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Research Article

Effects of Different Weeding Regimes on the Performance of Cassava Cultivars in Oyo and Makurdi, Nigeria

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Abstract

This study conducted at the University of Uyo Teaching and Research Farm and Research and Teaching Farm University of Agriculture Makurdi, 2019. The aim of the experiment is to examine the effectiveness of variety and weeding regimes on growth and yield components of cassava. It is a factorial experimental design with two factors, four varieties (TMS 30555, TMS419, NR8083 and NR8208) and four weeding regime (0, 1, 2 and 3). A 4 x 4 x 3 was laid out in a randomized complete block design replicated three times. During the research growth characters like plant height, number of leaves, leaf area and crop growth rate were measured. Other character like number of plantable stems, fresh weight, root circumference, Number of roots per plant was also recorded. Results showed that significant difference ($P<0.05$) in both the growth and yield components of cassava variety at different weeding regime. On variety the use of TMS 419 is superior in both growth and yield component; there was significant difference ($P<0.05$) in crop vegetative growth and yield component like plant height(282.28), number of leaves(238.12), leaf area (72.00) crop growth rate (10.55) plantable stem (3200.12), fresh weight (10.28), root circumference (8.00) and Number of root per plant(7.55). With regards to different weeding regime, weeding twice, recording second after weeding thrice in growth parameters such as plant height (270.53), number of leaves (237.23) leaf area (73.82) and crop growth rate (8.01) while higher in yield component of cassava such as fresh weight (9.52), number of plantable stem (3100.23), root circumference (7.42) and Number of root per plant (7.01). On location the cultivation of cassava in Oyo superseded the one in Makurdi in both growth and overall yield. From the study the result revealed the use of improved variety like TMS 419 and the adoption of twice weeding for both growth and optimum yield in cassava. This study, therefore, recommends the use of TMS 419 and twice weeding for cassava farmer in the study area.

Keywords: Cassava; Weeding regime; Varieties; Yield component

Introduction

Cassava (Manihot, esculenta Crantz) is widely grown in the tropics. It is root crop used as subsistence staple in many parts of the tropics. Cassava is also grown to some extent as an industrial raw material and as livestock feed. Cassava accounts for approximately a third of the total staples produced in Sub-Saharan Africa [1]. Cassava is grown almost exclusively as food in 39 African countries, stretching in a wide belt from Madagascar in the southeast to Senegal in the northwest [2], where the annual rainfall exceeds 900 mm falling over a period of 120-150 days, and the altitude ranges from sea level to 200mm. Four African countries (Mozambique, Nigeria, Tanzania and Zaria) are among the 10 largest cassava producers in the world. Cassava has a comparative high biological efficiency of food-energy and production because of rapid and prolonged crop growth and produces 2.2 times more calories per hectare than maize [1], with a lower resources cost [3]. Cassava's virtue as a human food item is that it is a cheap and abundant source of energy [3]. The stability of cassava production, measured using the yearly coefficient of yield variation from 1966 to 1986 (cassava 4.3%; maize, 36.2%) is the highest among the major world food crops [4]. The cassava crop is a storage root; it can be kept underground from 6 to 36 months after planting and is thus always

available to farmers. Cassava has the ability to recover from severe climatic stress (particularly drought) or pest and disease attack when favorable conditions return and yields can be achieved under marginal soil conditions. Cassava tubers can be prepared in many ways, depending upon local customs and prepared in many ways, depending upon local customs and preferences, and form the basic carbohydrate element of the diet. The leaves, consumed as preferred green vegetables in many parts of Africa, provide protein, minerals and vitamins. Processing is however required to remove cyanide and improve palatability before tubers and leaves are consumed (Hahn, 1984). Small-scale farmers in the tropics constitute over 70% of the farming population. Most of these farmers have land holdings smaller than 5.4 hectares [5].

Usually less than 2 hectares of these are cropped per growing season. Most small-scale farmers grow cassava because it tolerates poor soils, is drought resistant and can store well in the soil for several months until it is harvested [6]. Weeds are a major constraint to cassava productivity in Nigeria, as it takes much of the farmers' time to control them than any other cultural practice [7,8] had earlier reported yield reductions of 70% in cowpea (Vigna unguiculata (L) Walp), while [9] also reported yield losses of up to 95% in cassava in an uncontrolled weed growth. The impact of weeds on the yield of crops varies with the characteristics of the cultiver, the weed species, weed density, the environment and the stage of growth and duration of the crops exposure to weeds [10,11]. earlier reported that losses caused by weeds have been identified to stem mainly from their ability to effectively compete with the crops for nutrients, water and light. Weed infestation is a constraint in cassava production. Cassava is generally susceptible to weed infestation because of its initial slow growth after planting. Although, competition from weeds occurs at all periods of growth, the most damaging effects of weeds in Nigeria have been reported to occur in cassava during the early canopy formation and the third month after planting when tuberization commence [12]. Cassava competes well with weeds once canopy is fully formed. However, its ability to compete with weeds depends to some extent on how long after planting the crop stays weed free before canopy completely cover the ground. [13] reported that a typical peasant Nigerian farmer usually employs the use of hoe for weeding which is time consuming, expensive and energy sapping. Interference has been further defined as the detrimental effect of one plant species on another resulting from their interactions with each other. [14] held the view that competition occurs when the combined demand of growth factors in the environment by the organisms are higher than the available factors. [14] further pointed out that the fact that there is a shortage of the factor in the environment does not automatically give rise to competition until the organism interacts. Interaction includes another form of competition known as ammensalism as described by [15]. Ammensalism is a form of interaction among organism in which growth of one of the organisms is depressed while that of the other group remains unaffected by variety or cultivar. Hence, the need for introduction of different weeding regimes in cassava with the required variety to optimize yield.

Material and Method

The experiment was conducted during the rainy season of 2019 at the Teaching and Research Farm, the University of Agriculture, Oyo (9° 50'N and 11° 09'E) and Makurdi (7° 41'N and 8° 37'E). The average climatic condition of the two places is (Oyo 20-28°C and Makurdi 27-30°C). The experiment that was laid in a randomized complete block design (RCBD) with three replicate, a 4m2 plot was laid out with 1m between plots and 1m between blocks. There were 16 plots each within a block which gave the total number of 48 plots for the study for the two locations. The treatment where; four varieties (TMS 30555, TMS419, NR8083 and NR8208) and four weeding regime (0, 1, 2 and 3). Agronomic practice such as land clearing was done, weeding was done manually at 2 and 6 weeks after planting to ensure a weed free plots application of fertilizer at planting and top dressed at 6weeks after planting at the rate of (N100 kg/ha, P60 kg/ha K60 kg/ha) and harvesting was done manually, all the data were collected within the net plot of 4m2, where a total of 5 plants were tagged for data collection within each net plot. The parameters recorded were plant height (was taken with the aid of measuring tape from the base of the plant to the tip), the number for leaves (were counted fortnightly) from 5 plants that were tagged and the average used fortnightly, leaf area (using CI-203 Handheld lase leaf area meter) and crop growth rate were measured using the formula below. Other characters like fresh root weight was measured (with the aid of weighing balance), number of plantable stem (were weight), root circumference (with the aid of a vernier caliper), and number of root per plant in t/ha was recorded. All data collected were subjected to analysis of variance (ANOVA) Gensat version 17, while the least significant difference (LSD) at 5% level of probability was used in separating the means. Formula for Crop growth rate is given as

$$CGR=W2-W1/P(t2-t1)$$

Where, P = Ground area, W1 = Dry weight of plant/m2 recorded at time t1, W2 = Dry weight of plant/m2 recorded at time t2, t1 and t2 were the interval of time, respectively and it is expressed in g/m2/day.

Results and Discussion

Table 1 shows the effects of variety and weeding regime on the growth parameters of cassava grown in Oyo and Makurdi, where there were no significant different ($P<0.05$) in both variety and weeding regime, on variety TMS 419 had taller plant, higher number of leaves, leaf area and crop growth rate when compare with other varieties under consideration, with NR8208 recorded the least, this is not far from the fact that genetic makeup and environment factors might have led to such distinction, this finding is in agreement to the finding of Drop and Rulkens [16] who started that climatic factor, soil nutrient and plant genetic make-up plays an important role in plant vegetative growth. On weeding regime, weeding thrice recorded taller plants, higher number of leaves, leaf area and crop growth rate, most crops grow well vegetative when weed are control effectively and well-spaced to utilized

solar radiation, nutrients and water, this supported by the work of Ashraf [17] who reported that plant population, canopy covering, cultivar or variety affect crop vegetative growth either positively or otherwise depending of the method of weeding adopted, he also added that weed control and management strategy influences crop vegetative growth on location, the plants cultivated in Oyo out-grow the plant grown in Makurdi, this is not far from the fact that geographical location affects plant growth and yield. This accretion is supported by the finding of Yusuf and Paul [18] who reported that soil nutrients, rain fall pattern, cultural practice, climatic factors and also soil microorganism brigs variation in both plants floral part and yield in general. No interaction was recorded in all variables against the parameters.

Table 1: is the effects of variety and weeding regime on the growth parameters of cassava grown in both Oyo and Benue state. Nigeria.

Variety (V)	PH	NL	LA	CGR
TMS 30555	273.23	220.18	64.5	9.6
TMS 419	282.28	238.12	72	10.55
NR 8083	265.73	212.02	56.75	8.2
NR 8208	250	209.91	43.88	7.9
LSD (0.05)	20.2	10.1	10.02	1.02
Weeding (W)				
0	253.32	212.86	55.19	6.54
1	262.98	229.87	64.23	7.02
2	270.52	237.23	73.82	8.01
3	283.12	261.21	81.02	8.99
LSD (0.05)	21.02	16.18	10.31	0.38
Location (L)				
Oyo	283.43	257.91	72.13	9.51
Makurdi	275.83	231.34	65.32	7.61
LSD (0.05)	22.12	20.12	10.81	1.31
Interaction				
V X W	NS	NS	NS	NS
V X L	NS	NS	NS	NS
W X L	NS	NS	NS	NS

PH= plant height, NL=number of leaves, LA= leaf area, CGR= crop growth rate, NS= not significant.

Table 2 is the effects of variety and weeding regime on the yield parameters of cassava grown in both Oyo and Benue state, Nigeria. Where significant difference ($P<0.05$) was recorded in both varieties and weeding regime, on verities the use of TMS 419 out performs all the other varieties in fresh root weight, number of plantable stem, root circumference and number of root per plant followed by TMS 30555 with NR8208 having the least, the finding from this work agrees with the work of Nwawuisi [19] who stated that most improve varieties have edge in both growth and yield characters over the local varieties, he further added that most variation is caused by genetic makeup of the cultivar and mostly influence by environmental factors, cultural practice and soil nutrients [20] also collaborated with the finding in this work by reporting that TMS419 has exhibited outstanding result in both vegetative, yield related characters and over all yield, he attributed it to inherent genetic makeup and climatic factors. On weeding regime, wedding twice had been outstanding in both yield and yield related characters over the remaining wedding regime. This could be link to the fact that after such weeding, plant canopy covering plays an important role in suppressing the weeds as reported by Anwar [21] he added that weeding twice reduce weed seeds population in the soil (weed bank) aiding tuberization and add organic manure to the soil. [22] also reported that fresh root weight, number of plantable stem, root circumference and number of root per plant are greatly affect by cultural practice such as spacing, weeding and fertilizer application.

On location, the plants cultivated in Oyo out-grow the plant grown in Makurdi, this is not far from the fact that location affects plant growth and yield. This work is supported by the finding of Ogah and Madina [23] who reported that climatic factors such as rainfall, wind, temperature, relative humidity among others brings variation in both plants growth part and yield and yield related characters. Table 3 is the interaction between variety and wedding regime on fresh root weight of cassava grown in Oyo and Makurdi,

Nigeria Where a perfect combination exist between TMS419 and weeding regime 2 over other varieties and wedding regimes, this could be attributed to variety genetic make-up, cultural practice and also soil nutritional factors leading to weightier root, this work affirms the finding of Bari [24] who reported that soil nutrients, cultural practice, rainfall pattern, temperature, relative humidity, wind affect root weight leading to weightier root, he further added root weight is a combine effects of wedding and available nutrient uptake by the plant leading to tuber initiation, tuber weight and over all yield. Table 4 is the interaction between variety and wedding regime on root circumference of cassava grown in Oyo and Makurdi, Nigeria Where a perfect combination exist between TMS419 and weeding regime 2 over the other varieties and weeding regimes, this could be attributed to variety genetic make-up, cultural practice and also soil nutritional factors leading to weightier root, this work affirms the finding of INCRI [25] who reported that soil nutrients, cultural practice, rainfall pattern, temperature, relative humidity, wind affect root circumference leading to weightier root [26] also reported that yield is a component of root circumference, root weight and number of roots. [27] started that regular weeding as proven to have increases tuber circumferences and overall yield he futher added good yield in terms of number of tuber and tuber circumference has been archived with combination of improved variety due to genetic variability and weeding. Table 5 is the interaction between variety and location on number of plantable stem of cassava grown in Oyo and Makurdi, Nigeria.

Table 2: is the effects of variety and weeding regime on the yield parameters of cassava grown in both Oyo and Benue state. Nigeria.

Variety (V)	Fresh root weight (t/ha)	No. of Plantable stem (t/ha)	Root circumference (cm)	No. of root per plant
TMS 30555	8.23	3000.18	7.5	6.6
TMS 419	10.28	3200.12	8	7.55
NR 8083	7.73	2800.02	6.75	5.2
NR 8208	6	2600.91	5.88	4.9
LSD (0.05)	1.2	100.1	5.62	1.02
Weeding (W)				
0	6.32	2500.86	5.19	4.54
1	7.98	2600.87	6.13	5.02
2	9.52	3100.23	7.42	7.01
3	8.32	2700.21	6.92	6.12
LSD (0.05)	1.02	200.18	0.31	1.01
Location (L)				
Oyo	10.43	3100.91	7.13	8.51
Makurdi	8.83	2900.34	5.32	6.61
LSD(0.05)	1.12	300.12	1.81	1.01
Interaction				
V X W	*	NS	*	NS
V X L	NS	*	*	*
W X L	NS	NS	NS	NS

No.= number of plantable stems, No.= number of roots per plant. NS= not significant.

Table 3: is the interaction between variety and wedding regime on fresh root weight of cassava grown in Oyo and Makurdi, Nigeria.

Variety	0	1	2	3
TMS 30555	4.83	5.18	8.5	6.2
TMS 419	5.28	6.12	10	7.15
NR 8083	4.23	4.02	7.75	5
NR 8208	3	4.91	6.88	4.8
LSD (0.05)	0.2	0.5	1.62	0.82

CD= cow dung, PD=poultry dropping, GM=goat manure, DS=dung site, NS= not significant

Table 4: is the interaction between variety and wedding regime on root circumference of cassava grown in Oyo and Makurdi, Nigeria.

Variety	0	1	2	3
TMS 30555	4.23	5.28	7.5	6.1
TMS 419	5.48	6.32	8	7.35
NR 8083	4.53	4.12	6.95	5.1
NR 8208	3.1	4.96	6.68	4.3
LSD (0.05)	0.1	0.3	0.12	0.42

Table 5: is the interaction between variety and location on number of plantable stem of cassava grown in Oyo and Makurdi, Nigeria.

Variety	TMS30555	TMS419	NR8083	NR8208
Uyo	2700.13	3200.28	2700.2	2600.91
Makurdi	2600.01	3000.42	2500.1	2400.04
LSD (0.05)	100.03	250.13	221.11	200.14

Where a perfect combination exist between Oyo and TMS419 over Makurdi and other varieties, this could be attributed to variety genetic make-up, cultural practice and also soil nutritional factors leading to taller plant thereby resulting to higher plantable stem, this work is agrees with the finding of Agwu and Anyaeche [28] who reported that soil nutrients, cultural practice, rainfall pattern, temperature, relative humidity, wind affect plant height leading to plantable stem. Table 6 is the interaction between variety and location on root circumference of cassava grown in Oyo and Makurdi, Nigeria. Where a significant difference was recorded with the combination of Oyo and TMS419 over Makurdi and other varieties, this could be attributed to variety genetic make-up and also soil nutritional factors, this work is agrees with the finding of Chowdhury [29] who reported that soil nutrients, cultural practice, and environmental factor aid root initiation and root circumference leading to over-all yield. Table 7 is the interaction between variety and location on number of root per plant of cassava grown in Oyo and Makurdi, Nigeria. Where a significant difference was recorded with the combination of Oyo and TMS419, this could be attributed to varietal differences and also environmental factors, this work is collaborated by the finding of Anwar [30] who reported that climatic factors, soil factors and also crop inherent ability leads to root initiation and yield in general.

Table 6: is the interaction between variety and location on root circumference of cassava grown in Oyo and Makurdi, Nigeria.

Variety	TMS30555	TMS419	NR8083	NR8208
Uyo	7.33	8.28	6.8	5.91
Makurdi	6.91	7.42	5.2	5.04
LSD (0.05)	1.03	1.13	1.11	0.14

Table 7: is the interaction between variety and location on number of root per plant of cassava grown in Oyo and Makurdi, Nigeria.

Variety	TMS30555	TMS419	NR8083	NR8208
Uyo	6.93	8.18	8.5	7.3
Makurdi	5.98	9.12	7	6.14
LSD (0.05)	1.01	1.03	1.02	1.04

Conclusion

The result in this finding recommends the use of TMS 419 variety and twice weeding for cassava farmer in the study areas which improved yield and also reduced the cost of production, the result also brought to lamp light early vegetative growth which translate to canopy covering suppressing weed growth serving as a reducing weeding regularly.

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