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The Effect of Cassava and Melon Intercrop as Influenced by Wedding Regimes in Makurdi Benue State, Nigeria.

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Abstract

This study was conducted at Joseph Sarwun Tarker University Teaching and Research Farm Makurdi, in 2023 and 2024 rainy season to examine the effectiveness of weeding regimes on growth and yield components of cassava/melon intercrop. The experiment was laid out in a randomized complete block design arrangement and replicated three times. The treatments were the weeding regimes (0, 1 and 2) and farming methods were (sole TMS 419, sole melon and TMS 419 + melon). Both growth and yield parameters where recorded for cassava (plant height, number of leaves, leaf area, crop growth rate, fresh root weight, number of plant-able stems, root circumference and number of root per plant). Growth and yield parameters of melon (plant height, number of leaves, leaf area, crop growth rate, internode length, vine length, pod weight, number of pods, 100 seed weight and yield). Results showed that the growth and yield components of both cassava and melon were significantly different (P<0.05), on farming method. Intercrop TMS 419 and melon remained outstanding in the growth characteristics (plant height - 102.28cm, number of leaves - 138.12, leaf area - 74.10 and crop growth rate - 7.60). Also, sole TMS 419 outperformed the other treatments in yield characteristics (fresh root weight - 9.28, number of plant-able stems - 2700.12, root circumference - 9.10 and number of roots per plant - 7.55). For sole melon (internode length - 20.23cm, vine length - 229.18, pod weight - 823.50g, number of pods - 36.60, 100 seed weight - 201.11g and yield - 3332.23kg/ha). From the results obtained, intercrop is more advantageous compared to sole crops. Also, weeding twice a year recorded the best result in all the treatments examined. However, 2024 planting outperformed year 2023 season. This study therefore, recommends twice weeding and cassava/melon intercrop to serve as weed control mechanism and proper land utilization.

Keywords: Intercrop, Weeding regime, Cassava and Melon

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Introduction

Cassava (*Manihot, esculenta Crantz*) is widely grown in the tropics. It is a 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 (Madina et al., 2022). 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, with a lower resources cost (Hahn *et al*, 2004; lkpi *et al*, 2012). Cassava's virtue as a human food item is that it is a cheap and abundant source of energy (lkpi *et al., 2012*). The stability of cassava production, measured using the yearly coefficient of yield variation from 2020 to 2024 (cassava 20.3%; maize, 56.2%) is the highest among the major world food crops (Madina et al., 2023). About 92% of melon grown in Nigeria is intercropped (Esang et al., 2022) 'Egusi' melon seeds contain 34% crude protein and high quality cooking oil. Regrettably, melons like many other tropical vegetables have received very little research attention from scientists. Large area of land is being cropped to cassava-melon production in Nigeria yearly, yet yields obtained by farmers are low due to numerous constraints including weed problems. Intercropping system where crops are grown together for either the entire vegetative period or part of it and two more crops are grown simultaneously in the same plot. Reedy and Ghewande (2002) reported that intercropping is believed to have evolved from traditional agriculture of the tropical and subtropical countries and had been practiced at low level of technology. Egusi melon is often intercropped with yam, maize, cassava, cocoyam and many other food crops. In traditional Nigerian agriculture it is intercropped so as to help smother weeds early in the growing season. Yield from egusi melon grown in mixtures are often lower than 50% of those from the sole-crop. Work done by (Madina et al., 2021) showed that in a cassava/maize/melon mixture the melon component performed poorly because of shading by the higher canopy component crops. Melon seed yields were 1.07 t/ha for sole-cropped egusi melon but 0.3 to 0.6 t/ha in egusi melon/maize and egusi melon/cassava/maize mixtures, respectively. The same report showed that while the yields of egusi melon seed in the various mixtures were low, the grain yield of the associated maize in maize/egusi melon mixture was slightly higher than when sole-cropped. Related reports from (Madina et al., 2024) similarly indicated that egusi melon improved the yield of other component crops grown with it. Fagbamiye (2000) observed delayed anthesis in egusi/miaze intercrop but higher leaf area index in intercropped egusi melon than in those sole-cropped. The same report showed that egusi melon suppressed weed growth. Intercropping does not always result in increased yield of each component crop in a mixture; a few investigators have reported a reduction in the yield of each component crop (Kurtz *et al*, 2016). In others instances yield of the other (Madina et al., 2023). According to Ruthemberg (2002), it has now been accepted that increased food production in the tropics will involve replacing shifting cultivation with a system that will involve more intensive land use. It is also recognized that such a change will create problems of excessive pests and disease (Madina et al., 2024). Ekpe *et al* (2001) observed that appropriate weed control practices for such intensive/intercrop systems in the humid and sub-humid tropics will have to take into consideration the need to conserve the fragile tropical soils, must represent a demonstrable net gain in the use of resources available to the farmers and requires to be sufficiently attractive to encourage the farmers to abandon other available production options (Chinaka, 2003). Weeds are a major constraint to intercropping productivity in Nigeria, as it takes much of the farmers' time to control them than any other cultural practice (Makinde and Ogunyemi, 1998). Nnju (2005) had earlier reported yield reductions of 70% in cowpea (Vigna unguiculata (L) Walp), while (Madina et al., 2022) also reported yield losses of up to 95% in cassava in an uncontrolled weed growth. Hence, the need for introduction of different weeding regimes in cassava intercrops. The objective of the work is to investigate the effect of intercrop of cassava and melon as influence by wedding regime.

Material and Method

The experiment was conducted at Teaching and Research Farm of Joseph Sarwun Taker University Makurdi, (7° 41'N and 8° 37'E) in 2023 and 2024 rainy season. A $4m^2$ plots was used for each treatment, 9 plots in a block and a total of 27 plots for the whole of the experiment with 1m between and within the blocks, the experiment was laid out in a Randomized Complete Block Design replicated three times; the main treatments were zero weeding, weeding twice and weeding thrice at 3 and 6 months after planting while cropping systems; sole TMS 419, sole melon and TMS419+melon, the experimental site occupied an area of $55m^2$ and was divided into 3 replicates. Each block (replicate) was sub-divided into seven plots each measuring 6 x 9m. Both the block and the plot were separated from each other by a path of 1m. The stems were cut 25cm long and planting was done at an inclined angle of 45^0 on ridges at a spacing of 1 x 1m, giving a population of 10,000 stands per hectare. melon seeds were planted at the base of the ridge. Three seeds of melon were planted and later thinned down to two plants/hole at a distance of 1x1m apart for both sole and intercrop, thus giving a population of 20,000 per hectare. The main treatments were the weeding regimes control (no weeding), weeding once 6 months after planting and weeding twice at 2 and 6 months after planting. Data collected are: Plant height (5 tagged plants and their heights taken from ground level to the highest canopy point), Number of branches (counted from the 5 tagged plants), Leaf Area (this was determined on intact leaves of selected and tagged plant, using the length-wide portions), yield parameters taken were: Number of roots Per Plant (the total number of fresh roots divided by the number of stands harvested per sub-plot gave the mean number of roots per plant per treatment), Fresh Root Weight (root yield) (At harvest the fresh roots obtained per treatment was weighed. The weights were then converted to tones per hectare), Root diameter and length (This was taken after harvest by using a flexible tape to measure the diameter and length of the root), Tuber Dry Yield: The fresh cassava tubers on treatment basis were randomly harvested; peeled, washed and sliced. The sliced samples were Oven dried. Weighing was done two times daily on the samples until final weight was determined. Melon growth parameters are: plant height (measured by the aid of ruler from the tip to the based), number of leaves (counted from the tagged sample), Vine Length (The length of each of them was measured from the base to the tip using a measuring tape.) yield parameters of melon are; Mean number of fruits/plants (The total number of fruits on all the plants was taken and divided by tagged plants to get the number of fruits per plant), Weight of 1000 seeds: the 1000 seeds were randomly selected from each treatment and weighed. Mean weight of fresh fruits per plant, Seed yield per fruits (using an electric weighing balance) All the data collected were analyzed separately using the Analyses of variance (ANOVA) Method as outlines by Gomez and Gomez (1984). Mean

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were separated using the least significant difference (LSD) at 5% level of probability. Land equivalent ratio (LER) was determined using the method described by Harwood and Coworkers (IRRI, 1974)

Result and Discussion

Table 1 shows the effects of farming method and weeding regime on the growth parameters of cassava grown in Benue state. Nigeria. Where significant difference ($P<0.05$) was recorded with TMS/melon having taller plants, number of leaves, leaf area and crop growth rate when compared with sole melon and the sole TMS419. This is not far from the fact that different crop vegetative growth differs when in intercrop, this accretion agrees with the finding of Madina el at., 2021 Who reported that crop vegetative growth differs from one another even same cultivar differs due to genetic makeup, crop growth environment, he also added that crop compete for light, water and nutrient can lead to vegetative growth when in intercrop to when in sole.

On wedding regime, significant difference ($P<0.05$) was recorded in twice wedding regime recorded high in all the growth parameters (plant height, number of leaves, leaf area and crop growth rate) over zero and weeding once, this could be attributed to reduction in weed-crop competition, this work agrees with the finding of Juraimi el al., (2013) who reported that weeding twice or more improve root penetration, crop establishment and reduce competition and harboring of pest and disease Riya et al., (2017) and Madina et al., (2025) stated that zero weeding and or weeding once have be associated with pest infestation, difficulty in root penetration due to undisturbed soil which retard crop growth and most affect plant leaves as it has been affected by such pest causing damage and inhibiting photosynthetic activities. 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 so also melon aid in competing with weed thereby serving as cover crop to the soil.

On seasons, the cultivation of the crops in 2023 have out grown crop cultivated in 2024 rainy season significantly, with could be as a result of weather and cultural practices, this finding affirms the work of Ogah and Madina (2020) Who reported that cultural practices, rainfall pattern and temperature affects crop vegetative growth significantly.

Table 1 is the Effect of Cassava and Melon Intercrop as Influence by Wedding regime on growth parameters grown in Benue state, Nigeria.

F/M (F)	**PH**	**NL**	**LA**	**CGR**
Mellon	63.23	52.18	74.10	7.60
TMS 419	102.28	138.12	32.20	6.55
TMS/Mellon	187.73	202.02	46.75	8.20
LSD (0.05)	20.20	50.10	10.02	1.02
W/R (W)				
0	100.32	192.86	50.29	5.54
1	105.98	200.87	54.23	6.02
2	170.52	227.23	63.82	7.01
LSD (0.05)	21.02	16.18	1.31	1.08
Season (S)				
2023	153.43	187.91	56.63	6.51
2024	175.83	231.34	63.12	8.61
LSD (0.05)	22.12	20.12	10.81	2.01
Interaction				
F X W	NS	NS	NS	NS
W X S	NS	NS	NS	NS
F X S	NS	NS	NS	NS

PH= plant height, NL=number of leaves, LA= leaf area, CGR= crop growth rate, W/R= Wedding regime, F/M= Farming method, NS= not significant.

Table 2 shows the effects of intercrop and wedding regime on the yield parameters of cassava grown in Benue state. Nigeria, were significant different ($P<0.05$) was shown with TMS 419 when compared intercrop (TMS/Melon) having the highest in fresh root weight, number of plantable stem, root circumference and number of root per plant, this could be attributed to intercrop competition for both weather and soil nutrient, this work collaborate with the work of Bing et al., (2010) Who reported that most crop do well while in sole when compared to intercrop he attributed his reason to competitive nature of crop. He further added that some crops do have allelopatic effect which affects other crops in their environment or territory. The impact of weeds on the yield of crops in intercrop varies with the characteristics of the crops in mixture, the weed species, weed density, the environment and the stage of growth and duration of the crops exposure to weeds (Orkwor, 1990). Madina et al., (2022) 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.

On weeding regime, weeding twice has shown superiority statistically when compared with zero and weeding once, this could be as a result of competition. The finding in this work is in agreement with the work of Sunil et al., (2010) who reported crop yield is affected by weed competitive nature, this is true because fresh root weight, number of plantable stem, root circumference and number of root per plant is affected by weed management strategy employed by the farmer, he further added that bulking and root initiation is affected by weed and wedding twice and more have proven to increase yield in most crop including cassava.

On season 2023 rainy season, shows superiority over 2024 rainy season in all the yield and yield related character. NIMET (2021) reported that fresh root weight, number of plantable stem, root circumference and number of root per plant is strongly affected by climatic factors like rainfall, temperature, relative humidity and solar radiation.

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Table 2 is the Effect of Cassava and Melon Intercrop as Influence by Wedding regime on yield parameters grown in Benue state, Nigeria

F/M (F)	Fresh root weight (t/ha)	No. of Plantable stem (t/ha)	Root circumference (cm)	No. of root per plant
TMS 419	9.28	2700.12	9.10	7.55
TMS/Melon	5.73	2000.02	5.75	5.70
LSD (0.05)	3.20	120.10	2.62	1.02
W/R (W)				
0	5.32	2400.86	5.19	4.54
1	6.98	2600.87	6.13	5.02
2	8.52	2800.23	8.42	7.01
LSD (0.05)	1.02	210.18	0.31	1.01
Season (S)				
2023	7.43	2200.91	6.13	5.51
2024	8.83	3000.34	8.32	6.31
LSD (0.05)	1.12	320.12	1.81	1.01
Interaction				
F X W	*	NS	*	NS
W X S	NS	*	NS	*
F X S	NS	NS	NS	NS

No.= number of plantable stems, No.= number of roots per plant. F/M= farming method, W/R= wedding regime, NS= not significant.

Table 3 is table that shows interaction between farming method and wedding regime on fresh root weight of cassava grown in Makurdi, where a significant difference (P<0.05) with TMS 419 and weeding twice having weightier tubers when compared with other interactions, the finding in this work agrees with the work of Madina et al (2022) who stated that weeding frequently and weed management using manual, chemical or combination of both chemical and manual directly affect tuber weight positively since the source of nutrient competition has been reduced through weeding.

Figure 1 is the interaction between and wedding regime Cassava melon intercrop on fresh root weight of cassava grown in Makurdi, Nigeria.

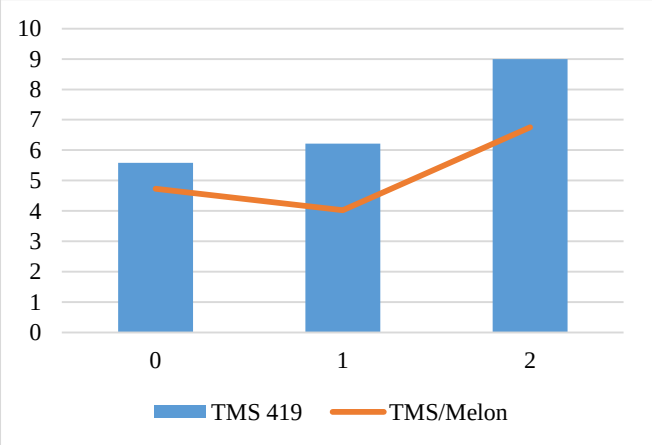

Figure 1 is the interaction between farming method and wedding regime on root circumference of cassava grown in Makurdi, Nigeria. A perfect interaction was recorded between TMS 419 and weeding twice having tubers with higher root circumference when compared with intercrop lots. This could be as a result of early plant establishment supressing weed growth and population as recorded in Table 1. This finding is a par with the work of Strang et al., (2007) who states that most plants tuber with higher circumference is mostly linked to nutrient availability and the ability of plant tuber to assimilate and utilize such nutrient. On the other hand, Kaya el al., (2003) reported that root circumference can be affected directly or indirectly by timeliness and frequency of weeding.

Figure 2 is the interaction between farming method and wedding regime on root circumference of cassava grown in Makurdi, Nigeria.

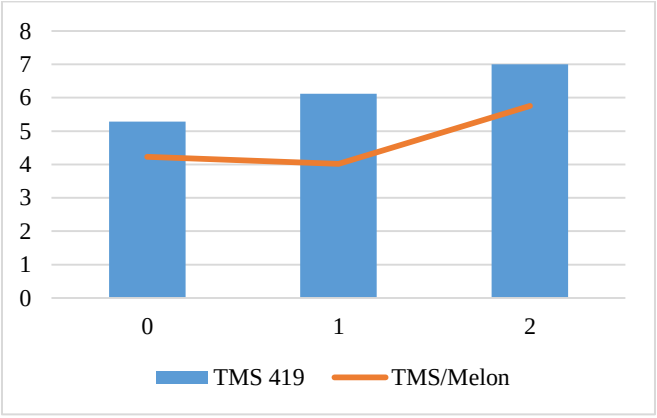

Figure 3 is the interaction between season and wedding regime on number of plantable stem of cassava grown in Makurdi, significant difference (P<0.05) was observed, where an interaction was recorded between 2023 rainy season and weeding twice when compared to other interactions, this is not far from the facts that rainfall, temperature and cultural practice might have led to such

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increase in plantable stem as shown in table 1, genetic makeup leading to plant height, residual effects, and previous season weed control reduces weed population also is directly connected to plantable stem as reported by IPCC (2007)

Figure 3 is the interaction between season and wedding regime on number of plantable stem of cassava grown in Makurdi, Nigeria.

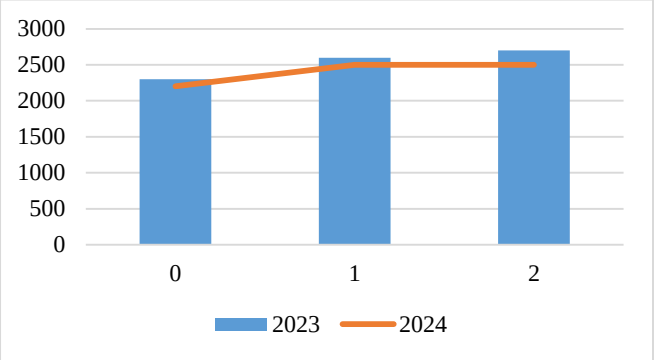

Figure 4 is the interaction between season and wedding regime on number of root of cassava grown in Makurdi. A prefect interaction exits between 2023 rainy season and twice weeding regime had higher number of tuber when compared with other weeding regime and 2024 rainy season. This result is not in agreement with the work of Jaya Suria et al., (2013) who reported that plots with higher number of root mostly don't have higher root circumferences as recorded in table 4, Hossain et al., (2002) and Esang et al., (2022) reported similar result to the finding in this work, stating that tillage practice parten have proven to increase root number or over all yield in tuber and root crop.

Figure 4 is the interaction between season and wedding regime on number of root of cassava grown in Makurdi, Nigeria.

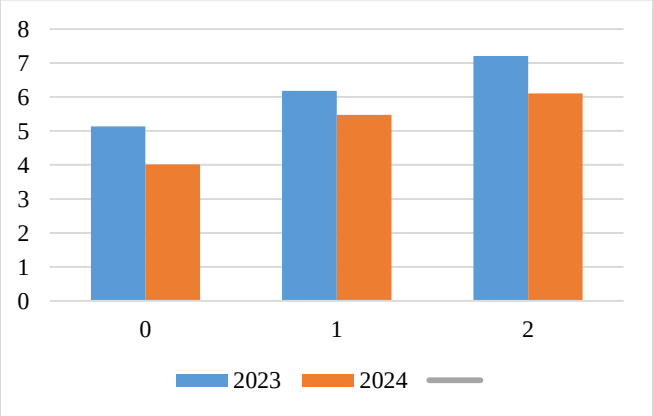

Table 7 shows the effects of intercrop and weeding regime on the yield parameters of melon grown in Benue state. Nigeria, significant difference (P<0.05) was recorded in farming method with sole melon significantly outperformed the intercrop of cassava and melon in internode length, vine length, pod weight per plant, 1000 seed weight and over all yield, this could be attributed to the fact that most sole cropping do well when compared with mix cropping, this work is collaboration with the work of Strang (2012) who stated that sole crop perform well in yield and yield related parameter when compared to mix cropping this he attributed to competing on the available soil and climatic resource thereby affecting the overall yield. On the contrary FAO (2000) reported that when compatible crops are grown in an intercropping system the component crops make better use of available growth resources than when grown as sole crops. Although the total land productivity per unit area is higher in intercropping than in sole cropping, intercropping however does not always result in increased yield of all the individual crops in the mixture. The more frequently observed trend is an increased yield of more aggressive component crops in the intercrop over their sole yield and reserved situation for the suppressed or less aggressive component crops in the mixture.

On weeding regime, weeding twice remain outstanding to weeding once and zero weeding, this could be link to the fact that free weed farm produces more when compared to a weed crop competitive farm Akunda (2001) suggested twice weed to enable the crop enjoy free weed farms, utilize available resources and reduce the infestation of pest/disease harbored in weeds, IITA (2014) In his work on melon stated that both yield and yield related character is influence by weed and method of weed control. He added that frequent weed control has proven to improve yield in melon production.

On seasons, the cultivation of melon in 2024 outperformed the cultivation in 2023 rainy season, this as reported by Lotze-Campen and Schellnhuber (2009) is due to improvement in cultural practice, residual effects of some fertilizer, chemical and organic manure from the previous rainy season. Temperature, rainfall patten and relative humidity influences crop yield as reported by Bello and Paul 2018. NIMET 2017 also reported same trend.

Table 7 is The Effect of Cassava and Melon Intercrop as Influence by Wedding regime on yield characters grown in Benue state, Nigeria

F/M (F)	Internode length	Vine length	Pod weight/plant	No of pods/plant	100seeds weight(g)	Yield kg/ha
Melon	20.23	229.18	823.50	36.60	201.11	3332.23
TMS/Melon	14.28	200.12	781.00	27.55	181.23	2921.12
LSD (0.05)	3.20	21.10	20.62	5.02	21.12	234.09
Weeding(W)						
0	14.32	219.86	725.19	29.54	103.21	2321.88
1	17.28	229.87	761.13	32.02	121.98	2635.12
2	19.42	232.23	823.42	37.01	211.01	3012.81
LSD (0.05)	2.02	10.08	20.31	4.01	22.10	245.12
Season (S)						

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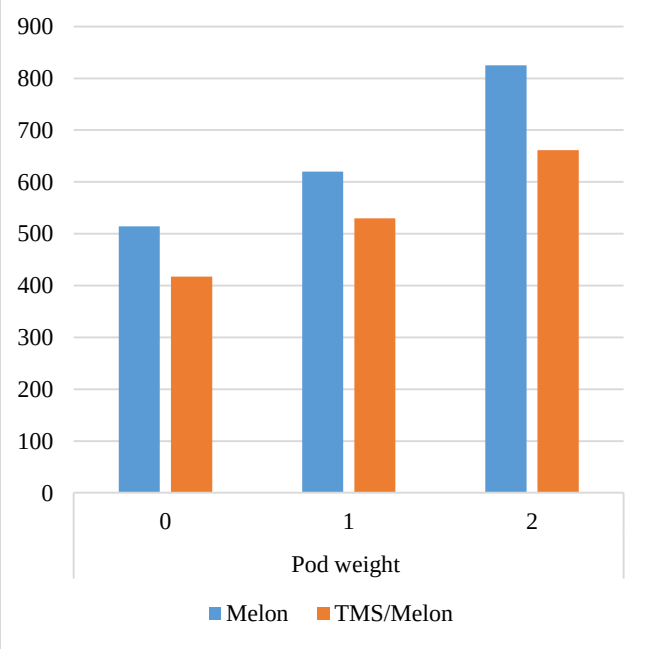
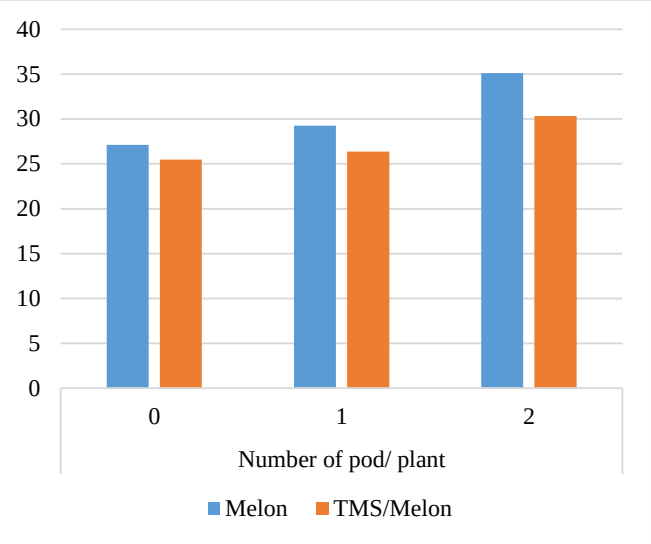
2023	18.41	210.91	717.13	28.51	187.89	2432.12
2024	21.13	230.34	825.32	35.61	201.81	3031.93
LSD (0.05)	2.12	16.12	23.81	5.01	21.91	245.11
Interaction						
F X W	NS	NS	*	*	NS	*
W X S	NS	NS	*	*	NS	NS
F X S	NS	NS	NS	NS	NS	*

F/M= farming system. NS= not significant.

Table 8 Interaction between farming method and weeding regime on some yield and yield related characters of melon grown in Makurdi, Benue State. Nigeria significant difference (P<0.05) was observed with sole melon and twice weeding out performing intercrop of melon and cassava with other weeding regime in pod weight, number of pod per plant and yield. This could be so because cultural practice in terms of weeding have proven to have affected yield and yield related character positively. This finding is in collaboration with the work of Wiley (2001) who reported that sole cropping result in greater competition against weeds, thereby reducing the need for weed population and weeding. On contrary Sassakawa (2000) reported that plant population plays an important role in controlling weed population reducing weeding and increasing yield in maize production. Shetty (2002) in his reported stated that yield related characters are affect crop yield directly such as pod weight and number of pod based on the management practice adopted, thereby affirming that regular weeding and adoption of farming method had increased yield related characters and over all yield. On the other hand, (Ekpe, 1988) reported that although intercropping does not always result in higher yields of each of the component crops, there appears to be a consensus among researchers in cropping system that intercropping results in increased total land productivity and higher land Equivalent Ratio (LER) than is obtainable in sole cropping.

Table 8 Interaction between farming method and weeding regime on some yield and yield related characters of melon grown in Makurdi, Benue State. Nigeria





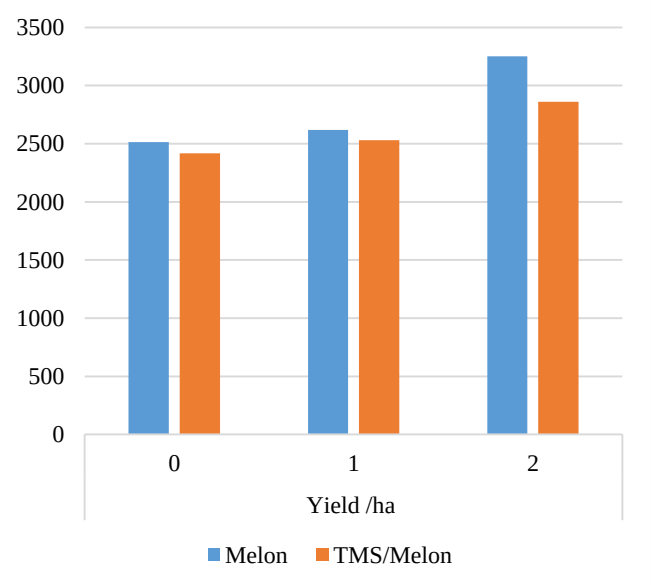


Table 9 Interaction between seasons and weeding regime on some yield and yield related character of melon grown in Makurdi, Benue State. Nigeria, where a perfect interaction has been observed between 2024 planting season and weeding twice, when compared with other treatments under consideration, this could be related to effects of cultural practice, residual effects rainfall and atmospheric temperature as reported by Yusuf (2018) who stated that crop vegetative growth, yield and yield related characters is affected by nutrients, solar radiation, free weed farms, crop arrangement, plant population and temperature.

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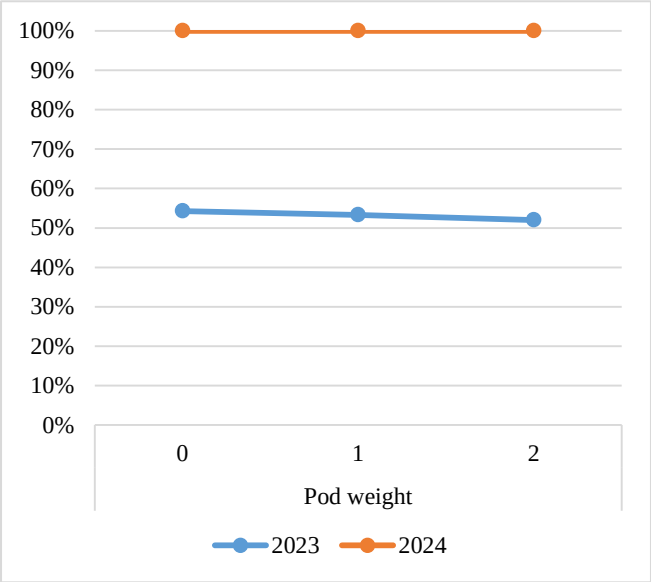
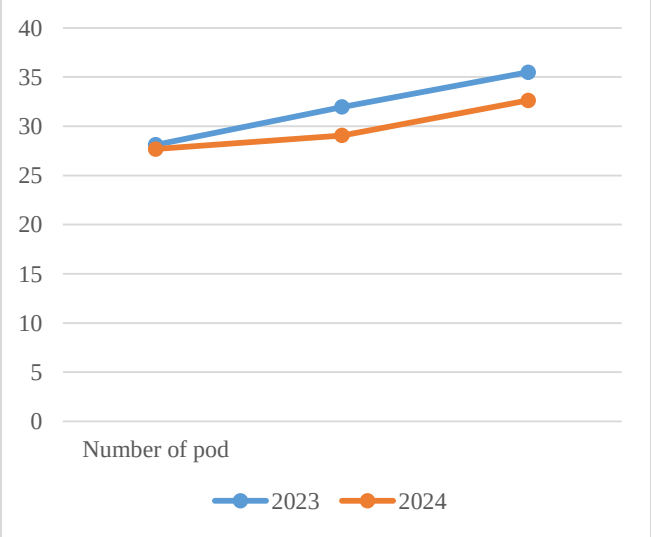
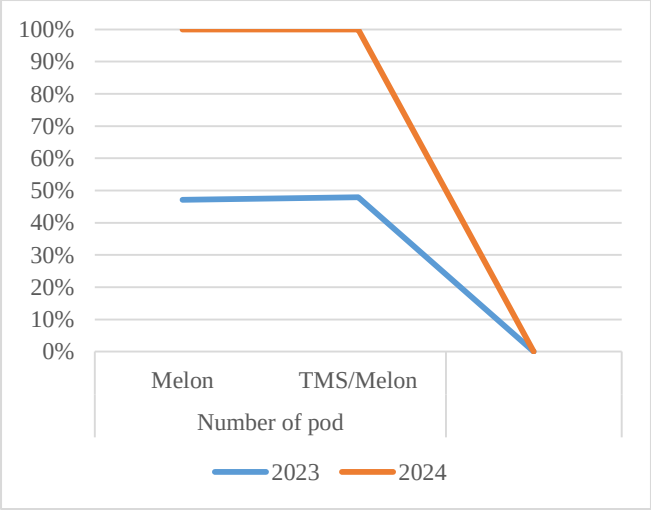
Table 9 is an Interaction between seasons and weeding regime on some yield and yield related characters of melon grown in Makurdi, Benue state. Nigeria







Conclusion

The results from this investigation have showed that farmers can use melon as a means of controlling weeds and cutting down cost of production particularly before formation of canopy by cassava. This study also shows that using intercrop of cassava and melon, weeding twice will give good crop yields. The effectiveness of melon as an alternative for weed control particularly where labor is limiting and land under cultivation is large and availability of capital is low is highly commendable.

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