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Evaluation of Garil efficacy as post emergence herbicide in lowland rice

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ABSTRACT: A Randomised Complete Block Design experiment was carried out in three consecutive years (2005, 2006 and 2007) at the experimental site of National Cereals Research Institute, Badeggi, to evaluate the efficacy of Garil as a post emergence herbicide in lowland rice. Garil has propanil + triclopyr as its active ingredient. FARO 52 was the test crop and the rate of Garil used were 4, 5, 6l/ha compared with a check chemical Orizoplus^{R} at 5l/ha. Orizoplus^{R} is made up of Propanil and 2, 4 – D Amine. Two hand weeding at 21 and 42 days after transplanting and weedy plot were also included as part of the treatments in a plot size of 5m x 10m and three replicates. It was observed that Garil was not phytotoxic to rice when applied on rice field indicating that it can be safely used in rice field without causing damage to the rice plant. The three years' pooled result of the trial showed that application of Garil at 5 – 6l/ha is good for weed control in lowland rice field which will also result into higher yield.

Introduction

One of the common yield limiting factors in crop production is weed *(1)* and it is considered to be a serious pest in crop production. Weeds compete with crop for soil nutrients, water and light thereby depriving crops of limited essential resources *(2)*. Farmers need to combat the nuisance cause by weeds in crop field.

Two hand weeding have been recommended for many annual crops, including rice which is to be weeded at 3 and 6 weeks after sowing *(3)*. However, 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 *(4)*. Many times also, hand weeding becomes cost prohibitive in many areas because of the gradually shrinking labour pool *(5)*

The use of herbicide is faster, effective and also suitable for both small scale and commercial farming and it is a good alternative to hand weeding if properly handled within the context of Integrated Weed Management practices. Many Agrochemical companies do manufacture new products that needed to be tested and the efficacy ascertained before being recommended for use.

The objective of this trial is to determine the efficacy of Garil as post emergence herbicide for weed control in lowland rice.

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Materials and Methods

A Randomised Complete Block Design experiment was carried out in three consecutive years (2005, 2006 and 2007) at the experimental site of National Cereals Research Institute, Badeggi, located at Lat. 09^{o} 45'N; Long 06^{o} 7'E, ALT 50.57 MSL to evaluate the efficacy of Garil as a post emergence herbicide in lowland rice. Garil has propanil + triclopyr as its active ingredient. FARO 52 was the test crop and the rate of Garil used were 4, 5, 6l/ha compared with a check chemical Orizoplus^{R} at 5l/ha with 200 litres of water per hectare. Orizoplus^{R} is made up of Propanil and 2, 4 – D Amine.

Two hand weeding at 21 and 42 days after transplanting and weedy plot were also included as part of the treatments in a plot size of 5m x 10m and three replicates. Transplanting of 21 day-old seedlings was done on 15 August, 2005; 21 August, 2006 and 13 September 2007 respectively at a spacing of 20cm x 20cm and two seedlings per hill. The herbicides were applied post emergence at 14 days after transplanting of rice. Fertilizer application was applied basal at 40kgN/ha, 40kgP_2O_5/ha and 40kgK_2O/ha using NPK 15:15:15 fertilizer source at two weeks after transplanting. Top dressing using Urea 46% was done at six weeks after transplanting at 40KgN/ha. Collected data include: prevalent weed species at the first flush before herbicide application; phytotoxicity score at 1, 2 and 3 weeks after herbicide application; weed control rating at 1, 2 and 3 weeks after herbicide application; weed cover score at 1, 2 and 3 weeks after herbicide application; plant height at maturity; panicle number/hill at maturity and grain yield. The data for the three years were pooled and combine analysis of variance was carried out using IRRISTAT analytical software and where F-ratio was significant, means were separated using Least Significant Difference.

Results and Discussion

Weed occurrence

All the three categories of weeds (grasses, broadleaved and sedges) were present at the experimental site (Table 1). Within the grasses, *Echinochloa stagina* Beauv was most prominent followed by *Leersia hexandra* (Sw) while in the broadleaved weed category, *Ipomea aquatica* Forsk appeared more than *Aeschynomene indica* L. *Nymphae lotus* Linn. and *Eichhornia natans* (P. Beauv) Solms-laub were similar in occurrence. Three sedges prominently occurred in the three years of experimentation. They are *Cyperus difformis* L, *Cyperus esculentus* Linn and *Klinga pumila* Michx.

Phytotoxicity

It was observed that Garil was not phytotoxic to rice when applied on rice field as there was no sign of any phytotoxicity on rice as a result of the herbicide application (Table 2) indicating that it can be safely used in rice field without causing damage to the rice plant.

Weed control rating

The percentage weed control rating differed significantly between the rates of herbicide used at 1 and 2 weeks after application (Table 2). Garil at 6l/ha had higher control rating than at 4 and 5l/ha. By 3 weeks of application, all the herbicide rates did not differ in weed control rating. It was observed that Garil at 4 – 6l/ha gave very high weed control rating as compared to the check chemical, Orizoplus^{R} and 2 hand weeding plots. Weedy check plot gave significant lowest value. The values indicated that Garil at 4 – 6l/ha would efficiently control weeds in lowland rice.

Table 1: Weed occurrence status at the experimental site during the first flush before herbicide application in the 3 years of experimentation at Badeggi.

Weed species	Status of occurrence		
	2005	2006	2007
Grasses			
Cynodon dactylon (Linn) pers	-	++	+++
Leersia hexandra (Sw)	++	++	++
Echinochloa stagina Beauv	+++	+++	+++
Imperata cylindrical var Africana C.E. Hubbard	-	+	+
*Paspalum v*aginatum	+	-	-
Broadleaves			
Aeschynomene indica L	+	+	+
Ipomea aquatica Forsk	++	++	+
Nymphae lotus Linn	+	+	++
Eichhornia natans (P. Beauv) Solms-laub	+	++	+
Sedges			
Fimbrostylis difforalis Gaudet	-	+	+
Klinga pumila Michx	++	++	++
Cyperus haspan	++	-	-
Cyperus difformis L	++	++	++
Cyperus esculentus Linn	++	++	++

+ = low; ++ = moderate; +++ = high

Weed cover score

Percentage weed cover score indicated that the level of weed occurrence after herbicide application was lower in the herbicide treated plot than in the weedy check (Table 3). At 3 weeks after herbicide application, all the herbicide treated plots gave lower values that were not significantly different from one another but significantly lower than that of the weedy check. 2 Hand weeding plot was also comparable to the herbicide plots in having lower weed occurrence showing that hand weeding can similarly control weeds in lowland rice.

Plant height at maturity

Weedy check plot had the shortest significant rice plant height of 110.0cm at maturity (Table 3). The tallest rice plant height of 119.2cm was obtained in Orizoplus^{R} applied plot but was not significantly different from the rice plant height obtained in the rest herbicide treated plots. It showed that presence of weeds can reduce plant growth.

Panicle no/hill at maturity

Apart from the weedy check plot that had significantly lower value (Table 3), all other treatments were not significantly different in panicle no/hill and thus indicating that Garil application does not affect the panicle no/hill negatively.

Grain yield

Highest grain yield of 3023.1kg/ha was obtained at 6l/ha of Garil application (Table 3). Weedy check plot gave significantly lower grain yield of 1013.8kg/ha. Among the rates of Garil used, the grain yield obtained at 5 and 6l/ha was at per with that of the Orizoplus^{R} the check chemical and therefore, Garil application at 5 – 6l/ha is good for weed control in lowland rice field which will also result into higher grain yield.

Table 2: Three years' combined mean effect of Garil on phytotoxicity on rice and weed control rating in rice field.

		Phytotoxicity score			% weed control rating		
		Weeks after application					
Treatment		1	2	3	1	2	3
1.	Garil @ 4l/ha	0	0	0	12.6^{b}	64.5^{b}	76.7^{a}
2.	Garil @ 5l/ha	0	0	0	13.9^{b}	70.0^{ab}	81.1^{a}
3.	Garil @ 6l/ha	0	0	0	23.9^{a}	79.4^{a}	84.4^{a}
4.	Orizoplus^{R} @ 5l/ha	0	0	0	16.1^{ab}	76.6^{ab}	81.1^{a}
5.	2 H/W @ 21 & 42 DAT	-	-	-	0.0^{c}	74.1^{ab}	76.1^{a}
6.	Weedy check	-	-	-	0.0^{c}	0.0^{c}	0.0^{b}
SE±		-	-	-	3.0	4.0	2.9
CV%		-	-	-	47.2	11.3	7.5

Figures in the same column followed by the same letter (s) are not significantly different at P = 0.05 of LSD
DAT = Days after transplanting; H/W = Hand weeding
Phytotoxicity score: 0 – 10 where 0 = no phytotoxicity and 10 = complete crop kill.

Table 3: Three years' combined mean effect of Garil on weed cover score, plant height, panicle number and grain yield

		% Weed cover score					
		Weeks after application			Plant height	Panicle number	Grain yield
Treatment		1	2	3	at maturity, cm	per hill	kg/ha
1.	Garil @ 4l/ha	16.8^{b}	16.7^{b}	12.8^{b}	113.5^{ab}	18.9^{a}	2578.7^{a}
2.	Garil @ 5l/ha	16.2^{b}	15.0^{bc}	12.0^{b}	116.8^{a}	19.8^{a}	2873.2^{a}
3.	Garil @ 6l/ha	10.7^{c}	9.9^{c}	10.0^{b}	118.0^{a}	19.9^{a}	3023.1^{a}
4.	Orizoplus^{R} @ 5l/ha	13.8^{bc}	12.2^{bc}	13.2^{b}	119.2^{a}	19.2^{a}	2837.3^{a}
5.	2 H/W @ 21 & 42 DAT	24.9^{a}	12.1^{bc}	12.8^{b}	116.4^{a}	20.2^{a}	2774.4^{a}
6.	Weedy check	25.3^{a}	41.5^{a}	45.0^{a}	110.0^{b}	16.6^{b}	1013.8^{b}
SE±		1.3	2.2	3.3	1.9	0.6	185.7
CV%		12.6	21.0	32.1	2.9	5.4	12.8

Figures in the same column followed by the same letter (s) are not significantly different at P = 0.05 of LSD
DAT = Days after transplanting; H/W = Hand weeding

Conclusion and recommendation

This trial was carried out for three consecutive years (2005, 2006, and 2007) and thus recommendation can be given as to its performance. The three years' combined analysis indicated that Garil is not phytotoxic to rice and thus it can be safely used in lowland rice field without causing damage to rice plant. Also the level of weed control in rice field was appreciable. The grain yield is enhanced and the use of low volume of water (200l/ha) will reduce cost of input application. It is recommended that Garil could be safely used as post-emergence herbicide in lowland rice at the rate of 5 – 6l/ha.

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