ALL INDIA CO-ORDINATED SPICES & CASHEWNUT IMPROVEMENT PROJECT

ANNUAL REPORT FOR 1973-74 (JULY-JUNE)

SUB CENTRE ANAKKAYAM/MANNUTHY
(KERALA STATE)

ANNUAL REPORT OF THE OFFICER-IN-CHARGE OF THE SUB-CENTRE AT ANAKKAYAM/MANNUTHY (KERALA) UNDER THE ALL INDIA CO-ORDINATED SPICES AND CASHEWNUT IMPROVEMENT PROJECT FOR THE YEAR 1973-74.

1. Report Period: From 1st July, 1973 to 30th June, 1974.
2. Project Code No: 176
3. Report No: ~~3~~ 3
4. Location: The scheme was functioning at the Cashew Research Station, Anakkayam in Malappuram District until 30-4-1973 and some items of work, included in the technical programme are still continuing there. Due to the non-availability of adequate land there, it was decided to lay out the field trials under the project in the Vellanikkara Campus of the Kerala Agricultural University. The head-quarters of the scheme was shifted to the Mannuthy Campus of the University on 1-5-1973.
5. Project Title: All India Co-ordinated Spices & Cashewnut Improvement Project.
6. Objectives: The main objective in starting the project is to bring about improvement in the Spices and Cashewnut Industry by undertaking adequate research on all aspects of production of these crops. The research programme include varietal improvement, determination of the best cultural and manurial practices, control of pests and diseases and the technology on the effective and economical utilisation of cashew and spices products.
7. Present Staff Position:

Name of sanctioned post.	Name of personel.	Date of joining.	Recruitment position of vacant post.
Junior Horticulturist/Dy.Director of Agriculture.	V.K.Damodaran, B.Sc(Ag),M.Sc (Hort.)	1-6-1972.	
Senior Research Assistant	G.Indrasenan M.Sc(Ag)	1-9-1973.	
Agrl.Demonstrator.	Smt.K.V.Eliamma.	14-4-1973	The post was vacant from 1.1.74 to5.7.74
	Sri.V.M.Mathew	7-7-1974	

(The staff working under the State Cashew Research Scheme at Anakkayam assisted in carrying out some of the trials under the Co-ordinated Project, in progress at that centre.)

8. Total sanctioned grant for the centre.

Year	Recurring	Non-recurring.
1970-71 (6 months)	13,860	5,000
1971-72	28,568	15,000
1972-73	29,288	...
1973-74	29,882	...
Total	1,01,598	20,000

9. Total amount spent

Year	Recurring	Non-recurring
1970-71	..	..
1971-72	..	..
1972-73	20,778.00	1,700
1973-74	41,606.47	
Total	61,384.47	1,700.00

10. Approved Technical Programme (a) <u>For the whole period.</u>

i. Collection of germplasm and breeding.
ii. Studies on vegetative propagation with emphasis on standardising the technique for air-layering and budding.
iii. Nutritional studies.
iv. Physiological and Plant Growth Regulater studies with emphasis on securing increased fruit set and minimising post-set drop.
v. Investigations on agro-techniques, such as spacing, inter-cropping etc.
vi. Research on plant-protection with emphasis on " Flower Scorch", 'die-back' etc.
vii. Technological research on extraction of Vitamin 'C', quality studies on shell oil, processing etc. (at Vittal and Bapatla centres only)

(b) <u>Programme for 1973-74 as approved in the last work-shop meeting</u>

1. Germplasm collection and description of types and varieties.
2. Standardisation of seedling selection (Vittal, Vridhachalam and Bapatla)

(Contd.....)

3. Comparative yield trial with existing high yielders.
4. Hybridization and selection
5. Propagation trials
6. Nutrient Removal by the crop (Vittal and Bapatla)
7. NPK Fertilizer Experiment
8. Pruning trial (Vridhachalam, Vittal)
9. Hormonal application to increase fruit-set in cashew.

11. RESULTS.

Seasonal Conditions:-

In the year 1973, the South-west monsoon started more or less normally and was very active during the month of June. However, it was weak during the month of July and became active again during August. The North-east monsoon which is more important for crop production in cashew, was sub-normal and the dry spell which followed in January, February and March had an adverse effect on Cashew crop. In spite of good flowering, the setting was poor.

During 1974, a few good showers were received during April and May, but the onset of the South-west monsoon was very late. The rainfall received during the month of June 1974 was only 21.9 cm. as compared to 72.49 cm during the same month in 1973. The total rainfall received during 1973 was 254.64 cm as compared to 287.63 cm, received during 1972.

(Contd.....)

A statement showing the rainfall received during the years 1972, 1973 and 1974 (upto June) is given as appendix I.

Work done during the year:-

The progress of work under the different items, included in the technical programme is summarised below:-

Experiment I.

GERMPLASM COLLECTION AND DESCRIPTION OF TYPES AND VARIETIES.

The germplasm collection at the Cashew Research Station, Anakkayam consists of 46 clonal types and 42 seedling types, which were collected from the major cashew growing regions in the state as well as from the Cashew Research Stations at Ullal, Bapatla and Vengurla. The collections also include a few exotic types from Brazil, Tanganyika, Tanzania, Malayasia and Northern Nigeria. These were planted during the years 1963-67.

Evaluation of these types in respect of the major economic characters was in progress during the post few years and this was continued during the year under report. The highest yield of 25.497 Kg was obtained from the type BLA-139-1, followed by BLA-273-1(23.005 Kg), NDR-2-1(18.615 Kg),UL-28-1(17-405 Kg), UL-27-1 (15.926 Kg), NLR-2-1 (14.394 Kg) and BLA-256-1 (14.498 Kg). Based on the mean yield for the last 6 years, the following types are the top yielders :-

Table I.

Showing the particulars of yield of promising types in the germplasm collection.

Type No.	Year of planting.	Mean yield of last 6 years. Kg.	Yield in 1973-74 Kg.	Highest yield obtained so far. Kg.
1	2	3	4	5
BLA-139-1	1963	16.274	25.497	25.497
UL-28-1	1965	11.474	17.405	18.690
BLA-273-1	1963	11.372	23.005	23.005
K-10-2	1964	11.125	6.612	19.650

(Contd.....)

1	2	3	4	5
K-28-2	1963	10.884	7.988	13.150
BLA-39-4	1963	10.608	9.990	18.410
K-27-1	1963	10.333	9.220	13.100
NLR-2-1	1964	9.875	14.394	14.394
K-18-2	1966	9.648	11.228	12.860
UL-27-1	1963	9.613	15.926	15.926
BLA-256-1	1963	9.106	14.498	14.498
NDR-2-1	1966	8.821	18.615	18.615

The yields obtained during 1973-74 season and their mean yields for the past 6/5 years are given in appendix II.

The type BLA-139-1 and UL-28-1 are early season bearers and the former has a short flowering phase. UL-28-1, however, produces small sized nuts, the mean weight being 0.355 g. Eight of the above types have been included in the Comparative Yield trial, recently laid out in the Cashew Research Station, Anakkayam.

Data on sex-ratio were collected in respect of 60 types, which were not studied during the last season. Among the types studied during the current season, the highest percentage of perfect flowers was found in type UL-21-1 (20.6 %) and the lowest in type MAL-1-3 (0.1%). The data are presented in appendix III

The data based on the descriptive blank were collected in respect of clonal and seedling types and the hybrid progenies.

Experiment 2.

STANDARDISATION OF SEEDLING SELECTION IN CASHEW

This item of work is not included in the programme of this Sub-centre.

Experiment 3.

COMPARATIVE YIELD TRIAL WITH EXISTING HIGH YIELDERS

Sixteen promising types, collected from the cashew Research Stations at Anakkayam, Bapatla, Vridhachalam and Vengurla are included in this Comparative Yield Trial. The trial has been laid out and planting done on 25-10-'73. The details of the trial are given below:-

(Contd.....)

Design : Randanised Block — No.of plants per plot - 9
Replications : 3 — Spacing - 8 metres x 8 metres
Treatments : 16 — Guard Row - One External.

Treatments.

1) H-4-7	From the Cashew Research Station Anakkayam.	(9) Sawantwadi	From the Cashew Research Station Vengurla.
2) K-10-2		(10) Ansur-1	
3) BLA-256-1		(11) Veng-36-3	
4) BLA-139-1		(12) Veng-37-3	
5) M-10/4	From the Cashew Research Station Vridhachalam.	(13) T-No-1	From the Cashew Research Station Bapatla.
6) M-6/1		(14) T-No-40	
7) M-44/3		(15) T-No-56	
8) M-76/1		(16) T-No-273	

Since sufficient number of seeds of M-44/3 was not available from the Cashew Research Station, Vridhachalam, it was substituted by type K-27-1 of Anakkayam.

Experiment 4.

HYBRIDIZATION AND SELECTION

The 50 hybrid progenies derived from 4 cross combinations, made at Kottarakara in 1963 were under evaluation during the past years. This was continued during the year under report. The highest yield of 15.291 Kg. was obtained from the progency H-3-17, followed by 10.395 Kg from H-4-7 and 10.029Kg from H-1-4. Progeny-war yields obtained during the season of 1973-74 are given in appendix IV. Based on the mean yield for the past 6 years, the best performers are the following:-

Table II.

Showing the yield particulars of promising hybrids.

Hybrid No.	Mean yield for the past 6 years. Kg.	Yield obtained during 1973-74. Kg.	Highest yield obtained so far. Kg.
H-3-17	13.466	15.291	15.800
H-4-7	12.921	10.395	22.050
H-1-4	8.676	10.029	11.630
H-3-13	8.151	5.960	12.050

(Contd.....)

During the season of 1972-73, crossess were made between five types, selected for the following characters:-

K-30-1	for large nut size
H-3-13	for high sex ratio
BRZ-9-1	for high shelling percentage
ALGD-1-1	for large number of nuts per panicle
BLA-139-1	for early and short flowering phase.

From the crosses made, 195 hybrid nuts were obtained, which on sowing yielded 162 seedlings. These were planted in the field, some of which failed to establish. There are now 121 hybrid seedlings in the above series.

In order to study the inheritance of some of the promising types and hybrids, selfed seeds were collected from them and supplied to Project Co-ordinator for further studies. 214 nuts from 14 types (including some of the hybrids and their parents) were thus collected and supplied.

Experiment 5.

PROPAGATION TRIALS.

With a view to standardise the technique of budding and grafting in the propagation of Cashew, trials were initiated in April, 1963. These preliminary trials indicated some success in Veneer grafting, done in May and side grafting done in June.

Monthly budding trials were started in May 1974, under which 50 bud insertions were made every month. There was no success in the buddings done in May and June. The trials are continuing.

Experiment 6.

STUDIES ON NUTRIENT REMOVAL BY THE CROP

This item of work is to be taken up at Vittal

Experiment 7.

NPK FERTILIZER TRIAL.

The object of the trial is to determine the most effective and economical doses of NP and K fertilizers to bearing Cashew Trees. The details of the trial are given below:-

Design : 3^3 Factorial Confounded.

Replications : 2

Treatments : All combinations of NP & K, each at 3 levels as

(Contd.....)

given below:-

N - 0	500g	1000g
P - 0	200g	400g
K - 0	500g	1000g

No. of plants per plot - 9
Spacing - 8 metres x 8 metres
Guard rows - External and internal.

According to the decision taken in the second work-shop meeting, the differential doses are to be applied from the 5th year onwards. During the pre-bearing stage of 4 years, fertilizers at a uniform dose is to be applied to all the trees. 500g Nitrogen, 250g. P2 05 and 250g K2 O are to be applied to each tree during the fourth year, 1/3, ½ and ¾ of the above doses being applied during the 1st, 2nd and 3rd years.

The trial has been laid out and the first application of fertilizers has been given in July, 1974.

Experiment 8.

PRUNING TRIAL.

This is not to be taken up at this centre.

Experiment 22.

HORMONAL APPLICATION TO INCREASE FRUIT-SET.

As decided in the review meeting of Cashew Research Workers, held at Vridhachalam in January 1974, a trial to study the effects of the following plant regulators on fruit-set and fruit-drop was carried out during the 73-74 bearing season :-

Design : Randomised Block No. of trees per plot - 2
Replications : 3

Treatments :
(1) Indole-acetic acid - 50 ppm.
(2) Naphthalene acetic acid - 10 ppm.
(3) " " - 20 "
(4) 2,4-D - 5 ppm
(5) " " - 10 "
(6) Water-spray - Control
(7) No spray - Do.

(Contd .....)

Acqueous solutions of the above plant regulators were sprayed on whole trees after opening of hermaphrodite flowers has commenced. Two sprayings were given on 15-3-1974 and 30-3-1974. Twenty five panicles, selected at random, were tagged soon after the first spray in order to make observations. The visible number of fruit-set at the time of first spray, number of fruits set subsequently, number of fruits dropped and the number of nuts harvested were recorded. The summary data are presented in table III.

Table III.

Showing the mean fruit-set, fruit-drop and mature nuts harvested from samples of 50 panicles and the total tree yields under the different treatments.

Tr. No.	Treatment	Mean No. of fruits set.	Mean No.of fruits dropped.	Mean No of nuts harvested.	Total tree yield in Kg.
1.	IAA-50 ppm	109.66	68.66	41.00	4.293
2.	NAA-10 ppm	75.00	44.00	31.00	1,994
3.	NAA-20 ppm	46.33	23.33	23.00	1.531
4.	2,4-D-5ppm	61.00	34.00	27.00	1.781
5.	2,4-D-10ppm	36.00	17.66	18.33	1.858
6.	Water spray	31.33	12.66	18.66	0.404
7.	No. Spray	33.33	17.33	16.00	0.369
	CD @ 5%	33.1	21.37	14.4	Not significant.
	'F' Test	**	**	xx	

The above data show that treatments 1 and 2 significantly increased the fruit-set and the number of mature nuts harvested. Fruit-drop also was significantly higher in treatments 1 and 2, as compared to control treatments; thereby indicating that the increased set under treatments 1 & 2 were not fully carried to maturity as a result of the treatments. The treatment differences are not reflected in the total yield, because the size of the trees varies considerably.

(Contd.....)

The data on fruit-set, fruit-drop, nuts harvested and the total tree yield are given in appendix V.

12. TECHNICAL SUMMARY.

The clonal and seedling types, planted at the Cashew research Station, Anakkayam during the years 1963 to 1967 were maintained properly and their evaluation in respect of economic characters was continued. The highest yield of 24-497Kg was obtained from the type BLA-139-1, followed by 23.005Kg from BLA-273-1, 18.615Kg NDR-2-1, 17.405Kg from UL-28-1, 15.926Kg from Ul-27-1, 14.394Kg from NLR-2-1 and 14.498Kg from BLA-256-1

Apart from the highest yield, BLA-139-1 is early in bearing and has a short flowering phase. UL-28-1 is also early in bearing, but produces nuts of small size(mean weight 0.355g)

Data on sex ratio were collected in respect of 60 types and 23 hybrid progenies which were not studied during the last season. Among these, the highest percentage of 20.6 of perfect flowers was recorded in type UL-21-1 and the lowest (0.1%) in type MAL-1-3

Based on the mean yield for the past 6 years, a comparative yield trial, including 16 types and hybrids has been laid out in the Anakkayam Station.

The comparative yield trial, involving 16 best yielders from the Cashew Research Stations at Anakkayam, Bapatla, Vridhachalam and Vengurla was laid out in September 1973.

Among the F1 hybrid progenies, planted in 1963, the highest yield of 15-291Kg was obtained from H-3-17, followed by 10.395Kg from H-4-7 and 10.029Kg from H-1-4.

195 hybrid nuts were collected from the crosses, involving 10 parental combinations, made during 1972-73 season, out of which 162 seedlings were obtained. These were planted in the field in 1973. Among these, only 121 progenies are now surviving.

(Contd.....)

In order to study the inheritance of some of the promising types and hybrids, selfing was done in 14 trees and 214 selfed nuts were collected. These were supplied to the Project Co-ordinator for further studies.

Monthly budding trial was started in May, 1974 and is being continued. There was no success in the buddings done in May and June. Veneer grafting will also be tried from August, 1974 onwards.

The NPK fertilizer trial as per the approved technical programme has been laid out.

Trial on the effects of spraying some plant regulators on fruit-set and fruit drop indicated that two sprayings of IAA @ 50 ppm and NAA @ 10 ppm significantly increased the fruit-set and the number of mature nuts harvested. The fruit-drop also was significantly higher in the above treatments as compared to the controls, thereby indicating that the increased set obtained as a result of the sprayings was not fully carried to maturity.

13. REMARKS OF THE WORK-SHOP ON THE LAST YEAR'S REPORT OF THE CENTRE AND THE ACTION TAKEN THERE-ON

NIL.

14. Additional information, if any.

NIL.

1/9/74

(V.K.Damodaran)
Deputy Director of Agriculture,
AICS & CIP.
Kerala Agrl.University Farm,Mannuthy
Officer in-charge.

Date & Signature of the Head of the Institution.

APPENDIX I.

Statement of rainfall received at Manjeri (3 KM from the Cashew Research Station, Anakkayam) during the Years 1972, 1973 & 1974.

Month	Rainfall received in centimetres.		
	1972	1973	1974
January	..	..	..
February	..	..	..
March	0.33	0.31	0.3
April	6.62	11.33	8.20
May	37.48	15.38	14.92
June	45.40	72.49	21.90
July	92.88	62.73	..
August	29.88	48.22	..
September	10.47	0.71	..
October	40.28	30.51	..
November	19.21	11.82	..
December	5.08	1.14	
Total	287.63	254.64	

APPENDIX II.

Table showing yield obtained during 1973-74 and the mean YIELD FOR 6 Years of the trees in the Germ-plasm Collection at the C.R.S.Anakkayam.

S.No.	Type No.	Yield in Kg. 1973-74	Yield in Kg. Mean for last 6 years	Weight of 100 nuts (g)
		1963 planting(clonal).		
1	K-3-1	0.804	3.250	
2	K-3-2	0.624	3.174	
3	K-4-1	1.091	2.443	
4	K-4-2	0.647	1.574	
5	K-7-2	4.274	4.881	
6	K-11-2	8.992	6.525	485
7	K-16-1	4.664	8.232	
8	K-20-1	3.457	6.043	645

(Contd.....)

1	2	3	4	5
9	K-21-2	4.121	5.297	
10	K-22-1	8.634	8.719	
11	K-22-2	7.727	5.569	674
12	K-25-1	3.837	5.564	
13	K-25-2	8.237	8.806	619
14	K-26-1	5.253	4.909	576
15	K-27-1	9.220	10.335	469
16	K-28-2	7.988	10.874	671
17	(BRZ-17-1)	9.623	7.642	

1964 Plantings (Clonal)

18	K-1-1	2.364	3.601	
19	K-1-2	6.902	7.008	628
20	K-9-2	2.319	2.580	
21	K-10-1	2.996	6.434	
22	K-10-2	6.612	11.128	
23	K-11-1	1.364	2.770	
24	K-12-1	4.711	6.790	560
25	K-12-2	1.230	2.656	
26	K-13-1	0.470	1.760	
27	K-13-2	3.367	3.863	
28	K-16-2	4.036	6.760	
29	K-17-1	1.433	1.834	580
30	K-17-2	2.012	2.740	~~580~~
31	K-19-1	7.440	9.143	731
32	K-19-2	1.111	3.735	
33	K-28-1	0.924	7.764	
34	NLR-1-1	1.423	3.677	604
35	NLR-1-2	0.879	1.235	
36	NLR-2-1	14.394	9.875	576
37	NLR-2-2	10.960	5.493	575
38	NLR-4-1	3.379	3.449	528
39	NLR-4-2	3.282	3.017	
40	NLR-5-1	0.342	1.615	514
41	NLR-5-2	3.715	2.381	
42	TGKA-3-2	5.509	2.706	583
43	BRZ-9-1	2.948	4.801	

(Contd.....)

1	2	3	4	5
44	BRZ-9-2	4.246	6.364	696
45	BRZ-16-1	0.568	0.569	
46	BRZ-16-2	0.264	0.979	
47	BRZ-17-1	9.623	7.014	
	1965 Plantings (Clonal).			
48	K-6-1	4.690	4.771	588
49	K-20-2	0.271	5.428	
50	K-30-1	4.407	2.721	1049
51	BRZ-10-2	7.069	7.546	
52	UL-2-1	5.362	3.215	
53	UL-22-1	5.981	3.580	
54	UL-27-1	15.926	9.613	453
55	UL-28-1	17.405	11.474	355
	1966 Plantings (Clonal)			
56	K-18-2	11.228	8.093	741
57	K-23-1	0.775	2.252	
58	K-23-2	4.002	5.420	621
59	K-27-2	6.087	3.023	
60	KTKM-2-1	2.773	1.175	
61	NDR-2-1	18.615	7.761	
62	CHKD-1-2	8.413	3.600	580
63	PNKLA-1-1	0.967	2.788	
64	BRZ-10-1	0.437	2.238	785
65	BRZ-11-1	1.650	2.408	782
	1967 Plantings (Clonal)			
66	K-5-1	2.877	1.363	
67	K-5-2	6.946	3.254	501
68	K-6-2	2.242	0.715	
69	K-7-1	3.235	2.512	
70	K-18-1	0.319	0.406	
71	K-21-1	0.408	1.061	
72	K-26-2	3.956	1.382	
73	K-29-1	1.821	0.953	
74	NLR-3-1	0.627	0.521	

(Contd.....)

1	2	3	4	5
75	CRPT-1-1	6.265	3.032	495
76	ALGD-1-1	8.552	3.713	378
77	NDR-2-2	7.073	2.330	
78	CHKD-1-1	10.560	4.040	
79	PTR-1-1	2.814	2.034	
80	PTR-1-2	4.539	1.831	360
81	PTR-1-3	2.953	1.250	
82	BRZ-11-2	5,931	2.920	
83	PNKA-1-2	8.056	2.552	1060
84	UL-2-2	2.017	0.819	

1963 Plantings (Seedlings types)

1	BLA-256-1	14.498	9.106	386
2	BLA-256-2	1.297	1.584	700
3	BLA-256-4	5.626	7.317	
4	BLA-56-1			
5	BLA-56-2	0.591	0.862	
6	BLA-56-3	0.875	1.082	626
7	BLA-56-4	3.023	1.973	668
8	BLA-139-1	25.497	16.274	445
9	BLA-139-2	2.640	2.255	672
10	BLA-139-3	6.993	4.687	755
11	BLA-139-4	6.620	3.268	679
12	BLA-121-2	8.367	4.980	709
13	BLA-121-4	6.334	4.514	
14	BLA-176-1	2.583	2.050	440
15	BLA-176-2	0.122	0.110	
16	BLA-176-3	1.996	1.801	420
17	BLA-176-4	1.195	0.766	
18	BLA-1-1-	2.184	1.997	462
19	BLA-1-2	7.181	6.555	
20	BLA-39-1	3.171	0.982	611
21	BLA-39-2	2.085	2.325	640
22	BLA-39-3	1.447	1.024	770
23	BLA-39-4	9.990	10.608	
24	BLA-273-1	23.005	11.372	565
25	BLA-273-2	3.841	2.580	

(Contd.....)

1	2	3	4	5
26	BLA-273-3	0.050	0.090	
27	BLA-273-4	3.329	2.458	700
28	ABD-1-1	0.636	2.952	
29	ABD-1-2	0.863	1.085	
30	ABD-1-3	0.092	0.712	
31	ABD-1-4	2.417	2.166	523
32	ABD-2-1	6.110	6.552	688
33	ABD-2-2	3.567	3.694	
34	ABD-3-1	0.606	2.224	929
	1964 Plantings.			
35	UL-1-1	2.574	0.951	526
36	UL-1-2	1.534	1.002	
37	UL-2-1	4.000	4.542	517
38	UL-2-2	1.619	2.228	489
39	UL-3-1	7.041	3.716	498
40	UL-3-2	7.178	3.765	408
41	UL-4-1	0.334	0.191	700
42	UL-4-2	0.240	2.123	
43	UL-5-1	0.620	4.032	575
44	UL-5-2	2.953	4.059	615
45	UL-6-1	1.566	1.554	547
46	UL-6-2	0.043	1.728	
47	UL-7-1	3.440	3.077	552
48	UL-7-2	1.136	2.386	520
49	UL-8-1	1.136	2.523	600
50	UL-8-2	4.573	4.841	
51	UL-9-1	NA	0.442	
52	UL-9-2	0.532	0.480	
53	UL-10-1	1.290	1.403	405
54	UL-10-2	1.283	1.352	280
55	UL-12-1	NA	0.1830	
56	UL-12-2	NA	0.100	
57	UL-14-1	2 .955	1.719	788
58	UL-15-1	4.078	7.145	612
59	UL-15-2	4.906	3.063	
60	UL-18-1	1.415	2.764	662
61	UL-18-2	1.208	1.686	664

(Contd.....)

1	2	3	4	5
62	UL-19-1	2.121	2.965	640
63	UL-19-2	7.244	3.707	
64	UL-20-1	1.188	0.539	610
65	UL-20-2	0.018	0.345	
66	UL-21-1	0.137	0.831	
67	UL-21-2	13.767	8.114	681
68	UL-22-2	0.038	1.265	
69	MAL-1-1	0.377	0.866	
70	MAL-1-2	1.023	1.229	
71	MAL-1-3	0.669	0.866	
72	MAL-1-5	0.458	1.823	
73	MAL-2-1	..	0.916	
74	MAL-2-2	1.405	1.557 ~~0.186~~	
75	MAL-2-3	0.751	2.497	
76	MAL-2-4	1.642	3.485	
77	MAL-2-5	0.405	0.186	
78	MAL-3-1	0.789	1.178	
79	MAL-3-2	..	0.142	
80	MAL-3-3	2.623	2.777	
81	PTR-1-1	..	0.433	
82	PTR-1-2	1.885	2.589	
83	PTR-1-3	0.743	2.357	
84	PTR-1-4	1.108	4.083	
85	PTR-1-5	0.022	--	
86	LOC-1-2	2.038	--	
87	LOC-1-3	1.196	--	
88	LOC-1-4	3.207	--	
89	LOC-1-5	0.861	--	
	1965 Plantings.			
90	TZA-1-1	--		
91	TZA-1-3	0.219		
92	TZA-1-4	0.421		
93	TZA-1-5	1.765		
94	TZA-1-6	--		
95	TZA-1-7	0.373		
96	TZA-1-8	0.012		
97	TZA-1-10	3.133		

(Contd.....)

98

1	2	3	4	5
98	K-30-1	NA		
	1966 Plantings.			
99	NDR-1-1	--		
100	NDR-1-2	--		
101	NDR-2-1	0.345		
102	NDR-2-2	--		
103	KTKM-1-1	0.135		
104	KTKM-1-2	--		
105	KTKM-2-1	--		
106	KTKM-2-2	Dried up		
107	ANSR-1-1	0.872		
108	ANSR-1-3	--		
109	ANSR-1-4	Dried up		
110	NGRA-1-1	--		
111	NGRA-1-2	--		
112	NGRA -1-3	0.076		
113	NGRA -1-4	--		
114	NGRA-1-5	0.147		
115	NGRA-1-6	--		
116	NGRA-1-7	0.231		
117	NGRA-1-8	--		
118	NGRA-2-1	--		
119	NGRA-2-3	--		
120	NGRA-2-4	--		
121	NGRA-1-9	0.582		
122	NGRA-1-10	--		

(Contd.....)

APPENDIX III.

Table showing the percentage of perfect flowers in some types and hybrid progenies.

S.No.	Type No.	Total number of flowers		Percentage of bisexual flowers
		Bisexual	Male	
1.	K-5-1	69	6231	1.1
2.	K-6-2	447	5896	7.04
3.	UL-5-1	116	4085	2.3
4.	UL-5-2	232	5425	4.3
5.	UL-622	20	4590	0.4
6.	UL-7-1	177	5080	3.4
7.	UL-7-2	130	10250	1.2
8.	UL-8-1	50	4736	1.0
9.	UL-9-2	335	4485	7.2
10.	UL-10-1	125	4150	2.9
11.	UL-10-2	410	4895	9.2
12.	UL-12-1	157	1725	8.0
13.	UL-12-2	256	5705	3.3
14.	UL-14-1	184	3571	4.8
15.	UL-19-1	125	4705	2.5
16.	UL-19-2	196	5819	3.3
17.	UL-20-1	127	5025	2.4
18.	UL-20-2	137	6280	2.1
19.	UL-21-1	361	1387	20.6
20.	UL-21-2	1113	7809	12.4
21.	UL-22-1	508	7168	6.6
22.	BLA-1-2	507	5328	8.9
23.	BLA-39-1	154	3913	3.8
24.	BLA-39-2	540	4587	10.5
25.	BLA-39-3	131	3923	2.9
26.	BLA-56-2	305	3980	7.0
27.	BLA-56-3	101	2497	3.9
28.	BLA-56-4	103	2630	3.7
29.	BLA-121-2	61	1457	4.0
30.	BLA-139-2	150	2450	5.7
31.	BLA-139-3	490	3560	7.5
32.	BLA-139-4	275	3980	6.8

(Contd.....)

1	2	3	4	5
33	BLA-176-4	276	4227	5.4
34	BLA-273-2	334	2505	13.4
35	BLA-273-3	547	4320	11.3
36	ABD-1-2	79	2435	3.1
37	ABD-1-3	12	1928	0.3
38	ANSR-1-1	423	4824	9.4
39	BRZ-11-1	730	4070	15.2
40	KTKM-1-1	31	4849	0.6
41	KTKM-1-2	4	3821	0.1
42	MAL-1-1	23	4247	0.5
43	MAL-1-3	4	4031	0.10
44	MAL-2-1	48	2760	0.18
45	MAL-2-2	21	3441	0.6
46	MAL-2-5	209	5236	3.8
47	MAL-3-1	46	3566	1.2
48	NDR-1-1	16	3795	0.4
49	NDR-2-1	33	4736	0.68
50	NDR-2-2	414	3833	9.7
51	NGRA-2-4	1	1746	0.06
52	PTR-1-1	138	6800	2.1
53	PTR-1-2	334	6784	4.6
54	TGKA-3-1	636	4456	12.5
55	TZA-1-1	476	3209	12.9
56	TZA-1-3	61	2612	2.3
57	TZA-1-4	193	2075	8.5
58	TZA-1-5	209	3018	6.4
59	TZA-1-7	52	2086	2.5
60	TZA-1-8	220	3852	5.4
	<u>Hybrids.</u>			
61	H-1-2	7	3022	0.20
62	H-1-3	10	2914	0.23
63	H-1-6	28	2501	1.1
64	H-2-2	50	3428	1.4
65	H-2-4	47	1896	0.2
66	H-2-6	26	3299	0.8
67	H-2-7	93	2271	4.0

(Contd.....)

1	2	3	4	5
68	H-2-8	56	3919	1.4
69	H-3-1	146	4492	3.1
70	H-3-2	81	3788	2.14
71	H-3-3	347	3810	8.56
72	H-3-4	467	6574	6.0
73	H-3-5	91	3637	2.4
74	H-3-7	229	3544	6.0
75	H-3-9	160	6370	0.9
76	H-3-10	124	3179	3.8
77	H-3-11	322	2361	12.0
78	H-3-12	205	4134	4.7
79	H-3-13	202	3857	5.0
80	H-4-8	811	3826	17.5
81	H-4-9	209	3012	6.4
82	H-4-10	725	2395	23.0
83	H-4-11	483	3361	13.0
84	H-6-1	267	7720	3.3

(Contd.....)

APPENDIX IV

Table showing the Yield of 1973-74 and the mean yield for the past 6 years of F1 hybrid progenies.

Sl.No.	Hybrid No.	Yield in Kg. 1973-74	Mean of last 6 years.	Weight of 100 Nuts (g)
1	2	3	4	5
	CROSS NO.I - TREE NO.12A x Tree No.27			
1	H-1-1	1.081	2.360	
2	H-1-2	1.002	1.657	472
3	H-1-3	2.108	2.056	645
4	H-1-4	10.029	8.676	561
5	H-1-5	1.893	3.612	565
6	H-1-6	0.689	1.458	-
7	H-1-7	0.471	3.265	540
8	H-1-8	0.107	--	-
9	H-1-9	4.515	4.783	666
10	H-1-10	2.712	4.668	659
11	H-1-11	4.982	4.213	621
12	H-1-12	4.147	3.584	645
	CROSS NO.2 - TREE NO.12A x TREE NO.8A			
13	H-2-1	0.749	1.856	720
14	H-2-2	0.519	1.839	
15	H-2-3	0.226	0.623	
16	H-2-4	0.181	0.380	490
17	H-2-5	1.045	4.049	588
18	H-2-6	0.729	1.796	702
19	H-2-7	2.509	3.168	521
20	H-2-8	0.904	1.197	
	CROSS NO.3 - TREE NO.30 x BRAZIL-18			
21	H-3-1	1.905	3.116	680
22	H-3-2	3.100	4.240	488
23	H-3-3	1.922	3.562	667
24	H-3-4	6.934	6.196	810
25	H-3-5	5.155	6.269	549
26	H-3-6	5.082	7.390	551
27	H-3-7	4.294	5.109	682

(Contd.....)

1	2	3	4	5
28	H-3-8	0.670	4.335	900
29	H-3-9	3.338	7.419	710
30	H-3-10	4.230	4.926	838
31	H-3-11	4.960	4.053	718
32	H-3-12	4.379	5.309	647
33	H-3-13	5.960	8.151	668
34	H-3-14	4.577	4.313	714
35	H-3-15	4.323	3.882	785
36	H-3-16	1.200	1.240	650
37	H-3-17	15.291	13.466	655
38	H-3-18	8.435	4.094	723
39	H-3-19	6.302	7.217	595
	CROSS NO.4 TREE NO. 30A x BRAZIL-18			
40	H-4-1	6.237	4.983	575
41	H-4-2	0.452	0.768	
42	H-4-4	5.377	4.208	505
43	H-4-5	2.992	4.977	678
44	H-4-6	4.135	4.997	715
45	H-4-7	10.395	12.921	620
46	H-4-8	1.130	2.060	613
47	H-4-9	2.962	4.165	460
48	H-4-10	2.756	5.136	735
49	H-4-11	7.159	5.868	642
50	H-4-12	1.595	2.774	422
51	H-5-1	0.272		
52	H-6-2	2.775		

(~~Contd~~.....)

APPENDIX V.

Table showing the total number of visible fruit-set on 50 panicles under the Plant Regulator trial

Tr No.	Treatment	Rep I	Rep II	Rep III	Total
1	IAA-50ppm	93	117	119	329
2	NAA-10ppm	75	87	63	225
3	NAA-20ppm	45	51	43	139
4	2,4-D-5ppm	95	72	16	183
5	2,4-D-10ppm	38	56	14	108
6	Water spray	23	33	38	94
7	No spray	49	45	6	100
	Total	418	461	299	1178

Table showing the number of fruits dropped from 50 panicles.

Treat-mentNo.	Treatment	Rep I	Rep II	Rep III	Total
1	IAA-50ppm	61	74	71	206
2	NAA-10ppm	39	59	34	132
3	NAA-20ppm	19	36	15	70
4	2,4-D-5ppm	55	46	1	102
5	2,4-D-10ppm	18	33	2	53
6	Water spray	8	13	17	38
7	No spray	22	30	--	52
	Total	222	291	140	653

(Contd.....)

APPENDIX V.

Table showing the number of mature nuts harvested FROM 50 panicles.

Treatment No.	Treatment	Rep I	Rep II	Rep III	Total
1	IAA-50ppm	32	43	48	123
2	NAA-10ppm	36	28	29	93
3	NAA-20ppm	26	15	28	69
4	2,4-D-5ppm	40	26	15	81
5	2,4-D-10ppm	20	23	12	55
6	Water spray	15	20	21	56
7	No spray	27	15	6	48
	Total	196	170	159	525

Table showing the total tree yield in Kg. from the trees under the different treatments

Treatment No.	Treatment	Rep I	Rep II	Rep III	Total
1	IAA-50ppm	9.198	1.140	2.542	12.880
2	NAA-10ppm	3.425	1.532	1.025	5.982
3	NAA-20ppm	2.384	0.801	1.408	4.593
4	2,4-D-5opm	3.113	2.070	0.159	5.342
5	2,4-D-10ppm	2.297	0.836	2.440	5.573
6	Water spray	0.555	0.456	0.200	1.211
7	No spray	0.223	0.272	0.614	1.109
	Total	21.195	7.107	8.388	36.690