WEEDING FREQUENCY EFFECT ON GROWTH AND YIELD OF MAIZE IN SOUTHGUINEA SAVANNAH

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ABSTRACT

A field trial was conducted in 2018 cropping season on the Teaching and Research Farm of the Federal University of Technology, Gidan Kwano campus to investigate the effect of weeds on the growth and yield of maize and determine the best time and frequency of weeding for optimum yield. The Treatments (no weeding (control), weeding at 2WAS, weeding at 4WAS, weeding at 6WAS, weeding at 8WAS, weeding at 10WAS, weeding at 2 and 4WAS, weeding at 4 and 6WAS, weeding at 6 and 8WAS, weeding at 8 and 10WAS) were layout in a randomized complete block design (RCBD), replicated three (3) times. The data collected on various parameters were subjected to analysis of variance (ANOVA) using statistical package (SAS 2016) and means were partitioned using Duncan multiple range test (DMRT) at 5% level of probability. The results obtained showed that the use of hybrid maize variety with early weeding at 4 and 6WAS which resulted in lower weed cover score, lower weed dry weight, lower number of days to 50% tasseling, maize taller plant, high maize cob weight and high yield could be an effective weed management strategy.

Keywords: Maize, Weeding frequency, Growth; Yield

INTRODUCTION

Maize (*Zea mays* L.) has long been seen to be one of the world's most promising cereal grains for human consumption (Tandzi and Mutengwa 2020). Among the factors constraining the production of maize in the tropics are inadequate supply of nutrients in the soil most especially nitrogen and intense competition with weeds. At the early stage of crop growth and development, the weed and rice plant requirements for nutrients are met but as growth advances for the two plant species, the nutrient supply normally falls short of the combining demands leading to competition(Musa and Timbale 2013). Maize is highly susceptible to weed competition particularly at the early stage of growth. In Nigeria, yield losses as high as 51 to 100% have been recorded in maize due to weed competition (Akobundu and Ekeleme 2000). According to Rao and Kang(Rao and Kang 2010), high cost of inputs such as fertilizer, improved seeds were of no use if not accompanied with efficient weed control. Maize (*Zea mays L*) is a member of the family Graminae and it is an annual crop serving as a good source of food for human consumption in form of maize powder, maize meal and confectionaries such as bread, biscuits and cakes. Maize is world's one of the three most popular cereal crops.It is grown worldwide on approximately 130 million ha annually with a production of 574 million metric tons (Itos 1998). For the past five decades, since Nieto *et al*. (1968) introduced the concept of 'critical periods of the crop growth cycle for competition from weeds', it has been accepted by the international community that there are certain periods in the life cycle of a crop when weeds pose challenges to the resource competition and must be removed to accelerate crop growth; it is believed that thereafter the presence of weed species could insignificantly interfere with crop yield. In particular, the concept considers the period from sowing to a specific stage/phase of the crop to advocate cultural, mechanical or chemical weed management practices.Critical period of weed control (CPWC) consider the yield loss due to the presence of all weeds present in the crop cycle. The CPWC is the time interval between the critical timing of weed removal (CTWR) and the critical weed-free period (CWFP), and the weed presence before and after the extremes of CTWR and CWFP may not significantly reduce crop yield. Although CPWC has been defined in different ways, it is generally accepted that CPWC is a time interval between two components viz., the critical timing of weed removal (CTWR) and the critical weed-free period (CWFP), and the weed presence before and after CPWC should not significantly reduce crop yield. In general, three relationships exist in CPWC (Nadeem *et al.*, 2013): (a) Maintaining the crop weed-free for the same duration that a weed infestation can be tolerated to avoid yield loss if weed control is performed during this period; (b) CWFP is lesser than CTWR so that yield loss will not occur if weeds are managed between these extremes; and (c) CWFP is of no longer duration than the CTWR, the crop must be kept weed-free between these timings to prevent yield loss. Knezevic *et al*. (2002) considered CPWC as a window for the removal of weedy species. IITA (2007) also reported that weedness of maize field may increase the incidence of insect pest infestation which can cause yield loss to about 60-85%.

MATERIALS AND METHODS

A field trial was conducted in 2019 cropping season at the Teaching and Research Farm of the Federal University of Technology, Gidan Kwano Campus Minna, Niger State, located in the Southern Guinea Savannah Agro-ecological Zone of Nigeria. The Treatments (no weeding (control), weeding at 2WAS, weeding at 4WAS, weeding at 6WAS, weeding at 8WAS, weeding at 10WAS, weeding at 2 and 4WAS, weeding at 4 and 6WAS, weeding at 6 and 8WAS, weeding at 8 and 10WAS) were layout in a randomized complete block design (RCBD). Two seeds were sown per hole at 25cm by 75cm intra and inter-row spacing respectively and later thinned to one per stand after two weeks. Weeding was done according to the experimental treatment. N.P.K 15:15:15 was applied at the rate of 180kg N, 90kg $P_2 05$ and 90kg K_2O ha^{-1} plant stand at 3WAS. Data were collected on weed cover score, weed dry matter, maize plant height, number of days to 50% tasseling, dry cob weight and grain yield. Weed cover score was taken from each plot on visual rating 1 to 6, where, 1- Clean plot, 2- Moderately Clean plot, 3- Fairly Clean plot, 4- Moderately weedy plot and 5- Fairly weedy. Samples of fresh weed were taken from a 50cm quadrant thrown in each net plot prior to each weeding operation at 6, 8 and 10 WAS. The weed samples were weighed to obtain the fresh weight, oven dried at 70^0c to a constant weight and weighed to obtain dry matter content (grams per m^{-3}).Plant height of the randomly tagged selected maize plants were measured using measuring tape from the ground levels to the apex of the flag leaf at 4, 6, and 8 WAS. The number of days to 50% tasseling was taken by visual observation and recorded, the maize cobs weight were randomly sampled per each plot and weight using weight balance in gram (g). Maize grain yield from each plot after shelling and winnowing were weighed with a meter balance and expressed in gram(g).The data collected were subjected to analysis of variance (ANOVA) using statistical package (SAS 2016) and means was partitioned using Duncan multiple range test (DMRT) at 5% level of probability.

RESULT

Effect of time of weeding and weeding frequency on weed cover score and weed dry weight

Weeding at 4 and 6WAS significantly ($P<0.05$) recorded lower weed cover score compared to other treatments and control (Table 1). Weeding at 2WAS, 6WAS and 4 and 6W was significant, implying that they succeeded in reducing weed plants as compared to other treatments (Table 1).

Effect of time of weeding and weeding frequency on maize plant height and number of days to 50% tasseling

Plant heights were significantly difference ($p < 0.05$) throughout the sampling period, weeding at 2 and 6WAS produced taller plant height compared to other treatments (Table 2). Lower number of days to 50% tasselling was seen on weeding at 2 and 4WAS compared to other treatments

Effect of time of weeding and weeding frequency on maize cob weight and grain yield

The effect of time of weeding and weeding frequency on cob weight were differed significantly ($p < 0.05$) in which treatment with weeding at 4 and 6WAS recorded higher cob weight compared to other treatments (Table 3). Grain yield were significantly difference ($p < 0.05$) with weeding at 4 and 6WAS recorded higher grain yield compared to other treatments

DISCUSSION

Lower weed cover score and lower dry weight in weeding at 4 and 6WAS could be as a result of the ability of the treatments to reduce weed presence which did not allowed weeds to grow to maturity thus, could not be woody at that time and produced the lower dry weight compared to other treatments. This is in agreement with the work of Rao, (2000) who reported that weed controlled within two or three weeks of emergence reduces weed covers score and weed dry weight. Taller plant heights recorded could be as a result of lower weed presence and early weeding intervention at 4 and 6WAS, better weed management ecreased competition for resources thus, provided optimum supply of resources for growth and development of maize which has translated into taller height. This is in agreement with the finding of Ofunsun-Anim and Limani (2007) reported that provided weeds were subsequently removed, infestation for the first 3WAS did not have adverse effects on the growth and yield of crops. Number of days to 50% tasseling could be as a result of early weeding which helps the plant to have good head start over the weeds. This is in agreement with the findings of Adeosum (2005), Ado (2007) and Osipitan (2010) who all reported that critical period of weed competition occurs during the first 40 days of most crop growth. Higher Cob weight and grain yield could be as a result of lower weed cover and taller plant height which has translated into better yield. This is in agreement with the finding of Shinggu *et al.*, (2009) who reported that effective weed control measures in maize during the first 4-5 weeks after sowing are essential for maximizing the yields in maize.

CONCLUSION

On the basis of this study it is suggested that the use of hybrid maize variety with early weeding at 4 and 6WAS which resulted in lower weed cover score, weed dry weight, taller plant, therefore, it is advisable for the farmers or the growers of maize to do their first weeding 4-6weeks after planting in order to get optimum yield.

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Table 1:

Treatment	Weed Cover Score			Weed Dry Weight		
	4WAS	6WAS	8WAS	6WAS	8WAS	10WAS
No Weeding (Control).	5.00^{a}	5.67^{a}	6.00^{a}	35.38a	59.20a	63.62a
Weeding at 2 WAS	3.00^{d}	3.33^{d}	3.67^{c}	12.14c	22.41c	40.61b
Weeding at 4 WAS	3.33^{c}	2.67^{d}	3.67^{c}	10.78d	17.67d	37.18b
Weeding at 6 WAS	4.33^{b}	4.67^{b}	2.33^{d}	30.03b	14.26d	12.90d
Weeding at 8 WAS	4.33^{b}	4.67^{b}	4.33^{c}	33.21a	39.26bc	12.74d
Weeding at 10 WAS	4.67^{ab}	5.33^{ab}	5.00^{b}	34.81a	57.97a	57.77ab
Weeding at 2 And 4 WAS	4.33^{b}	2.67^{d}	2.00^{d}	13.72c	14.75d	17.79c
Weeding at 4 And 6 WAS	4.67^{ab}	2.67^{d}	2.00^{d}	12.90c	13.83d	15.15c
Weeding at 6 And 8 WAS	4.33^{b}	4.38^{b}	4.00^{c}	30.69b	14.81d	12.35d
Weeding at 8 And 10 WAS	4.67^{ab}	5.67^{a}	5.76^{ab}	31.44b	46.19b	57.12a
SE ±	0.22	0.33	0.39	21.61	5.45	4.67

Effects of time of weeding and weeding frequency on weed cover score and weed dry weight.

Means followed by the same letter(s) on a column are not significantly different according to Duncan Multiple Range Test (DMRT) at p=0.05. WAS: Week after Sowing

Table 2: Effect of time weeding and weeding frequency on maize plant height and number of days to 50%

tasselling

Treatment	Plant Height (cm)			Days to 50% tasseling
	6WAS	8WAS	10WAS	
No Weeding (Control).	60.40[d]	115.00[d]	158.33[d]	63.33 [a]
Weeding at 2 WAS	80.87[a]	133.67[c]	166.33[cd]	57.67[bc]
Weeding at 4 WAS	75.93[b]	131.33[c]	183.33[bc]	59.33[abc]
Weeding at 6 WAS	66.33[c]	117.33[b]	193.33[b]	59.33 [abc]
Weeding at 8 WAS	63.40[c]	130.00[c]	180.67[bc]	60.00 [abc]
Weeding at 10 WAS	64.43[c]	117.00[d]	171.33[c]	60.67 [ab]
Weeding at 2 And 4 WAS	81.87[a]	179.00[a]	201.67[a]	54.67 [c]
Weeding at 4 And 6 WAS	70.03[bc]	153.00[b]	198.00[a]	57.67[bc]
Weeding at 6 And 8 WAS	68.27[bc]	137.67[bc]	175.67[bc]	62.00 [ab]
Weeding at 8 And 10 WAS	62.33[cd]	117.00[d]	166.00[cd]	62.33 [ab]
SE ±	1.83	4.06	4.15	0.63

Means followed by the same letter(s) on a column are not significantly different according to Duncan Multiple Range Test (DMRT) at p=0.05. WAS: Week After Sowing.

Table 3: Effect of time of weeding and weeding frequency on cob weight and grain yield

Treatment	Cob weight (g/plot)	Grain Yield (g)
No Weeding (Control).	2833.3 [b]	2133.3[cd]
Weeding at 2 WAS	3633.3 [ab]	2066.7[cd]
Weeding at 4 WAS	3000.0 [b]	2166.7[cd]
Weeding at 6 WAS	3466.7 [ab]	2733.3[bc]
Weeding at 8 WAS	3433.3 [ab]	1933.3[cd]
Weeding at 10 WAS	2700.0 [b]	1833.3[d]
Weeding at 2 And 4 WAS	4400.0 [a]	3500.0[ab]
Weeding at 4 And 6 WAS	3733.3 [ab]	3633.3[a]
Weeding at 6 And 8 WAS	3400.0 [ab]	2700.0[bcd]
Weeding at 8 And 10 WAS	2966.7 [b]	2233.3[cd]
SE ±	133.97	131.99

Means followed by the same letter(s) on a column are not significantly different according to Duncan Multiple Range Test (DMRT) at p=0.05.WAS: Week after Sowing.