Effect of time of herbicide application and sweetpotato morpho-types on the effectiveness of herbicide on weeds

Korieocha, D.S[1], Ogbonna, M.C[1]., Nwokocha C.C. [1], Echendu, T.N.C[1]. and Okorocha E.O.A [1]

National Root Crops research Institute, Umudike. P.M.B. 7006, Umuahia- Abia state. davesam2k@yahoo.com

Abstract

A field experiment was conducted at the National Root Crops Research Institute, Umudike in 2008 cropping season, to determine the time of herbicide application for weed control in sweetpotato production and also to determine the effect of sweetpotato morpho-types in weed control in sweet potato production. The treatments consisted of four times of herbicide application, namely: At planting, 14 days after planting, 21 days after planting, 28 days after planting, two sweetpotato morpho-types which include TIS 87/0087 (spread) TIS 8164 (erect), manual weeding and unweeded plot. The plot size was 6mx5m, weed control ratings in the plots were taken at 8 WAP on a scale of 0-10, where 0-4= poor weed species control: 4.1-7.9 = satisfactory control: 8.0-10.0 = excellent weed species control. Data collected were subjected to analysis of variance using GLM procedure of SAS and significant difference among means variable were tested, using fisher's least significant difference (LSD) at 5% alpha level. Application of herbicide at 14 days after planting significantly ($P<0.05$) controlled broad leaved weed species and also recorded the lowest weed density, compared to the other time of herbicide application. Combination of sweetpotato morpho-types TIS 87/0087 (spread) with time of application at 14 days after planting gave the highest significant total root yield (16.84 t/ha), compared to other treatment combinations. Application of herbicide at 14 DAP gave the highest total root yield (10.17 t/ha) which did not significantly differ with the yield (8.76 t/ha) obtained when manual weeding was employed and also had a comparative advantage over others as income was ₦128, 033.40.

Keywords: Time of herbicide Application, Sweetpotato morpho-types, Weeds.

Introduction

Sweetpotato *(Ipomoea batatas* [L.] Lam is a creeper of the convolvulaceae family; it is originated from Central America and is a widely grown important, staple food in most parts of tropical and sub-tropical region of the word. It ranks 7th among the world's major food crops. The crop has ceased to be a "back yard crop or "gap filler," survey reports in Nigeria show that production, Marketing and utilization have expanded in the last decade beyond its traditional central and riverine areas (Agboola, 1979) to almost all ecological zones in the country (Tewe *et al,* 2001).

Thus Nigeria production output has put Nigeria as the number one producer of sweet potato in Africa with annual output of 3.46 million metric tons (FAO, 2006). Globally, Nigeria is the second largest producer with China leading (106,197 million metric tons). The crop is grown for both human and animal consumption. Household income is supplemented by sales of the root tubers in local markets and urban dwellers. Its importance in starch, alcohol, livestock, pharmaceutical and textile industries cannot be over emphasized (Wolfe, 1992). The orange fleshed varieties with high β-carotene content have become very important in combating vitamin A deficiency especially in children. Despite the high agronomic potentials of sweet potato being a short duration crop 3-4 months that could be cropped more than once in the year, its production is fraught with a number of production constraints. Notable among them is weed competition.

Weed competition has been identified as a major production constraint in sweet potato production in Nigeria (Unamma, 1984). Yield losses caused by Un-controlled weed growth have been estimated at between 42 and 65% in Nigeria (Unamma, 1984). Weed competition with sweet potato may be reduced through many interventions such as timely herbicide application and use of sweet potato morpho-types.

The objectives of this study is to determine time of herbicide application for weed control in sweet potato production and also to assess the potentials of sweet potato morpho-types in checking weeds under sweet potato production.

Materials and methods

The experiment was conducted at the research farm of the National Root crops Research Institutes, Umudike, Nigeria ($05^{0}.29^{0}$N, $07^{0}.33$'E and 122m above sea level), in the 2008 cropping season. The soil was sandy loam, the plot size was 6mx5m. Each treatment was replicated three times using a randomized complete block design. The land was cleared, ploughed, harrowed and ridged before planting. Sweetpotato varieties 87/0087 and 8164 were planted during the second week of June, 2008 spaced 100cm x 30cm along the crest of the ridges at a density of 33,333 plants ha^{-1} , compound fertilizer (15:15:15 NPK) was applied to all the plots at 4 weeks after planting (WAP) at the rate of 400kg/ha. Application of herbicides was done four times namely; At planting, 14 days after planting (DAP), 21 days after planting (DAP) and 28 days after planting and two sweetpotato morpho-types TIS 87/0087 (spread) and TIS 8164 (erect), manual weeding at 4+6+8 weeks after planting (WAP) and unweeded plot. A mixture of Atrazine/metolchlor (primextra gold),fluazifopbutyl (fusilade) at 1.5 + 1.0kg ai /ha. At 8 weeks after planting, plots were visually scored for weed control by two independent assessors on a rating scale of 0-10, with 0, representing no weed control and 10 indicating complete control of weeds. Seven and half was regarded as an acceptable level of weed control. Sweetpotato yield was assessed at harvest (4 months after planting). Data collected were subjected to analysis of variance using the GLM procedure of SAS and significant differences among means were separated using Fisher's least significant difference (F-LSD) at 5% level of probability. Economic assessment of the weed control treatment was conducted using labour productivity index, available yield indexes as well as return per naira investment (Ezedinma *et al,* 2006).

Result and discussion

The results of the effects of sweetpotato morpho-types and time of herbicide application on weed types, weed density and rating are presented in Table1. Sweetpotato morpho-types showed no significant ($P>0.05$) effects on broad leaved weed, sedges, weed density and weed rating. However significant ($P<0.05$) effect was observed on gasses. TIS 87/0087 (Spread) suppressed grasses more than TIS 8164 (erect). This results indicated that the sweetpotato canopy of TIS 87/0087 emerge may have a smothering effect on grass weeds. Akobundu (1980) reported that sweetpotato (spreading type) is a weed suppressant in intercropping system. Sweetpotato morpho-types did not show any significant ($P>0.05$) effect on weed rating. However, the two varieties gave ratings greater than 7.5. Effect of time of herbicide application on weed rating showed significant difference. All the treatments performed better (7.5-9.0) than unweeded (4.8). Herbicide application at 14 DAP which is a candidate for recommendation also sustained a weed rating of 8.63 which did not differ significantly with the weed rating of 9.9 of manual weeding. Sweetpotato morpho-types and time of herbicide application interaction significantly ($P<0.05$) influenced total root yield (t/ha) (Table 2). Application of herbicide at 14 DAP gave the highest total root yield (10.17 t/ha) which did not significantly differ with the yield (8.76 t/ha) obtained when manual weeding was employed. Effect of sweetpotato morpho-type showed that TIS 87/0087 significantly ($p<0.05$) gave better total root yield (8.05 t/ha) than TIS 8164 (erect). TIS 87/0087 (spread) in combination with time of herbicide application of 14 DAP gave the highest significant total root yield (16.84 t/ha) compared to other treatment combinations.

Summary of economics of time herbicides application and sweetpotato mropho-types (Table 3), showed that TIS 87/0087 spread type combine with time of application at 14 days after planting (DAP) gave the highest return per naira investment (₦2.19), also had a comparative advantages over other as in income was ₦128, 033.40.

Table 1. Effect of time of herbicides application and Sweetpotato morpho-types on weed types control, weed rating and density in 2008 at Umudike

Variety	Weed type Broad leaves	(No/m^2) Grasses	Sedges	Weed density(No/m^2)	Weed rating at 8WAP
TIS 87/0087	75.40	17.60	6.90	96.00	7.7
TIS 8164	78.70	17.72	5.80	103.00	8.0
$LSD_{0.05}$	27.77ns	7.30	4.61ns	41.8ns	0.88ns
Time of herbicide application					
At planting	88.50	32.70	6.40	107	8.0
14 DAP	44.00	14.80	6.40	65.00	8.63
21 DAP	75.80	14.10	12.80	98.00	8.3
28 DAP	113.90	1.30	1.90	125.00	7.5
Manual weeding	2.90	2.90	1.50	8.00	9.9
Unweeded	137.40	40.70	9.00	194.00	4.8
$LSD_{0.05}$	48.09*	29.96*	7.98ns	72.4*	1.53*

Table2. Effect of time of herbicides application and Sweetpotato morpho-types on total root yield (t/ha) in 2008 at Umudike

Variety	Time of herbicides		Application 21 DAP	28 DAP	Manual weeding	Unweeded	Variety mean
	At planting	14 DAP					
TIS 87/0087	4.41	16.84	10.08	4.70	10.77	1.52	8.05
TIS 8164	3.96	3.49	5.67	9.04	6.74	6.26	5.86
Time of application							
Mean	4.18	10.17	7.87	6.87	8.76	3.89	
$LSD_{0.05}$							
Variety	0.97*						
Time of application	1.68*						
Variety xTime of application	2.37*						

Table 3. Summary of economics of time of herbicide application and sweetpotato morpho-types at Umudike

Treatments	Yield (t/ha)	Total costs #/ha	Gross return #/ha	Net return (#/ha)	Return/ # investment	Labour productivity t/md
TIS 87/0087x@planting	4.41	107726.6	61740	-45986.6	-1.74	0.036
TIS 87/0087x 14DAP	16.84	107726.6	235760	128033.4	2.19	0.138
TIS 87/0087x21 DAP	10.08	107726.6	141120	33393.4	1.34	0.082
TIS 87/0087x 28 DAP	4.70	107726.6	65800	-41926.6	-1.64	0.038
TIS 87/0087 x weed free	10.77	112296.6	150780	38483.4	1.34	0.062
TIS 87/0087x unweeded	1.52	101696.6	21280	-86446.6	-4.78	0.013
TIS 8164x14 DAP	3.49	107726.6	48860	-58866.6	-2.20	0.029
TIS 8164x 21 DAP	5.67	107726.6	79380	-28346.6	-1.36	0.046
TIS 8164x 28 DAP	9.04	107726.6	126560	18833.4	1.17	0.074
TIS 8164x weed free	6.74	115696.6	94360	-21336.6	-1.23	0.035
TIS 8164 x unweeded	6.26	101696.6	87640	-14056.6	-1.16	0.052
TIS 8164 x @planting	3.96	107726.6	55440	-52286.6	-1.94	0.032

Conclusion

Sweetpotato morpho-type, TIS 87/0087 spread combine with time of application at 14 days after planting (DAP) controlled grass weed and broad leaved weed species effectively and also gave the farmer the highest total root yield with an income of #128,033.40 when compared other treatments.

References

Agboola, S.A. (1979). An Agricultural Atlas of Nigeria, 248 pp.

Akobundu, I.O. (1980). Weed Control Strategies for Multiple Cropping System of the Humid and Sub-humid Tropics. In: Weeds and their Control in the Humid and Sub-humid Tropics: Proceedings of a Conference held at the IITA, Ibadan Nigeria, 3-7 July 1978, edited by 1.0 Akobundu, Ibadan IITA, Weed Science Society of Nigeria pp 80-95.

Ezedinma C.C., G. Asumugha and F. Nweke (2006). Trends in Farm Labour Productivity and Implications for Cassava Industrialization in Nigeria. Proceedings of the 40th conf. Agricultural soc. Of Nigeria held at NRCRI, Umudike October 16-20, 2006.

FAO (2006), FAOSTAT, Data-base Results. Food and Agricultural Organization, Rome Italy.

Tewe, O.O., Abu O.O., Ojeniyi, E.F. and Nwokocha H.N. (2001). Status of Sweetpotato Production, Utilization and Marketing in Nigeria in Root Crops in the 21st Century. Compiled by Akoroda M.O. and Ngeve J.M. p 65-74.

Unamma, C.P.A., Enyinnia, J. and Emezie J.E. (1984). Critical Period of Weed Interference in Co-coyam/Maize/Sweetpotato. Trop. Pest Management 31:21-23.

Wolfe, J.A. (1992). Sweetpotato to an Untapped Food Resources. Pub. Collaboration with CIP-Peru. Cambridge University press.