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Full Length Research Paper

Effect of cassava/legumes intercrop before rice on weed dynamics and rice grain yield at Badeggi, Nigeria

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A trial was carried out at the lowland experimental field of National Cereals Research Institute, Badeggi, Nigeria during the cropping seasons of 2005 and 2006 to determine the effect of preceding lowland rice with cassava/legume intercrop in the dry season on weed dynamics and rice grain yield. The treatments consisted of FARO 52 rice variety cultivated after cassava (IIT 427 and Bida local) intercropped with *Mucuna pruriens,* Soybean TGX 1019 – 2EN and Cowpea IAR 48 and sole cassava (IIT 427 and Bida local) and fallow as the control. The treatments were factorials combined and arranged in a randomized complete block design and replicated three times each year. The results indicated that the least weed dry matter and percentage weed cover score were obtained when rice was cropped after cassava IIT 427 intercropped with *M. pruriens,* also in plots where cassava Bida local was intercropped with *M. pruriens.* The highest weed dry matter and occurrence of troublesome weeds such as *Leersia hexandra, Echinochloa colona* and *Echinochloa stagnina* were recorded in rice grown after fallow. The highest grain was obtained in rice cultivated after cassava cowpea intercrop.

Key words: Cassava/legume intercrop, weed dynamics.

INTRODUCTION

Rice is the major staple food in the developing world and its production is essential for many economically poor countries. For some of these, chemical weed control has become a normal practice where herbicides such as propanil, thiobencarb, butachlor, oxadiazon, among others are currently used in pre - or post – emergence applications. Although such treatments have increased farmers′ productivity they also have brought about proliferation of some difficult – to – control weed species, for which chemicals do not appear to be solution in long term (Labrada, 2003). Weeds are the cause of serious yield reduction problems in rice production worldwide. Losses caused by weeds vary from one country to another, depending on the predominant weed flora and on the control methods practiced by farmers (Williams et al., 1990). David (1996) reported that yield losses due to uncontrolled weed growth in transplanted lowland rice were approximately 50%. It is rare however, for farmers not to undertake some weed control and therefore losses on farmers' fields are likely to be considerably less. Williams et al. (1990) observed that rice growers are spending more for weed control.

The value of good cultural practices cannot be underestimated in their importance to weed management. Although they are generally not enough by themselves, good practices can greatly suppress weeds and enhance the effectiveness of herbicides used in combination with them. Most, if not all of these cultural methods will be a necessary part of crop management anyway, so in controlling weeds, they become extremely cost effective (Albert and James, 2004). Crop rotation may be an effective practice for controlling serious weeds because it introduces conditions that affect weed growth and reproduction which may greatly reduce weed density (Ricardo et al., 1999). In addition, Forcella and Lindstrom (1988) reported that after seven to eight years of weed

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Table 1. Predominant weeds identified during the experiment 2005 and 2006.

Weed species	Degree of occurrence	
	2005	2006
Broad leaf		
Aeschynomene spp	+	++
Nymphaea lotus L.	++	+++
Ludwigia spp	++	+++
Commelina diffusa Burm.f.	+	+
Sphenoclea zeylanica Gaertn.	+	++
Ipomoea spp	+	+
Grasses		
Acroceras zizanioides Dandy	++	+
Echinochloa spp	++	+
Leersia hexandra Sw.	++	+
Paspalum scrobiculatum L.	+	+
Oryza longistaminata (L.) Vahl.	++	+
Cynodon dactylon (L)Pers.	+++	++
Sedges		
Cyperus spp	+	++
Fimbristylis miliacea (L.) Vahl.	+	-

- Not present, + Low, ++ Medium and +++ High.

management the number of weed seeds was six times greater in continuous crop than in a rotated system. Another benefit of crop rotation may be associated with a chance of selecting troublesome weeds (Ball, 1992).

Omafra (2006) stated that crop rotation in an important strategy for developing a sound long - term weed control programme. Weeds tend to thrive with crops of similar growth requirements as their own, and cultural practices designed to contribute to the crop may also benefit the growth and development of weeds. Though Albert and James (2004) reported that not all rice soils can be rotated to other crops. However, rotation out of rice can greatly reduce weed population in subsequent rice crops. Rotating to crops for which effective controls are available is one of the best ways to manage weeds that cannot be selectively controlled with herbicides and cultural practices in rice. Herbicide-based weed management is becoming the most popular method of weed control in rice. However, while herbicide application certainly controls several weeds, it does not eliminate others, thereby provoking a weed shift of tolerant species. In some areas it is believed that herbicide use will solve all weed problems.

Experience shows, however, that although herbicide use alleviates the problem of labour for weeding, incorrect use of herbicides may bring about other environmental problems. The advent of herbicide-resistant species is an increasingly worrying problem for farmers, extension workers and policy-makers in many rice-producing areas. The existing practice of recommending herbicide is found to be inadequate in controlling the above weed menace. Rotating rice with other crops has not gained much recognition in term of weed management perspective. Therefore, the purpose of this study was to determine the influence of pre - rice cropping on weed infestation in low land rice.

MATERIALS AND METHODS

The trial was carried out during the cropping seasons of 2005 and 2006 at lowland experimental field of National Cereals Research Institute, Badeggi with mean annual rain fall of 1207.1 and 1131.6 mm in 2005 and 2006 respectively, and located in (LAT.9°45N, LOG 60°7E, ALT.70.57M) in the Southern Guinea Savannah zone of Nigeria. The trial was carried out to determine the effect of relaying lowland rice with cassava/legume intercrop grown in preceding dry season on weed infestation and rice grain yield. Relay cropping is the growing of two or more crops on the same field with the planting of the second crop after the first one has completed its development (Osita, 2005). The treatments consisted of (FARO 52) rice variety cultivated after cassava IIT 427 intercropped with *M. pruriens,* Soybean TGX 1019 – 2EN, Cowpea IAR 48 or cassava Bida local intercropped with *M. pruriens,* Soybean TGX 1019 – 2EN, Cowpea IAR and sole cassava and fallow as the control.

The treatments were factorials combined and arranged in randomized complete block design and replicated three times in each year of the study. The plot size was 5 x 6 m. Bunds were constructed to demarcate end of plots and control water. The field was puddled manually and transplanting was done at spacing of 20 x 20 cm at one seedling per hill (45 kg seed rate per hectare) on 16th September and 15th September of 2005 and 2006 respectively, seedling was transplanted at age of 21 days. Hand weeding was done 4 and 8 weeks after transplanting (WAT). Fertilizer was applied at rate of 80 - 40 - 40 N, P_2O_5 and K_2O Kg/ha (NCRI, 1997) at 4 weeks after transplanting. Data collected were percentage weed species composition during the growth of crop, weed density (m^{-2}) and weed dry matter (g m^{-2}) at 4 and 8 weeks after transplanting, rice tiller number, rice plant height in cm at harvest and rice grain yield t ha^{-1}.

All data collected were subjected to analysis of variance (ANOVA) using statistical package M-Stat-C Version 1.3 (Snedecor and Cochran, 1967) and the significant means were separated using the Duncan Multiple Range Test (Duncan, 1955) at 5% probability.

RESULTS AND DISCUSSION

Weed parameters

The prominent weeds identified in the experimental plot included all categories of weeds broad leaf, grasses and sedges (Table 1). The different weed species found in these plots were in line with the findings of Sattin and Berti (2006), who reported that weed flora usually includes several species that contemporarily infest the same field. It was observed that the highest weed number was recorded in fallow plots in the two years of study. Throughout the period of study the least weed

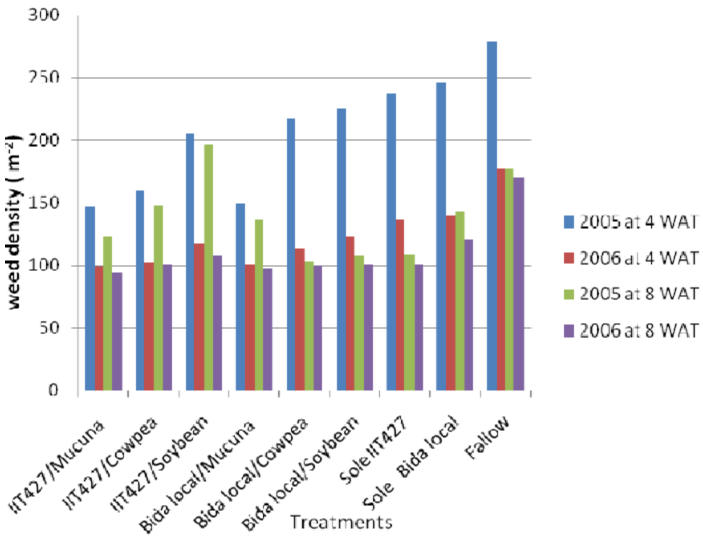

Figure 1. Effects of relaying cassava/legume intercrop with rice on weed density (m^{-2}) at 4 and 8 weeks after transplanting (WAT).

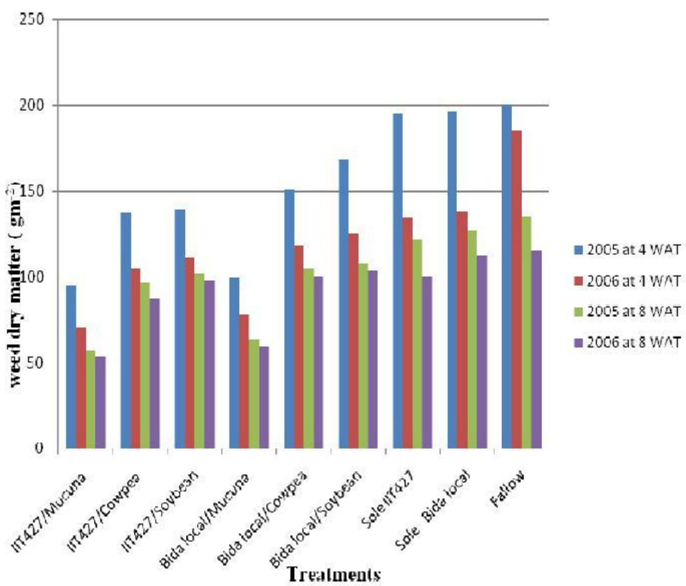

Figure 2. Effects of relaying cassava/legume intercrop with on weed dry matter (gm^{-2}) at 4 and 8 weeks after transplanting (WAT).

number was observed in rice grown after Cassava IIT427 intercrop with *M. pruriens*. Also when observed the weed number in rice grown after sole cassava the least found in Cassava IIT427 variety. It was also observed that weed species number recorded in each treatment was lower in 2006 than 2005 (Figure 1) and this agreed with Forcella and Lindstrom (1988) who reported that after seven to eight years of weed management the number of weed seeds was six time greater in continuous crop than

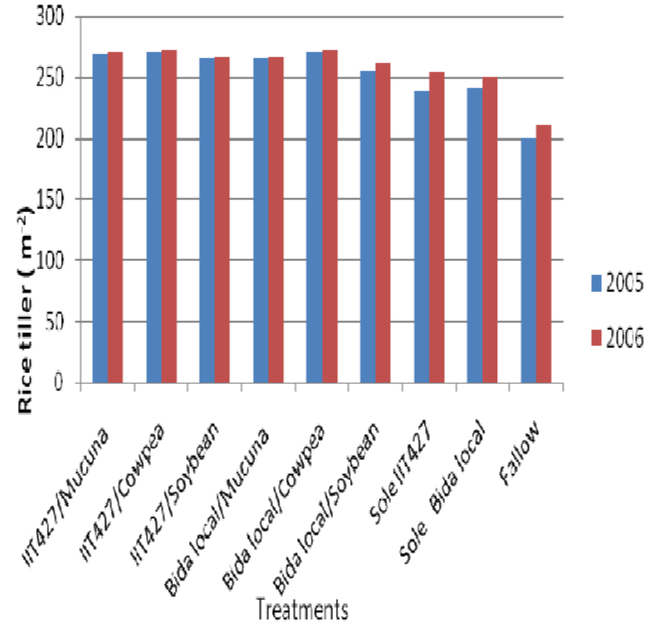

Figure 3. Effects of relaying cassava/legume intercrop with rice on rice tiller (m^{-2}).

in a rotated system.

The highest weed number recorded in fallow plots also agreed with Ricardo et al. (1999) that crop rotation may be an effective practice for controlling serious weeds because it introduces conditions that affect weed growth and reproduction which may greatly reduce weed density. While the least number of weeds found in rice grown after cassava intercrops is in consonance with that of Albert and James (2004) that rotation out of rice can greatly reduce weed population in subsequent rice crops. Also Hooda (2002) reported that when upland crops are rotated with rice, the population *Scripus maritimus* weed has been reduced drastically even without adoption of weed control measures. The weed dry matter at 4 and 8 weeks after planting followed trend of weed density in which the highest was recorded in plots grown with rice after fallow and also the weed dry matter recorded in each plot was higher in 2005 than 2006 (Figure 2). Rice tiller per stool was affected by pre - rice cropping in which rice grown after cassava IIT 427 and Bida local intercrop with cowpea produced higher tiller number which was not differ significantly with what was recorded in cassava IIT 427 intercrop with *M. pruriens* in the two years of study. Rice grown after fallow recorded the least tiller number. This agreed with Mahdi et al. (2007) that crop rotation can improve yield and profitability over time.

It was also observed that rice tiller number found in each treatment was higher in 2006 than 2005 (Figure 3). Rice panicle was affected by pre rice cropping in which the highest was obtained in rice after cassava cowpea intercrop (Figure 4). There was also significant effect of

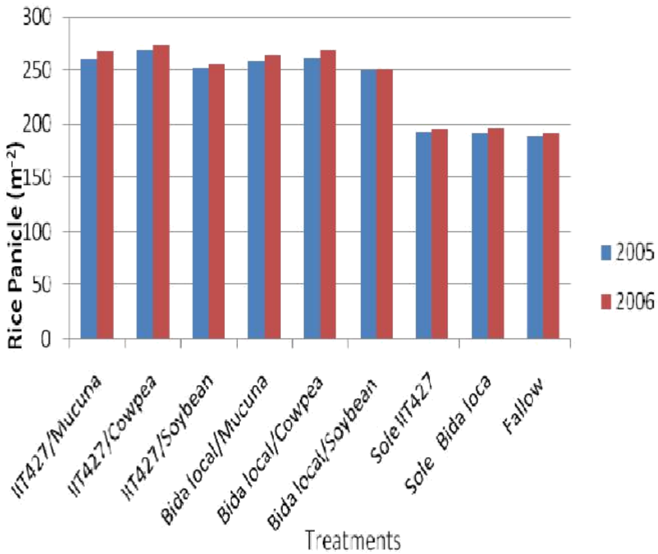

Figure 4. Effects of relaying cassava/legume intercrop with rice on rice panicle (m^{-2}).

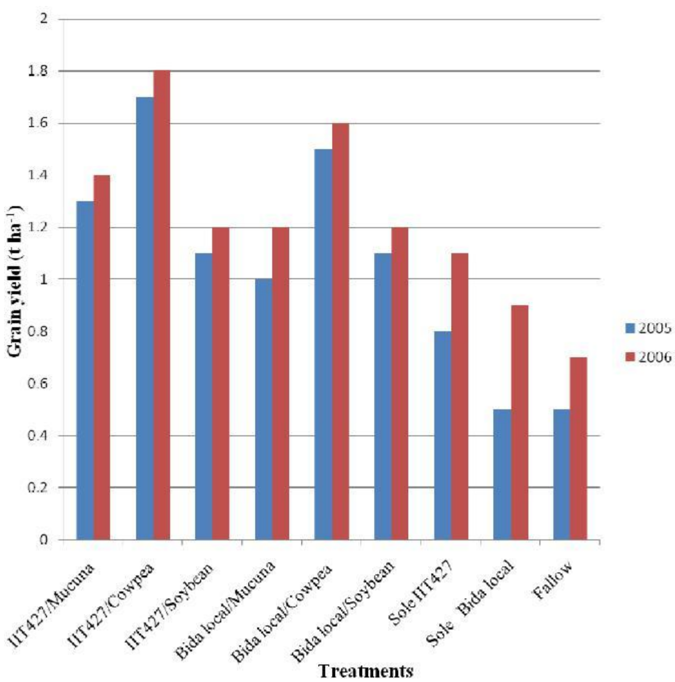

Figure 5. Effects of relaying cassava/legume intercrop with rice on rice grain yield (th^{-1}).

pre–rice cropping on rice grain yield in that the highest was obtained when rice was cropped after cassava cowpea intercrop though does not par much with what was obtained from other intercrops as compared to that of sole cassava and fallow (Figure 5). The results is in line with that of Mitchell et al. (1991) who stated that croprotation increases yield and the practice is essential in sustainable agriculture systems

Conclusion

The study showed rotation of rice with cassava legume intercrop reduced weed population, weed dry matter and increase rice yield.

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