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PERFORMANCE OF GALL MIDGE AND BPH RESISTANT RICE CULTURES UNDER VARIED PROTECTION MANAGEMENTS

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Seven new gall midge resistant rice cultures and two BPH resistant cultures were tested under three different pest managements. Gall midge and BPH resistant rice cultures need protection against yellow stem borer *Scirpophaga incertulas* Wlk., which is a predominent pest in Warangal region. Similarly all the cultures viz., Surekha, Mashuri, Vijaya Mashuri, Sona Mashuri, Tella Hamsa require protection from the increasing menace of sensonal pests like leaf folder and whorl maggot. A variety like WGL 22245, which is totally resistant to midge and capable of staging recovery through inbuilt compensatory mechanism proved to be superior to other varieties. In view of the increasing plant protection cost, it is advisable to adopt a need based protection, even on pest resistant rice cultures, which is sound both economically and environmentally.

Yield losses due to insect pests in Warangal zone account for 30-40% on an average, particularly after the advent of new rice varieties (Ramasubbaiah *et al*., 1980). Earlier studies at this centre revealed that maximum protection schedule was an essential part of rice cultivation, in order to exploit the potentiality of new high yielding varieties (Anon. 1966-'76; Sanjeeva Rao *et al*., 1980) Under the reorientation programmes of pest management, host plant resistance has paved the way for minimum use of insecticides in rice cultivation (Anon. 1980). But changing vistas of major insect pests necessiated to study the merits and demerits of a pest resistant variety, before it spreads extensively (Venugopal *et al*., 1981). Hence, studies were conducted at Agricultural Research Station, Warangal during *Kharif* and *Rabi* seasons of 1981-82 with certain new pest resistant rice cultures under three different levels of protection management, with a view to evaluate the reaction of these cultures in relation to pest incidence.

MATERIAL AND METHODS

Seven new gall midge resistant cultures viz., IET 6080 IET 6056, WGL 26889 and WGL 13400 (Surekha) in *Kharif* season and WGL 22245, WGL 33345 in *Rabi*, were tried under three different protection managements viz., minimum insecticide support (based on pest monitoring T_1); maximum insecticide support (pre-scheduled management-T_2) and no insecticidal support (solely dependent on plant resistance T_3). In Rabi season two new BPH resistant cultures, IET 7570 and IET 7572 were included. During both the seasons Jaya, a popular variety relatively susceptible to all pests was included as a check. The trials were

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laid out in a split plot design with three replications. A plot size of 30 m^2 was adopted in both the seasons. Observations on all seasonal insect pests were made by following stratified random sampling on 24 fixed hills at 25, 45, 65 days after transplanting (DAT) and a day before harvest Grain yield from net plots was recorded. The statistically scrutinised data (average of three replications) are presented in Tables I to III.

RESULTS AND DISCUSSION

It is evident from the deadheart and white ear incidence recorded during both the seasons that yellow stem borer *Scirpophaga incertules* Wlk, was the predominant pest. All the new cultures resistant to gall midge, *Orseolia oryzae* W. M. recorded more than 25per cent deadheart (table-1) it was ashigh as 33.5 percent in rabi season particularly on new BPH resistant varieties derived from Manoharsali donor (Table-II). The impact of whorl maggot *Hydrellia* sp , at early stages and leaf folder, *Cnaphalocrocis medinalis* Guen., at reproductive phase was also high (19 percent and 30 percent leaf damage respectively) under no insecticidal management (Table-1).

The incidence of borer at early stage in both the seasons and the leaf folder in Kharif was appreciably reduced in all the new varieties even with minimum (need based) support of insecticides. BPH was well below the injury levels on allthe test cultures and therefore the treatments could not be evaluated against BPH. Interestingly, in *Rabi* season two new varieties evolved through W. 12708 and W. 1263 donors tolerant to yellow stem borer (Anon. 1977) performed well even under no insecticidal management. Particularly WGL-22245, a variety under pre-release stage was promising, 7 5, 5 6 and 5 4ton/ha., under maximum insecticidal minimum insecticidal and no insecticidal managements respectively (Table-III). These results are in conformity with those of earlier experiments at this centre (Anon 1979). Jaya, a susceptible variety to all the pests performed well recording 6.3 ton/ha., under pre scheduled protection management in both the seasons. The observations at other centres of AICRIP (Anon. 1981) also support these results. IET 6056, a complete resistant variety to gall midge was on par with popular variety, 'Surekha' in its performance when shielded from pests other than gall midge like stem borer and leaf folder.

During both the seasons of the study, the need-based application treatment (T_1) consisting of only two sprays recorded higher cost benefit ratio in all the varieties except WGL 22245 and WGL 33345 as compared to maximum protection treatment (T_2). The cost benefit ratio ranged from 1:0.4 to 1:7.7 and 1:0.3 to 1:1.2 in the need based and pre-scheduled protection managements respectively (Table III). The deviation noticed in the two new Warangal varieties might be attributed to their high recuperative capacity to withstand the damage due to the borer through compensation by way of additional effective tillers

The number of panicle bearing tillers in the untreated plots of these cultures were around 13 as compared to about 9 in other cultures. The pre-scheduled maximum protection treat ment costing about Rs. 1995/- per hectare is not only beyond the means of small and marginal farmers but also little remunerative with varieties like WGL 22245; Hence it would be economical to minimise the use of insecticides by timing the application based on past populations as an adjunct to the varietal resistance.

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Table-1 Pest incidences at different stages of crop growth, in gall midge resistant cultures Kharif 1981.

Variety (Gross)	YELLOW STEM BORER (% DH) 45 DAT T_1	T_2	T_3	Mean	65 DAT T_1	T_2	T_3	Mean	WHORL MAGGOT (% DL) 30 DAT T_1	T_2	T_3	Mean	LEAF FOLDER (%) 60 DAT T_1	T_2	T_3	Mean
IET 6080a (CR.44-35 × W.12708)	8.9 (2.5)	5.3 (0.9)	20.4 (12.4)	11.5	10.8 (3.7)	7.1 (1.6)	29.7 (24.6)	15.9	22.5 (14.7)	14.6 (16.4)	23.2 (15.5)	20.1	16.7 (3.5)	9.3 (1.6)	32.7 (29.2)	11.5
IET 6056a (CR.44-35 × W.12708)	7.2 (2.0)	3.1 (0.4)	15.9 (7.6)	8.7	7.2 (1.7)	1.8 (0.1)	27.3 (21.1)	12.1	11.4 (14.5)	17.0 (9.0)	22.3 (14.4)	20.6	11.9 (4.4)	5.8 0.9	30.1 (25.1)	15.8
SUREKHAa (IR.8 × Siam 29)	8.9 (2.6)	5.1 (0.9)	19.9 (11.8)	11.3	9.3 (2.7)	13.4 (5.6	28.9 (23.4)	17.2	25.1 (18.0)	22.4 (14.5)	22.7 (14.9)	23.4	13.0 (5.0)	7.8 (1.2)	31.1 (26.3)	17.3
WGL 26889a (IR.22 × WEL 12708)	7.5 (1.7)	6.6 (1.4)	16.2 (8.2)	10.1	9.2 (2.6)	8.5 (2.3)	27.2 (20.9)	15.8	23.4 (15.9)	21.0 (12.9)	23.2 (15.5)	22.5	11.9 (4.2)	7.4 (1.6)	34.4 (32.0)	17.9
WGL 26420a (WGL 13400 × W.13801)	11.4 (4.0)	4.3 (0.6)	18.8 (11.5)	11.8	14.2 (6.0)	10.4 (3.3)	30.6 (25.9)	18.4	23.5 (15.9)	23.9 (16.4)	26.0 (19.3)	24.5	9.3 (2.6)	8.1 (2.0)	30.5 (25.7)	16.0
JAYA (T_{141} × IR.8)	8.0 (2.0)	3.5 (0.5)	19.2 (11.1)	10.2	10.3 (3.2)	7.9 (2.0)	26.4 (19.7)	14.9	25.4 (18.4)	21.2 (13.1)	25.6 (18.7)	24.1	10.1 (3.3	7.7 (1.8)	31.0 (26.5)	16.3
Mean	8.7	4.7	18.6		10.2	8.2	28.4		23.7	20.0	23.8		11.2	7.6	31.6	
CD (0.05)* Varieties				NS				1.7				2.2				NS
Treatments				1.4				1.1				1.4				1.3
Interaction				NS				2.7				3.3				Ns

*Analysis based on angular transformation

T_1 = Two applications of Chlorpyriphos @ 0.4 Kg. a.i./ha. at 25 & 50 DAT

T_2 = Seedling root dip 0.02% Chlorpyriphos + three applications of Carbofuran @ 1 kg a.i./ha. at 20, 40 and 60 DAT + one spray with monocrotophos @ 0.4 kg a.i./ha. at 80 DAT.

T_3 = No insecticidal application.

a = gall midge resistant
DL = Damaged leaves
DH = Deadheart.

Table-2 Pest incidences at different stages of crop growth in gall midge and PBH resistant cultures, Rabi 1981-82.

Variety (Cross)	YELLOW STEM BORER (% DH/WE)															
	25 DAT				45 DAT				65 DAT				Pre-harvest			
	T_1	T_2	T_3	Mean	T_1	T_2	T_3	Mean	T_1	T_2	T_3	Mean	T_1	T_2	T_3	Mean
IET 7570b (Sona × Manoharsali)	5.0 (0.8)	6.0 (1.4)	37.3 (31.2)	16.1	9.8 (3.5)	3.9 (0.6)	27.3 (21.2)	13.7	19.8 (12.0)	5.4 (1.0)	13 9 (5.9)	13.0	20.7 (12 7)	5.4 (1.0)	13.1 (5.4)	13.1
IET 7572b (Sona × Manoharsali)	5.9 (1.9)	1.8 (0.1)	35.3 (33.6)	14.3	7.4 (2.4)	3.9 (0 6)	28.4 (32.7)	13 2	14.8 (7.2)	2.6 (0.2)	14.2 (10.1)	10.5	16.7 (8.5)	4 8 (0.9)	14.0 (6.5)	11.8
WGL 22245a (IR.579 × WGL 12708)	8.3 (2.5)	2.1 (0.1)	21.4 (13 5)	10.6	6 4 (1 6)	2.4 (0.2)	15.3 (7.1)	8.0	11.8 (4 2)	4.1 (0.7)	8.2 (2.6)	8.0	19 9 (11.7)	6 6 (1 3)	12.7 (4.9)	13.1
WGL 33345a (Sona × Kakatiya)	8.2 (2.7)	2.0 (0.1)	23 8 (17.1)	11 3	12.2 (5.1)	2.0 (0.1)	17.8 (9.7)	10.7	16 5 (8 7)	2.2 (0.2)	16.0 (6.8)	11.2	15.4 (7.1)	6.7 (1.4)	10 9 (3 3)	11.0
Jaya (T_{141} × IR.8)	10.0 (3.5)	1.8 (0.1)	26 0 (19.3)	12.6	13.8 (6.1)	2.0 (0 1)	26.0 (19 7)	13.9	13.6 (6.3)	8.5 (1.1)	15 1 (6.8)	12 4	17.2 (8.8)	9.3 (2.7)	13.4 (5.8)	13. 3
Mean	7.5	2.7	28.8		9 9	2.8	23.0		15.3	4.6	13.3		18.0	6.6	12.8	
CD (0.05)* Varieties				NS				NS				NS				NS
Treatments				2.4				3.2				2.7				2.0
Interaction				5 3				NS				NS				Ns

a = Gall midge resistant b = Brown plant hopper resistant

*Analysis based on angular transformation

WE = Whiteears

SINGH*

Table 3: Grain yield and Net profit in different varieties, *Kharif* 1981 and *Rabi* 1981-82.

Variety	KHARIF Yield (kg/ha)				KHARIF Net profit* (Rs.)		KHARIF Cost : Benefit		RABI Variety	RABI Yield (kg/ha)				RABI Net profit* (Rs.)			RABI Cost : Benefit	
	T_1	T_2	T_3	Mean	T_1	T_2	T_1	T_2		T_1	T_2	T_3	Mean	T_1	T_2	T_1	T_2
IET 6080	5152	5184	2348	4228	3105	1550	1:7·7	1:0·7	IET 7670	3226	6556	2051	3614	1056	2374	1:2.6	1:1.2
IET 6056	5020	5754	3178	4651	2303	1225	1:5·7	1:0·5	IET 7572	3763	6004	2419	4062	1280	2486	1:3.2	1:1.2
Surekha	4874	5705	2934	4504	2025	1469	1:5·1	1:0·7	WG 22245	5645	7527	5466	6213	—176	581	—	1:0.3
WGL 26889	4743	5216	3015	4325	1760	756	1:4.4	1:0.4	,, 33345	4660	6541	4570	5257	—286	469	—	1:0.2
WGL 26420	5216	6112	2608	4645	2860	2385	1:7.1	1:1.2	—	—	—	—	—	—	—	—	—
Jaya	5574	6324	3048	4982	2758	2190	1:6.9	1:1.9	Jaya	4839	6362	4391	5197	160	469	1.0.4	1.0.2
Mean	5097	5716	2855						Mean	4427	6398	3781					
(C.D. 0.05)	Varieties			22									627				
	Treatments			20									269				
	Interaction			41									895				

T_1 = Rs.400/— (Two applications of Chlorpyriphos)
T_2 = Rs.1985/— (Seedling root dip + three applications of Carbofuran + One spray of monocrotophos)
T_3 = Nil.
*Paddy @ Rs.125/—per quintal.