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Short communication

Weed management in lowland rice in Makurdi, Nigeria

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Rice includes over twenty wild species and two cultivated species *Oryza sativa* Linn, (Asian rice) and *Oryza glaberrima* Steud (African rice) (Nwapu 2003). It is the grain with second-highest worldwide production after maize. Asian rice (*Oryza sativa* L.) has taken the pride of place in Africa over the traditional *Oryza glaberrima* and is being grown by farmers across the continent (Ng *et al.* 1988). Sub-Sahara Africa, and West Africa is the leading producer and consumer of rice. West Africa accounts for 64.2% and 61.2% of total rice production and consumption in the sub-Sahara Africa, respectively. Nigeria is said to rank highest as the producer and consumer of rice in the sub-region with figures slightly above 50%. In Nigeria, the crop is very important in the food economy, and is the only crop that is cultivated in all agro-ecological zones from coastal swamp to Sahel. The annual average consumption of the stable for an average Nigerian is as high as 24.8 kg of rice, which represent 9% of the total calorie intake.

Rice production in Benue state accounts for as much as 40% of total grown in Nigeria (Avav and Uza 2002). The fertile Fadama or flood plains of river Benue support much of the production. Most farms ranged in size from about 0.5 - 3.0 ha. However, the yield of rice is greatly affected by weeds. The weeds along with harboring insects, compete with crop for water, light and plant nutrient and adversely affect the micro-climate around the plant (Nojavan 2001). Therefore, study was done to determine the effect of some weed management methods on the yield of lowland rice at Makurdi, Nigeria.

The experiment was conducted between July to December, 2012 at the Teaching and Research Farm of Federal University of Agriculture, Makurdi (07^0 41^0N, 08^0E and 98m above sea level) in Southern Guinea Savannah agro-ecology zone in Nigeria. The experiment contained seven treatments in a randomized complete block design (RCBD) with three replications. The gross plot size was 4 x 4 m (16 m^2). The experimental site was sprayed with glyphosate at 1.44 kg/ha, 18 days before cultivation of the land. Thereafter, when the sprayed field had dried the land was cleared of the dried grasses and trees by slashing with cutlasses. The land was tilled by hand and made into flat seed beds using a hoe. The variety of rice *'Faro 44 (SIPI 692033)'* was used. Sowing was done on the 14th July, 2012 by broadcasting the rice seeds at 80 kg/ha. Two hoe weeding were carried out according to treatments. The first hoe-weeding was done 3 weeks after sowing (WAS) while the second hoe-weeding was done 6 WAS. Herbicides were applied according to treatments as conventional tillage followed by (*fb*) 2,4-D at 1.44 kg/ha at 3 weeks after planting (WAS), conventional tillage *fb* propanil at 1.44 kg/ha at 3 WAS, conventional tillage *fb* one hoe weeding at 3 WAS, conventional tillage *fb* pendimethalin at 0.66 kg/ha, conventional tillage *fb* hoe weeding at 3 and 6 WAS, conventional tillage *fb* 2,4-D + propanil at 1.44 kg/ha at 3 WAS, conventional tillage and no weed control. Data was collected to determine the effect of the different weed management methods on the yield of lowland rice, Before the land was sprayed with glyphosate (1.44 kg/ha), an identification of the exiting weeds was made. Data on weed count was taken at 3 WAS using one meter square quadrant randomly. Three plants were selected at random from a replicated treatment and the number- of tillers per plant were counted. The height of rice plant was determined at maturity by taking three plants at randomly from each replication. Yield pareamers and yield data were taken. The experimental data was subjected to analysis of variance and the treatments were separated based on the fisher's least significant difference (F–LSD) at 5% level of probability (0.05--).

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Effect on weeds

The composition of weeds in the rice at 8 WAS had more of grasses and broad-leaved weeds dominating the experimental sites (**Table 1**). Treatment with 2,4-D at 3 WAS had the highest

Table 1. Common weeds at the experimental site

Family	Name of Weed	Level of Infestation
Grasses		
Poaceae	*Panicum laxum* Sw	+++
Poaceae	*Imperata cylindrica L.*	+++
Poaceae	*Rottboaellia cochinchinensis* Lour	+++
Poaceae	*Paspalum scrobiculatum* Linn	++
Poaceae	*Leptochloa caerulescens* Steud	+
Poaceae	*Echinochloa colona* Linn	+
Broad-leaves		
Asteraceae	Ageratum conyzoides	+++
Asteraceae	Tridax procumbens Linn	++
Poaceae	Panicum subalbidum Kunth	++
Onagraceae	Ludwigia hyssopifolia	+
Onagraceae	Ludwigia abyssinica A. rich	+
Amaranthaceae	Alternanthera sessilis Linn	+
Araceae	Pistia stratioles Linn	+

+++ = High Infestation; ++ = Medium Infestation; + = Low Infestation

number of grasses while 2,4-D + propanil at 3 WAS had the highest composition of broad-leaved weeds. The dominance of the experimental site by grasses indicated that grasses dominate the natural fallow in the study area. The dominance of grasses in plots treated with 2,4-D at 1.44 kg/ha was due to its low effect on grasses as conformed with Akobundu's report (1987). The dominance of broad-leaved weed in 2,4-D + propanil plots at 1.44 kg/ha + 1.44 kg/ha was due to the fact that the mixture of such herbicide does not have severe effect on broad-leaved weeds as single application does (**Table 2**). The synergistic effect as shown by Akobundu (1987) on weed has more effect on grasses than on broad-leaves, therefore favoring the establishment of broad-leaved weeds over grasses.

Effect of weed control on growth

The highest number of tillers (68.3) was found in plots treated with propanil at 3 WAS and 2 hoe weeding at 3 and 6 WAS gave 58.7 and 57.3 tillers, respectively. However, 44.0 number of tillers were obtained in treatment of 2,4-D at 3 WAS, which was the lowest among all other treatments, but was significantly superior to control plot (**Table 3**). This was explained by Fageria *et al.* (1997) that the decrease in the number of tillers per plant was attributed to the death of some of the last tillers as a result of their failure in competition for light and nutrient. Hoe weeded plots at 3 and 6 WAS enhanced plant height upto 113.9 cm at full maturity, followed by plots treated with propanil at 3 WAS, which resulted plant height of 133.9 cm at full maturity. Plots of 2,4-D + propanil resulted 114.8 cm plant height at maturity.

Effect on yield

The number of grains per panicle was not significantly affected by treatments including the

Table 2. Effect of weed management methods on weed composition

Treatment	Grasses (%)	Broad-leaved (%)
Conventional tillage followed by (*fb*) 2,4-D at 1.44 kg/ha at 3 Weeks after planting (WAS)	56.30	43.70
Conventional tillage *fb* propanil at 1.44 kg/ha at 3 WAS	51.10	48.90
Conventional tillage *fb* one Hoe weeding at 3 WAS	53.70	46.30
Conventional tillage *fb* pendimethalin at 0.66 kg/h	48.80	51.20
Conventional tillage *fb* Hoe weeding at 3 and 6 WAS	46.10	53.90
Conventional tillage *fb* 2,4-D + propanil at 1.44 kg/ha at 3 WAS	45.80	54.20
Conventional tillage, no weed control	54.00	46.00
LSD (p=0.05)	NS	NS

Table 3. Effect of weed control methods on number of tillers per plant and plant height

Treatment	Number of tillers per plant at 6 WAS (no./plant)	Plant Height at 9 WAS (cm)	Number of grains/ panicle	Grain yield (t/ha)	1000-grain weight (g)
Conventional tillage followed by (*fb*) 2,4-D at 1.44 kg/ha at 3 Weeks after planting (WAS)	44.00	85.90	186	1.07	24.00
Conventional tillage *fb* propanil at 1.44 kg/ha at 3 WAS	58.70	133.90	312	1.41	26.00
Conventional tillage *fb* one Hoe weeding at 3 WAS	46.30	104.80	268	2.03	25.27
Conventional tillage *fb* pendimethalin at 0.66 kg/h	46.70	103.40	237	1.22	23.17
Conventional tillage *fb* Hoe weeding at 3 and 6 WAS	57.30	141.70	300	2.45	25.37
Conventional tillage *fb* 2,4-D + propanil at 1.44 kg/ha at 3 WAS	47.70	114.80	356	2.33	25.10
Conventional tillage, no weed control	68.30	110.40	281	0.83	24.47
LSD (p=0.05)	NS	NS	NS	NS	NS

SE = Standard Error; $LSD_{0.05}$ = Least Significant Different; NS = Not significantly different at 5% level of probability (FLSD)

control plots. The plots with treatments of 2,4-D + propanil at 3 WAS had the highest number of grains/ panicle as 356.00. This was followed by plots of 2 hoe weeding, which resulted in 281.0 number of grains/panicle while one hoe weeding resulted 268.0 number of grains/ panicle. Plots of pendimethalin had 237.0 number of panicle while 186.0 grains/panicle were obtained from 2,4-D treated plots (**Table 3**). Akobundu and Ahissou (1984) found that weed interference in rice adversely affect greatly, yield component such as tillering, panicle numbers as well as number of grains per panicle. The hoe weeding at 3 and 6 weeks gave the highest yield of 2.45 t/ha. Although, this was not significantly different from plots applied with 2,4-D + propanil at 3 WAS, which yielded 2.33 t/ha. Propanil at 3 WAS and pendimethalin *fb* 2, 4-D at 3 WAS also yielded 1.41 t/ ha and 1.07 t/ha respectively. The lowest yield of 0.83 t/ha was obtained in control plots. Singh *et al*. (1994) reported that combine application of herbicide and 2 mechanical hoe weeding was more effective in reducing weed growth and maximizing grain yield.

It was concluded that relative high yield was obtained from herbicides treated plots especially with 2,4-D + propanil For higher yield in lowland rice production at Makurdi, 2 hoe weeding at 3 and 6 WAS or application of a mixture of 2,4-D + propanil at 1.44 kg/ha + 1.44 kg/ha can be recommended.

SUMMARY

A trial was conducted on the research farm of Federal University of Agriculture, Makurdi, Nigeria during 2012 cropping season to evaluate the effect of weed management methods on the yield of lowland rice using the variety '*FARO 44 (SIPI 692030)*'. Seven treatments included conventional tillage (CT) with 2,4-D at 1.44 kg/ha at 3 WAS, CT followed by propanil applied at 1.44 kg/ha at 3 weeks after planting (WAS), CT followed by one hoe weeding at 3 WAS, CT followed by pendimethalin applied at 1.44 kg/ha, CT followed by 2 hoe weeding at 3 and 9 WAS, CT followed by 2,4-D + propanil 3 WAS at 1.44 kg/ha + 1.44 kg/ha, CT, no weed control. Results indicated that, although there was no significant differences. Trend showed that CT followed by 2 hoe weeding at 3 and 9 WAS gave the highest ($p<0.005$) yield of 2.45 t/ha followed by CT followed by 2,4-D + propanil at 1.44 kg/ha + 1.44 kg/ ha with 2.33 t/ha. Lowest yield of 0.83 t/ha was obtained from the control plot.

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