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Effect of Imazethapyr 10% SL as Post Emergence Harbicide on the Growth and Yield of Groundnut (*Arachis Hypogaea L.)* in Mubi Adamawa State, Nigeria

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Abstract:
*A field experiment was carried out at the Adamawa state university Department of Crop Science Teaching and Research Farm during the rainy season of 2019 ,to Evaluate the Effect of Imazethapyr 10% SL as post Emergence Herbicide on the Growth and Yield of Groundnut with the objective of selecting the minimum concentration of the herbicides that can control weeds without negatively affecting the growth and yield of groundnut. The treatments consisted of the following: T_1 = 75ml, T_2 = 100ml, T_3 = 125ml, T_4 = 150ml, T_5 = 175ml, T_6 = 200ml, T_7 = 225ml, T_8 = 250ml, T_9 = 275ml of imazethapyr dissolve in 16 liter sprayer while T_{10} = Control (hoe weeding). The experiment was laid out in a Randomized Complete Block Design (RCBD) in three replicates, imazethapyr applied 35 days after sowing when the weeds were actively growing. Date collected was subjected to Analysis of Variance (ANOVA), significant means where separated using Duncan Multiple Range Test (DMRT) at P≤ 0.05. The results shows significant difference across the levels of the herbicides for most of the growth character, the plot treated with T_7 (225ml/16l sprayer) performed poorly while the control T_{10} (manual weeding) recorded higher growth rate at 2, 4, 6, and 8 Weeks After Treatment Application, higher number of leaves at 2, 4, 6, and 8, higher number of nodes 2, 4, 6, and 8. T_9 produces more number of immature pod at harvest (9.33) and fewer root nodules per plant (25.00) compared with the other treatments and the control. The yield character such as yield per plot (kg), pod yield in kg/ha and harvest index does not vary across the treatments and the control. Significant positive correlation was found between Pod yield in kg/ha with biological yield per plot (r=0.4608**), pod yield per plot (r=0.7220**), Harvest index (r=0.8373**), Number of matured pod per plot (r=0.6795**), number of pod per plot (r=0.6795**), Number of leaves at two weeks (r=0.4173**), number of nodes at four weeks (r=0.4018*), plant height at two weeks (r=0.3772*) and plant height at four weeks (0.4608**). Suggest that improvement in those characters will help enhance the yield of groundnut. It can be concluded that application of imazethapyr 10% SL at the rate of 75-100ml/16 liter sprayer applied 35 days after sowing is recommended for managing complex weed flora and obtaining higher seed yield of groundnut in Mubi, and can serve as a substitute for manual weeding which is time consuming, laborious and expensive.*

Keywords: *Imazethapyr, post emergence, herbicide, growth, yield, groundnut*

1. Introduction

Groundnut (*Arachis hypogaea* L.) is a grain legume and oilseed, which is widely cultivated in tropical and subtropical regions. It has a key role in human nutrition. In Africa and Asia, more peanut is grown than any other grain legume (including soy bean) [1].

Groundnuts in Nigeria are grown in commercial quantities mostly for the extraction of oil which is used in cooking, the cake which is the by-product of the oil extracted nut is used as an animal feed and also in the production of peanut flour. Apart from extracting the oil content of the nuts, it is also commonly used as a snack and can be boiled, roasted, fried or crushed into candies, and kuli-kuli. Most times it is also used in place of Egusi to make a soup called 'groundnut soup', especially when dried and grounded [2]. Groundnut improves soil fertility through nitrogen fixation, with the help of rhizobium in the root nodules.

China, India, Nigeria, USA and Myanmar are the leading groundnut producing countries in the world. Developing countries in Asia, Africa and South America account for over 97% of world groundnut area and 95% of total production. However, the productivity of Asia (2217 kg ha^{-1}) and Africa (929 kg ha^{-1}) is very poor as compared to Americas (3632 kg ha^{-1}) [3]. Reasons attributed to low productivity of groundnut in Nigeria includes various factors such as non availability of improved seeds, inefficient fertilizer use, weed infestation, shortage of irrigation water, drought, seasonal variation of rainfall, inadequate research efforts and inefficient extension services [4].

Weeds reduce yield by competing with the groundnut plants for resources such as sunlight, space, moisture and nutrients throughout the growing season [5].

Herbicides and hand weeding significantly brought down the nutrient removal by weeds and enhanced the uptake of nutrient by groundnut crop [6]. [7] opined that hand weeding twice significantly increased the kernal yield of groundnut upto 2.42 times than unweeded control. [8] reported that the farmers practice of hand weeding twice on 20 and 40 days after sowing (DAS) resulted in lower weed dry matter and higher pod yield (1496kgha-1)in rabi ground nut compared with application of pendimethalinat 1.0 kg ha^{-1} (714 kg ha^{-1}). [9] reported that hand weeding twice at 2nd and 4th weeks after sowing was effective to control weeds and recommended to improve vegetative growth of groundnut. But this cultural method is time consuming, energy sapping and costly.

[10] An important and relatively less expensive control option is chemical weed control, which involves the use of different herbicides applied as PRE and POST-emergence of crops. [11] estimated that non-use of herbicides for weed control in crops could increase cost of production by 20%. The use of herbicide for weed control in groundnut can significantly reduce the need of labour for hand weeding thereby lowering the cost of production. On per hectare estimation, herbicide could replace approximately the need for 10 laborers in weed control.

The use of herbicides is therefore often considered an effective alternative to hand weeding. This alternative as observed by [12] is often applicable to large hectares of farm land where hand weeding may not be feasible due to labour and other logistic constraints. The increasing scarcity and high cost of labour for manual weeding necessary to achieve adequate yields of groundnut in Nigeria have led to growing interest in herbicides [13].

The most effective way to tackle the problem of weeds on groundnut field is to apply a post emergence herbicide like imazethapyr which will eliminate the weeds without having an adverse effect on the groundnut itself. Imazethapyr is the first herbicide registered in peanut to provide both post-emergence and residual control of many problem weeds [14]. [15] reported that post emergence application Imazethapyr was very effective in controlling weeds in lentil. The critical period of crop-weed competition was found to be 4 to 8 weeks after sowing [16]. Thus, in case of groundnut, early removal of weeds before flowering and during pegging is important [17]. [18] reported that, chemical control of weeds forms an excellent alternative to manual weeding.

Therefore this research is design to determine the effect of imazethapyr 10% SL as post emergence herbicide on the growth and yield of groundnut with the objective of selecting the minimum concentration of imazethapyr that can control the emergent grasses without affecting the growth and yield of groundnut.

2. Materials and Methods

2.1. Description of the Study Area

The research was carried out at the Faculty of Agriculture Department of Crop Science Teaching and Research Farm, Adamawa State University Mubi, during the 2019 rainy season. Latitude 10^0 10' and longitude 10^0 30' north of the equator and between longitude 13^0 10' and 13^0 30' East of Greenwich meridian and at an altitude of 696m above sea level.

2.2. Sources of Seed

The seeds for the experiment were purchased from local farmers in Mubi and it was tested for viability by floatation method before planting.

2.3. Land Preparation

The land was disc ploughed and harrowed to a fine tilt. The main plot size was 7 x 24m^2 which was divided into 2 x 2m^2 subplots and a pathway of 0.5m between subplots for easy movement of water.

2.4. Sowing

Two seeds were sown two per hole at a depth of 2cm and covered with soil at a spacing of 30 cm intra row spacing and 40cm inter row spacing, which was later tinned to one per stand at 2 weeks after sowing.

2.5. Treatments and Experimental Design

The treatments consisted of different levels of imazethapyr 10% SL as follows:

T_1 = 75ml, T_2 = 100ml, T_3 = 125ml, T_4 = 150ml, T_5 = 175ml, T_6 = 200ml, T_7 = 225ml, T_8 = 250ml, T_9 = 275ml of imazethapyr 10% SL dissolve in 16 liter of water and sprayed using 16 Liter knapsack sprayer while T_{10} = Control (Hoe

weeding).Five (5) weeks after sowing when the grasses have emerged and are actively growing, the treatments were applied across the experimental plot in a Randomized Complete Block Design (RCBD) in three replicates.

2.6. Data Collection

Data was collected from five randomly selected plants from each treatment on the following Growth characters: Plant height, Number of leaves, Number of nodes at 2, 4, 6 and 8 weeks after treatments application. While the yield character observed were: Number of immature pods per plant, Number of immature pods per plot, Number of matured pods per plot, Number of matured pods per plant, Number of pods per plant, Number of pods per plot, Number of root nodules per plant, 1000 seed weight, Biological yield per plot, Grain yield per plot, Grain yield kg/ha is calculated using the formula

$Grainyield(kg/ha) = \frac{Grainyield\ (kg)}{Areaofsubplot\ (\mathrm{m2})} \times 10{,}000\ \mathrm{m}^2$ while Harvest index is calculated using the formula

$$Harvestindex\ (HI) = \frac{Economicyield\ (kg)}{BiologicalYield\ (kg)}$$

2.7. Data Analyses

The data collected was subjected to analysis of variance (ANOVA) and correlation computed using Statistical Package for Scientist and Engineers (SPSE). Significant means were separated using Duncan Multiple Range Test (DMRT) at $P \leq 0.05$.

3. Results

3.1. Physical and Chemical Properties of the Soil from Experimental Site

The soil texture of the experimental site is sandy clay with 70% sand and 21% clay with pH 8.0 which is slightly basic. It is deficient in major nutrients like; nitrogen 0.048%, phosphorus 0.035%, and potassium 0.9%. It has high percentage of zinc 43.54mg/kg (Table 1).

3.2. Effect of Imazethapyr 10% SL on Plant Height and Number of Leaves at Various Weeks of Herbicide Application

The Analysis of Variance (ANOVA) showed significant difference at $P < 0.05$ for plant height at 2 , 4 , 6 and 8 weeks after treatment application (WATA) with T_{10}= hoe weeding attaining a height of 27.27cm, 29.23cm, 31.00cm and 33.93cm respectively. While (T_7) recorded the least plant height of 14.06cm, 16.67cm, and 23.80cm at 2, 4 and 8 WATA respectively, while at 6 WATA (T_6) recorded the least plant height of 20.33 cm (Table 2).

The Analysis of Variance (ANOVA) also revealed significant difference at $P < 0.05$ for number of leaves at 2, 4, 6 and 8 WATA the control (T_{10}) hoe weeding recorded the highest number of leaves of 265.33, 285.33, 308.00 respectively while at 8 WATA, (T_5) recorded the highest number of leaves of 397.00, the lowest number of leaves was recorded in T_7 at 2, 4, 6 and 8 WATA as 130.33, 158.00, 221.33 and 320.33 respectively. The number of leaves produced by the other treatments in the respective weeks do not differ significantly (Table 3).

3.3. Effect of Imazethapyr 10% SL on Number of Nodes, Matured Pods Per Plant, Matured Pods Per Plot, Number of Pods Per Plant and Number of Pods Per Plot

The Analysis of Variance (ANOVA) revealed significant difference at $P < 0.05$ for number of nodes at 2, 4, 6 and 8 WATA, the control (T_{10}) hoe weeding recorded the highest number of nodes of 67.67, 72.67 and 78.67 respectively, while at 8 WATA, while T_6 recorded the highest number of nodes of 97.33, the lowest number of nodes was recorded in T_7 at 2, 4, 6 and 8 WATA as 32.33, 38.33, 52.67, 78.33 respectively. The number of nodes produced by the other treatments in the respective weeks do not differ significantly (Table 4).

ANOVA revealed no significant difference at $P<0.05$ for number of matured pods per plant, matured pods per plot, number of pod per plant and number of pod per plot. (Table 5)

Effect of imazethapyr 10% SL on Number of Immature pods per plant, immature pods per plot, root nodules per plant and one thousand seed weight, Biological yield per plot, Economic yield per plot,Harvest index andGrain yield $kgha^{-1}$ and

ANOVA revealed significant difference across the different treatments and the control with T_9 yielded the highest number of immature pod per plant 9.33 while T_4 yielded the lowest number of immature pod per plant 6.33. There was also variation in the number of root nodules per plant with the control T_{10} recorded the highest number of root nodules per plant 67.67 while T_9 recorded the lowest root nodules per plant of 25.00. One thousand seed weight also showed significant different across the various treatments with T_4 recorded the highest weight of 466.67g while the lowest was recorded in T_7 412.33g (Table 6).

ANOVA showed no significant difference at $P < 0.05$ for biological yield per plot with T_3 yielded the highest biological yield per plot of 0.93 kg, while the least biological yield was produced by T_1=0.63 kg. Economic yield per plot, harvest index and pod yield in kg/ha do not show significant difference across the various treatments and the control (Table 7).

3.4. Pearson Correlation between Pod Yield In Kg/Ha and Other Phenotypic Traits

There was high significant correlation between Pod yield in kg/ha with biological yield per plot (r=0.4608**), pod yield per plot (r=0.7220**), Harvest index (r=0.8373**), Number of matured pod per plot (r=0.6795**), number of pod per plot (r=0.6795**), Number of leaves at two weeks (r=0.4173**), number of nodes at four weeks (r=0.4018*), plant height at two weeks (r=0.3772*) and plant height at four weeks (0.4608**) (Table 8).

Parameter	valued obtained
Sand	70%
Silt	9%
Clay	21%
Chemical properties parameter	**valued obtained**
Soil PH	8.00
Sodium (Na) %	0.13
Magnesium (mg) %	1.12
Total potassium (K) %	0.90
Available calcium (Ca) %	1.15
Copper (cu) mg/kg	12.66
Iron (fe) mg/kg	17.13
Zinc (zn) mg/kg	43.54
Phosphorus (p) %	0.04
Nitrogen (N) %	0.05
Carbon (C) %	1.18
Conductivity Ng/cm	875.15

Table 1: Physical and Chemical Properties of the Soil from Experimental Site

Code	Herbicide Concentrations (ml/16 Liter sprayer)	Weeks after Herbicide Application							
		PLH2Wks	PLH4Wks	PLH6Wks	PLH8Wks	NL2wks	NL4wks	NL6wks	NL8wks
T_1	75	17.40^{b}	21.33^{b}	25.00^{b}	28.40^{b}	162.67^{bc}	192.67^{b}	250.00^{ab}	310.33^{b}
T_2	100	19.07^{b}	21.17^{b}	23.17^{bc}	24.40^{c}	226.00^{ab}	247.00^{ab}	276.00^{ab}	293.33^{b}
T_3	125	18.67^{b}	21.17^{b}	23.23^{bc}	25.00^{bc}	220.33^{abc}	246.00^{ab}	301.67^{a}	338.67^{ab}
T_4	150	17.47^{bc}	20.33^{bc}	23.00^{bc}	25.13^{bc}	177.33^{abc}	197.00^{ab}	253.33^{ab}	324.00^{ab}
T_5	175	16.80^{bc}	20.00^{bc}	23.77^{bc}	26.53^{bc}	176.33^{abc}	209.67^{ab}	269.67^{ab}	392.00^{a}
T_6	200	14.33^{bc}	17.00^{bc}	20.33^{c}	24.40^{c}	151.00^{bc}	222.67^{ab}	252.33^{ab}	274.67^{b}
T_7	225	14.06^{c}	16.67^{c}	20.50^{c}	23.80^{c}	130.33^{c}	158.00^{b}	221.33^{b}	320.33^{b}
T_8	250	14.33^{bc}	18.67^{bc}	21.35^{bc}	24.67^{bc}	161.33^{bc}	220.67^{ab}	256.67^{ab}	321.67^{b}
T_9	275	16.07^{bc}	19.67^{bc}	22.00^{bc}	24.67^{bc}	160.00^{bc}	210.67^{ab}	286.33^{ab}	336.33^{ab}
T_{10}	(Hoe weeding)	27.27^{a}	29.23^{a}	31.00^{a}	33.93^{a}	265.33^{a}	285.33^{a}	208.00^{a}	333.00^{ab}
SE±		2.33	2.09	1.78	1.86	45.32	44.28	37.22	35.32

Table 2: Effect of Imazethapyr 10% SL on Some Growth Parameters of Groundnut

Mean followed by the same superscript within the same column and treatment are not significantly different at P ≤ 0.05 (DMRT). *= Significant at P ≤ 0.05,**=Significant at P ≤ 0.01, NS=Not significant PLH= Plant Height, NL= number of leaves, wks= Weeks after Treatment Application

Code	Herbicide Concentrations (ml/16 Liter sprayer)	Weeks after Herbicide Application							
		NN2Wks	NN4Wks	NN6Wks	NN8Wks	MPP_{plant}	MPP_{plot}	NPP_{plant}	NPP_{plot}
T_1	75	44.67^{bc}	50.00^{abc}	64.67^{abc}	77.67^{bc}	8.00^{a}	147.67^{a}	13.00^{a}	202.33^{a}
T_2	100	56.33^{ab}	63.00^{ab}	68.33^{abc}	73.33^{bc}	10.67^{a}	151.67^{a}	19.33^{a}	234.67^{a}
T_3	125	44.33^{abc}	65.00^{ab}	73.67^{ab}	84.33^{abc}	10.33^{a}	165.67^{a}	17.67^{a}	266.33^{a}
T_4	150	40.00^{abc}	54.00^{abc}	64.00^{abc}	81.33^{abc}	11.00^{a}	148.33^{a}	15.33^{a}	232.00^{a}
T_5	175	44.00^{bc}	53.00^{abc}	75.00^{ab}	68.67^{c}	8.67^{a}	103.33^{a}	16.67^{a}	207.33^{a}
T_6	200	37.67^{c}	44.67^{bc}	58.00^{bc}	97.33^{a}	8.67^{a}	77.00^{a}	12.33^{a}	163.33^{a}
T_7	225	32.33^{abc}	38.33^{abc}	52.67^{c}	78.33^{bc}	9.33^{a}	114.00^{a}	14.67^{a}	181.67^{a}
T_8	250	40.00^{abc}	54.33^{abc}	69.00^{abc}	80.67^{bc}	10.33^{a}	167.00^{a}	17.00^{a}	233.67^{a}
T_9	275	40.00^{a}	51.33^{abc}	63.67^{abc}	84.33^{abc}	8.33^{a}	92.33^{a}	13.67^{a}	202.67^{a}
T_{10}	(Hoe weeding)	67.67	72.67^{a}	78.67^{a}	85.67^{ab}	10.67^{a}	155.00^{a}	19.33^{a}	241.33^{a}
SE±		11.34	11.82	9.28	7.88	1.78	64.82	3.71	65.52

Table 3: Effect of Imazethapyr 10% SL on Some Groundnut Attributes

Mean followed by the same superscript within the same column and treatment are not significantly different at P ≤ 0.05 (DMRT). *= Significant at P ≤ 0.05,**=Significant at P ≤ 0.01, NS=Not significant, NN=number of nodes, MPPplant= Matured pod per plant, $MPP_{plot=}$ Matured pod per plot, $NPP_{plant=}$ Number of pod per plant, $NPP_{plot=}$ Number of pod per plot

Code	Herbicide Concentrations (ml/16 Liter sprayer)	Weeks after Herbicide Application							
		$IMPP_{plant}$	$IMPP_{plot}$	RNP_{plant}	TSW (g)	$BYP_{plot\ (kg)}$	$SYP_{plot\ (kg)}$	HI	SY(kg ha^{-1})
T_1	75	7.00^{ab}	54.67^{a}	29.00^{bc}	456.67^{ab}	0.63^{b}	0.07^{a}	0.28^{a}	466.67^{a}
T_2	100	7.33^{ab}	83.00^{a}	42.33^{bc}	438.67^{ab}	0.83^{ab}	0.13^{a}	0.16^{a}	375.00^{a}
T_3	125	7.33^{ab}	101.00^{a}	34.33^{bc}	451.33^{ab}	0.93^{a}	0.10^{a}	0.24^{a}	451.67^{a}
T_4	150	6.33^{b}	83.67^{a}	40.00^{bc}	466.67^{a}	0.77^{ab}	0.07^{a}	0.27^{a}	533.33^{a}
T_5	175	8.67^{ab}	104.00^{a}	29.00^{bc}	457.67^{ab}	0.83^{ab}	0.07^{a}	0.21^{a}	466.67^{a}
T_6	200	8.33^{ab}	59.67^{a}	34.67^{bc}	450.33^{ab}	0.67^{ab}	0.07^{a}	0.23^{a}	375.00^{a}
T_7	225	9.00^{a}	67.67^{a}	33.33^{bc}	412.33^{b}	0.73^{ab}	0.10^{a}	0.20^{a}	366.67^{a}
T_8	250	9.00^{a}	66.67^{a}	45.00^{b}	429.00^{ab}	0.83^{ab}	0.10^{a}	0.24^{a}	508.33^{a}
T_9	275	9.33^{a}	110.33^{a}	25.00^{c}	439.67^{ab}	0.73^{ab}	0.07^{a}	0.24^{a}	441.67^{a}
T_{10}	(Hoe weeding)	8.33^{a}	86.33^{a}	67.67^{a}	438.00	0.77^{ab}	0.07^{a}	0.28^{a}	533.33^{a}
SE±		1.27	39.47	9.55	22.09	0.14	0.13	0.06	167.79

Table 4: Effect of Imazethapyr 10% SL on Some Groundnut Attribute

Mean followed by the same superscript within the same column and treatment are not significantly different at P ≤ 0.05 (DMRT). *= Significant at P ≤ 0.05,**=Significant at P ≤ 0.01, NS=Not significant$IMPP_{plant=}$ Immature pod per plot, $IMPP_{plot=}$ Immature pod per plot, $RNP_{plant=}$ Root nodules per plant, TSW= One thousand seed weight, $BYP_{plot\ (kg)=}$ Biological yield per plot, $SYP_{plot\ (kg)=}$ seed yield per plot, HI=Harvest index, SY(kg ha^{-1})= Seed yield.

	BYP_{Plot}	SYKg/ha	SYP_{Plot}	H I	NL8wks	MPP_{Plot}	NPP_{Plot}	$IMPP_{Plot}$	RNP_{Plot}
SY Kg/ha	0.4608**								
SYP_{Plot}	0.6095**	0.7220**	---------						
H I	---------	0.8373**	0.6606**						
LA8wks	0.4624**	----------	----------	----------	----------	---------	----------	0.4072*	-------
$MPPP_{lot}$	0.5687**	0.6687**	0.6133**	0.5064**	----------	---------	---------	-------	-------
$NPPP_{lot}$	0.7653**	0.6795**	0.7273**	0.4982**	0.7311**	0.8057**	----------	0.8057	-------
NL2 wks	0.4784**	0.4179*	0.3611*	--------	----------	--------		--------	0.3563*
NN2wks	0.4705**	0.4294*	0.3709*	----------	----------	0.4264*	----------	-------	0.3710*
NN4wks	--------	0.4018*	---------	---------	----------	0.3819*	----------	-------	0.3677*
PLH 2wks	---------	0.3772*	----------	0.3698*	---------	0.4059*	0.4085*	--------	0.4709**
PLH4wks	-------	0.3559*	0.3418*	--------	---------	--------	0.4493*	-------	0.4514**
PLH8wks	--------	------	---------	--------	---------	-------	0.3726*	-------	0.4953**

Table 5: Pearson Correlation for Growth and Yield Character in Groundnut
** Significant At P<0.05 ** Significant at P<0.01 NS = Not Significant*

BIYPP= Biological yield per plot, YI Kg/ha=Pod yield in Kg /ha, HI=Harvest index NL= Number of leaves $NPPP_{lot}$= number of pod per plot, $MPPP_{lot}$= Matured pod per plot, $IMPPP_{lot}$=Immature pod per plot , $RNPP_{lnt}$= root nodules per plant, PLH= Plant height, NN=Number of nodes.

4. Discussion

There was high significant difference for plant height at 2, 4, 6, and 8 weeks after treatment application, the control (manual weeding) recorded the highest plant height compared with the other treatments while the higher concentrations of herbicides T7= 225ml/16liter recorded the least plant height. This result therefore suggest that the herbicide concentration up to that level had a detrimental effect on the growth of groundnut by affecting some physiological processes in the plant leading to stunted growth. This result agrees with the findings of [19] who reported that proper weed control was responsible for increase in plant height and dry matter production in groundnut.

Number of leaves and number of nodes showed significant difference across the various treatments and the control, manual weeding also recorded the highest number of leaves and nodes, while the higher concentrations like T7, T8, and T9 recorded the least number of leaves and nodes. This result is not surprising because the toxicity of the herbicides might have tempered with the photosynthetic activity and nutrient assimilation leading to stunted growth and reduced photosynthetic area.

Most of the yield character observed in this research such as Number of matured pod per plot, number of pod per plant, number of pod per plot number of immature pod per plot, pod yield per plot, harvest index and seed yield in kg/ha does not vary between the treatments and the control. These results therefore suggest that imazethapyr has effect on the

growth of plant to certain extent but do not necessarily affect the yield of groundnut as most of the yield character were not affected by the application of imazethapyr. The result is contrary to the findings of [20] on groundnut who reported that manual weeding of groundnut gives the highest yield.

Number root nodules per plant, one thousand seed weight and biological yield per plot varies significantly across the various herbicides treatments with the higher concentrations yielded more immature pod per plot, fewer root nodules, lighter one thousand seed weight and yielded the least biological yield per plot. Suggest that those characters were seriously affected by the application of imazethapyr.

Significant positive correlation was observed between pod yield in kg/ha with biological yield per plot, pod yield per plot, Harvest index, Number of matured pod per plant, number of pod per plot, Number of leaves at two weeks, number of nodes at four weeks, plant height at two weeks and plant height at four weeks. Suggest that improvement in any of this character will help enhance the yield of groundnut. Therefore these characters should be given more priority when planning hybridization aim at improving the yield of groundnut. The results agree with the finding of several research. [21] reported that pod yield per plant exhibited significant positive correlation with kernel yield per plant, number of kernel per plant, hundred kernel weight [22] observed similar association of pod yield per plant with other yield contributing characters, [23] also reported significant positive association for pod yield per plant with kernel yield and 100 seed weight.

5. Conclusion

Imazethapyr 10% SL can perfectly substitute manual weeding in groundnut production since the performance in most of yield character do not differ significantly across the various treatments and the control. Therefore application of imazethapyr 10% SL at higher concentrations of between 250-275 ml per 16 liter sprayer applied once at five (5) weeks after sowing can perfectly control the weeds but will adversely affect the growth character of groundnut. But for the yield characters, it has no effect significant effect on them. Therefore the application of lower rate of 75-100 ml/ 16 liter applied at 5 weeks after sowing can completely control the emergent weeds without affecting the yield of groundnut as most of the yield character were not affected by therefore this herbicide can be a substitute to manual weeding which is laborious, time consuming and cost effective. Significant positive correlation between pod yield in kg/ha with biological yield per plot, pod yield per plot, Harvest index, Number of matured pod per plant, number of pod per plot, Number of leaves at two weeks, number of nodes at four weeks, plant height at two weeks and plant height at four weeks. Suggest that improvement in any of this character will help enhance the yield of groundnut. Therefore these characters should be given more priority when planning hybridization aim at improving the yield of groundnut.

7. Recommendations

- I recommend the use of imazethapyr 10% SL at the rate of 75 -100 ml/16Litre spray at 5 weeks after sowing for the control of weeds, and enhance productivity in groundnut.
- Further research to be carried out over locations and seasons for stability
- Lower levels of Imazethapyr 10% SL to be tested on groundnut.
- Imazethapyr 10% SL should be tested on other leguminous crops such as soya bean, bambara nut, cowpea etc

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