations were studied. Freshly harvested seed was found to give lower germination percentage. Storing the seed for 100 days was found to be an alternative to get good germination. The seed germination was found to be decreased rapidly as the concentration of ethyl methane sulphonate was increased whereas gamma rays could influence germination only slightly. Treatments with both mutagenic agents retarded the seed germination. However, gamma rays found to have stimulatory effect on germination at lower doses. The survival of seedling found to be affected by both the treatments, stimulatory effect of seedling height was observed at certain doses of gamma ray treatments. The growth of root was more affected by Ethyl methane sulphonate and that of the shoot by gamma rays. Survival of plants and plant growth was found to be not significantly affected by both mutagens. In gamma ray treatments, a non-significant increase in height was observed. Tiller number and inflorescence per clump were not affected by both the treatments. Pollen sterility showed a positive relationship with doses of both treatments Chlorophyll chimeras were observed in both the treatments. Morphological variations noticed included dwarf plants and plants with alternations in inflorescence, leaf structure and plants with chaffy car heads. Green fodder yield as well as dry matter content were found to be significantly not affected by both mutagen treatments.  $M_1 V_1$  clobe numbers 5, 10, 12 and 13 were found to give higher yield than the remaining clones.

Open pollinated seeds collected from six guinea grass clones were used for genetic evaluation of progeny. The progeny of pubescent clones were found segregating into pubescent and glabrous types indicating the production of superior hybrid clones using the glabrous character as marker gene. Dry matter yield was found contributing maximum towards green fodder yield. Plant height and tiller counts have also shown positive correlation with green fodder yield. Through divergence analysis the six varieties were grouped into 3 genetic constellation. The inter cluster distance was maximum between II and III. The inflorescence count was contributing maximum towards divergence followed by crude protein content, tiller counts and height.

Studies on variability, correlation and path analysis revealed that selection based on plant height, leaf area index and leaf: stem ratio will be effective for the improvement of fodder yield in guinea grass.

A selection index was prepared on the basis of green fodder yield, height, tiller number, leaf area and leaf: stem ratio. Six progenies of MC-23 and Mackuenii were identified as genetically superior while exercising 10 per cent selection.

### **Lemon grass**

Autotetraploidy was induced in lemongrass by seed treatment with colchicine. The survival of colchicine treated plants was lower than their control in all the treatments. In colchicine treated plants, the height, number of tillers and length and width of stomata increased whereas there was reduction in the number of stomata and pollen fertility. The plants selected as suspected polyploids after vigorous screening of the population were found more vigorous and robust than their control.

### **Koduveli**

Seven ecotypes of *Plumbago rosea* and one related species *Plumbago zeylanica* were used for the evaluation. Pollen grains of all ecotypes of *P. rosea* did not germinate under invitro and in vivo conditions. All the pollination techniques failed to give positive result on seed set in *P. rosea*. Plumbagin content was significantly low in *P. zeylanica* when compared to all other ecotypes of *P. rosea*. High yielding mutants were observed in 0.75 and 1.0 kR of mutagen. Twenty four high yielding mutants were selected for further evaluation.

### **Orchids**

Fourteen *Dendrobium* genotypes were evaluated morphologically in replicated field trials and were crossed in a diallel pattern to analyse compatibility relationships. A total of 190 combinations (88 crosses + 88 reciprocals + 14 selfs) were attempted. Incompatibility was analysed at 9 different stages from pollination to hardening and a total of 123 combinations succumbed to incompatibility at these different stages. Seedlings from 67 combinations were established successfully in the green house out of which 16 combinations flowered. Morphological characterization of the hybrids, heterosis and gene action were studied. Out of the 16 flowering combinations, 40 promising individual hybrids were selected based on novelty, distinctiveness and uniformity for further trials and development into commercial varieties.

Twelve monopodial orchid varieties were evaluated morphologically in replicated field

trials and were crossed in a diallel pattern to study compatibility relationships. A total of 116 combinations (50 crosses, 54 reciprocals & 12 selfs) were attempted. Incompatibility was analysed at 8 different stages starting from pollination to seedling deflasking. 58 combinations aborted in the stages from pollination to capsule harvest. Harvestable green capsules were obtained from 58 combinations and were inoculated in vitro in half MS medium. Capsules from 12 combinations did not contain seeds and seeds from 10 combinations did not germinate. Protocorms from 12 combinations aborted in vitro. A total of 92 combinations succumbed to incompatibility of different stages and seedlings from 24 combinations were deflasked. Analysis of growth rate in vitro and seedling morphology at deflasking were done

### **Anthurium**

Studies were conducted in six commercially important varieties of *A. andreaeanum*. viz. Honeymoon red, chilli red, Kalympong orange, Kalympony red, Pink and white. Among the 78 cross combinations, the highly compatible crosses were HR x P and P x HR. The cross combinations HR x CR, HR x KR, CR x W, KR x P, P x P and W x KR had medium fruit set and high germination. The incompatible cross combinations were KO x KR, CR x HR, CR x P, W x CR, KR x KR and W x KO.

Fifty genotypes of *Anthurium andreaeanum* were subjected to variability studies. High PCV and GCV were recorded for anthocyanin content, pollen fertility, inclination of candle to spathe and duration of interphase. High heritability and genetic advance were recorded for all the characters except suckering ability which indicated that selection of plants with superior phenotypic characters will result in significant improvement of the crop. Most of the characters showed high phenotypic and genotypic correlations. Pollen fertility ranged from 7.03% to 50.80%.

Variability studies indicated high PCV and GCV for the characters, number of suckers per plant, pollen fertility and duration of male phase. High heritability coupled with high genetic advance values were found for the characters number of suckers per plant, pollen fertility and pollen size. Plant height was found to have highly significant positive phenotypic correlation with number of suckers per plant, leaf size, internodal length, number of spadices per plant and pollen fertility. Duration of female phase showed positive genotypic correlation with all characters except days to initiation of female phase. Pollen fertility estimate using acetocarmine method indicated that most of the genotypes had low fertility values. A total of 23 crosses were attempted based on the availability of receptive spadices and fresh pollen, out of which 12 were found to be successful. Among the 12 successful crosses per cent of candles bearing fruits was 100 per cent for six crosses. Among the ten female parents, 'PR x MO', 'LR x PR' and 'PR x KR' performed as the best female parents and among the four male parents 'Liver Red' performed as the best pollen parent.

Another study on variability showed high PCV and GCV for the characters plant height, position of candle, days to initiation of female phase, number of days in female phase and spathe size. The characters with high heritability coupled with high genetic advance values were plant height, spathe size, spathe candle ratio, position of candle, number of flowers/candle and days to initiation of female phase. Plant height was found to be positively correlated with number of leaves and spadices per year. Spathe size and candle length were positively correlated. Candle length had high positive genotypic correlation with position of candle and number of flowers per candle. Scoring of compatibility reaction based on a scale ranging from 0 to 09 showed the highest compatibility score of 9 for PR x LR and CR x MN crosses. The best female parents were Nitta orange, liver red and pompon red are the best pollen parents. Only the variety Ceylon red and Liver red performed well both as female and male parent.

The characters with high heritability coupled with high genetic advance values were leaf area, anthocyanin content and inclination of candle. Plant height was found to be positively correlated with number of leaves and spadices per plant per year. Candle length had positive genotypic correlation with position of candle. The best female parents identified were 00 x KR and PR x LR based on the overall performance.

Morphological and compatibility studies were conducted in six commercially important varieties of *A. andreanum* viz. Honeymoon red, Chilli red, Kalympong orange, Kalympong red, Pink and white. Large sized plants were observed in Kalympong red. The leaf plastochrom duration was lowest in white and Chilli red varieties. The varieties pink and Kalympong red produced super large flowers and the white variety produced smallest flowers. There was significant correlation between leaf size and spathe size. The largest leaf size and spathe size were observed in the pink variety. The candle was long and fleshy in the variety pink and shortest in the white variety. Maximum angle between spadix and plane of the spathe was observed in the Honeymoon red variety. The angle was minimum in Chilli red. Maximum number of flowers were produced in Pink and Honeymoon red varieties. The average percentage of candles bearing fruits was maximum for the variety White and minimum for Kalympong red. Maximum fruits were harvested from the cross P x HR (52.3%). Average duration of fruit maturity was maximum for the variety white. Pink and Honeymoon red varieties produced larger sized seeds. Maximum germination was observed in combination with white as the female parent (63.4%). Germination was lowest Kalympong orange. Among the 28 cross combinations, the highly compatible crosses were MR x W, KR x P, P x P and W x KR had medium fruit set and high germination. The incompatible cross combinations were KO x KR, CR x HR, CR x P, W x CR, KR x KR and W x KO.

## VARIETIES RELEASED

### Rice

1. Name of variety : **Aarathy**  
Breeding methodology adopted : Recombination breeding(Jaya x Ptb.33)  
Season : Khariff  
Situation : Wetlands – as transplanted crop for delayed sowing situations  
Duration : 127 days  
Productivity : Grain – 3825 kg/ha  
Straw – 6550 kg/ha  
Special features : High yielding,  
Medium duration  
Red rice
2. Name of variety : **Remya**  
Breeding methodology adopted : Introduction (Evolved at the Rice Research Station, Moncompu  
Season : Khariff  
Situation : Wetlands – as transplanted crop  
Duration : 126 days  
Productivity : Grain – 4193 kg/ha  
Straw – 6775 kg/ha  
Special features : High yielding  
Medium duration  
Red rice

### Sesame

1. Name of the variety : **Soma**  
Breeding methodology adopted : Pureline selection from Type No.38  
Season : Summer  
Situation : Rice fallows  
Duration : 83 days

Productivity	: Seeds – 173 kg/ha
Special features	: Determinate growth Shy branching Multi loculed capsules White bold seeds
2. Name of the variety	: <b>Surya</b>
Breeding methodology adopted	: Pureline selection from Type No.42
Season	: Rabi Suitable for summer rice fallows also
Situation	: Open uplands
Duration	: 87 days
Productivity	: Seeds – 355 kg/ha
Special features	: Multi loculed capsules Shy branching

3. Name of variety	: <b>Thilak</b>
Breeding methodology adopted	: Pureline selection from “North Kerala Local”
Season	: Summer
Situation	: Rice fallows
Duration	: 84 days
Productivity	: Seeds – 648 kg/ha
Special features	: Branching plant type

### **Groundnut**

1. Name of variety	: <b>T.G.3</b>
Breeding methodology adopted	: Mutation Breeding from Spanish improved (Evolved at BARC, Trombay)
Season	: Khariff and Summer
Situation	: i) Khariff in uplands – In the open as well as under partial shade in coconut gardens ii) Summer in rice fallows

Duration	: 108 days
Productivity	: Khariff – Pods : 2880 kg/ha Khariff – under shade – Pods : 511 kg/ha Summer – Pods : 2745 kg/ha
Special features	: Early bunch type
2. Name of the variety	: <b>T.G.14</b>
Breeding methodology	: Recombination of mutants from Spanish improved (Evolved at BARC, Trombay)
Season	: Khariff and Summer
Situation	: i) Khariff in uplands – in the open ii) Summer in rice fallows
Duration	: 111 days
Productivity	: Khariff – Pods – 3136 kg/ha Summer – Pods 2472 kg/ha
Special features	: Early bunch type Shallow pod burial
3. Name of the variety	: <b>Spanish improved</b>
Breeding methodology adopted	: Introduction [Exotic variety]
Season	: Khariff
Situation	: Uplands – in the open
Duration	: 105 days
Productivity	: Pods – 2873 kg/ha
Special features	: Early bunch type
4. Name of the variety	: <b>Sneha</b>
Breeding methodology	: Combination breeding
Season	: Khariff Season
Situation	: Adapted for cultivation in uplands during Kharif season



- Duration : 86 days
- Productivity : Pod yield – 2400 kg/ha - 1
- Special features : Oil content – 47%  
Protein content – 24%
5. Name of the variety : **Snigdha**
- Breeding methodology : Combination breeding
- Season : Kharif season
- Situation : Adapted for cultivation in uplands during khariff season
- Duration : 87 days
- Productivity : Pod yield 2458 kg ha - 1
- Special features : Oil content – 47%  
Protein content – 23.3%

### **Cowpea**

1. Name of the variety : **V.26**
- Breeding methodology adopted : Introduction – Induced mutant of Pusa Phalguni [Evolved at IARI, New Delhi]
- Season : Khariff
- Situation : Open uplands as companion crop for tapioca
- Duration : 66 days
- Productivity : Seed – 490 kg/ha
- Special features : Non- to shy-trailing type  
Erect plant type
2. Name of the variety : **Chharodi-1 (G.C.2)**
- Breeding methodology adopted : Introduction [Evolved at G.A.U.]
- Season : Khariff
- Situation : Uplands – as floor crop in coconut gardens

Duration	: 76 days
Productivity	: Seed – 351 kg/ha
Special features	: Compact plant type Synchronous pod maturity

### **Blackgram**

1. Name of the variety	: <b>T.A.U. 2</b>
Breeding methodology adopted	: Introduction [Evolved at BARC, Trombay]
Season	: Rabi
Situation	: Uplands – as floor crop in coconut gardens
Duration	: 75 days
Productivity	: Seeds – 372 kg/ha
Special features	: Tolerant to partial shade Tolerant to moisture stress

### **Vegetable Chilli**

1. Name of the variety	: <b>Jwalamukhi*</b>
Breeding methodology adopted	: Recombination breeding – Vellanotchi x Pusa Jwala
Season	: All seasons
Situation	: Homesteads
Duration	: 137 days
Productivity	: Fruits – 22.5 tons/ha
Special features	: Protracted fruiting Succulent fruits Tolerant to partial shade
2. Name of the variety	: <b>Jwalasakhi*</b>
Breeding methodology adopted	: Recombination breeding – Vellanochi x Pusa Jwala

Season	: All seasons
Situation	: Uplands as pure crop
Duration	: 125 days
Productivity	: Fruits – 19.6 tons/ha
Special features	: Large succulent fruits Low pungency Smooth and sulphur coloured

- The above two varieties were highlighted in the Agricultural Policy of Kerala State

### Vegetable Cowpea

1. Name of the variety	: Malika
Breeding methodology adopted “Trivandrum Local”	: Single plant selection from
Season	: Khariff and summer
Situation	: Homesteads and rice fallows
Duration	: 100 days
Productivity	: Veg. Pods – 9.8 tons/ha
Special features	: Pole type Long, light green pods
2. Name of the variety	: <b>Sharika</b>
Breeding methodology adopted “Valiyavila Local”	: Single plant selection from
Season	: Khariff and summer
Situation	: Khariff – uplands Summer – rice fallows Suitable for homesteads also
Duration	: Khariff – 90 to 110 days Summer – 70 to 110 days
Productivity	: Veg. Pods – Khariff – 12.84 tons/ha

Special features : Veg. Pods – Summer – 10.62 tons/ha  
: Pole type  
Long pods with purple beak

### **Grain Cowpea**

1. Name of the variety : **Shubhra**  
Breeding methodology adopted : Recombination breeding  
Season : Summer season  
Situation : Summer rice fallow condition  
Duration : 67 days  
Productivity : Grain yield: 988 kg/ha  
Special features : Protein content: 22.75%  
Cooking quality: Very good

### **Bhindi**

1. Name of the variety : **Kiran**  
Breeding methodology adopted : Single plant selection from  
Local “Kilichundan”  
Season : Khariff and summer  
Situation : Khariff – uplands  
Summer – Rice fallows  
Duration : 100 days  
Productivity : Fruits – 11.21 tons/ha  
Special features : Early fruiting  
Long, straight, yellowish-green fruits

### **Amaranthus**

1. Name of the variety : **Arun**  
Breeding methodology adopted : Mass selection  
from “Palappoor Local”  
Season : Throughout the year  
Situation : Rice fallows, uplands and in homesteads

Duration : 54 - 140 days  
 Productivity : Vegetable – 20.1 tons/ha per cutting

Special features : Photo-insensitive  
 Purple colour  
 Good quality, suitable for multi-cut

**Sweet Potato**

1. Name of the variety : **Kanjangad**

Breeding methodology adopted : Clonal selection from “Kanjangad Local”

Season : Khariff

Situation : Uplands

Duration : 115 days

Productivity : Tubers – 12.02 tons/ha

Special features : Purple coloured and Spindle shaped tubers  
 Yellow, soft flesh

**Guinea grass**

1. Name of the variety : **Haritha**

Breeding methodology adopted : Mutation breeding from F.R.600

Season : Throughout the year

Situation : Uplands

Duration : Semi-perennial grass

Productivity : Grass – 1.74 t/ha per cutting

Special features : Shy flowering  
 Glabrous leaves  
 Suitable for partial shade

2. Name of the variety : **Marathakam**

Breeding methodology adopted	: Mutation breeding from F.R.600
Season	: Throughout the year
Situation	: Uplands
Duration	: Semi-perennial grass
Productivity	: Grass – 9.05 tons/ha per cutting
Special features	: High fodder yield Better fodder quality

## **Coconut**

1. Name of the variety	: <b>Komadan</b>
Breeding methodology adopted	: Introduction- Local Cultivar
Season	: Not applicable
Situation	: Uplands
Duration	: Perennial
Productivity	: 163 nuts/palm/year
Special features	: Nut colour - bronze Weight of husked nut – 551 g Copra content per nut – 177 g Oil content – 65.2 %

## **Varieties in the pipeline**

- \* Yellow Vein Mosaic resistant bhindi.
- \* High yielding hybrid bhindi
- \* Guinea grass with high fodder yield
- \* Bajra Napier Hybrid with high fodder yield and better quality
- \* Multiple resistant tomato
- \* High yielding fodder cowpea
- \* High yielding black gram with high nitrogen fixing capacity
- \* High yielding fodder rice bean

## PLANT BREEDING AND GENETICS CLUB

The 'Plant Breeding and Genetics Club' was inaugurated by Dr.R. Vikraman Nair, Dean, College of Agriculture on 16.1.2002. The following activities were conducted as part of the Club.

- \* Study tour to Rajiv Gandhi Centre on 22.7.2002 was conducted in which all the staff members and PG students took part.
- \* A guest lecture was arranged on 3.8.2002 in which Dr. V. Gopinathan Nair, Former Professor and Head of the Department of Plant Breeding and Genetics, College of Agriculture, Vellayani delivered a lecture on "Genetically modified plants – scope and limitations".
- \* A lecture on "Plant Breeder's Rights" was delivered by Dr. R. Gopimony, Former Professor and Head of Plant Breeding and Genetics, College of Agriculture, Vellayani on 3.2.2003.
- \* A study tour to "Seaside Farm" at Perumathura owned by Sri. V.K. Karthikeyan, Joint Director of Agriculture (Rtd.) a former M.Sc. (Ag.) student of this College and Biotechnology Centre at Kazhakuttam was conducted on 18.5.2004 in which all the staff members and PG students participated.
- \* Another study tour was conducted to Tropical Botanical Gardens at Palode on 27.7.2004 where the staff, PG students and JRFs had a very good exposure to the germplasm collections available there and also to the functioning of the tissue culture and biotech Labs.
- \* A guest lecture on "Intellectual property Rights" was delivered by Dr. R.S. Kulkarni, Professor, Department of Genetics and Plant Breeding, GKVK Campus, University of Agricultural Sciences, Bangalore on 17-6-2005.

## PUBLICATIONS

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Name of Book	Author
Field and Plantation Crops (Malayalam)	Dr. R. Gopimony (State Institute of Lanaguages)
Rose (Malayalam)	“
Crop Botany (Malayalam)	“
Plant Breeding (Malayalam)	“
Pre-Degree Botany (Malayalam)	“
Banana Cultivation (Malayalam)	“
Plant Breeding Manual (English)	“
Agricultural Genetics (Malayalam Translation of the English Text Book of the Same name by James L. Brow Baker)	“
A guide for farmers (Malayalam)	“ (S.P.C.S., Kottayam)
Homestead farming (Malayalam)	“ “
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The man and the Universe	“ (D.C. Books, Kottayam)
The Raw Expedition	“ “
Gold from the Soil	“ (Gandhi Smaraka Nidhi)
Home Garden	“ (KAU)
Pineapple	“ “
Krishi Panchangam	“ “
Sasya Sabdavali	“ “
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## AWARD WINNERS



**Dr. V.G. Nair**

Kerala State Krishivijnan award

1997



**Dr. Sverup John**

Kerala State Krishivijnan award

1999



**Dr. C. Lekha Rani**

Indian Council of Agricultural  
Research Jawaharlal Nehru  
National award

2004



**PG STUDENTS SECURING I.C.A.R. FELLOWSHIP**

**Reeja S. Dharan** for M.Sc. (Ag.)  
(1991-11-30)

**Babu. R** for M.Sc. (Ag.)  
(1995-11-27)

**Yasin Jeshima** for Ph.D.  
(2003-21-12)

**PG STUDENTS SECURING CSIR FELLOWSHIP**

**Muthuswamy. A** for Ph.D.  
(2000-21-14)

**Mini. S** for Ph.D.  
(2001-11-18)

**Bini. K.** for Ph.D.  
(2001-11-66)



**Bini Philip** for Ph.D.  
(2001-21-13)

**Lovely. B.** for Ph.D.  
(2001-21-13)



