

## WEED COMPETITION AND PRODUCTION RESPONSE ON GROWTH AND YIELD OF CASSAVA AT UMUDIKE, ABIA STATE NIGERIA DURING COVID 19 PANDEMIC.

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### ABSTRACT

*Cassava is a crop of the humid tropics that belongs to species known as *Manihot esculenta crantz* and *Manihot utilissima pohl*. It can grow on relatively marginal soils and erratic rainfall conditions. It is also refers as easy crop because it is easy to cultivate and easy to process. Cassava is an all season plant because it is available all year round. These attributes make it a buffer against other crop failure in food security. Cassava serves as a staple food in African sahara region and of great production value in economic growth. This root crop is a necessary component in farming system and research focus in South Eastern Nigeria. Currently, research findings have given principal recommendation on the use of some improved cassava varieties in cultivation which are resistance to diseases and can thrive in an extreme weed environment. Example, TME-419, TMS-9025, TMS-30572 and many more, others are the local varieties such as NWAUGO, EKPE and Nwaiwa. These are popular in south eastern Nigeria and are going out in production because of inadequate management. Base on this, research were conducted to identify the effect of weed on cassava multiplication process and methods to control the weed competition on the plant using some economic measures as well as farm practices such as herbicide application, periodic weeding, land preparation. The weed effects was determine by the plant characteristics on growth, leave area index and root yield. This research work on the weed competition were monitored also to examine if there is a correlation on pest and disease incidence on response in cassava production as a result of unchecked weed in cassava propagation at National root crop research institute Umudike south eastern Nigeria.*

**KEYWORDS**—*Manihot* species, production value, growth and yield response

### INTRODUCTION

Cassava (*Manihot* spp) belong to the family Euphorbiaceae and is the most important root crop grown in the south Sahara region of Africa. The crop is easy to cultivate and process, and it is available all year round and act as a buffer against other crop failure. Cassava requires minimal input for cultivation and yet produce relatively good yields with little labour input.(Fischer et al 2002).The weed competition affects the nutrient distribution among young growing cassava plants during establishment period which eventually results to a poor yield during harvest. Note, despite cassava ability to adapt to biotic and abiotic stress in the production, poor edaphic condition, irregular rainfall, high yield per unit area of land, the rapid depletion of the plant nutrient and physical condition like weed constitutes limitation on growth and yield of cassava in many part of African sahara region. Cassava contain little protein and anti-nutritive factor HCG (hydro cyanogenic glucoside) which is removed during processing period. ( Okorie 1990). However, research on weed competition between cassava growth, root yield and weed biomass is an

interest in this research during Covid 19 pandemic period. A lots of factors play some vital role during this propagation period example, lack of labour to carry out some weeding work on experimental trials, unavailability of herbicides and transportation restriction. This research work was carried out and the results was also obtained. Periodic weeding practice of 0-3Wk(WAP),12Wk(WAP),24Wk (WAP) were done, Weeds significantly affect the growth and yield of cassava in the experimental rial without proper weed control. Further findings shows that proper weed control can conserve the little nutrient content in cassava. In cassava field where weed is not adequately managed, yield reduction between 45 to 80% is observed. Whereas about 75 to 98% yields per Ha<sup>1</sup> was recorded on the experimental trial that was properly and priodic weeded. On the unweeded trial, it was observed that there is a nutrition competition between the cassava and the weed. The nutrient in-balance especially at 3months after planting(MAP3) which affected the growth of cassava plant at the early stage. This research were conducted at National root crop research institute Umudike during

Covid 19 pandemic period. 2020 and 2021 planting season to determine the effect of nutrients competition on cassava growth and yield on weed biomass after two (2) planting season of weed challenges.

### MATERIALS AND METHODS

The experiment was conducted at National Root Crop Research Institute Umudike, Abia State, Nigeria 2020 and 2021 cropping season. The experimental design was Randomized Complete Block Design (RCBD). The following factors were noted during the planting period, planting density and the position of the cutting. These are three primary factors that are important in the growing of cassava. Selecting planting sites without proper soil test affect the yield, land use history, vegetation and topography was considered although cassava tolerates a broad range of soil condition for growth, it grows well on loamy soil (medium texture) with high organic content (Levith.et 1998).

The cutting after properly screened were planted on ploughed land using minimal tillage Technique- (FAO.2004) of mounds 30 -60cm high and 1 -2m apart

flat ridges was set up for cultivations. TME 419 an improved variety was used as the cultivar on the trial field with a set up control. Note, ridges were used for the planting because it's suitable for heavy soils; and can prevent water logging which leads to root rot.

Cassava growth and manifestation stages. The magnitude of the interface of weed with the plant was directly related to both the density of the weed infestation and the length of time during which interference occurred. Weed plant create a different competition pressure from the cassava crop depending on the development stage(Zollinger and Dexter 1994). Hence, weed infestation increased with progressing of the plant at developmental stage and the greatest value of the CABW (cassava plant affected by weed) and RYE (root yield effect) where determined during 60days DAP. In this variant the effect of herbicides also decreased with the number of surviving plant at this stage, some thermophilic weed species emerge decreasing performance of soil nutrients on the plant after application of herbicides was observed with increasing weed densities (Taylor and Hartzler 2000).

**Table 1: Effects of the applied herbicides on weed abundance at different stages of cassava development period (the fresh biomass per weed species m<sup>-2</sup>)**

Weed Species	Time of estimation of weed infestation in cassava propagation									
	V1		V2		V3		R1		R2	
	A	B	A	B	A	B	A	B	A	B
THICK	233.8	87.3	261.5	189.9	1327.2	670.5	4213.3	3428.5	4733.2	5026.3
CLUSTERS	42.1	2.7	119.6	21.8	90.0	51.5	533.2	377.5	442.1	682.1
THORNS	20.1	8.6	27.0	8.2	36.9	28.0	409.3	188.9	692.5	146.3
CAST	42.3	1.7	24.7		107.1		341.0	115.4	248.6	177.0
VENNI	32.1	5.7	36.9	5.0	48.7	19.6	187.1	282.8	271.6	90.3
FERN		1.3	1.7	99.0	11.3	72.2	362.9	187.0	20.0	3.0
HAZG	4.7	0.3	7.9	1.0	15.8	63.0	66.2	158.5	37.7	
TAGY	22.9				6.5	1.3	16.5	79.6		
NWS	8	7	7	7	11	8	8	8	7	6
NWP	72.0	36.0	82.0	57.5	97.3	73.4	102.9	49.4	84.0	77.4
TFWB	398.5	107.6	479.3	326.2	1671.8	907.0	6129.5	4663.9	6445.7	6125.0
TDWB	77.0	20.7	94.0	71.5	331.6	226.5	1109.7	865.3	1131.0	1038.4

NWS- number of weed species; NWP- number of weeded plant per m<sup>2</sup>, TFWB – total fresh weed biomass (gm<sup>-2</sup>); TDWB – total dry weed biomass (gm<sup>-2</sup>)

**Table 2: Effects of the applied herbicides on the agronomic traits of Cassava production at different developmental stages [2months-10months average]**

Time of estimation	Cassava plant height (cm)		Cassava plant yield (kg ha)		Dry matter content (%)	
	A	B	A	B	A	B
V1	9.3	6.8	3241.2	3195.3	42.6	42.5
V2	11.3	11.0	3034.2	2817.2	42.7	42.7

V3	21.9	21.5	2968.2	3159.5	44.3	42.0
V4	107.9	111.1	2382.3	2704.5	41.7	41.5
V5	148.8	201.6	1939.5	2921.9	29.0	41.0
Average	57.2	70.4*	2711.1	2959.6*	40.1	42.0*
	LSD <sub>0.05</sub> = 0.45		LSD <sub>0.05</sub> = 0.8		LSD <sub>0.05</sub> = 0.85	

**Table 3: Average yield(Y) and survived stand count (SSW) of the cassava plant after different periods of coexistence with weeds till harvest time.**

Treatment	Y(t ha <sup>-1</sup> )	SSW(t ha <sup>-1</sup> )
Control group 1 <sup>1/</sup>	26.40a*	8.59a
CWD <sup>3/</sup> up to 60 DAP <sup>4/</sup>	23.70 <sup>a</sup>	7.35 <sup>a</sup>
CWD up to 90DAP	11.84 <sup>b</sup>	3.40 <sup>b</sup>
CWD up to 120DAP	6.21 <sup>bc</sup>	2.32 <sup>bc</sup>
CWD up to 150DAP	2.68 <sup>c</sup>	0.94 <sup>c</sup>
CWD up to 180 DAP	0.87 <sup>c</sup>	0.37 <sup>c</sup>
Control group 2 <sup>2/</sup>	0.11 <sup>c</sup>	0.06 <sup>c</sup>
CV(%)	25.71	28.14

\*Table followed by the same letter in the column do not differ significantly from one another by the Turkey's test at 5% of probability. 2or 3 crop free from the weeds during the whole cycle respectively and the competitive coexistence with weeds at 180 days after planting.

Regarding the first group of treatment (periods of coexistence of cassava and weed) the roots yield and the survival stem count of the cassava plant were not influence by the fertilizer application the crop. The plant was only influence by the different period of coexistence with the weeds community. By evaluating the yield it was observed the decline in root production when the periods of coexistence of weeds and crop were similar

or superior to 120days between the planting and the weeding period. The yield loss was about 90% when the first reading was executed after the 120 days of coexistence of crop and weeds (Table ).

The highest productivities were observed in the control group free from competition and in the treatment in which the coexistence of crop and weeds occurred up to 60days

**Table 4: Description of the periods of coexistence of weeds and cassava crop field. NRCRI REPORT (2012)**

Treatment	Description
Control group 1 <sup>1/</sup>	Crop always kept in areas free from weeds
TCWD <sup>3/</sup> UP TO 60 DAP <sup>4/</sup>	Coexistence with weeds 60 days after planting
TCWD up to 90 DAP	Coexistence with weeds 90 days after planting
TCWD up to 120 DAP	Coexistence with weeds 120 days after planting
TCWD up to 150 DAP	Coexistence with weeds 150 days after planting
TCWD up to 180 DAP	Coexistence with weeds 180 days after planting
Control group 2 <sup>2/</sup>	Coexistence with weeds until the end of the cycle

### PLANTING MATERIALS

The Cassava is propagated by the use of stem cuttings, the cutting measures – 15 – 30cm long with -4 – 6 nodes each are used. The cassava stems were cut 2 -3 days before planting. This allow the stem to develop Callus(auxins), which promotes early sprouting and development.(Parker 1993).These cutting are gotten from matured cassava stem of 9to 12months old and was preserved under shade for a few days before cutting and planting. Some were planted vertically in upright

direction and horizontal this is of choice. Thus vertical or angular planting is also recommended in dry area (Fayaz 2007). Periodic weeding operation was carried out routinely as analysed above to ensures healthy sprouting, good crop establishment and each experimental trial has a control. Soil moisture content were carried out to know if there is adequate moisture in the soil. This is important because young plants do not tolerate drought unlike old plant. The sprouting occurs

between 9-14 days of after planting. The same was observed too on the control trial.

### WEED COMPETITION IN CASSAVA

#### PROPAGATION

Weeds competition after planting was monitored at different growth stage and was observe as a major constraint in the yield reduction. The most damaging effect of weeds on cassava yield occurs during early canopy formation and tuberization. This starts from 90-180days after planting. On the trial research, which was monitored and controlled from weed periodically was observe to be progressively doing well as was kept free from weeds at the early stage of growth. The period of 90-120days after planting is referred as the critical duration of weed interference in cassava propagation, farmers must choose to weed at 3-12 weeks (WAP) to obtain satisfactory yield. On this experimental trial it was observed that there are significant growth and yield of cassava from the weed control trial against none weed check trial after 3MAP. Research shows that properly weed spacing at 30-60days after planting produces a satisfactory yield up to 78% to 96% maximum yield as it was weeded periodically with herbicide and manual weeding, whereas unweeded trials have a significant tuber loss and growth inefficiency of 50 and 85% observed. (Parker 2015). Cassava trial was weeded with hand held hoes (manual method) this method is effective if it is done at right time but the method may damage plant parts especially the tender superficial roots. Used herbicide for the weed control in experimental trial are pre-emergence /post emergence herbicide, some herbicides used are;

- Pre -emergence herbicide
- Sulfentrazone applied at -1.5-3.0kg ht<sup>^</sup> .....active ingredient concentration 480g/L
- Premextra applied at -2.5-30kg ht<sup>^</sup>.....active ingredient concentration 480g/L
- Acetochlor +atrazine applied at 1.5-3.0kg ht<sup>^</sup>.....active ingredient concentration 250 +225 g/L

Post emergence herbicide used are paraquat or Gramoxone at 0.5-1.0kg ht<sup>^</sup> the measurements are to coincide on standard application base on the soil (IITA 1985). Lower rate application of these herbicide is recommended for high soils area whereas higher rate is recommended for heavy soil. Thus most post emergence herbicide are none selective and should be directed on the weed only. early weeding prevents the weeds from competing with the crop for nutrients, water, light and space. (melifouwa 2014).

#### CASSAVA YIELD

Fresh root yield of cassava under farmer's condition is about 2-10 tons per hectare, but cassava may yield up to 40-60 tons per hectare where growing condition are best (Muoneke 2011). In National root crop research institute Umudike Abia state Nigeria. The Research proves that root yield in cassava is 35--65tons per hectare which are influenced by Cultivar, cultural operations like periodic weeding, fertilization, field spacing and land preparation and climate etc.

#### PEST AND DISEASE;

Like other crops, cassava is susceptible to pest & diseases and these affect the field drastically like the weeds. Some common diseases associated with cassava propagation are-

Bacterial blight – (*Xanthomonas Campestris Manihots*)

Bacterial Stem Hot – (*Erwinia Canotorora*)

Fungi Disease include:

Anthracnod – *Collectotrichum Gloeosporioides*, *Collectotrichum Graminicola*), The most dangerous of these are:

African Mosaic Diseases (AMD)

Cassava Bacterial Blight. CBB

These are *Xanthomonas* Species. Other disease are

Brown Streak (viruses) Brown leaf spot (fungus).

The most Important control measure for AMD and CBB are to use the tolerant Cassava varieties and use of asymptomatic planting materials and good insecticides.

### EFFECT OF WEEDING TIME ON GROWTH AND YIELD OF CASSAVA

Table 5:

WEEDING TIME	WEED BIOMASS (T-Ha-1)			CASSAVA ROOT YIELD (T-Ha-1)		
	Range	Average	Standard Deviation	Range	Average	Standard Deviation
No weeding	5.9-77	6.8	0.8	0.5-107	4.4	4.9
1 time weeding-4weeks	2.0-5.6	3.3	1.6	10.6-25.8	19.3	6.3
2 time weed	0.1-1.2	0.5	0.5	22.7-39.4	30.3	6.8
3 time weed	0.0-0.2	0.1	0.1	22.7-36.6	29.4	5.7

Note:cassava fresh root yield as influenced by (manual-hoe) mechanical and herbicide treatment weeding in the first and second periodic weeding after planting.

HERBICIDE/MECHANICAL	APPLICATION RATE	Overall weed	TIME (MAP)	ROOT
Control	(g ai ha <sup>-1</sup> )t	Control		YIELD
Acetochlor+Atrazine	475g/Lha.....	53%	120days	8.12%
Sulfentrazone	480g/Lha.....	60%	120days	10.77%
Primextra	480/Lha.....	47%	120days	8.45%
MECHANICAL	NA	90%	120days	11.5%

### EFFECT OF WEED ON AREIAL PARTS STEM AND LEAVE AFTER 120 DAYS MAP

Aerials part fresh....	Treatment	Leave Area index
8.19	2.17	1.73

This result concedes with FAO finding in African weed biomass control in 1992. The amount of weed can be seen in the tables above affecting cassava establishment and yield.

### DISCUSSION

It is well known that poor weeding condition can cause reduction in growth and yield of cassava. The linear relationship of weed biomass and cassava root yield suggest certainly simple competition on water nutrients, root area etc. The weeds absorb water and nutrient that are meant available on the soil for the cassava to utilize and yield, especially at the early stage of planting this results in a serious survival challenge which affects the crop on attaining proper yield. Periodic weeding from this study indicates that cassava yield are high in the trial of no weed biomass. And have a significant yield loss even with the propagation of the improve varieties that are resistance to disease and other extreme condition.

### CONCLUSION

The tolerance of cassava to extreme condition such as weed effect and disease, should not be overlooked as these significantly affect the production response of the cassava plant on coexistence. The interference of weed on cassava growth and yield can be traced on periodic weeding plan when the cassava coexist with the weed especially 30DAP. Moreover, delay in weeding cause the competition with plant on nutrient distribution which resulted to the loss on the Cassava yield and growth. Cassava been a source of food energy and great economic value in Nigeria especially in south eastern region should be bettered through cultural practices of weeding immediately after planting using herbicides or manual weeding at 30DAP in order to tackle food security.

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