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ASSESSMENT OF WEED CONTROL PRACTICES ON SELECTED MAIZE (Zea mays L. Moench) LANDRACES PRODUCTION

Ngonadi, E.N.[a], Uko, I.[b]* and Okonkwo, N.J.[b]

[a]Department of Crop Science & Horticulture, Chukwuemeka Odumegwu Ojukwu University, Igbariam.

[b]Department of Crop Science & Horticulture, Nnamdi Azikiwe University, Awka.

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ABSTRACT

This study was conducted in 2021 and 2022 cropping season at the Teaching and Research farm Department of Crop Science and Horticulture, Chukwuemeka Odumegwu Ojukwu University, Igbariam, Anambra State. The aim was to determine the effect of selected weed control methods on selected maize cultivars (Landraces). It was laid out as a 3x4 factorial combination in randomized complete block design (RCBD) with three replications. The main factor consisted of maize landraces (Oka bende, Oka Abakaliki and Oka Nsukka) while the sub-factor were four weed control methods (weedy-check, hoe weeding, pre-emergence, and post-emergence herbicide application). Data were collected on the germination percentage (at 5DAS and 8DAS), growth (plant height, stem girth and leaf area) and yield parameters. Data collected was subjected to data analysis of variance (ANOVA), and significant mean were separated using Fisher's Least Significant Difference. The highest number of percentage seed germination was observed in Oka Bende (92.2% at 5DAS) and Oka Abakaliki (99.0% at 8DAS). The tallest plants obtained in Oka Bende (249.0 cm), leaf area and plant girth is highest in Oka Nsukka. The Oka Abakiliki gave the highest percent grain weight (14.6 kg) followed by Oka Bende (14.4 kg). Application of pre-emergence herbicides indicated a more superior weed control effect when compared with the other selected weed control methods.

Keywords: Maize landraces, weed control practices.

1. INTRODUCTION

Weeds are regarded as one of the major problems in crop production around the world; especially in the tropics (Ogundale, 2006). They can compete with productive crops or convert productive land into unusable scrub. They are often poisonous, distasteful, harmful, and consequently interfere with the use and management of desirable plants by significantly reducing crop yield as well as contaminate harvests (Anikwe *et al.,* 2000). Weeds compete with crop for space, nutrients, water and light (Bogatek *et al*., 2006) and one of the major important crops that cannot compete effectively with weeds is the maize plant.

Maize (*Zea mays* L.) commonly known as corn is one of the cereal crops which belongs to the grass family, Poaceae. It is one of the most important cereal crops of the world after rice with respect to cultivated area (FAOSTAT, 2014). In Nigeria, about 5.5 million metric tons of maize grain was produced in 1999 from 3.2 million hectares which was estimated to have increased to 7.0 million metric tons in 2003 from 3.2 hectares. Furthermore, in 2007 and 2008, maize production amounted to 67.4 and 75.3 million metric tons, respectively (FAO, 2009). The

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phenomenal increase in maize production in Nigeria over the past few years was attributed to improved management practices, multiple utilization of the crop for various food items, livestock feed and industrial materials (FAOSTAT, 2014).

However, the full potential of this very important crop cannot be attained; especially among the local small scale farmers without an effective and efficient weed control method. Hence weed management is a major concern in modern day agricultural system. The competition between weeds and maize at critical growth stages could reduce both the quality and quantity of maize yield over 30% (Mahmood and Ali, 2009). As weeds compete with crop for essential resources, farmers are also adopting mechanical, cultural, biological and chemical control methods in the control of weeds in crop fields (Ahmed *et al.,* 2014). Among the weed control methods, is the physical methods (hand pulling, hand hoeing) which is tedious and has great exhaustion effect on small and medium scale farmers. Hence, farmers tend to move towards other alternative methods due to labour crisis during critical period of weed control which include integrated weed management (Ahmed *et al.,* 2015).

Thus, this study was conducted to determine the response of three selected cultivars of maize landrace to different weed control methods at Igbariam, Anambra State.

2. MATERIALS AND METHODS

The experiment was carried out at the Teaching and Research Farm of the Department of Crop Science and Horticulture, Chukwuemeka Odumegwu Ojukwu University, Igbariam, Anambra State which lies between latitude 16° 75'N and longitude 13° 35'E and altitude 139 m above sea level. The area experiences a bimodal rainfall pattern with its peak in June and subsequently decreased with a daily temperature range of 20^{o}C – 30^{o}C.

The study was laid out in a 3 x 4 factorial experiment in a Randomized Complete Block Design (RCBD) replicated three times. The main factor consisted of the maize cultivars while the sub-factor were the weed control methods. The three cultivars of maize (landrace) planted were sourced from seed vendors in their various locality (Oka Abakiliki, Oka Bende, Oka Nsukka. The weed management methods were weedy check, two hoe weeding at 3 and 6 weeks after planting (WAP), pre- emergence application of Atrazine (3WAP) at the rate of 3kg ai/ha and post emergence herbicide application.

The land used for this experiment was cleared manually and tilled very well into fine tilt. Planting was done on ridges with planting depth of 2cm, inter row 75cm and intra row spacing of 25cm on a 3m long ridges. The resultant seedlings were thinned down to two plants per stand after two weeks of sowing.

2.1 Data collection

Weed species percentage frequency: this was obtained by counting and recording the number of times an individual specie occurred in a quadrat. This was obtained using the formula as reported by Awodoyin and Olubode (2009), where;

$$\text{Weed percentage frequency} = \frac{\text{Number of units in which the specie occurred}}{\text{Total number of unit studied}} \times 100$$

2.2 Yield component

Data on grain yield of maize were collected (De-husked maize weight, cob length, cob fresh weight and number of cobs was counted after harvest). The dry grain weight per plot was extrapolated to tonnes per hectare as outlined by Steel and Torrie (1980).

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2.3 Data analysis

Data collected was subjected to analysis of variance (ANOVA) using Gen-stat Release 10.3 statistical. While the means were separated using the Fisher's Least Significant Difference (LSD) at 5% probability level.

3. RESULTS

3.1 Soil Physico-chemical characteristics of the experimental site

The physicochemical characteristics of the topsoil at the experimental site are presented in Table 1. The result of obtained showed that the sandy clay loam soil was acidic with low nutrient status with regard to the total nitrogen, available phosphorus, potassium, percentage organic carbon, calcium, sodium and magnesium which were below critical levels.

3.2 Germination

Table 2 showed the result of number of germinated maize seeds. At five and eight days after sowing, both were not significantly different. Oka Nsukka recorded highest germinated seed at 5DAS 92% in the month of July, 2022 while at 8DAS Oka Bende had the highest value as 99%. The lowest number of germination percentage was recorded in Oka Abakiliki 86.5% at 5DAS and 96.6% at 8DAS respectively. The weed management practices applied as examined was significantly different in all the months at 5DAS both in 2021 and 2022, with the highest value in pre-emergence herbicide application 95.3% The analysis of variance showed that the interaction between cultivar and weed management practices was not significant.

Table 1: Physical and chemical properties of soil at the experimental site

Parameters	Value
Clay	230 (g/kg)
Silt	210g (g/kg)
Fine sand	420 (g/kg)
Coarse sand	160 (g/kg)
Textural class	Sandy clay loam
Bulk Density	1.39gm-3
Total porosity	48.92 (%)
Moisture Content	20.52 (%)
Dispersion Ratio	0.87 (%)
Aggregate Stability	17.02 (%)
Hydraulic conductivity	4.59 (cmhr-1)
pH (H2O 1:1)	5.98
Oxygen Content	0.76 (%)
Nitrogen	0.055 (%)
Available Phosphorus	3.89mgkg-1
Ca2+	
1.5(cmolkg-1)	
Mg2+	
1.3 (cmolkg-1)	

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Na+ 0.24 (cmolkg-1) K+ 0.26 (cmolkg-1)	
ECEC	4.99 (cmolkg-1)
B S	87 (%)

Source: Agricultural Development Programme (ADP) Soil Laboratory Unit.

Table 2: Effect of variety and weed control methods of maize on germination at 5 and 8days after sowing (DAS) in May, June and July at Igbariam in 2021 and 2022 cropping season.

	Germination at 5 DAS						Germination at 8 DAS					
	May		June		July		May		June		July	
Treatment	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022
Variety(Var.)												
V1	86.7	88.1	87.6	89.4	87.7	90.0	98.2	96.4	98.5	97.6	97.8	96.6
V2	90.4	91.0	90.7	90.6	90.8	89.3	97.0	98.0	96.8	98.4	97.4	99.0
V3	90.2	89.6	90.5	91.1	90.4	92.2	96.7	98.1	97.3	98.5	98.0	98.7
Mean	**89.1**	**89.5**	**89.6**	**90.3**	**89.6**	**90.5**	**97.3**	**97.5**	**97.4**	**98.1**	**97.7**	**98.1**
LSD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
WCM												
W0	85.5	86.3	86.5	87.3	85.6	86.4	96.1	97.0	96.1	96.8	96.3	97.2
W1	90.4	89.6	90.2	91.4	90.2	92.3	98.3	98.4	98.3	99.0	98.2	99.2
W2	94.3	94.2	95.3	93.3	95.1	93.6	99.2	98.0	99.2	98.5	99.3	98.6
W3	87.6	88.0	87.5	89.2	87.8	88.6	97.2	97.4	97.2	96.6	97.0	96.7
Mean	**89.5**	**89.6**	**89.8**	**90.3**	**89.7**	**90.2**	**97.7**	**97.7**	**97.6**	**97.7**	**97.6**	**98.0**
LSD	5.7	5.8	5.5	5.2	5.5	5.6	NS	NS	NS	NS	NS	NS
Interaction												
Var. x WCM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS = Not significan**t, W0** = Weedy check, **W1** = Hoe weeding (weeded control), **W2** = Pre-emergence herbicide application, **W3** = Post-emergence herbicide, **V1**= Oka Abakiliki, **V**2= OkaBende, **V3**= Oka Nsukka,WCM= Weed control methods.

3.3 Plant height

Table 3 showed that the result on growth parameters. Plant height, among the cultivars were not significantly different but under the weed control methods applied, the result indicated a significantly difference. The pre-emergence herbicides recorded the highest value (83.1 cm) in July, 2021 at 4WAS and (249.0) at 8WAS in the month of May 2021. The lowest plant height value was obtained on the weedy check plot both at 4WAS and 8WAS (46.4 and 106)

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respectively. The analysis of variance showed that the interaction between cultivar and weed management practices was not significant.

3.4 Leaf area and Stem girth

Table 4, showed the result on leaf area and stem girth. Oka Bende recorded the highest value at both parameters (884cm^2 and 9.7cm) at 8WAS in the month of June, 2021. Oka Abakaliki recorded the lowest values both on the plant girth and Leaf area 8.1 cm and 804 cm^2 at 8WAS respectively. The weed management practices applied as examined was significantly different on the plant girth with the highest value on pre-emergence herbicide (11.6 cm) and lowest in weedy check (6.2 cm). While the highest value for plant leaf area was recorded in pre-emergence as 1038 cm^2. The analysis of variance showed that the interaction between cultivar and weed management practices was not significant.

Table 3: Effect of variety and weed control methods of maize on plant height at 4 and 8 weeks after sowing in May, June and July at Igbariam in 2021 and 2022 cropping season.

	Plant Height at 4WAS						Plant Height at 8WAS					
	May		June		July		May		June		July	
Treatment	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022
Variety(Var.)												
V1	64.7	60.1	64.8	62.4	64.8	63.0	204	201	205	203	203	202
V2	59.5	57.0	63.2	64.6	63.4	65.3	189	190	195	201	192	200
V3	63.2	61.6	60.5	61.1	61.4	62.2	192	191	191	196	189	201
Mean	**62.4**	**59.5**	**62.8**	**62.7**	**63.2**	**63.5**	**195**	**194**	**197**	**200**	**194**	**201**
LSD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
WCM												
W0	49.9	46.3	49.5	47.3	50.6	46.4	108	106	114	112	108	106
W1	58.3	55.6	58.2	54.4	58.2	52.3	210	208	210	209	211	208
W2	81.6	80.2	82.7	81.3	83.1	80.6	249	239	248	246	249	244
W3	60.3	58.0	60.5	59.2	60.8	58.6	214	213	215	213	216	214
Mean	**62.5**	**60.1**	**62.7**	**60.5**	**63.1**	**59.2**	**195**	**191**	**196**	**195**	**196**	**193**
LSD	7.5	7.8	6.9	7.2	8.8	8.9	20.9	19.8	20.1	19.7	21.1	19.6
Interaction												
Var. x WCM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS = Not significan**t, W0** = Weedy check, **W1** = Hoe weeding (weeded control), **W2** = Pre-emergence herbicide application, **W3** = Post-emergence herbicide, **V1**= Oka Abakiliki, **V**2= Oka Bende, **V3** = Oka Nsukka, **WCM**= Weed control methods.

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Table 4: Effect of variety and weed control methods of maize on plant girth and leaf area (CM^2) at 8 weeks after sowing in May, June and July at Igbariam in 2021 and 2022 cropping season.

	Plant Girth at 8WAS						Leaf Area at 8WAS					
	May		June		July		May		June		July	
Treatment	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022
Variety(Var.)												
V1	8.5	8.1	8.6	8.4	8.4	8.3	627	618	626	619	603	613
V2	9.2	9.0	9.7	9.6	9.5	9.3	657	645	663	640	629	637
V3	9.0	8.6	9.2	9.1	9.3	9.0	662	653	656	648	617	643
Mean	**8.9**	**8.5**	**9.1**	**9.0**	**9.0**	**8.8**	**649**	**638**	**648**	**636**	**616**	**631**
LSD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
WCM												
W0	7.2	6.3	7.0	6.3	7.0	6.2	574	563	577	561	541	540
W1	8.6	8.3	8.2	8.4	8.0	8.3	617	611	614	608	575	564
W2	11.6	9.7	10.8	9.8	10.7	9.6	777	735	779	739	743	717
W3	8.6	8.0	8.6	8.2	8.4	8.0	627	618	627	620	596	590
Mean	**9.0**	**8.0**	**8.6**	**8.1**	**8.4**	**8.0**	**649**	**618**	**649**	**632**	**614**	**602**
LSD	4.0	3.0	3.5	3.0	3.5	3.1	NS	NS	NS	NS	NS	NS
Interaction												
Var. x WCM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS = Not significan**t, W0** = Weedy check, **W1** = Hoe weeding (weeded control), **W2** = Pre-emergence herbicide application, **W3** = Post-emergence herbicide, **V1**= Oka Abakiliki, **V**2= Oka Bende, **V3** = Oka Nsukka, WCM= Weed control methods.

3.5 Maize Yield

The highest percent grain weight (14.6 kg) was recorded in Oka Abakiliki while the lowest grain weight (8.2 kg) was obtained in Oka Bende in the month of July, 2021 (Table 5). The cob weight recorded the highest value of 1.7 kg in Oka Nsukka in the month of May. The weed management practices applied as examined was significantly different on the percent grain weight treated with pre-emergence herbicide in June, 2021 and lowest value in weedy check. The analysis of variance showed that the interaction between cultivar and weed management practices was not significant (P>0.05).

Results on dehusked cob weight and number of harvested cob at 8 weeks after sowing (WAS) are presented in Table 6. The highest dehusked cob weight (0.48 kg) was recorded in Oka Abakilikiin the month of July 2021 while the lowest dehusked cob weight (0.40 kg) was obtained in Oka Nsukka. The number of harvested cob recorded the highest value of 31.8 in Oka Abakiliki in the month of July and lowest in Oka Bende. The weed management practices applied as examined was significantly different on the dehusked cob weight and number of harvested cob treated with pre-emergence herbicide in July and June, 2021 respectively and

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lowest value in weedy check (0.20kg). The analysis of variance showed that the interaction between cultivar and weed management practices was not significant (P>0.05).

Table 5: Effect of variety and weed control methods of maize on percentage grain weight and cob weight at 8 weeks after sowing in May, June and July at Igbariam in 2021 and 2022 cropping season.

	Percentage Grain Weight @ 8WAS						Cob Weight @ 8WAS					
	MAY		JUNE		JULY		MAY		JUNE		JULY	
Treatment	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022
Cultivar												
V1	14.6	15.1	14.4	13.1	10.7	9.0	1.2	1.4	1.5	1.4	1.8	1.4
V2	14.4	13.5	13.9	12.6	8.2	8.3	1.2	1.0	1.6	1.4	1.4	1.0
V3	14.2	13.6	14.3	14.1	8.4	9.2	1.7	1.1	1.3	1.5	1.0	1.7
Mean	**14.4**	**14.0**	**14.2**	**13.2**	**9.1**	**8.8**	**1.3**	**1.2**	**1.5**	**1.4**	**1.4**	**1.3**
LSD	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
WCM												
W0	7.2	6.3	6.7	7.3	8.0	6.8	1.1	1.0	1.1	1.2	1.3	1.2
W1	11.8	9.6	11.8	9.4	8.2	8.3	1.3	1.4	1.3	1.0	1.2	1.0
W2	21.5	20.2	21.6	19.3	9.4	8.6	1.8	1.6	1.2	1.3	1.3	1.1
W3	17.6	16.0	16.9	15.2	9.0	8.9	1.4	1.2	1.2	1.4	1.0	1.1
Mean	14.5	13.0	14.2	12.8	8.6	8.2	1.4	1.3	1.2	1.2	1.2	1.1
LSD	5.7	5.8	5.5	5.2	5.5	5.6	NS	NS	NS	NS	NS	NS
Interaction												
Var x WCM	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

NS = Not significant**, W0** = Weedy check, **W1** = Hoe weeding (weeded control), **W2** = Pre-emergence herbicide application, **W3** = Post-emergence herbicide, **V1**= Oka Abakiliki, **V**2= Oka Bende, **V3** = Oka Nsukka, WCM= Weed control methods.

Table 6: Effect of variety and weed control methods of maize on dehusked cob weight and number of harvested cob at 8 weeks after sowing in May, June and July at Igbariam in 2021 and 2022 cropping season.

	Dehusked Cob Weight @ 8WAS (Kg)						Number of Harvested Cob @ 8WAS					
	MAY		JUNE		JULY		MAY		JUNE		JULY	
Treatments	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022
Cultivars												
V1	0.46	0.45	0.47	0.46	0.48	0.47	31.1	30.2	31.7	32.5	31.8	30.7
V2	0.40	0.42	0.44	0.44	0.45	0.44	29.0	28.1	30.6	30.1	30.5	32.0
V3	0.44	0.41	0.40	0.41	0.40	0.41	31.3	29.3	29.3	29.5	29.4	29.1
Mean	**0.43**	**0.42**	**0.43**	**0.43**	**0.44**	**0.44**	**30.4**	**29.2**	**30.5**	**30.7**	**30.5**	**30.2**

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LSD WCM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
W0	0.21	0.22	0.21	0.21	0.20	0.22	18.4	20.1	19.1	21.0	19.1	19.7
W1	0.38	0.36	0.37	0.38	0.38	0.39	26.2	24.6	26.1	23.3	26.1	25.8
W2	0.69	0.70	0.68	0.68	0.72	0.69	42.6	42.7	42.8	41.8	42.7	42.6
W3	0.48	0.47	0.47	0.46	0.48	0.48	35.1	34.0	33.3	34.4	33.2	35.6
Mean	**0.44**	**0.43**	**0.43**	**0.43**	**0.44**	**0.45**	**30.5**	**30.3**	**30.3**	**30.1**	**30.2**	**30.9**
LSD	0.06	0.05	0.06	0.05	0.06	0.06	4.7	4.6	3.8	4.0	3.9	4.7
Interaction												
Var x WCM	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS = Not significan**t, W0** = Weedy check, **W1** = Hoe weeding (weeded control), **W2** = Pre-emergence herbicide application, **W3** = Post-emergence herbicide, **V1**= Oka Abakiliki, **V**2= Oka Bende, **V3** = Oka Nsukka, WCM= Weed control methods.

4. DISCUSSION

Among the herbicides that were evaluated, maize in the plots treated with pre-emergence herbicide (Atrazine) had taller maize plants than the other weed control methods. The results indicated that using the combinations of herbicides and hoe weeding will constantly keep the maize plots almost weed free. This is similar to the findings of Mahadi (2011) who reported that weed competition decreases growth and yield of maize plant. The weed control treatments proved superior to weed check in yield parameters. The efficiency of various chemical method and hoe weeding control practice in enhancing grain yield have previously observed by Saberali (2007) and Toloraya *et al.*, (2010).

5. CONCLUSION

The result from this research suggested that the growth and yield parameters output was affected by the various weed control method applied. Moreover, the selected landrace maize cultivars responded positively to the weed control treatments especially ‘Oka Bende’ and ‘Oka Nsukka’ and should be produced more in their localities.

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