Weeds Associated With *Zea Mays* (L) and *Arachis Hypogaea* (L) After Application of Primextra Gold Herbicide.

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ABSTRACT
An experiment to evaluate the efficacy of Primextra Gold herbicide in controlling weeds associated with Zea mays (L), and Arachis hypogaea (L) was conducted in the green house of the University of Port Harcourt. The experiment was laid out in a Completely Randomized Design with four replicates and weed control treatments– 0.0 kg a.i/pot, 0.5 kg a.i/pot,1.0.kg a.i/pot, 1.5 kg a.i/pot 2.0 kg a.i/pot which were applied after planting of maize and groundnut but before seedling emergence. The Weed Assessment parameters investigated include the weed flora, weed identification and classification, Weed frequency occurrence and weed density and this was done to determine the herbicide efficacy. Results show that the effects of the treatments were mostly significant ($p \leq 0.05$) for all parameters measured. The control showed the highest values in all the measured parameter. The diversity and density of the weed flora was higher in the untreated pots than in treated pots. Broadleaves were found to have associated more with groundnut crops, while sedges and grasses where more in maize crops. The most common weeds identified were from the families of Poaceae, Rubiaceae and Cyperaceae.

***Keywords**: Weeds, primextra Gold herbicide, maize, groundnut, weed assessment parameters.*

INTRODUCTION

Maize (*Zea mays*) is a plant belonging to the family of Poaceae. It is cultivated globally being one of the most important cereal crops worldwide. Maize is not only an important human nutrient, but also a basic element of animal feed and raw material for manufacture of many industrial products and it is also being recently used as biofuel. Groundnut (*Arachis hypogaea* (L.), a member of the fabaceae family, is an important food and oil crop. It is the third major oil seed of the world after soybean and cotton (FAO, 1990). These arable crops are cultivated and consumed all over the world, but these crops are easily affected by weeds which affect their growth, development and crop yields.

Weeds are unwanted and undesirable plants which interfere with the utilization of land and water resources and thus adversely affect human welfare. Akobundu, I.O. (1992). The occurrence of weeds in agricultural crops leads to substantial yield reductions causing economic losses all over the world. Crop damage from weeds generally is larger than from other pests. Anyanwu, D.I. (2001) Weed is a plant that is successful in colonizing disturb, but potentially productive sites and at maintaining their abundance under conditions of repeated disturbance. Weeds can viably contend with crop species, can bring down yields, and expand work prerequisites (Klingman and Ashton, 1975). Presence of certain weeds may contribute to reduce insect infestations in crops.

Weeds constitute a major limiting factor to cowpea production in Nigeria. Okafor & Adegbite, (1991) reported that weed could cause crop yield losses ranging from 50 to 80 %.

Crop losses by weeds could be aggravated by delay in weeding or inability to weed throughout the entire crop growth period. Akobundu, (1987), Weeds also act as reservoirs or alternate hosts for insects, diseases and nematodes. Weeds are controlled mainly by hand weeding, but also by other agricultural practices such as increased ploughing, delayed planting and crop rotations. Some mechanical weeding is also carried out using simple traditional implements and some modern tools. Animal-powered weeding systems are efficient in time and cost savings (Smith *et al*., 2012). Akobundu, 1992 reported that Integrated Weed Management (IWM) which is the use of two or more sets of cultural, mechanical, preventive, biological and chemical control practices to –Limit the introduction and spread of weeds is the most effective weed control method. PrimextraGold have been effective in the of control weeds in cucumber (Ugwunna *et al*., 2015) and melon (Ochekwu *et al*., 2015). Primextra Gold is a preemergent, residual herbicides. Omovbude, S., & Udensi, U. E. (2013) It is toxic to algae and the atrazine component has potential to contaminate the ground water in some circumstances. Primextra Gold which is a recently introduced herbicide in Nigeria and has not been widely experiment on by farmers. Ugwunna *et al* (2013). Other herbicides that can be used to control annual weeds include benefin + oryzalin ,benefin + trifluralin. Song, C (2006). Hence, this study was carried out to examine the effectiveness of Primextra Gold, in controlling weeds associated with of maize and groundnut, and to provide useful information to the agriculturists on the herbicides type to be used and to ascertain the effect of weed control efficiency of primextra Gold herbicides.

MATERIALS AND METHODS

Experimental site

University of Port Harcourt is located on latitude 4^0 52'N and 4^0 55'N and longitudes 6^0 54'E and 6^0 56'E in Obio/Akpor Local Government Area (LGA), Rivers State. It is situated in the Niger Delta wetland of southern Nigeria. The study site is characterized by tropical monsoon climate with mean annual temperature of 25^0C to28^0 C and annual rainfall over 3000mm. the relative humidity is very high with an annual mean of 85% while, the soil is usually sandy or sandy loam underlain by a layer of impervious pan. The study site was situated at the Centre of Ecological studies, department of plant science and Biotechnology with a coordinate of Longitude N 04O 54' 16.1", latitude 006O 55' 23.3" and altitude 4m above sea level in the University of Port Harcourt, Rivers state, Nigeria..

SOURCES OF MATERIALS

Primextra Gold herbicide was obtained from the ADP (Agricultural Development Programme) Port Harcourt, River State. The Primextra Gold herbicide contains two active constituents, 290 g/l S-Metalochlor and 370 g/l Atrazine. Maize (swan- 1- yellow), Groundnut (Kano-5), were obtained from the Centre of Ecological Research, The soil used was obtained from a prestine environment from the university of Port Harcourt premises. The plastic buckets used of surface area of 0.026 m^2 and height 10 cm.

Table 1: Result of Soil test analysis

pH (1:1)	E.C(uS)	% T.N	% Or.C	Ca cmol/kg	Mg cmol/kg	K cmol/kg	Na cmol/kg	Exc.Acidity	CEC	PPM P	ppm Mn	ppm Fe	ppm Zn	ppm Cu	ppm Pb	ppm As	ppm Cd	ppm Mercury	% Sand	% Silt	% Clay	% Org.Matter
8.4	151.3	3.7	35.5	4.6	1.1	0.4	0.1	0.04	6.3	336.7	201.4	134.7	101.3	38.1	0.6	0.2	1.4	0.1	79	9	12	61.77

EXPERIMENTAL DESIGN

The analysis was laid out in a Completely Randomized Design with five treatments and each treatment replicated 4 times. The analysis on seed sowing, herbicides application, weed emergence, weed identification and weed count, injury scoring/rating were all carried at the greenhouse of the University of Port Harcourt. Primextra Gold was applied post plant emergence with CO_2 pressurized backpack sprayer. Sufficient quantity of moisture was maintained in the soil.

Table 2. Primextra gold treatments applied

Treatments	Primextra Gold Concentration Kg a.i / pot	Primextra Gold Concentration kg ai/ ha
T1	Control – 0.0 kg a.i/pot	0.00 kg ai/ ha
T2	0.5 kg a.i/pot	0.758 kg ai/ ha
T3	1.0 kg a.i/pot	1.515 kg ai/ ha
T4	1.5 kg a.i/pot	2.272 kg ai/ ha
T5	2.0 kg a.i/pot	3.029 kg ai/ ha

WEED ASSESSMENT PARAMETERS

Weed flora, identification and classification. The total number of weeds present was separated into the different species, counted and recorded at weekly interval, that is at 7, 14 and 21 DAT (days after treatment).

Frequency: The percentage frequency of occurrence of each species was calculated using the formula (Anyanwu *et al*. 2014);

$$\text{Frequency} = \frac{\text{Total no of sample plots in which the species occur}}{\text{Total no of sample plots studied}} \times 100\%$$

Weed density: (m^{-2}). The density for each species was calculated per pot according to Anyanwu, *et al*. (2014)

$$\text{Density} = \frac{\text{Total number of the species in all the Sample Units}}{\text{Total number of sampling Unit Studied.}}$$

Classification of Weeds into Broadleaves, Sedges and Grasses.

Broadleaf weeds have two seed leaves as they emerge through the soil. Their leaves are generally wider than those of grass weeds. Veins on the leaves are branched or net- like.

Grasses: have only one seed leaf, their leaf blades are narrow and have parallel veins. Stems are round or oval. They may develop seed heads at the ends of the stems, but if they have flowers, the flowers will be inconspicuous.

Sedges: Sedges look a lot like grasses but their stems are triangular. Their leaves are usually shiny and smooth. Sedges often have "nuts" or tubers attach.

Weed Control Efficiency (WCE %): Weed control efficiency connotes the magnitude of weed reduction due to the weed control treatment. It expresses the percentage (%) reduction in weed population due to weed management practices over control. The weed control efficiency was calculated using the result from the weed count in treated and untreated pots and expressed in percentage. The weed control efficiency was calculated as follows:

$$WCE\ \% = \frac{weed\ population\ in\ control\ pots - weed\ population\ in\ treated\ pots}{weedpopulationincontrolpots} \times 100$$

RESULTS

WEED FLORA AND CLASSIFICATION

The weed species observed to be associated with the two crops are presented in Table 3a below.

Table 3a showed the species contents in maize plant pot. Different weed species were found to have associated with maize plant. A total number of 77 weed species was recorded for pot treated with herbicides concentration of 0.5kg; 67 weeds species was recorded for pot treated with 1.0kg; 72weeds species was recorded for 1.5kg and 92 weeds was recorded for the pot treated with herbicides concentration of 2.0kg. .A total number of 359 weeds was recorded for control pot. Pots treated with herbicides showed decreased number of weeds species as shown in table 3a

Table 3a.Weed species associated with maize treated with herbicides in different concentrations at 7DAT to 21DAT

		T1 DAT			2 DAT			3 DAT			4 DAT			5(control) DAT		
Weed species	Family	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21
Phyllantus Amarus (L)	Euphorbiaceae	5	3	0	3	4	5	2	5	9	0	8	10	4	12	15
*Oldenlandia corymbosa (*L*)*	Rubiaceae	8	2	12	9	0	7	3	8	8	11	8	10	26	28	32
Peperonia pellucida (L.)	Piperaceae	5	4	10	7	10	10	5	1	3	8	3	2	14	27	20
Cyperus rotundus (L.)	Cyperaceae	5	5	6	3	4	8	4	8	8	7	7	9	39	41	45
Spermacoce ocymoides (L.)	Rubiaceae	5	0	5	3	3	0	0	0	0	0	0	0	5	3	3
Axonopus compressus (L.*)*	Poaceae	1	0	1	0	0	0	1	0	1	0	1	0	1	0	3
*Synedrella nodiflora (*L).	Asteraceae	0	0	2	1	0	1	1	2	0	3	0	0	5	16	0
*Physalis sp (*L).	Solanaceae	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0
Solenostemon moriostachyus(L.	Lamiaceae	0	0	0	3	0	0	0	3	0	0	0	0	4	3	0
Ageratus conyzoides	Asteracae	1	1	0	0	0	0	0	0	0	1	2	1	3	4	5

(L.)																
TOTAL		26	15	36	30	21	31	16	27	29	31	29	32	101	135	123

The weed species observed to be associated with the groundnut crop is presented in Table 3b below.
Eight (8) weed species were recorded dominating. The control (no herbicide treatment) had highest number of weed species while the 0.5 kg a.i/hectare had the lowest. There was a general decline in weeds species with application of herbicide at concentration from 0.5 kg a.i/hectare to 2.0 kg a.i/hectare at 7DAT to 21 DAT in groundnut. increased herbicides concentration lead to decrease in the number of weeds in the treated pot. From 7DAT to 21DAT .A total of 56 weeds species were recorded for 0.5kg; 65 weeds species was recorded for 1.0kg; 93 weeds for treatment 1.5kg; 70 weeds species recorded for treatment 2.0kg.and the control showed the highest weeds count of 196 from 7DAT to 21DAT, Example of weeds species dominantly associated with groundnut are *Cyperus rotundus (*L.*), Eleusine indica*(L.*) Peperonia pellucida* L.), and *Oldendandia corymbosa* L). *etc.*

Table 3b. Weeds associated with groundnut crop treated with herbicides in different concentrations at 7DAT to 21DAT.

		T1 DAT			2 DAT			3 DAT			4 DAT			5(control) DAT		
Weed species	Family	7	14	21	7	14	21	7	14	21	7	14	21	7	14	21
Triumfelta rhomboidea L	Malvaceae	6	3	0	0	1	0	2	5	4	0	8	5	4	12	15
Oldenlandia corymbosa L	Rubiaceae	6	6	1	12	0	10	6	5	7	9	8	5	10	7	9
Peperomia pellucida (L.)	Piperaceae	1	1	0	0	3	10	5	2	5	9	3	2	14	27	20
(Cyperus rotundus L	Cyperaceae	1	6	13	7	5	7	17	10	10	10	7	9	13	10	17

Phyllantus amarus (L.)	Euphorbia-ceae	2	1	3	2	1	1	2	1	0	0	0	0	1	1	3
*Ageratum conyzoides (*L*)*	Asteracae	1	0	1	0	0	0	4	7	0	0	0	0	1	0	3
Urena lobatus nodiflora (L.)	Malvaceae	0	2	2	1	0	1	1	2	0	3	0	0	5	16	0
Physalis sp(L.)	Solanoideae	0		0	1	0	0	0	0	0	1	0	0	0	1	0
Digitarian sp (L.)	Poaceae	0	0	0	3	0	0	0	3	0	0	0	0	4	3	0
TOTAL		17	19	20	26	10	29	37	30	26	23	27	20	52	77	67

PERCENTAGE FREQUENCY OF OCCURRENCE (%) OF WEEDS SPECIES IN THE DIFFERENT CROPS TREATED WITH HERBICIDE

In maize plants, *Cyperus rotundus* (L.*)* was the most occurring weed species in the untreated pot, while *Peperonia pellucid* (L.) had the highest frequency of occurrence in the treated pot, from herbicides concentration of 1.5 kg a.i/hectare (T4) and 2.0 kg a.i/hectare (T5). *Cyperus rotundus* (L.), *Echinochloa* sp (L.), and *Cynodon dactylon* (L.*)* showed the least occurrence (Table 4a).

In groundnut pots, all the species present at the control showed 100% frequency of occurrence except *Triumfelta rhomboidea* (L.), at the treated pots, 100% frequency of occurrence were observed for *Oldenlandia corymbosa* (L.), (T1) 0.5 kg a.i/pot and (T3) 1.5 kg a.i/pot; *Peperonia pellucida* (L.)*;* (T2)1.0 kg a.i/pot, there was a decrease in frequency of occurrences of the weed species at the (T4) 2.0 kg a.i/pot (table 4b)

Table 4a: Frequency of Occurrence of Weed Species in the Different Treatment with Herbicides in Maize Plant

Weed sp	T1	T2	T3	T4	T5
Phyllantus amarus (L.)	50	25	50	25	50
Oldenlandia corymbosa (L.)	50	0	0	0	0
*Peperonia pellucida (*L.*)*	50	100	50	100	100
Cyperus rotundus (L.)	100	0	0	0	100
*Physalis sp (*L.*)*	25	0	0	0	0
Solenostemon moriostachyus (L.*)*	25	0	0	0	0
*Spermacoce ocymoides (*L.*)*	75	0	0	0	0
*Colosia triggia (*L.)	50	0	0	0	0

Table 4b: Frequency of occurrence of Weed Species in the Different Treatment with Herbicides in Groundnut Plant.

Weed sp	T1	T2	T3	T4	T5
Phyllantus amarus (L.*)*	100	25	0	0	25
Peperonia pellucida (L).	100	75	100	75	50
Oldenlandia corymbosa (L).	100	100	25	100	25
Cyperus rotundus (L).	100	0	0	0	0
Triumfelta rhomboidea (L).	0	0	0	25	0

DENSITY OF THE WEEDS (count /m^2) SPECIES TREATED WITH HERBICIDES CONCENTRATION

In maize, the highest density was observed in (*Cyperus rotundus* L *)*, followed by *Olden landia corymbosa* (L).,in control, while *Phyllantus amarus* (L). showed the least density. In

the treated pot, *Cyperus rotundus* (L.) showed the highest density in pot treated with herbicides concentration of 2.0 kg a.i/pot as shown in (Table 5a).
In groundnut *Peperonia pellucid* (L) and *Oldenlandia corymbosa* (L) were densely populated both in the control pots and the treated pots. *Phyllantus amarus* (L.) and *Cyperus rotundus* (L.) were least populate in the treated pots. (Table 5b).

Table 5a: Density of Weed (count / m^2) Species Treated With Herbicides In Maize

Weed species	**T1**	**T2**	**T3**	**T4**	**T5**
Phyllantus amarus (L).	19	10	19	10	19
Oldenlandia corymbosa (L).	269	0	0	0	0
Cyperus rotundus (L).	433	0	0	0	433
Spermacoce ocymoides (L).	106	0	0	0	0
Physalis sp (L).	10	0	0	0	0
Solenostemon moriostachyus(L).	0	0	0	0	0
Colosia triggia (L).	29	0	0	0	0
Peperonia Pellucida (L).	58	144	58	144	135
Axonopus compressus (L).	0	0	0	0	0

Table 5b: Density of weed (count /m^2) Species treated with herbicides in groundnut

Weed species	T1	T2	T3	T4	T5
Oldenlandia corymbosa (L).	58	39	10	10	39
Peperonia Pellucida (L).	327	231	173	250	144
Cyperus rotundus (L).	481	0	0	0	0
Phyllantus amarus (L).	58	39	10	10	39

CLASSIFICATION INTO BROADLEAVES, SEDGES AND GRASSES.
Examples of broadleaves observed where categoried into the family of the following species. Asteracae, Rubiaceae, linderniaceae, Amaranthaceae and Lamiaceae . Examples of sedges includes, cyperaceae e.g *Cyperus rotundus*
Examples of grasses observed were from the families which include the following Poaceae, *Cyperaceace, onagraceae*. Fig.1a. showed the classification and estimation of broad leave weeds present in the tested crop.

A. **broadleaves in maize**

In Maize pot, the untreated pot showed the highest broadleaves, grasses and sedges than the treated pot from 7 DAT to 21 DAT. In the treated pot, concentration of herbicides from treatment 1.0kg a.i/pot to 2.0 kg a.i/pot showed reduction in broadleaves which show that higher increase in herbicides concentration caused a drastic reduction of broadleaves weed species in maize. As showed on (fig1a)

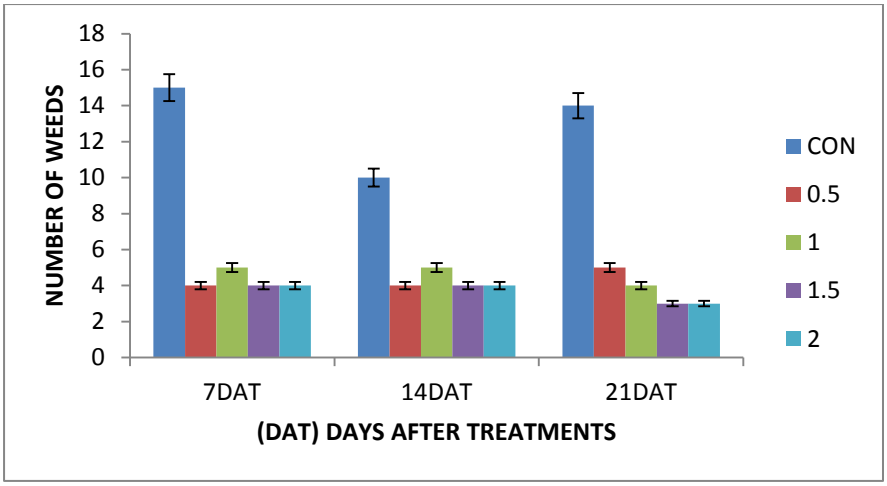

Fig.1a. Broadleaves in maize

B. Sedges in maize plant

The untreated pots were relatively higher than the treated pots from 7DAT to 21DAT. Herbicides concentration from 0.5kg to 1.0kg showed increased number of sedges compared to treatment 1.5kg to 2.0kg at 7DAT and 21DAT.AT, higher concentration of herbicides showed increased number of sedges. Fig 1b

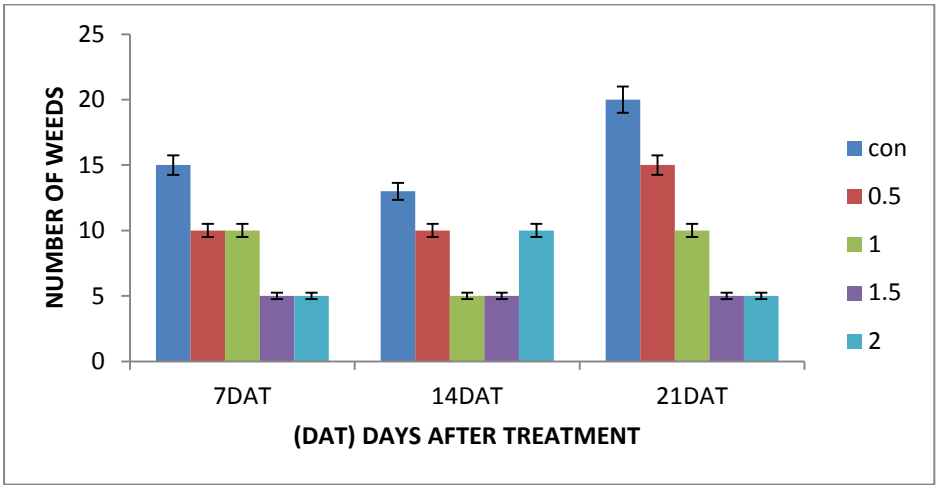

Fig 1b. Sedges in maize

C. Grasses in maize plant.

The grasses were relatively abundance, from 7DAT the number of grasses ranged from 0-30, where the untreated pot showed the highest number of grasses as compared to the untreated pot. At 14DAT, there were an increased number of grasses, from the herbicide concentration of 0.5kg to 2.0kg at 21DAT, the number of grasses occurrence was on the declined from herbicides concentration of 0.5kg to 2.0kg,but was found to have associated more to maize crops than other crops tested.fig 1c

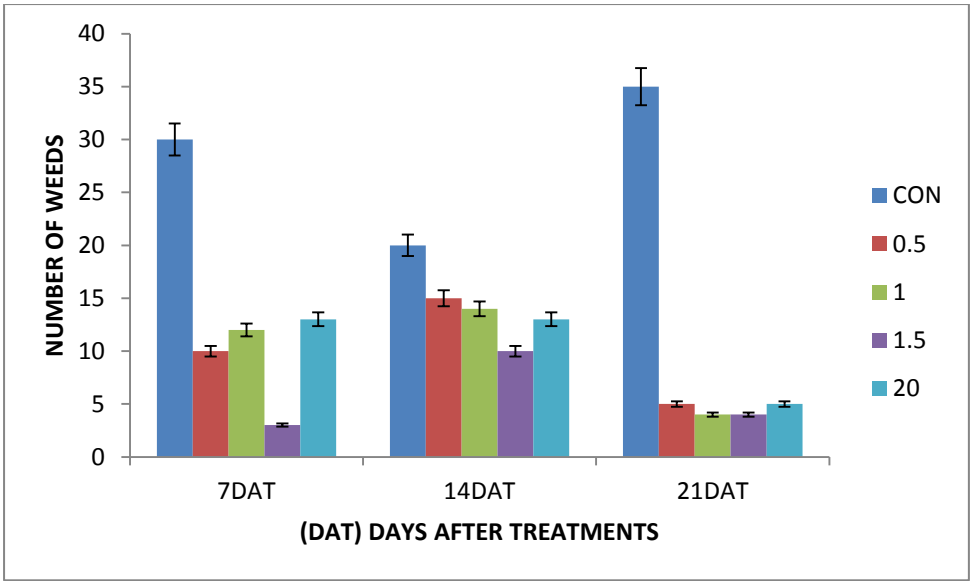

Fig.1c. Grasses in maize plant

BROADLEAVES IN GROUNDNUT PLANT

In Groundnut, the control showed the highest weed species compared to the treated pots, increase concentration of herbicides caused great reduction of weed species, at 7DAT - 21DAT, the weed ranged from5 to 30 weed species. Broadleaves weeds were found to have associated more to groundnut than maize plant. Although there was a declined in the pots treated with herbicides. A total number of 130 broadleaves was recorded in great at 21DAT across the concentration rated. As showed in Fig2a

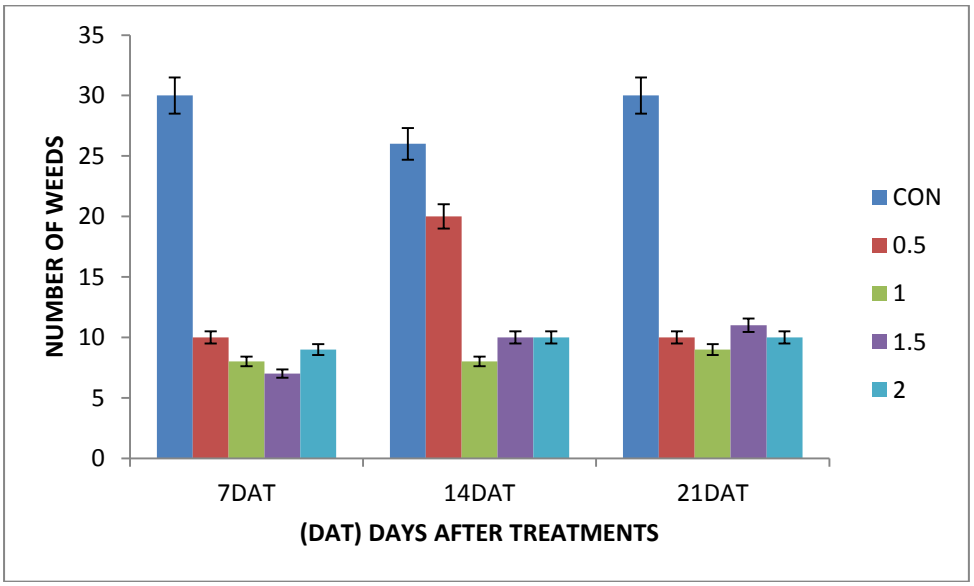

Fig 2a. Broadleaves in Groundnut Plant

B. SEDGES IN GROUNDNUT PLANT

Sedges occurred in groundnut plant from 7dat to 21dat, although on d decreased, in the treated pot, the highest number of sedges ranged from 0-9, while the untreated ranged 0-15 number of weeds. Fig. 2b

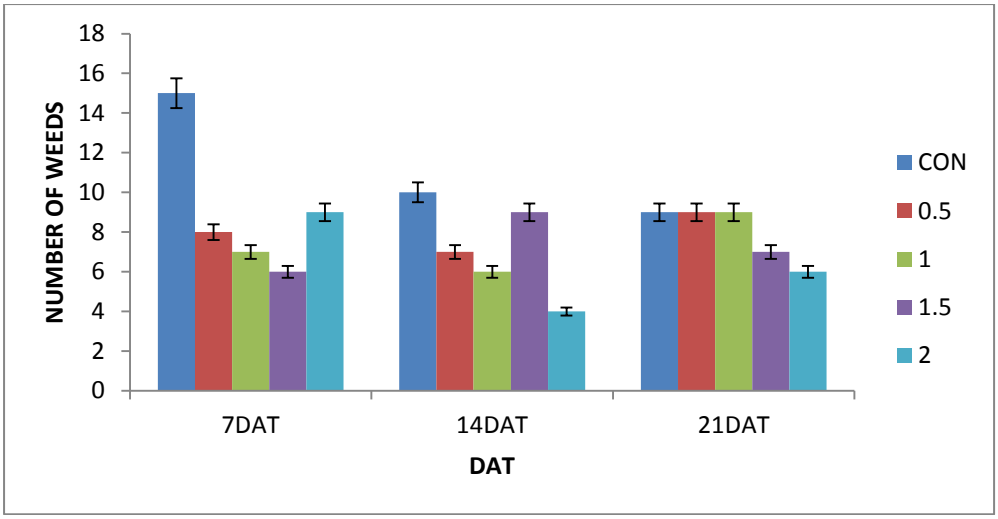

Fig2c. Number of sedges in groundnut plant.

Grasses in groundnut

Herbicides concentration affected the number of grasses in groundnut pots, the untreated pot showed the highest number of weeds as compared to the treated pots. At 7DAT to 21DAT, the total number of grasses ranged from 0-23 in the untreated pot. Fig. 2c.

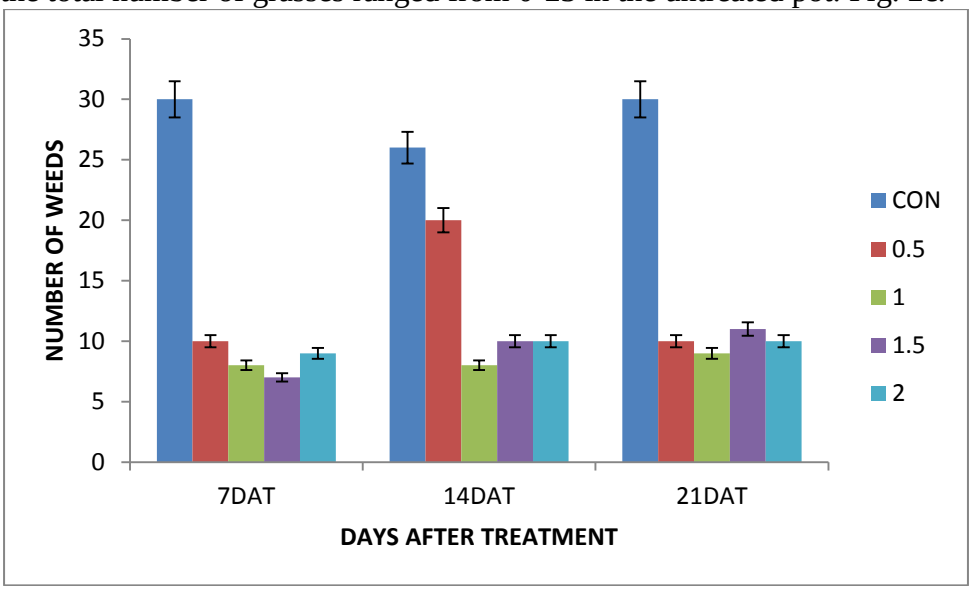

Fig 2c Grasses in groundnuts.

WEED CONTROL EFFICIENCY (WCE %) OF PRIMEXTRA GOLD.

Weed Control Efficiency is used to indicate the capacity of the herbicide to control weeds by reduction or elimination. The result for weed control efficiency is presented in Fig 4.2. Primextra gold herbicides had an effective weed control, Maize had an effective weed control of 90% to 95% respectively in treatment 0.5-1.50 kg a.i/pot, but 95% at herbicides concentrations of treatment 2.00 kg a.i/pot, at 14 DAT, but showed 100% WCE% at 21 DAT, from treatment 0.5 kg a.i/pot to 2.0 kg a.i/pot. In Groundnut treatment 0.5 kg a.i/pot and 1.00 kg a.i/pot showed 90% of WCF%, at 14DAT, then acceleration to 95 to 100% WCE % 21DAT.

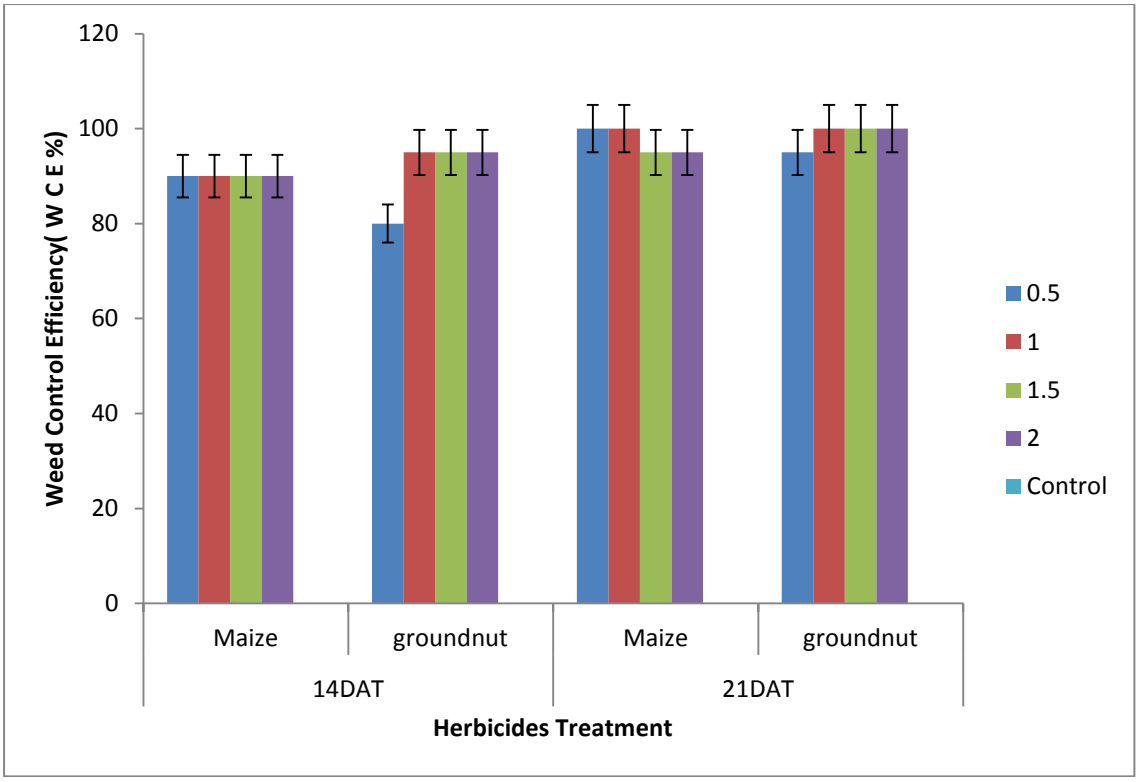

FIG. 2e. Weed Control Efficiency of primextra gold herbicides.

DISCUSSION

Weed species, frequency, density and growth rates are critical factors influencing how long weeds can compete with the crop before yields are reduced. Weeds such as *Ageratum conyzoides* L., *Aspillia Africana* L, *Oldenlandia corymbosa* L, *Synedrella sp, perperonia pellucid* L., *Triumfelta rhomboidea* L, *Lindernia* sp L. were some of the weeds species that were more frequent in the all the crops tested. The untreated pots had a higher number of weeds than the treated pots showing the efficiency of primextra Gold in controlling weeds. This statement is in agreement with (Omovbude and Udensi, 2013). Low weed density saw in the herbicide-treated plots could be ascribed to successful weed control of the herbicide and its capacity to control weed beyond critical period of growth (Omovbude and Udensi, 2013). Inhibitory impact of herbicides on weed growth has been reported by Jerzykiewicz and Klobus, 2007 that Primextra Gold has been appeared to decrease weed densities in maize plant.

The total number of weeds in the tested crops was significantly reduced. The untreated pots showed significantly higher number of weeds than the treated pots .This is in line with Babu, (2008). The number of weeds found in the maize and groundnut pots decreased with increased herbicide treatments showing the efficiency of increased treatment of the herbicide in reducing weed density. This result is in agreement with Sobotka and Barlow (1983) and Khan *et al.*,(2003) who reported that weed control methods significantly affects weed density m^{-2}. Low weed density observed in the herbicide-treated plots could be attributed to effective weed control of the herbicide and its ability to control weed beyond the critical period of growth (Omovbude and Udensi, 2013).

Maize and Groundnut treated with 0.5kg a.i ha-1 – 2.0kg a.i. ha-1 of Primextra Gold demonstrated generally low number of weeds showing that the use of this herbicide at these fixations can effectively control the aggregate number of weeds including broadleaf, grasses and sedges. Groundnut pot demonstrated the most astounding broadleaves weed species in the control pots and the treated pots, while grasses and sedges were observed to be the most

noteworthy in maize plant both in the control and treated pots. The most common weeds identified were from the families of Poaceae, Rubiaceae, Asteraceae, Chenopodiaceae :and Cyperaceae.

CONCLUSIONS

Primextra gold herbicide was able to reduce the invasion of weeds species and weeds density effectively, and should be recommended for use in weeds control especially in groundnut and maize. Broadleaves were found to have associated to groundnut as compared to maize, while sedges and grasses found dominated with maize plants Primextra Gold, providing effective control of both grasses and broadleaf weeds. Further studies are required to find out the reaction of Primextra Gold on the weeds associated with maize and groundnut in natural environment and the impact of the herbicide viability and plants susceptibility

REFERENCES

Akobundu, I. O. (1987).*Weed Science in the Tropics*: *Principles and Practices*. Wiley, New York.

Akobundu, I.O. and Agyakwa C.W. 1987: *A Handbook of West Africa Weeds*. 2nd Editiom. International Institute of Tropical Agriculture, Ibadan, Nigeria

Akobundu, I.O. Ekeleme F., Agyakwa C.W and Ogazie, C.A.2016.: *A Handbook of West Africa Weeds*. 3rd Edotion. International Institute of Tropical Agriculture, Ibadan, Nigeria

Akobundu, I.O. (1992). Integrated Weed Management Techniques to Reduce Soil Degradation. Pages 278-288. In J. Richardson, eds. Proceedings of the first international weed control congress, Melbourne, Australia. Melbourne. *Weed Science Society of Victoria*.

Anyanwu, D.I. (2001). *Ecological Approach to Weed Science*. Acotec technologies Ltd. Port Harcourt, Nigeria**.**

Anyanwu, D.I., Awi –Waadu, G.D.B., Tanee, F.B.G and Ochekwu. E.B. (2014); Fundamental Principles of Ecology. M & J. Grand Orbit Communication Ltd. Port Harcourt Nigeria.

Ashley, R. O., Morishita, D. W., Gardner, G. F., & Bradish, R. (2008). Weeds. In Idaho Master Gardener Program Handbook (p. ch. 14). University of Idaho Extension.

Babu, V. (2008). Physiological studies on weed control efficiency in Turmeric (Curcuma longa L.). Dharwad: Department of Crop Physiology, College of Agriculture, Dharwad, University of Agricultural Sciences, Dharwad - 580 005

Bokan, S. (2009): The Impact of Weed retrieved from website:http://www.environment.gov.au/biodiversity/invasive/weeds/weeds/why/impact.html. 17/10/2016

FAO. (1990). *Summaries of the papers of the World Food Summit, November 1996.* Rome, Italy.

Jerzykiewicz, J., & Klobus, G. (2007). The effect of Triazine- and Urea-type herbicides on photosynthetic apparatus in cucumber leaves. Acta Societatis Botanicorum Poloniae, 76(1), 43-47.

Khan, M. A., Marwat, K. B., Khan, N., & Khan, I. A. (2003).Efficacy of Different Herbicides on the Yield and Yield Components of Maize. Asian Journal of Plant Sciences, 2(3) (1682-3974 2003 Asian Network of Scientific Information), 300-304.

Klingman and Ashton, 1975) .Weed viably contends with crop species. (*Weed crop competition)*

Ochekwu, E.B. Ogwunna,, R.U., Udensi, E. U. & Ogazie, A. C. (2015): Efficacy of primextra gold in controlling weeds of melon (*Citrillus lanatus* (Thunb.) Matsun &Nak.).

Scientia AFfricana. An International Journal of Pure and Applied Sciences. December, 2015. VOL. 14 No. 2

Omovbude, S., & Udensi, U. E. (2013). Evaluation of Pre-Emergence Herbicides for Weed Control in Cowpea (*Vigna unguiculata* (L.) Walp.) in a Forest - Savanna Transition Zone. *American Journal of Experimental Agriculture, 3*(4), 767-779.

Okafor & Adegbite, 1991) Weeds constitute a major limiting factor to cowpea production in Nigeria.

Smith, R. G., & Menalled, F. D. (2012). Integrated strategies for managing agricultural weeds: making cropping systems less susceptible to weed colonization and establishment.*Mont Guide:A Self-Learning Resource from MSU Extension. Montana State University Extension MT200601AG*.

Sobotka, F., & Barlow, J. (1983). Banvel Herbicide: *A programmed approach to economic weed control in maize*. Fragmenta Herbologica Jugoslavica, 12:51-58.

Song, C., Teng, C., Tian, L., Ma, H., & Tao, B. (2006). Seedling growth tolerance of curcubit crops to herbicides Stomp and Acetachlor. Gen. Appl. *Plant Physiology,* 32(3- 4), 165-174.

Ugwunna R, Ochekwu E.B and Anyanwu,D.I (2013): Efficacy of Primextra Gold herbicides in the of control weeds in cucumber. (*Cucumis sativus* L.) J. Appl. Sci Environ. Manage. VOL 19(4): 569 - 574