

WEED SPECIES DIVERSITY AS INFLUENCED BY DIFFERENT HERBICIDE FORMULATIONS AND RATES IN LOWLAND RICE FIELDS IN NIGERIA

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ABSTRACT

Different formulated mixtures of Propanil + 375 ml MCPA, Propanil + 200ml MCPA, Propanil + 250ml MCPA, Propanil + 240 g ha⁻¹ Conday, 240g ha⁻¹ conday and Butachlor 4L ha⁻¹ along with Orizoplus at 4L ha⁻¹ as chemical check. Weedy check and 2 hand weeding at 3 and 6 weeks after transplanting were included in the treatments. The experiment was laid out in a Randomized Complete Block Design with three replicates at the experimental field of National Cereals Research Institute, Yandev and Badeggi, Nigeria. The variety of rice used was FARO 52 (WITA 4). Weed occurrence and their presence differed among the formulated herbicides. Both weed density and dry matter were lower while higher rice grain yield was recorded with the application of Orizoplus at 4 L ha⁻¹ and 2.4 kg propanil+375 ml MCPA ha⁻¹.

Key words: diversity, herbicide, formulations, rates, lowland rice.

Citation: Adagba, M.A., A.U. Gbanguba, A.A. Ndarubu, U. Ismaila and M.N. Ukwungwu. 2014. Weed species diversity as influenced by different herbicide formulations and rates in lowland rice fields in Nigeria. Pak. J. Weed Sci. Res. 20(1): 21-36.

INTRODUCTION

One of the most labor demanding operations in rice production is weed control. This is partly due to weed species diversity arising from continuous lowland rice production. Weeding by hand is the common practice of controlling weeds in Nigeria. However, this method is tedious due to shortage of labour and as such is usually curtailed and inadequately executed resulting in yield reductions due to weed competition. The use of herbicides in intensive rice cultivation is therefore rapidly gaining widespread acceptance among rice farmers

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in Nigeria. Therefore, there is a dire need to continuously evaluate new selective post emergence herbicides for broad spectrum weed control in rice field.

Keeping this in view, the present investigation was conducted to find out a selective broad spectrum herbicide for control of grasses, sedges and broad leaved weeds in a single spray in rice field as an alternative to the existing recommendations.

Therefore, the objective of this study was to determine the growth of different weed species under application of different herbicide formulations.

MATERIALS AND METHODS

A field trial was conducted at Badeggi (9⁰45'N, 60⁰7'E) and Yandev (8⁰18⁰, 7⁰20E) lowland fields during 2010 raining season. The experimental sites were ploughed and harrowed using a tractor. The treatments were as following, Orizo plus at 4 L ha⁻¹, 2.4 kg propanil plus 375 ml MCPA ha⁻¹, 2.4 kg propanil plus 200ml MCPA ha⁻¹, 2.4 kg propanil plus 120g condax ha⁻¹, applied at 3 weeks after planting, 1.6 kg propanil plus 250ml ha⁻¹ MCPA applied at 3 and 5 weeks after planting, 240g condax ha⁻¹ applied at planting and 3 weeks after planting and Butaclor 4L ha⁻¹ at planting stage.

Other treatments included hand weeding at 3 and 6 weeks after planting and a weedy check as the control. The trial was laid out in a Randomized Complete Block Design (RCBD) and replicated three times. The test rice variety was FARO 52. Data were on parameters of weed occurrences, weed density, weed dry matter, numbers of panicles m⁻², plant height at harvest and rice grain yield ha⁻¹.

All data collected were then subjected to statistical analysis and the means were compared using the least significant difference (LSD) at 5% level of probability.

RESULTS AND DISCUSSION

The predominant weeds found in the experimental fields at 3, 6 and 9 weeks after herbicide application are as indicated in Table-1, 2, 3, 4, 5 and 6.

At 3 weeks after herbicide application at Badeggi (Table-1) there was low occurrence of the broad leaves, *Melochia corchorifolia* and *Heteranthera callifolia* with Orizo plus at 4L ha⁻¹, 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹ and 240g Condax ha⁻¹, *Hydrolea glabra* and *Ipomea* spp. at 2.4 kg propanil +200ml MCPA ha⁻¹, 2.4 kg propanil +120g Condax ha⁻¹ and 1.6kg propanil + 250ml MCPA ha⁻¹, while *Hyptis lancoelata* was low in most of the treatments. The weedy check produced moderate to high occurrence of broad leaves. Among the

grasses *Acroceras ziranoides* and *Cynodon dactylon* appeared low with the application of Orizo plus and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹ and 2.4 kg propanil +120g Condax ha⁻¹, while the appearance of *Echinochloa* spp. and *Oryza longistaminata* was moderate. With exception of *Brachiara deplexa* and *Paspalum conjugatum*, the moderate appearances of other grasses were observed with the application of condax at 240g ha⁻¹. Among the Sedges *Scirpus Jacobi* had low appearance with Orizo plus at 4L ha⁻¹ and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹. All the other sedges had no appearance with the application of Orizo plus and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹ and 2.4 kg propanil +120g Condax ha⁻¹.

At 6 weeks after herbicide application (Table-2) the broad leaved weeds *Hyptis lancoelata*, *Melochia corchorifolia* and *Heteranthera callifolia* appeared at low to moderate status in all treatments with the exception of hand weeding. While *Ageratum conyzoides* did not appear with the application Orizo plus and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹. Among the grasses *Echinochloa Spp*, *Acroceras ziranoides* and *Oryza longistaminata* appeared generally moderately with the application of Orizo plus and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹. Only *Cynodon dactylon* had a low appearance in all the treatments. All the other grasses and sedges did not appear. Generally, the application of only Condax at 120g ha⁻¹ resulted into moderate appearance of grasses.

At 9 weeks after herbicide application (Table-3) *Hyptis lancoelata* appeared low with the application of Orizo plus and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹ while *Melochia corchorifolia* and *Heteranthera callifolia* appeared moderately in all the treatments except at 2.4 kg propanil +120g Condax ha⁻¹. Among the grasses and sedges same trend was observed as in 6 weeks after herbicide application.

At Yandev, 3, 6 and 9 weeks after herbicide application (Tables-4, -5 and -6) the broad leaves i.e. *Hyptis lancoelata*, *Melochia corchorifolia* and *Heteranthera callifolia* had appearances with the application of Orizo plus and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹. Among the grasses all the *Echinochloa* spp. and *Oryza*

longistaminata appeared generally moderately while *Cynodon dactylon* appeared low with Orizo plus and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹. With the exception of *Scripus Jacobi* most of the sedges did not appear with Orizo plu and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹.

The effects of application of formulated herbicides on weed density and weed dry matter at 3, 6 and 9 weeks after herbicide application are shown in Tables-7 and -8. The results indicated that hand weeding produced the least weed density and dry matter in all the sampling periods in both locations. Similarly, Orizo plus at 4L/ha and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹ produced lower weed density and dry matter than the weedy check.

The effects of application of formulated herbicides on rice plant height, panicles m⁻² and grain yield were presented in Table-8. Hand weeding produced taller rice plants, maximum number of panicles and rice grain yield. Similarly, the application of Orizo plus at 4L ha and all rates of 2.4 kg propanil +375ml MCPA ha⁻¹, 2.4 kg propanil +200ml MCPA ha⁻¹, 1.6kg propanil + 250ml MCPA ha⁻¹ produced rice plant height, panicles m⁻² and grain yield that were comparable to the maximum obtained on hand weeding in this study.

The predominant appearance of *Echinochloa Spp* and *Oryza longistaminata* might be due to their resistance to the herbicide applied and the result was similar to the findings of Bakare et al. (2008) who found *Echinochloa* spp. to be the most prominent grassy weeds in rice when evaluating formulated mixtures of Propanil plus Triclopyr for post-emergence weed control in lowland rice production. Weed density and dry matter were significantly affected by application of formulated herbicides. The highest weed density and dry matter were recorded in weedy check. The application of different formulations showed different weed control. These results are corroborated with those reported by Rao (2005) and further supported by the work of Patel et al. (1985) and Rao and Moody (1988), who obtained a variable control in rice nurseries with the use of different herbicides. The yield of rice produced by the use of herbicides were comparable with the farmer's practices of two hand weeding and all the herbicides performed similar, which resulted in almost the same yield except in Condux at 240g ha⁻¹ and Butachlor at 4L ha⁻¹. This agrees with the work of Abeysekera (2001) which shows that herbicides when used in rice suppressed weeds and increased the yield of rice.

CONCLUSION

Among the broad leaved weeds *Hyptis lancoelata*, *Melochia corchorifolia* and *Heteranthera callifolia* were resistant to all the rates of herbicides applied in this study. The grasses including *Echinochloa* spp., *Acroceras ziranioides*, *Oryza longistaminata*, and *Cynodon dactylon* as well as the sedges i.e. *Scripus Jacobi* were not controlled at all the rates of Orizo plus and 2.4 kg propanil +375ml MCPA ha⁻¹, and 2.4 kg propanil +200ml MCPA ha⁻¹. The application of Orizo plus at 4L ha⁻¹ and 2.4 kg propanil + 375 and 200 ml MCPA ha⁻¹ provided more effective and season long weed control. The split application of 1.6 kg propanil +250 mlMCPA ha⁻¹ and Butachlor at 4L ha⁻¹ were not effective on the weeds in this study. The application of Orizo plus at 4L ha⁻¹ and 2.4 kg propanil + 375 and 200 ml MCPA ha⁻¹ provided more effective and season long weed control which should be adopted the farmers.

ACKNOWLEDGMENT

The authors are thankful to the National Cereals Research Institute, Badeggi, Nigeria and the Candel Company Ltd., Lagos, Nigeria for their financial support and facilitation of the research conducted.

Table-1. Effect of post-emerg. herbicides on weed occurrence 3 wks after application in lowland rice at Badeggi during 2010

Weed species	Orizo plus 4L ha ⁻¹	2.4 kg propanil ha ⁻¹ + 375g MCPA	200g MCPA	1.6 kg prop. + 250 g MCPA	2.4 kg prop. +120 g condax	240g condax ha ⁻¹	Butaclor @ 4L ha ⁻¹	Hand weeding	Weedy check
Broad leaves									
<i>Ipomea Spp</i>	-	-	+	+	-	+	++	-	+++
<i>Hydrolea glabara</i>	-	-	+	+	-	+	++	-	+++
<i>Heliotropium idicum</i>	-	-	-	+	-	-	-	+	++
<i>Scoparia dulcis</i>	-	-	-	+	-	-	-	-	++
<i>Aeschynomene Spp</i>	-	-	-	-	+	++	+	-	+++
<i>Nympae lotus L.</i>	-	-	-	+	-	+	-	++	+++
<i>Ludwigia Spp</i>	-	-	-	+	-	+	+	+	+++
<i>Sphenoclea zeylanica</i>	-	-	-	-	-	+	+	-	+++
<i>Agerantun conyzoides</i>	-	-	-	-	-	+	++	-	++
<i>Hyptis lancoelata</i>	+	+	+	+	+	+	++	-	++
<i>Eichormia natans</i>	-	-	-	+	-	-	+	-	++
<i>Melochia corchorifolia</i>	+	+	+	+	-	+	++	-	+++
<i>Heteranthera califolia</i>	+	+	+	+	-	+	++	-	+++
Grasses									
<i>Echinochloa crus-pavonis</i>	++	++	++	++	++	++	++	+	+++
<i>Echinochloa obusiflora</i>	++	++	++	++	++	++	++	+	++
<i>Echinochloa colona</i>	++	++	++	++	++	++	++	+	++
<i>Leptochloa caerulscerns</i>	-	-	-	+	-	++	++	-	+++
<i>Paspalum orbicular</i>	-	-	-	-	-	++	++	-	++
<i>Leersia hexandra</i>	-	-	-	-	-	+++	++	+	+++
<i>Digitaria horizontalis</i>	-	-	-	++	-	++	+	+	+++
<i>Setaria pallid</i>	-	-	-	+	+	++	+	-	+++
<i>Brachiaria deplexa</i>	-	-	-	-	-	+	-	-	++
<i>Sacciolepis Africana</i>	-	-	-	+	-	++	+	-	+++
<i>Acroceras ziraniodes</i>	+	+	+	+	+	++	++	-	++
<i>Paspapalum conjugatum</i>	-	-	-	-	+	+	++	-	+++
<i>Oryza longistaminanta</i>	++	++	++	++	++	++	++	+	+++
<i>Cynodon dactlon</i>	+	+	+	+	+	++	+	+	+++
Sedges									

<i>Cyperus</i> spp.	-	-	-	+	-	++	+	-	+++
<i>Fimbristylis miliacea</i>	-	-	-	-	-	++	+	-	+++
<i>Scripus Jacobi</i>	+	+	+	+	-	+	+	-	+++
<i>Phychozpora carynbisa</i>	-	-	-	+	-	+	+	-	++
<i>Sclena verrucosa</i>	-	-	-	+	-	+	++	-	+++

High +++, Moderate ++, Low +, not present -

Table-2. Effect of post-emerg. herbicides on weed occurrence 6 wks after application in lowland rice at Badeggi during 2010

Weed species	Orizo plus @ 4L ha ⁻¹	2.4 kg propanil ha ⁻¹ +		1.6 kg prop.+ 250 g MCPA	2.4 kg prop.+ 120 g conдах	240g conдах ha ⁻¹	Butaclor @ 4L ha ⁻¹	Hand weeding	Weedy check
		375g MCPA	200g MCPA						
Broad leaves									
<i>Ipomea Spp</i>	-	-	+	+	-	+	++	-	+++
<i>Hydrolea glabara</i>	-	-	+	+	-	+	++	-	+++
<i>Heliotropium idicum</i>	-	-	-	+	-	-	-	-	++
<i>Scoparia dulcis</i>	-	-	+	+	+	++	+	+	+++
<i>Aeschynomene Spp</i>	-	-	-	-	+	++	+	-	+++
<i>Nympae lotus L.</i>	-	-	-	+	-	+	-	++	+++
<i>Ludwigia Spp</i>	-	-	-	+	-	+	+	+	+++
<i>Sphenoclea zeylanica</i>	-	-	+	+	-	++	++	-	+++
<i>Agerantun conyzoides</i>	-	-	-	-	-	+	+	-	++
<i>Hyptis lancoelata</i>	+	+	+	+	+	+	++	-	++
<i>Eichormia natans</i>	-	-	-	+	-	-	+	-	++
<i>Melochia corchorifolia</i>	+	+	+	++	+	++	++	-	+++
<i>Heteranthera califolia</i>	+	+	+	+	++	++	+	-	+++
Grasses									
<i>Echinochloa crus-pavonis</i>	++	++	++	++	++	++	++	+	+++
<i>Echinochloa obusiflora</i>	+	++	++	++	++	++	++	+	++
<i>Echinochloa colona</i>	++	++	++	+++	++	+++	+++	+	++
<i>Leptochloa caerulscerns</i>	-	-	-	+	-	++	++	-	+++
<i>Paspalum orbicular</i>	-	-	-	-	-	++	++	-	++
<i>Leersia hexandra</i>	-	-	-	-	-	+++	++	+	+++

<i>Digitaria horizontalis</i>	-	-	-	++	-	++	+	+	++
<i>Setaria pallid</i>	-	-	-	+	+	++	+	-	+++
<i>Brachiaria deplexa</i>	-	-	-	-	-	+	-	-	+++
<i>Sacciolepis Africana</i>	-	-	-	++	-	++	+++	-	+++
<i>Acroceras ziraniodes</i>	+	+	++	+	++	+++	++	-	+++
<i>Paspapalum conjugatum</i>	-	-	-	-	+	+	++	-	+++
<i>Oryza longistaminanta</i>	++	++	++	++	++	++	++	+	+++
<i>Cynodon dactlon</i>	+	+	+	+	+	++	+	+	+++
Sedges									
<i>Cyperus Spp</i>	-	-	-	++	+	++	+	-	+++
<i>Fimbristylis miliacea</i>	-	-	-	+	+	++	+	-	+++
<i>Scripus Jacobi</i>	+	+	+	+	-	+	+	-	+++
<i>Phychospora carynbisa</i>	-	-	-	+	-	+	+	-	++
<i>Sclena verrucosa</i>	-	-	-	+	-	+	++	-	+++
High +++, Moderate ++, Low +, not present -									

Table-3. Effect of post-emerg. herbicides on weed occurrence at 9 wks after application in lowland rice at Badeggi 2010

Weed species	Orizo plus @ 4L ha ⁻¹	2.4kg propanil ha ⁻¹ + 375g MCPA	200g MCPA	1.6kg prop.+ 250g MCPA	2.4 kg prop. + 120g condax	240g condax ha ⁻¹	Butaclor @ 4L ha ⁻¹	Hand weeding	Weedy check
Broad leaves									
<i>Ipomea Spp</i>	-	-	+	+	-	+	++	-	+++
<i>Hydrolea glabara</i>	-	-	+	+	-	+	++	-	+++
<i>Heliotropium idicum</i>	-	-	-	+	-	-	-	+	++
<i>Scoparia dulcis</i>	-	-	-	+	-	-	-	-	++
<i>Aeschynomene Spp</i>	-	-	-	-	+	++	+	-	+++
<i>Nympae lotus L.</i>	-	-	-	+	-	+	-	++	+++
<i>Ludwigia Spp</i>	-	-	++	+	-	+	+	+	+++
<i>Sphenoclea zeylanica</i>	-	-	+	-	-	+	+	-	+++
<i>Agerantun conyzoides</i>	-	-	-	-	-	+	++	-	++
<i>Hyptis lancoelata</i>	+	+	+	+	+	+	++	-	++
<i>Eichormia natans</i>	-	-	+	+	-	-	+	-	++
<i>Melochia corchorifolia</i>	+	+	+	+	-	+	++	-	+++

<i>Heteranthera califolia</i>	+	+	+	+	-	+	++	-	+++
Grasses									
<i>Echinochloa crus-pavonis</i>	++	++	++	++	++	++	++	+	+++
<i>Echinochloa obusiflora</i>	++	++	++	++	++	++	++	+	++
<i>Echinochloa colona</i>	++	++	++	++	++	++	++	+	++
<i>Leptochloa caerulscerns</i>	-	-	-	+	-	++	++	-	+++
<i>Paspalum orbicular</i>	-	-	-	-	-	+++	++	-	++
<i>Leersia hexandra</i>	-	-	-	-	-	+++	++	+	+++
<i>Digitaria horizontalis</i>	-	-	-	+++	-	++	+	+	+++
<i>Setaria pallid</i>	-	-	-	+	+	++	+	-	+++
<i>Brachiaria deplexa</i>	-	-	-	-	-	+	-	-	++
<i>Sacciolepis Africana</i>	-	-	-	+	-	++	+	-	+++
<i>Acroceras ziraniodes</i>	+	+	+	+	+	++	++	-	++
<i>Paspapalum conjugatum</i>	-	-	-	-	+	+	++	-	+++
<i>Oryza longistaminanta</i>	++	++	++	++	++	++	++	+	+++
<i>Cynodon dactlon</i>	+	+	+	+	+	++	+	+	+++
Sedges									
<i>Cyperus Spp</i>	-	-	-	+	-	++	+	-	+++
<i>Fimbristylis miliacea</i>	-	-	-	-	-	++	+	-	+++
<i>Scripus Jacobi</i>	+	+	+	+	-	+	+	-	+++
<i>Phychospora carynbisa</i>	-	-	-	+	-	+	+	-	++
<i>Sclena verrucosa</i>	-	-	-	+	-	+	++	-	+++

High +++, Moderate ++, Low +, not present -

Table-4. Effect of post-emerg. herbicides on weed occurrence at 3 wks after application in lowland rice at Yandev 2010

Weed species	Orizo	2.4 kg propanil ha ⁻¹ +		1.6kg	2.4 kg	240g	Butaclor @	Hand	Weedy
	plus @ 4L ha ⁻¹	375g MCPA	200g MCPA	prop.+ 250g MCPA	propanil + 120g condax	condax ha ⁻¹	4L ha ⁻¹		
Broad leaves									
<i>Ipomoea Spp</i>	-	-	+	+	-	+	++	-	+++
<i>Hydrolea glabara</i>	-	-	+	+	-	+	++	-	+++
<i>Heliotropium idicum</i>	-	-	-	+	-	-	-	+	++

<i>Scoparia dulcis</i>	-	-	-	+	-	-	-	-	++
<i>Aeschynomene Spp</i>	-	-	-	-	+	++	+	-	+++
<i>Nympae lotus L.</i>	-	-	-	+	-	+	-	++	+++
<i>Ludwigia Spp</i>	-	-	-	+	-	+	+	+	+++
<i>Sphenoclea zeylanica</i>	-	-	-	-	-	+	+	-	+++
<i>Agerantun conyzoides</i>	-	-	-	-	-	+	++	-	++
<i>Hyptis lancoelata</i>	+	+	+	+	+	+	++	-	++
<i>Eichormia natans</i>	-	-	-	+	-	-	+	-	++
<i>Melochia corchorifolia</i>	+	+	+	+	-	+	++	-	+++
<i>Heteranthera califolia</i>	+	+	+	+	-	+	++	-	+++
Grasses									
<i>Echinochloa crus-</i> <i>pavonis</i>	++	++	++	++	++	++	++	+	+++
<i>Echinochloa obusiflora</i>	++	++	++	++	++	++	++	+	++
<i>Echinochloa colona</i>	++	++	++	++	++	++	++	+	++
<i>Leptochloa caerulscerns</i>	-	-	-	+	-	++	++	-	+++
<i>Paspalum orbicular</i>	-	-	-	-	-	++	++	-	++
<i>Leersia hexandra</i>	-	-	-	-	-	+++	++	+	+++
<i>Digitaria horizontalis</i>	-	-	-	++	-	++	+	+	+++
<i>Setaria pallid</i>	-	-	-	+	++	++	+	-	+++
<i>Brachiaria deplexa</i>	-	-	-	-	++	+	-	-	++
<i>Sacciolepis Africana</i>	-	-	-	++	-	++	+	-	+++
<i>Acroceras ziraniodes</i>	+	+	+	+	+++	++	++	-	++
<i>Paspalum conjugatum</i>	-	-	-	++	++	+	++	-	+++
<i>Oryza longistaminanta</i>	++	++	++	++	++	++	++	+	+++
<i>Cynodon dactlon</i>	+	+	+	+	+	++	+	+	+++
Sedges									
<i>Cyperus Spp</i>	-	-	-	+	-	++	+	-	+++
<i>Fimbristylis miliacea</i>	-	-	-	-	-	++	+	-	+++
<i>Scripus Jacobi</i>	+	+	+	+	-	+	+	-	+++
<i>Phychospora carynbisa</i>	-	-	-	+	-	+	+	-	++
<i>Sclena verrucosa</i>	-	-	-	+	-	+	++	-	+++

High +++, Moderate ++, Low +, not present -

<i>Cynodon dactlon</i>	+	+	+	+	+	++	+	+	+++
Sedges									
<i>Cyperus Spp</i>	-	-	-	+	-	++	+	-	+++
<i>Fimbristylis miliacea</i>	-	-	-	-	-	++	+	-	+++
<i>Scripus Jacobi</i>	+	+	+	+	-	+	+	-	+++
<i>Phychospora carynbisa</i>	-	-	-	+	-	+	+	-	++
<i>Sclena verrucosa</i>	-	-	-	+	-	+	++	-	+++

High +++, Moderate ++, Low +, not present -

Table-6. Effect of post-emerg. herbicides on weed occurrence at 9 wks after application in lowland rice at Yandev 2010

Weed species	Orizo plus @ 4L/ha	2.4 kg 375g MCPA	propanil/ha 200g MCPA	1.6kg prop.+ 250g MCPA	2.4 kg prop. + 120g conda	240g conda ha ⁻¹	Butaclor @ 4L ha ⁻¹	Hand weeding	Weedy check
Broad leaves									
<i>Ipomea Spp</i>	-	-	+	+	-	+	++	-	+++
<i>Hydrolea glabara</i>	-	-	+	+	-	+	++	-	+++
<i>Heliotropium idicum</i>	-	-	-	+	-	-	-	+	++
<i>Scoparia dulcis</i>	-	-	-	+	-	-	-	-	++
<i>Aeschynomene Spp</i>	-	-	-	-	+	++	+	-	+++
<i>Nympae lotus L.</i>	-	-	-	+	-	+	-	++	+++
<i>Ludwigia Spp</i>	-	-	-	+	-	+	+	+	+++
<i>Sphenoclea zeylanica</i>	-	-	-	-	-	+	+	-	+++
<i>Agerantun conyzoides</i>	-	-	-	-	-	+	++	-	++
<i>Hyptis lancoelata</i>	+	+	+	+	+	+	++	-	++
<i>Eichormia natans</i>	-	-	-	+	-	-	+	-	++
<i>Melochia corchorifolia</i>	+	+	+	+	-	+	++	-	+++
<i>Heteranthera califolia</i>	+	+	+	+	-	+	++	-	+++
Grasses									
<i>Echinochloa crus-pavonis</i>	++	++	++	++	++	++	++	+	+++
<i>Echinochloa obusiflora</i>	++	++	++	++	++	++	++	+	++
<i>Echinochloa colona</i>	++	++	++	++	++	++	++	+	++
<i>Leptochloa caerulscerns</i>	-	-	-	++	-	++	++	-	+++
<i>Paspalum orbicular</i>	-	-	-	-	-	++	++	-	++

<i>Leersia hexandra</i>	-	-	-	-	-	+++	++	+	+++
<i>Digitaria horizontalis</i>	-	-	-	++	-	++	+	+	+++
<i>Setaria pallid</i>	-	-	-	+	+++	++	++	-	+++
<i>Brachiaria deplexa</i>	-	-	-	-	++	+	+	-	++
<i>Sacciolepis Africana</i>	-	-	-	+	-	++	+	-	+++
<i>Acroceras ziraniodes</i>	+	+	+	+	-	++	++	-	++
<i>Paspalum conjugatum</i>	-	-	-	-	-	+	++	-	+++
<i>Oryza longistaminanta</i>	++	++	++	++	+++	++	++	+	+++
<i>Cynodon dactlon</i>	+	+	+	+	++	++	+	+	+++
Sedges									
<i>Cyperus Spp</i>	-	-	-	+	-	++	+	-	+++
<i>Fimbristylis miliacea</i>	-	-	-	-	-	++	+	-	+++
<i>Scripus Jacobi</i>	+	+	+	+	-	+	+	-	+++
<i>Phychospora carynbisa</i>	-	-	-	+	-	+	+	-	++
<i>Sclena verrucosa</i>	-	-	-	+	-	+	++	-	+++

High +++, Moderate ++, Low +, not presen

Table-7. Effect of different herbicide formulations and rates on weed density (m^{-2})

Treatments	3 Weeks after herbicide application		6 Weeks after herbicide application		9 Weeks after herbicide application	
	Badeggi	Yandev	Badeggi	Yandev	Badeggi	Yandev
	Orizo plus 4L ha ⁻¹	50	99	52	76	97
2.4 kg propanil plus 375ml MCPA ha ⁻¹	51	111	57	75	96	112
2.4 kg propanil plus 200ml MCPA ha ⁻¹	57	112	59	76	96	118
1.6 kg propanil plus 250ml MCPA ha ⁻¹	70	121	66	83	100	131
2.4 kg propanil plus 120g Condax ha ⁻¹	60	122	59	77	101	143
240gCondax ha ⁻¹	97	132	100	112	132	156
Butachlor 4L ha ⁻¹	100	138	70	100	141	162
Hand weeding	41	78	49	52	65	82
Weedy check	161	257	139	172	176	222
SE±	8.2	9.1	2.9	4.8	4.2	4.5
CV%	18.4	18.9	16.8	10.6	11.9	15.2

Table-8. Effect of different herbicide formulations and rates on weed dry matter (g m^{-2})

Treatments	3 Weeks after herbicide application		6 Weeks after herbicide application		9 Weeks after herbicide application	
	Badeggi	Yandev	Badeggi	Yandev	Badeggi	Yandev
Orizo plus 4L ha^{-1}	79.0	111.3	118.4	121.4	161.3	187.9
2.4 kg propanil plus 375ml MCPA ha^{-1}	89.3	112.2	129.0	132.0	162.4	186.8
2.4 kg propanil plus 200ml MCPA ha^{-1}	88.4	112.4	130.3	133.2	164.8	190.2
1.6 kg propanil plus 250ml MCPA ha^{-1}	100.3	125.5	137.9	145.0	170.6	201.8
2.4 kg propanil plus 120g Condax ha^{-1}	101.4	121.7	130.7	134.9	181.4	207.6
240g Condax ha^{-1}	101.3	132.0	157.0	166.3	199.9	221.3
Butachlor 4L ha^{-1}	119.3	136.8	163.6	173.8	201.2	245.6
Hand weeding	56.7	76.9	97.0	111.2	99.6	111
Weedy check	137.3	198.6	170.7	190.3	278.9	321.9
SE±	1.8	1.4	9.3	3.7	3.7	3.8
CV%	11.2	12.6	13.5	14.4	13.3	15.8

Table-9. Effect of different herbicide formulations and rates on yield and yield component of rice

Treatments	Rice plant height (cm)		Panicles m ⁻²		Rice grain yield (t ha ⁻¹)	
	Badeggi	Yandev	Badeggi	Yandev	Badeggi	Yandev
Orizo plus 4L ha ⁻¹	121.0	120.1	260	251	3.9	2.9
2.4 kg propanil plus 375ml MCPA ha ⁻¹	121.3	120.0	260	250	3.9	2.9
2.4 kg propanil plus 200ml MCPA ha ⁻¹	121.0	120.0	260	250	3.9	2.8
1.6 kg propanil plus 250ml MCPA ha ⁻¹	120.3	119.5	259	248	2.1	2.0
2.4 kg propanil plus 120g Condax ha ⁻¹	119.3	114.0	249	237	3.0	2.8
240g Condax ha ⁻¹	199.3	119.0	175	155	1.9	1.1
Butachlor 4L ha ⁻¹	119.2	119.0	170	151	1.9	1.1
Hand weeding	127.0	126.1	260	252	4.1	3.7
Weedy check	106.7	105.9	151	123	1.0	0.7
SE±	3.2	2.9	8.2	4.9	1.2	0.9
CV%	6.1	4.9	5.3	6.3	14.3	12.9

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