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ALL INDIA CO-ORDINATED CASHEW
IMPROVEMENT PROJECT (AICCIP)
MADAKKATHARA, KERALA

ANNUAL REPORT 1991-92



KERALA AGRICULTURAL UNIVERSITY
MADAKKATHARA-680656
THRISSUR, KERALA
I N D I A

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GENERAL INFORMATION

Project title : All India Co-ordinated Cashew Improvement Project (AICCIP)

Project code : 176

Report No. : 21

Date of start : 01.05.1973

Period of report : 01.01.1991 to 31.03.1992

Sponsored by : Indian Council of Agricultural Research, Krishi Bhavan, New Delhi

Centre : Cashew Research Station
Madakkathara - 680 656
Kerala Agricultural University
Thrissur district, Kerala state.

Present staff position:

Name of post	Name of personal	Date of joining	Position of vacant post
1. Associate Professor	Dr.M. Abdul Salam	11.06.1990 to 26.09.1992	Nil
	Sri.T.N. Jagadeesh Kumar (Asst. Prof.)	01.11.1991	Nil
2. Assistant Professor	Dr.S.Pathummal Beevi Assoc. Prof.(NC)	04.05.1989	Nil
3. Jr. Asst. Professor	Smt.P.B. Pushpalatha	30.11.1987 to 22.10.1991	Nil
		Smt. K.E. Usha	01.02.1992
4. Farm Assistant (Grade II)	Sri. C. Gireesan	05.06.1987	Nil

Financial outlay of the centre

Year	Total sanctioned grant			Total amount spent		
	Recurring Rs.	Non-Recurring Rs.	Total Rs.	Recurring Rs.	Non-Recurring Rs.	Total Rs.
1972-73 to 1977-78	2,95,110	86,000	3,81,110	2,76,060	33,543	3,09,603
1978-79 to 1979-80	1,33,908	--	1,33,908	1,41,912	--	1,41,912
1980-81 to 1984-85	4,99,000	50,000	5,49,000	5,87,954	7,472	5,95,426
Seventh Plan						
1985-86	80,000	--	80,000	1,29,657	--	1,29,657
1986-87	1,63,000	--	1,63,000	1,65,704	--	1,65,704
1987-88	1,65,000	50,000	2,15,000	1,72,800	56,417	2,29,217
1988-89	1,69,000	--	1,69,000	1,87,617	--	1,87,617
1989-90	1,72,000	--	1,72,000	2,45,053	--	2,45,053
1990-91	1,91,800	--	1,91,800	2,20,477	--	2,20,477
1991-92	3,36,800	--	3,36,800	2,32,766	--	2,32,766

TECHNICAL PROGRAMME FOR THIS CENTRE AS APPROVED IN THE
NATIONAL GROUP DISCUSSION OF CASHEW RESEARCH WORKERS HELD
AT CPCRI KASARGOD FROM 30th AUGUST TO 1st SEPTEMBER 1991

CROP IMPROVEMENT AND VARIETY RELEASE

- i) Germplasm collection, maintenance and description ,
of types
- ii) Multilocational trial with 18 cashew varieties/hybrids
from Vittal, Vridhachalam, Vengurla, Madakkathara and
Bapatla
- iii) New multilocation trial with varieties from Bapatla,
Vengurla, Vridhachalam and NRC-Cashew, Puttur
- iv) Hybridisation and selection

PROPAGATION AND ROOT STOCK STUDIES

- i) Flush grafting in cashew - standardisation of time of
beheading for inducing flushes
- ii) Top working trials in cashew - large plot trial on
top working
- iii) Screening of cashew root stocks at nursery stage for
the use as dwarfing root stock

AGRONOMY

- i) Foliar application of urea along with insecticides
- ii) NPK fertilizer experiment

CROP PROTECTION

- i) Chemical control of pest complex in cashew
 - (a) Tea mosquito
 - (b) Control of minor pests

- ii) Control of stem and root borer in cashew-prophylactic control trial

- iii) Bioecology of pests of regional importance and survey of pest complex and natural enemies

- iv) Screening of germplasm to locate tolerant/resistant types to major pests of the region

I CROP IMPROVEMENT

Gen-1 (a) Germplasm collection evaluation, characterisation and cataloguing

Principal Investigator : Sri. T.N. Jagadeesh Kumar

Associate : Smt. K.E. Usha

A total of 99 accessions collected till 1991 have been maintained and observations recorded. Softwood grafts of these accessions were planted with a spacing of 4m x 4m. An additional 25 local, high yielding and tea mosquito tolerant types were collected from Anakara and Kothachira of Palakkad district, Iritty and Ulikkal areas of Kannur district during 1991-92 season. Softwood grafts of 15 these accessions have been successfully prepared and will be planted during this season.

The details of the germplasm accessions planted till 1991 are given below:

Sl. No.	Source of collection	No. of accessions collected	Remarks
a)	Republic of Panama	14	Not listed in Table 1
b)	Kerala Cashew Farm, Kottarakkara	11	
	Cashew Research Station Madakkathara	26	
	Cashew Research Station Anakkayam	24	
c)	NRCC, Puttur	8	
d)	Bapatla	7	Released varieties
e)	Vengurla	6	of Bapatla, Vengurla, Jhargram
f)	Jhargram	1	and Vittal
g)	Vittal	2	
	Total	<u>99</u>	

Observations on biometric characters of all the accessions and flowering characters of 63 accessions were recorded. The mean data are given in Table 1.

Gen-3 Expt.2

Varietal evaluation - multilocational trial with 18 varieties from Vittal, Vridhachalam, Vengurla, Bapatla and Madakkathara.

Principal Investigator : Sri. T.N. Jagadeesh Kumar
Associate : Smt. K.E. Usha

The experiment was laid out during June 1987.

The experiment details are given below:

Design	:	Randomised Block Design
Treatments	:	18 (18 varieties)
Replication	:	3
No. of plants per treatment	:	4
Spacing	:	7.5 x 7.5 m
Planting material	:	Softwood grafts
Date of planting	:	15.06.1987

Table 1 Biometric and flowering characters of the accessions in clonal germplasm conservation block

ACC. No.	Type/variety	Source of collection	Plant height (m)	Plant habit	Branching	Girth (50cm & above ground level)	Canopy spread (m)		No. of laterals per leader	Date of first flowering	Length of panicle	Breadth of panicle
							E-W	N-S				
1	2	3	4	5	6	7	8	9	10	11	12	13
<u>ACCESSIONS PLANTED DURING 1988</u>												
15	Brazil-2	Cashew Farm, Kottarakkara	3.25	Erect	Intensive	29.00	3.58	3.78	24.75	01.11.91	14.25	14.88
16	Brazil-3	"	1.93	Bushy	Extensive	15.33	1.80	2.13	22.75	05.11.91	14.15	13.82
17	Brazil-20	"	2.78	Semierect	Extensive	27.75	3.68	3.93	19.00	12.11.91	18.50	24.00
18	Brazil-239	"	3.20	Spreading	Intensive	29.25	4.05	4.05	21.00	25.11.91	15.50	20.50
19	Brazil-249	"	3.06	Spreading	Extensive	27.67	3.77	3.73	18.60	25.11.91	14.38	18.00
20	Brazil-244	"	2.65	Spreading	Extensive	25.25	3.20	3.23	16.50	01.12.91	19.75	23.50
21	Brazil-248 M	"	2.70	Semierect	Intensive	30.00	2.78	3.50	17.50	01.12.91	15.00	16.80
22	Brazil-248 S	"	2.63	Erect	Intensive	20.00	2.23	2.28	14.00	01.12.91	12.50	21.50
23	KTR-27	"	2.75	Semierect	Intensive	29.25	3.65	3.43	19.50	25.11.91	15.57	22.71

Contd.....

Table 1 contd....

1	2	3	4	5	6	7	8	9	10	11	12	13
24	Paruthiyara	Cashew Farm, Kottarakkara	2.40	Erect	Extensive	23.33	3.50	3.20	23.00	28.11.91	13.88	16.00
25	Vapala	"	2.58	Erect	Intensive	27.25	2.58	2.60	23.00	15.11.91	16.25	20.25
26	Anakkayam-1	CRS Madakkathara	2.60	Semierect	Extensive	27.25	3.68	3.78	24.70	20.11.91	11.88	16.25
27	BLA-39-4	"	2.53	Erect	Intensive	25.00	3.10	3.10	45.00	20.11.91	12.65	17.85
28	K-22-1	"	2.37	Semierect	Extensive	20.33	2.60	2.50	20.00	25.11.91	15.88	17.63
29	NDR-2-1	"	3.00	Erect	Extensive	28.75	2.90	2.70	22.00	02.12.91	15.50	20.88
30	H-3-13	"	2.68	Semierect	Extensive	24.00	2.78	3.10	20.00	25.11.91	17.75	20.13
31	H-3-17	"	2.85	Spreading	Extensive	25.50	3.48	3.00	25.00	25.11.91	20.00	20.50
32	H-680	"	2.93	Spreading	Intensive	29.50	4.40	3.65	18.50	28.11.91	15.00	16.50
33	H-682	"	2.90	Bushy	Intensive	27.00	3.97	3.77	16.00	10.12.91	11.25	13.50
34	H-718	"	3.20	Semierect	Extensive	29.33	4.10	4.20	17.50	20.11.91	13.67	18.67
35	H-719	"	3.20	Erect	Extensive	29.25	3.66	3.55	24.00	20.11.91	14.00	17.00
36	H-856	"	2.80	Semierect	Extensive	28.75	3.88	3.78	18.30	28.11.91	15.88	20.00
37	H-1588	"	3.83	Semierect	Extensive	27.75	3.20	2.75	17.00	30.10.91	20.67	28.67

Contd....

Table 1 contd....

1	2	3	4	5	6	7	8	9	10	11	12	13
38	H-1589	CRS Madakkathara	2.90	Erect	Extensive	25.50	2.70	2.80	18.50	04.11.91	16.00	18.00
39	H-1591	"	2.78	Semierect	Extensive	24.75	3.18	3.30	15.00	25.11.91	15.80	17.60
40	H-1593	"	2.53	Semierect	Intensive	23.67	2.70	2.93	17.50	01.12.91	14.50	17.75
41	H-1596	"	2.70	Semierect	Intensive	29.50	3.50	3.70	19.25	25.11.91	14.50	18.50
42	H-1597	"	2.88	Spreading	Extensive	29.25	4.28	4.05	21.00	10.11.91	17.25	17.38
43	H-1598	"	3.75	Erect	Extensive	27.00	3.58	3.13	22.50	25.11.91	16.88	19.13
44	H-1600	"	2.50	Bushy	Extensive	23.75	2.83	3.23	24.00	20.11.91	17.33	19.33
45	H-1602	"	2.28	Semierect	Extensive	20.25	2.33	2.45	19.50	25.11.91	13.40	14.80
46	H-1608	"	2.70	Semierect	Extensive	27.25	3.03	3.33	25.00	28.11.91	14.00	16.00
47	H-1610	"	2.30	Semierect	Extensive	20.25	2.75	2.60	20.50	05.01.91	16.25	17.90
48	M-1-2	"	3.13	Erect	Intensive	31.75	3.13	3.50	24.00	25.01.91	13.25	16.88
49	M-26-2	"	2.52	Bushy	Intensive	29.25	3.65	3.80	23.50	15.11.91	13.38	16.00
50	PTR-1-1	"	2.50	Semierect	Intensive	23.00	3.45	3.48	21.00	28.11.91	12.75	16.63

Contd....

Table 1 contd....

1	2	3	4	5	6	7	8	9	10	11	12	13
<u>ACCESSIONS PLANTED DURING 1989</u>												
51	A-6-1	CRS Madakkathara	2.43	Semierect	Intensive	26.50	2.98	3.20	33.00	01.12.91	15.33	19.50
52	Pu-1	NRCC Karnataka	2.16	Erect	Extensive	17.33	1.60	1.33	16.50	24.11.91	16.00	19.00
53	Pu-2	"	2.03	Semierect	Intensive	23.00	2.38	2.55	13.20	15.11.91	17.00	14.80
54	Pu-4	"	2.40	Semierect	Extensive	19.00	2.93	2.70	16.50	10.12.91	14.66	16.00
55	Pu-6	"	3.00	Erect	Extensive	22.00	3.13	2.85	18.00	01.12.91	15.00	19.14
56	Pu-7	"	2.50	Semierect	Extensive	20.00	3.00	2.50	18.00	20.11.91	12.67	14.00
57	Pu-8	"	3.50	Erect	Extensive	27.00	3.08	3.23	18.00	25.11.91	18.60	24.00
58	Rajamundry	CRS Bapatla	2.08	Semierect	Extensive	17.25	1.95	2.10	15.00	25.11.91	11.66	21.33
59	UL-12-2	CRS Anakkayam	1.67	Bushy	Extensive	20.25	2.75	2.50	16.50	25.11.91	14.67	19.67
60	Brazil-8	"	2.95	Semierect	Extensive	22.75	2.58	2.70	18.00	25.11.91	14.17	17.16
61	K-3-1	"	2.45	Semierect	Intensive	24.25	3.55	3.70	18.00	30.11.91	18.00	19.33
62	K-3-2	"	2.33	Semierect	Extensive	25.55	2.50	2.68	22.50	30.11.91	17.30	19.50

Contd....

Table 1 contd....

1	2	3	4	5	6	7	8	9	10	11	12	13
63	K-4-1	CRS Anakkayam	2.03	Semierect	Extensive	25.75	3.00	3.03	18.15	25.11.91	15.00	21.00
64	K-4-2	"	2.48	Semierect	Extensive	26.00	2.95	3.20	22.50	25.11.91	15.83	27.33
65	K-10-2	"	2.43	Semierect	Extensive	26.00	2.75	3.30	18.00	25.11.91	16.00	19.00
66	K-10-2	"	2.73	Spreading	Extensive	25.00	2.47	2.87	34.50	01.12.91	13.83	17.33
67	K-16-1	"	2.25	Semierect	Extensive	18.00	2.40	2.50	24.90	25.11.91	14.50	17.66
68	K-18-2	"	2.80	Erect	Extensive	21.50	2.08	2.30	21.00	25.11.91	15.17	19.17
69	K-19-1	"	2.55	Semierect	Intensive	24.75	2.88	2.73	20.25	25.11.91	13.33	18.50
70	K-19-2	"	2.93	Spreading	Extensive	29.75	3.50	3.53	24.00	25.11.91	15.00	20.67
71	K-30-1	"	2.05	Semierect	Extensive	22.25	2.25	2.20	24.75	15.11.91	14.00	18.28
72	H-3-4	"	2.20	Bushy	Extensive	21.25	2.50	2.45	18.00	10.11.91	16.25	19.14
73	H-3-9	"	2.38	Spreading	Extensive	28.67	3.08	3.08	28.50	10.11.91	13.00	15.60
74	H-7-6	"	2.40	Semierect	Extensive	22.00	2.83	2.93	25.50	10.12.91	17.17	21.17
75	H-8-1	"	2.33	Semierect	Intensive	24.67	2.40	2.33	26.50	01.12.91	15.33	17.17
76	H-8-6	"	1.73	Spreading	Extensive	19.00	2.26	2.73	13.50	25.11.91	18.40	19.40

Contd....

Table 1 contd....

1	2	3	4	5	6	7	8	9	10	11	12	13
77	H-8-7	CRS Anakkayam	2.28	Erect	Intensive	24.75	2.40	2.55	24.00	28.11.91	13.00	19.00
78	H-8-8	"	2.43	Semierect	Intensive	22.75	2.50	2.28	18.00			
79	H-8-10	"	2.37	Semierect	Intensive	22.00	1.87	2.47	16.00			
80	H-8-15	"	1.93	Bushy	Intensive	20.50	2.05	2.28	17.25			
81	H-9-3	"	1.85	Spreading	Extensive	18.25	3.00	2.40	15.75			
82	BLA-256-4	"	1.90	Spreading	Intensive	21.00	2.93	3.07	16.00			

Treatments : 18 varieties

Sl. No.	Treatment No.	Variety	Source
1	T ₁	H-1598	Madakkathara
2	T ₂	H-1600	"
3	T ₃	H-1608	"
4	T ₄	H-1610	"
5	T ₅	Vittal 30/4	Vittal
6	T ₆	Vittal 59/2	"
7	T ₇	Bapatla T-129	Bapatla
8	T ₈	Bapatla T-40	"
9	T ₉	Bapatla 2/15	"
10	T ₁₀	Bapatla 2/16	"
11	T ₁₁	Vengurla-2	Vengurla
12	T ₁₂	Vengurla-3	"
13	T ₁₃	Vengurla-4	"
14	T ₁₄	Hybrid 24 (V5)	"
15	T ₁₅	Vridhachalam 33/3	Vridhachalam
16	T ₁₆	Vridhachalam 44/3	"
17	T ₁₇	Vridhachalam 26/2	"
18	T ₁₈	Anakkayam-1 (Check variety)	Madakkathara

All the cultural practices and plant protection measures were done as per the package of practice recommendations. Observations on plant height, stem girth, canopy spread, panicle and nut characters and nut yield were recorded.

The mean data on the panicle characters, yield and yield attributes are given in Table 2. Three cashew hybrids from Madakkathara (H-1600, H-1608 and H-1610) and one variety from Vengurla (Vengurla-3) produced longer panicles. The breadth of the panicle was more in the varieties 26/2, H-1600, H-1610 and Vengurla-3. The number of fruits per panicle were more in the varieties Vengurla-5, Vengurla-3, H-1598, Vittal 59/2, Vridhachalam 26/2, Anakkayam-1, Vengurla-2 and H-1600. The highest nut yield (5.84 kg/tree) was obtained from the varieties 44/3 followed by H-1598 (5.59 kg/tree) and 26/2 (5.42 kg/tree). The performance of these three varieties (44/3, H-1598 and 26/2) were on par but superior to all the other 15 varieties. The nut weight was more with the hybrid H-1610 where as the kernel weight was more with variety 2/16. The shelling percentage was more with the variety T-129 and it was on par with that of Anakkayam-1, Vittal 30/4 and T-40.

Gen-4 : Hybridization and selection

The objective of this project is to evolve high yielding varieties with desirable attributes like medium to bold nut size, high shelling percentage, high kernel weight etc.

The hybridization work at this centre was in progress from 1973 to 1979. A total number of 142 F_1 progenies are

Table 2 Panicle characters and yield attributes of different cashew varieties

Sl. No.	Variety	Panicle		No. of fruits/panicle	Nut yield kg/tree	Nut weight (g)	Kernel weight (g)	Shelling (%)
		Length (cm)	Breadth (cm)					
1	2	3	4	5	6	7	8	9
1	H-1598	12.67	9.77	6.00	5.59	6.11	2.01	32.70
2	H-1600	17.20	15.60	5.33	3.00	7.62	2.04	27.00
3	H-1608	18.13	11.77	3.33	3.87	7.87	2.02	25.66
4	H-1610	18.83	14.37	3.33	1.08	8.88	2.37	26.86
5	30/4	16.33	11.27	3.00	3.92	5.40	1.86	34.40
6	59/2	14.57	12.43	6.00	2.68	7.04	2.09	29.54
7	Tr.No.129	15.27	11.80	3.67	1.91	4.17	1.46	35.48
8	Tr.No.40	15.20	11.93	4.67	0.83	5.68	1.93	34.03
9	2/15	13.93	10.77	4.00	1.88	7.19	2.31	31.97
10	2/16	13.60	13.03	3.67	1.70	8.07	2.46	30.47

Contd....

Table 2 contd....

1	2	3	4	5	6	7	8	9
11	V2	14.93	10.77	5.67	1.85	6.46	2.04	31.61
12	V3	19.27	13.77	6.33	2.31	7.23	2.18	29.53
13	V4	14.60	12.17	3.33	1.89	7.40	2.33	31.40
14	V5	14.37	13.20	6.67	2.09	4.77	1.38	29.07
15	33/3	15.93	11.93	4.00	2.62	7.28	1.67	22.97
16	44/3	11.43	8.00	2.33	5.84	6.00	1.80	30.06
17	26/2	15.70	16.07	6.00	5.42	7.04	2.21	31.43
18	Anakkayam	13.70	10.77	5.67	2.41	4.83	1.71	34.43
SEm±		0.83	1.25	0.57	0.54	0.15	0.15	0.89
CD(0.05)		2.39	3.59	1.66	1.53	0.32	0.52	2.52

in the field as on 31.12.1991. After the initial evaluation, 14 hybrids were identified as promising. Of these, the four hybrids viz. 1597, 1598, 1608 and 1610 planted in the year 1973 have recorded a mean yield above 10 kg per tree per year for the past 14 years. Three of these viz. H-1598, H-1608 and H-1610 are undergoing multilocational trial in all the co-ordinating centres since 1987.

The following numbers of clonal progenies (softwood grafts) of the above hybrids have also been planted during 1987-88 at this centre for progeny evaluation.

<u>Hybrid No.</u>	<u>No. of clonal progenies</u>
1597	10
1598	16
1608	45
1610	27

The performance of the above hybrids are also being assessed in the comparative yield trial initiated during 1989 at the Regional Agricultural Research Station, Pillicode in Kannur district of North Kerala.

As per the recommendations of the National Group discussion of Cashew Research workers held at CPCRI Kasargod from 30 August to 1st September 1991, the following cross combinations were identified for further hybridisation.

1. BLA 139-1 x Vetore-56
2. BLA 139-1 x VTH-711
3. BLA-139-1 x Kankadi types

The concerned centres have been contacted for providing planting materials of Vetore-56, VTH-711 and Kankadi type. Since the same will be collected and planted during this year, hybridisation involving above parent combinations will be taken up subsequently. However hybridisation with the cross combination BLA-139-1 x NDR-2-1 was tried. Since the flowering phases of the two varieties do not synchronise always, only few crosses could be made during this year. Since the setting was poor sufficient progenies could not be obtained and hybridisation work will be continued during next year.

II AGROTECHNIQUES

A. HORTICULTURE

Hort. 2. Screening of cashew root stocks at nursery stage for the use as dwarfing root stock

Principal Investigator : 1. Smt. P.B. Pushpalatha
(from 01.04.91
to 21.10.91)

2. Smt. A. Suma
(from 22.10.91 to
31.01.92)

3. Smt. K.E. Usha
(from 01.02.92 to
31.03.92)

Associate : Sri. T.N. Jagadeesh Kumar

The objective of the experiment is to identify cashew types showing dwarfing characters. The anatomical and morphological characters were studied at nursery stage to locate dwarf types. Seeds collected from 5 trees showing less vigorous growth and 5 trees showing vigorous growth were utilised for the study. Growth characters were studied during the year 1990-91.

During 1991-92 phenolic content in leaves, stomatal index and bark percentage were studied. The results are given in Table 3.

Table 3 Data on growth and anatomical characters of less vigorous and vigorous cashew varieties

Varieties/types	Nut weight	Germi- nation percent- age	Growth characters				Anatomical characters				
			Height (cm)	Girth (cm)	No. of leaves	Inter- nodal length (cm)	Phenolic content (ppm)		Stomatal index	Bark percentage	
						Leaves	Bark of shoot tips			Stem	Root
Less vigorous											
1. Tree No.2286 (Madakkathara)	6.10	70.00	23.50	2.30	6.20	2.40	37	44	354	23.00	31.44
2. UL-8-2 (Anakkayam)	5.60	70.00	26.50	2.23	6.80	2.50	31	45	383	20.86	36.38
3. UL-10-2 (Anakkayam)	5.20	50.00	16.30	1.95	7.30	1.47	31	44	384	22.52	34.36
4. Tree No.2273 (Madakkathara)	5.00	80.00	23.90	2.08	6.60	2.58	46	46	387	21.10	31.54
5. Tree No.2121 (Madakkathara)	6.00	75.00	21.45	2.14	6.00	2.30	35	48	371	21.50	34.26
Vigorous types (All from Madakkathara)											
1. K-22-1	6.20	90.00	25.02	2.88	7.60	3.24	31	34	461	17.36	23.84
2. H-1591	10.80	80.00	25.68	2.26	7.40	3.48	28	36	440	16.94	21.60
3. H-1610	9.20	75.00	27.52	3.08	8.50	3.96	22	25	494	16.56	22.24
4. K-10-2	8.50	95.00	25.30	2.28	9.00	3.26	36	26	474	17.62	21.20
5. H-1600	8.20	70.0	26.60	2.96	8.00	3.42	30	25.5	398	17.62	20.90

The nut weight and germination percentage of less vigorous types were low when compared to vigorous types. Height, girth, number of leaves and internodal length were more in the vigorous types. The stomatal index in leaves of less vigorous types were lower than that of vigorous types. A field trial will be laid out with the seedlings of both the types during the ensuing season (June-July) for further evaluation.

A field survey was conducted in Palakkad district and two cashew dwarf types were identified. The seeds collected will also be included for further studies.

Hort. 3. (a) Top working trial

Principal Investigator : 1. Smt. P.B. Pushpalatha
(from 01.04.91 to
21.10.91)

2. Smt. A. Suma
(from 22.10.91 to
31.01.92)

3. Smt. K.E. Usha
(from 01.02.92 to
31.03.92)

Associate : Sri. T.N. Jagadeesh Kumar

The trial was taken up during February 1988 as an observational trial to find out the possibility of rejuvenating unproductive cashew trees by top working with high yielding clones. The treatments are given below:

- Age group of trees : a) Between 5-10 years
b) Between 10-15 years
- Height of beheading : a) 0.5 m above ground level
b) 1.0 m above ground level
- Season of grafting : a) Grafting during April-June
b) Grafting during September-October (Second season)

The growth parameters, flowering characters and yield of the trees were recorded since 1990. The flowering characters and yield recorded during 1991 and 1992 are presented in Table 4 and 5.

During 1991 the growth characters and yield were more in trees beheaded at 1 m height as compared to 0.5 m height. The age of trees did not exert any significant influence. A maximum yield of 2.2 kg nuts was obtained from tree No.2355 beheaded at 1 m height. During 1992 a maximum of 4.7 kg nuts could be obtained from Tree No.1934 beheaded at 0.5 m height.

(b) Large plot trial on top working

A large plot trial on top working consisting of 53 trees was taken up during January 1991. Trees planted during 1972 were beheaded at 1 m height. Softwood grafting was done during April and November. Grafting was undertaken during January 1992 also in trees where grafting was not

Table 4 Growth, flowering characters and yield of top worked trees during third year after top working

Tree No.	Height of beheading (m)	Girth (cm)	Number of primary branches	Spread		Number of panicles per m ²	Number of nuts per panicle	Yield (kg)
				EW	NS			
10-15 years								
1934	0.5	22.20	8	6.50	6.60	6.40	10.00	1.00
1936	1.0	20.20	11	5.40	4.90	13.60	8.00	1.20
1938	1.0	25.90	10	4.10	5.10	10.00	6.60	1.50
1945	0.5	25.80	12	4.00	4.20	0.80	5.60	0.90
5-10 years								
2355	1.0	25.60	14	3.80	3.80	12.20	9.60	2.21
2357	1.0	28.00	13	4.00	3.90	11.20	10.20	1.00
2360	0.5	26.50	9	2.90	2.80	10.00	5.60	0.50
2362	0.5	18.00	5	2.50	2.90	10.40	6.20	1.10

Table 5 Growth, flowering characters and yield of top worked trees during fourth year after top working

Tree No.	Height of beheading (m)	Girth (cm)	Number of primary branches	Spread		Number of panicles per m ²	Number of nuts per panicle	Yield (kg)
				EW	NS			
10-15 years								
1934	0.5	25.00	7	9.30	9.50	19.20	11.60	4.70
1936	1.0	27.00	3	8.00	7.50	13.60	7.60	3.60
1938	Dried during 1991-92							
1945	0.5	30.00	5	7.00	8.00	13.80	8.40	3.60
5-10 years								
2355	1.0	27.50	4	9.00	9.00	11.19	8.60	1.40
2357	1.0	29.00	4	4.50	5.00	10.60	-	-
2360	Dried during 1991-92							
2362	0.5	19.00	3	3.50	5.00	11.60	6.40	1.30

successful. Spraying was given against the attack of tea mosquito. BHC was applied on the bark of stem borer infected trees. A second cutting was given at 0.5 m height on the unsprouted trees during February but they failed to sprout. Clay mixed with BHC was also applied on the trunk.

The observations are given in Table 6. Out of 53 top worked trees, 19 trees were survived. The success of grafting was 63.4%. The growth and yield characters will be recorded since 1993.

Hort. 4. Vegetative propagation trial

Principal Investigator : 1. Smt. P.B. Pushpalatha
(from 01.04.91 to
21.10.91)

2. Smt. A. Suma
(from 22.10.91 to
31.01.92)

3. Smt. K.E. Usha
(from 01.02.92 to
31.03.92)

Associate : Sri. T.N. Jagadeesh Kumar

1) Flush grafting in cashew

(a) Standardisation of time of beheading for inducing flushes.

The study aims at standardising the ideal time of beheading of cashew trees for inducing flushes for flush grafting. Five trees were beheaded in each month since

Table 6 Success percentage in grafting of top worked trees (1991-92)

Age of trees	Height of beheading	Month of beheading	Number of trees beheaded	Number of trees survived
1	2	3	4	5
19 years	1 m.	January 1991	53	19

Month of grafting	Number of grafts made	Number of successful grafts	Percentage of success	Yield (kg)
6	7	8	9	10
April & November 1991	123	78	63.4	To be recorded during 1993

October, 1991. Flushes of 7 days and 14 days old were grafted on 21 days old root stock. Observations recorded are given in Table 7.

B. AGRONOMY

Agron. 3. Foliar application of urea along with insecticides

As per the decision of the IXth biennial workshop (AICCIP) held at Coimbatore during 1989, this trial was taken up during October 1989 with the following treatments.

Treatments

- | | | |
|----------------|---|-------------------------------|
| T ₁ | : | SA + Endo without urea spray |
| T ₂ | : | SA + Endo with 2% urea spray |
| T ₃ | : | SA + Endo with 3% urea spray |
| T ₄ | : | SA + Endo with 4% urea spray |
| T ₅ | : | No SA+Endo with 2% urea spray |

Note: SA - Soil application of N @ 500 g/tree/year
 Endo - Endosulphan 0.05% spray
 P&K - Uniform dose @ 125:125 g/tree/year for all the treatments

The above spray treatments were imposed thrice (during flushing, flowering and nut formation stages). Leaf samples were collected for analysis before the first spray and after the last spray. The observations on number

Table 7 Success percentage in grafting as influenced by the time of beheading

Sl. No.	Month of beheading	Month of grafting	No. of grafts made	Successful grafts		Temperature		Humidity	
				No.	(%)	Max.	Mini.	Max.	Min.
1	October 1991	November 1991							
		7 days old	100	4	4	31.5	23.0	87.0	63.0
		14 days old	100	0	0				
2	November 1991	December 1991				31.9	21.7	78.0	49.0
		7 days old	100	0	0				
		14 days old	100	0	0				
3	December 1991	January 1992				32.6	20.9	69.0	36.0
		7 days old	100	0	0				
		14 days old	100	0	0				
4	January 1992	February 1992				34.5	21.8	87.0	42.0
		7 days old	100	0	0				
		14 days old	100	0	0				
5	February 1992	March 1992				36.9	22.8	84.0	38.0
		7 days old	100	2	2				
		14 days old	100	2	2				

of panicles/m², number of nuts/plant, yield and shelling percentage were also recorded. The details on nut yield and shelling percentage are given in Table 8.

The highest nut yield was obtained from the treatment T₁ (soil application and spraying endosulfan without urea) followed by T₃ ie. soil application followed by spraying 3% urea alongwith endosulfan. However, tea mosquito attack was lowest in T₄ (spraying 4% urea alongwith endosulfan) followed by T₃ (3% urea along with endosulfan).

Table 8 Nut yield and shelling percentage as influenced
by foliar application of urea along with insecticides

Treatments	Number of panicles/m ²	Number of nuts/plant	Yield (kg/tree)	Shelling percentage	Percentage of Tea mosquito attack
T ₁	128	1060	5.48	28.50	54.74
T ₂	108	755	3.95	27.50	54.66
T ₃	121	924	4.93	28.00	42.75
T ₄	106	775	4.30	28.00	38.54
T ₅	126	580	3.08	27.50	55.07

III CROP PROTECTION

Ent. 1. Chemical control of pest complex in cashew

Expt.1(a) Control of major pest - Tea mosquito
(Large plot trial)

Principal Investigator : Dr.S. Pathummal Beevi

Objectives: To assess the efficacy of schedule sprays with recommended insecticides in large area and to find out the economics of chemical treatment with special reference to major pest, tea mosquito bug.

Year of start : 1989

Technical programme (in brief): Three scheduled sprays with recommended insecticides in large area of 1.25 ha (CYT layers) planted in 1973 were given as follows:

1st spray : at new flush emergence (endosulfan 0.05%)

2nd spray : 30 days after 1st spray (endosulfan 0.05%)

3rd spray : 30 days after 2nd spray (Carbaryl 0.1%)

There were 141 and 80 trees respectively in the treated and untreated blocks.

Sampling details: Ten per cent of the trees in the treated and untreated blocks were marked in clusters at random at the rate of three trees per cluster. Five clusters from the

treated and three from the untreated blocks were selected for recording the occurrence of tea mosquito and other pests. Observations on the extent of infestation by the pests were recorded one day before first spraying and at 10, 20 and 30 days after each spraying (vide proforma Nos. I-IV in proceedings of IX biennial workshop of AICCIP).

The first spraying was given with endosulfan 0.05% during first week of December 1990 with the onset of flushing. The second spraying was given with endosulfan (0.05%) during first week of January 1991 at flowering stage, followed by carbaryl 0.10% as third spray during last week of January 1991 coinciding with fruit set stage. Observations were recorded on the infestation by tea mosquito on shoots, panicle and nuts in treated and untreated plots and presented as percentage infestation and mean score values. In the case of flower thrips the intensity of attack was assessed by percentage nut infestation and mean score values.

Results

The percentage infestation and mean score values of tea mosquito and flower thrips attack at 10, 20 and 30 days after each spraying are given in Appendix I to IV.

The overall mean percentage infestation by tea mosquito and flower thrips in sprayed and unsprayed plots

(after three sprays) is given in Table 9. The mean per cent infestation by tea mosquito in unsprayed trees was 15.98 as against 4.20 in the plot received scheduled spray. The damage intensity assessed by scoring also indicated a significant difference between sprayed and unsprayed, the mean values being 0.05 and 0.48 respectively. The extent of damage by thrips on nuts were assessed in sprayed and unsprayed blocks. About 45.48% of nuts were affected by flower thrips while in untreated it was significantly reduced to 22.32%. The extent of scab formation on thrips affected nuts was also estimated by scoring. However there was no significant variation in mean score values between sprayed and unsprayed.

Economics of scheduled spray

Individual tree yield was recorded from treated and untreated plots. The cost benefit ratio was worked out and presented below:

Mean nut yield

Trees received scheduled spray : 6.63 kg/tree (mean of 141 trees)
 Trees unsprayed : 5.38 kg/ha (mean of 80 trees)

Cost of scheduled spray for 141 trees:

* Cost of insecticide for 3 sprays	:	Rs. 608/-
** Labour cost for three sprays	:	Rs. 1000/-
Total cost	:	Rs. 1608/-
Cost of scheduled spray/tree	:	Rs. 11/40

Yield and receipts

Per tree yield in control	:	5.38 kg
Per tree yield in treated	:	6.63 kg
Yield increase/tree	:	1.25 kg
Gain due to insecticide application (@ Rs.15/kg)	:	Rs. 18.75
Benefit/cost ratio	:	1.64

* Cost of insecticide for three sprays

Insecticides	Qty	Rate	Total cost
Endosulfan (2 sprays)	3.0 lts.	Rs.116/lt.	Rs. 348.00
Carbaryl	2.0 kg.	Rs.130/kg	Rs. 260.00
	Total cost		Rs. 608.00

** Labour cost for three sprays

Spray	No. of laboures engaged M + W	Wage rate	Amount (Rs)
First	3 + 3	Rs. 50/-	300.00
Second	3 + 4	Rs. 50/-	350.00
Third	3 + 4	Rs. 50/-	350.00
	Total cost		1000.00

Table 9 Tea mosquito and flower thrips attack in experimental plots
(Mean of three sprays)

Treatments	Cluster No.	Tea mosquito		Thrips		
		Percentage infestation	Mean score	Percentage nut infestation	Mean score	
Sprayed	1	3.87	0.07	28.44	1.04	
	2	6.19	0.05	21.78	1.02	
	3	2.96	0.03	19.33	0.76	
	4	3.87	0.03	23.83	0.80	
	5	4.08	0.06	18.22	0.79	
	Mean	4.20	0.05	22.32	0.88	
Unsprayed	1	17.06	0.51	38.22	0.97	
	2	16.18	0.49	56.22	1.23	
	3	14.70	0.43	42.00	1.12	
	Mean	15.98	0.48	45.48	1.10	
	CD	1%	8.949	0.314	17.590	0.980
		5%	3.372	0.118	6.505	0.362

New experiment

Title : Chemical control of pest complex in cashew

1. Control of major pests - tea mosquito
2. Control of minor pests

Objective: The objective of this experiment is to find out an alternate spray schedule for tea mosquito management, by rationalising the use of insecticides, with special thrust on reducing the number of sprays and to find out the most critical spray(s). It will be useful to formulate a viable and most economic spray schedule.

Year of start : November 1991

Technical programme:

The treatments were given as shown below:

- T₁ - monocrotophos (0.05%) one spray at flushing
- T₂ - endosulfan (0.05%) one spray at flowering
- T₃ - Carbaryl (0.10%) one spray at fruiting stage
- T₄ - T₁ and T₂
- T₅ - T₁, T₂ and T₃
- T₆ - T₁ and T₃
- T₇ - T₂ and T₃
- T₈ - Untreated control

Design : RBD

No. of trees/
treatment : Two

No. of replications : Three

Two trees in each treatment were separated from the adjoining set of treatments by one set of guard trees all around. The guard trees were also sprayed (half portion of the canopy facing the treated trees) with the same insecticides of the respective treatments. Pre-treatment observations were recorded one day before spraying. The post treatment observations were recorded on the occurrence and intensity of infestation by tea mosquito, minor pests and other natural enemies (vide proceedings of National Group Discussion of Cashew Research Workers 30th August to 1st September 1991).

Progress of work: First spraying with monocrotophos 0.05% was given during first week of December 1991 coinciding with flush emergence; the second spray with endosulfan (0.05%) and third spray with carbaryl (0.1%) was given at the time of panicle emergence and fruit set in respective plots. Observations were recorded on insect infestation at 30 days after each spray. The mean infestation and the yield after three sprays is given in Table 10. Monocrotophos 0.05% as first spray at flushing was effective in reducing tea mosquito infestation on shoots. Subsequently endosulfan 0.05% and carbaryl 0.1% at flowering and fruit set stages had considerably reduced tea mosquito attack on newly formed panicle and tender nuts. However, single spray with any of the three insecticides were not

Table 10 Tea mosquito infestation in experimental plots (mean of three replications)

Treatments	Pre-count		After first spray				After second spray				After third spray		Yield kg/tree
	Shoot		Shoot		Panicle		Panicle		Nuts		Nuts		
	Per- cent age	Mean score	Per- cent age	Mean score	Per- cent age	Mean score	Per- cent age	Mean score	Per- cent age	Mean score	Per- cent age	Mean score	
T ₁	3.39	0.03	9.96	0.08	16.38	0.07	37.91	0.23	21.42	1.28	23.73	0.84	3.133
T ₂	2.72	0.01	31.74	0.44	27.40	0.20	7.27	0.03	7.44	0.46	10.28	0.33	6.000
T ₃	3.14	0.02	34.39	0.85	26.58	0.33	32.04	0.48	18.98	0.61	5.03	0.51	6.617
T ₄	1.42	0.06	11.47	0.22	15.33	0.23	11.28	0.12	3.14	0.05	7.51	0.28	10.600
T ₅	3.58	0.04	10.14	0.39	14.25	0.19	7.38	0.11	4.21	0.13	4.31	0.18	14.370
T ₆	1.72	0.05	5.71	0.13	18.58	0.14	19.60	0.22	13.49	0.53	9.44	0.27	9.467
T ₇	3.42	0.12	27.36	0.82	18.47	0.50	7.15	0.25	7.17	0.13	4.53	0.04	13.570
T ₈	3.07	0.11	32.18	0.79	30.93	0.53	38.45	0.36	23.64	0.58	28.67	0.85	5.200

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effective in increasing the yield. Maximum yield of 14.370 kg/tree was recorded in T_5 where all the three sprays were given. However the mean yield in the case of T_4 and T_7 was also considerably high.

Minor pests

Observations on the incidence of minor pests in experimental plots are given in Table 11. First spray with monocrotophos (0.05%) had reduced the infestation by leaf roller (Anigraea albomaculata) and leaf minor the two important foliage pests noticed in experimental area. After second spray with endosulfan, the extent of infestation by the blossom webber on panicles was less and the flower thrips population was also reduced. Likewise third spray with carbaryl 0.1% was effective in reducing the infestation by blossom webber, apple and nut borer and flower thrips.

Natural enemies

The important natural enemies observed in experimental plots were the spiders, mirid bugs and chrysopa. Among the insect pollinators black ants were predominant. The natural enemy population was reduced in insecticide treated plots as compared to untreated control (Table 12).

Table 11 Infestation by minor pests in experimental plots (mean of three replications)

Treatments	Mean percentage infestation										
	Pre-count			After first spray			After second spray		After third spray		
	Leaf minor		Leaf roller	Leaf minor		Leaf roller	Blossom webber	Thrips mean (Nos)	Blossom webber	Apple and nut borer	Thrips mean (Nos)
	Shoot	Leaves	<u>A. albo-maculata</u>	Shoot	Leaves						
T ₁	2.82	7.33	9.05	1.28	9.33	1.50	7.43	11.20	3.67	6.67	11.78
T ₂	2.13	6.67	5.24	12.08	14.67	11.49	2.77	3.13	2.67	4.78	8.50
T ₃	1.98	6.67	7.31	14.07	13.33	13.60	7.37	11.53	1.75	1.98	2.50
T ₄	1.24	10.00	7.10	1.50	2.67	2.00	2.00	3.50	2.35	1.39	4.44
T ₅	1.32	13.33	6.85	1.83	4.00	1.75	0.83	3.28	1.08	0.56	2.10
T ₆	1.39	6.67	0.00	0.33	1.33	2.90	5.58	7.83	1.83	2.08	3.72
T ₇	1.28	10.67	0.70	11.15	16.00	13.47	2.08	0.67	1.50	1.83	1.80
T ₈	0.81	3.33	5.65	13.67	26.00	16.35	10.35	12.51	3.07	6.96	13.03

Table 12 Occurrence of natural enemies and black ants in experimental plots
(mean number per quadrant) (Mean of three observations)

Treatments	Before spraying		After first spray				After second spray				After third spray			
	Black ants	Spider	Black ants	Spider	Mirid bug/ panicle	Chry- sopa larvae	Black ants	Spiders	Mirid bug	Chry- sopa	Black ants	Spiders	Mirid bug	Chry- sopa
T ₁	1.58	1.25	0.33	0.25	0.08	1.29	2.58	4.33	2.08	0.58	4.38	2.42	2.33	0.75
T ₂	1.08	0.67	2.42	3.58	5.00	3.58	2.00	0.67	1.58	2.42	5.33	3.42	1.83	0.77
T ₃	0.75	0.50	3.00	2.08	5.67	4.98	4.33	5.67	5.37	6.75	3.00	1.25	0.92	0.25
T ₄	0.58	0.67	0.42	0.42	1.33	2.02	1.33	0.33	0.58	2.50	4.18	3.08	1.92	0.58
T ₅	0.67	0.50	0.08	0.17	1.00	2.08	0.83	0.50	1.08	1.92	3.92	1.80	0.58	0.67
T ₆	0.50	0.42	0.40	0.00	0.43	2.61	4.41	3.00	5.42	5.37	4.35	2.50	1.08	0.75
T ₇	0.67	0.50	1.83	2.74	5.00	4.67	2.17	2.58	3.42	2.97	1.92	2.17	1.08	0.58
T ₈	0.58	0.60	3.42	2.58	7.17	5.08	5.08	6.50	7.33	7.08	6.00	5.25	5.08	2.75

Ent. II Control of stem and root borer

1. Prophylactic and curative treatments

Principal Investigator : Dr.S. Pathummal Beevi

This trial was started in May 1988, to study the effectiveness of certain materials when applied on the collar portion and exposed roots for preventing the infestation by stem and root borer in cashew.

Technical programme: The following treatments were imposed on trees planted during 1973. The experimental area comprised of 629 trees of the seedling progenies of Tree 20 of Anakkayam.

T₁ - Coal tar + Kerosene 1:2 (V/V)

T₂ - Coal tar + Kerosene 1:4 (V/V)

T₃ - Kaolin paste

T₄ - HCH 0.2% swabbing

T₅ - Untreated control

No. of trees/treatment : 25

Five blocks were demarcated in the area which consisted of 25 healthy trees along with few trees showing stem borer attack symptoms. The treatments were applied twice a year during May and November. Before each application the collar portion and exposed roots were thoroughly cleaned by using a coir brush to dislodge termite galleries

and stem borer eggs if any. Coal tar was heated and mixed with kerosene in required proportion. The treatments were applied on the collar portion upto 1 m height and on exposed roots.

Observations were recorded for the presence of eggs and symptoms of attack at monthly intervals. The observations recorded from January to August 1991 is presented in Table 13. Maximum infestation was noticed in tar + kerosene 1:2 treatment; 17 Nos. from January to May and 14 Nos. from June to August, whereas in untreated it was only 10 Nos. No attack could be noticed in kaolin treated trees while one tree was attacked in BHC treatment during the period. A less infestation was noticed in tar + kerosene 1:4 treatment as compared to tar + kerosene 1:2.

This experiment was concluded as per the proceedings of National Group Discussion of Cashew Research Workers held at Kasargod 30th August to 1st September 1991.

The results for three year period from 1988-89 to 1990-91 were subjected to statistical analysis by repeated Chi-square test and the data is presented in Table 14.

During the first year of treatment (1988-89) all the treatments except tar + kerosene 1:4 was effective in

Table 13 Stem and root borer infestation as influenced by Prophylactic treatments

Year and month	Stage of infestation	Treatments										
		T ₁		T ₂		T ₃		T ₄		T ₅		
		No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	No.	Per-centage	
1	2	3	4	5	6	7	8	9	10	11	12	
(After I treatment)	E	-	-	-	-	-	-	-	-	-	-	-
1991 January	M	1	3.85	1	3.85	-	-	-	-	1	3.70	
	T	1	3.85	1	3.85	-	-	-	-	1	3.70	
1991 February	E	1	3.85	-	-	-	-	-	-	1	3.70	
	M	-	-	-	-	-	-	-	-	-	-	
	T	1	3.85	-	-	-	-	-	-	1	3.70	
1991 March	E	3	11.54	-	-	-	-	-	-	1	3.70	
	M	2	7.69	-	-	-	-	-	-	-	-	
	T	5	19.23	-	-	-	-	-	-	1	3.70	
1991 April	E	8	30.75	1	3.85	-	-	-	-	2	7.41	
	M	-	-	-	-	-	-	-	-	-	-	
	T	8	30.75	1	3.85	-	-	-	-	2	7.41	
1991 May	E	2	7.69	1	3.85	-	-	-	-	3	11.11	
	M	-	-	-	-	-	-	-	-	-	-	
	T	2	7.69	1	3.85	-	-	-	-	3	11.11	

Contd.....

Table 13 contd.....

1	2	3	4	5	6	7	8	9	10	11	12
(After II treatment)											
1991 June	E	9	34.62	1	3.85	-	-	-	-	1	3.70
	M	-	-	-	-	-	-	-	-	-	-
	T	9	34.62	1	3.85	-	-	-	-	1	3.70
1991 July	E	5	19.23	2	7.69	-	-	1	4.00	1	3.70
	M	-	-	-	-	-	-	-	-	-	-
	T	5	19.23	2	7.69	-	-	1	4.00	1	3.70
1991 August	E										
	M										
	T										
											- No fresh attack -

E - Early stage of infestation (gummosis, extrusion of gummy frass)

M - Middle stage of infestation (gummosis, extrusion of powdery frass and yellowing of leaves)

T - Total infestation

Table 14 Stem and root borer infestation as influenced by prophylactic treatments

Sl. No.	Treatments	No. of trees treated	No. of trees infested in different treatments					
			1988-89		1989-90		1990-91	
			After I treatment (Jun-Nov)	After II treatment (Dec-May)	After I treatment (Jun-Nov)	After II treatment (Dec-May)	After I treatment (Jun-Nov)	After II treatment (Dec-May)
1	Tar + Kerosene 1:2	26	0 (b)	2 (a)	0 (b)	14 (a)	15 (a)	19 (a)
2	Tar + Kerosene 1:4	26	2 (b)	6 (a)	1 (b)	6 (b)	4 (b)	3 (b)
3	Kaolin clay	26	0 (b)	0 (b)	0 (b)	3 (b)	0 (b)	0 (c)
4	BHC 0.2%	25	0 (b)	1 (a)	1 (b)	3 (b)	1 (b)	1 (c)
5	Untreated control	27	8 (a)	7 (a)	12 (a)	11 (a)	5 (b)	8 (b)

The figures followed by the same letter do not differ significantly tested by Chi-square - significant at 5% level.

protecting the infestation by stem borer after first treatment (June-November). All the treatments were statistically on par. In untreated control 8 Nos. were infested. However after the second application, infestation was noticed in all the treatments except in Kaolin clay treatment, which were on par with control.

After first application in 1989-90 all the treatments were equally effective with one number each infested in Tar + Kerosene 1:4 and BHC 0.2%. After second application; BHC 0.2% and Kaolin clay recorded minimum infestation (3 Nos.) which were on par. Maximum infestation (14 Nos.) was recorded in Tar + Kerosene 1:2, which was statistically on par with control.

In the third year of treatment (1990-91) also maximum infestation was noticed in Tar + Kerosene 1:2 (15 Nos.) which was significantly higher than that of control. The other treatments were on par with control. After the second treatment also, Tar + Kerosene showed maximum attack of 19 Nos. Tar + Kerosene 1:4 was on par with untreated control. No attack could be noticed in Kaolin treatment where as one number was infested in BHC treatment.

New experiment

Another experiment was started in November 1991 with the following modified treatments.

- T₁ - Neem oil 5%
- T₂ - Neem seed kernel extract 5%
- T₃ - Kaolin paste + Arpoos
- T₄ - Neem cake extract 5%
- T₅ - BHC 0.2%
- T₆ - Untreated control

The above treatments were applied during the last week of November 1991 as given in previous experiment. Twenty five trees were selected in blocks with atleast 3-4 infested trees in the centre of the plot. The observations were recorded on the incidence of stem and root borer at monthly intervals. Only one tree was infested in neem oil treated trees. No infestation could be noticed in other treatments and untreated control.

Ent. III Bio-ecology of pests and survey of pest complex
and their natural enemies

Principal Investigator : Dr. S. Pathummal Beevi

Objective: To study the occurrence of different pests of regional importance on cashew in relation to climatic factors or the seasonal abundance and also to study the extent of parasitisation on major pests.

Technical programme in brief including observations required: The extent of pest infestation and their seasonal abundance have to be reported for all the major pests. Data is to be collected from a minimum of 12 individual trees which are not sprayed with any insecticides through out the year. Fortnightly/monthly observations have to be recorded in the proforma Nos. I to IV (vide proceedings of National Group Discussion of Cashew Research Workers, August/September 1991). The extent of parasitisation should be studied at fortnightly/monthly intervals by observing atleast 50 host insects.

Four quadrants (0.5 x 0.5 m) are to be marked on each tree on the four sides and the leaders in each quadrant are to be tagged and total number of shoots recorded in each leader. The intensity of infestation and incidence of various pests are to be recorded in each leader.

Results obtained during the period under report:

Observations were recorded on the incidence of tea mosquito, stem and root borer and other minor pests. Tea mosquito infestation was maximum (Table 15) during December 1991 to February 1992. The panicle infestation ranged from 21.32 to 42.65 per cent and nut infestation 0.97 to 9.56. Data on other pests are given in Table 16. The stem and root borer infestation was maximum (10.69%) during May 1991.

Table 15 Monthwise occurrence of tea mosquito (mean percentage infestation and mean score values)

Month	Shoot		Panicle		Nuts	
	Percent- age	Mean score	Percent- age	Mean score	Percent- age	Mean score
1991						
January	-	-	6.01	0.11	9.56	0.08
February	-	-	4.62	0.09	1.86	0.07
March	-	-	0.72	0.10	0.97	0.06
April	-	-	1.50	0.06	3.33	0.03
May	-	-	-	-	-	-
June	2.94	0.09	-	-	-	-
July	5.20	0.15	-	-	-	-
August	-	-	-	-	-	-
September	-	-	-	-	-	-
October	-	-	-	-	-	-
November	3.50	0.08	-	-	-	-
December	7.09	0.29	21.32	0.64	-	-
1992						
January	-	-	42.65	1.25	5.35	0.15
February	-	-	34.03	3.20	5.00	0.07
March	-	-	-	-	4.75	0.04

Mean of 12 trees

Table 16 Seasonal occurrence of minor pests and stem and root borer

Month	Leaf minor		Apple and nut borer (%)	Flower thrips			Flower beetles number/panicle	Blossom webber panicle affected (%)	Leaf roller (% shoot)	Stem borer (%)
	Shoots affected	Leaves affected		Percentage nuts affected	Mean score	No. of thrips/panicle				
1991										
January	4.79	18.06	2.38	28.67	1.50	5.25	4.40	4.47	-	8.75
February	1.49	25.00	3.61	13.83	0.15	5.00	5.25	3.00	-	9.24
March	-	-	5.27	15.67	0.25	2.35	2.40	1.28	-	5.26
April	-	-	2.80	21.36	1.08	4.70	-	-	-	7.14
May	-	-	-	-	-	-	-	-	-	10.69
June	1.14	2.33	-	-	-	-	-	-	3.10	3.71
July	2.92	11.67	-	-	-	-	-	-	3.85	3.00
August	-	-	-	-	-	-	-	-	6.00	-
September	-	-	-	-	-	-	-	-	-	-
October	7.87	21.63	-	-	-	-	-	-	4.56	-
November	12.55	29.33	-	-	-	-	-	-	7.63	2.56
December	10.76	20.75	-	-	-	-	-	5.90	5.60	4.25
1992										
January	7.24	18.17	5.84	10.05	0.15	3.71	8.21	8.33	-	5.50
February	0.75	12.00	8.23	25.40	1.12	7.23	4.70	7.00	-	7.00
March	-	-	3.83	19.82	0.60	5.50	-	2.85	-	5.00

Mean of 12 trees

Leaf minor attack was maximum in regular flushes during November 1992. The flower thrips damage was maximum during January 1991 and February 1992, the percentage nut infestation being 28.67 and 25.40 respectively. The other pests noticed were the leaf roller, blossom webber and flower beetles. Few species of beetles noticed on cashew flowers were collected and preserved for identification. The mean number of beetles present in flowers ranged from 2.40 to 8.21.

Survey of natural enemy complex (Madakkathara)

Natural parasitisation was noticed on leaf roller Anigraea albomaculata by an unidentified parasite. Leaf roller incidence was noticed on monsoon flushes and regular flushes. Maximum parasitisation of 25 per cent could be noticed during October 1991 (Table 17). The mealy bug Ferrisia virgata was parasitised to the maximum extent of 10.91 per cent during January 1991 (Table 18). The other predators present in cashew ecosystem were the spiders, mirid bug and chrysopa. The mean number of predators present in one quadrant per tree is given in Table 19. Predators' activity was maximum in the panicle during Feb. '92.

Survey in private plantations

Survey was conducted in private plantations in the districts of Quilon and Palakkad during 1991-92 season. The important insect pests, natural enemies and pollinators observed in each locality was recorded and presented in Table 20.

Table 17 Natural parasitism on leaf roller
Anigraea albomaculata

Month	Number of caterpillars examined	Number of parasitised caterpillar	Per cent parasitism
1991			
June	46	4	8.69
July	40	5	12.50
September	46	5	10.87
October	60	15	25.00
November	42	8	19.05
December	40	2	5.00

Table 18 Natural parasitism by Aenasius advena Comp.
on cashew mealy bug Ferrisia virgata

Month	Number of nymphs examined	Number of adult parasites	Per cent parasitism
1991			
January	110	12	10.91
February	108	10	9.26
March	150	11	7.33
April	150	4	2.67
December	78	6	7.69
1992			
January	80	4	5.00
February	75	4	5.33
March	70	3	4.29

Table 19 The population level of predators

Predators	Mean number per quadrant/tree			
	December	January	February	March
1 Spiders	2.25	3.00	6.50	5.25
2 Mirid bug (nymphs + adults)	-	6.17	7.33	5.08
3 Chrysopa larvae	4.98	5.08	7.08	2.75

Mean of 12 trees

Table 20 Insect pest occurrence in private plantations

Sl. No.	District/Taluk Village surveyed	Pests and natural enemies		Intensity % infestation	Month of survey	Remarks	
		Common name	Scientific name				
1	2	3	4	5	6	7	
1.	Quilon/Kottarakkara/ Valakom (unsprayed area) Area : 1 ha. No. of trees : 150 Nos.	Tea mosquito	<u>Helopeltis antonii</u>	23.33 (P)	December 1991	Moderate	
		Leaf roller	<u>Anigraea albomaculata</u>	25.00 to 42.85	"	Moderate	
		Leaf miner	<u>Conopomorpha syngramma</u>	10.00 to 30.00	"	Moderate	
		Stem and root borer	<u>Plocaederus ferrugineus</u>	8.33	"	Moderate	
		Spiders					Present
		Wasps					Present
		Honey bees					Present
		Ants				Present	
2.	Quilon/Kottarakkara/ Mulayirachal (Unsprayed area) Area : 4 ha No. of trees : 600 Nos.	Tea mosquito	<u>H. antonii</u>	12.50 (S) 35.59 (P)	"	Moderate to high	
		Leaf rollers		20.00	"	"	
		Bark borer					"
		Stem borer			9.29		Moderate

Contd....

Table 20 contd....

1	2	3	4	5	6	7
3. Palakkad/Ottapalam/ Nagalassery (Unsprayed area) Area : 3 ha No. of trees : 400 Nos.	Tea mosquito	<u>H. antonii</u>	19.21 (P) 10.45 (S)	February 1992	Moderate to high	
	Stem borer	<u>P. ferrugineus</u>	20.00	"	High	
	Leaf roller	<u>A. albomaculata</u>	< 5		Low	
	Leaf miner	<u>C. syngramma</u>	15.00		Moderate	
	Flower thrips		5 Nos./ panicle		"	
	Flower beetles				Present	
	Honey bees, ants				"	
4. Palakkad/Anakkara/ Kudallur (one spray was given) Area : 30 acres No proper spacing	Tea mosquito	<u>H. antonii</u>	5 to 15 (P) 10 to 50 (S)	February 1992	Moderate to high	
	Stem borer		50 trees		"	
	Leaf miner		5.00		"	
	Flower beetles				Present	
	Mirid bugs				"	
	Ants				"	
	Vasps				"	
	Spiders				"	

Ent. IV Screening of germplasm to locate tolerant/
resistant types to major pests of the region

Principal Investigator : Dr.S. Pathummal Beevi

Objectives: To identify the varieties/types which are tolerant/resistant to the major pest, tea mosquito.

Technical programme: All the accessions available in the germplasm are to be screened for tea mosquito infestation. In each tree the observations are to be recorded from 0.5m x 0.5m area of the canopy on all the four sides at fortnightly/monthly intervals in proforma Nos.I to IV and VII.

All the accessions planted during 1988 (Acc. Nos.15 to 50) and 1989 (Acc. Nos. 51 to 82) were observed at monthly intervals and recorded the tea mosquito infestation. Unlike as in previous year (age of trees - 1-2 years) a moderate to heavy infestation was noticed during 1991-92 when the plants attained third and second year of growth.

Tea mosquito infestation was first noticed in few accessions during the month of July in monsoon flushes. A widespread occurrence was noticed during August and it attained maximum during September giving die-back of the affected shoots. Within the different accessions, there was no synchronisation in flushing in July and August and

tea mosquito infestation varied significantly between accessions. Hence the mean infestation from July to September is presented in Table 21. The per cent shoot infestation reached as high as 71.87 in the accession numbers 48 (M-1-2). In few accessions viz. H-1588, H-1589 (1988 planting), H-3-4, H-3-9, H-7-6, K-10-1, Pu-1, Rajamundry, H-8-6, H-8-8 and H-8-15 (1989 planting) infestation was 0 to 10 per cent. In the accessions K-22-1, NDR-2-1, H-718, H-719, Pu-6, Pu-7, Pu-8, K-16-1, K-18-2, K-30-1, H-8-1, H-8-7 and H-9-3 the infestation level ranged from >10 to 25 per cent.

Regular flushing and flowering was noticed from the month of October and tea mosquito infestation on newly formed flushes and panicles was recorded at monthly intervals. Because of the non-synchronisation in flushing and flowering in different accessions and for easiness of computation, the data is presented as mean of two consecutive months (Table 21). A moderate to heavy infestation on newly formed flushes ranging from 3.37 to 88.46 per cent could be noticed on different accessions during October-November. During December-January the minimum infestation was 5.35% in Pu-6 and maximum in H-8-7 (76.79%). Due to increased attack on regular flushes during October-November in most of the varieties the panicle initiation was very poor. Delayed flowering was noticed in some of the varieties. In most of the varieties yield was below 500 g/tree.

Table 21 Tea mosquito infestation in different accessions
(mean of four replications)

Acc. No.	Varieties	Jul-Sep		Oct-Nov		Dec-Jan		Feb-Mar		Yield of tolerant types (kg)	Mean infestation Dec-Mar	
		%	mean score	%	mean score	%	mean score	%	mean score		%	mean score
1	2	3	4	5	6	7	8	9	10	11	12	13
Accessions planted in 1988												
15	Bz1-2	61.67	3.12	37.50	1.16	42.90	1.32	26.67	0.78			
16	Bz1-3	28.00	0.96	25.50	0.40	37.69	1.16	-	-			
17	Bz1-120	45.00	1.34	38.46	0.50	46.28	1.38	64.71	1.92			
18	Bz1-239	32.00	1.25	12.31	0.30	19.87	0.65	40.00	1.20			
19	Bz1-241	48.34	1.20	6.29	0.09	58.33	1.94	32.00	0.96			
20	Bz1-244	31.00	1.90	9.35	0.15	57.14	1.68	55.56	1.10			
21	Bz1-248 (M)	39.29	1.29	3.37	0.09	56.93	1.67	13.33	0.39			
22	Bz1-248 (S)	42.67	1.08	-	-	-	-	28.57	0.80			
23	KTR-27	44.16	1.55	5.00	0.09	47.14	1.34	36.36	1.08			
24	Paru-1	26.67	1.65	12.93	0.11	48.79	1.45	57.14	1.71			
25	Vapla	32.00	3.05	9.02	0.12	45.40	1.30	-	-			

Contd....

Table 21 contd....

1	2	3	4	5	6	7	8	9	10	11	12	13
26	Anakkayam-1	66.00	1.63	22.54	0.30	57.80	1.71	-	-			
27	BLA-39/4	36.30	1.77	28.00	0.20	52.63	1.87	22.54	0.70			
28	K-22-1	14.25	0.43	26.75	0.16	40.00	1.30	10.00	0.30	0.700	25.00	0.80
29	NDR-2-1	22.25	0.75	-	-	35.08	1.03	40.05	1.20	1.000	37.57	1.12
30	H-3-13	27.38	1.09	-	-	27.50	0.90	51.35	1.53	1.200	39.45	1.22
31	H-3-17	27.38	1.09	-	-	34.28	1.10	31.37	0.93	0.700	32.83	1.02
32	H-650	38.64	1.24	12.90	0.32	32.00	1.12	42.50	0.93			
33	H-682	32.40	1.01	17.45	0.16	27.12	0.87	47.67	1.43			
34	H-718	23.85	0.76	23.75	0.33	20.39	0.63	30.00	0.80	0.600	25.20	0.72
35	H-719	20.00	0.60	-	-	23.30	0.40	25.00	0.31	0.500	24.15	0.36
36	H-856	31.00	1.08	10.50	0.07	40.00	1.08	-	-	0.800	20.00	0.54
37	H-1588	4.17	0.13	17.65	0.15	23.83	0.56	28.15	0.84			
38	H-1589	7.57	0.23	15.60	0.15	-	-	-	-			
39	H-1591	48.00	1.46	55.56	1.85	24.52	1.15	22.54	0.62			
40	H-1593	48.78	1.39	48.48	1.45	8.80	0.25	27.51	0.69			
41	H-1596	50.00	1.45	38.46	1.25	24.80	0.62	18.40	0.57	0.600	21.60	0.59
42	H-1597	50.00	1.50	23.33	0.83	17.17	0.58	4.55	0.15			

Contd....

Table 21 contd....

1	2	3	4	5	6	7	8	9	10	11	12	13
43	H-1598	46.78	1.40	25.00	0.75	18.40	0.49	36.81	2.00			
44	H-1600	55.35	1.78	39.39	1.27	20.97	0.43	11.93	0.38			
45	H-1602	69.00	3.25	46.88	1.41	43.35	0.88	4.35	0.12			
46	H-1608	66.00	2.08	11.76	0.35	23.45	0.43	11.46	0.35			
47	H-1610	56.00	1.75	26.67	1.00	6.25	0.04	12.15	0.37			
48	M-1-2	71.87	2.06	59.26	1.78	7.69	0.05	12.69	0.38			
49	M-26-2	63.33	2.23	69.23	1.92	16.50	0.61	18.60	0.45	4.400	17.55	0.53
50	PTR-1-1	55.00	1.45	37.14	0.86	48.15	0.88	30.72	0.90			
Accessions planted in 1989												
51	AG-1	28.71	0.69	24.14	0.72	7.99	0.25	22.88	0.45	1.200	15.44	0.35
52	PU-1	-	-	85.19	0.44	70.62	1.82	-	-			
53	PU-2	29.00	0.84	-	-	54.55	1.21	51.61	1.51			
54	PU-4	40.22	1.21	40.63	0.81	18.43	0.47	27.60	0.83			
55	PU-6	13.77	0.55	45.16	1.35	5.35	0.24	7.92	0.24			
56	PU-7	16.34	0.64	50.00	1.50	28.18	0.51	53.89	1.62			
57	PU-8	12.00	0.60	45.45	1.36	31.55	0.60	30.37	0.93			

Contd....

Table 21 contd.....

1	2	3	4	5	6	7	8	9	10	11	12	13
58	Rajamundry	-	-	63.64	1.91	27.94	0.41	26.92	0.83			
59	UL-12-2	27.88	1.06	40.74	1.10	23.02	0.42	37.50	1.11			
60	Bz1-18	61.67	1.68	-	-	9.51	0.17	21.16	0.41			
61	K-3-1	54.66	2.23	59.26	1.78	35.03	0.79	61.86	1.90			
62	K-3-2	56.67	1.20	42.31	1.35	37.78	1.18	52.28	1.45			
63	K-4-1	65.94	1.98	25.81	0.97	18.94	0.25	37.20	1.03			
64	K-4-2	31.00	1.01	17.65	0.65	17.65	0.65	22.85	0.20			
65	K-10-1	-	-	12.12	0.36	22.22	0.47	42.31	1.26	0.800	32.27	0.87
66	K-10-2	48.33	1.46	6.90	0.21	10.81	0.31	41.31	1.18			
67	K-16-1	22.50	0.35	29.03	0.81	24.43	0.49	35.91	1.00			
68	K-18-2	13.57	0.54	30.00	0.83	17.06	0.39	30.51	0.70	0.900	23.79	0.55
69	K-19-1	44.00	1.34	20.00	0.67	7.36	0.15	33.97	0.57			
70	K-19-2	47.50	0.90	30.30	0.70	40.05	1.13	-	-	0.500	20.03	0.57
71	K-30-1	20.00	0.20	9.33	0.33	66.85	2.01	35.33	0.99			
72	H-3-4	10.00	0.40	15.38	0.46	41.98	1.34	39.29	1.16			

Contd.....

Table 21 contd....

1	2	3	4	5	6	7	8	9	10	11	12	13
73	H-3-9	8.33	0.34	9.21	0.33	52.00	1.55	44.32	1.20			
74	H-7-6	7.15	0.23	5.63	0.30	-	-	32.00	0.78			
75	H-8-1	22.50	0.63	70.00	1.67	-	-	81.48	2.43	0.500	40.74	1.22
76	H-8-6	-	-	5.00	0.18	-	-	49.34	1.08			
77	H-8-7	24.59	0.45	5.80	0.35	76.79	2.25	25.00	0.75			
78	H-8-8	-	-	4.55	0.13	68.85	1.80	36.00	1.08			
79	H-8-10	37.50	1.12	-	-	29.32	0.85	27.59	0.84			
80	H-8-15	-	-	3.03	0.12	59.79	1.73	-	-			
81	H-9-3	19.34	0.58	1.72	0.07	48.46	1.50	50.00	1.00			
82	BLA-256-4	53.13	0.88	4.60	0.12	33.25	1.05	85.71	2.57			

Inspite of the moderate to heavy infestation in germplasm block, few varieties have produced nut yield of more than 500 g. In those varieties tea mosquito infestation was less on panicle and developing nuts during the months of January, February and March. The mean infestation from December to March and the mean yield recorded are given in Table 21. Panicle infestation was lowest (15.44%) in the variety AG-1, the yield being 1.2 kg. However, maximum yield of 4.4 kg could be obtained in the case of M-26-2 in which the tea mosquito attack was only 17.55%. The varieties/types K-22-1, NDR-2-1, H-3-13, H-3-17, H-718, H-719, H-856, H-1596, M-26-2, K-10-1, K-18-2, K-19-2 and H-8-1 were comparatively tolerant to tea mosquito attack which recorded a maximum of 40.74% and minimum 15.44% infestation. The previous year's result also indicates a similar trend.

In the case of K-22-1 both the shoot as well as panicle attack was less as compared to other varieties.

The time of flowering as well as the inherent genetic character of the varieties seems to be the factors responsible for tea mosquito tolerance.

RESEARCH PUBLICATIONS

1. George, T.E., Pushpalatha, P.B. and Veeraraghavan, P.G. (1991). Improved Cashew Varieties and Hybrids Developed by Kerala Agricultural University. The Cashew (January-March 1991) : 7-8.
2. Abdul Salam, M., Aravindakshan, M. and Pushpalatha, P.B. (1991). Recent trends in cashew production technology. Cashew Bulletin 28(5).
3. Pushpalatha, P.B., Abdul Salam, M. and Suma, A. Insitu grafting in Cashew - An experiment at Madakkathara (1991). The Cashew (April-June 1991):6-7.
4. Veeraraghavan, P.G., Pushpalatha, P.B., Abdul Salam, M., Nalini, P.V. and Suma, A. Two more cashew varieties from Kerala Agricultural University (1991). The Cashew : 11-13.
5. Pushpalatha, P.B., Abdul Salam, M., Aravindakshan, M., Balakrishnan, S. and Sitarama Rao, D. Flush grafting in Cashew - A booklet published by KAU.
6. Pushpalatha, P.B., Abdul Salam, M., Suma, A., Aravindakshan, M., Balakrishnan, S. and Sitarama Rao, D. Top working in Cashew - A booklet by KAU (in press).

7. Veeraraghavan, P.G., Pushpalatha, P.B., Pathummal Beevi, S., George, T.E. (1991). Kasumavu (Malayalam) a booklet by KAU.

RESEARCH HIGHLIGHTS

1. A clonal germplasm conservation block with 97 accessions was established
2. Out of the 4 hybrids viz. H-1597, H-1598, H-1608 and H-1610 identified as high yielders of this centre the two hybrids H-1598 and H-1608 have been proposed for the University variety release
3. Eighteen high yielding cashew varieties evolved at six Cashew Research Centres of India are under evaluation at this centre. Yield data of the last 4 years has revealed that 3 varieties Vridhachalam 44/3, H-1598 and Vridhachalam 26/2 are superior to all other 15 varieties.
4. A maximum of 4.7 kg nuts were obtained from an unproductive cashew tree by top working with high yielding clones, in the 4th year of top working
5. Screening of vigorous and less vigorous cashew types revealed that it is possible to identify the dwarf types

in the seedling stage itself using morphological characters, phenolic content in leaves, stomatal index, bark percentage in root etc. as criteria

6. Results of three years study on the prophylactic control with different materials against stem and root borer has revealed that tar + kerosene mixture is not effective in preventing stem and root borer infestation. Continuous application of tar + kerosene 1:2 has resulted in increased infestation due to bark splitting and gummosis on treated trees. BHC 0.2% and kaolin clay were equally effective in preventing stem borer infestation
7. Scheduled sprays with recommended insecticides proved to be effective in minimising pest damage and to increase yield
8. A noctuid pest, Anigraea albomaculata was identified as a new species of leaf roller occurring on regular and monsoon flushes at Madakkathara. The important predators noticed on cashew inflorescence in unsprayed area were the spiders, mirid bug and chrysopa larvae
9. The accessions, M-26-2, K-10-1, K-18-2, H-856, K-22-1, NDR-2-1, H-3-13 and H-3-17 were comparatively tolerant to tea mosquito attack and produced good yield during 3rd year of planting

**ACTIONS TAKEN ON THE RECOMMENDATIONS OF THE NATIONAL
GROUP DISCUSSION OF CASHEW RESEARCH WORKERS
30-31st AUGUST AND 1st SEPTEMBER, 1991**

Recommendations

Actions taken

I CROP IMPROVEMENT AND VARIETY RELEASE

- | | |
|---|---|
| <p>1. 14 accessions of Panama origin available at Madakkathara will have to be made available to the NRCC and other Co-ordinating centres. Adequate clonal materials are to be produced in these accessions in the course of next few years</p> | <p>: All the 14 Panama accessions planted in 1988 are in the early stage of evaluation. After identifying the most promising types the further multiplication shall be taken up.</p> |
| <p>2. Entries for new MLT from Bapatla, Vengurla, Vridhachalam and NRCC, Puttur should be collected and planted during the next season</p> | <p>: Vacant land was not available at this centre for laying out the new MLT. A proposal has been submitted to the University for allotting the rubber estate, adjacent to Cashew Research Station. Accordingly 5.5 ha rubber estate is allotted to this station as per order No.R5/68847/91 dated 8.6.1992. The Estate Officer is requested to make available the area after removal of trees. Follow up will be done in order to get the land at the earliest for laying out the new MLT.</p> |

3. Hybridisation programme is not being carried out since 1979 at Madakkathara. The programme will have to be implemented immediately
- : The cross combinations identified for this centre are BLA-139-1 with Vetore-56, VTH-711 and Kankadi types. Of these VTH-711 has been collected last year. The other two accession will be collected during this season. New hybridisation work has been started during 1991-92 season with BLA-139-1 and NDR-2-1 as parents. The setting per cent was very poor, hence sufficient progenies could not be obtained

II PROPAGATION AND ROOT STOCK STUDIES

1. Madakkathara centre should standardise the time of beheading the cashew trees for inducing flushes for flush grafting. As the softwood grafting technique has already been standardised, in the flush grafting experiment different age of root stocks need not be tried and only different age of flushes be tried
- : The experiment has been started during October 1991. Flush grafting is being done with flushes of 7 and 14 days old
2. Screening of rootstocks for dwarfing characters at nursery stage may be continued. A field trial needs to be laid out with 2 groups of root stock
- : This is being followed at this centre. Field trial will be laid out in July 1992

3. All the centres should try flush grafting in low cost mist chambers. An additional grant be provided to each centre for this purpose : This will be taken up after the completion of mist chamber construction
4. For propagation trials a minimum of 100 grafts per treatment should be prepared : This instruction is followed at this centre
5. While reporting the yield data on top worked trees total area of the plot should be taken into consideration by all centres : In the preliminary trial on topworking only six trees are available. The area-wise yield will be recorded in the case of large plot trial in subsequent years

III AGRONOMY

1. The new NPK experiment trial should be laid out by the end of September 1991 with same technical programme already in vogue in other centres : The trees in the old NPK area will be removed by July 1992 and the experiment will be laid out during August/September 1992
2. The observations on tea mosquito and other pest incidence should be done treatment-wise in all the centres in the Experiment 2 : This is being followed at this centre
3. KAU will be requested to take up adhoc scheme on the basic studies of nutrition since they already have a lead on the same : Action could not be taken up in this aspect

IV CROP PROTECTION

1. Experiment 1 monitoring of pest population and natural enemies will have to be done : This has been recorded at this station and included in this report
2. Temperature should be recorded at the time of spraying : This has been done
3. Correlation of weather parameters with populations of different pests to be worked out from the data collected for a minimum period of 5 years : This will be done after taking adequate data on pest occurrence in subsequent years
4. Survey to be extended to different tracts of the region : Survey has been conducted in Palakkad and Quilon districts during 1991-92 season
5. Large plot trial to be concluded. Final report to be submitted for inclusion in the annual report 1991-92 : The final report is included in this report

Meteorological data 1991-92

Month	Temperature °C		Relative Humidity		Rainfall (mm)	Number of rainy days
	Maximum	Minimum	Maximum	Minimum		
1991						
January	33.6	22.2	74	41	3.9	1
February	35.9	21.7	74	28	0	0
March	36.4	24.9	84	47	1.8	0
April	35.6	24.5	83	53	83.8	4
May	35.1	25.5	85	55	56.1	5
June	29.7	23.8	94	82	993.1	26
July	29.1	22.8	94	79	975.6	27
August	29.0	22.7	95	78	533.3	24
September	31.5	23.6	91	64	61.5	7
October	30.9	23.2	90	74	281.7	14
November	31.5	23.0	87	63	191.3	9
December	31.9	21.7	78	49	0.2	0
1992						
January	32.6	20.9	69	36	0	0
February	34.5	21.8	87	42	0	0
March	36.9	22.8	84	38	0	0

APPENDIX I

Tea mosquito - percentage infestation on Shoots/Panicle/Nuts
(Mean of three observations)

Treatments	Clusters	Days after 1st spray			Days after 2nd spray			Days after 3rd spray			Mean
		10 (S)	20 (S)	30 (P)	10 (P)	20 (P)	30 (P)	10 (N)	20 (N)	30 (N)	
Sprayed	1	5.03	2.87	0.00	4.55	3.05	1.67	5.00	10.00	2.67	3.87
	2	6.60	2.00	0.00	11.28	12.67	0.00	11.50	11.70	0.00	6.19
	3	0.00	0.00	0.00	8.00	0.00	3.50	9.05	0.00	5.10	2.96
	4	0.00	0.00	0.00	11.15	9.82	0.00	3.90	10.00	0.00	3.87
	5	8.33	3.17	0.00	5.28	12.12	0.00	3.03	2.54	2.22	4.08
	Mean		3.99	1.61	0.00	8.05	7.53	1.03	6.50	6.85	2.20
Unsprayed	1	20.00	23.33	0.00	25.00	15.30	5.67	16.93	17.78	29.49	17.06
	2	0.00	12.50	3.84	10.71	31.71	22.85	17.39	28.46	18.18	16.18
	3	9.50	10.00	8.50	13.00	39.18	12.00	12.78	16.72	10.59	14.70
	Mean		9.83	15.28	4.11	16.24	28.73	13.51	15.70	20.99	19.42

CD 3.372 (5%)
8.949 (1%)

S - Shoot
N - Nuts

P - Panicle

APPENDIX II

Tea mosquito infestation - mean score values (mean of three observations)

Treatments	Clusters	Days after 1st spray			Days after 2nd spray			Days after 3rd spray			Mean
		10 (S)	20 (S)	30 (P)	10 (P)	20 (P)	30 (P)	10 (N)	20 (N)	30 (N)	
Sprayed	1	0.03	0.04	0.00	0.05	0.08	0.07	0.07	0.21	0.12	0.07
	2	0.04	0.05	0.00	0.07	0.06	0.00	0.08	0.17	0.00	0.05
	3	0.00	0.00	0.00	0.08	0.00	0.04	0.06	0.00	0.13	0.03
	4	0.00	0.00	0.00	0.12	0.09	0.00	0.04	0.03	0.00	0.03
	5	0.06	0.11	0.00	0.13	0.05	0.00	0.05	0.10	0.07	0.06
	Mean	0.03	0.04	0.00	0.09	0.06	0.02	0.06	0.10	0.06	0.05
Unsprayed	1	0.12	0.22	0.00	0.30	0.28	0.32	1.27	0.85	1.20	0.51
	2	0.00	0.25	0.18	0.40	0.40	0.39	1.41	0.89	0.48	0.49
	3	0.20	0.19	0.39	0.34	0.35	0.39	0.85	0.81	0.38	0.43
	Mean	0.11	0.22	0.19	0.35	0.34	0.37	1.18	0.85	0.69	0.48

CD 0.314 (1%)
0.118 (5%)

S - Shoot
N - Nut

P - Panicle

APPENDIX III

Thrips damage on nuts (mean of three observations)

Treatments	Clusters	Percentage infestation						Mean
		After second spray			After third spray			
		10	20	30	10	20	30	
Sprayed	1	16.00	12.00	40.00	49.33	22.67	30.67	28.44
	2	32.00	36.00	16.00	21.33	14.67	10.67	21.78
	3	24.00	20.00	28.00	13.33	16.00	14.67	19.33
	4	25.00	32.00	20.00	26.00	25.33	14.67	23.83
	5	20.00	16.00	28.00	6.67	22.67	16.00	18.22
	Mean	23.40	23.20	26.40	23.33	20.27	17.34	22.32
Unsprayed	1	36.00	12.00	32.00	46.67	49.33	53.33	38.22
	2	48.00	72.00	60.00	48.00	62.67	46.67	56.22
	3	64.00	36.00	48.00	36.00	26.67	41.33	42.00
	Mean	49.33	40.00	46.67	43.56	46.22	47.11	45.48

CD 6.505 (5%)

17.590 (1%)

APPENDIX IV

Thrips damage on nuts - mean score values (mean of three observations)

Treatments	Clusters	Days after second spray			Days after third spray			Mean
		10	20	30	10	20	30	
Sprayed	1	1.50	1.67	1.60	0.69	0.45	0.33	1.04
	2	1.60	2.10	1.67	0.37	0.20	0.16	1.02
	3	1.30	1.30	1.20	0.21	0.25	0.27	0.76
	4	1.20	1.30	1.20	0.40	0.40	0.29	0.80
	5	1.30	1.20	1.50	0.10	0.36	0.27	0.79
	Mean		1.38	1.51	1.43	0.35	0.33	0.26
Unsprayed	1	1.80	1.60	1.60	0.57	0.96	0.72	0.97
	2	1.60	1.61	1.67	0.72	0.84	0.92	1.23
	3	1.42	1.33	1.87	0.72	0.80	0.57	1.12
	Mean		1.61	1.51	1.71	0.67	0.87	0.74

CD 0.980 (1%)
0.362 (5%)



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