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FERTILIZER TYPES AND VARIETAL EFFECTS ON PERFORMANCE OF WATERMELON (*Citrullus lanatus*) IN OGBOMOSO, NIGERIA

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ABSTRACT

Fertilizer use is a critical factor for the growth and yield of watermelon. However, there is a lack of information on the effect of organic and inorganic fertilizer on the growth and yield of watermelon in Nigeria. This study addressed this gap by evaluating the effect of different fertilizer on performance of watermelon varieties. Three varieties Kaolak (KK), Sweet Sangaria (SS) and Micklee Plus (MP) of watermelon and five fertilizer treatment (Control (no fertilizer), NPK 15:15:15 (NPK), Poultry manure (PM), Organomineral (OGM) and Mack pure (MKP) in a factorial fitted into Randomized Complete Block Design and replicated thrice were carried out at Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso between May- August, 2024. Soil samples were taken before planting and analysed for physical and chemical properties. Data on growth (number of leaves and number of vines) and Yield (number of flower and number of fruit) parameters were taken, nutrient analysis for matured fruit was also carried out and analysed using ANOVA and treatment means separated with LSD at 5% level. The highest number of leaves were recorded in MP varieties treated with PM at both 2 and 4 weeks after sowing (WAS). MP treated with PM and control had the highest number of vines at 2 and 4 WAS. Also, MP treated with OGM had the highest (33.8) number of flowers while MP varieties treated with PM had the highest number of fruits (36.2.) Results of nutrient analysis shows variety KK in control had highest (4mg/kg) Nitrogen. All the three varieties were not significantly different in P (0.5mg/kg), K (3.3mg/kg), Z (0.5mg/kg) and Vitamin A (0.7%). KK treated with PM and Control had highest Fe (0.6mg/kg) and SS treated with OGM had highest amount of Vitamin C (40.1%) . In Conclusion, MP treated with PM performed best in terms of growth and yield as they were significantly influenced by the fertilizer and variety types and there was similarity in variety and fertilizer treatment in nutrient content analysis.

Keywords: Fertilizer types, Watermelon varieties, Yield parameters, Growth parameters and Nutrient

INTRODUCTION

Watermelon *(Citrullus lanatus* L.) belongs to the family Cucurbitaceae (Kyriacou *et al*., 2018). It is the most popular Cucurbitaceous fruits. It is highly nutritious and contains significant amount of sugar. Today, when more and more attention is paid to a healthy diet, the demands of consumers on the market are formulating the method of production and quality of watermelon fruits (Kyriacou *et al*., 2018; Dalorima *et al.,* 2021). Watermelon is a warm season plant, largely produced in the drier core savanna zones in Nigeria (Anikwe *et al.,* 2016). Its production across agro-environments in the South East is still low despite high rate of its consumption, this situation is due to high humidity that is known to adversely affect flowering and inappropriate soil and water management practices. It is ranked the top five most frequently purchased and cultivated fruits globally (National Watermelon Production Board, 2008).

However, watermelon production in Nigeria is faced with several challenges including poor soil fertility, low soil organic matter and inadequate use of fertilizers (Adeboye and, Ogunwale, 2014). The use of organic and inorganic fertilizer has been proposed as a potential solution to these challenges (Owoade and Abolakale, 2021). Organic fertilizers are derived from natural sources while inorganic fertilizers are chemically produced. The use of these fertilizers can affect the growth and yield of watermelon in different ways. This study seeks to address this gap by evaluating the effect of different fertilizer on performance of watermelon varieties in Ogbomoso.

MATERIALS AND METHODS

Study area

The research was carried out during the 2024 planting season which began in March at the Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State located on longitude 4^0 10E and

latitude 8^0 10N in the Guinea savanna zone of southwest Nigeria. The temperature ranges between 28^0C-33^0 C with a high humidity of about 74% all year round except January when there will be dry wind blows. Average annual rain is 1217mm spanning eight months (March to October) with dry spell in August. The soil of the site is moderately drained with a sandy loam texture.

Fertilizer and seed source, Experimental treatments and design

Seed of watermelon, organomineral and macpure fertilizers used for this research were purchased from a certified Agro store (SOLOKAD) in Ibadan while poultry manure (PM) was collected from LAUTECH Teaching and Research Farm..

Five fertilizer treatments; Control (T1), NPK 15:15:15 (T2), Poultry manure (T3), NPK 15:15:15 + Mackpure organic fertilizer (T4) and Mackpure organic fertilizer (T5), and three varieties of water melon (Kaolak, Micklee plus and Sweet Sangaria. The experiment was factorial fitted into Randomized Complete Block Design (RCBD) and replicated three times.

Field preparation and layout

Land preparation was carried out. The experimental plot was divided into three replicates, each containing fifteen beds to give a total of forty-five beds. Each bed size was 2 m × 3 m and 1 m space between beds. The blocks were spaced 1m apart to ease movement during cultural operations and for spreading out the vines across the ground.

Agronomic activities

Sowing

Total number of 540 watermelon seeds were sown directly at a spacing of 75 cm x 100 cm and a depth of 2.5 cm with 2 seeds per hole.

Post planting operation

Weeding

Manual weeding with hoe was carried out every two weeks after planting to ensure proper growth and spreading of the plants, reduce competition for nutrients between plant and weed and to avoid weeds becoming secondary host for pest that can destroy the plants.

Insect Pest and Diseases

Insect pests and disease were controlled by application of Cypermethrin (10% EC) at 500 mls/ha according to the producer's recommendation (approximately 42 mls was used for 833 m^2 plot and 42 litres of water was used in diluting it before spraying on the plot)

Supplying

Seeds that did not germinate 2 weeks after planting were re-supplied.

Fertilizer Application

NPK 15:15:15 was applied at 350 kg/ha (40g per plant) at 2 weeks after planting. Organomineral was formulated (60 g of NPK 15:15:15 was mixed with 120 g of Mackpure organic fertilizer and the mixture was applied at 17.8 g per plant. at 2 weeks after planting. Poultry manure and Mackpure organic fertilizer were applied at 2.5 t/ha (1.2 kg/plant) while Mackpure at 0.25 t/ha (12 g/plant) at three weeks before planting.

Harvesting

Watermelon was harvested after maturation (10-12 weeks after planting).

Data collection

Data on growth (Numbers of leaves and vines/plant) and yield (numbers of flowers and fruits/plant) parameters were determined by counting. Nutrient analysis was carried out for nutrient content of the matured fruit (N, P, K, Fe, Zn, Vitamin A and Vitamin C).

Data analysis

Data collected were subjected to Analysis of Variance (ANOVA) (Gomez and Gomez, 1984). Means obtained were separated by Least significant difference at 5% probability level.

RESULTS

Effects of Fertilizer and Varietal Types on Growth Parameters of Watermelon

Number of leaves

Table 1 shows the effect of fertilizer and varietal types on number of leaves of watermelon. Fertilizer types significantly influenced the number of leaf ($P \leq 0.05$) of watermelon plants.

At 2 weeks after sowing (WAS),the highest (7) fertilizer mean was obtained in poultry manure while the least (5) was obtained in NPK 15:15:15.

Varietal mean were all the same at 2WAS.At 4WAS ,highest fertilizer mean was recorded in poultry manure while the leas (26)t was recorded in NPK 15:15:15.Varietal mean was highest (35) in Micklee plus and least in Kaolak (30). The highest (8) number of leaves was recorded with Micklee plus variety treated with poultry manure (PM) while the least (4) number of leaf was recorded on sweet sangaria varieties treated with NPK 15:15:15 Also, there was no significant difference interaction between fertilizer treatment and variety. At 4 WAS, Micklee Plus variety treated with PM had the highest (53) number of leaves while the least (21) number of leaf was recorded on Kaolak variety where no fertilizer was applied which is Control. The interaction between fertilizer treatment and variety was significantly different

Number of vine

Table 2 shows the effects of different fertilizer on the number of vine of watermelon and varietal type at different growth stages. At week 2 WAS, both fertilizer mean and varietal mean are the same (2). At 4WAS, the highest fertilizer mean was observerd in Poultry manure and Mackpure (4). Varietal mean was highest in Micklee plus(4) while the least was observerd in Kaolak and sweet sangaria (3).Highest (3) number of vine were recorded in Micklee Plus variety where no fertilizer treatment was applied , where treated with PM and Kaolak treated with Organomineral (OGM). The rest had the least (2) number of vine. At 4WAS, Micklee Plus without any fertilizer treatment, the ones treated with PM and Mackpure (MKP) had the highest (4) number of vine . And other varieties like Kaolak treated with OGM, Sweet Sangaria treated with PM and MKP. Least (3) number of vine was recorded at the rest like Kaolak treated with PM, MKP, NPK, and where no fertilizer treatment was applied.

There was no significant difference in the variety at both growth stages and the interaction between variety and fertilizer treatment at 4WAS.There was significant difference in fertilizer treatment at both growth stages and the interaction between variety and fertilizer treatment at 2WAS.

Effect of different fertilizer and varietal types on fruit yield of watermelon

Number of flower

Table 3 shows the effect of different fertilizer and variety types on number of flowers in watermelon plants.Highest (29) fertilizer mean was recorded in Control (no fertilizer) while the least was NPK 15:15:15 had the least (20). Varietal mean was highest (26) in sweet sangaria although they are all similar while the least (24) was recorded in Micklee plus. Micklee Plus variety treated with OGM had the highest (34) number of flower, followed by Sweet Sangaria variety treated with Control (32) i.e no fertilizer application while Kaolak variety treated with MKP organic fertilizer had the least (17) number of flower. Number of flower was not significantly influenced by Variety type, fertilizer treatments and interaction between variety and fertilizer.

Number of fruit

Table 4 shows the effect of different fertilizer and variety types on number of fruit of watermelon plant. Highest (32) fertilizer mean was recorded in Poultry manure while the least (19) was NPK 15:15:15. Varietal mean was highest (28) in Kaolak amd least (24) in Micklee plus.Micklee Plus treated with PM had the highest (36) number of fruits while Micklee Plus treated with OGM had the least (12) number of fruits. Fertilizer and interaction between variety and fertilizer were significantly influenced while there is no significant difference in variety. The number of fruit in variety was not significantly influenced, however, fertilizer and interaction between fertilizer and variety was significantly influenced

In Table 5, the result for the analysis of nutrients in matured fruit was carried out and shown. Fertilizer treatment were all significantly influenced in P, K, Zn, Fe, Vit A and C except for in Nitrogen where it was not significant.Varieties were not significantly influenced all through except in Iron (0.08). The interaction between Variety and Fertilizer treatment are majorly not significant except in N (0.5), K (0.001) and Vit A (0.006) which were significantly influenced.

DISCUSSION

Results from the experiment revealed that the highest number of leaves was gotten from the variety Micklee Plus treated with poultry manure which corresponds with a research carried out by Eifeidiyi *et al.,*2017, it was observed that plants in organic manure treated plots showed higher number of leaves compared to the other fertilizer types. Sabo *et al.,* 2013 also stated that the application of organic manure sources such as burnt rice husk, poultry manure and wood ash had the highest number of leaves but the highest was produced from the application of poultry manure. Also, Dada and Olanrewaju in 2020 reported that application of poultry manure improves the growth of watermelon plants leading to a higher number of leaves and overall better health.

The highest number of vine was recorded in Micklee Plus variety treated with poultry manure in correspondent with Ali *et al.,*2020, their research focused on organic fertilization's impact on watermelon growth,which includes vine number. Their findings showed a significant improvement in vine production with the application of poultry manure. Abdel-Moneim, M. H., *et al.* (2018) research explores the differences in growth attributes, including the number of vines, between plants treated with poultry manure versus chemical fertilizers. According to El-Habbasha & Abd El-Monem, 2020 the effectiveness of poultry manure in increasing vine numbers and overall yield in watermelon plants was discussed.

Highest number of fruits was recorded in Micklee Plus variety treated with Poultry manure.This was similar to the research carried out by Ajayi *et al.,*2009 that application of increased organic fertilizer (Poultry manure) produced the highest number of fruits per plant which could be attributed to the ability of Poultry manure to promote vigorous growth. In contrary to this research, Eifediyi *et al.,*2017 reported that the highest number of fruit was produced from plants that received inorganic fertilizer (NPK) fertilizer. Also, Adeyeye *et al.,*2016 reported that the plants treated with 50% NPK + 50% Compost (organomineral) produced the highest number of fruits.

The highest number of flowers was recorded in Micklee Plus variety treated with Organomineral. This was contrary to a research reported by Oga and Umekwe in 2015 that the application of inorganic fertilizer (60Kg/ha NPK) produced the highest number of flowers while the least was produced from plots treated with no fertilizer (control). Also, Sabo *et.,al* in 2013 reported that highest numbers of flower was obtained in plants treated with 100kg/ha NPK.

CONCLUSIONS AND RECOMMENDATION

Conclusion

It was observed from the experiment that the application of Poultry manure (organic fertilizer) performed very well on Micklee plus watermelon varieties. Poultry manure also performed best in terms of growth and yield performance.However, the nutrients were best in plants treated with inorganic fertilizer and organomineral although they were all very similar. So, there were no significant difference in the varietal nutrients. Kaolak performed best without fertilizer (control) and sweet sangaria treated with organomineral and mackpure.

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Table 1. Effect of different fertilizer on the number of leaves of watermelon plant

	Fertilizer types					
Variety	**Control**	**NPK 15:15:15**	**Poultry manure**	**Organo Mineral**	**Mack pure**	**Variety Mean**
		2 WAS				
Kaolak	5	5	6	7	5	6
Sweet Sangaria	7	4	6	6	6	6
Micklee Plus	7	5	8	5	6	6
Fertilizer Mean	6	5	7	6	6	6
LSD Variety	NS					
LSD Fertilizer	1.2					
LSD V*F	NS					
		4 WAS				
Kaolak	21	26	33	43	27	30
Sweet Sangaria	32	24	31	35	37	32
Micklee Plus	38	27	53	22	35	35
Fertilizer Mean	30	26	39	33	33	32
LSD Variety	NS					
LSD Fertilizer	9.8					
LSD V*F	13.1					

$LSD_{0.05}$ = LSD at 5% probability level. V is variety ,F is fertilizer, WAS - week after sowing, ns is not significant,v*f is interaction between variety and fertilizer

Table 2: Effect of different fertilizer on the number of vine of watermelon plant

	Fertilizer types					
Variety	Control	NPK 15:15:15	Poultry manure	Organo Mineral	Mack Pure	Variety Mean
		2WAS				
Kaolak	2	2	2	3	2	2
Sweet Sangaria	2	2	2	2	2	2
Micklee Plus	3	2	3	2	2	2
Fertilizer	2	2	2	2	2	2
LSD Variety	NS					
LSD Fertilizer	0.4					
LSD V*F	0.4					
		4WAS				
Kaolak	3	3	3	4	3	3
Sweet Sangaria	3	3	4	3	4	3
Micklee Plus	4	3	4	3	4	4
Fertilizer	3	3	4	3	4	3
LSD Variety	NS					
LSD Fertilizer	0.8					
LSD V*F	NS					

$LSD_{0.05}$ = LSD at 5% probability level. V is variety ,F is fertilizer, WAS - week after sowing, ns is not significant,v*f is interaction between variety and fertilizer

Table 3: Effect of different fertilizer on number of flower of watermelon plants

	Fertilizer types					
Variety	**Control**	**NPK 15:15:15**	**Poultry manure**	**Oragano mineral**	**Mack pure**	**Variety Mean**
Kaolak	34	27	25	22	17	25
Sweet Sangaria	32	20	23	24	29	26
Micklee Plus	21	19	20	38	24	24
Fertilizer	29	22	23	28	23	25
LSD Variety	Ns					
LSD Treatment	Ns					
LSD V*F	Ns					

$LSD_{0.05}$ = LSD at 5% probability level. V is variety ,F is fertilizer,ns is not significant v*f is interaction between variety and fertilizer

Table 4: Effect of Different Fertilizer on Number of Fruit of Watermelon Plant

Variety	Fertilizer types					
	Control	NPK 15:15:15	Poultry manure	Oragano mineral	Mack Pure	Variety Mean
Kaolak	22	25	33	36	24	28
Sweet Sangaria	26	18	27	26	24	24
Micklee Plus	33	14	36	12	23	24
Fertlizer	27	19	32	25	23	25
LSD Variety	Ns					
LSD Fertilizer	9					
LSD V*F	166.2					

$LSD_{0.05}$ = LSD at 5% probability level. V is variety ,F is fertilizer,ns is not significant v*f is interaction between variety and fertilizer

Table 5: Effect of different fertilizer on watermelon matured fruit analysis

Fertilizer	N	P	K	Zn	Fe	Vit A	Vit C
Treatment	g/kg	Mg/kg	Cmol/kg)	Cmol/kg	Cmol/kg	(%)	
Control	3.50	0.40	3.20	0.40	0.50	0.60	36.40
NPK 15:15:15	3.20	0.50	3.10	0.40	0.40	0.40	36.50
Poultry manure	3.60	0.40	3.30	0.30	0.40	0.50	36.30
Organomineral	3.30	0.40	3.50	0.40	0.40	0.30	35.10
Mackpure	3.30	0.40	3.20	0.30	0.40	0.40	38.00
LSD Fert trt	ns	0.04	0.11	0.11	0.10	0.13	2.30
Variety							
Kaolak	3.40	0.40	3.20	0.40	0.50	0.40	36.70
Sweet Sangaria	3.30	0.40	3.20	0.30	0.40	0.40	36.50
Micklee Plus	3.40	0.40	3.20	0.40	0.40	0.50	36.10
LSD Variety	ns	ns	ns	Ns	0.08	Ns	ns
Lsd V*F	0.5	ns	0.001	Ns	Ns	0.006	ns

$LSD_{0.05}$ = LSD at 5% probability level. V is variety ,F is fertilizer,trt is treatment,Vit is Vitamin, ns is not significant, v*f is interaction between variety and fertilizer