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Evaluation of Formulated Mixtures of Propanil plus Triclopyr for Post-Emergence Weed Control in Lowland Rice Production

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ABSTRACT: A formulated mixture of propanil + triclopyr was evaluated at 2, 3 and 4l/ha along side with a check chemical (Orizoplus^R made up of propanil + 2, 4 – D Amine) in 2005 and 2006. Weedy check and 2 hand weeding at 21 and 42 days after transplanting were included among the treatments. The experiment was done in a Randomized Complete Block Design with three replicates at the experimental field of National Cereals Research Institute, Edozhigi and Badeggi located at Lat. 09° 45N; Long 06° 7E, ALT 50.57 MSL. The variety of rice used was FARO 52 commonly known as WITA 4. Significant difference occurred in the level of weed control. Propanil + triclopyr though controlled weeds; the control level was significantly lower than the check Orizoplus^R in each respective application rate. There was no phytotoxic effect of the herbicides on rice, indicating that the herbicides are not injurious to rice crop. As post-emergence herbicide in lowland rice, formulated mixture of propanil + triclopyr is recommended to be applied at 3 – 4l/ha.

Keywords: Herbicides; Hand weeding; Propanil + Triclopyr; Orizoplus[®]

Introduction

Weeds often compete with crops for nutrients, water, light and space. The yield loss can be as high as 75% in planted rice in Nigeria arising from weed competition (1). Weeds are therefore real constraints to rice production (2). The use of hand weeding or hoe weeding in the control of weeds by most smallholder farmers in developing countries is known to be time-consuming and labour intensive. It can take more than 50% of the farmer's labour input into crop production (3).

It has been stated (4) that progress would be made in the development of weed management technologies for smallholder farmers if research addresses the difficult problem of finding alternative to hand weeding. Hence the calls for herbicide usage for fast and more effective weed control measure. Many Agro-chemical Companies have started to formulate new herbicides. The effectiveness of these herbicides has to be determined.

The objective of this trial is to evaluate the effect of the newly developed formulated mixture of propanil + triclopyr as weed control chemical in lowland rice.

Materials and Methods

A Randomized Complete Block Design experiment with three replicates was carried out in 2005 at Edozhigi and 2006 at Badeggi, the experimental field of National Cereals Research Institute located at Lat. 09° 45N; Long 06° 7E, ALT 50.57 MSL A formulated mixture of propanil + triclopyr was evaluated at 2, 3 and 4l/ha. Check chemical (Orizoplus^R having propanil and 2, 4 – D Amine as active ingredients) was similarly included among the treatments at 2, 3 and 4l/ha as well as weedy check and 2 hand weeding at 21 and 42 days after transplanting (DAT). The variety of rice used was FARO 52 commonly known as WITA 4. Transplanting of 21 day-old seedlings of rice at 2 seedlings/hill was done on 16 August 2005 and 13 September 2006 after land puddling at a spacing of 20cm x 20cm on a plot size of 5m x 10m. The herbicides were applied at 14 DAT with 300l/ha of water.

Data collected include: prevalent weed species at the first flush; weed control rating; phytotoxicity; tillering and grain yield. The obtained data were subjected to analysis of variance using IRRISTAT analytical software and where F-ratio was significant, means were separated using Least Significant Difference.

Results and Discussion

Weed occurrence status

The prevalent weeds at the experimental site at the first flush before herbicide application are listed in Table 1.

Table 1: Weed occurrence status at the experimental site during the first flush before herbicide application in 2005 and 2006

Weed species	Status of occurrence	
	2005	2006
Grasses		
<i>Cynodon dactylon</i> (Linn) Pers	++	++
<i>Leersia hexandra</i> (Sw)	++	++
<i>Echinochloa stagnina</i> Beauv	-	+++
<i>Imperata cylindrica</i> var <i>africana</i> C.E. Hubbard	-	+
Broadleaves		
<i>Aeschnomene indica</i> L	+	+
<i>Ipomea aquatica</i> Forsk	++	++
<i>Nymphaea lotus</i> Linn	-	+
<i>Eichhornia natans</i> (P. Beauv) Solms-lab	-	+
Sedges		
<i>Cyperus haspan</i> L	++	++
<i>Klinga pumila</i> Michx	++	++
<i>Fimbrostylis difforalis</i> Gaudet	+	+
<i>Cyperus difformis</i> L	++	++
<i>Cyperus esculentus</i> Linn	++	++

+ = low; ++ = moderate; +++ = high; - = not observed

Table 2: Effect of formulated mixture of propanil + triclopyr on rice phytotoxicity and weed contro; rating in 2005 and 2006

Treatment	Phytotoxicity rating on rice				Weed control rating+		
	2005		2006		2006		
	Days after application		Days after application		Days after application		
	7	14	7	14	7	14	28
1 Propanil + Triclopyr at 2l/ha	0	0	0	0	6.7 ^b	6.7 ^b	6.0 ^c
2. Propanil + Triclopyr at 3l/ha	0	0	0	0	6.7 ^b	7.0 ^b	7.0 ^{bc}
3. Propanil + Triclopyr at 4l/ha	0	0	0	0	7.0 ^b	7.0 ^b	7.7 ^b
4.. Orizoplus ^R at 2l/ha	0	0	0	0	7.0 ^b	8.3 ^{ab}	8.7 ^{ab}
5. Orizoplus ^R at 3l/ha	0	0	0	0	8.0 ^a	8.7 ^a	8.7 ^{ab}
6. Orizoplus ^R at 4l/ha	0	0	0	0	8.0 ^a	8.7 ^a	9.0 ^a
7. 2 hand weeding 21 & 42 DAT	0	0	0	0	0.0 ^c	8.7 ^a	6.0 ^c
8. Weedy check	-	-	-	-	0.0 ^c	0.0 ^c	0.0 ^d
SE±	-	-	-	-	0.2	0.5	0.4
CV%	-	-	-	-	4.9	14.3	9.9

Phytoxocity Rating Scale: 0 – 10 where 0 = no toxicity and 10 = total crop kill

Weed Control Ratinf Scale: 0 – 10 where 0 = no weed control and 10 = complete weed kill

DAT: Days after transplanting; + = Not observed in 2006

Figures in the same column followed by the same letter (s) are not significantly different at P=0.05 of LSD

Echinochloa stagna Beauv was the most prominent grassy weed in 2006. In both 2005 and 2006, *Leersia hexandra* (Sw) and *Cynodon dactylon* (Linn) Pers occurred moderately. Among the broadleaved weeds, *Ipomea aquatica* Forsk had higher occurrence than the others while within the sedges, *Klinga pumila* Michx, *Cyperus haspan* L, *Cyperus difformis* L and *Cyperus esculentus* Linn were prominent.

Phytotoxicity

Both the test chemical and check herbicide had no phytotoxic effect on the rice in all the rates of application (Table 2). This indicates that the herbicides were not injurious to rice and thus can be safely used on rice field. The herbicides are therefore selective in action.

Weed control rating

Significant difference occurred in the level of weed control (Table 2). The herbicide treated plots controlled weeds better than the untreated plots. Formulated mixture of propanil + triclopyr though controlled weeds, the control level was significantly lower than the check Orizoplus^R in each respective application rate.

Tillering

Among the herbicide treated plots, there was no significant difference in the tiller number per hill in both years (Table 3). In 2006, the weedy check plot had significantly lower tiller number than other treatments. This indicates that the herbicides did not affect tillering negatively.

Table 3: Effect of formulated mixture of propanil + triclopyr on rice tillering and grain yield in 2005 and 2006

Treatment 2006	Tiller no/hill 8 WAT		Grain	
	2005	2006	2005	
1 Propanil + Triclopyr at 2l/ha	10.0 ^a	18.3 ^a	2531.7 ^a	2230.1 ^{ab}
2. Propanil + Triclopyr at 3l/ha	11.0 ^a	19.7 ^a	2510.0 ^a	2682.5 ^a
3. Propanil + Triclopyr at 4l/ha	14.3 ^a	18.3 ^a	2910.0 ^a	2658.7 ^a
4.. Orizoplus ^R at 2l/ha	15.0 ^a	20.6 ^a	2690.0 ^a	2111.1 ^{ab}
5. Orizoplus ^R at 3l/ha	15.3 ^a	18.3 ^a	2873.3 ^a	2277.8 ^{ab}
6. Orizoplus ^R at 4l/ha	13.7 ^a	19.1 ^a	3098.3 ^a	2603.2 ^a
7. 2 hand weeding 21 & 42 DAT	15.9 ^a	15.7 ^b	1078.3 ^b	1642.9 ^b
8. Weedy check	10.9 ^a	11.1 ^c	13.7 ^c	730.1 ^c
SE±	1.4	0.8	197.3	297.7
CV%	6.2	8.2	28.5	24.4

DAT: Days after transplanting

WAT: Weeks after transplanting

Figures in the same column followed by the same letter (s) are not significantly different at P=0.05 of LSD

Grain yield

There was significant difference in the grain yield of rice obtained in both years (Table 3). The 2 hand weeding treatment and weedy check gave significant lower yields than the herbicide treated plots. The formulated mixture of propanil + triclopyr plots had comparable yield in each rate of application to that of the check chemical (Orizoplus^R). The grain yield in both years indicated that the formulated mixture of propanil + triclopyr can be applied as post-emergence herbicide in lowland rice at the rate of 3 – 4l/ha without causing yield loss to rice.

Conclusion

The use of formulated mixture of propanil + triclopyr in lowland rice will not cause any phytotoxic effect on rice but weeds would be appreciably controlled. As post-emergence herbicide in lowland rice, the formulated mixture of propanil + triclopyr is therefore recommended to be used at 3 – 4l/ha.

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