Direct RESEARCH JOURNALS

Direct Research Journal of Agriculture and Food Science Vol.1 (3), pp. 40-43, September, 2013
Available online at http://directresearchpublisher.org/drjafs

Original Research Paper

Effect of Rice Husk, Hoe Weeding and Glyphosat E in the Management of Spear Grass (*Imperata cylindrica)* on Maize (*Zea mays* L.)

Isah*, K.M.[1], Abdulmaliq, S.Y[1]. Lawal, A.F.[2], Tswanya, N.M.[3], and Majin, N. S[1].

[1]Department of Crop Production, Faculty of Agriculture, Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria.
[2]Department of Agricultural economics and Extension Services, Faculty of Agriculture, Ibrahim Badamasi Babangida University, Lapai, Niger State, Nigeria.
[3]Department of Agricultural Technology, Niger State College of Agriculture, Mokwa, Nigeria.

ABSTRACT

Trials were conducted on a highly infested fields with Imperata cylindrica at Mokwa (09o 18'N and 05o 04'E) during 2009 and 2010 cropping seasons to evaluate the effects of rice husk, hoe weeding and glyphosate application in the management of spear grass (Imperata cylindrica) on maize (Zea mays L). The trials were laid out in a Randomised Complete Block Design (RCBD) consisted of four treatments viz: rice husk, glyphosate application, hoe weeding and no weeding as a control replicated four (4) times. The results showed that the burning of rice husk caused significant ($p < 0.05$) delay in the number of days to first emergence and lower shoot count of Imperata cylindrica with resultant higher maize cobs and grain yield were compared to those of application of glyphosate, hoe weeding and no weeding. However, the maize plants were found to be significantly ($p < 0.05$) taller at the time of harvest with the application of glyphosate and burning of rice husk than the corresponding hoe weeding and no weeding.

Keywords: Spear grass (Imperata cylindrica), Rice husk, Glyphosate, Weeding, Maize (Zea mays L.)

*Corresponding Author E-mail: matthewmokwa@yahoo.com

Accepted 29 June 2013

INTRODUCTION

Maize (*Zea mays* L.) is ranked as the second most important cereal crop in the world after wheat with respect to cultivated area and total production. The crop ranks third after sorghum and millet in Nigeria with its production mostly concentrated in the Southern Guinea and Rain Forest zones (Raemaekers, 2001; Wunderlin and Hansen, 2008). It is an important staple food in Nigeria with its production reaching 5.5 million MT in 1999 and 7.0 MT in 2003 (FOS, 2004). It is also used in livestock feeds and industries especially in breweries, the stover is used as fuel and for building, making hats, mats, ropes and for the manufacture of furfural. However, it is highly constrained by a number of biotic and abiotic factors (Emechebe, *et al*., 1991). The biotic factors include pests such as nematodes, stem borers and army worms, diseases such as Downey mildew and maize virus as well as various categories of weeds including *Imperata cylindrica.*

Imperata cylindrica. (L) Raeuschel, also known as spear grass in West Africa, alang-alang in Asia and cogon grass in America is a perennial grassy weed of significant importance in tropical and sub-tropical regions, as well as in some warm parts of the temperate regions of the world (Holm *et al*., 1977; Garrity *et al*., 1997; Wunderlin and Hansen, 2008). Yields of annual crops are severely affected by competition from the weed. It caused yield reductions of 51-52% in maize when the crop was weeded 2-4 times (Akobundu and Ekeleme, 2000). Higher maize grain yield losses of 80-100% has also been reported (Koch *et al*., 1990; Udensi *et al*., 1999). Complete crop failure usually occurs when crops were grown in slashed plots without additional weeding (Chikoye *et al*., 2001).

In addition to crop yield losses, *I cylindrica* increases the cost of crop production, reduces the market value of damaged tuber crops, and increases the risk of fire in

Table 1: Effect of rice husk burning, hoe weeding and glyphosate application on number of days to first emergence and shoot count of *Imperata cylindrica* on maize at Mokwa, 2009 and 2010 wet seasons.

Treatments	No. of days to first *Imperata* emergence		*Imperia* shoot count/18m^2											
			2WAP[2]		4WAP		6WAP		8WAP		10WAP		Harvest	
	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Rice husk Burning	70.3a[1]	84.1a	0.0b	0.0c	0.0c	0.0c	0.0c	0.0d	0.0c	0.0d	1.1c	0.0d	3.1d	4.3d
Glyphosate application	27.9b	28.2b	0.0b	0.0c	2.2b	4.1b	6.3b	10.2c	6.3b	13.2c	8.3b	15.3c	10.2c	19.1c
Hoe weeding	3.1c	2.7c	4.0a	6.1b	3.3b	5.2b	20.1a	26.3b	10.1b	22.1b	20.5b	36.4b	48.3b	63.2b
No weeding	1.2c	2.5c	5.0a	9.2a	18.2a	28.1a	20.3a	38.2a	46.8a	63.3a	88.2a	91.3a	90.1a	121.3a
LSD at 5% DF	1.32	1.28	1.01	1.27	1.42	1.49	1.61	10.52	7.72	4.21	10.1	9.30	6.31	11.21

1- Means followed by same letter(s) within a column are not significantly different at 5% probability (LSD).
2- Weeks After Planting.

perennial crops. It readily burns, even when green, destroying other vegetation while it regenerates very rapidly from its underground rhizome system, thereby displacing other plant species (Sebuliba-Mutumba, 1999). Many control measures have been employed including fire preventive measure, slashing/cutting, dip ploughing, shade based management practices and the use of herbicides. The use of herbicides such as paraquat, glyphosate (N-(phosphonomethyl)glycine), a broad-spectrum systemic herbicide, dalapon and imazapyr among others are known to be quicker in action but costly (Brook, 1989; Townson, 1991; Terry *et al*., 1997; Sebuliba-Mutumba, 1999). It has become necessary to find a cheap means for poor resource farmers through which this weed can be checked. The consultation with farmers in the study area shows that rice and melon husk packed in a place and fire is set to burn reduces the effect of *Striga hermonthica* and *Imperata cylindrica* (Personal Communication). The objective of this study therefore, was to evaluate the effect of rice husk, hoe weeding and in the management of spear grass (*Imperata cylindrica)* on maize (*Zea mays* L.).

MATERIALS AND METHODS

The trials were conducted on a highly infested fields with *Imperata cylindrica* at Niger State College of Agriculture, Mokwa (09^o 18'N and 05^o 04'E) during 2009 and 2010 cropping seasons. It lies in the Southern Guinea Savanna ecological zone of Nigeria. The trials were laid out in RCBD consisted of four treatments viz: burning of rice husk, glyphosate application, hoe weeding and no weeding as a control replicated four (4) times. Each plot consisted of six ridges spaced 75cm wide and 6m long. The plot size is 4.5m x 6m (27m^2). The data were collected from the four inner ridges (18m^2). Rice husk at equivalent of 400 kg/ha was collected and placed on the respective plots and then burnt. The land was then manually ridged to avoid transferring of soil from a plot to another. Maize variety - Acr. 97 TZL Comp. 1 – W obtained from International Institute of Tropical Agriculture (IITA) was planted at 50cm intra-row spacing using three to four seeds per stand and later thinned down to two at 2 weeks after planting (WAP). Plots where herbicide are supposed to be applied, glyphosate at.1.4 l/ha was applied as post emergence using knapsack spraying equipment. Glyphosate was applied two weeks before planting. While, hoe weeding was done twice at 3 (WAP) and 6 WAP in those plots where weeding are manually done. Fertilizer at equivalent of 100kgN – 50kgP_2O_5 – 50kgK_2O/ha was applied. Half dose of N and full doses of P_2O_5 and K_2O/ha was applied at 3 WAP while the remaining half of N was applied at 6 WAP. The parameters that were recorded: number of days to first *Imperata* emergence, number of *Imperata* found/plot at 2, 4, 6, 8, 10 WAP and at harvest, maize height at 2 WAP and harvest, weight of maize cobs/ha and maize grain yield in kg/ha. The data collected were subjected to analysis of variance (ANOVA) and means partitioned using Least Significance Difference (LSD) at 5% probability.

RESULTS

Number of days to first *Imperata cylindrica* emergence

The Table 1 showed that the number of days to first emergence of *Imperata cylindrica* was significantly different at 5% probability in 2009 and 2010. The number of days to first emergence of *Imperata* was significantly delayed with rice husk burning compared with glyphosate application, hoe and no weeding in both years. In addition, the number of days to emergence was delayed with glyphosate application compared with hoe and no weeding.

Table 2: Effect of rice husk, hoe weeding and glyphosate application on maize height, number of cobs and maize grain yield (kg/ha) at Mokwa 2009 and 2010 wet seasons.

Treatments	Maize height (cm) 2WAP		Harvest		Weight of maize cobs t/ha		Maize grain yield kg/ha	
	2009	2010	2009	2010	2009	2010	2009	2010
Rice husk burning	51.0	56.3	163.3a[1]	173.1a	3.5a	3.7a	2460a	2842a
Glyphosate application	54.3	53.1	166.2a	172.3a	2.3b	2.5b	2033b	2211b
Hoe weeding	50.3	54.2	140.7b	141.3b	2.3b	2.1b	2029b	2209b
No weeding	53.1	55.1	83.8c	50.2c	0.3c	0.5c	202c	281c
LSD at 5% DF	5.94	5.98	7.46	7.93	0.68	0.71	78.97	80.21

Means followed by same letter(s) within a column are not significantly different at 5% probability (LSD).

Imperata cylindrica shoot count

No weeding supported significantly higher number of *Imperata cylindrica* shoot count on maize throughout the crop life cycle compared with all other treatments in thetwo years of the study except at 2 and 6 WAP in 2009 where hoe weeding supported similar shoot emergence compared with no weeding (Table 1). No emergence of *Imperata cylindrica* on plots with rice husk burning until 10 WAP in 2009 and at harvest in 2010 and when they occurs, they were the least.

Table 1: Effect of rice husk burning, hoe weeding and glyphosate application on number of days to first emergence and shoot count of *Imperata cylindrica* on maize at Mokwa, 2009 and 2010 wet seasons. The Table 2 showed that the maize height differed significantly among the treatments at 5 % probability at harvest only in the two years. Maize plants on plots with rice husk burning and application of glyphosate were significantly taller compared with those that were hoe weeded and no weeding in 2009 and 2010. Also, maize plants hoe weeded were significantly taller compared with those un-weeded.

Weight of maize cobs

Maize in rice husk burning plots produced significantly ($p < 0.05$) higher cobs weight compared with application of glyphosate, hoe weeding and no weeding during the two years (Table 2). In addition, application of glyphosate and hoe weeding supported significant production of higher cobs weight compared with no weeding in the two years.

Maize grain yield

Rice husk burning supported significant ($p < 0.05$) highest maize grain yield in the two years (Table 2). Also, maize grain yield was significantly ($p < 0.05$) higher with the application of glyphosate and hoe weeding compared with no weeding in 2009 and 2010 seasons. Table 2 shows effect of rice husk, hoe weeding and glyphosate application on maize height, number of cobs and maize grain yield (kg/ha) at Mokwa 2009 and 2010 wet seasons.

DISCUSSION

The present work describes the effects of different treatments to mange of spear grass *Imperata cylindrical on maize* (*Zea mays* L.). There was a delay in *Imperata cylindrica* emergence and no emergence of *Imperata cylindrica* on plots with rice husk burning until 10 WAP in 2009, at harvest in 2010 and when they occurs, they were the least is an indication that rice husk burning reduces the emergence of the weed. This might be due to over-heating of the soil surface thereby destroying the rhizomes of this weed.

The aggressive and invasive nature of *Imperata cylindrica* is attributed to its rhizome, which are normally concentrated in the upper 15 to 20 cm of soil (Ivens, 1980). Rhizomes have a high regenerative ability because of the numerous buds that readily sprout in to new shoots (Holms *et al*., 1977; Ivens, 1980). Rice husk burning also supported significantly ($p < 0.05$) taller maize plants compared with hoe weeding and no weeding, higher number of maize cobs and grain yield compared with all other treatments evaluated in this study. It is highly likely that the high fertility of the soil because of destruction of underground rhizome in the top soil (15 to 20 cm depth), which after decomposition serves as an organic manure for maize performance. It also provide as a source of all necessary macro and micro nutrient in available forms, thereby improving the physical and biological properties of the soil (Abou *et al*., 2006).

Makinde and Ayoola (2008) reported that application of manure provided long term residual nitrogen than inorganic fertilizer. Application of glyphosate caused significant ($p < 0.05$) delay in the emergence *Imperata cylindrica* compared with hoe weeding and no weeding.

This may be due to the fact that hoe weeding may not be able to remove the rhizome completely from the soil

surface. Chikoye *et al*. (2002) reported similar effects from hoe weeding and these make farmers to weed out several times, if the expected yield was to be increased and that will obviously add to the cost of production.In all the cases, application of glyphosate and hoe weeding resulted in significantly taller plants, higher number of cobs and grain yield of maize compared with no weeding. The efficacy of the chemical glyphosate had been reviewed by Udensi *et al*. (1999), Akobundu *et al.* (2000) and Chikoye *et al*. (2002) and the above results did correspond to these.

CONCLUSION AND RECMMENDATIONS

It is evidenced from this study that rice husk burning is an effective measure for *Imperata cylindrica* control. It is therefore recommended in fields with spot infestation of the weed to prevent further spread. However, in larger areas of infestation application of herbicide glyphosate at post emergence is recommended

REFERENCES

Abou E, Hoda MM, Mohammed A, Fawzy ZF. (2006). Relationship, growth and yield *Agriculture Science Moshtohor* 43(2): 791-805

Akobundu IO, Ekeleme F (2000). Effects of method of *Imperata cylindrica* management on maize grain yield in the derived savanna of south-western, Nigeria. Weed Res., 40: 335-341.

Akobundu IO, Udensi UE Chikoye D (2000). Velvetbean (Muccuna spp.) suppresses speargrass (*Imperata cylindrical* (L.) Raeuschel) and increases maize yield. *Int. J. Pest Management*. 46: 103-108.

Brook RM (1989). Review of literature on (*Imperata cylindrical* (L.) Raeuschel) with particular reference to southeast Asia. *Tropical Pest Management* 35:12-25.

Chikoye D, Ekeleme F, Udensi EU. (2001). *Imperata cylindrica* suppression by intercropping cover crops in *Zea mays/ Manihot esculenta* systems. *Weed Sci.*,49: 658-667.

Chikoye, D., Manyong, Y.M., Carsky R,Ekeleme F, Gbehounou G, Ahanchede A (2002). Response of speargrass (*Imperata cylindrical)* to cover crops integrated with hand-weeding and chemical control in maize and cassava. *Crop Protection* 21:145-156.

Emechebe AM, Singh, BB, Lelegi TO, Atokple IDK, Abu KJ (1991). Cowpea *Striga* problems and research in Nigeria. In: Kim S.K. (ed) combating *Striga* in Africa. *Proceedings International Workshop* organized by IITA, ICRISAT and IDRC, Ibadan, pp.61-65.

FOS (2004). Nigerian statistical facts sheets on economic and social development, Federal office of statistics, Abuja, Nigeria pp. 1-26.

Garrity DP, Soakadi M, Van Noordwijk M, De La Cruz, R, Pathak PS, Gunasena, HPM, Van So N, Huljun G, Majld NM (1997). The *Imperata* grasslands of tropical Asia area, distribution and typology. *Agroforestry Systems* 36:3-29.

Holm LG, Plucknett DL, Pancho JV, Herberger JP, (1977). The World's Worst Weeds: Distribution and Biology, Honolulu, University Press of Hawaii, 609pp.

Ivens GW (1980). *Imperata cylindrica* (L) Beauv.in West African agriculture, BIOTROP Special Publication No. 5, Indonesia, pp. 149-156.

Koch W, Grobmann F, Weber A, Lutzeyer HJ, Akobundu IO (1990). Weeds as components of maize/cassava cropping systems,in Standortgemaesse landwirtschaft in West Afrika. Universitaet Hohenheim, Sturtgart, Germany pp.283-298.

Wunderlin RP, Hansen BF (2008). Imperata cylindrical. Atlas of Florida vascular plants. (http//www.plantatlas usf edu. S.M. Landy and K.N. Campbell (application development). Florida Centre for community Design.

Makinde EA Ayoola (2008). Residual influence of early season crop fertilization and cropping system on growth and yield of cassava. Am. J. Agric. and Biol. Sci. 3(4): 712-715.

Raemaekers RH(2001). Crop production in Tropical Africa, 2nd edition, Longman Publishing Co. Ibadan, Nigeria., pp. 23-27.

Sebuliba-Mutumba R (1999). Hand hoe weed management in beans (*Phaseolus vulgaris*) and its effect on weed growth and crop economic returns. In: *Civings, O.A., Tussime, G. Nampala, P. and Adipala, E. proceedings of the 17th Biennaial Weed Science Society Conference for Eastern Africa,* Harare., Pp.1-5.

Terry PJ, Adjers G, Akobundu IO, Anoka AU, Drilling ME, Tjtrosemito S, Utomo M (1997). Herbicides and mechanical control of *Imperata cylindrica* as a first step in grassland rehabilitation, *Agroforestry Systems* 36: 151-179.

Townson JK (1991). *Imperata cylindrica* and its control. Weed Abstracts, 40: 457-468.

Udensi EU, Akobundu IO, Ayeni AO, Chikoye D (1999). Management of congograss (*Imperata cylindrical)* with velvetbean (*Mucuna puriens* var.utilis) and herbicides. *Weed Tech.* 13:201-208.