R. P. F. III

(116)

FINAL REPORT

1. Institute Code No: Goa XVII P1-78/18-ICI-M18/0150

2. I. C. A. R. Code No:

3. Name and Address of Research Institute/Centre:

ICAR Research Complex for Goa (CPCRI)
Ela, Old Goa.

4. Project Title: Development of integrated pest control in paddy

5. Name and Designation of Project Leader D.Sundararaju, Scientist S1(Entomology)

6. Name (s) and Designation(s) of Project Associates including Project Leader and work to be done:

Sl. No.	Name and Designation	Time spent	work done
1.	D.Sundararaju, Scientist S1(Ento)	3 months/year	As listed in the technical programme

7. Location of Research Project with complete address (Division/Section/Sub-Centre)

ICAR Complex Farms, Goa.

8. Date of start

June 1978

9. Date of termination

Dec 1983

10. (a) Objectives (Not more than 150 words)

Vide column No.2 of the Annexure

(b) Practical Utility including background information (Not more than 150 words)

Knowledge gathered in this project will be utilised to formulate effective integrated control prearamme against rice pests.

FINAL PROJECT REPORT

1. Project No: Goa XVII P1-78/18-ICI-H10/0;50.

Development of integrated pest control in paddy

1 a. Neme of the Project Leader, Associate and Location of the project.

D.Sundararaju, ICAR Research Complex, Farm, Margao.

2. Objective of the project:

a. To study the seasonal outbreak and extent of damage caused by various major pests in rice.

b. To evolve suitable integrated control measures by using various methods of control mainly cultural and chemical control especially for kharif rice.

3. Technical programme:

a. The level of incidence and extend of damage will be assessed by survey during cropping season at different locations.

b. The seasonal fluctuations in population of the pests will be studied through light traps and these will be correlated with weather parameters and safe period of planting with minimum pest infestation will be evolved as cultural method of control.

c. Effective chemicals will be screened by applying in different dosages and in different methods.

4. MATERIALS AND METHODS:

a. Survey on present status of insect pests.

With a view to understand the present status of insect pests, qualitative survey(Roving Survey) was undertaken from 1978-1981 in South Goa during different cropping periods viz., nursery, vegetative and reproductive phases.

b. Studies on seasonal abundance of rice pests:

(i) Studies on fluctuation of population in light trap catches:

During kharif seasons of 1979-81, light trap catches of important rice pests were recorded daily in a Chinsurah light trap fixed with 200 watts bulb from June to October of each season. The rainfall pattern of the kharif seasons was compared with light trap catches in order to understand the population trends and build up of different pests. For the sake of convenience, every month was divided into four weeks and weekly populations were tabulated.

(ii) Intensity of pest damage in different periods of transplanting:

With a view to find out safe period of transplanting with minimum pest infestation coupled with maximum yield, four fortnightly transplanting were undertaken in the months of June (early planting) and July(late planting) for three consecutive kharif seasons (1979 to 81) in a Radomised Block Design with five replications in a plot size of 40 sq.m. with Jaya variety. The data on pest incidence and yield were recorded.

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c) Studies on chemical control of insect pest:

(i) Seedling root dip technique.

Experiment 1.

During 1980 kharif season, the nursery with 'Jaya' variety was protected with carbofuran granules @ 1.25 kg a.i./ha, on 10th day after sowing (DS) and at the time planting, the seedling root dip treatments with chlorpyriphos were given in a split plot design. The main treatments consisted of different dipping timings with chlorpyriphos viz., 30 mt, 1, 2, 3 hr in 1% urea solution and 12 hr and sub treatments consisted of 0.02 and 0.04% concentration with a plot size of 10. sq. m. The data on incidence of whorl maggot and gallmidge were recorded.

Experiment II.

In kharif 1981, we used susceptible Jaya to test eight treatments:(a) Carbofuran alone (1.25 kg a.i./ha) (b) 500 kg Neem cake /ha+ carbofuran, (c) 1000 kg Neem cake/ha + carbofuran (d) 1500 kg Neem cake/ha + Carbofuran (e) 2000 kg Neem cake/ha +Carbofuran (f) Treatment (a) + Chlorpyriphos 0.02% seedling root dip in 1% urea solution for 3 hr at transplanting (g) Treatment (a) + Chlorpyriphos 0.02% seedling root dip for 12 hr at planting and (h) Control,. The neem cake and carbofuran granule were applied in the nursery at 20 DS and water was impounded untill seedlings were pulled out and planted at 27 DS.

The comparative efficacy of different treatments was rated by gallmidge damage and the grain yield.

Experiment III.

In 1982 kharif, eight treatments viz (a) Chlorpyriphos 0.02% seedling root dip (SRD) for 12 hr (b) seedling root treatment (SRT) in Chlorpyriphos 0.02% treated carbono-phosphate slurry (CPS) for one minute (d) SRT in Chlorpyriphos 0.02% treated CPS for 5 mt, (e) SRT in chlorpyriphos 0.02 treated CPS for 10 mt (f) SRT in chlorpyriphos 0.02% treated CPS for 20 mt, (g) SRT in Chlorpyriphos 0.02% treated CPS for 30 mt, and (h) unprotected control were evaluated.

For all the treatments, nursery unprotected seedlings of 'Jaya' variety (5. 3% silvershoot was recorded in the nursery) were planted in a replicated trial in 5 x 5 m plots at 20 x 13 cm spacing. The carbono phosphate required for the mainfield area (@ 300 kg/ha which is equal to 60 kg/ha) was mixed with wet clay in 3:1 ratio and thick slurry was prepared after adding required water. The chlorpyriphos 20 EC was mixed in the slurry at 0.02% concentration. The roots of seedlings were uniformly coated with chlorpyriphos treated slurry and planted. At the time of planting, the mainfield was kept in puddled muddy condition with very low water stagnation. The comparative efficacy in different treatments was assessed for gall midge damage and yield.

(ii) Trials on application of granular insecticides:

The first experiment was conducted in a split plot design with four replications in a sandy loam soil during 1979 kharif season using 'Jaya' variety. The main treatments comprised of five insecticides viz., carbofuran, mephosfolan, phorate isofenphos and quinalphos along with an untreated control. The sub treatments were of one application on 15 DT (days after transplanting) and two applications on 15 DT and 35 DT @ 1.0 kg a.i./ha.

The second experiment was also conducted in the same season with same design and main treatments; but the respective granular insecticides were first applied at nursery @ 1.25 kg a.i./ha, followed by application in the main field @ 1.0 kg a.i./ha. The sub treatments were of one application on 20 DT and two applications on 20 and 40 DT in the main field. The granules were broadcasted in the standing thin film of water and the water was impounded for three days. In both experiments, the net plot size of each sub treatment was 10 sq.m. and 25 day old seedlings were planted at 20 x 10 cm spacing. The thrips damage was scored, while the whorl maggot and leaf folder damage were expressed in percentage.

(iii) Trials on combination of seedling root dip and granular application.

Experiment I:

Studies on combining seedling root dip using chlorpyriphos with an economic dose of carbofuran granules were made to reduce the present carbofuran dose of 1.00 kg a.i./ha. An experiment was laid out in kharif 1980 in a split plot design with four replications using carbofuran 3% granule at different dosages viz., 0.5, 0.75 and 1.0 kg a.i./ha as maintreatments. The details of the sub treatments were given in Table 8. One month old seedlings of 'Jaya' were planted at 20 x 10 cm spacing, with a plot size of 10 sq.m. each in sandy loam soil. The granules were broadcasted in the standing thin film of water and water was impounded for three days. Observations on incidence of gall midge, leaf folder, whorl maggot and on grain yield were recorded. The calorimetric estimation of terminal residues of carbofuran was also done in grain and straw with help of M/s Rallis Agrochemical Research Station, Bangalore.

Experiment II:

The effectiveness of chlorpyriphos as seedling root dip and carbofuran as granular application were evaluated during kharif seasons of 1981 - 83 against rice gall midge and leaf folder.

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The nursery was protected with carbofuran 3% granule at 40 and 20 kg/ha on 10 DS during 1981 & 1983 seasons respectively. In 1982, the nursery was unprotected.

At the time of transplanting, two seedling root dip treatments with chlorpyriphos 0.02% (12 hr dipping and 3 hr dipping in 1% urea solution) were compared. During 1983 season, root treatment for 5 - 10 minutes in chlorpyriphos 0.02% treated carbono phosphate slurry was also included. for comparision.

All chlorpyriphos treated plots were applied with carbofuran 3% granules at 20 kg/ha on 20 DT. Water was impounded for 3 days after granular application. The trial was conducted in a randomised block design along with untreated control in four replications with 'Jaya' variety in a plot size of 10 x 5 m at 20 x 15 cm spacing in sandy loam soil. The gall midge damage was recorded on 45 and 60 DT and leaf folder damage was recorded on 75 DT and data on grain yield were also recorded.

5. RESULTS AND DISCUSSIONS:

(a) Survey on present status of insect pests:

The qualitative survey (Roving Survey) undertaken from 1978 to 1981 revealed that in kharif seasons gall midge (Orseolia oryzae (W.M.)), whorl maggot, (Hydrellia sp), case worm, (Nymphula depunctalis (Gm)), thrips, (Baliothrips biformis (Bagn)), hispa, (Dicladispa armigera (Oc)), and blue beetle (Leptispa pygmaea B), were found to be damaging in different intensity in nursery/direct sown crop and in early stage of transplanted crop. In tillering and flowering phase, leaf folder (Cnaphalocrocis medinalis (Gn)), grass hoppers, (Oxya velox F and Heiroglyphus sp), green leaf hoppers, (Nephotettix nigropictus (Stal) and N. virescens (Dist)), brown plant hopper (Nilaparvata lugens (Stal)), cut worms (Mythimna spp), and Gundhi bug (Leptocorisa acuta (Thnb.)) were also damaged to significant level. Whereas in Rabi season, only caseworm was found to be serious in all parts of this territory.

Among them, the major key pests were identified as gall midge, leaf folder and whorl maggot in kharif season and case worm in Rabi season. Besides rice, gall midge was found to breed on three species of grass viz., Paspalum spp, Cynodan dactylon and Eragrotis spp. during kharif season.

Table-1: LIGHT TRAP CATCHES OF LEAF FOLDER MOTHS AND RAINFALL AT GOA DURING 1979 to 1981.

Months/ weeks		No/Week 1979	1980	1981	Rainfall(mm) 1979	1980	1981
June	1	33	21	Nil	Nil	356.9(4)	344.4(2)
	2	Nil	26	Nil	6.4	157.6	296.5(2)
	3	Nil	23	Nil	557.7(7)	590.9(2)	426.4(3)
	4.	P.F.	15	35	278.3(2)	307.4(2)	498.4(4)
July	1	P.F.	29	8	148.0(1)	151.6(1)	113.2
	2	9	131	27	158.0	35.4	99.4
	3	17	43	100	71.4	313.5(2)	206.4(3)
	4	32	123	86	499.3(5)	228.7(1)	817.0(7)
Aug.	1	51	3235	145	304.6(2)	147.6	365.0(1)
	2	496	2190	147	120.8(1)	287.1(1)	92.6
	3	1550	131	68	26.2	250.2(2)	172.6(1)
	4	925	50	43	98.6(1)	147.2	54.2
Sept.	1	188	168	126	7.3	45.6	Nil
	2	263	52	58	3.0	35.4	55.6
	3	276	47	26	33.4	9.0	230.2(3)
	4	18	72	43	97.4	21.2	111.2
Oct.	1	32	58	14	Nil	1.0	17.6
	2	67	55	28	1.0	4.0	0.5
	3	16	62	75	Nil	Nil	Nil
	4	33	49	53	41.7	Nil	55.8
Total		3966	6580	982	2453.1(19)	3090.3(15)	3957.5(26)

P.F. Power failure. Figures in parentheses indicate number of rainy days with above 50 mm rainfall.

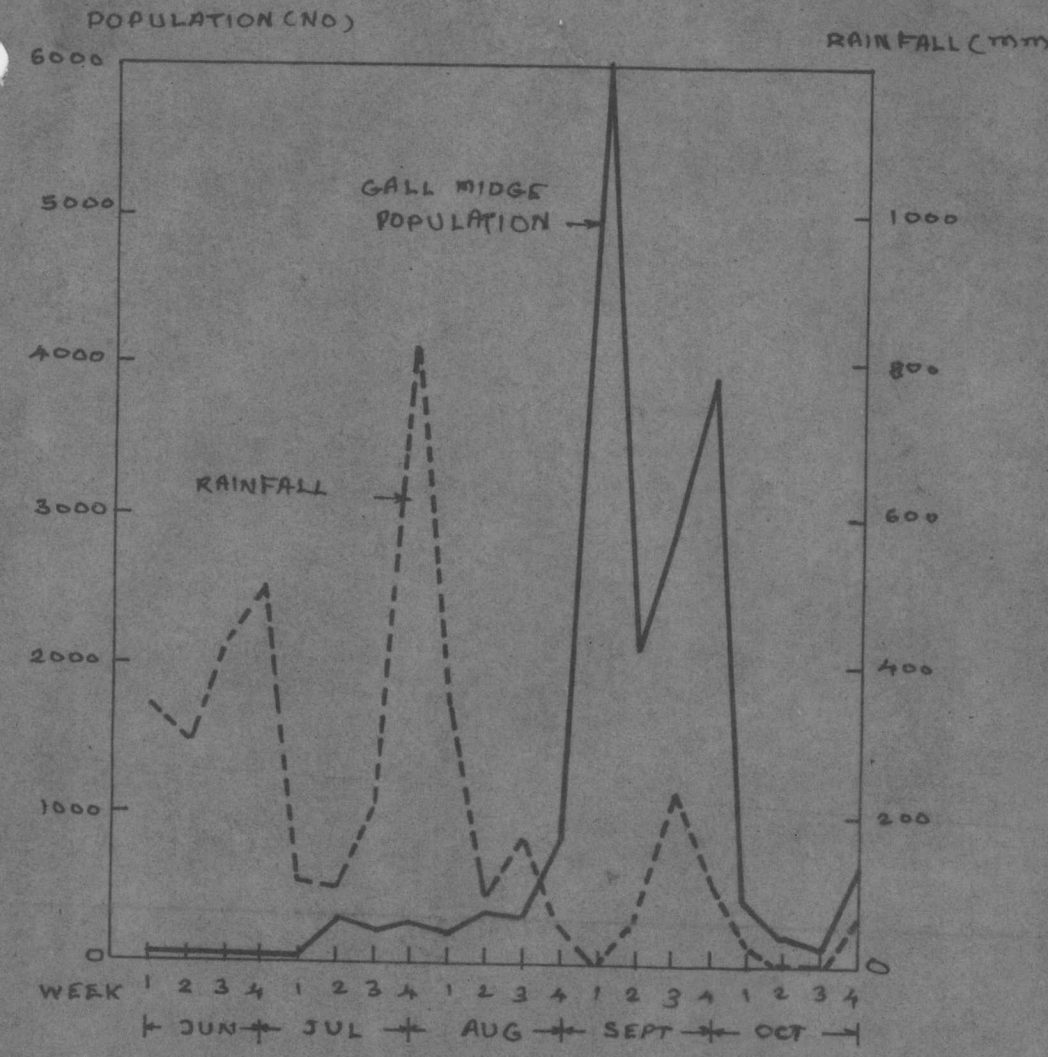

Fig-1 GALL MIDGE POPULATION & RAINFALL PATTERN AT GOA - INDIA · 1981.

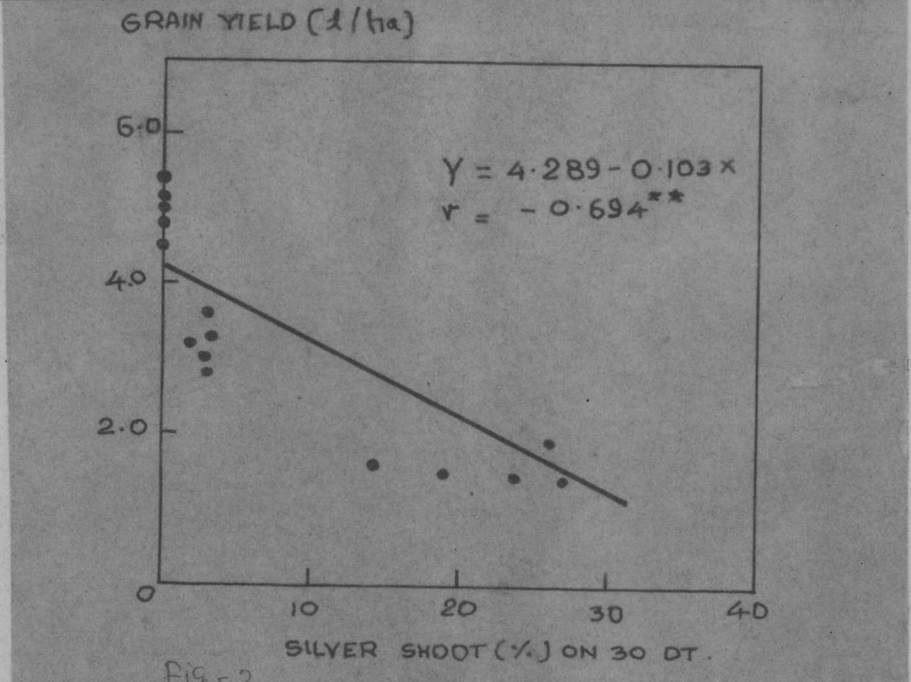

Fig-2.

RELATIONSHIP BETWEEN GALLMIDGE INFESTATION & YIELD AT GOA, INDIA, 1981.

After kharif rice, farmers of this locality are very prompt in ploughing or digging the land and burning of paddy stubbles especially in single cropped area. By this, farmers are unconciously eliminating various residual pest population which mostly thrives on paddy stubbles. As a result, the early direct sown(sown in May) or early transplanted rice (transplanted in June) always escape from major key pests except leaf folder whose damage potential depends on the intensity of rainfall during the months of June and July. If the intensity of rainfall was heavy and continuous in June and July, the leaf folder attack will be negligible even in late planted paddy as the build up of population was continuously interupted due to heavy rain whereas, if there is light rainfall or short break in monsoon for one week to 10 days in the month of June, the out break of this pest can be seen even in the early transplanted paddy(transplanted in June). The late planted rice(transplanted in July) was found to be always prone to gall midge(especially in interior areas of this territory), whorl maggot and to certain extent Gundhi bugs.

In the coastal and low lying areas sporadic occurrence of grass hoppers, cut worms,and brown plant hopper were noticed in certain years.

b. Studies on seasonal abundance of rice pests:

(i) Studies on fluctuation of population in light trap catches:

Eventhough pests like gall midge, leaf folder, whorl maggot, caseworm, green leaf hopper, brown plant hopper and gundhi bugs were noticed in the light trap catches, distinct trend with respect to leaf folder, and gall midge population w was only noticed(Table -1 and Fig. 1).

The peak emergence of moth was in August indicating the probable period of pest out break during July to September and maximum of 42.2 and 32.3% leaf damage was noticed in 1979 and 1980 seasons respectively(Table- 2) in unprotected plots.

However, the build up of population was to depend on pattern of rainfall in the beginning of monsoon. If the rainfall was heavy and continuous in the months of June and July, the catches in the light trap was continuously low (Table -1) and out break of the pest was very negligible (3.7% leaf damage during 1981 season).

Table 2: INFLUENCE OF PLANTING TIME ON RICE WHORL MAGGOT, GALL MIDGE AND LEAF FOLDER AND YIELD AT GOA.

Planting Period	% whorl maggot damage on 30 DT			% gall midge damage(%) on 30 DT		on 45 DT		Leaf folder damage (%) on 75 DT			Yield (t/ha)		
	1979	'80	'81	'80	'81	'80	'81	'79	'80	'81	'79	'80	'81
7th June	0.0a	0.0a	0.7a	0.0a	0.0a	0.0a	0.0a	0.4a	0.3a	0.4a	4.2a	6.9a	5.1a
22nd June	5.5b	4.2b	2.3b	0.0a	0.0a	0.0a	0.0a	32.8b	1.4b	0.5a	3.6b	6.2a	4.7b
7th July	25.8c	9.0c	2.3b	0.0a	2.8b	6.0b	29.7b	32.4b	22.9c	3.7b	2.8c	4.7b	3.2c
22nd July	30.1c	18.5d	3.8b	5.9b	23.0c	15.4c	32.4b	42.2c	32.3b	2.0b	2.6c	4.2b	1.6d

In a column, means with common letters are not significantly different at 5% level .

DT = days after transplanting.

The light trap catches of gall midge recorded in 1981 indicated that the peak emergence was noticed in the month of September, about two months after peak rainfall indicating the probable period of outbreak of the pest (Fig.1). This indicated that rice planted early(June) in monsoon has more possibility of escaping from gallmidge, infestation than late (July) planted rice.

(ii) Intensity of pest damage in different periods of transplanti

The results indicated that early planted crop recorded significantly lower damage of whorl maggot than late planted crop.(Table 2). Further, the early planted crop is completely free from gall midge damage upto 45DT.

The late planted crops recorded gall midge infestation from 30 DT onwards with significant yield reduction in yield (table -2) whereas the early planted crop recorded maximum yield upto 6.9t/ha in 1980. Gall midge infestation recorded on 30 DT of 1981 was correlated with grain yield and was found to be significantly negative (r=0.694) (Figure 2).

Therefore as cultural method of pest control, it was always suggested to practice either direct sowing in the last week of May or transplant in the month of June in order to achieve maximum yield and minimum pest infestation especially for Jaya and IR -8 varieties.

(c) Studies on chemical control of insect pest:

(i) Seedling root dip technique:

Experiment I

The results indicated that all chlorpyriphos treatments were completely free from gall midge damage upto 30 DT. However, seedling root dip for 12 and 3 hr at 0.02% concentration was optimum by recording least gall midge damage of 8.0 and 7.0% respectively whereas untreated control recorded maximum of 38.7% damage.(Table-3).

But with regard to control of whorl maggot, all treatment combinations were found to be equally effective by recording minimum leaf damage of 2.4 to 8.3% whereas untreated control recorded maximum damage of 17.3%.

Table 3: EFFECT OF SEEDLING ROOT DIP WITH CHLORPYRIPHOS ON INCIDENCE OF WHORL MAGGOT AND GALL MIDGE.

Kharif - 1980

Main treatment with Chlorpyriphos	% whorl maggot damage on 15 DT		% gall midge damage on 30 DT		45 DT	
	a	b	a	b	a	b
30 mt dip in 1% urea	2.7a	4.7ab	0	0	17.2bc	14.1b
1 hr -do- -do-	8.3b	5.8bc	0	0	25.1c	10.5a
2 hr -do- -do-	3.9ab	6.9c	0	0	13.1ab	11.3a
3 hr -do- -do-	5.2ab	3.2ab	0	0	7.0a	6.1a
12hr dip.	6.1ab	2.4a	0	0	8.0a	3.9a
Control	17.3c	13.4b	3.5	3.8	38.7d	30.1c

Sub treatment a= Chlorpyriphos at 0.02% concentration
b= -do- 0.04% -do-

In a column, means with common letters are not significantly different at 5% level.

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Therefore, it was concluded that for effective gallmidge and whorl maggot control nursery protection followed by seedling root dip with chlorpyriphos 0.02% for 12 hr or 3 hr in 1% urea can be followed.

Experiment II.

The comparative efficacy of different treatments was rated by gall midge and the grain yield (Table -4)

The carbofuran nursery treatment + chlorpyriphos seedling root dip was superior to nursery treatments with carbofuran alone or a combination of carbofuran and neem cake for controlling the gallmidge and encouraging higher yield. Irrespective of combination of nursery treatment, neither carbofuran alone nor in combination with Neem cake even upto 2000 kg/ha had affected gall midge. Nursery treatment with carbofuran @ 1.25 kg a.i./ha+chlorpyriphos 0.02% seedlings root dip for 12 hr before planting provided best and most economic control.

Experiment III.

The comparative efficacy in different treatments was assessed for gall midge damage and yield (Table -5).

Because of planting of gallmidge infested seedling, all treatments recorded gall midge incidence even on 15 DT and it further increased significantly only in untreated control upto 45 DT. But beyond 60 DT, no significant difference was noticed between different treatments. This is mainly due to planting of gallmidge infested seedlings which continuously induced tillering beyond one month after planting and hence initial protection in the nursery is obligatory. As an alternative to chlorpyriphos 0.02% seedling root dip treatments for 12 or 3 hr, Chlorpyriphos 0.02% treated carbonophosphate treatment may also be practiced as carbonophosphate is commonly used in rice and coconut soils at Goa during kharif season.

(ii) Trials on application of granular insecticides.

The results of 1979 experiments revealed that incidence of thrips damage was noticed in both experiments and the damage score ranged from 1 to 4 on 30 DT. However, all insecticides were found to be superior to untreated control in controlling the pest (Table 6 and 7)

The damage of whorl maggot varied from 0 to 0.4% only in the first experiment on 30 DT, this indicating the effectiveness of all granular insecticides against the pest. In the second experiment also, the level of incidence was below 5% and the incidence was found to be lowest in Mephosfolan treated seedlings.

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Table 4: EFFECT OF DIFFERENT TREATMENTS ON GALL MIDGE DAMAGE AT 50 DT and YIELD, KHARIF 1981.

Treatments	% gall midge damage	productive tillers/ hill	Yield t/ha
Carbofuran 1.25 kg a.i./ha	35.4c	5.4b	2.75d
-do- + 500 kg NC/ha	34.1c	5.4b	2.63d
-do- + 1000 kg NC/ha	35.4c	5.4b	2.55d
-do- + 1500 kg NC/ha	40.9c	5.3b	2.93c
-do- + 2000 kg NC/ha	34.7c	5.6b	2.85cd
-do- + RD with Chlorpyriphos 0.02% in 1% urea solution for 3 hr. at planting	22.2b	6.8a	3.85b
-do- + RD with Chlorpyriphos 0.02% for 12 hr, at planting	7.8a	6.9a	4.03a
Control	42.2c	4.0c	2.13d

In a column, the data with common letter are not significant different at 5% level.

NC= Neem Cake, DT = Days after transplanting, RD= Root dip.

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Table 5: EFFECT OF SEEDLING ROOT DIP TREATMENTS ON GALL MIDGE DAMAGE AND RICE GRAIN YIELD AT GOA, INDIA.

Treatments	Silver shoot (%)				Productive tillers/hill(No)	Grain yield t/ha
	15DT	30 DT	45 DT	60 DT		
SRD with chlorpyriphos 0.02% for 12 hr.	3.8a	2.5ab	11.4ab	19.3a	6.4a	3.37a
SRD with chlorpriphos 0.02% in 1% urea solution for 3 hr.	6.9a	1.9a	8.9a	25.5a	5.9a	2.45b
SRT in chlorpyriphos 0.02% treated CPS for 1.mt	5.7a	8.0c	19.7c	26.1a	6.1a	2.19b
-do- 5 mt	3.3a	7.1c	18.4bc	30.1a	5.5a	2.09b
-do- 10 mt	7.1a	5.1bc	15.8ab	34.0a	5.5a	2.28b
-do- 20 mt	5.3a	7.5c	16.8bc	26.2a	5.4a	2.45b
-do- 30 mt	3.5a	5.5bc	16.6bc	26.8a	5.0a	2.31b
Control	5.6a	20.2d	32.6d	27.9a	4.8a	1.71b

[a] Mean of three replications. In a column, means followed by a common letter are not significantly different at 5% level.

SRD = Seedling root dip, SRT = Seedling root treatment, CPS = Carbono phosphate
DT = days after transplanting.

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In both the experiments, the infestation of leaf folder was minimum in all treatments on 45 DT and the incidence gradually increased after 45 DT only in untreated plots. Further, only one application of carbofuran of mephosfolan at 15/20 DT was found to be very effective throughout the crop period against leaf folder. In the x case of other insecticides, only one application may control the pest only upto 45 DT and hence two applications were found essential.

The insecticidal control of all the pests in time had also influenced the grain yield significantly, ranging from 3.9t/ha in control plot to as high on 6.1 t/ha in carbofuran and mephosfolan treated plots. Thus it may be concluded that among various insecticides tried, carbofuran and mephosfolan application @ 1.0 kg a.i./ha on 15 /20 DT were found to be most promising for controlling major rice pests during kharif season and thereby recorded increased yield significantly.

(iii) Trials on combination of seedling root dip and granular application.

Experiment I:

From table 8, it is clear that all treated plots recorded significant low damage of gall midge(0.0 to 8.8%) leaf folder (1.6 to 2.7%), whorl maggot(score of 1.6 to 1.8) and higher yield (5.0 to 6.2 t/ha) than untreated control which recorded higher damage of 28.4%, 28.4%, score of 6.0% and lower yield of 3.8t/ha respectively.

Carbofuran residues in grain and straw ranged from 0.041 to 0.092 ppm which were less than tolerance limits of 0.02 ppm fixed by W.H.O. and U.S.E.P.A.. Therefore, it was concluded that nursery treatment with carbofuran at 1.25kg a.i./ha on 10 DS and seedling root dip for 12 hr with chlorpyriphos 0.02% at transplanting followed by carbofuran granular application a at 0.5 kg a.i./ha at 20 DT was found tobeoptimum in controlling major pests in sandy loam soil and in recording equal grain yield than higher dosages of carbofuran in the mainfield.

Experiment II:

The results of three experiments conducted during 1 981 to 1983 revealed that all treated plots were free from gallmidge during 1981 and 1983 seasons. In 1982 trial, upto 45 DT gall midge was low, but beyond 60 DT, no significant difference between treated and untreated plots was noticed(table-9). This is mainly due to planting of unprotected seedlings from nursery which were already infested with gall midge upto 5.4%.

Leaf folder was very effectively controlled in all treated plots. Further, all treated plots recorded higher productive tillers and significant higher yield than untreated control. Therefore, for effective control of gallmidge and simultaneous control of leaf folder in sandy loam soil of Goa, protect the nursery with carbofuran 3% granule @ 20 kg/ha, adopt any one of above mentioned chlorpyriphos treatment at the time of transplantin of carbofuran 3% granules @ 20 kg/ha on 20 DT. However, need based foliar application of any of the recommended spray insecticide is required for control of the earhead pests.

Table 6: EFFECT OF GRANULAR INSECTICIDES ON THE INCIDENCE OF THRIPS, WHORL MAGGOT, LEAF FOLDER AND ON YIELD Kharif 19

Main treatments	Thrips damage on 30DT (Scale 1-9)	% whorl maggot damage On 30 DT	% leaf folder damage on 70 DT		Yield t/ha	
			A	B	A	B
Carbofuran 3 G	1.0a	0.4a	7.3a	6.9a	6.0a	6.1a
Mephosfolan 5 G	1.0a	0.1a	7.7a	8.4a	5.7a	6.1a
Phorate 10 G	1.0a	0.1a	28.0b	5.9a	5.1b	5.8b
Isofenphos 5 G	1.0a	0.0a	20.2b	6.7a	4.7bc	5.4bc
Quinalphos 5 G	1.0a	0.0a	30.0b	10.7a	4.4c	5.3c
Control	3.8b	31.2b	55.6c	50.4b	30.9d	3.9d

A = Sub treatment on 15 DT B = Sub treatment on 15 & 35 DT

Table 7: EFFECT OF GRANULAR INSECTICIDES ON THE INCIDENCE OF THRIPS, WHORL MAGGOT, LEAF FOLDER AND ON YIELD Kharif 19

Main treatments	Thrips damage on 30 DT (Scale 1-9)	% whorl maggot damage on 30 DT	% leaf folder damage on 75 DT		yield t/ha	
			A	B	A	B
Carbofuran 3G	1.0a	3.3bc	4.3a	4.5a	5.9a	6.0a
Mephosfolan 5 G	1.0a	1.6a	3.8a	4.3a	6.2a	6.0a
Phorate 10 G	1.0a	2.3ab	28.5b	3.8a	4.5b	6.0a
Isofenphos 5 G	1.0a	3.0bc	24.9b	3.3a	4.6b	5.6bc
Quinalphos 5 G	1.0a	3.9c	26.6b	3.6a	4.6b	5.4c
Control	3.3b	3.1bc	58.1c	55.0b	3.9c	4.0d

A= Sub treatment on 20 DT B= Sub treatment on 20 & 40 DT

* In a column, the data with common letter are not significantly different at 5% level

Table 8: EFFECT OF CARBOFURAN ON INCIDENCE OF MAJOR RICE PESTS, GRAIN YIELD AND TERMINAL RESIDUES, kharif 1980.

Carbofuran (dosages)	Whorl maggot damage on 30 DT*		% gall midge attack on 45 DT		% leaf folder damage on 60 DT		grain yield t/ha		Residue in grain (ppm)		Residue in straw (ppm)	
	a	b	a	b	a	b	a	b	a	b	a	b
0.50 kg a.i. /ha	1.6a	1.9a	0.0a	8.8b	1.7a	2.7a	5.8b	5.0b	0.041	0.041	0.041	0.033
0.75 kg a.i./ha	1.7a	1.8a	0.0a	6.7b	1.9a	2.2a	5.8ab	5.2ab	0.048	0.054	0.054	0.048
1.00 kg a.i./ha	1.7a	1.8a	0.0a	1.8a	1.6a	2.3a	6.2a	5.5a	0.077	0.069	0.092	0.054
Control	6.0b	5.9b	28.4b	24.1c	27.0b	28.4b	3.8c	3.8c	-	-	-	-

* Based on scale of 0-9; 0= No damage; 9= Severe feeding leisions causing leaf breaking.

Sub treatments: a. Nursery treatment with carbofuran granules @ 1.25 kg a.i./ha on 10th day after sowing + seedling root dip with chloropyriphos 0.02% for 12 hr. at transplanting.) + Main field water surface application of carbofuran granules at 20 DT

b. Main field water surface application at 20 DT (Days after transplanting)

In a column, the data with common letter are not significantly different at 5% level.

Table 9: CHEMICAL CONTROL OF RICE GALL MIDGE AND LEAF FOLDER AT GOA, INDIA [a]

Treatments	Silver shoot(%) 45 DT			Silver shoot(%) 60 DT			Leaf folder damage(%)			Productive tillers/hill (No)			Yield t/ha		
	1981	'82	'83	'81	'82	'83	'81	'82	'83	'81	'82	'83	'81	'82	'83
A	0.0a	6.0a	0.0a	0.0a	34.7b	0.0a	0.5a	3.6a	0.0a	8.9a	7.1a	7.3a	4.7a	3.4a	3.5a
B	0.0a	4.7a	0.0a	0.0a	27.7a	0.0a	1.0a	3.9a	0.0a	7.3b	6.5a	7.3a	4.4a	3.3a	3.6a
C	NT	NT	0.0a	NT	NT	0.0a	NT	NT	0.0a	NT	NT	7.1a	NT	NT	3.5a
Control	16.0b	36.7b	10.8b	35.7b	28.1a	18.0b	7.7b	31.1b	15.9b	4.7c	4.9b	6.7a	2.7b	1.2b	2.5b

Treatments A = NP+ RD with chlorpyriphos 0.02% for 12 hr fb 20 kg carbofuran 3% gr. on 20 DT.

B = NP+ RD with chlorpyriphos 0.02% for 3 hr in 1% urea solution fb 20 kg carbofuran 3% gr on 20 DT.

C = NP+ RT with chlorpyriphos 0.02% treated CP slurry for 5-10 mt fb 20 kg carbofuran 3% gr on 20 DT.

[a] In a column means followed by a common letter are not significantly different at 5% level.

NP = Nursery protection with carbofuran 3% gr @ 40 kg and 20 kg/ha respectively during 1981 and '82 seasons and in 1982 nursery was unprotected.

RD= Root dip, RT = Root treatment, fb = followed by, CP = Carbono phosphate

Gr = granule, NT = not tried, DT = days after transplanting.

7. CONCLUSION:

During the survey, gall midge, leaf folder, and whorl maggot were identified as major key pests of kharif rice. Early direct sowing in the last week of May or transplanting in June was found to be best cultural method of control to avoid gall midge problem and to certain extent other pests also and for getting maximum yield.

Among different chemical treatments tried on the late transplanted crop(July), nursery protection with carbofuran 3% granules @ 20 kg /ha on 10th day after sowing followed by seedling root dip for 12 hr in 0.02% chlorpyriphos or in 0.02% chlorpyriphos + 1% urea for 3 hr or in 0.02% chlorpyriphos treated carbono phosphate slurry for 5-10 mt at the time of planting was found tobe effective for control of gall midge and whorl maggot in medium type of land.

In addition to above chemical treatments, single application of carbofuran 3% granule @ 20 kg/ha on 20th day after planting was found to give sustained control of gall midge in mainfield as well as effective control of other key pests(leaf folder and whorl maggot). However, need based foliar application of any of the recommended spray insecticide is required for control of the earhead pests.

However, in the low lying areas, as seedling root dip treatment as well as granular application are not practicable, planting of gall midge resistant varieties like CR-94-721-3 and Vikram along with need based foliar insecticidal spraying for the control of most of the external feeders(leaf folder, earhead bugs etc.,) was the only soultion.

8. Recommendations to be passed on to the Extension Agency:

a. Adopt early sowing(in last week of May) or early planting (in June) to escape from gallmidge and other major pests and to get maximum yield especially for Jaya & IR 8 varieties.

b. If Jaya or IR 8 is planted late.. (July), always protect the nursery with carbofuran 3% granules @ 20 kg/ha and follow seedling root dip treatment with chlorpyriphos 0.02% and apply 20 kg carbofuran 3% granule on 20th day after planting for the control of gallmidge, and leaf folder and follow/ application of any of the spray insecticide against earhead pests in medium type land(kher land). / need based

c. In gall midge endemic low lying areas, always grow gall midge resistant varieties(CR-94-721-3 and Vikram) and follow need based application any of recommended of foliar insecticides against foliage and earhead pests, since the seedling root dip treatment and granular application are not practicable in low lying areas.

9.Publications arising out the project:

a. List of papers published:

i. Sundararaju, D.1980. Efficacy of granular insecticides in controlling rice pests, in Goa (Abst), Seminar on pest management in rice. TNAU, Coimbatore pp.7-8.

ii. Sundararaju, D. 1983 Efficacy of granular insecticides in controlling rice pests in Goa Proc. Rice Management Seminar. TNAU, Coimbatore pp. 100-104.

iii. Sundararaju, D.1984, Efficacy of nursery protection and seedling root dip for gall midge control IRRN 9(1):24-25.

iv. Sundararaju, D.1985, Chemical control of rice pests in Goa, J. Maharashtra agric. Univ. 10(1):(In press).

b. List of papers sent for publication to IRRN:

i. Effectiveness of seedling root dip treatments for control of gall midge.

ii. Chemical control of gall midge and leaf folder at Goa.

iii. Influence of planting time on rice whorl maggot.

iv. Influence of planting time and rainfall on gall midge damage and yield at Goa.

v. Light trap catches of rice leaf folder and rainfall pattern at Goa.

vi. Record of weed host plants and parasites of gallmidge in Goa.

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13. Approximate expenditure incurred in the Project: (Give reasons for variation, if any, from original estimated cost)

Rs.33,000/= (including salary)

14. Publications and material (one copy each to be supplied with this proforma)

a) Research papers **Vide column No; 9 of the Annexure**

b) Popular articles

c) Reports

d) Seminars and workshops (Relevant to the Project) in which the Scientists have participated:

Attended Seminar on Pest Management in Rice, Oct 1980, Coimbatore.

e) Material developed such as new varieties of crops or breeds of farm animals, implements, products, etc.)

Cultural and chemical control measures against rice pests were evolved.

15. Details (Nos. etc.) of Field/Laboratory Note books and final material and their location,

ICAR Complex File.

16. Comments/suggestions of Project leader regarding possible future line of work that may be taken up arising of this project:

Natural enemies of rice pests in Goa are to be studied in detail.

17. Signatures with name of Project Leader and Associates:

18. Signature (with comments, if any) of Head of Division/Section/Station :

Chowdy Thirumurthi

19. Signature (with comments, if any) of Director :