206711

RICE RESEARCH STATION, PATTAMBI
ANNUAL REPORT 1972-73

INTRODUCTION

The Paddy Breeding Station, Pattambi was established in 1927 by the then Government of Madras and was transferred to the Government of Kerala in 1956 consequent on the reorganization of the States. This station was upgraded to the status of a Central Rice Research Station in 1963 with three Regional stations at Mannuthy, Moncompu and Kayamkulam and two sub-stations at Vyttila and Kottarakkara. This station was transferred to the Kerala Agricultural University on 1-2-1972. The main objectives of the station are to:

* evolve high yielding varieties of rice suitable for different agroclimatic regions of the state;
* find out and recommend suitable cultural and manurial schedules for rice for the different seasons;
* research on paddy pests and diseases and their control measures;
* study the chemical and biological aspects of rice soils;
* multiplication and distribution of quality seeds and seed certification;
* serve as an authoratative information centre on matters concerning rice production, protection and conservation.

For the purpose of research, the station is organised into divisions of varietal improvement, Agronomy, Agricultural Chemistry, Plant Pathology, Entomology, and Statistics. In addition to these the All-India Co-ordinated Rice Improvement Project, All India Co-ordinated Agronomic Experiments Scheme, All India Co-ordinated Crop weather Scheme and a Seed Testing laboratory are also ~~furnishing~~

functioning at this station. A scheme on pulses research is also functioning at this station. Besides, the station is also engaged in the production of elite seed and plant materials of vegetables and horticultural crops.

~~For the purpose of~~

The Rice Specialist is the principal investigator and controlling officer of the station and the different schemes working at this station. The staff particulars of the station are furnished separately.

PUNJAB

1. Sri S.Gopalakrishnan, B.Sc.(Ag)Assoc.IARI, Ph.D. Rice Specialist.

2. Shri K.Gopalan, B.Sc.,L.C.(Ag) M.Sc(Agri)Asstt Pathologist (AICRIP) from 24-5-72.

3. Shri K.L.Jeena, B.Sc., Breeder(AICRIP) from 24-5-72.

4. Shri K.Rajagopal Reddy, B.Sc.(Ag)M.Sc.(Ag) Asso.IARI-Officer in-Charge (Andhra)

5. Shri V.S.Gnanasekaran, B.Sc.(Ag)M.Sc(Ag)-Pathologist (AICRIP) till 14.5.72.

6. Shri A.P.Sreedharan Nair, B.Sc.(Ag) ~~M.Sc(Ag)~~ Asso. IARI - Entomologist (AICRIP) from 25-5-72.

7. Sri K.S.Vidyadharan, B.Sc.(Ag);M.Sc.(Ag)-Agronomist (AICRIP) from 25-5-72.

8. Shri P.S.Kannoly, B.Sc.(Ag) M.Sc.(Ag)-Asst.Rice research Officer (Agronomy)

9. Shri K.Karunakaran, B.Sc.(Ag);Asst.Rice research Officer (Entomology)

10. Shri M.S. Kunhuthy, B.Sc.(Ag);M.Sc.(Ag)-Assistant Rice Chemist (AICRIP)

11. Shri K.K.Omanakuttan Nayar, B.Sc.(Ag)-Asst.Rice research Officer (Agronomy) till 11-7-72.

12. Shri K.V.George, B.Sc.(Ag) M.Sc.(Ag) Asst. Rice research Officer-(Agrology)

13. Sri.K.Karunakaran, B.Sc.(Ag) M.Sc.(Ag); Ph.D.-Assistant Rice Research Officer (Breeding)

14. Sri.C.V.Abraham, B.Sc.(Ag); M.Sc.(Ag); Ph.D. Statistical Officer (AICRIP) till 30-11-72.

15. Shri K.P.Venkiteswaran, B.Sc.(Ag) M.Sc.(Ag)- Asst.Rice research Station Officer (Statistics)

16. Shri V.J.Joseph, B.Sc.(Ag) ; M.Sc. (Ag)-Statistical Officer. (AICRIP) from 5-12-72.

17. Shri K.A.Varkey, B.Sc.(Ag), M.Sc.(Ag) M.Sc.(Ag) Assistant Rice research Officer(Chemistry) from 5-12-72.

18. Shri G.Ravindranathan Nair, B.Sc.(Ag) ; M.Sc. (Ag) Research Assistant.

19. Shri K.Thomas, B.Sc.(Ag) M.Sc.(Ag) Research Assistant.

20. Shri K.Ravindran Nair, B.Sc.(Ag); M.Sc.(Ag) Rice Assistant.

21. Shri V.S.Sukumaradev, B.Sc.(Ag) ; M.Sc.(Ag) Rice Assistant.

22. Sri G.N.Chennaiah, B.Sc.(Ag);M.Sc.(Ag) Research Assistant.
23. Sri K.Ramanjaneyulu Nair, B.Sc.(Ag);M.Sc.(Ag) Res. Assistant.
24. Sri K.Ramarao, B.Sc.(Ag); M.Sc.(Ag) Research Assistant.
25. Smt. A.Kantikumari, B.Sc.(Ag) Research Assistant.
26. Sri G.Vetiml, B.Sc.(Ag) Research Assistant.
27. Sri M.Abdul Khaleq, B.Sc.(Ag.) Research Assistant.
28. Sri T.G.Radhakrishnan, B.Sc.(Ag) Research Assistant.
29. Smt.P.Chandrika, B.Sc.(Ag) Research Assistant.
30. Sri P.C.Abookaker, B.Sc.(Ag) M.Sc.(Ag) Research Assistant.
31. Sri S. SRSKadrinath B.Sc(Ag); M.Sc.(Ag) "

A Statement indicating the account for the year is given below:

Name of Scheme	Sanctioned budget for 1972-73. Rs. Ps.	Expenditure during 1972-73 Rs. Ps.
1. Rice Scheme	3,09,400-00	4,89,833-78
2. All India Coordinated Rice Improvement Project	1,19,450-00	1,06,646-84
3. Soil and Plant Analysis (AICARS)	44,000-00	46,854-98
4. Composit Farm	1,39,830-00	1,44,575-46
5. Seed Scheme	29,610-00	22,627-37
6. Pulses scheme	23,860-00	17,620-98
7. Coconut Nursery	600-00	14-10
8. Meteorology	8,840-00	4,974-76
	8,95,890-00	9,33,146-65

Total receipts : Rs. 2,25,645-36

PROGRESS OF RESEARCH

Weather conditions during 1972-73.

The rainfall during the year was fairly normal. The total rainfall during the year was 2715.4 mm which was 8.6% higher than the past 10years average of 2500.3 mm. During April the rainfall was only 2/3 of the normal and it has slighly affected the medan crop. During the first half of May a rainfall of 377.8 mm was received which was nearly twice the normal for the period. This heavy precipetation has adversely affected the dry sown bulk crop due to stignation of water and submersion of crop.

Table-1. Rainfall during the year 1972-73 as compared to the average of last 10 years.

Month	Normal rainfall in MM Average of 10 years 1962-63 to 1971-1972.	Rainfall in MM-1972-73	Deviation from the normal.
April	65.0	45.0	-20.0
May	194-7	377.8	+183.1
June	505.6	444.9	-60.7
July	705.6	713.8	+ 8.2
August	377.3	303.8	-73.5
September	203.9	187.8	-16.1
October	252.2	408.7	+156.5
November	118.1	123.2	+5.1
December	51.9	110.4	+ 58.5
January	.....	.....	.....
February	4.9	.....	.....-4.9
March	21.1	.....	....+21.1
TOTAL	2500.3	2715.4	+215.1

The unusual dry spell which followed from the middle of May till the end of June has adversely affected the preparation and sowing of the nurseries as well as transplanting. This delay in the onset of monsoon has slighly affected the cropping programme and resowing had to be resorted to in several cases. During August and September the rainfall was below normal which necessitated pumping of water from wells for irrigating the palliyal crop. The rainfall during October to December was above normal and no rains were received during January to March. Details of rainfall are presented in Table.1 and data on other meteorological factors in Table-2.

Table-2 Meteorological data for the year 1972-73

Month	No. of rainy days.	Mean maximum temp. in°C	Mean minimum temp. in°C	Absolute maximum temperature in °C		Mean relative humidity	Hours of bright sunshine
April	3	35.6	24.9	37.7	21.1	88	286.5
May	10	32.3	24.0	36.5	21.9	94	186.2
June	12	31.3	24.2	34.3	21.1	94	187.6
July	23	28.6	23.0	30.8	21.4	96	114.2
August	21	29.5	22.8	30.6	21.6	97	176.1
September	10	32.2	23.2	32.7	21.6	96	218.0
October	15	31.4	23.5	34.0	21.8	96	181.3
November	7	33.8	23.0	33.8	19.8	91	245.7
December	3	32.0	21.7	34.0	17.9	90	242.2
January	Nil	33.5	20.0	35.0	18.2	83	307.8
February	Nil	32.4	22.0	38.5	15.6	81	287.6
March	Nil	37.4	22.9	41.0	17.1	89	299.0

VARIETAL IMPROVEMENT

The items of research work included the following:

1. Comparative yield trial of advanced cultures
   - A. Medium duration cultures;
   - B. Short duration cultures.
2. Preliminary yield trial
3. Dry sown trial of cultures
4. Studies on the effect of different spacings on the performance of the new promising culture 6473.
5. Germplasm bank
6. Breeding materials under selection
7. Fresh crosses.

I. Comparative yield trials of advanced cultures:

A. Medium duration cultures:

The following medium duration cultures were evaluated during the year in 4 replicated yield trials, 2 in the ~~fresh~~ first crop season (April-May - August-September) and 2 in the second crop season (September-October - January-February).

Culture	Parentage	Rice colour
Cul.3	Ptb.10 x IR.8	Red
Cul.4	,,	White
Cul.1138	,,	White
" 1139	,,	Red
" 1140	,,	Red
" 1141	,,	White
" 1167	,,	Red
" 1180	,,	Red
" 6473	IR8/2 x Annapoorna	Red
" 6952	IR.533 x Ptb.15 x T (N) 1	White
IET 1136	IR8/2 (B.589-A4-18/2 x T(N)1	White
IET 1991	GEB.24 x T(N)1	White
Cul.587-4	Tainan-3 mutant	White
MC.IR.8	Natural Cross in IR.8	Red

The details of the lay out of the trials are furnished below:

Particulars	I crop		II crop	
	Trial No.I	Trial No. II	Trial No.I	Trial No. II
Field	V.4a	III 1b.	V.2a	III 2b.
Date of sowing	26-5-72	22-5-72	1-9-72	8-9-72
Date of planting	30-6-72	13-6-72	27-9-72	29-9-72
Layout	R.B.D.	R.B.D.	R.B.D.	R.B.D.
No.of cultures and varieties	12	8	11	8
Replications	3	3	3	3
Plot size A) Gross b) Nett	5 x 3 M 4.6 x 2.7 M	4.95x6.0 M 4.95x6.0M	6.6 x 2.7 M 6.2 x 2.4 M	4.5 x 5.4 M 4.5 x 5.4 M
Spacing (cm)	20 x 15	20 x 15	20 x 15	20 x 15
Total NPK (kg / ha)	90:76:40	80:50:50	80:40:40	80:50:50

The data on flowering duration and grain yield of these four trials are furnished in Table-3.

Table-3. Summary of results of yield trials of medium duration cultures

Cultures/ varieties	Flowering duration(days) and grain yield in kg per ha in 4 trials							
	I crop season				II crop season			
	Trial No.I		Trial No.II		Trial No.I		Trial No.II	
	Flowering duration	Grain Yield	Flowering duration	Grain Yield	Flowering duration.	Grain Yield	Flowering duration	Grain Yield
1	2	3	4	5	6	7	8	9
Cul.3	96	3684	—	—	81	3439	—	—
Cul.4	96	4428	—	—	81	3679	—	—
Cul.1138	—	—	99	7374	—	—	69	3539
,, 1139	—	—	99	7094	—	—	68	3863
,, 1140	93	4804	94	7790	77	3517	66	3770
,, 1141	—	—	96	7216	—	—	69	3498
,, 1167	—	—	99	6856	—	—	68	3675
,, 1180	95	4462	96	7461	77	3467	68	3779
,, 6473	96	5159	—	—	81	4430	—	—
,, 6952	97	4119	—	—	84	3663	—	—
IET 1136	97	4481	—	—	—	—	—	—
IET 1991	—	—	—	—	86	2811	—	—

1	2	3	4	5	6	7	8	9
Cul.587-4	86	4301	---	---	75	3831	---	---
NC.IR.8	96	4106	---	---	83	3808	---	---
IR.8	98	4308	---	---	---	---	---	---
IR.20	96	3985	---	---	88	3887	---	---
Jaya	94	5147	95	6892	75	4122	81	3704
Aswathy	---	---	99	6677	---	---	73	3416
C.D.(P=0.05)	---	1285	---	397	---	N.S.	---	184

Inference in Brief.	Cul.6473 recorded the highest yield. Statistically all the cultures except cul.3 were on a par with with check varieties.	Cul.1140 recorded the highest yield & was statistically on par with Cul.1180 and 1138.	Highest yekdk yield was recorded by Cul. 6473. The yield differences were not statistically significant.	Cul.1140 and and 1180 recorded the maximum grain yield and were statistitically on a par with Jaya and Cul. 1139.

B. <u>Shortduration cultures:</u>

There were four replicated yield trials of advanced short duration cultures during the year, out of which 2 were during the first crop season and the remaining 2 in the second crop season.

The cultures under trial were the following:

Culture	Parentage	Rice colour
Cul.12035	IR8/2 x Annapoorna	White
Cul.1285	Ptb.10 x IR.8	Red
Cul.6717	Cul.28 x Ptb.1	Red

The data on flowering duration and yield of these four trials are furnished in table-4.

Table.4 Summary of results of yield trials of short duration cultures.

Cultures/ varieties	Flowering duration(days) and grain yield in kg per ha							
	I crop season				II crop season			
	Trial No.1		Trial No. 2		Trial No.1		Trial No. 2	
	Flowering duration.	Grain yield	Flowering duration	Grain Yield	Flowering duration	Grain yield.	Flowering duration.	Grain Yield
Cul.12035	74	4659	81	5642	70	2793	76	1567
,, 1285	79	4947	82	5613	77	2628	84	2444
,, 6717	69	4332	--	--	65	2270	--	--
Annapoorna	69	4620	68	4687	65	2516	70	1270
Triveni	70	4410	76	5179	69	2621	71	1047
Rohini	71	4737	77	5613	53	1818	55	1301
C.D.(P=0.05)		N.S.		279		358		-
Inference:	Statistically all the cultures and varieties tested were on par. Cul.1285 recorded the maximum yield		Cul.12035 recorded the maximum grain yield. Cul. 12035 & 1285 and Rohini were statistically on par.		The crop was severely affected by stemborer. Maximum yield was recorded by Cul.12035.		The crop was severely affected by stemborer. Maximum yield was recorded by Cul.1285.	

II. Preliminary yield trial:

A preliminary yield trial was conducted during the second crop season in which 24 cultures from 6 crosses combinations were evaluated. The trial had 2 replications and a plot size of 5.13 sq.m.(net). Spacing adopted was 20 x 15 cm and total NPK applied was 80:40:40 kg per ha.

Date of sowing: - -1972. Date of Planting: - -1972.

Based on uniformity and reasonable freedom from diseases, 3 medium duration and 4 short duration cultures which had equal or higher yileds than the respective standards were selected for comparative yield trials.

The details of the composition of the cultures tried and selected are as follows:-

S. No.	Crosses	No.of cultures Tried	Selected		
			Medium duration	Short duration	Total
1.	Cul.28 x Leb Mueh Nahng	6	--	3	3
2.	IR861 x Cul28	4	--	--	--
3.	IR8(IR533 x Ptb.15 x T(N)1)	6	3	-	3
4.	IR8/2 x Ptb.7	6	--	1	1
5.	IR8/2 x Jeeragasala	1	--	--	--
6.	IR8 x Co.32	1	--	--	--
	Total	24	3	4	7

Details of flowering duration and grain yield of the seven selected cultures are furnished in Table-5.

Table-5. Details of new cultures selected from Preliminary Yield Trial

S.No.	Culture No.	Parentage	Flowering duration.	Grain yield kg/ha	Rice colour
1.	7779	IR8(IR533 x Ptb.15 x T(N)1)	98	3362	White
2.	7781	-do-	94	3460	,,
3.	7782	-do-	95	3557	,,
4.	7753	Cul.28 x Leb Mueh Nahng	79	2656	,,
5.	21278	-do-	80	3265	,,
6.	21592	-do-	80	2680	,,
7.	21491	IR8/2 x Ptb-7	79	2826	Red
Standards:					
Jaya			90	3562	
IR.8			99	3143	
6473			94	3606	
Annapoorna			71	3484	
Triveni			74	3508	
12035			79	2656	

III. Dry sown trial of cultures.

A trial wasconducted in split plot design with replications in sodan lands to evaluate the following 3 cultures under dry sown, rainfed condition adopting two spacings with a uniform seed rate of 80 kg/ha.

Culture	Parentage	Rice Colour
6473	IR.8/2 x Annapoorna	Red
12035	-do-	White
12814	Annapoorna x Chennellu	Red

As Jaya, Cul.6473, Aswathi and IR.8 were very late in flowering and thus subjected to bird damage these varieties were excluded from the trial.

The grain yield data of the trial in kg/ha are furnished in Table-6.

Table-6. Summary of results of dry sown trial of cultures.

Sl. No.	Variety/culture	Mean grain yield (kg/ha) S1 (15 x 15 cm)	S2 (45 cm)	Mean
1	Ptb-28	2384	2715	2550
2	Triveni	2516	2030	2265
3	Annapoorna-28	2345	2214	2280
4	Chennellu	2021	2299	2160
5	T (N) 1	1952	2130	2041
6	Cul.12035	2030	1944	1987
7	Cul.12814	1998	1798	1898
8	Bala	1620	1497	1559
C.D.(P=0.05)				
a) Varieties				474
b) Spacing		Not significant		
c) Spacing x varieties		Not significant		

Inference:

1. Ptb-28 recorded maximum yield and was significantly superiot to T(N)1, 12035, 12814 and Bala. Bala recorded the lowest yield and was significantly lower in yield than Ptb.28, Triveni, Annapoorna, Chennellu and T(N)1
2. The yield difference between the two spacings tried was not significant.

IV. Studies on the effect of different spacings on the performance of the new promising culture 6473.

A trial was laid out during the third crop season with culture 6473 to study its performance under 9 different spacing combinations and 4 replications. The planting was in doubles and N P K applied was 80:40:40 kg respectively per hectare.

Brief results of the trial are presented in Table-7.

Table-7. Brief results of a spacing trial with culture 6473

Treatment No.	Spacing (cm)	Gross plot size (M)	Net plot size (M)	Area (sq.m)	No. of hills	Mean grain yield (kg/ha)
1	30-30-20 x 5	1.60 x 6.05	1.40 x 5.95	8.3300	746	3028
2	20-30-30 x 10	1.60 x 6.10	1.40 x 5.90	8.2600	354	3182
3	20-30-30 x 15	1.60 x 6.15	1.40 x 5.85	8.1900	234	3713
4	30-15-30 x 5	1.40 x 6.05	1.05 x 5.95	6.2475	714	3342
5.	30-10-30 x 10	1.60 x 6.10	1.20 x 5.90	7.0800	354	3869
6	30-15-30 x 15	1.85 x 6.15	0.90 x 5.85	5.3650	156	4333
7	40-15-40 x 5	1.33 x 6.05	0.80 x 5.95	5.3550	476	3219
8	40-10-40 x 10	1.50 x 6.10	1.00 x 5.90	5.9000	236	3701
9	40-15-40 x 15	1.65 x 6.15	1.10 x 5.85	6.4350	156	3834
C.D. (P=0.05)						700

Inference: The yield differences between treatments No.6,5, 9,3 and 8 were not statistically significant. Spacings of 30-15-30 x 15 cm; 30-10-30 x 10 cm and 40-15-40 x 15 ranked as I, II and III respectively in grain yield.

Auxillary data on the effect of the spacing combinations on the important yield attributes of this culture were also collected. These data are furnished in Table-8.

Table-8. Effect of different spacing on some yield attributes of Culture-6473.

Treatment No.	Spacing (cm)	Mean plant height at maturity (cms)	Mean No. of productive tillers	Mean length of main panicle (cm)	Mean No. of spikelets on main panicle.
1.	20-20-20 x 5	80.27	5.30	21.90	103.70
2.	20-20-20 x 10	83.15	7.23	23.05	107.62
3.	20-20-20 x 15	83.77	8.80	22.92	104.50
4.	30-30-30 x 5	78.03	5.42	21.85	97.17
5.	30-30-30 x 10	84.55	6.87	23.22	113.60
6.	30-30-30 x 15	84.62	9.57	23.25	109.90
7.	40-40-40 x 5	80.17	5.22	22.07	101.72
8.	40-40-40 x 10	81.92	6.85	23.57	113.32
9.	40-40-40 x 15	85.25	10.22	23.77	119.82

These data indicated that, in general the wider spacings tended to increase the plant height, number of productive tillers panicle length as also the number of spikelets per panicle.

V. Germplasam Bank

Type collections numbering 581 and 281 were maintained during the first crop and second crop seasons respectively.

VI. Breeding materials under detailed study and selection:

The details of breeding materials under selection and initial evaluation during the year are presented in Table-9.

.....16

Table.9 Details of breeding materials under selection and initial evaluation at the Rice Research Station, Pattambi during 72-73.

serial Number.	Cross or Parentage	I crop season			II crop season			III crop season		
		Generation.	No.of lines grown.	No.of single plants selected	Generation.	No. of lines grown.	No. of single plants selected.	Germination.	No. of lines grown.	No.of single plants selected.
1	2	3	4	5	6	7	8	9	10	11
1.	Cul.28 x Leb Muey Nabng	F6	186	20	F7	20	10	---	---	---
2.	IR8x(IR.533xPtb.15x T (N) 1	F6	118	4	F7	4	3	---	---	---
3.	IR.661 x Cul.28	F6	191	30	F7	30	17	---	---	---
4.	IR8/2 x Ptb.7	F6	121	8	F7	8	1	---	---	---
5.	Cul.11812 x T(N)1	F5	70	2	F6	2	1	---	---	---
6.	IR8/2 x Jeerageasala	F5	64	3	F6	3	-	---	---	---
7.	Ptb.15 x T(N)1	F7	23	5	F8	5	1	---	---	---
8.	Cul.6067 x Cul.6473	F3	106	14	F4	14	-	---	---	---
9.	Mashoori x 6473	F2	6091	130	F3	130	71	---	---	---
10.	12035 x 10074	F2	1891	125	F3	125	6	---	---	---
11.	10074 x 12035	F2	664	59	F3	59	3	---	---	---
12.	6067 x 11828	F2	8183	54	F3	54	17	---	---	---
13.	6473 x 11828	F2	54	5	F3	5	---	---	---	---
14.	11828 x 6473	F2	76	13	F3	13	-	---	---	---
15.	6473 x 12035	F2	282	23	F3	23	1	---	---	---
16.	12035 x 6473	F2	170	14	F3	14	5	---	---	---
17.	12035x Ptb.12	F2	1443	11	F3	11	1	---	---	---

1	2	3	4	5	6	7	8	9	10	11
18.	12035 x Ptb.18	F2	131	5	F3	5	2	—	—	—
19.	Ptb.31 x Cul.25	F2	2001	1	F3	1	—	—	—	—
20.	Triveni x Ptb.15	F2	611	18	F3	18	1	—	—	—
21.	Field hybrid	—	10	1	—	1	—	—*	—	—
22.	Irradiated MR54-42	M2	130068	279	—	—	—	M3	279	453
23.	Aswathy x 6967	F3	137	86	—	—	—		—	—
24.	Rohini x 6967	F3	134	36	—	—	—	—	—	—
25.	DGWG x Ptb.15	F3	153	45	—	—	—	—	—	—
26.	IR 8 x Ptb.15	F3	109	29	—	—	—	—	—	—
27.	Rohini x Ptb.15	F5	5	14	F6	14	4	—	—	—
28.	6-3-8 x Ptb.15	F5	4	4	F5	4	—	—	—	—
29.	MR.54-42 x IR4	F3	282	227	—	—	—	24	227	65
30.	Aswathy x Ptb.20	F3	41	—	—	—	—	—	—	—
31.	T(N)1 x Ptb.29	F3	1	—	—	—	—	—	—	—
32.	Co.25 x IR.262	F6	7	25	F7	25	16	—	—	—
33.	T(N)1 x Ptb.20	F3	1	—	—	—	—	—	—	—
34.	Ptb.20 x T(N)1	F3	1	—	—	—	—	—	—	—
35.	Ptb.7 x DGWG	F5	2	19	F6	19	10	—	—	—
36.	IR.8 x 6-3-8	F5	5	21	F6	21	5	—	—	—
37.	Pookkala combo x Annapoorna	F6	25	26	F7	26	8	—	—	—
38.	MR.54-42 x 6473	F2	7 Families	55	—	—	—	—	—	—
39.	Aswathy x 6967/2	F2	9 Families	33	—	—	—	—	—	—
40.	T(N)1 x Co.25	—	—	—	F8	273	13	—	—	—
41.	IR.8 x Co.25	—	—	—	F8	60	31	—	—	—
42.	Pookkala combo x T(N)1	—	—	—	F7	31	3	—	—	—
43.	,, x Co.20	—	—	—	F7	10	1	—	—	—
44.	(Ptb.10 x IR.8) x Annapoorna	—	—	—	F8	3	—	—	—	—
45.	(T(N)1 x Co.25) x T (N) 1	—	—	—	F2	22 Families	38	—	—	—
46.	(T(N)1 x Co.25) x Co.25	—			F2	3	,,	23	—	—
47.	IR.8 x Cul-3	—	—	—	F2	3	,,	47	—	—
48.	Rohini x Ptb.10	F2	4916	85	F3	85	37	—	—	—

VII. Fresh crosses:

The following fresh crosses were effected during the year and F1 plants grown and seeds collected:-

Sl.No.	Cross	No.of plants (F1)
1.	Jaya x Tenpakhia	2
2.	Jaya x Oryza spontanea	1
3.	Triveni x Cul.12814	2
4.	C.4-63 x Triveni	2
5.	6473 x W.12708	1
6.	MN.54-42 x C4-63	8
7.	MN.54-42 x IR.20	20
8.	T(N)1 x Ptb-26	4
9.	Jaya x 10074	2
10.	Jaya x Pookali	2
11.	Jaya 10764	1
12.	Jaya x 72 (Assam collection)	1
13.	Ptb.23 x Triveni	1
14.	Palngamukku local x Jaya	1
15.	Jaya x Dunghan shali	2
16.	Jaya x Ptb.28	5
17.	Jaya x 587-4	1
18.	T(N)1 x Ptb.28	5
19.	10074 x Annapoorna-28	8
20.	Jaya x (Cul.28 x Leb Muey Nahng)	4
21.	T(N)1 x Siem-7	11
22.	T(N)1 x 8895	3
23.	T(N)1 x CS.195	15
24.	Annapoorna x NC 1620	2
25.	Annapoorna x CH.42	6
26.	Aswathy x (Gimbozu x Saffedan)	1
27.	Jaya x NC.1620	4
28.	10074 x 1285	13.

VARIETAL IMPROVEMENT (AICRIP)

1. Uniform Variety Trial-I (1 crop)

The object of the experiment was to study the performance of early duration varieties in advanced stages testing at two levels of fertilization. The design of the experiment was split plot with fertilizer as main plot and variety as sub plot with four replications. The average grain yield and flowering duration are given in Table-10.

Table-10. Treatment details and average grain yield of UVT-1.

Tr. No.	IET No.	Designation	Cross	Grain yield in kg / ha		
				50N.25P.25K.	100 N.50P.50K.	Mean
1	893	V.2151	[illegible]	4560	4838	4699
2	849	V.3385	,,	4121	4691	4554
3	1410	V.R.44-3.	[illegible]	4332	3153	3142
4	1448	VR 44-1	,,	3461	3358	3359
5	1522	[illegible]	[illegible]	4397	4491	4514
6	1526	[illegible]	,,	4634	3657	4144
7	1389	[illegible]	[illegible]	4518	4942	4780
8	1393	V.15124	[illegible]	4697	4722	4709
9	1389	[illegible]	[illegible]	4020	4317	4159
10	Check	[illegible]	[illegible]	4713	4491	4641

.....20

2. Uniform Variety Trial-2 (1 crop)

The object of the experiment was to study the performance of medium duration varieties in advanced stages of testing at 2 levels of fertilization. The design of the experiment was split plot with fertilizer as main plot and variety as sub plot with four replications. The average grain yield and flowering duration of the different entries are given in Table-11.

Table-11. Treatment details and average grain yield of U.V.T.2.

Fr. No.	IET No.	Designation	Cross	Grain yield in kg/ha 50N 25P 25K	100 N 50 P 50 K	Mean	Flowering duration.
1.	990	B.9621	MTU.1 x T(N)1	4417	5306	4861	99
2.	1030	CR.10-4103	T.90 x IR.8	4764	5097	4931	99
3.	1136	IR.644.RB.2b. IR8/2 x (B.539 A4-18/2x T(N)1		4958	5069	5014	99
4.	1391	CR.10.5071	T.90 x IR.8	3869	4500	4035	101
5.	1431	IR522-1P4 B	IR.262 x TKM1.6	4014	5250	4632	96
6.	1432	IR.667 RP1B	IR8 x (Vukra x T(N)1)	4056	4681	4368	101
7.	1449	CR 73-7	T635 x W.12	4250	4486	4368	101
8.	1451	CR.83-23	T.137 x GLB.24	5111	5500	5306	99
9.	1535	CR.10-112	T.90 x IR.8	4056	4181	4118	96
10.	1540	CR.10R-117	,,	5019	5264	5298	95
11.	1990	RP 5-2	GLB.24 x T(N)1	5069	5083	5076	96
12.	1991	RP.5-3	,,	5097	4694	4896	96
13.	1995	RP.4-1	T.90 x IR. 8	5208	5528	5368	100
14.	1996	RP.4-2	,,	5403	5778	5590	99
15.	2143	RP.3-2	T.90 x T(N)1	5125	5306	5215	101
16.	2295	CRR-178	IR8x CR.1014	6167	5006	5586	95
17.	2477	RP5-46	GLB24 x T(N)1	3417	3917	3667	99
18.	Check	IR.20		4889	4931	4910	101
19.	,,	Vijaya		4694	4833	4762	105
20.	,,	Jaya		5292	5403	5347	95

3. Uniform Variety Trial.I (UVT-1)(Aleron)

Tr. No.	IET No.	Designation	Cross	Grain yield in kg/ha 60N 25K 25P	120N 60P 50K	Mean	Flowering duration.
1	833	C.8431	T(N)1 x Co.29	2577	2125	2550	76
2	1522	[illegible]	T(N)1 x TKM.6	2577	2711	2644	73
3	1.26	[illegible]	T(N)1 x [illegible].6	3169	2611	[illegible]	76
4	1940	[illegible]	[illegible] x IR 8	3022	2600	[illegible]	72
5	[illegible]	[illegible]	IR 8 x C.445	2678	[illegible]	[illegible]	70
6	[illegible] Local	C.10754	[illegible].12 x T(N)1	2469	[illegible]	[illegible]	72
7	Check	[illegible]		2489	2735	[illegible]	66
8	[illegible]	[illegible]	[illegible] x T(N)1	2389	2555	[illegible]	66
9	2271	[illegible]	"	3000	[illegible]	[illegible]	79
10	Check	[illegible]		2500	[illegible]	[illegible]	67
11	[illegible]	[illegible]	[illegible]	2000	[illegible]	[illegible]	67
12	[illegible]	[illegible]	"	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	[illegible]	3344	[illegible]	[illegible]	75
14	[illegible]	[illegible]	[illegible]	2055	[illegible]	[illegible]	78
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	70
16	[illegible]	[illegible]		2544	2666	[illegible]	76
17	Check	[illegible]		[illegible]	[illegible]	2544	69
18	Check	[illegible]		[illegible]	[illegible]	2550	74

4. [illegible]

The object of the experiment was to study the comparative performance of medium duration varieties in advanced stages of testing at 2 levels of fertilization. The design of the experiment was sub-plot with fertilizer as main plot and variety as sub plots with four replications. The details of the varieties tried and results obtained are given in Table-1[illegible].

Table.13. Treatment details and average grain yield of UVT.2A.

Tr. No.	ITL. No.	Designation	Cross	Grain yield in kg/ha. N P K 60:25:25	N P K 120:50:50	Mean	Flowering duration
1.	1039	CR.10-4103	T.90xIR8	4297	4047	4172	83
2.	1391	CR10-5071	,,	5143	4429	4786	92
3.	1432	IR667-82-1B	IR8(Yukra x T(N)1)	4905	4045	4477	92
4.	1451	CR83-25	T 137 x GEB.24	4845	4643	4744	88
5.	1990	RP.5-1	GEB.24 x T(N)1	4595	4536	4566	91
6.	1991	RP. 5-3	,,	4762	4329	4545	90
7.	1956	RP.4-2	T.90 x IR.8	4095	4107	4101	85
8.	2143	RP.3-x 2	T.90 x T(N)1	5262	3917	4590	95
9.	2254	RP.4-14	T.90 x IR.8	[illegible]	[illegible]	5036	70
10.	2295	CR-12-178	IR8 x CR.1014	6119	[illegible]	[illegible]	82
11.	2399	RP.176-4	O.Perennis x IR.8/2	3798	3702	3750	83
12.	Check	Jaya		5000	4940	4970	85

........23/

AGRONOMY

The items of research work included were the following:-

1. Effect of soil compaction on the yield and nitrogen response of upland rice.
2. Time of application of nitrogen (upland)
3. Rotation experiment.
4. Experiment on competing ability of rice with weeds in rainfed uplands.
5. Comparative performance of wet and dry nursery seedlings .
6. Time of Nitrogen application for medium duration rice.
7. Effect of levels and time of application of phosphate for rice on the yield
8. Experiment on 'minimal' cultivation using 'Lasquat'.
9. Studies on Iron toxicity in rice
10. Comparative yield trial with pre-release cultures.
11. Monthly planting experiment.
12. Feeler trials with micronutrients in cultivators fields.

The details of the experiments and results obtained are as follows:-

1. Effect of soil compaction on the yield and nitrogen response of upland rice:

Rapid nitrification of the applied ammonical fertilizer and its subsequent loss through percolating waters reduces the efficiency of nitrogen applied in the rainfed uplands. Compaction of soil to a desired bulk density is reported to increase the efficiency of applied nitrogen in such marginal and submarginal rice soils. The present study was, therefore, undertaken in the virippu season (April-May to Sept-October) of 1970-1971 to study the effect of soil compaction on the grain yield and nitrogen response of upland rice varieties.

The treatments comprised of 3 levels of compaction and 3 levels of nitrogen (Table-14). The design of the experiment was split plot, with compaction as major treatment and nitrogen as minior treatment. There were 8 replications. Half the dose of nitrogen(as urea) was applied at seeding and the rest at panic

initiation. Phosphorous and potash were applied as basal dressing. The test varieties were Ptb.30 in 1970-71, Ptb.28 in 1971-72 and Taichung (Native)1 in 1972-73. The seeds were dibbed at a spacing of 15 cmx 15 cm adopting a seed rate of 50 kg per hectare and compaction was given immediately after dibbling, using 80 and 330 kg stone rollers.

The results recorded in the previous two seasons revealed significant difference between nitrogen levels in grain yields as well as the yield attributing characters. Though there was no significant difference between the degrees of compaction, the trend of the results favoured soil compaction. This practice increased the efficiency of the applied nitrogen to a considerable extent.

In the current year, the weather conditions were not quite favourable for crop growth. The percentage of germination was quite normal in all the plots but severe moisture stress during the vegetative stages affected badly the growth of rice seedlings in the plots which did not receive nitrogen. The plots which were not compacted also showed poor crop growth. In order to ensure uniform plant population at harvest, four samples (each having 0.25 sq.m. area) were harvested at random from each plot. The effect due to compaction, was significant, unlike in the other two seasons. Plots receiving compaction with 330 kg roller recorded the best yields. Response to nitrogen was linear. The results indicated that the efficiency of the applied nitrogen could be increased considerably by giving compaction with a heavy roller. The percentage of increase in yield due to compaction was 38.6 over no compaction while that for applied nitrogen was 44.1 over no nitrogen.

Table-14. Grain yield as influenced by soil compaction and applied nitrogen(kg/ ha)

		Nitrogen(kg/ha)			
		0	40	80	Mean
Degree of Compaction	No compaction	998	1346	1478	1592
	compaction with a 80 kg roller	1250	1610	1826	1965
	compaction with a 330 kg roller	1414	1866	2016	2206
Mean		1538	2009	2217	
CD (0.05) nitrogen			93.0		
	compaction		121.0		

2.Time of application of nitrogen (upland)

Earlier trials at the station have shown that T(N)1 is the most suitable high yielding variety under moden conditions and the response to N was linear up to 100 kg per ha. Nitrogen applied in moden lands is subjected to heavy loss through leaching, surface run off etc. The efficiency of applied nitrogen is increased by split application in appropriate quantities during the various growth stages of the crop. An experiment was therefore initiated during the first crop season of 1972-73 to study the effect of split application of N to T(N)1 rice in moden lands. The experiment was laid out in randomised rice in moden lands. The experiment was laid out in randomised block design with 15 treatments and 3 replications. Two levels of N (60 and 120 kg N/ha) were tried at different rates during the three main growth stages of the crop (table.15). Advantages if any of sulphur coated urea over ordinary urea and foliar application of nitrogen over soil--application were also studied. Seeds at the rate of 80 kg per ha. were dibbled at a spacing of 15 x 15 cm. Phosphorus and potash were applied at the rate of 50 kg each of P_2O_5 and K_2O respectively per ha at the time of dibbling. The crop was raised purely under rainfed conditions.

The results (Table.12.15) reveal that the effect of nitrogen was positive and significant up to 120 kg N/ha. The effect of split application of nitrogen was also significant at both the levels tried (60 and 120 kg N/ha). At 60 kg N level Tr.6(30kg as basal + 15 kg each as foliar spray at tillering and panicle initiation) recorded the highest grain yield followed by Tr.5, the grain yields of the low treatment having (1778 kg and 1517 kg respectively per ha) At 120 kg N level Tr.11 (30 kg basal + 30 kg tillering + 60 kg at panicle initiation stage) recorded the highest yield of 2164 kg/ha followed by Tr.10(60kg basal+60kg at panicle initiation stage) At the higher levels of nitrogen tried only. Tr.11 was found to be significantly superior to Tr.6, the best among lower doses of nitrogen tried. The two treatments receiving no basal nitrogen (Tr.2 and 9) recorded the lowest yields. This indicates the necessity for applying a portion of nitrogen as basal, under upland conditions. The trend in grain yield show that the nitrogen should be applied in the vegetative phase when the dose of nitrogen is 60 kg per ha. When the dose of nitrogen is 120 kg /ha ½ the dosemay be applied at the vetative phase and the remaining at panicle initiation state. In both casesz the ~~hh~~ total nitrogen applied in the

.....26

vegetative phase of the crop can be split into two with 30 kg N as basal and the remaining at tillering stage.

Foliar application of nitrogen was found to be more effective at the lower level of N nitrogen tried (Tr.5 and 6)

Though not singificant, sulphur coated urea (slow release nitrogen source) exerted some favourable influence on grain yield (Tr.6 and 13 over trial 1 and 8 respectively).

Effect of time of application of N on yield attributes and yield.

Tr. No.	Quantity of N in kg per hat at				Mean no. of prod. tillers per hill	Mean earhead wt.	Grain yield kg/ha
	Dibbling	Tillering	P.I. Stage	Total.			
1.	60	0	0	60	4.0	1.27	1446
2.	0	60	0	60	3.3	1.41	853
3.	30	0	30	60	4.4	1.37	1469
4.	15	15	30	60	4.0	1.42	1422
5.	30	15F	15F	60	4.3	1.56	1517
6.	30	15 F	15 F	60	5.1	1.56	1778
7	60	0	0	60Sc	4.7	1.48	1564
8	120	0	0	120	4.9	1.34	1469
9.	0	120	0	120	3.5	1.38	924
10.	60	0	60	120	5.4	1.66	1809
11.	30	30	60	120	5.6	1.65	2164
12.	60	30	30	120	5.4	1.71	1754
13.	60	30F	30F	120	5.8	1.68	1762
14.	120	0	0	120Sc	4.5	1.31	1765
15.	0	0	0	..	2.1	1.08	332

F. Foliar spray Sc. Sulphur coated urea.

3. Rotation experiment:-

At present only one medium duration rice is raised in pallyals (single cropwet lands) where no irrigation facilities exist. With a view to explore the feasibility of raising more than one crop in such lands a one year two crop rotation experiment was commenced during the first crop season of 1972.73. The experiment.....26page

laid out in randomized block design with 3 replication. There were treatments comprising of a short duration rice-Triveni in the first crop season in all the plots followed by 8 different/ kinds of crops in the second crop season (Table-16). The cultural and manurial practices have been followed to suit each crop under the local conditio In addition to the economics the influence of different rotations on soil fertility is also being studied.

The mean yield data for the year 1972-73 are presented in Table.16. The grain yield data for the first crop season do not show any significant differences. This shows a more or less uniform condition of the soil where the experiment is being conducted. In the 2nd crop season 5 crops viz. Paddy, cowpea, tapioca, gingelly and ragi have given encouraging results. The experiment will be repeated for two more years before a final conclusion is drawn.

Table.16. Summary of yields(kg/ha) obtained for different crops in rotation.

Tr.No.	Crop sequence		Yield (kg/ha)	
	First crop	Second crop	1st Crop	2nd crop
1	Paddy	Paddy(Triveni)	2683	3642
2	Paddy	Groundnut(TMV2)	2715	1048
3	Paddy	cowpea(Puza dofasli)	2819	4137
4	Paddy	Tapioca (Mala-vella)	2864	8613
5	Paddy	Gingelly(Local)	2886	249
6	Paddy	Cholam (CSH1)	2788	1375
7	Paddy	Ragi(Dibiya sinha)	2873	1056
8	Paddy	Sunflower(Russian variety)	2810	295
	CD(0.05)		N.S.	

4. Experiment on the competing ability of rice with weeds in rainfed uplands:-

Paddy seeds are dibbled or sown broadcast in the uplands, (modan lands) with the onset of the South W West monsoon. Weeds in these fields germinate along with the rice and create heavy crop-weed competition thereby decreasing grain yields substantially. In order to study the competing ability of rice with weeds an experiment

.....27

was laid out using the early duration dwarf indica rice strain Triveni as the test variety during the 'virippu' season of 1972.

The object of the study can be divided into 2 parts i.e. (1) to find out the period for which rice crop should be kept free of weeds without affecting yields and (2) to find out the period of weed competition that an upland rice crop can stand without affecting yield.

The design of the experiment was randomized block with 3 replications and 12 treatments (Table.17). The seed was dibbled adopting a seed rate of 80 kg / ha at a spacing of 30 kg N, 40 kg P_2O_5 and 40 kg K_2O /ha. At the tillering and panicle initiation stages nitrogen was topdressed at 25 kg each per ha. In order to ensure uniform stand of weeds in all the plots, weed seeds consisting cleome spp. and Echinochloa spp were also sown broadcast at the rate of 5 kg per ha along with fertilizers. The percentage of germination of paddy seeds and weed seeds were almost uniform in all the plots.

The "weed free condition" favoured early and vigourous growth of rice seedlings and produced significantly higher yields compared to weedy condition.

Increasing the period of weed free condition beyond 30 days after sowing did not effect much significant increase in grain yield though the weed free conditions resulted progressive increase in grain production. The reduction in yield observed in the treatment which was kept weed free for 15 days only after sowing was due to the re-growth of weeds late in the season.

Time of weed removal was observed to influence grain production. However, weed free conditions were more favourable for rice as evidenced by the grain yield data recorded for time of weed removal. This indicates that the dwarf indica rices have very poor competing ability with the weeds that germinate alongwith them. The best time of weed removal was 30 days after seeding. However, there was no significant difference between the yields recorded, for treatments received weeding at 30 and 15 days after sowing. The reduction in yield when weeds were removed only after 45,60 and 75 days after sowing was due to the fact the crop suffered from very heavy weed competition in the early stages and it could not recover its vigour and usual growth rate. These treatments produced fewer number of productive ears per hill with lighter panicles.

The resultsof this experiment conclusively prove that the crop-weed competition should be checked thoroughly during the period of active growth of the rice seedlings. This condition can be achieved either by keeping the crop weed free upto 45 days after seeding or by giving the crop one hand weeding 30 days after sowing.

Table.17. Effect of "weed free" condition and "time of weed removal on the yield and associated characters of rice".

Treatment Weed free condition.	Grain yield (kg / ha)	Panicle wt. (gram)	Productive panicle per hill	Dry matter of weeds at harvest(kg/ha
1. 0-15 days after dibbling	1474	1.97	5.5	1891
2. 0-30 ,,	1694	1.67	6.1	1103
3. 0-45 ,,	1907	1.76	6.6	418
4. 0-60 ,,	1915	1.85	6.1	472
5. 0-75 ,,	1931	1.65	6.1	315
6. 0-90 ,,	1868	1.70	6.0	236
Time of weed removal				
7. 15th day after dibbling	1324	1.55	5.0	1340
8. 30th ,,	1493	1.73	4.5	1576
9. 45 ,,	1064	1.60	4.5	630
10. 75 ,,	536	1.39	3.3	158
11. 65 ,,	876	1.60	4.5	315
12. No weeding control	173	0.83	3.7	9535
CD (0.05)	327	0.33	0.85	717

5. Comparative performance of wet and dry nursery seedlings:-

Three systems of rice nursery are in vogue in Kerala, namely, dry, semi-dry and wet. Results on the experiments conducted on the comparative performance of seedlings from these nurseries are rather conflicting. Moreover, these studies have been conducted with the tall indicas. The present experiment was initiated in the viri-ppu season of 1971-72 to study the comparative yielding ability of seedlings raised according to the dry and the wet systems and also to investigate the influence of seed rate in the productivty of rice seedlings.

The experiment was conducted in randomized block design with 3 replications. The treatments comprised of two types of nursery (wet and dry) and 8 seed rates (0.5; 1.0 ; 1.5; 2.0; 2.5; 3.0; 3.5 and 4.0 kg per 40 m^2.) Seeds were sown in well prepared and statistically laid out seed beds for both the system. No manures were applied in the nursery. Seedlings from these beds were transplanted 25 days after sowing in the main field, which received a basal dose of 40 kg N, 50 kg P_2O_5 and 50 kg K_2O per ha at the time of last puddling. The spacing adopted was 20 cm x 15 cm with one seedling per hole. Nitrogen was top dressed twice i. e. at the tillering and the panicle initiation stages with 20 kg N per ha each time. The test variety was Jaya.

The results of the trials conducted during the two seasons of the current year revealed marked differences in yield due to the type of nursery and the seed rate. The wet nursery seedlings were relatively more healthy and vigorous, but the dry nursery seedlings regained vigour immediately after planting in the main field. However, the superiority of wet nursery seedlings in grain yield was clearly manifested in both the seasons. There was no marked difference between the two nursery types on the production of ear bearing tillers. But, the wet nursery seedlings produced significantly more number of spikelets per panicle. This may be the reason why the wet nursery seedlings proved to be sup erior to the dry nursery seedlings.

The influence of seed rate on the productivity of seedlings was remarkable and was more pronounced in the wet nursery. The lower the seed rate, the greater was the growth rate of seedlings in the nursery and the earlier was the establishment in the main field. The thin-sown nursery seedlings flowered earlier than the thick-sown nursery seedlings, possibly because they reached physiological maturity earlier as they were not subjected to much competion for space, light and nutrients in the initial growth medium. The thick-sown seedlings are less vigorous, their establishment was slow when transplanted and came to flower late by about a week's time.

....30

This trial indicates that the wet nursery system is significantly superior to the dry system and that seeds should be sown as thin as possible in the nursery. The best seed rate is 0.5 kg per $40m^2$. The maximum quantity of seeds that can be sown without much reduction in yield is 2 kg per $40m^2$.

The results confirm the conclusion drawn during the previous year.

.....31

Table.18. Grain yield and ancilliary characters of Jaya rice as influenced by the type of nursery

Type of Nursery.	Grain yield (kg/ha)			Productive tillers per hill			No.of grain per panicle.			Flowering duration (days)		
	1crop	2nd crop	Mean	1 crop	2nd crop	Mean	1crop	2nd crop	Mean	1st crop	2nd crop	Mean
Upland	4891	4163	4527	6.9	6.6	6.8	113	88	101	103	91	97
Lowland	5358	4669	4964	7.1	7.4	7.3	119	102	111	98	85	91
CD (0.05)	408	61	NS	NS	NS	—	—	11				

Table.18-A. Grain yield and ancilliary characters of Jaya rice as influenced by seed rate in the nursery

Seed Rate (kg/40m^2)	Grain yield kg/ha			Productive tillers p er hill			No.of grains per panicle.			Flowering duration (days)		
	I crop	II crop	Mean	I crop	II crop	Mean	I crop	II crop	Mean	I crop	II crop	Mean
0.5	5747	4660	5204	6.8	6.9	6.9	127	101	114	97	83	90
1.0	5503	4565	5034	6.8	7.2	7.0	127	100	114	99	85	92
1.5	5245	4497	4871	7.2	6.7	7.0	118	100	109	100	86	93
2.0	5183	4470	4827	7.0	7.2	7.1	115	101	103	101	88	95
2.5	5034	4402	4718	6.9	6.7	6.8	117	96	107	101	88	95
3.0	4871	4253	4562	7.1	7.1	7.1	114	93	104	102	91	97
3.5	4606	4307	4457	7.3	7.1	7.2	105	83	94	102	92	97
4.0	4328	4130	4229	6.9	7.0	7.0	107	83	95	103	92	98
CD (0.05)	218	124	-	-	-	-	14	10	-	-	-	-

.....32.

6. Time of nitrogen application for medium duration rice.

In an observational trial conducted in 1968-69 it was found that application of nitrogen at booting and heading stages was quite advantageous for rice crop as it increased the paniele weight. No deleterious effect was noticed due to nitrogen application at these stages. The present trial was initiated, therefore, in the viruppu season of 1971-72 to study the effect of fractional application of nitrogen during the different growth stages of dwarf indica rice variety Jaya. The stages of application were planting (25 days after sowing) tillering (40 days after sowing), pubicle paniele initiation, booting and heading. The level of bitrogen was 100 kg per ha in the form of urea(Table-1 A common dose of P_2O_5 and K_2O were applied at the rate of 50 kg each per ha. at the time of puddling. The experiment was laidout in randomized block design, with two replications. During all the 4 seasons under trial the test variety was transplanted at a spacing of 20 cm x 10 cm 25 days after sowing the seeds in the wet nursery.

In none of the two seasons in 1971-72, the treatment differences on grain yield showed signifieance. Similar trend followed in the two crop seasons of the current year also. Split application of nitrogen, however, was generally favourable for crop growth and single application of the entire dose of nitrogen either at planting or at the different stages did not give better results compared to the split application in any of the seasons. Application of a portion of nitrogen at the booting and heading stages was iend to increase the grain yield. However, this practice was observed to pre-dispose the plants to the incidence of pests and diseases., and hence can be recommended only under an umbrella of effective plant protection measures

.....33

Table-19. Grain yield (kg/ha) and ancillary characters of 'Jaya' rice as influenced by fractional application of nitrogen.

Treatment (N kg/ha)						Grain yield			No.of productive		Mean No.of grains per panicl		
No.	Basal	Tiller-ing.	Panicle initiation.	Booting.	Heading.	I crop	II crop	Mean	I crop	II crop	Mean	I crop	II crop	Mean
1	100	—	—	—	—	4524	2541	3533	5.0	4.0		99	101	99
2	—	100	—	—	—	4372	2693	3533	5.0	4.0		91	107	99
3	—	—	100	—	—	3586	2851	3219	4.3	4.7		90	120	106
4	50	50	—	—	—	4359	2706	3533	4.9	4.8		85	113	100
5	50	—	50	—	—	4243	3110	3677	5.2	5.1		99	101	100
6	50	—	—	50	—	4934	3092	4023	5.0	4.8		90	97	94
7	50	—	—	—	50	4470	3138	3804	3.9	5.0		104	104	104
8	50	25	25	—	—	4239	2851	3554	5.2	5.7		112	103	108
9	50	—	25	25	—	4489	3040	3765	4.9	5.1		105	104	106
10	50	—	—	25	25	4120	3152	3636	3.7	4.0		103	108	105
11	—	50	50	—	—	4079	3151	3615	5.3	4.9		103	96	99
12	—	50	—	25	25	3463	2783	3315	6.5	5.4		164	101	103
13	—	50	—	25	25	4726	3166	3946	5.6	4.7		110	102	111
14	—	—	50	25	25	3874	2661	3268	6.7	4.9		106	116	111
15	20	20	20	20	20	4365	3141	3753	4.5	5.0		118	108	113
16	25	25	25	25	—	4717	3143	3930	5.7	4.6		121	107	114
CD(0.05)						N.S.	N.S.	N.S.						

.....34/

7. Effect of levels and times of application of Phosphate for rice on the yield:-

Studies conducted in India on the phosphate requirements of rice have yielded conflicting results. Some research workers observed positive responses in the yield of rice to phospha manuring. On the other hand some others found that phosphate did not influence the yield of rice to any significant level. A series of field trials conducted at the Central Rice Research Station, Pattambi, giving all the phosphates as basal application also gave erratic results. It was reported that absorption of P is maximum when applied as basal in sandy loam soils rather than basal application plus top dressing at tillering stage.

In order to find out the optimum requirement of P and its best time of application different levels of P viz., 15kg 30, 45 and 60 kg P_2O_5 /ha was tried with different time of application viz., basal application, tillering stage and at panicle initiation stage, and the combinations. The trial was commenced in the 1970-71 first crop season and continued for six seasons. The 32 treatment combinations of 4 levels of P and 8 times of high yielding variety, Jaya was the test variety, which was planted giving a spacing of 20 cm x 15 cm with 2 seedlings per hill. A total nitrogen of 80 kg/ha was given as uniform dose to all plots; ¼ of which was applied as basal and ~~was given to all plots and applied as~~ rest at panicle initiation stage. 50 kg K_2O/ha was given to all plots and applied as basal dressing.

Grain yield in (kg/ha) corresponding to different levels of P in different years and seasons are furnished below:-

	15 kg	30 kg	45 kg	60 kg	Significant or
1970-71					
1st crop	3488	3488	3466	3393	Not significan
2nd crop	Crop failed due to drought				
1971-72					
1st crop	3900	3919	3873	3807	Sig.CD.54 kg/h
2nd crop	3155	3070	3307	3340	Sig.CD.198 kg/
1972-73					
1st crop	4890	4638	4618	4756	Not significant
2nd crop	3768	3932	3906	3918	Not significant

It can be seen from the data presented that no significant differences were observed between levels of P_2O_5 during the first season of the trial. Highest yield was recorded in the lowest level tried, i.e. 15 kg P_2O_5 / ha; 30 kg P_2O_5 / ha also recorded in yield but beyond 30 kg/ha the trend was for reduction in yield due to addition of P_2O_5. The trial in the second crop season of that year was vitiated due to drought. During 1971-72 significant results were obtained for both the seasons between levels of P_2O_5 tried. 30 kg P_2O_5 /ha recorded the highest yield during virippu season but it was on par with during 15 kg P_2O_5. 60 kg P_2O_5/ ha recorded the highest yield during the mundakan season but it was on par with 15 and 45 kg P_2O_5/ha. During 1972-73 first crop season there was not any significant difference among the levels tried. Maximum yield is obtained for 60 kg P_2O_5 followed by 60 kg P_2O_5 and 45 kg P_2O_5/ha.

The data show that during first crop season, when the crop is grown throughout the period under waterlogged condition, maximum yield is obtained for the lower doses of P_2O_5. Where as during the second crop season, when the field is likely to be drained and dry conditions prevail during the growth stages, maximum yield is obtained for higher doses of P_2O_5. During the first crop season of 1972-73, when dry conditions prevailed immediately after planting for 3 weeks, and there was no standing water in the field the higher doses of P_2O_5 recorded the higher yield confirming the conclusion drawn above.

.....36

Grain yield in Kg/ha corresponding to different times of application of P_2O_5 in Rice

B.T.P. (Percentage of P_2O_5 at planting, tillering and panicle initiation)

Year and Season.	B.T.P. (1) 100.0.0	B.T.P. (2) 75.25.0	B.T.P. (3) 75.25.0	B.T.P. (4) 50.50.0	B.T.P. (5) 50.25.25	B.T.P. (6) 25.75.0	B.T.P. (7) 25.0.75	B.T.P. (8) 0.50.50	Significant
1970-71 First crop:	3327	3436	3542	3518	3459	3459	3419	3475	Not Significant
IInd crop	Results vitiated due to drought.								
1971-72									
First crop	3860	3774	3893	3880	3860	3886	3814	4058	,,
IInd crop	3201	3313	2135	3221	3358	3201	3175	3355	,,
1972-73									
First crop	4750	4515	4664	4710	4668	4710	4780	4769	,,
IInd crop	3360	3939	3958	3834	3840	3914	3939	3820	,,

The treatment differences were not significant for the time of application of P_2O_5

....37

8. Experiment on 'minimal cultivation' using 'paraquat'

Normally ardnous and time-consuming cultivations are required to prepare land for raising rice. Puddling operations required considerable amount of water which is a dear imput. Gramaxone, a paraquat based herbicide, is claimed to possess a unique combination of properties which make it ideal for killing weeds at land preparation time thereby reducing the cost of cultivation. In order to investigate the usefulness of grammaxone in bringing down the cost of cultivation for transplanted rice, atrial was initiated during the 'mundakan' season of 1972-73. The experiment was laid out in randomised block design with 4 replications and 6 treatments (Table.21) The best variety was Aswathi, transplanted at a spacing of 20 x 15 cms with 2 seedlings per hill. The NPK schedule followed was 90:45:45 kg per hectare. Fifty percent of the nitrogen was applied at planting along with the whole quantity of phosphorous and potash.

The effectiveness of the different treatments was evaluated by visual rating two weeks after transplanting. Ammonium sulfamate, a product supplied by Messrs Dharmasi Morarjee Company was found thoroughly infective on the control of weeds at the concentration tried. It caused only a mild scorching of weeds. Grammaxone was very effective in weed control, but regrowth of weeds occured after sometime. This was checked by spraying propanil, as in treatment 5 or by hand weeding as in treatment 6.

The data on grain yield revealed siguificance with the the ordinary practice consisting of two ploughings, one puddling and one hand weeding proving significantly superior to the other treatments. There was no significant difference between the treatments 5 and 6 (Grammazone + one ploughing + propanil spray and Gramaxxone + one ploughing and hand weeding respectively) and between 4 and 3 (Grammaxone + one ploughing and Grammaxone along without ploughing respectively). Ammonium sulphate recorded very poor yield, because of the exh exuberant weed growth which almost completely smoothered the rice plants. The superiority of the treatments 5 and 6 over the treatments 4 and 3 is attributable to the additional weed control practices received by them.

This trial will be repeated during the next two seasons to work out the economics of minimal cultivation.

Table.21. Grain yield (kg/ha) and weed control rating corresponding to the different treatments.

Treatment	Grain	Weed control rating	
		15 days after planting(*)	at harvest.
1. Ordinary practice (2 ploughings, one puddling; one hand weeding)	2015	1	1
2. Ammonium sulnate at 2.5 kg per ha. sprayed on grass and transplanted 7 days after application.	376	5	5
3. Gramaxone spray at 3.75 litre/ha and planting after 7 days (no ploughing)	1316	2	3
4. Gramaxone spray at 3.75 lit/ha and planting after 7 days (one ploughing before planting)	1416	2	3
5. Gramaxone as in treatment 4 plus one propanil spray at 3 kg ai/ha	1663	2	2
6. Gramaxone as in Treatment 4 plus one hand weeding	1604	2	2
CD (0.05)	198		

(*) :- 1= Good control of weeds
5= No weed control.

.....39/

9. Studies on iron toxicity in rice

Bronzing disease is causing heavy damage to the rice crop in the waterlogged acid soils of Kerala and assumes serious proportions when high yielding dwarf indica varieties are cultivated. Preliminary studies in the station have indicated that the application of lime and topdressing of NP and K in the affected field will check the disease to a remarkable extent. Based on the above findings an experiment was laid out in randomized block design with 12 treatments and 3 replications in the first crop season of 1972-73 to study the effectiveness of these treatments on the ~~xxxxxxxx~~ incidence and control of bronzing disease due to excess of iron and other iron and other harmful substances in the soil. Aswathy rice which is found to be more susceptible to iron toxicity was used for the studies. The experiment was laid out in all illdrained wet land field. Three week-old seedlings were planted in the experimental plots at a spacing of 20 x 10 cm with 2 seedlings per hill. A normal dose of 40 kg each of N, P_2O_5 and K_2O were applied at the time of ~~xxxxxxx~~ planting and 40 kg N per ha top dressed at panicle initiation stage.

In both seasons, the crop had only a mild incidence of bronzing in the early tillering stage and later on the symptoms disappeared. The effect of treatments on grain yield was not significant in both seasons.

10. Comparative yield trial with pre-release cultures.

With a view to study the performance of improved cultures evolved in the various rice research stations in Kerala and the E.P.M.Estate, Ottappalam a comparative yield trial was commenced during the first crop season of 1972-73, at the Rice Research Station in the state to study the comparative merits of these cultures under the diffirent agro-climatic conditions prevailing in the State. Twentyfive

cultures of short to medium duration group and two check varieties (Annapoorna and Jaya) were included in the trial. The experiment was laid out in randomized block design and replicated twice. Three week old seedlings raised in wet nursery were planted in the mainfield at a spacing of 15 x 15 c.m. with 2 seedlings per hill. 40 kg each N, P_2O_5 and K_2O were applied per hectare at the time of transplanting. The crop was ~~trux~~ top dressed with 40 kg N per hectare at the time of panicle initiation.

The mean grain yield (kg/ha) and flowering duration of the cultures are given in Table.23. Flowering duration of the cultures are grouped into short (75 days or less) and medium (above 75 days) for comparing the results.

In the first crop season only three cultures from the short duration group viz. OTP.7 (Tr.7), 10 x 1 x 1 (Trt.10) and 12035 with a per hectare yield of 4239 kg, 4211 kg and 40~~4~~41 kg respectively recorded slighly higher yields over the check variety. The difference between them, however has not significant. Annapoorna which yielded 4006 kg grain per ha. Among the medium duration grup culture No.1140 and 1180 recorded higher yields than the check variety Jaya with a per hectare yield of 4375 kg, 4164 kg and 4152 kg respectively, although the differences between them was not significant. Similarly in the 2nd crop season 10 x 1 x 1 (Tr.10) and 12035 (Tr.19) were superior to Annappurna with mean yield of 3864 kg 3272 kg, 3110 kg per hectare in the short duration group. In the medium duration group, MN.3-6-2 (Tr.16) gave the highest yield (3984 kg) followed by OTP.3 (Tr.3) 3657 kg, OTP.5 (Tr. 5) 3657 kg and 1180 (Tr.20) 3541 kg. Culture 6473 and Jaya were equal in yield viz. 3494 kg (Table.23)

.....41

Table.23. Flowering duration and grain yield of different cultures

Tr. No.	Variety/ culture	Source	Flowering duration		Grain yield (kg/ ha)	
			1st crop	2nd crop	1st crop	second crop
1	OTP 1	E.P.M.Estate Ottuppalam.	92	94	3760	3461
2	,, 2	,,	78	77	2977	2547
3	,, 3	,,	83	82	2661	3762
4	,, 4	,,	97	92	3070	2814
5	,, 5	,,	80	83	3567	3657
6	,, 6	,,	75	74	3725	2972
7	,, 7	,,	69	67	4239	3083
8	,, 8	,,	85	85	3538	3461
9	MN.40 - 31	R.R.S. Manmuthy	76	73	3760	3120
10.	10 x 1 x 1	,,	70	69	4211	3864
11.	Mn 79-60	,,	80	81	3888	3449
12.	Mn 203-1-1	,,	74	69	3538	2698
13.	24-20	A.C. AND, TVELLAYANI	61	62	3425	2360
14.	M4-79-6-1	R.R.S. Moncompu	79	78	3216	3004
15.	M4 26-4-2	,,	76	78	3292	3076
16.	M4 5-6-2	,,	84	86	3678	3984
17.	1140	C.R.R.S.Pattambi	86	81	4375	3253
18.	6473	,,	87	83	3129	3494
19.	12035	,,	76	73	4041	3273
20.	1180	,,	83	85	4164	3541
21.	2	R.R.S.Kayamkulam	73	—	3636	———
22.	III-3	,,	78	—	3743	———
23.	16 (KV x T(N)1	,,	66	63	3713	2851
24.	8 (KV x T(N)1	,,	67	62	3585	3066
25.	4 (KV c T(N)1	,,	66	—	3444	———
26.	Jaya (Check)	,,	88	90	4006	3110
27.	Annapoorna,,	,,	88	90	4152	3494

(Tr.21,22 and 25 were not included in the 2nd crop season trial).

CD (0.05) CD 684

.....42

11. Monthly Planting Experiment:

With a view to study the response of new high yielding dwarf indica rices to change of season and applied nitrogen, trials were initiated in the station during the first crop season 1971-72 and repeated in 1972-73. Seven experiments each were planted in anx year at monthly intervels starting in the first week of June. The experiment was laid out in split plot design with varieties in main plots and nitrogen levels in sub plots. The varieties were Annapoorna, Rohini, Triveni, T(N)1 IR.8, Jaya Aswathy and Culture 6473 (♀ IR 8/2 x Annapoorna). The nitrogen levels were 0,50 and 100 kg per ha.

Seedlings aged 16 to 18 days, raised in wet nursery beds were planted in the experimental plots at a spacing of 15 x 15 cm with 2 seedlings per hill. Phosphorous and Potash were applied as basal along with ½ the dose of nitrogen. The remaining dose of N was applied at panicle initiation stage. The grain yield data are presented in Tab.e24 and grain yield response to added N in Table.24.A.

The results show that Jaya has outyielded other varieties in all the 7 months under trial. Among the short duration varieties (Annapoorna, Triveni and Rohini) Triveni recorded highest mean yield in June, August, October and November, Rohini in September and December and Annapoorna in July. Taichung (Native)1 and Annapoorna were the lowest yielders in majority of the months.

Seasonal varientions in grain yielded could be noticed in all the varieties. The hihest yields were always recorded by June or July plantings and it declined in subsequent months even inspite of the bright weather condition that prevailed from August enwards. This may be attributed to an increase in reduction in the soil due to prolonged flooding which helps to increase the concentration of toxic substances like F2++, Al++ in the soil. Toxic concentration of these reduction products will inhibit the absorptive function of roots and availability of nutrients, to plants resulting in poor yields.

.....43

The profound influence of applied nitrogen on grain yield could be noticed upto 50 kg level. Beyond that the rate of response was low or negative (table-24.A.-B.). The magnitude of response was high in crops planted in the months of September, October and November.

Table.24. Grain yield of rice varieties as influenced by the month of planting (kg/ ha)

Months of Plants.	Variety								
	Annapoorna	Triveni	Rohini	T(N)1	6473	Jaya	Aswa-thy	IR 8	CD (0.
June	3670	4158	4074	3923	4024	444	4091	3895	-
July	4394	4091	3090	3670	3704	4848	3973	4362	4
August	2559	3300	3131	2660	2542	3889	2407	2879	5
September	2896	3148	3232	2802	3653	4343	3771	3013	3
October	3148	3384	3005	2441	3165	4024	3182	3302	3
November	2576	3727	2424	2660	3165	3316	3047	2997	
December	2557	2290	3643	2222	2811	2980	2845	2879	1

Table.24A. Grain yield of rice varieties as influenced by the levels of nitrogen (kg/ha) . (Averaged over all the 8 varieties).

Month	Nitrogen (kg / ha)			
	0	50	100	CD.(0.05)
June	3451	4209	4394	172
July	3855	4310	4259	193
August	2340	3268	3199	274
Sep tember	3811	3586	3737	17
October	2441	3457	3821	123
November	1970	3199	3400	133
December	2456	2778	2694	76

.....44

Table.24.B. Grain yield response of rice varieties at levels of N (kg/ha).

Variety	N.level	June	July	August	Sept.	Octo.	November.	December
Annapoorna	N 50	1011	454	[illegible]	791	213	1179	226
	N 100	1263	[illegible]	741	1176	614	1235	225
Triveni	N 50	404	640	[illegible]	680	898	1004	168
	N 100	258	[illegible]	154	737	1487	1145	140
Rohini	N 50	674	488	1313	912	561	619	293
	N 100	337	455	1650	1011	926	870	419
T(N) 1	N 50	607	371	605	[illegible]	1179	1307	336
	N 100	[illegible]	337	505	976	1519	1151	-57
Jaya	N 50	473	336	2191	724	1538	1515	1334
	N 100	1310	336	2357	1342	1977	1372	365
Aswatay	N 50	737	121	730	1179	982	1173	505
	N 100	603	169	639	1353	1319	1518	280
I R. 8	N 50	[illegible]	283	[illegible]	[illegible]	1247	1516	336
	N 100	2003	553	226	84	1053	1027	224
6473	N 50	707	150	1293	1431	1095	1544	280
	N 100	875	-151	12	589	1488	1526	224

12. <u>Feeler trials with micronutrients in cultivators fields</u>

Based on the recommendation finalised at the third annual workshop of Coordinated Scheme of micronutrient of soils, a scheme is being implemented from the first crop season of 1972-73 in cultivators fields to study the effect of application of micronutrients in increasing the yield of the high yielding varieties of rice. One experiment each was conducted at [illegible] and Mannarghat, during the first and second crop season of 1972-73. The trials were laid out in randomized block design with 13 treatments and 2 replications.

..........45

Treatments.

1. N P K
2. NPK + Ca
3. NPK + Mg
4. NPK + Si
5. NPK + Fe
6. NPK + Mn
7. NPK +Zn
8. NPK + Cu
9. NPK + B
10. NPK + Mo
11. NPK +Mg +Si
12. NPK + Ca + Mg+ Si
13. NPK +Ca+Fe+Mn+Zn+Cu+B+Mo
14. NPK +Fe+Mn+Zn+Cu+B+Mo
15. NPK + Si+ Fe+Mn+Zn+Cu+B+Mo

Levels of NPK : 90:40:45 kg /ha (to be applied in the form of ammonium phosphate, urea and muriate of potash) Half the dose remaining dose of N at panicle initiation stage.

The different elements were applied in the form and quantity as given below:-

1. Mg as magnesium sulphate	25 kg /ha
2. Si as sodium silicate	25 ,,
3. Ca as quick lime	500 ,,
4. Fe as ferrous sulphate	11.2 ,,
5. Mn as magnese sulphate	11.2 ,,
6. Zn as zinc sulphate	11.2 ,,
7. B as borax	10 ,,
8. Mo as ammonium molybdate	1 ,,
9. Cu as copper sulphate	25 ,,

Calcium magnesium and silica are applied as basal and the trace lements 3 weeks after planting. All the nutrients were applied through soil. Popular high yielding varieties like IR8, Jaya and Aswathi were used for the studies. Three weeks old seedlings were planted in experimental plots measuring 7 m x 5 m, Seedlings were planted at spacing of 20 x 10 cm and 2 seedlings per hill.

The results (Table.25) indicate that Mo was most effective in increasing the grain yield of rice at Kumbidi during both seasons . The increase in grain yield over the control was 367 kg and 366 kg in the 1st and second crop season respectively. This was followed by Tr.6 (Mn) in the first crop season and Tr.9 (B) in the second crop season. Among the micronutrient combiat-

In Mannarghat Tr.2 (Ca) recorded the highest yield (234 kg over control) in the first crop season and Tr.12 (Combination of micronutrients without Mg and Si) in the 2nd crop season (308 kg over control) followed by Tr.10 (Mo) and Tr.6 (Cu) in the first and second crop season respectively. The general trend of the results indicated that molybdenum is more effective in increasing the grain yield in both centres. Combination of all micronutrients +Si (Tr.15) has given good response in majority of the trials.

Among the individual nutrients Fe and Mg in all centres and silica at Mannarghat had shown a marked depressing influence on grain yield. The trials will have to be continued for two more seasons.

Table.25 Effect of micronutrients on grain yield.

Treatment	Grain yield in kg per hectare			
	Kumbidi		Mannarghat	
	1st crop	Second crop	1st crop	Second crop
1. NPK (control)	5716	5387	5439	5109
2. NPK + Ca	5679	5437	5373	5284
3. NPK + Mg	5603	5416	5369	4737
4. NPK + Si	5176	5449	5263	4891
5. NPK + Fe	5586	5391	5403	5002
6. NPK + Mn	5029	5382	5496	5170
7. NPK + Zn	5643	5478	5473	5164
8. NPK + Cu	5779	5426	5426	5382
9. NPK + B	5809	5519	5486	4890
10. NPK + Mo	6083	5653	5539	5223
11. NPK + Mg + Si	5549	5278	5483	5143
12. NPK + Ca + Mg + Si	5573	5040	5549	4784
13. NPK+Ca+Fe+Mn+Zn+Cu+B+Mo	5368	5086	5219	5417
14. NPK+Mg+Fe+Mn+Zn+Cu+B+Mo	5803	5199	5456	4890
15. NPK+Si+Fe+Mn+Zn+Cu+B+Mo	5803	5490	5499	5135
16. NPK+Ca+Mg+Si+Fe+Mn+ Zn+Cu+B+Mo	5869	5020	5449	4798

....47

AGRONOMY (AICRIP)

1. Nitrogen variety trial with early duration varieties:

The object of the experiment is to study the optimum dose of Nitrogen and yield potential of 8 short duration varieties. Five levels of Nitrogen were tried under a uniform dose of 80 P and 50 K. The experiment was laid out in split plot design with varieties as main plot and levels of N as sub plots with 3 replication during first and second crop seasons.

The average grain yield of different treatments are given in Table.26.

Table.26. Average grain yield in kg/ha at different levels of N

Variety	NO		N 50		N 100		N 150		N 200	
	1 crop	2nd crop	1 crop	2nd crop	1 crop	2nd crop	1 crop	2nd crop	1 crop	II crop
1.IET 2508	1718	1800	2364	2411	3091	2248	3048	2275	3036	2248
2.T.Hamsa	1542	1562	2370	2078	2676	1766	2717	1976	2567	2146
3.Triveni	2004	1976	2758	2377	3389	2703	3512	2500	3213	2072
4.Cauvery	1311	1562	1895	2221	2348	2397	2319	2194	2385	2139
5.Ratna	1786	1942	2403	2397	3012	2615	3024	2309	2800	2194
6.IET.1526	1948	1922	2725	2214	3238	2330	3080	2207	2988	2194
7.IR579-48-12	1942	2038	2500	2784	3036	3125	3315	2977	3279	2887
8.RP.5-46	1315	1847	1580	2146	2010	1771	1924	2194	1850	2078

First crop CD (0.05) Varieties: 33
,, ,, Nitrogen: 34

2nd Crop CD.(0.05)
Varieties:
Nitro gen :

The local choice recorded significantly higher yields over the rest of the varieties. In the second crop season, however, IR 579 was found to be sup rior to the others varieties. Yields significantly increased upto 100 kg N/ha beyond which yields tended to decline. Incidence of pests and diseases was serve at these levels of N.

.....48

3. Nitrogen variety trial with medium duration varieties.

The object of the experiment is to study the optimum nitrogen level and maximum yield potential of 8 medium duration varieties. Five levels of nitrogen were tested under a uniform dose of 80 P x 50 K. The design of the experiment is split plot with varieties as main and nitrogen as sub plot with 3 replications during the first and second crop seasons. The average grain yield of the different treatments are given in Table.27. The local choice, 6473 recorded the maximum grain yield in the firs t crop season, although it was at par with RP.4-14. These varieties proved to be significantly superior to the rest. In the second crop season Jaya and 6473 were observed to be significantly superior to the other varieties.

Response to N was significant during both the seasons. Yields tended to decline when the nxt level of N was increased from 100 to 150 and 200 kg/ha.

Table.27. Average grain yield in kg/ha at different levels of N

Variety	N_0		N_{50}		N_{100}		N_{150}		N_{200}	
	I crop	II crop	I crop	II crop	I crop	II Crop	I crop	II crop	I crop	II crop
1. Jaya	3905	3145	4854	5038	5396	5378	5223	4885	4680	4748
2. Vijaya	3275	3585	4098	4383	4515	4670	4893	4292	4680	4166
3. IR- 20	3599	1356	3895	2102	4690	3558	80 48	3877	4798	2358
4. RP.4-14	3885	1327	4640	1957	5426	2645	5552	2839	5087	2470
5. CR.10-4103 (IET.1039)	3556	3547	4699	4670	4948	4875	4525	4534	4234	4099
6. RP.4-2	3490	1521	4844	1967	5060	2344	5056	2470	5300	2403
7. RP.5-3 (IET.1991)	3217	3430	3570	3992	4438	4360	4312	3856	4689	3798
8. 6473(local)	3895	3439	4631	5552	5038	5300	4854	5592	4864	4699

CD (0.05) First crop season. Variety: 63 Nitrogen 48

" 2nd crop season Variety: 131 Nitrogen: 78

.....49

3. Time of Application of nitrogen for direct seded rice in rainfed uplands.

The object of the experiment was to find out the optimum dose and time of application of Nitrogen in dry land for short duration varieties. 3 levels of Nitrogen (0,60 and 120) and three times of application (Basal), Tillering and panicle initiation were tested under a common dose of 80 P and 50 K. The design of the experiment was RBD with 4 replications. The test variety was Annapoorna. The results revealed significant linear response to nitrogen. Application of a major potion of nitrogen at seedling was found to be quite essential as it helped the plants to tide over moisture stress during the vegetation period. Application of 60 kg N/ha at seeding and 30 kg N/ha each at tillering and panicle initiation stages recorded the highest yields although the rate of response per unit nitrogen was highest at 60 kg N/ha applied in two equal doses at seeding and tillering stages, as influenced by time of applicant of nitrogen.

Table.38. Treatment details and average grain yield.

Treatment particulars (Nitrogen applied)				Grain yield (kg/ha)	Relative Response (Kg grain per kg of N)
	Basal	Tillering	Panicle initiation		
1.	0	0	0	220	220
2.	60	0	0	1319	21.98
3.	30	30	0	1260	21.00
4.	30	0	30	1195	19.92
5.	30	0	30F	1223	20.38
6.	120	0	0	1835	15.29
7.	60	30	30	2151	17.93
8.	60	30	30F	2132	17.33
9.	30	60	30	1864	15.53
10.	30	60	60	1606	13.38
	CD (0.05)			99	

F = Foliar application of N.

...50

4. TAN. (Time of application of Nitrogen for light Irrigated soils.

The object of the experiment was to study the proper time of application and optimum dose of nitrogen for early duration varieties in lightly irrigated soils. The layout of the experiment was randomised block with four replications. The level of Nitrogen was 0 and 100 kg while that of P and K were 50 kg each. The variety used was Triveni during both the seasons. The treatment particulars and grain yield are given in table-29.

Table.29. Grain yield corresponding to different treatments.

Treatment particulars (Nitrogen applied)				Grain yield (kg/ ha)	
Basal	Tillering	Panicle initiation	Booting	I crop	II crop
1. 0	0	0	0	1483	1771
2. 100	0	0	0	3270	3604
3. 100S	0	0	0	3907	3290
4. 75	25	0	0	3498	2890
5. 75	0	25	0	3470	2786
6. 75	0	25F	0	3565	3116
7. 75	0	0	25	3422	3073
8. 50	25	25	25	3508	3047
9. 50	0	25	25	3574	2890
10. 25	25	25	25	3707	3047
CD. (0.05)				332	472

F = foliar application of urea

S = sulphur coated urea.

Application of nitrogen in splits considerably increased the grain yield during both the seasons. On equal nitrogen basis, sulphur-coated urea applied at planting was found to be as effective as split application, but significantly superior to ordinary urea when applied entirely as basal dressing.

.....51-

5. Weed control trial for transplanted rice.

To study the relative efficiency of different methods of weed control in transplanted rice two expnriments using different herbicides were conducted during the 1st and 2nd crop seasons. The design was RBD with four replications. Jaya was raised under a fertility level of 120 N: 60P: 50:K. Weed growth was poor in both the seasons. The average grain yield of the different treatments during the two seasons are given in Table.30 and 30.A.

Table.30. Treatment particulars and grain yield - (I crop)

Treatment particulars.				Grain yield (kg/ha)	Weed weight (kg/ha)
1. C.288 (G)	1.0 kg ai/ha	6 days after sowing		4254	83
2. C.290 (G)	1.0	,,	,,	4198	62
3. C.1869 (G) + 24-D(G)IPE	1.5 0.5	,,	,,	4552	64
4. C.19490 (G)+ 2.4D.IPE(G)	1.5 0.5	,,	,,	4164	69
5. Saturn G + 2.4-D(G)IPE	1.0 0.5	,,	,,	4179	82
6. Saturn (G)	1.5	,,	,,	4104	236
7. Machete (G)	1.5	,,	,,	4151	195
8. Taveron (G)	0.75/0.05		,,	4235	91
9. NTN 5006/ 2.4-D IPE(G)	2.0/0.05		,,	4076	201
10. Propapil 2,4-D	3.0 1.0 ai/ha	Propanil at 2-3 leaf stage of grass followed by 2,4-D a few weeks later.		3852	69
11. ToK (G)	2.1 ,,	6 days after planting		4048	144
12. Ronstar	1.0 ,,	,,		4468	51
13. Hand weeding				4468	83
14. No weeding				3678	722
CD (0.05)				441	

In the first crop season the granulated herbidide CI8649 in consideration with 2, 4-D registered the highest average yield although it was statistically at par with C.288 Ronstar, Tavrone G, C.290 Machete and handweeding. All the herbicidal treatments recorded significantly more yield than the control. All the herbicides a quite effective on the control of weeds.

During the second crop season the treatment effects were not significant. The hand weeded plots registered the higher yield. Weed growth was poor even in the control plots.

Table.30.A. Treatment particulars of grain yield II crop

Treatment Particulars			Grain yield (kg/ha)	Weed weight (kg / ha)
1. 2,4-D IPE(G)	0.8 kg ai/ha	4 days after transplanting	5285	25
2. MCPA-K(G)	1.0 ,,	6 days ,,	5180	15
3. Machete	1.0	,,	5361	26
4. C.19490	,,	,,	5247	36
5. C.19490 G+ 2,4-D. DIPE	G. 0.75/ 0.5	,,	5123	22
6. C.288 (G)	1.0	,,	5190	23
7. Benthio carb (G)+1.0+ 2,4-D IPE (G)	0.5	,,	5171	15
8. Tavron G	0.75/ 0.5	,,	5266	18
9. Machete (G)	1.5	,,	5332	25
10. ToK (G)	2.1	,,	5066	33
11. Ronstar G	1.0	,,	5247	17
12. Propanil followed by 2,4-D	1.0	Propanil spray at 2-3 leaf stage followed by 2,4-D a few weeks later	5180	42
13. Hand weeding			5380	14
14. No weeding			5028	65
CD. (0.05)			---	

6. Weed control trial for direct seeded rice in puddled soils

In order to study the relative effeciency of different weedicides in the control of weeds in direct sown rice fields, 2 trials with different weedicides were conducted during the first and second crop seasons. The design of the experiment was RBD with five replication. The variety used was Jaya under a manurial dose of 120 N 50 P 50K. Weed seeds were also sown along with the paddy seeds in order to ensure uniform weed growth in all the plots. The average grain yield from the different treatments for both the seasons are given in Tables.31 and 31.A.

In the first crop season all the herbidical treatments outyielded the unweeded control, the percentage of increase on an average being 22.1. Ronstrar and hand weeding registered respectively 28.8 and 28.3% more yield over the control, but theu were statistically at par with Machete, NFN 5006/2,4-D. and Stam F-34.

.....53

In the second crop season hand weeding recorded the highest yield. However, it was on par with Machete at 1.5 kg ai/ha, judged from the ratings on weed con rol, toxicity to rice and grain yields obtained, it was concluded that Machete, Propanil and Ronstar would be safely used in direct seeded rice fields with considerable advantage.

Table.31. Treatment particulars and grain yield (first crop)

Treatment particulars			Grain yield (kg/ha)	Weed wt (kg/ha)
1. Benthiocarb	1.5 kgai/ha	6 days after planting	5445	16
2. Machete	,,	,,	5627	8
3. MPN 5006/2,4D-IPE	2.1/0.45	,,	5594	20
4. Tavron	0.6/0.4 ai/ha	10 days ,,	4974	41
5. C.288	1.0 ,,	6 ,,	5474	10
6. C.290	,,	,, ,,	5547	9
7. Ronstar	1.0 ,,	,, ,,	5914	51
8. Stam IV-10	300	Spray at 2-3 leaf stage	5327	17
9. Propanil + MCPA	3.0 1.0	-do-	5580	16
			5760	5
10. Hand weeding			4489	122
11. No weeding			299	5
C.D. (0.05)				

Table.31.A. Treatment particulars and grain yield (second crop)

Treatment particulars			Grain yield (kg/ha)	Weed weigh (kg/ha)
1. Saturn 10 2/3(g)	1.5 kg ai/ha	6 days after sowing.	5013	414
2. Machete 5% G	1.0 ,,	,,	5220	517
3. Machete 5% G	1.5	,,	5385	69
4. Tavron G	0.6/0.4	10 days	4910	64
5. C.288-7 5% G	1.0	6 days ,,	4986	28
6. C.19490 2.5% G	1.0	,, ,,	4779	106
7. Ronstar 2% G	1.0	,, ,,	4931	40
8. Hand weeding			5473	14
9. No weeding			4395	159
10. Propanil followed by 2,4-D-	3.0 1.0	3-3 leaf stage	5213	28
CD. (0.05)			154	

(Contdd.....54)

CHEMISTRY DIVISION.

The experiments laid out during the year include the following.

1. Permanent Manurial Experiment (Old)
2. Permanent Manurial Experiment (new)
3. Foliar Nutrition Trials (Modan lands)
4. Foliar Nutrition of Urea (Wet lands)
5. Ligaite fly ash trial
6. Weedicidal trial
7. Trial of weedicide 0385 EC on dry sown crop of rice
8. Study on weed control with new preemergent weedicides O 385 granules in wet broadcast rice (I crop)
9. Study on weed control with new post emergent weedicides II crop.

1. Permanent Manurial experiment (Old)

The experiment was started during the first crop season 1958 with the object of assessing the effect of continuous application of green leaf and ammonium sulphate and their combination to rice crop. The design of the experiment is R.B.D. with 5 treatments and 6 replications. PTB 2 and PTB. 20 varieties belonging to tall indica were used for the first and second crop seasons respectively. Ammonium sulphate was applied as single top dressing one month before flowering.

In both the seasons maximum tiller number and height were observed in treatment getting 16,000 lb of green leaf per acre. This is in concurrence with the previous years observations. Plants in treatments receiving inorganic nitrogen were more greenish but were shorter in height. Data on grain and straw yield are given in table-32. The results were significant only during the second crop season. Treatment 2 was find to be significantly superior to other treatments which were all on par.

Table-32
Yield of grain and straw

Treatments	I Crop Yield in kg/ha		II Crop Yield in kg/ha	
	Grain	Straw	Grain	Straw
1. Green leaf @ 5000 lb/acre	2117	5455	2194	4605
2. Green leaf @ 10000 lb/ac	2275	6165	2423	5102
3. Green leaf @ 5000 lb/ac + 15 lb N as Amm. Sulphate	1998	4796	2224	4605
4. Amm.sulphate to supply 30 lb N/acre	2020	4677	2041	4107
5. Amm.sulphate to supply 60 lb N/acre	2160	5740	2109	5030
C.D. (0.05)				

The organic carbon status of the soil has no marked change due to the continuous application of green leaf. Plots receiving ammonium sulphate alone show low organic carbon status. This is ture for the available potash also. There is no marked difference in the status of phosphorus and soil pH.

2. Permanent manurial tiral (New)

The experiment was commenced during the first crop season 1962 with the aim of assessing the effect of continuous application of gren leaf, cattle manure, Ammonium sulphate and their combinations with and without K_2O and P_2O_5 . The design of the experiment is R.B.D. with 6 treatments and 4 replications. PTB-2 and 20 belonging to tall indica were used for the first and second crop seasons respectively. Organic manures and P & K were applied as basal dressing and ammonium sulphate in one dose one month before flowering. The results were not statistically significant during both the seasons. The grain and straw yield of the different treatments are given in Table-33. The highest yields were recorded in plot receiving a combination of organic and inorganic manures.

Table-33

Yield of Grain and straw

Treatments	I crop Yield in kg/ha Grain	Straw	II crop Yield in kg/ha Grain	Straw
1. Cattle manure @ 8000 lb/acre	2273	8969	2706	6764
2. Green leaf @ 8000 lb/acre	2286	5844	2760	5682
3. Cattle manure @ 4000 lb+ Green leaves @ 400 lb/acre	2516	8225	2814	7197
4. Amm.sulphate to supply 40 lb N/ac	2300	7359	2219	5952
5. Cattle manure @ 4000 lb + Green leaves @ 4000 lb + NPK. 20 lb/acre	2814	8874	2706	6548
6. Greenleaf 4000 lbs & NPK @ 20 lb+ lb/acre	2367	8909	2922	6818
71 Cattle manure @ 2000 lb + Green leaf @ 2000 lb + NPK @ 20 lb/ac	2381	9032	2922	6656
8. Amm.sulphate to supply 40 lb N/ acre + P & K @ 20 lb/ac	2611	9334	2597	6602

C.D. (0.05) (F. Ns)

Soil analysis revealed that high percentage of organic carbon as well as available potash is seen in the plot receiving cattle manure @ 8000 lb/ac. Pore space and moisture holding capacity is maximum in treatments getting cattle manure, while bulk density is maximum where complete inorganic fertilisers are given.

receiving 65 Kg N/ha as complete basal. Complete foliar recorded lower yield in second crop than soil + foliar or soil alone. This might be due to the rains received at the time of foliar application. During the second crop season the stem borer infestation was maximum in complete foliar plots and minimum in complete soil plots. The complete foliar plots were late in flowering than others, the more the quantity of nitrogen sprayed, the greater was the delay in flowering. Grain straw yields , of the different treatments are given in Table-35.

Table-35.

Average yield of grain and straw.

Treatment particulars	I Crop Yield in kg/ha		II crop Yield in kg/ha	
	Grain	Straw	Grain	Straw
1. 45 kg N/ha complete soil	3267	5544	2380	4267
2. 45 Kg N/ha soil + foliar	3389	5433	2600	4500
3. 45 Kg N/ha complete foliar	3356	6111	1920	4100
4. 65 Kg N/ha complete soil	3844	6322	3010	5433
5. 65 kg N/ha soil + foliar	3722	6105	2633	4833
6. 65 kg N/ha complete foliar	3756	7700	1920	5000
7. 85 Kg N/ha complete soil	4156	6995	3420	5766
8. 85 Kg N/ha soil + foliar	4078	6690	2577	5000
9. 85 Kg N/ha complete foliar	4433	7811	2010	5556
C.D.	141	1286	591	368

5. Lignite fly ash trial:-

This experiment was commenced during the first crop season 1969 to compare the effect of lignite fly ash (a product of Neyveli Lignite Corporation) against the commonly used liming materials like lime, dolomite. The experiment was laid out in RBD with 4 treatments and 5 replications with the variety IR.8-68. The grain and straw yields revealed no significant difference between the treatments (Table-36). The periodical pH reading also revealed that there was no marked effect due to the treatments.

.....

The moisture equivalent is too low compared with plots supplied with inorganic manures. Ph is seen to be higher in the plots receiving cattlemanure @ 8000 lb/ac. The same is the case with electrical conductivity also.

3. Foliar nutrition trial (Modan lands)

The experiment was started during the first crop season 1972 with the aim of assessing the efficacy of foliar feeding of urea to dry sown rice crop in combination with soil application. The experiment is laid out in R.B.D. with 9 treatments and 3 replications. Since there was an unusual dry spell after the sowing the germination was not uniform and hence yield data were assessed from sample plots which is given in Table-34. The results indicates the efficacy of soil plus foliar application of urea or soil application.

Table-34.

Yield of grain and straw.

Treatment particulars	Yield in kg/ha Grain	Straw
1. 45 kg N/ha complete soil	1316	4767
2. 45 kg N/ha soil + foliar	1230	5867
3. 45 Kg N/ha complete foliar in 2 equal doses	1348	5600
4. 65 Kg N/ha complete soil	1466	6233
5. 65 Kg N/ha soil and foliar	1556	5983
6. 65 Kg N/ha complete foliar	1016	6900
7. 85 Kg N/ha complete soil	1523	7000
8. 85 kg N/ha soil and foliar	1546	5800
9. 85 kg N/ha complete foliar	1406	7683
P	NS	

4. Foliar nutrition of Urea (wet land)

An experiment on foliar nutrition of urea in the same lines as in the modan land (upland) was laid out in wet land with 9 treatments replicated thrice with Jaya during the first and second crop seasons. The grain and straw yield increased significantly with increasing doses of nitrogen in both seasons. In the first crop season maximum grain and straw ~~yields~~ yields were recorded from plotsreceiving 65 Kg N/ha as complete foliar but during second crop season the maximum yield was recorded by plots

.....

Table-36

Grain and straw yield in kg/ha

Treatments	I crop		II crop	
	Grain	yield	Grain	yield.
1.No lime	4426	5966	3551	4659
2.Burnt lime 250 kg/ha	4301	5824	3722	4716
3.Dolomite 400 kg/ha	4341	5284	3563	4773
4.Lignite fly ash 1600 kg/ha	4301	5341	3585	4659
F	NS		NS	

6. Weedicidal trials:-

To study the efficiency of 2 preemergent weedicides viz., Machete (2 Chloro-2,6- diethyl N- Butoxy methyl acetamuilide) and Tok E. 25 (2,4- Dichlorophenyl, 4- nitrophenyl ether) a trial was commenced during the first crop season 1971. During the first crop season the experiment was dry sown and for the second crop season it was wet sown. Test variety was Jaya. A seed rate of 100 kg/ha was used. The manuring schedule was 75 N: 40 P: and 40 K. The design of the experiment was R.B.D. with 8 treatments and 4 replications. Hand weeded control plots were weeded twice. Machete granules were applied 3-4 days after sowing and Tok was sprayed 3-4 days before sowing. The weed counts and grain yields are furnished in Table-37.

Table-37.

Weed count and grain yield

Treatment particulars	I Crop		II crop	
	Weed count/sm	Grain yield kg/ha	Weed count/ s.m.	Grain yield kg/ha
1. Machete 1.5 kg a.i./ha	81	2893	25	1700
2. Machete 2.5 kg a.i./ha	44	3135	15	1367
3. Machete 3.0 kg -do-	57	3293	37	1350
4. Tok-E.25 2.0 kg -do-	181	2368	23	1700
5. Tok-E.25 3.0 kg -do-	116	2893	26	2400
6. Tok-E.25 3.5 kg -do-	79	3256	38	2167
7. Hand weeding	199	3199	28	3050
8. No weed control	716	1044	43	2567
C.D. (0.05)		945		660

.....

During the I crop season Machete at 2.5 - 3.0 kg a.i gave good weed control than Tok while the higher yiled were recorded by Machete 3.0 kg ai/ha and Tok. 3.5 kg ai/ha and they were on par. During the second crop season Tok treated plots gave given significantly higher yields than Machete. During this season there was injury to seedlings in plots applied with Machete.

7. Trial of weedicide 0385 EC on Dry sown crop of rice.

An experiment to study the effect of a new weedicide 0385 (Monsanto Chemicals) in comparison with Machete, Saturn, Chemrice, Propanil, hand weeding and no weed control was laid out. The lay out of the experiment was RBD with 3 replications and and 12 treatments. Seeds of Triveni at 100 kg/ha were broadcasted and NPK schedule of 30 N 30 P 30 K were adopted. The dry spell revailed after sowing has affected the germination and vitiated the results. The comparative efficiency of weedicides turned in controlling the weeds are given in table-38.

Table.38. Weed control and average grain yield

Treatment particulars.	Weed control %	Crop injured %	Plant Population/cm
1. 0385 EC 2 kg ai/ha immediately after sowing	42.0	13.3	168
2. -do- 4 ,, ,,	63.3	11.6	136
3. -do- 6 ,, ,,	80.0	40.0	85
4. -do- 2 ,, as postemergent at 2 leaf stage	63.3	50.0	65
5. -do- 4 ,, ,,	88.1	59.0	27
6. -do- 6 ,, ,,	95.0	88.1	11
7. Machete EC 3 kg ai/ha as pre-emergent 6 days after sowing	80.0	5011	100
8. Saturn EC 1.5 kg ai/ha 6 days after sowing	83.3	20.1	122
9. Chemrice 4 kg ai/ha postemergent at 2-3 leaf stage	76.6	10.0	132
10. Propanil 3 kg ai/ha as postmer-gent	25.0	13.3	127
11. Hand weeding	100	Nil	104
12. No weeding	Nil	Nil	128

8. Study on weed control with new preemergent weedcide 0385 Granules in wet broadcast rice (First Crop Season)

An experiment to study the effect of 0385 granules in comparison with Ma chete, Saturn and Tavron G and with weeding and no weeding, was conducted during the first crop season under wet broadcast condition there were 16 treatments replication three. The variety tried was Annapurna under a manurial schedule of 70 : 35 : 35 kg. NPK per hectare. The percentage of crop injury and weed control and grain yield are given in Table-39. Crop injury was more when the dose of 0385 G was increased in both methods of application. Machete granules though gave better weed control caused greater plant injury. Saturn in lower doses gave good yield and less plant injury. The highest yield was recorded by Saturn @ 1 kg ai/ha (soil incorporation).

Table.39

Treatment details, crop injury, weed control & grain yield.

	Treatments.	Crop injury %	Weed control %	Grain yield kg/ha
1	0385 5% granules 0.5 kg ai/ha as pre-sowing incorporation.	12.5	62.5	2553
2	do 1.0 ,,	10.0	55.0	2353
3	do 2.0 ,,	40.0	60.0	1640
4	do 0.5 as presowing surface application	5.0	27.5	2020
5	do 1.0 ,,	17.5	40.0	2333
6	do 2.0 ,,	55.0	77.5	1733
7	Machete 5% granules 1.0 as presowing incorporation.	87.5	85.0	1600
8	do 1.5 -do-	95.0	77.5	1-
9	do 1.0 as presowing surface application	99.5	92.5	-
10	Saturn 10% granules 1.0 as presowing incorporation.	25.0	57.5	3173
11	do 1.5 -do-	27.5	42.5	2600
12	do 1.0 as presowing surface application	50.0	52.5	2833
13	do 1.5 -do-	95.0	35.0	-
14	Tavron G.0.75/0.50 5 to 7 days after sowing	40.0	50.0	2767
15	Hand weeding	0.0	100.0	2800
16	No weeding.	0.0	0.0	2553

9. Study on weed control with new post-emergent weedicides (Second Crop Season)

An experiment to study the comparative performance of new post-emergent weedicides like 0385 EC, 0385 granules, weedone granules, weedone W.P. and A gromore 2,4-D was conducted with 18 treatments and 3 replications in RBD during the second crop season with Annapurna variety (wet broadcast. The manurial dose given was 30N 30P 30K. The crop injury, weed control and grain yield recorded are given in Table-40.

Table-40

Treatment details of crop injury, weed control & grain yield.

	Treatment particulars.	Crop injury %	Weed control%	Grain yield kg/ha
1.	0385 EC 0.5 kg ai/ha at one leaf stage	2	26	2333
2.	-do- 1.0 ,, ,,	62	80	1837
3.	Weedone G.12 kg/ha 40 days a fter sowing	0	66	2787
4.	0385 G. 0.5 kg ai/ha at one leaf stage.	10	51	2733
5.	-do- 1.0 ,, ,,	51	78	1580
6.	-do- 2.0 ,, ,,	100	88	-
7.	0385 EC0.5 ,, at 2 leaf stage.	0	56	3087
8.	-do- 1.0 ,, ,,	16	68	2553
9.	2.0 ,, ,,	100	93	-
10	0385 G 0.5 ,, ,,	6	53	2267
11	-do- 1.0 ,, ,,	90	85	573
12	-do- 2.0 ,, ,,	100	95	-
13	Machete G.1.5,, at one leaf stage.	0	10	2087
14	Saturn EC.1.5 kg -do-	6	50	2867
15	Hand weeding.	0	100	2973
16	No weeding.	0	0	1887
17	Weedon W.P. 2kg ai/ha 40 days after sowing	0	30	2907
18	Agromore 2,4-D.W.P. 1 kg/ha ,,	5	40	2173

ENTOMOLOGY DIVISION

The following trials were conducted.

1. New Insecticidal Trial (AICRIP)
2. Chemical Evaluation Trial ,,
3. New Insecticidal trial
4. Insecticide Trial-I
5. Insecticide Trial-II
6. Insecticide Trial-III
7. Seedling Dip Experiment (AICRIP)
8. Chemical control in nursery ,,
9. Maximum protection trial ,,
10. Gallmidge resistant variety trial (AICRIP)
11. Gallmidge screening trial ,,
12. Screening trial with Assam Rice Collections (AICRIP)
13. Stem borer resistant variety trial ,,
14. General Screening for Insect resistance ,,
15. Epidemiology of insect pests

.....

I. Chemical Experiments:-

New Insecticide Trial:

The object of the experiment is to ~~examine~~ evaluate the effectiveness of potential chemicals against rice pests.

This experiment was laid out during first crop season in R.B.D with 16 treatments and 2 replications. The plot size used was 40 sq. meters and spacing 20 x 15 cm. Jaya seeds sown in nursery on 3.6.72 were planted on 30.6.72. For the treatment 15, maximum protection, seedlings were dipped in 0.02% carbofuran solution and planted, and cytrolane G at 1.0 kg ai/ha applied at 20,40 and 60 days after transplanting. In other treatments chemicals were applied four times, first as a protective application and then against gallmidge, stem borer and leaf roller attack. The details of treatments, dose and results are given in Table.1

Results and discussion:

Gallmidge: The attack by gall midge ranged from 1.2 % in maximum protection to 6.1 % in Roger, the percentage of attack in the control being 5.4 %. Maximum protection treatment was significantly superior to all other treatments.

Stem Borer: The incidence of dead hearts ranged from 1.2 % in maximum protection to 5.8% in Lebaycid G with only 2.0% in control. In the case of white ear heads the incidence ranged from 1.0% in Fundal to 9.2% in Lebaycid G. The treatments differences were not significant but Furadan 82.7% W.P. and maximum protection have given best control of stem borer.

Table.41. Counts on 50. D.A.T.

Tr. No.	Insecticides	Dose in kg/ha	Silver Shoot %	Aug.V	Dead heart %	A.V.	White ear %	A.V.	Leaf roller damaged leaves	Rolling larges.	Yield in kg/
1.	Dursban 10G	0.5	5.0	12.85	2.3	8.79	7.3	15.60	28	3	323
2.	Folithion 5 G	1.5	5.2	13.18	2.2	8.53	1.3	6.49	21	29	410
3.	Lebaycid 5G	1.5	5.8	13.98	5.8	13.96	9.2	17.65	82	98	165
4.	MIPCIN 20EC	0.25(2)	2.5	9.15	2.6	9.33	1.3	6.54	43	84	331
5.	[illegible] 4G	1.5	4.4	12.14	1.3	6.50	4.9	12.80	74	44	213
6.	Paddigard 7.5 G	1.5	5.1	13.01	1.5	7.14	4.5	12-31	42	11	266
7.	Tavaron 50EC	0.5	5.6	13.68	1.3	6.50	4.9	12.80	42	0	45
8.	Galacron 3G	1.5	5.4	13.40	2.7	9.50	1.5	6.97	2	0	49
9.	Vamidothion 40EC	0.5	4.3	11.95	1.8	7.70	6.8	17.26	49	3	35
10.	Birlane 24EC	0.5	1.8	12.64	3.3	10.43	6.8	15.18	34	2	26
11.	Furadan 3G	0.2 (3)	3.5	10.76	4.0	11.45	8.9	17.37	42	4	41
12.	Fundal 82.7%.P	0.5	5.0	12.98	1.8	7.86	1.0	5.74	2	0	4
13.	Orthene 75 W.P.	0.5	5.0	13.75	2.6	9.38	1.5	7.10	62	2	4
14.	Rogor 5G	1.5	6.1	14.28	2.0	8.21	8.5	10.82	42	7	3
15.	Maximum protection	(1)	1.2	6.27	1.2	6.27	2.1	8.31	18	0	4
16.	Control	5.4	13.39	2.0	8.09	4.8	12.64		34	5	3
17.	Experiment mean	4.7			2.4		38.5			373	3
	CD	3.8			NS		NS				

A.V. Angular value.

Leaf roller: The best control of leaf roller is obtained by treatments Galacron G, Fundal, maximum protection and Tarvron 50 EC.

Yield: The treatments Galacron, Fundal, Tavron and Maximum protection have given the higher yields. The lowest yield was re ded by Paddigard treatments which recorded the maximum x leaf-roller attack.

.....f

2. Chemical Evaluation Trial:

The object of the experiment to evaulate the effectiveness of selected available chemicals for controlling each specific pest.

The chemical evaluation trial for the first crop was designed to provide information on the effectiveness of chemical control of stem borer, gall midge and leaf roller. Jaya was the variety used with 28 treatments and 2 replications in R.B.D. Chemicals were applied four times during the crop growth. A maximum protection as in NIT and a local schedule of spraying Parathion (Ekatox) with 24 other treatments and 2 untreated controls were in the experiment. The treatments with results are given in Table.42

Result:

Gallmidge: In this experiment the incidence of silver-shoot varied from 1.0% to 14.6%. There is significant differences between treatments. The treatments of maximum protection, Thimet G, Diazinon-G, Cytrolane G, Ekalux G and Folidol being superior than the other chemicals.

Stem borer:

The incidence of dead hearts was low and hence the treatment differences were not significant. In the case of white ears the incidence varied from 1.7 to 10%. There is significant difference. Folithion, Dimecron, Ekalux G, Ekatox, Nuvacron Nuvan and Cytrolane G are found to be efficient in the control of stem borers

Leaf roller.

Phosvel and Folithion are found to be the best for leaf roller control. In addition Sevin SP, Dimecron, Ekalux EC and Ekalux G, Folidol and Nuvacron are also found to be better in the control of leaf roller. Granular application of Thimet does not have any effect for the control of leaf roller and the same trend is maintained by Thiodan, Sevidol and Endrex.

Grain Yield. The highest yield has been recorded by Folition followed by maximum protection and Phosvel and Ekalux EC. Grain yield data show that the treatment are significant. Folithion and Phosvel being superior to others.

.....65

Table.42.

Tr. No.	Insecticide		Dose	Silvershoot %	Silvershoot A.V.	Deadheart %	Deadheart A.V.	Whitear %	Whitear A.V.	Leaf roller No.of leaves affected.	Leaf roller No of living larvae	Yield in kg/ha
1.	Ambithion	EC	0.5	9.6	18.02	4.4	12.12	3.3	10.53	65	5	3707
2.	Anthio	EC	0.5	8.2	16.67	1.6	7.23	6.8	15.09	30	5	3835
3.	BHC	G	1.5	7.9	16.35	2.5	9.15	4.7	12.55	30	6	2899
4.	Bidrin	EC	0.5	11.4	19.78	2.0	8.18	3.9	11.36	40	0	4755
5.	Birlane	G	1.5	722	15.56	1.6	7.23	4.6	12.36	90	13	2190
6.	Cytrolane	G	0.5	(4)4.0	11.51	1.2	6.27	3.0	9.95	43	2	3488
7.	Diazinon	G	1.5	(3)3.9	11.40	1.0	5.74	2.9	9.90	68	11	4161
8.	Dimecron	EC	0.5	11.6	19.94	1.7	7.44	1.7	7.51	37	1	4293
9.	Dipterex	G	1.5	9.7	18.13	1.8	7.73	4.1	11.70	35	3	2314
10.	Dursban	EC	0.2	7.1	15.44	1.3	6.50	2.2	8.59	28	2	4572
11.	Ekalux	EC	0.5	7.5	15.94	2.1	8.26	2.6	9.30	13	1	5018(2)
12.	Ekalux	G	1.5	4.0	11.55	1.2	5.27	16.5	23.99	68	14	1355
13.	Endrin	G	1.5	6.7	14.97	1.2	5.27	16.5	23.99	41	1	4161
14.	Folidol	EC	0.5	5.6	13.63	1.7	7.51	3.3	10.53	12	1	4672
15.	Folithion	EC	0.5	6.1	14.30	5.2	13.18	1.7	7.58	0		5826
16.	Lebaycid	EC	0.5	10.2	18.58	2.0	2.0	8.02	3.8	11.31	40	2 3289
17.	Nuvacron	EC	0.5	10.2	22.49	1.3	6.61	2.6	9.20	8	0	4822
18.	Nuvan	EC	0.5	10.7	19.77	2.0	8.13	3.0	10.00	55	8	3484
19.	Sevidol	G	1.5	8.5	16.95	2.1	8.34	4.5	12.20	50	7	2358
20.	Sevin	SP	0.5	9.3	17.80	1.2	6.27	3.3.	10.46	40	1	4404
21.	Thimet	G	1.25	2.5	9.13	1.8	7.70	10.0	18.47	67	10	1143
22.	Thiodan	EC	0.5	8.9	17.32	2.1	8.30	5.6	13.72	31	4	2537
23.	Thiodan	G	1.5	10.6	18.99	1.9	7.81	3.9	11.86	55	9	1951
24.	Phosvel	EC	0.5	10.6	18.99	1.9	7.81	3.9	11.36	55	0	1951 5185
25.	Max.Protection.		(1)	1.0	5.74	1.0	5.74	3.0	9.93	46	3	5408
26.	Local schedule			7.5	15.85	1.5	7.03	2.1	8.43	10	7	2676
27.	Control			11.0	19.41	2.4	8.85	9.6	18.07	23	3	3652
28.	Control			10.4	18.81	1.9	7.91	7.8	26.23	23	3	3652
29.	Experiment mean			8.0		1.9		4.5		37	4	3654
	CD			3.8		NS		6.5				1595

During the second crop also this experiment was continued with two changes in the treatments, Treatment 11 Ekalux EC being replaced by Phosalone EC and Treatment 13 Endrin G being replaced by Agronule G. Results are furnished in Table.42.A.

Table.42.A.

Tr. No.	Insecticides		Silvershoot %	Silvershoot A.V.	Deadhearts %	Deadhearts A.V.	White ear %	White ear A.V.	Leaf affected leaves.		roller living larves.		Yield in kg / ha
1.	Ambithion	EC	0.5	4.4	12.17	3.8	11.30	10.4	18.73	12	3		2230
2.	Anthio	EC	0.5	7.3	15.64	8.7	17.12	7.8	16.18	20	8		1171
3.	BHC	G	1.5	6.3	14.53	1.2	6.36	12.5	20.73	17	14		683
4.	Bidrin	EC	0.5	3.9	11.45	8.1	16.57	5.7	13.84	8	3		2676
5.	Birlane	G	1.5	3.9	11.39	3.6	10.99	9.0	17.45	20	14		1240
6.	Cytrolane	G	0.5	1.2	6.27	1.6	7.21	4.1	11.62	14	3		3762
7.	Diazonon	G	1.5	3.1	10.18	2.8	9.54	12.9	21.03	15	7		1728
8.	Dimecron	EC	0.5	9.2	17.63	3.5	10,76	5.7	13.86	9	2		2648
9.	Dipterex	G	1.5	4.0	11.57	11.1	19.49	12.4	20.59	25	15		822
10.	Dursban	EC	0.2	5.4	13.49	1.3	6.53	5.9	14.04	6	0		3553
11.	Phosalone	EC	0.5	4.3	12.02	2.5	9.18	5.7	13.79	9	4		2871
12.	Ekalux	G	1.5	2.6	9.26	2.1	8.35	7.4	15.78	20	9		2815
13.	Agronule	G	1.5	5.6	13.92	3.4	10.60	3432	20.17	10	11		1212
14.	Folidol	EC	0.5	5.6	13.69	1.9	7.95	6.3	14.58	2	0		3052
15.	Folithion	EC	0.5	4.8	12.68	2.7	9.46	6.9	15.24	6	5		2843
16.	Lebaydic	EC	0.5	6.6	14.93	8.8	17.30	13.2	21.33	15	9		1296
17.	Nuvacron	EC	0.5	5.8	13.92	2.7	9.50	3.3	10.53	4	1		3358
18.	Nuvan	EC	0.5	5.8	12.13	5.4	13.42	4.1	11.68	14	5		934
19.	Sevidol	G	1.5	8.5	16.95	4.1	11.63	18.4	25.40	20	14		655
20.	Sevin	SP	0.5	5.7	13.80	7.1	15.45	14.6	22.43	8	4		2662
21.	Thimet	G	1.25	5.3	8.64	3.0	10.00	23.06	15	15	10		655
22.	Thiodan	EC	0.5	8.3	16.73	1.5	6.92	8.2	16.66	9.	7		2522
23.	Thiodan	G	1.5	4.9	12.80	5.5	12.59	5.21	10.04	22	12		962
24.	Phosvel	EC	0.5	7.5	15.30	7.1	15.42	5.1	13.04	0	0		4111
25.	Max.Protection			1.4	6.73	3.8	11.24	1.2	6.19	13	7		4431
26.	Local schedule			7.0	15.38	1.0	5.77	2.2	8.55	0	0		3832
27.	control			7.1	15.49	8.0	16.42	18.2	25.22	24.26			683
28.	control			5.0	12.94	9.8	19.27	8.3	16.72	15.16			502
	Experiment			5.2	4.5	8.8		8.8					2139.6
	Mean			5.2		4.5		8.8					1144
	CD			4.92		8.25	9.64						

Results:-

Gallmidge: The incidence of silvershoot ranged from 1.2 to 7.1%. There is significant difference between treatments. Treatment 6 cytrolane and treatment 25 maximum protections being superior. Diazinon G, Ekalux G and Thimet g are also effective in reducing silvershoot incidence.

Stemborer: Deadheart incidence varied from 1.0 to 11.7%. Local practising of spraying parathion? Dursban, BHC.G, Thiodan EC and cytrolane G are found to check deadheart incidence considerably white ear heads ranged from 1.2 to 18.2 % Nuvan are found to give good reduction in white ear heads.

Leaf-roller: Phosvel EC, Local Schedule of spraying Ekatox, Folidol, Dursban, Nuvacron , Cytrolane G and Bidrin EC are found to effectively reduce leaf roller attack.

Grain yield:- Higest grain yield are obtained from treatment maximum protection, Phosvel EC, Local practice, Cytrolane G, Dursban EC and Nuvacron EC (Table.42.A).

Discussion: Taking into account the results of both first and second crop experiments the following observations are made.

Gallmidge: Considerable reduction in the incidence of silvershoot can be attained by the application of (1) seedling dip at 0.02%, Carbofuran solution followed by cytrolane G at 1.0% kg ai / ha. at 20, DAT (2) Thimet G at 1.25 kg ai/ha at 10 DAT. (3) Cytrolane G at 0.5 kg ai/ha at 10 DAT and (4) Diazinon G at 1.5 kg ai/ha at 10 DAT.

Deadhearts: Stem borer causing damage at tillering stage i.e. deadhearts can be successfully checked by the application of (1) Parathion (Ekatox) 0.5 kg ai/ha (2) Dursban at 0.2 kg ai/ha (3) Cytrolane G at 0.5 kg ai/ha(4) Ekalux G at 1.5 kg ai/ha (5)Folidol EC 0.5 kg and Thiodan EC 0.5 , kg BHC G at 1.5 kg, Diazenon G at 1.5 kg and Nuvacron EC at 0.5 kg ai/ha. White ear head incidence can be effectively reduced by (1) Maximum protection (2) Local Schedule (3) Nuvacrone EC and Nuvan EC.

Leaf roller:- Spraying (1) Phosvel EC (2) Dursban EC(3) Folidol (4) Nuvacron (5) Bidrin (6) Dimecron (7) Folithion (8) Sevin and applying cytrolane G.

....68.

Grain yield: The highest grain yield are recorded by (1) maximum protection followed by (2) Phosvel EC (3) Folithion (4) Nuvacron and 5. Cytrolane.

I-3. New Insecticide (station) Trial.

The objective of the experiment is to evaluate the effectiveness of potential chemicals at specific intervals on the control of rice pests.

This experiment was laid out in RBD using 19 chemicals and one untreated control in two replications. The concentrates being sprayed at 10,25,40,55 and 70 days after planting and the granules applied thrice i.e. 10,30 and 60 days after planting. The 19 chemicals used include 13 as sprays and 6 as granules. The results of the first crop experiment are furnished in Table.42.

Results:

Gallmidge. The incidence of silversheet ranged from 2.8 to 11.0 but the treatments are not statistically significant. The data reveal that cytrolane G and Dursban EC are highly effective in the control of gall midge.

Stem borer: Deadheart incidence show that treatments are significantly different in their efficacy. Dursban EC, Phosvel EC, Birlane EC, Furadan G, Formothion, Ekatox, Bidrin, Birlane G Ekalux and Cytrolane G being effective in checking deadheart incidence. White ear incidence was low ranging from 1.0 to 5.2%. Bidrin EC Ekalux EC, Birlane G Diazinon G, and Dursban EC being effective in checking white ear incidence.

Grain yield: Maximum grain yield is recorded by Dursban EC, followed by Furadan G, Ekatox, Phosvel Ekalux EC, Birlane EC, Cytrolane G, Ambithion and BHC-G.

During second crop also the same experiment was repeated without any change. The results are furnished in Table.43.A.

.....89

Table.43.

Tr. No.	Insecticide		Dose in kg/ha	Silver shoot %	Silver shoot A.V.	Dead heart %	Dead heart A.V.	white ear %	white ear A.V.	yield in kg/ha
1.	Phosvel	EC	0.5	4.1	11.69	1.9	1.94	3.2	6.50	7343
2.	Birlane	,,	,,	8.3	16.73	1.9	8.02	1.3	6.50	7262
3.	Bidrin	,,	,,	6.9	15.19	2.3	8.64	1.0	5.74	5556
4.	Phosalone		,,	6.3	14.63	13.4	21.43	1.6	7.38	5918
5.	Formothion		,,	10.3	18.75	2.1	8.40	3.0	9.94	5314
6.	Ekalux	,,	,,	5.9	14.06	2.8	9.71	1.0	5.74	7186
7.	Ambithion	,,	,,	9.8	18.24	4.3	12.02	2.0	8.10	6280
8.	Dursban	,,	,,	3.3	10.50	1.6	7.26	1.2	6.39	8248
9.	Lebayeid	,,	,,	8.1	16.50	5.7	13.82	5.2	13.18	5797
10.	Dimecron	,,	,,	10.1	18.58	5.3	12.26	1.5	7.04	5374
11.	Nuvacron	,,	,,	11.0	19.37	4.2	11.78	4.3	11.90	5773
12.	Nipsin	,,	,,	4.4	12.02	6.9	15.20	2.5	9.18	5495
13.	Cytrolane G	,,	,,	2.8	9.67	2.8	9.71	4.5	12.28	6461
14.	Birlane	,,	,,	10.1	18.52	2.3	8.67	1.0	574	5773
15.	Furadan	,,	1,0	5.0	12.87	2.0	8.03	1.5	7.03	7669
16.	BHC	,,	1,5	6.9	16.60	10.3	18.63	1.3	6.50	6220
17.	Ekalux	,,	,,	5.8	13.89	3.2	10.34	1.5	6.94	5857
18.	Diazinon	,,	,,	4.8	12.65	4.0	11.53	1.2	6.39	5676
19.	Ekatox	,,	0.5	7.6	16.04	2.1	8.26	2.3	8.79	7488
20.	Control	,,	Nil	6.1	14.32	11.0	19.37	2.2	8.51	5193
	Experiment mean			6.9		4.50		2.6		6289
	C.D.			NS		6.70		NS		966

Result:

Gallaidge: The treatments are not significant. But Ekalux G, Cytrolane G and Dursban EC are found efficient in controlling silvereheat incidence.

Stem borer:- The treatment differences are not significant. Phosvel, Bidrin EC, Phosalone EC, Ekatox, Dimecron and Cytrolane G are found efficient to control dead heart. The white ear incidence ranged from 1.2 to 20.6% and the treatments are significant. Birlane EC, Phosvel, EC, Ambithiong Phosalone, Dimecron, Bidrin, Dursban and Ekalux EC are the best.

..... .70.

Table - 43.A.

Tr. No.	Insecticide	Dose	Silvershoot %	Silvershoot A.V.	Deadhearts %	Deadhearts A.V.	White ear %	White ear A.V.	Grain yield in kg/ha.
1	Phosvel EC	0.5	6.5	14.78	4.0	11.47	1.8	7.77	5737
2	Birlane EC	,,	7.7	16.11	5.8	13.99	1.2	6.26	5435
3	Bidrin EC	,,	4.2	11.81	4.4	12.11	2.6	9.30	5344
4	Phosalone EC	,,	4.2	11.85	5.5	13.61	2.5	9.09	5378
5	Formothion EC	,,	6.4	14.69	8.3	16.78	8.7	17.05	4520
6	Ekalux EC	,,	5.7	13.84	7.3	15.72	3.2	10.02	5314
7	Ambithion EC	,,	5.0	12.86	5.9	14.00	2.2	8.62	5284
8	Durbban EC	,,	2.9	9.83	5.8	13.97	3.0	9.94	5797
9	Lebaycid EC	,,	5.4	13.39	8.1	16.56	5.6	13.74	4408
10	Dimecron EC	,,	5.3	13.27	5.6	13.63	2.5	9.02	5012
11	Nuvacron EC	,,	4.5	12.30	7.7	16.16	3.4	10.66	5103
12	Mipsin EC	,,	5.9	14.00	10.2	18.65	13.5	21.59	4016
13	Cytrolane G	1.5	2.3	8.64	5.9	14.00	11.6	19.89	5103
14	Birlane G	1.5	5.2	13.12	9.7	18.15	7.4	12.77	2774
15	Furadan G	1.0	3.7	11.04	7.7	16.10	5.2	13.18	5223
16	BHC	1.5	7.8	16.18	6.1	14.32	12.2	20.42	4287
17	Ekalux G	1.5	1.5	7.04	6.9	15.25	9.3	17.16	4589
18	Diazinon G	1.5	4.7	12.48	6.2	14.38	11.3	19.61	3835
19	Ekatox G	0.5	3.9	11.41	5.6	13.73	6.5		5012
20	Control		6.6	14.89	8.4	16.80	20.6		3351
	Experiment mean		4.97		6.78		6.72		4826
	CD		NS		NS		9.19		NS

Table - 44.

Tr. No.	Insecticide	Dose	Silver Shoot %	Silver Shoot A.V.	Deadheart %	Deadheart A.V.	White ear %	White ear A.V.	Yield in kg/ha
1.	Birlane EC	0.25	9.5	17.92	3.5	10.80	2.4	8.89	4347
2.	,, ,,	0.05	8.9	17.33	2.8	9.26	1.7	7.47	4658
3.	Bidrin	0.5	12.7	20.84	1.9	7.88	1.8	7.79	4917
4.	Birlane S.O	1.0	11.3	19.68	1.3	6.45	1.2	6.18	4886
5.	Endrex EC	0.3	1114	19.74	2.0	8. 17	1.7	7.60	5145
6.	Thiodan EC	0.5	9.9	18.38	2.0	8. 19	2.5	9.02	4810
7.	Birlane G	1.5	11.3	19.61	1.8	7.63	1.0	5.74	4271
8.	Cytrolane G	1.0	5.7	13.79	3.9	9.81	1.9	7.82	5342
9.	Control		13.4	21.42	4.0	11.48	2.5	9.05	3898
	Experiment mean		10.5	2x2	2.2		1.8		4697
	CD		NS		NS		NS		NS

Table - 44.A.

Tr. No.	Insecticide	Dose	Silver Shoot %	Silver Shoot A.V.	Dead hearts %	Dead hearts A.V.	White ear %	White ear A.V.	Yield in kg/ha
1.	Birlane EC	0.25	6.7	15.06	7.7	16.13	4.3	12.02	4575
2.	,,	0.5	5.7	13277	4.8	12.72	4.1	11.70	4886
3.	Bidrin ,,	0.5	5.6	13.63	8.1	16.50	4.6	12.42	4712
4.	Birlane S.O	1.0	8.1	16.50	7.3	15.67	10.7	19.06	3138
5.	Endex EC	0.3	6.2	14.39	5.4	13.39	4.3	11.97	4620
6.	Thiodan EC	0.5	4.0	11.57	8.4	16.83	4.5	12.27	4468
7.	Birlane G	1.5	14.00	5.9	6.3	14.50	10.8	19.23	2789
8.	Cytrolane G	1.0	3.0	10.00	8.2	16.59	11.4	19.77	4256
9.	Control		8.1	16.57	10.1	18.52	16.0	23.57	2546
	Experiment mean		5.9		7.4	2x2	7.9		3999
	CD.		NS		NS		NS		965

Grain Yield: The yield differences are not significant. highest yield is recorded by Drusban followed by Phosvel.

Discussion: Considering the result of the new insecticide trial for both first and second crop the conclusion arrived at is as follows.

Gall midge: Cytrolane G, Dursban EC, Ekalux G and Furadan G are highly effective in checking down the incidence of silver shoot.

Stem Borer: Data on the incidence of dead hearts reveal that Phosvel EC, Bidrin, Dursban, Birlane EC and Ekatox are the best for lowering stem borer attack consuming the dead hearts. With regard to white ear heads control, Birlane EC, Bidrin, Dimecron, Phosalone, Ekalux, Ambithion, Dursban and Phosvel are effective.

Grain yield: Combined data show that a mean grain yield of 7023 kg by Dursban , 6540 kg by Phosvel, 6446 by Furadan, G. 6299 by Birlane EC and 6250 kg by Ekalux EC and Ekatox are the highest yield obtained.

I.4 Insecticide Trial.

Objective: of the Experiment is to study the relative efficiency of some newer chemicals in comparison to Endrin for the control of rice pests. This experiment was laid out in RBD with 9 treatments and 3 replications. The treatments include 5 in the forms of sprays, 2 as granules and one as surface oil with an untreated control. The sprayings were given at 15 days interval starting 10 DAT and granules applied thrice i.e., 10.30 and 60 DAT. Result of first crop trial are given in Table.44.

....7i/

Result:-

Gallmidge: The incidence of gall midge ranged from 5.7 to 12.7% The treatments are not significantly different. The lowest record of 5.7 is by Cytrolane G.

Stem Borer: The deadheart incidence varied from 1.3 to 4.0%. The lowest record is by Birlane S.O. followed by Birlane G. In the case of white ar head Birlane G has recorded the lowest followed by Birlane S.O. The treatments are not significant.

Grain yield: There is no significant difference between the treatments in grain yield. The maximum yield is recorded by Cytrolane G followed by Endrex EC.

The same experiment was repeated during second crop season also. The results are furnished in Table.44.A.

Gallmidge: As in first crop Cytrolane G treated plots have recorded lowest incidence of silvershoot, followed by Thiodan EC.

Stemborer: Deadhearts incidence ranged from 5.4 to 10.1 %. The lowest incidence is in Birlane EC followed by Endrex. In the case of white ear the attack ranged from 4.1% to 16%. The lowest incidence is in Birlane EC followed by Endrex EC.

Grain yield: The treatments are significant. The highest yield is recorded by Birlane EC at 0.5 kg ai/ha followed by Nidrin EC and Endrex EC.

15. Insecticide Trial-II.

The objective of the experiment was to find out the time and interval at which Thimet G are to be applied for the successful control of gall fly attack. This experiment was laid out with the specific intention of findings out the times at which Thimet granules are to be applied economically for controlling the attack of gall fly during March. The dose adopted is 1.5 kg ai/ha. The experiment was laid out in RBD with 9 treatments and 3 replications. The details of treatments and results are furnished in Table.45.

.....72/

Table.45.

Tr. No.	Insecticide	Dose	Applied at days after planting				Silver shoot
1	Thimet--G	1.5 kg ai/ha	5	20	35	50	3.9
2.	,,	,,	5	20	35	—	8.7
3.	,,	,,	5	20	—	—	7.1
4.	,,	,,	5	—	35	50	8.3
5.	,,	,,	5	—	35	—	7.7
6.	,,	,,	—	20	35	50	4.5
7.	,,	,,	22	36	85	—	7.7
8.	,,	,,	22	20	—	50	4.4
9.	Control	..	—	20	—	—	12.4

Sankar

Incidence of silvershoot data reval that lowest incidence is recorded in Treatment I followed by Treatment 8 and treatment No.6.

The entire experiment was severely infested by leaf roller at 50 DAT and hence Ekatox was sprayed once to control leaf roller. As the chemical was not found effetive for the leave folder pest, the yield was very much vitiated.

I.6 Insecticide Trial-III:-

The Objective of the experiment was to find out the time and interval at which Sevidol G are to be applied for the successful control of Stem borer attack.

The major pest infesting the rice crop during 2nd crop is stem borer. Sevidol 4.4 G has been found efficient and cheap in controlling stem borer. This experiment was laid out with 9 treatments and 3 replications to find out the time and interval at which Sevidol granules at 1.5 kg ai/ha are to be applied for economical control of stem borer. Details of treatments and results are furnished in Table.46.

.....73/

Table.46.

Tr. No.	Insecticide	Dose	Applied at days after planting	Dead heart	White ear	Yield
1.	Sevidol	4.4 & 1.5	10 25 40 55	2.5	6.0	3270
2.	,,		10 25 40 —	2.6	8.2	3640
3.	,,		10 25 — —	5.3	20.5	3530
4.	,,		10 — 40 55	4.2	11.3	3660
5.	,,		10 — 40 —	4.2	11.7	3600
6.	,,		— 25 40 55	3.6	17.9	3480
7.	,,		— 25 40 —	4.3	19.9	3300
8.	,,		— 25 — 55	9.8	15.1	3360
9.	,,		— — — —	9.1	21.4	3160

Stem Borer:-

Incidence of deadhearts is lowest in Tr.1 followed by Tr.2. So also white ear heads are lowest in Tr.t I followed by Treatment.2.

Grain yield:- The maximum grain yield is recorded by Tr.1 (3720 kg) followed by Trt.5 (3660 kg) and Tr.2 (3640)kg.

1.7. Seedling Dip Experiment:

The object of the experiment is to evaluate the effectiveness of seedling dip treatments and some late nursery treatments for controlling insect pests during the plant establishment state. This experiment was conducted both during first and second crop season. There were 15 treatments, including 13 chemicals treatments and two untreated con rols. The details of treatments with the data on silvershoot and deadheart incidence are summarised in Table.47.

.....72

Table-47.

Tr. No.	Chemical	Formulation	dose	Applied as Nursery	Seedling dip	Silver sheet.	% dead hearts.
1.	Cytrolane	5G	0.5 kg	—	—	172	154
2.	Cytrolane	5 G	0.02	—	x	1.3	100
3.	Diazinon	,,	,,	—	x	1.3	10.4
4.	Dimecron	100 EC	,,	—	x	0.7	11.2
5.	Dursban	10 G	1.0	xxx	x	1.6	16.6
6.	,,	40.8EC	0.02	-	x	0.2	0.6
7.	Endrin	2G	,,	-	x	1.8	4.2
8.	Folidol	46.7EC	,,	-	x	1.7	11.3
9.	Furadan	3G	0.5	x	-	3.5	18.8
10.	,,	75 WP	0.02	-	x	1.3	11.6
11.	Thimet	10 G		-	x	1.2	18.5
12.	,,	,,	0.02	-	-	1.0	7.6
13.	Thiodan	35EC	0.02	-	x	1.9	5.4
14.	Control					1.0	12.7
15.	Control					1.5	14.6

Nursery treatments are applied 4-5 days prior to pulling out seedlings. Seedling dip is done in the concerned insecticide solution for 14 hours. Seedlings dipped in Thiodan and Folidol were affected by the chemical giving a scorched appearance. High percentage of seedling mortality was also noticed during establishment stage. Dursban and Diazinon treated seedlings established well and the attack by whorl maggot was practically nil in the treatments. In addition to these, seedlings dipped in Furadan and Cytrolane were also excellent in their performance. In general seedlings dip was better than late nursery treatments. Treatments 3,10,7,2 and 6 are found better in their order of merit towards tolerance to the attack of various pests.

I.8 Chemical control in Nursery (AICRIP)

The objective of the experiment is to evaluate the effectiveness of selected insecticides for controlling specific pests in nurseries.

.....75/

The treatments consist of seed soaking and nursery treatment. For seed soaking 0.02% solution of Cytrolane G, Dursban EC, Thimet G and Furadan WP were used. Seeds were soaking in insecticide solution for 12 hours drained and after germination sown in nursery. In others chemicals were applied in the nursery. There were 15 treatments of which 4 were seed soak, 9 nursery application and 2 controls (Table.48).

Table.49.

Tr. No.	Chemical	Formulation	Rate	Applied as seed soak	Nursery treated
1.	Cytrolane	5 G	0.02	x	-
2.	,,	,,	1.0 kg	-	-
3.	Diazinon	,,	1.25	—	—
4.	Dimecron	100EC	0.5 ,,	—	—
5.	Dursban	4%xkg40.8kg	0.03	—	x
6.	,,	,,	0.5	-	x
7.	Ekalux	5 G	1.5	-	x
8.	Folidol	46.7 EC	0.5	-	x
9.	Folithion	100EC	,,	-	x
10.	Thimet	10 G	0.02 ,,	x	-
11.	Thimet	,,	1.25	-	x
12.	Furadan	75 WP	0.02	-	x
13.	,,	36	0.02	-	x
14.	Control				
15.	Control				

In the nursery incidence of pests was less in treatment 1, 5,6,10,11 and 12. Early attack of Thrips, Hispa, Lepthispa and Care worm ~~mixing~~ was noticed in all the treatments during plant establishment stage. During firstcrop. During second crop Tr.4,7,9,10 and 13 were better than other at 30 DAT.

.....76/

VII. VARIETAL TRIALS

11. Varietal Protection Trial (AICRIP)

The objective of the experiment is to estimate the magnitude of loss in yield resulting from pest infestation and to ascertain the reaction of variety to the protection afforeded by the insecticides.

The variety included for the trial during first crop was Jaya, Vijaya, IET 1991, IET.1093, Ratna. IR-20 and Aswathi as local. The experiment was laid out using split plot design with three replications. The main plot treatments were protection and no protection and sub plot treatments variety. In protection a nursery application of Diazinon at 1.25 kg ai/ha was followed in the field by applications of Cytrolane granules at 1.0 kg ai/ha at 10, 25, 45 and 65 DAT. The results are summarised in Table.50,

Table.50.

Variety.	Protected percentage silver shoot	dead heart	white ear	Yield in kg/ha	Unprotected percentage silver shoot	Dead heart	White ear.	Yield in kg/ha	Difference in yield.
JAYA	0.2	0.6	2.0	6004	8.2	1.8	2.8	4000	2004
VIJAYA	0	0.2	1.5	4490	7.4	4.2	6-0	3118	1372
IET1991	0.2	0.3	1.5	4386	7.1	4.4	6.4	3066	1320
IET1039	0.1	0.1	1.7	4930	4.3	3.6	4.5	3506	1424
~~RATNA~~	~~0.1~~	~~0.2~~	~~3947~~	~~0.0~~	~~2.6~~	~~8.5~~	~~3222~~		
RATNA	0.1	0.2	2.7	3947	4.8	2.6	8.5	3222	725
IR.20	0	0.7	0	4347	9.8	1.4	0	2937	1410
W12758	0.1	0.7	2.9	3700	0.5	3.0	4.6	2976	724
ASWATHY	1.0	0.6	2.1	5280	8.3	3.2	3.9	3571	1719

.....77/

In the unprotected plot in addition to silver shoot, deadhearts and white ear heads there was heavy attack of leaf roller and hence the reduction in yield can also be attributed to the leaf roller attack. In the case of protected plots the leaf roller attack was negligible or pra tically nil. The data reveal that the yield potency of Jaya and Aswathi are high if proper plant pro ection measures are adopted at the proper time. In the case of W12758 and Ratna the yield differences are low which explains that these variety offer some amount of field resistance to pests and ~~xxxxxxx~~ fairly good crop can be raised even without adopting high plant protection measure.

During second crop the varieties included in the maximum protection trial were 1. IET.1991, 2. IET 1039, 3. RP-9-4 4. CR.93-6, 5. IET. 2507, 6. IET.2508, 7. IR.20 and Aswathi. The design layout etc. were as per first crop. Details of varieties and results are furnished in Table.50.A.

Table.50-A

Variety	Protected % SS	% DH	% WE	Grain yield in kg/ha	Unprotected % SS	% DH	% WE	Grain yield in kg /ha	Yield difference in kg / ha
IET.1991	.2	1.4	.9	4494	2.5	12.0	4.1	2455	2039
IET.1039	.2	1.0	.3	5012	3.5	8.1	2.6	2994	2017
RP.9-4	.3	.7	.8	5069	.2	3.5	3.6	3418	1651
CR93-6	.0	2.5	.2	3972	2.6	12.7	8.3	1228	2744
IET.2507	1.6	0	.7	4765	2.4	9.5	2.4	3492	1273
IET.2508	.1	.3	.2	4497	1.9	4.4	3.5	2328	2169
IR.20	0	1.4	.2	5273	.8	15.3	.5	2804	2469
ASWATHI	0	1.7	.0	5838	1.1	12.8	1.9	3968	1870

On the protected side seedlings were dipped for 14.hours in Carbofuran 0.02% solution and then planted. Cytrhane granules at 1.0kg ai/ha were applied at 20,40,60 DAT. The data reveal remarkable difference in yield between protected plots and unprotected plots. Aswathy ranks first in yield in both protected and unprotected plots. All the 8 varieties passes high potential for high yield but will be mainifested only if adequate plant protection measures are adopted.

.....78/

II.2 Gallmidge resistant variety trial (GMT) (ACRIP)

The object of the experiment is to study the comparative yield performance and relative resistance to gall midge of certain gall midge resistants selections. The trial consisted of 30 varieties in split plot design and 2 replications. The main plot treatments are 2 in number 1.Protected against pests and 2. Unprotected. The sub plot treatments are 30 varieties. Plot size consists of 6 rows each 5 cms of long. For protection the followang schedule was adopted.

1. Nurserieis protected with 1.2 kg ai/ha of Thimet on 15th day after sowing.
2. Thimet at 1.25 kg ai/ha applied on 10 DAT
3. Diazinon at 1.5 ,, ,, 30 DAT
4. BHC G at 1.5 ,, ,, 50 DAT and supplimented with Parathion 0.4 kg ai/ha to control leaf foller.

The incidence of Silvershoot was very less in all the treatments. In the unprotected side the number of silvershoot varied from 0.7 per squire meter and in the protected side from 0-3. The following entry numbers are promising.

Entry numbers: 1502; 1503; 1506; 1508; 1511; 1512 1516; 1517; 1518; 1519; 1520; 1522; and 1528.

Entry Nos.1502 and 1528 are found tolerant to leaf roller incidence but it needs further investigations.

.....79/

Table.51.

Entry No.	IET No.	Designation	Cross	Entry No.	IET No.	Designation	Cross
1501	2884	RP-W-6-12	IR8 x Sia-lon-29	1516	2899	W13227	IR 8 x W1263
2	2885	,, 6-13	,,	7	2900	W12249	,,
3	2886	,, 6-15	,,	8	2901	W13362	IR8xSian-29
4	2887	RP-7-2	IR8xW1263	9	2902	W13400	,,
5	2888	,, 7-4	,,	1520	2903	W13418	,,
6	2889	,, 8-8	IR8xW1257	1	2904	CR.93-6	CR55-14 x IR8
7	2890	,, 8-9	,,	2	2905	W12708	IR8 x W 1263
8	2891	,, 8-11	,,	3	2906	CR57-29	IR8 x Ptb-21
9.	2892	,, 9-1	IR8 x W1251	4	2907	CR54-49	,,
1510	2893	.. 9-2	,,	5	2910	CR129-118-	CR56-17 xIR8
1	2894	,, 9-3	,,	6	2911	RPW-6-17	IR8 x Sian-20
2	2895	,, 9-4	,,	7	2946	W13801	IR8 x W1263
3.	2896	,, 9-6	,,	8	2959	W13230	,,
4.	2897	,, 9-7	,,	9	W1263		
5.	2898	RP.10-2	IR8 x Ptb-28	1530	Jaya		

II.3. Gallmidge Screening Trial(AICRIP)

The object of the experiment is to study the relative resistance of selected cultures to gallmidge attach. On the 136 cultures sown 24 failed to germinate. So 112 cultures were planted in 2 rows of 21 hills each with W12608 , W1263, Ptb.18, and Ptb.21 as resistant checks and Jaya as susceptible checks. The incidence of gall midge was very low. 63 cultures were found to be free of silversheet both at 30 DAT and 50 DAT. These cultures are progenis from cross of 1.Jaya x W1263, 2. IR8 x W.1263, 3.IR8 x Siam 29, 3. IR8 x Ptb-21. 4.IR8x PTB .18 x (Eswarakore x IR8) and 5. IR8/2 x Ptb-7.

II.4 Screening Trial with Assam Rice Collections.(AICRIP)

..... The object of the experiment is to screen Assam Rice Collection cultures for low pest incidence and classfy other selected cultures. The experiment was planted with 332 ARC cultures in 2 replications. Plot size was 14 rows of 21 hills each. The cultures were evaluteed for incidence of whrol maggot, leaf roller, gall fly and stem borer, on 30 DAT and 50 DAT. 84 cultures showing good performance and resistance to pest complex were selected for further trials..

II.5.Stem borer resistant variety Trial:

The object of the experiment is to study the relative resistance to stemborer of certain stem borer resistant selections and their comparative yield performance under protected conditions. (Table.62) This experiment was laid out in split plot design with two replications. The main plot treatments consist of protected plots and unprotectd plots. The sub plot treatments include 50 varieties. In protection cytrolane G at 1.0 kg ai/ha were applied at 10,35 and 60 DAT besides parathion spray at 0.4 kg ai/ha against leaf roller.

The response of different varieties to protection was quite descernible. In the unprotected side almost all the varieties were highly susceptible to stem borer, especially the short duration varieties. The entry numbers which were almost free from the incidence of stem borer are listed below. No.1601; 1602;1603;1605;1608;1612;1616;1639;1640;1641;1643; 1645;1646;1648.

II.6. General Screening for Insect resistance:

The object of the experiment is co evaluate the resistance offered by the cultures against stem borer, gallmidge and and leaf roller attack. 434 entries were planted with 2 rows and 12 hills in each row. Check varieties Jaya(Susceptible) and Ptb.2, Ptb.18, W12708, W1263 (resistant) were planted. Jaya and one resistant check were planted after every five cultures. Staggered planting at 15 days interval of silvershoot and leaf roller was less. But the attack of stem borer was severe especially at the dead heart causing stage. In the first planting excepting 76 cultures all the other manifested severe infestation of white ear. The second planting suffered drought at the boot leaf stage and hence further observations were cancelled.

.....81/

Table - 52.

Entry No.	IET No.	Designation	Cross	Entry No.	IET No.	Designation	Cross
1601	2780	CR43-127	TKM 6 x T(N)1	1626	2845	RP6-1899-25-4	TKM6 x IR8
2	2781	CR44-88-3-1	TKM 6 x IR8	7	2846	,,242-1-1-1	,,
3	2782	CR44-44-2-2-	,,	8	3087	,,516-31-8-1-1-1	,,
4	2784	CR44-93-1-1	,,	9	3088	,,1899-10-5-6-1-1	,,
5	2787	CR44-126	,,	1630	3089	,,590-22-5-5-51-1	,,
6	2788	CR57-MR-1511	IR8 x Ptb21	1	3090	,,242-2-3-1-1	,,
7	2789	,, 1521	,,	2	3091	,,516-32-7-5-1-1	,,
8	2790	,, 1523	,,	3	3092	,,516-29-1-5-1-1	,,
9	2791	,, 1635	,,	4	3093	,,516-29-1-4-1-1	,,
1610	2795	CR60-MR-1620	CR56-17 x IR8	5	3094	,,1899-6-1-1-1	,,
1	2796	CR93-MR-1545	CR55-13 x IR8	6	3095	CR44-1048	,,
2	2797	CR93-MR-1549	,,	7	3096	,, 1050	,,
3	2798	,, 1009	,,	8	3097	,,1051	,,
4	2800	CR94-MR-1550	CR55-36 x IR8	9	3098	CR139-1046	CR44-35 x TKM-6
5	2802	CR95-R-MR-1558	,,	1640	3099	,, 1047	,,
6	2808	RP6-508-2-3	TKM6 x IR8	1	3100	,, 1049	,,
7	2812	RP6-516-33-1-1	,,	2	3101	,, 1052	,,
8	2813	RP6-516-33-6-1	,,	3	3102	,, 1053	,,
9	2815	,, 34-1-8	,,	4	3103	,, 1057	,,
1620	2818	RP6590-10-1-11	,,	5	3104	,, 1058	,,
1	2828	,, 22-18	,,	6	3105	,, 1061	,,
2	2830	,, 22-5-4-1	,,	7		Jaya	
3	2833	RP6-242-2-3-3-1	,,	8	12708		
4	2839	RP6-1899-14-2-2-1	,,	9		135580	
5	2842	RP6-1899-18-1-4	,,	1650		RATNA	

III. EPIDEMIOLOGY OF INSECT PESTS:

The Objective of the experiment is to study the ecology of major insect pests of rice crop using information gathered from infestation encountered on periodic plantings and specimens collected from light trap. This trial was started from 1966-67. IR8 seedlings are planted in 100 squire meter plots starting from the normal season of 1st crop i.e. June 1st fortnight. This is continued at fortnightly intervals upto January 1st fortnight. Each planting is taken as a treatment. In each treatment observations are taken at four points on 16 plants each. Incidence of silvershoot, dead heart, white ear head and grain yield is also taken on these 16 plants. In addition to these observations incidence of other pests are also noted.

Previous Result:-

Incidence of gallmidge:

Previous results reveal that the maximum incidence of gall midge is seen during June 1st or 2nd fortnight plantiugs the incidence becoming low in subsequent months.

Stemborer:-

In the case of stem borer, two definite trials are seen. The incidence of dead hearts is seen maximum in July 1st planting and also in October to December planting. White ear incidence is maximum in October and December plantings.

The current years results show some variation in the incidence of kanor pests. Gallmidge has been found to infest July plantings as well as October plantings with the same intensity. The incidence of stem borer has been fairly serious in July, August, October, November and January plantings, incidence of dead hearts being high in November and January plantings and white ear in July, August and October plantings (Table — 53).

..... /

Table--53.

Tr. No.	Date of sown	date of planting	Incidence of % Silver shoot	Dead heart	White ear	Date of harvest	Yield in kg/ha
1.	8-5-'72	1-6-'72	7.93	0.83	3.78	19-9-'72	4000
2.	23-5-'72	16-6-'72	2.53	0.20	0.23	6-10-72	4600
3.	8-6-'72	1-7-&2	8.55	3.68	0.58	21-10-72	4400
4.	22-6-'72	16-7-72	2.65	2.10	9.43	3-11-72	3750
5.	8-7-'72	1-8-&72	1.10	9.73	1.43	14-11-72	3500
6.	23-7-'72	16-8-'72	2.05	10.78	7.88	23-11-72	5000
7.	8-8-'72	1-9-'72	1.48	2.28	1.55	12-12-72	4300
8.	23-3-'72	16-9-72	0.67	1.90	5.23	28-12-72	3500
9.	8-9-'72	1-10-72	10-95	8.20	7.85	11-1-'73	3000
10.	23-9-'72	16-10-72	2.43	3.80	1.68	8-2-'73	2400
11.	8-10-72	1-11-72	0.93	5.63	1.80	8-2-'73	2300
12.	23-10-72	16-11-72	1.70	17.50	1.65	27-2-'73	2800
13.	8-11-72	1-12-72	0.83	10.25	4.10	14-3-'73	3800
14.	23-11-72	16-12-72	0	10.25	5.20	29.3.'73	4500
15.	8-12-72	1-1-'73	0	15.30	0	21.4.'73	4700

PATHOLOGY DIVISION.

The items of work included the following trials.

1. Fungicidal trial against Blast disease
2. Fungicidal trial against sheath blight
3. Studies on the effect of N and K on sheath blight
4. Fungicidal trial against blight disease
5. Breeding varieties resistant to blast
6. Screening for blast resistance.

1. Fungicidal trial against blast disease.

A field trial was conducted during the first crop season to evaluate the efficiency of different fungicides in controlling blast disease. The experiment was laid out in randomised block design with 7 treatments and 5 replications. The suceptible variety MN 54-42 was used for the experiment. The incidence of the disease was only average and hence correct assessment could not be made. The yield differences also were not statistically significant. The average grain yield obtained for the different treatments are given in Table-54.

Table-54.

Treatment	Average grain yield in kg/ha
1. Hinosan	3395
2. Dithane Z-78	3440
3. Dithane M-45	3793
4. Aureofungin	3493
5. Kasumin	3437
6. Kabelde	3340
7. Control	3173

2. Fungicidal trial against sheath blight.

Trials were conducted during the first and second crop seasons to select out some effective fungicide for the control of sheath blight disease. The layout lay out of the experiment was randomised block design with 7 treatments and 5 replications. The variety, Annapoorna was used. During the first crop season the difference in grain yield were not statistically significant. Plots sprayed with Fytolan showed the symptoms of phytotoxicity. During the second crop season there was no disease in any of the treatments and hence the data were not considered. The grain yield of the different treatments during the first crop season are given in Table-55.

.....

Table-55

Treatments	Grain yield kg/ha
1. Hinosan	4687
2. Dithane Z-78	4757
3. Dithane M-45	4409
4. Aureofungin	4569
5. Fytolan	4097
6. Neo azosin	4527
7. Control	3750

3. Studies on the effect of N and K on sheath blight.

The effect of five levels of Nitrogen was studied during the first crop season. The lay out of the experiment was randomised Block design with 5 treatments and 4 replications using Annapurna. It was found that the intensity of the disease increased and grain yield decreased with the dose of Nitrogen. The differences in grain yield were not statistically significant. The average grain yield of the different treatments are given in Table-56.

Table-56.

Treatments	Mean yield kg/ha
1. 50 kg N/ha	4252
2. 100 kg N/ha	4088
3. 150 kg N/ha	4020
4. 200 kg N/ha	3668
5. 250 kg N/ha	3580

During the second crop season the effect of 5 levels of Potash was studied to ascertain whether application of Potash induces any tolerance to sheath blight attack. The design of the experiment was randomised block design with 4 replications. The level of Nitrogen was kept high at the rate of 200 kg/ha. The disease incidence during the crop period was very mild and hence conclusive results could not be obtained. There was no significant difference in the grain yield due to different levels of Potash application. The average grain yield of the different treatments are given in Table 56.A.

.....

Table 56A.

Treatments	Mean grain yield kg/ha
1. 0 Kg k_2O/ha	2100
2. 40 ,,	1652
3. 60 ,,	1980
4. 120 ,,	1928
5. 160 ,,	2020

4. Fungicidal trial against Blight disease:-

A trial was conducted during the second crop season to compare the efficacy of different fungicides in controlling blight disease (Bipolaris oryzae) The experiment was laid out in randomised block design with seven treatments X five replications. The variety Benibog was used for the experiment. Sprayings were given in fortnightly intervals. The treatment differences were not ~~sa#as#~~ statistically significant. The mean yield of the different treatments are given in Table-57.

Table- 57.

Treatments	Mean grain yield in kg/ha
1. Hinosan	4450
2. Dithane Z-78	5000
3. Dithane M-45	5900
4. Aureofungin	5300
5. Fytolan	5300
6. Miltox	5450
7. Control	5650

5. Breeding varieties resistant to Blast.

To isolate blast resistant lines, F4 progenies of the following cross combinations were screened and a total number of 230 single plants were selected for further screening.

Crosses	No.of lines
1. IR.8 x Te tep	139
2. IR.8 x Tadukan	72
3. IR.8 x Zenith	7
4. CR 36 # 148 x Te tep	9

.....

6. Screening for blast resistance.

One hundred and twenty five varieties were ~~sieeet~~ selected from different trials like UVT, PVT & IET and were tested for their resistance to blast disease. The screening was made after pre-disposing the plants to disease by giving high dose of Nitrogen (200 kg N/ha) and providing high relative humidity. Out of these the following varieties were found to be in the resistant group.

Sl.No.	Designation	Cross
1	RP 5-2	VEB 24 x T(N)1
2	RP 5-3	,,
3	RP 3-2	T 90 x T (N) 1
4	RPCR 6B-3	IR8-246 x GS. 418
5	RP 84-482	IR8/2 x Sigadis
6	CR 62-150	MNP 36 x CR. 25
7	RP-65-2	GEB 24 x T(N) 1/2
8	BK 190	R 14 x IR-8
9	Pusa 7-22-10-2-1	IR8 x RS.1
10	C 24846	GEB 24 x Sigadis x T(N)1
11	CR 115-102	C 19524 x ER 24
12	RP 79-9	IR 8 x N22
13	CR 3416 .	TKM 6 x T(N) 1
14	1285	PTB. 10 x IR.8
15	17-160-1-9	Kochuvithu x T(N) 1
16	RP 319-3-1-8	T.141 x IR 661-1-175-3
17	CR 115-168	C 19524 x IR.24
18	CR 126-42-3	Dunganshali x IR 8
19	FH. 256	(IR 8 x Sigadis) NS 1200
20	NRL 72-78	(CR SLO 17) x NP 130
21	NRL 88-97	,,

PATHOLOGY (AICRIP)

1. Uniform Blast Nursery:-

The object of the experiment was to assess varieties, prerelease varieties and materials of special interest for blast reaction under nursery condition, to evaluate the degree of resistance of donors and to determine the rate of disease spread in the different varieties. During the year a new

.....

(Slender Grain Variety Trial). Varieties with a few of the best yielding blast resistant varieties selected from previous BRVT (Blast Resistant Variety Trial) and UBN (Uniform Blast Nursery) and to identify high yielding Blast resistant varieties for endemic areas. 100 entries were compared with Jaya and disease susceptible Pusa 2-21 and Retna as checks. Out of these 29 entries were found to be resistant to neck blast. Most of these had 18, sigadis or GEB 24 as one of the parents. As the general Blast incidence level was low a correct assessment could not be made.

PULSES SCHEME

1. Foliar application of Phosphorus on cowpea and blackgram.

Studies on the effect of foliar application of phosphorus in comparisan with soil application were continued during the year on cowpea and blackgram. The levels of P_2O_5 tried were 0.30, 60 and 90 kg/ha. In blackgram the highest yieldwas obtained for 90 Kg P_2O_5 (~~half as soil and half as foliar~~) applied through soil followed by 60 kg P_2O_5 given half as soil and half as foliar. In the case of Blackgram a dose of 90 kg P_2O_5 (half as soil and half as foliar) recorded the maximum yield followed by 60 Kg P_2O_5 (completely soil). But the treatment effects were not statistically significant in both the experiments.

2. N.P.K. Trials on Cowpea and blackgram.

Experiments to study the effect of N P and K on Cowpea and blackgram were continued during this year. In these trials Rhizobium cultures were substituted for nitrogen. In the case of cowpea maximum yield was recorded by 45 kg N + 90 kg P_2O_5 followed by 45 Kg N + 60 Kg P_2O_5/ha. In the case of black gram highest yield was recorded in treatment receiving 30 Kg N + 90 Kg P_2O_5 followed by 15 kg N + 90 Kg P_2O_5/ha. However the treatment effects were not statistically significant in both the experiments.

3. Maintenance of types:

The total number of types maintained in different Pulse crops are listed below.

Cowpea	88	Blackgram	50
Greengram	50	Redgram	102
Lab Lab	6	Soyabean	28

.....

layout was adopted in which there was a control core of susceptible variety which was inoculated artifically with blast. Test entries were planted alternating with susceptible variety perpendicular to the central core. Three readings at different distances from the central core were taken for disease incidence and spread. It was observed that the intensity of incidence was more near the source of infection which ~~tendede~~ tended to lessen as the distance from the source increases. 528 entries were tested during the first crop season and 534 entries during the second crop season. Out of these 327 entries during the first crop season x 109 entries during second crop season were resistant or tolerant.

2. Evaluation of varieties for suceptibility resistance to sheath blight.

The object of the experiment was to assess varieties, special interest materials and potential donors to sheath blight disease with special emphasis upon field reaction including disease spread. 674 entries were tested out ~~se~~ of which 441 entries were in different suseeptible groups and the remaining ones in the resistant or tolderant groups.

3. Helminthosporium screening trial:-

The object of the experiment was to test varieties IET (Initial Evaluation Trial) material and special interest material for their resistance to Helminthosporiose disease. 739 entries were tested for their reaction ~~fe~~to the disease. Out of these 81 entries were under different grades of susceptibility and the remaining 658 entries were under the resistant or tolerant groups.

4. Assessment of leaf spot panicle browning of screen material.

The object of the experiment was to assess the degree of resistance or susceptibility of screen material to the leaf spot and panicle browning complex. The reaction of 637 entries were studied in detail.

5. Blast resistant variety trial:-

The object of the experiment was to compare yield and disease levels on UVT (Uniform Variety Trial) and SGVT

.....

4. Breeding work:

Selections from the progenies of the following crosses of cowpea were made during the year.

Parentage	Generation	No.selected.
Calicut. 51 x Pusa Dofasli	F4	10
Calicut-51 x New Era	F4	5
New era x Calicut-51	F4	7
Calicut-51 x Kolinji	F4	2
Manjeri local x Pusa Dofasli	F2	5
Manjeri local x New Era	F2	1

SEED TESTING LABORATORY

The Seed testing laboratory was established in 1966. The main objective of the Laboratory is to obtain accurate and reproducible results regarding purity, composition, moisture content, rate of occurance of weed seeds and the percentage of seeds that can be expected to produce normal seedlings under favourable conditions. In some instances additional information regarding presence of fungi on seeds and varietal purity also are tested.

During the year, 1600 seed samples received from Seed Farms and Registered Seed Growers were tested. Out of these 120 samples were unfit for seed purpose. Staff of the Laboratory had also assisted in the Seed certification programme of the Department of Agriculture. Reference test of seed samples received from Nagpur Seed Testing Laboratory were analysed and the results compared. The laboratory has also assisted in the standardisation programme of the Central Seed Testing Laboratory in the germination of gourds.

TRIAL CULTIVATION OF WHEAT, OATS AND BARLEY ON THE HIGH RANGES OF KERALA.

In order to explore the possibilities of growing Wheat, Oats and Barley in the high altitude regions of Kerala trial cultivation was conducted at Ambalavayal, Nelliampathy, Vadanappady and Madupetty.

I. WHEAT.

The trials conducted at Attappady was damaged by heavy rains immediately after the sowing and at Nelliampathy by

by wild animals.

At the Indo-Swiss Project Farm, Madupetty (6000' above MSL) the varieties Kalyansona, Sharbathi sonora, Chotilerma and Kira were tried. The highest grain yield was recorded by Chotilerma (4050 kg/ha) followed by Kira (4040 kg/ha). The performance of the other two varieties ~~are~~ were poor.

At the Horticultural Research Station, Ambalavayal (3000' above MSL) the varieties tried were Kalyan sona, Sharbathi sonora; Pusa lerma and HD. 4502. The performance of all the varieties were poor however the maximum yield was recorded by Pusa lerma (1650 kg) has followed by Sherbathi Sonora (1280 kg/ha).

At Vadanappady (1750' MSL) the varieties tried were Kalyan Sona, Chetilerma & Kira. Here also the performance of the varieties particularly Kalyan sona were poor. The highest yield of 1350 kg/ha was recorded by Kira.

2. OATS:

Three oats varieties viz. Kent, NP. 101, Rapida were tried at Vadanappady and Madupetty. Though the germination and growth were satisfactory there was no grain setting at Vadanappady. At Madupetty the performance was quite satisfactory. The grain yield recorded by Kent, NP. 101 and Rapida were 4160, 3652 and 3332 kg/ha respectively.

3. BARLEY.

Results of the trial conducted with Barley varieties at Vadanappady were not encouraging.

ALL INDIA COORDINATED AGRONOMIC EXPERIMENTS SCHEME.

Simple Fertilizer Trials in cultivators' fields and fertiliser trials at the Model Agronomic Centre, Karamana have been in existance in Kerala from 1953 and 1955 respectively under the Fertilizer use and Soil Fertility Project and are being continued under the All India Coordinated Agronomic Experiments Scheme (AICAES)

The main objective of the experiments conducted at the Model Agronomic Centre are to study:

.....

i. the response of important cereals to nitrogen phosphorus and potassium singly and in combinations;

ii. the best method and time of fertiliser application;

iii. the relative efficiency of complex fertilisers;

iv. the residual and lon-term effects of fertilisers and manures;

v. the most suitable intensive crop rotation for maximum production.

The main objectives of simple fertilizer trials in cultivators fields are to study:-

i. the response of rice to nitrogen, phosphorus and potassium with a view to formulating fertiliser recommendations for different agro climatic regions of the state.

ii. the relationship between crop responses and soil test values.

The SFT districts were divided into agriculturaly homogenous zones on the basis of soil type, cropping pattern etc. and the trials have conducted in the fields of cultivators selected at random. The IADP districts, Palghat and Alleppey were selected for conducting simple fertilizer trials and after completing 3 years tials, these were shifted to Trichur and Quilon districts from the second crop season 1971.

The results of the experiments conducted in Model Agronomic Centre, Karamana and S.F.Trials during 1971-72 have were presented and discussed at the Sixth Annual Workshop of AICAES held at the Tamil Nadu Agricultural University, Coimbatore during January 24--29, 1973. The results of the experiments during 1972-73 are being analysed. A summary of the results of 1971-72 are furnished below.

I. Model Agronomic Experiments:

1. Among the 6 crop rotation sequences tried to asscertain the production potential and economics of high intensity crop rotation with high yielding varieties, the sequential cultivation of paddy--paddy- bhindi yielded the maximum output and income. The cultivation of a non-cereal

crop during summer was found to be advantageous from the point of view of total production and income.

2. In the experiment to study the direct, residual and commulative effect of P, K and farmyard manure started on a fresh site in first crop 1971-72 season, direct response to P was negative during first crop season. But this trend was not revealed in the II crop season.

3. In the experiments conducted to determine the response of high yielding varieties of rice to P and K in relation to their time of application, significant and positive response to potasium applied at 60 and 120 kg/ha was detected during the first crop season. Substantial response to potassium was also observed during the second crop season. There was no response to P and the two methods of application of P and K did not show any differences.

4. Responses to nitrogen applied at 60 and 120 kg/ha were highly significant and positive during first and second crop seasons. These were influenced by the application of potassium, the maximum grain yield being obtained for a combined application of 120 kg N 60 kg K_2O/ha. The N-k interaction was ~~co-potassium~~ however not manifested in the second crop season. Response to potassium at 60 kg/ha was detected only during the second crop season.

5. The physical damage sustained by rice as a result of foliar application of urea was progressively higher when the biuret contents in urea was 0.3% and above but a significant depression in grain yield was not registered on this account.

6. A study of the relative merits of different slow-release nitrogenous fertilisers has revealed that AM fertiliser to supply 100 kg N/ha was found to be better than sulphur coated urea and Karanj cake.

II. Simple fertiliser trials:-

Simple fertiliser trials in cultivators fields were conducted in Alleppey and Palghat Districts during the first crop season and in Quilon and Trichur Districts during the second crop season, to study the response of high yielding varieties of rice to N.P and K and Zinc.

....

1. Response to Nitrogen:-

Positive and significant responses to nitrogen upto 120 kg / ha over 60 kgs of potasium and phosphoreus / ha were obtained in Koippuram, Mallappalli, Kulanada and Pandalam blocks of Alleppey district and Sreekrishnapuram and Mannarghat blocks in Palghat district. In Muthukulam and Bharanickavu blocks of Alleppey district and Trithala, Pattambi, Ottappalam and Palghat bocks of P alghat district, there was good response to nitrogen even at the highest level of 160 kg/ha. In Quilon district, response to nitrogen was recorded in all the zones upto 120 kg/ha, and there was additional res ponse to 160 kg per ha of Nitrogen in Karunagappally and Ochira blocks. The response to 40 kg N/ha was not significant in Trichur District except in Pazhayannur and Vadakkancherry Blocks. The difference in response to N due to successive doses were not significant beyond 80 kg level in all zones, of Trichur District

2. Response to zinc.

Response to zinc at 25 kg/ha over a level of N120, P60, K60 was significant in the Pandalam and Kulanada blocks of Alleppey district, Ottappalam and Palghat blocks of Palghat district, Elanthur and Kannix blocks of Quilon district and Chowghat and Chowannur block of Trichur District. In all these blocks where responses to zinc was seen, responses were also observed to the highest level of N (160 kg/ha) applied in conjunction with higher doses of P and K at 90 per kg as compared to the lower doses of 60 kg/ha.

3. Response to phosphorus:

In Koippuram and Mallappali blocks of Alleppey district responses to successive doses of P at 60, 120 and 180 kg was significant upto the highest level. In other zones these were significant only upto 120 kg/ha; irrespective of the level of available P. The extent of these responses was almost equal to that registered for N.

In Palghat district significant response upto 120 kg per ha was recorded only in Ottappalam and Palghat blocks.

..... /

In Quilon district the response to P was positive and significant upto the highest level (180 kg/ha) in all the z ones, the response being highest in Sasthamcottai and Vettikkavala blocks.

In Trichur district significant positive response was obtained to P at 60, 120 and 180 kg/ha in Pazhayannur and Wadakkancherry blocks. In Irinjalakkuda and Chalakkudy blocks, the response was negative.

4. Response to Potash.

The nature of response to potash was not uniform in Alleppey district. In Koippuram and Mallappally blocks the res ponses were linear and positive upto 90 kg/ha while in Kulanada and Pandalam blocks, the significant was attained only at the highest level of 90 kg/ha. On the other hand the maximum response of 491 kg/ha was obtained at 60 kg level in Muthukulam and Bharanikkavu blocks in Alleppey district and there was significant reduction at 90 kg level. The influence of different levels of K on the grain yield was negative in Trithala, Pattambi, Mannarghat and Sreekrishnapuram blocks of Palghat district, the maximum depression being registered at the intermediate level of 60 kg K 20/ha.

In Quilon district positive response to K was indicated only in Sasthamcottah and Vettikkavala blocks in Trichur District the response was significant only in Pazhayannur and Wadakkancherry blocks.

5. C.Type experiment:-

Positive response to N in the absence of P and K was significant in Mavelikkara block (Alleppey district) only in the ML fertility class. In Coyalmannam and Alathur blocks (Palghat district) this was significant both in LL and LM classes, the maximum being in the former. Irrespective of

.....

the fertility status of the soils there was positive response to N in Kottarakkara Block (Quilon District). There was no response to P in Mavelikkara block (Alleppey District) while this was significantly positive at 60 kg/ha level in LL, LM classes of Coyalmannam and Alathur blocks (Palghat District) In Kottarakka block (Quilon District) the response to P was linearly positive and significant in soils having low P while this trend was negative in soils with high P.

Positive response to K was observed in LL, ML fertility classes in Mavelikkara block (Alleppey district) at the highest level of 180 kg/ha while in the ML class there was response to successive doses of K. In Coyalmannam and Alathur blocks (Palghat District) response was not evident to K while in Mavelikkara block (Quilon District) and Ollukkara Block (Trichur District) the response to Potash was erratic.

Oo-oO