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Pest management strategy for rain-fed upland rice in coastal Orissa

P. C. Rath* and R. C. Dani

Crop Protection Division, Central Rice Research Institute, Cuttack 753 006, Orissa, India

ABSTRACT

Field trials were conducted for insect pest management in upland rice during wet seasons of 2007 and 2008 at Farm Science Centre, Santhapur, Cuttack, Orissa. Two varieties i.e. one high yielding variety (HYV), Anjali and a local check, Kolia and two management practice viz., schedule based protection (seed treatment with carbendazim (Bavistin) 2 gm/kg seed, herbicide pretilachlor (Rifit) 50EC @ 800 g a.i. ha^{-1} at 6 days after sowing and monocrotophos 36EC @ 500g a.i. ha^{-1} at 30 days after germination), need based protection(seed treatment with chlorpyriphos 20EC @ 3.75 lit 100kg^{-1} seed and application of monocrotophos 36EC @ 500 g a.i. ha^{-1} on pest infestation) and no protection (farmer practice as control) were compared for insect pest management and grain yield in upland rice ecosystem. During both the years, Anjali recorded the highest grain yield of 3.75 t ha^{-1} (2007) and 3.69 t ha^{-1} (2008) under need based protection. Similarly, Kolia under need based protection recorded higher grain yield of 2.36 t ha^{-1} (2007) and 2.76 t ha^{-1} (2008) than other treatments. Under all the protection, practices tested the variety, Anjali performed better than the check variety, Kolia in controlling pests like stem borer, termite and gundhi bug.

Key words: *upland, rice, Anjali, Kolia, insect, pest, management*

In India 6.5 m ha area is under rain fed upland rice, out of which 5.2 m ha is in Eastern India (Maiti *et al.*, 2007). It is grown as direct sown crop under aerobic soil conditions. Weeds constitute the most economically important biotic constraint accounting for about 20% loss in grain yield. Other pests (insect and diseases) account for about 15-20% additional loss (Widowsky and O'Toole, 1990). Termites (*Odontotermes obesus* and *Microtermes obesi)* are most important insect in red light textured soil with low water holding capacity under prolonged drought conditions. Rice gundhi bug (*Leptocorisa oratorious* and *Leptocorisa acuta*) is another important pest in upland conditions. The nymph and adult of gundhi bug feed on milk of developing grains rendering them chaffy. The yellow stem borer (YSB), *Scirpophaga incertulas* (Walk.) is one of the most predominant insect pest in rice growing tracts of India, Bangladesh and South East Asian countries causing serious damage (Islam, 1996). It attacks the rice plants from seedling to maturity almost in all ecosystems (Misra *et al.* 2005). Among diseases, blast (*Pyricularia grisea*) and brown spot (*Bipolaris oryzae*) diseases, however, cause significant damage to rice crop in upland situation. Information on the insect pests and their management in upland rice is very much limited. Therefore, an attempt was made for identifying a suitable strategy for management of all the constraints in rainfed upland rice system keeping in view the historical incidence of pests in the area.

MATERIALS AND METHODS

Field trials were conducted for management of pests in upland rice during wet seasons of 2007 and 2008 at the Farm Science Center, Santhapur, Cuttack. Two, rice cultivars viz. one local landrace Kolia and another high yielding variety (HYV) Anjali were selected for the trial. Two insect pest management practices viz. one schedule based protection in which seed treatment was done with carbendazim (Bavistin) 2 gm kg^{-1} seed, herbicide pretilachlor (Rifit) 50EC @ 800 g a.i. ha^{-1} at 6 days after sowing (DAS) and monocrotophos 36EC was applied @ 500 g a.i. ha^{-1} at 30 days after germination (DAG) and need based protection in which seed treatment was done with chlorpyriphos 20EC @ 3.75 lit 100l.g^{-1} seed and application of monocrotophos 36EC @ 500 g a.i. ha^{-1} on pest infestation were compared with farmer practice, where no pest control measures were taken was taken as control. The

experiment was laid out in randomized block design with three replications in both the years. Data related to percent dead heart, percent white ear head, percent plant damage by termites and percent grain damage by gundhi bug were collected and after necessary transformation, statistical analysis was done. Grain yield data were also recorded in both the years.

RESULTS AND DISCUSSIONS

The result of the trial during wet season 2007 (Table 1) revealed that highest grain yield of 3.75 t ha^{-1}, least number of dead hearts (3.5 %), white ear heads (2.0%) and plant damage by termites (3.1%) were recorded in the treatment of need based protection practice in variety Anjali. Yield increase over control was maximum (112.61%) in need based protection practice in local variety Kolia followed by the same treatment in the high yielding variety Anjali (66.66%). This need based protection treatment was found to be better than that of schedule based protection practice in reducing the insect damage and increasing the grain yield in both the varieties during wet season 2007.

The result of the trial during wet season 2008 (Table 2) indicated that highest grain yield (3.69 ha^{-1}), least DH (5.8%), WEH (4.8%), plant damage by termites (3.63%) and grain damage by gundhi bug (14.87%) were recorded in the treatment of need based protection treatment in the variety Anjali. The yield

Table 1. Influence of pest practices on insect pest damage in upland rice, wet season, 2007

Treatments	DH% 48 DAG	WEH% before harvest	% of plants damage by termite at 33DAG	Yield t ha^{-1}	%Yield increase over control
Shedule based protection in Kolia	6.9(15.26)	5.0(12.91)	6.2(14.33)	1.72	54.95
Need based protection in in Kolia	4.3(11.98)	2.6(9.30)	3.5(10.87)	2.36	112.61
Farmer practice in Kolia	9.2(17.68)	7.29(15.63)	8.4(16.83)	1.11	-
Shedule based protection in Anjali	6.4(14.63)	5.4(13.49)	6.9(15.22)	3.11	38.22
~~Shedule~~ need based protection in. Anjali	3.5(10.82)	2.0(9.50)	3.1(10.08)	3.75	66.66
Farmer practice in Anjali	9.1(17.65)	8.1(16.59)	8.9(17.42)	2.25	-
CD (P=0.05) Treatment	1.33	0.93	1.06	0.33	
CD (P=0.05)Variety	-	-	-	0.27	

DAG – days after germination; DH – dead heart; WEH – white ear head
Data in the parenthesis are arc sine transformed values

Table 2. Insect pest management in upland rice in wet season, 2008

Treatments	DH% 48 DAG	WEH% before harvest	% of plants damage by termiteat 33DAG	% of grain damage by gundhi bug at harvest	Yield t ha^{-1}	% Yield increase over control
Shedule based protection in Kolia	8.8(17.24)	6.93(15.24)	7.46(15.85)	30.13(33.13)	2.18	32.12
Need based protection in Kolia	7.06(15.41)	6.8(15.10)	6.66(14.94)	19.76(26.39)	2.76	67.27
Farmer practice in Kolia	9.5(17.95)	8.13(16.55)	8.53(16.96)	36.02(36.68)	1.65	-
Shedule based protection in Anjali	7.2(15.59)	5.66(13.71)	6.86(15.13)	20.44(26.74)	3.14	21.23
Need based protection in Anjali	5.8(13.92)	4.8(12.63)	3.63(10.97)	14.87(22.53)	3.69	42.47
Farmer practice in Anjali	9.0(17.44)	8.26(16.69)	8.26(16.69)	25.37(30.17)	2.59	-
CD (P=0.05) Treatment	1.13	1.39	1.35	4.28	2.12	
CD (P=0.05)Variety	0.93	1.14	1.10	3.49	0.45	

DAG – days after germination; DH - dead heart; WEH – white ear head
Data in the parenthesis are arc sine transformed values
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increase over control was maximum (67.27%) in the need based protection treatment in the local variety Kolia followed by the same treatment in high yielding variety Anjali 42.47%. Similar results were recorded during both the seasons. This need based protection treatment was found to be much better than that of schedule based protection practice in reducing the insect damage and increasing the grain yield in both the varieties in both the years.

During both the years, high yielding variety, Anjali recorded highest grain yield of 3.75 t ha^{-1} (2007) and 3.69 t ha^{-1} (2008) in need based protection treatment. Similarly, in the cultivar Kolia, the need based protection treatment recorded higher grain yield of 2.36 t ha^{-1} (2007) and 2.76 t ha^{-1} (2008) compared with other treatments. Under all the protection strategies tested the variety, Anjali performed better than the local check, Kolia showing less damage by pests like stem borer, termite and gundhi bug. Under farmer's practice seed is generally sown directly behind the plough at a high seed rate of 100 kg ha^{-1} whereas, under improved cultivation practices seed is sown in lines with a seed rate of 80 kg ha^{-1} involving more labour. Furthermore, under improved cultivation practice herbicide was used to control weeds and thereby, weeding cost was reduced. In need based protection treatment, less expenditure is incurred due to minimum use of pesticides. Based on the findings of the present investigation it may be concluded that need based protection practice is superior to other methods of pest management in rainfed upland rice.

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