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Research Article

EFFECTS OF EARLY WEED REMOVAL ON SOME YIELD ATTRIBUTES OF *ZEA MAYS* L. VAR. TZB (FARZ 34) CULTIVATED IN OWERRI, SOUTH EAST NIGERIA

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ABSTRACT

Investigation was conducted on the effects of early weed removal on some yield attributes of Zea mays L. var. TZB (FARZ 34) cultivated in Owerri, Nigeria with the aim of evaluating the extent of reduction in total output occasioned by delays in weed removal following seed sprouting. Healthy seeds of this variety were obtained from State Agricultural Development Corporation. The seeds were sown onto manually prepared plots in a Completely Randomized Design. Weeds on treated subplots were removed ten day following germination while those growing on the other plots (untreated) were not removed until 30 days after germination. Data on yield attribute parameters such as number of marketable cobs per plant, green earlength of undehusked cob, thousand grain weight etc. were collected. Results showed that difference in number of cobs per plant between crops harvested from treated and untreated subplots was statistically significant $p<0.01$. Other yield attributes investigated gave similar results with varying degrees of percentage yield differences between crops from treated and untreated subplots. The implication of this is that *Zea mays* competitive capability with weeds at early vegetative stages was inadequate comparable to that of the weeds. Incorporating early weed removal in the total farming plan will result in substantial yield gain for growers.

KEY WORDS: Weeds, Infestation,Yield, *Zea mays*, Dehusked, Cobs.

INTRODUCTION

The menace of weeds constitutes a major setback to the realization of optimum yield of crop plants. Among known adverse biotic factors which hinder adequate grain yield in *Zea mays*, weed infestation is of paramount importance (Williams *et al.*, 2014). Worldwide maize production is hampered up to 40% by competition from weeds (Oerke and Dehne, 2004). Weeds compete with the crop for space, sunlight, water and other nutrients. Many of them simply choke the crops. Others exert allelopathic effects on the environment which is usually targeted at nearby crops (Cheng and Cheng, 2016). Worst of all certain weeds are parasitic and would stop at nothing less than starving the target crop of all life sustaining nutrients. Weeds also reduce yield by interfering with smooth harvesting process, thereby increasing cost of production.

Irrespective of the mode of action, weeds reduce yield by a significant proportion. Khan *et al.* 2003 reports that weed control practices result in 77 - 96.7% higher yield than non-weed control. Kebede 2000 reported that most farmers in Ethiopia lose upto 40% of yield in maize due to weed.

MATERIAL AND METHOD

The experiment was conducted in the Botanical garden of the Department of plant science and Biotechnology, Imo state university Owerri between 2013 and 2014. Owerri is located on latitude $5^0$28'34.7160''N and longitude$7^0$1'33.0708''E in the tropical forest climate of south east Nigeria. The climate of Owerri is classified as AM by the koppen Geiger system. The annual average temperature is 26.4^0C with a precipitation of 2219 mm with dark brownish loamy soil.

The experimental plot of 20mx20m dimension was selected in one portion of the garden and cultivated manually. Manual leveling of the plot was also undertaken to take care of the harrowing aspect of the land preparation. The prepared plot was divided into 2 equal subplots of 10mx20m each. The *Zea mays* variety TZB which is a white open pollinated variety was obtained from State Agricultural Development programme office, Owerri. Seeds were planted on the two subplots same day at the rate of 90cm x 40cm and sowing debt of 2-3cm. The experiment was replicated four times at different sections in the garden. In each of the three main plots, each subplot of 10x20 was labeled as subplot A and the other as subplot B. In each main plot one subplot was chosen at random to receive early weeding ie from 10 days after sprouting (treated), while in the other subplot, weeding was delayed till after 30 days of sprouting (untreated). Aside this weeding time difference, all the other treatments such as input applications were conducted at the same time and same rate.

On harvesting, data on the number of cobs per plant, green ear length of the cobs, the number of grains per cob (counted for ten large cobs of each subplot). The weight of one thousand grains from each subplot was also measured.

RESULT

Yield attributes of *zea mays* var. TZB plants of both treated and untreated subplots were measured. The parameters measured were [1] Number of cobs per plant [2] Ear length of undehusked cobs [3] Number of grains per cob. (4) Thousand grain weight. For each parameter measurement, data was collected by taking ten samples from each of the four replicates and calculating the mean. Tables One and Two show the number of cobs of *Zea mays* var. TZB per plant of treated and untreated subplots respectively.

Table 1: Number of cobs per plant of treated subplots.

S/N	No of cobs/plant
1	1
2	1
3	2
4	1
5	2
6	1
7	3
8	1
9	1
10	1
Total	14

Table one above shows the no of cobs per plant in the treated subplots. A mean of 1.4 cobs per plant was obtained. All plants had at least one cob per plant with the highest being 3 cobs per plant.

Table 2: Number of cobs per plant of untreated subplot

S/N	No of cobs/plant
1	1
2	0
3	1
4	1
5	2
6	1
7	2
8	0
9	1
10	0
Total	9

In the untreated subplots some plants had no marketable cobs throughout their growing season; giving a mean of 0.9 cobs for the 10 zea mays plant sampled.

Table 3: Summary of values for the Number of Cobs/Plant.

Treated Subplot	Untreated Subplot
N_1 = 10	N_2 = 10
$\sum X_1$ = 14	$\sum X_2$ = 9
Mean 1 = 1.4	Mean 2 = 0.9
S. deviation 1 = 0.7	S. deviation 2 = 0.73
Variance 1 = 0. 49	Variance 2 = 0. 54

Comparing the two sets of data with the student t-test analysis method shows that a statistical significant difference exist in the means $p < 0.01$.

Table 4: Summary of values on green ear length of treated and untreated subplots

Sample 1(treated subplot)	Sample 2(untreated subplot)
N_1 = 10	n_2 = 10
$\sum X_1$ = 199cm	$\sum X_2$ = 146.3cm
Mean1 = 19.9	Mean 2 = 14.63
S.deviation= 2.01	S.deviation 2 = 1.74
Variance = 4.06	Variance = 3. 03

The comparison of the two sets of data using student T-distribution analysis shows a statistically significant difference exists $P< 0.01$. df = 18.

Table 5: Summary of values on number of grains per cob.

Sample 1 (treated subplot)	Sample 2 (untreated subplot)
N_1 =10	N_2 = 10
$\sum X_1$ = 4284 grains	$\sum X_2$ = 3224 grains
Mean 1 =428.4	Mean 2 = 322.4
S.deviation = 42.29	S.deviation = 42.62
Variance = 1788.04	Variance ==1816.01

The difference b/w the two sets values on number of grains per cob is statistically significant P<0.01. df =18

Table 6: Summary of values for 1000 grain weight from the subplots.

Sample 1 (Treated)	Sample 2 (Untreated)
N_1 = 10	n_2 = 10
∑X = 350.21gms	$\sum X_2$ = 255. 25gms
Mean 1= 35.02	Mean 2 = 25.53
S.deviation = 0.6932	S.deviation = 0.7488
Variance = 0.8325	Variance =0.5607

The t-test analysis indicates that a significant difference exist between the 1000 grain weight of *zea mays* harvested in the two sets of subplots .The grains harvested from the treated plots weighted 27.16% more than the untreated grains.

DISCUSSION

In all parameters measured as yield attributes, improvements were recorded in the treated subplots over the untreated. The reason for the lag in the yield attributes in the untreated subplot may be attributed to competition from weeds at the early stage of the crop development. This result is in conformity with results of similar studies conducted by other workers (Evans, 2003; Lum *et al.*, 2005; Silwana and Lucas, 2002).

In number of marketable cobs per plant the treated crops produced at least one marketable cob per plant. The untreated plants marketable cob production was reduced by 35.7%. Since a cob will normally reach maturity and produce mature maize grains, the implication is that a loss in yield of 35.7% is expected by the delay in weeding. In a similar result silva *et al.* 2011 observed that growth values for corn above ground part and root system were 30% smaller in non-weeded plots as compared to weeded ones. Similarly, Brenchley 2017 reported that removal of the aerial parts of weeds enables the crop to forge ahead far more rapidly inspite of what the roots of weeds may be doing in the soil. Amare *et al.* 2014 reported that weed control treatment proved significantly superior to weedy check with respect to yield attributes of maize such as number of cobs per plant. Their report shows that maximum average number of cobs per plant of 1.9 was observed in weed controlled plots while in the non-controlled plots it was 0.47. The reason for this reduction in cob number may be due to delay in female flowering and maturation which is usually induced as a result of competition from weeds (Evans, 2003).

In the earlength of the cobs, the difference between the treated and untreated cobs was statistical significant (P< 0.01). Between the treated cobs and the untreated cobs, a 26.6% reduction in earlength was recorded. In a similar study on effect of weeds on corn earlength, Amare *et al.* 2014 report a maximum earlength of 19.2cm in early hoed plots, while in that of non-weeded plots [weedy check] the maximum earlength was 12.3cm.These reduction could be due to the effects of early interaction between the young maize plants and the weeds. Hartzler 2010 while commenting that early removal of weeds is essential in order to protect yield potentials of crops, observed that crops demand for resources competed for (light, nutrients and water) were greatest at early stages. He concluded that non-competitive interactions between weeds and corn very early in the growing season can significantly affect corn growth, development and yield potential, prior to the onset of significant competition for resources later. The impact is such that when the weeds are removed later, the yield potential may rarely recover to its normal level.

Another yield attribute measured was number of grains per cob. In this attribute again a 24.74% reduction was observed between the treated and untreated plants. This figure which is similar to the percentage reduction in earlength [26.6%] suggests a positive correlation between earlength and the number of grains per cob. The implication of this reduction is since it has been reported that the competition between weeds and maize occurs at an early stage of the vegetation period [Silwana and Lucas, 2002] weeds have utilized significant amount of nutrient which the maize crop could have absorbed and internalized for grains production.

On the yield attribute of thousand grain weight (TGW), a significant reduction of 27.11% was recorded between the treated and untreated plants. The implication of this is that early competition from weeds did seriously diminish the nutrient utilization capability of the untreated crops that even when the weeds were removed later, significant biochemical processes of cell division, development and maturation could no longer proceed as genetically programmed. These results agree with that of Amare *et al.* 2014 where it was recorded that a reduction in the biomass occurred in maize plants grown in non-weeded area as compared to the biomass of weeds. In evaluating tine weeding in some districts of New Zealand, Dastgheib 2004 observed that the best treatment was 2 passes of tine, pre-emergence and early post emergence at 3-leaf stage of maize crop. His conclusion was that late post emergence weeding at 5-leaf stage was not an effective treatment. Similar observation was also made by Silva et al. 2011. These results are in agreement with that of Patel *et al.* (2006) who stated that all weed control treatments produce significantly superior results than the non-weed control. Correa *et al.* (1990) also recorded similar result in a demonstration for chemical weed control in rain fed maize cultivation.

CONCLUSION

The result of this investigation on the effects of early weeding on some yield attributes of Zea mays L. var. TZB shows that in all the attributes investigated a reduction range of between 25-35% was recorded between the treated and untreated maize plants. It is pertinent to observe that this loss which is statistically significant could be reduced by early removal of weeds. The recommendation to maize growers especially in the tropical rainforest climate of south east Nigeria where major input lack is almost ubiquitous, is to include early weed removal in the overall programmes of farming so that immediately the crop sprouts, weed removal begins. This will ensure substantial reduction in yield loss different annual crops.

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