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THE GROWTH, YIELD AND SEED QUALITY OF SOLANUM MACROCARPON AS AFFECTED BY NPK FERTILIZER

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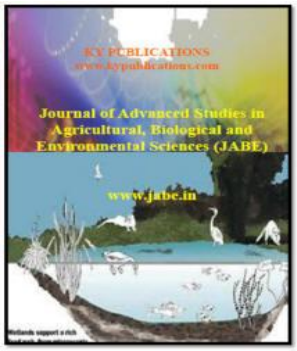

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ABSTRACT

The growth, yield and seed qualities of solanum macrocarpon in respond to NPK fertilizer was investigated. The fertilizer treatments were: (0, 100, 200, 300, 400 kg/ha) of NPK 15, 15, 15.The experiment was laid out in a randomized complete block design with four replications. The data collected were: plant height, leaf area, number of leaves and off shoot per plant and seed parameters which are: fruit size, ripening stages. The analysis of variance (ANOVA) was used at 5% level of probability to separate the means. Fertilizer applications had significant effect on the vegetative parameters taken and 400kg/ha of NPK produced plants that are better than other treatments, which is not significantly different from application of 300kg/ha fertilizer .Fruit size and ripening stages have significant effects on solanum macrocarpon seed qualities. The harvesting of fruits at half and full ripe stages produced seeds with similar qualities while the fruits from deep and breaker stage ripening produced significantly lower seed qualities. The biggest fruits produced seeds with the best qualities. It is therefore concluded that 300kg/ha NPK is optimum for the production of solanum microcarpon and half ripening stages of fruits with 5cm diameter produced best seed qualities.

Key Words: solanum microcarpon ,NPK fertilizer ,Fruits Qualities.

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INTRODUCTION

Solanum microcarpon is one of the most important vegetable commonly used in southern Nigeria. It contribute substantially to the people diet as source of soup and widely grown for both consumption and for sales due to its potential leaf production (Ojo and Olufolaji ,1997).Despite of the significant of this vegetable in the traditional farming systems and its dietary important ,it cultivation and productivity like other leafy vegetables is limited by the declined soil fertility in other words when the soil nutrient diminishes in the way that lower its ability to support and nourish plants (Donoran and Casey,1998).Solanum microcarpon being a vegetable required Nitrogen for cell division and enlargement, production of protoplasm and leaf size development, while the disturbance of these physiological process as a result of inadequate nutrient supply will eventually lead to yield reduction. Akanbi and Togun,(2002) reported an increase in leaf size and shoot yield with increase in level of available Nitrogen on celosia and amaranth. Variability in fruits size and weight has a significant impact on fruits and seeds qualities while the final fruit weight of crop is a long term

integration of climatic, nutritional, cultural and biological events. The actual fruit weight results from the balance between assimilates supply by photosynthesis and assimilates demand from all individual competing sinks (Warren, 1972,Bentin et al 1998).

The increase in potential fruit size and weight has been reported to be under the control of available nutrients (especially N) before and just after anthesis. Nitrogen has been reported to promote auxins synthesis, cell division and enlargement as well as influenced synthesis and partitioning of photosynthentate in vegetable. Hence there is high positive correlation between final fruit weight and seed qualities in vegetables such as tomato (Bentin et al 1998 and Okra Akanbi ,2002).The role played by fruit size in seed qualities of fruit vegetables cannot be under scored. In some crops, fruit sizes he plant were allowed to grow for determine fruit traits such as number of seeds, seed weight and viability. The implication is that growers and seed producer need to take into consideration fruit size when selecting fruits for seed production. Hence the aim of the study is to assess the effects of Nitrogen supply on growth, shoot and seed yield of solanum marcrocarpon and also to assess the relationship between fruit size, ripening stages and seed qualities.

MATERIALS AND METHODS

T he experiment was conducted at Ladoke Akintola University of Technology, Ogbomoso to assess the effect of NPK fertilizer, fruit size and fruit ripening stage on the growth ,yield and seed qualities of solanum macrocarpon. Ogbomoso is on the latitude 8" 10^{N} and longitude 4"10^{E} with 420meters above the sea level. It has a bimodal rainfall pattern (1150mm --- 1250mm per year) with the peak in July and September and short rainfall break in August while the dry season last from November to March. It has a minimum temperature of 28^{0c} and maximum temperature of about 74^{0c} all year round except in January when the dry winds blow from the North .The soil of the experimental site was sandy loam and has been under guinea grass fallow for two years before it was used for this experiment. The top 30cm of the soil had a Ph 5.81kg^{-1},organic matter, 2.90kg^{-1},organic carbon, 2.90kg^{-1},Nitrogen, 0.26gkg^{-1},Available P ,7.40kg^{-1},Available K, 0.26gkg^{-1}, Exchangeable Mg,0.59 $cmolkg^{-1}$ (table 1).

The experiment was laid out in a randomized complete block design (RCBD) with four replicates. Plot sizes were 2m x 1.8m with 1m gap between plots. Total land area for the experiment was 20m x20m ($400m^2$).The seedling spaced at 60cm x30cm with one plant per stand. Weed was controlled by the use of hoe as at when necessary while insect pest was controlled using Karate at the rate of 40ml to 20litre of water as at when needed. The plant were allowed to grow for 8 weeks after transplanting while the fertilizer treatments were applied a week after transplanting using ring method. The fertilizer treatments were: 0kg/ha (control) ,100,200,300 and 400kg/ha. Six plants per plot were also selected and tags for fruits and seeds traits assessments. The plants were left for 18 weeks after transplanting while 36 fruits were harvested per plots which were later sorted out into small, medium and big fruits. Among each fruit size category 3 fruits were selected based on 4 ripening stages.

Growth parameters were assessed fortnightly from 2 weeks after transplanting (WAT) to 8 weeks after transplanting. The parameter were stem height, leave number, leaf area, number of off shoot per plant and the yield parameters such as seed weight, number of seed per fruit, average fruit weight, and fruit yield. Data was analyzed using analysis of variance (ANOVA) at 5% level of probability and the means were compared using LSD.

RESULTS

Application of NPK fertilizer at different levels improved the vegetable growth parameters measured and it is significantly better when compared with no fertilizer treatment (0kg/ha).The plant height was at its highest at (8WAP) when 400kg/ha of NPK were applied followed by the application of 300kg/ha fertilizer and the least with the control (0kg/ha)(table 1).Leaf area was significantly different at all the growth stages .The highest leaf area recorded was at 6WAP through the application of 400kg/ha fertilizer followed by plant that received 300kg/ha fertilizer treatment and the least with 0kg/ha (table 2).Fertilizer treatments were all

significantly affect the number of leaves of the vegetable at all the growing stages study except at 8WAP.Plant that received 400kg/ha fertilizer produced the highest leaf number at all stages of growth followed by 300kg/ha fertilizer treatment which are not different statistically from the plant that received 200kg/ha treatments (table3).The number of off shoot per plant were also significantly affected by the fertilizer application at all growth stages of the crop and plants that were treated with 400kg/ha fertilizer had significant higher number of offshoot per plant followed by 300kg/ha treatment which is significantly similar in mean values to 200kg/ha treatments and the least from unfertilized plant (table 5).The shoot yield of solanum marcrocapon is shown in fig 1 and the application of fertilizer at different rate produced significantly higher yield when compared with unfertilized plant. Application of 300kg/ha fertilizer treatment produced the highest shoot yield followed by 200kg/ha treatment and least from unfertilized plant (fig 1).The shoot crude protein of solanum marcrocarpon was affected by the application of NPK fertilizer in this study and plant that received 400kg/ha fertilizer produced the highest crude protein followed by plant that treated with 300kg/ha and the least from unfertilized plants (fig 2).

Table 1: Soil chemical and physical properties

Property	Value
PH	5.81
Organic carbon	2.90
Available N	0.26
Available P	7.40
Exchangeable K	0.29
Exchangeable Ca	3.11
Exchangeable Mg	0.59
% Sand	86.0
% Silt	7.50
% Clay	6.50

Table 2: NPK effect on stem height of *Solanum marcrocarpon* at different growth stages

Fertilizer rate (Kg/ha)	Stem height (cm) → Weeks after planting ←			
	2	4	6	8
0	7.9	10.3	15.7	16.3
100	19.2	20.5	21.3	22.3
200	20.9	18.4	20.2	24.5
300	22.6	23.7	24.4	25.6
400	27.5	28.3	28.9	30.4
Prob. of F	Xx	X	Ns	X
LSD (5%)	11.6	14.5	15.8	12.1

x, xx = Significant at 5 and 1% probability levels respectively; ns = not significant at 5% probability

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Table 3: NPK effect on leaf area of *Solanum marcrocarpon* at different growth stages

Fertilizer rate (Kg/ha)	Leaf area (cm^2) → Weeks after planting ←			
	2	4	6	8
0	2.7	18.4	8.4	26.9
100	81.6	150.1	215.4	155.4
200	85.9	95.6	117.3	112.5
300	104.3	120.7	127.2	136.7
400	145.9	167.9	257.0	192.1
Prob. of F	X	X	x	X
LSD (5%)	114.7	129.7	134.9	133.5

x, xx = Significant at 5% and 1% probability levels respectively; ns = not significant at 5% probability

Table 4: NPK effect on number of leaves/plant of *Solanum marcrocarpon* at different growth stages

Fertilizer rate (Kg/ha)	Number of leaves/plant → Weeks after planting ←			
	2	4	6	8
0	4.5	3.0	6.2	8.2
100	4.4	8.3	8.8	11.4
200	6.3	10.5	10.6	14.2
300	6.2	10.1	10.2	12.2
400	8.6	14.8	15.0	17.3
Prob. of F	X	X	x	Ns
LSD (5%)	3.3	6.9	7.1	9.4

x, xx = Significant at 5 and 1% probability levels respectively; ns = not significant at 5% probability

Table 5: NPK effect on number of off shoot/plant of *Solanum marcrocarpon* at different growth stages

Fertilizer rate (Kg/ha)	Number of offshoot/plant → Weeks after planting ←			
	2	4	6	8
0	0.0	0.0	0.0	0.0
100	3.2	4.0	4.4	5.3
200	4.1	5.5	6.4	7.2
300	4.0	5.5	6.2	7.0
400	4.8	6.1	6.7	7.8
Prob. of F	Xx	xx	Xx	Xx
LSD (5%)	2.5	3.0	2.8	3.3

x, xx = Significant at 5 and 1% probability levels respectively; ns = not significant at 5% probability

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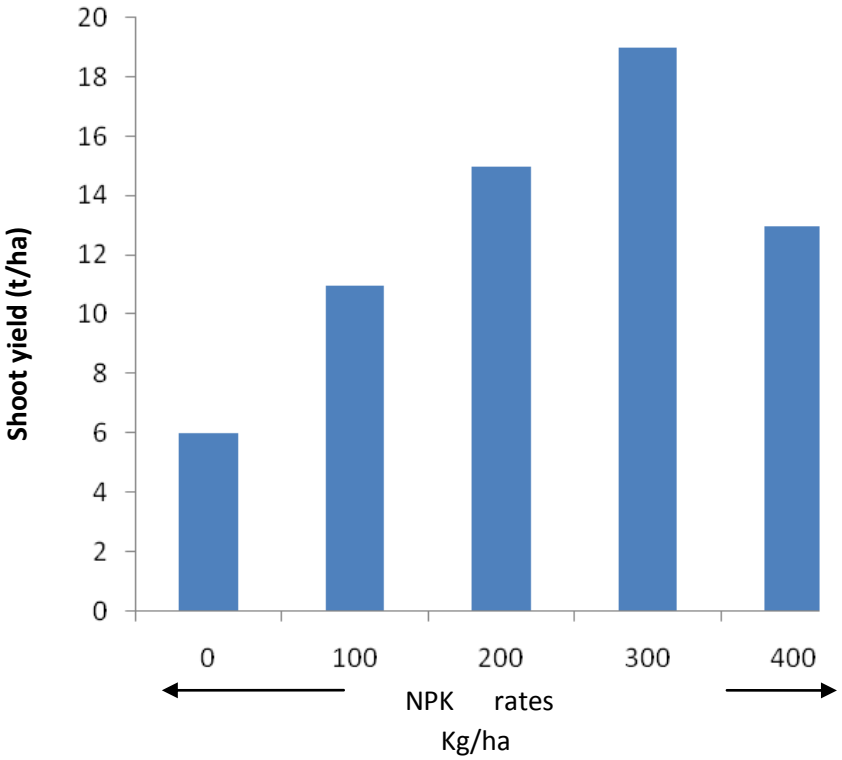

Fig 1 Effect of NPK fertilizer on shoot yield of *Solanum marcrocarpon*

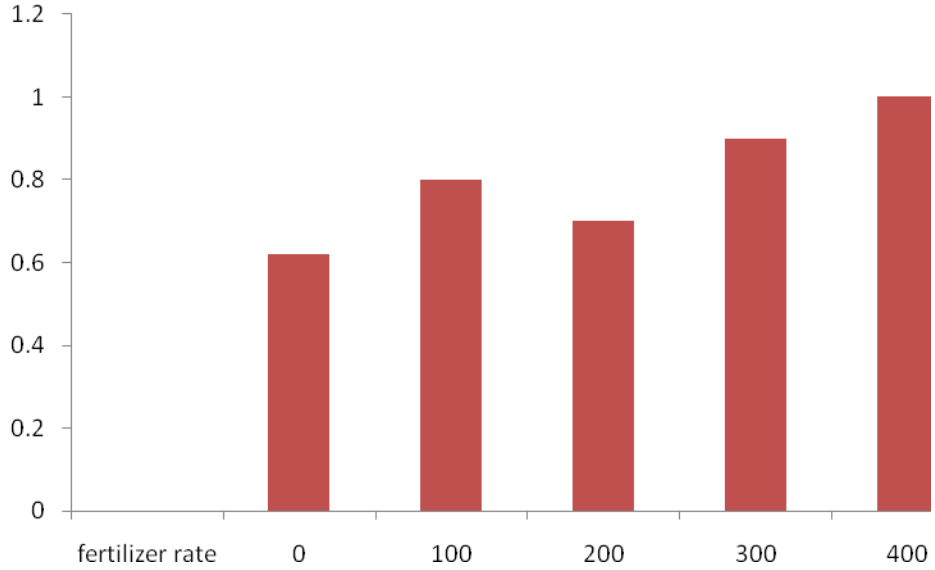

Fig 2: Effects of NPK fertilizer rates on the crude protein content of solanum microcarpon

DISCUSSION

The results of the study shows that application of NPK fertilizer improved the vegetative growth parameters of the plant ie the fertilizer gave a significant increase in the

Plant height, number of leaves, leaf area and number of off shoot per plant of solanum marcrocarpon plant when compared with unfertilized plant. This work agree with Olaniyi and Ojetayo (2010) who reported that

application of fertilizer gave vigorous development in plant vegetative parts due to the release of considerable amount of nutrients for plant use, which is essential for the formation of plant essential molecules such as chlorophyll and protoplasm.

The observed behavior of vegetable shoot yield in this experiment is attributed to NPK fertilizer ability to released nutrient elements quickly for plant uptake. This is in line with the report of Olatunji and Ayuba (2011) that application of NPK fertilizer produced higher yield of maize. The effectiveness of NPK fertilizer on improved shoot crude protein of solanum marcrocarpon is attributed to the released of considerable amount of Nitrogen which is an essential element for the production of protein by the plant. This is in line with the work of Akanbi et al (2007) which shows that nutritional contents of telfairia occidentalis were improved with adequate fertilizer application and the crude protein ,iron (Fe) and ascorbic acid contents were better in plants that received 100%NPK fertilizer.

In conclusion, this research work showed that application of fertilizer is imperative to achieved optimum growth and shoot yield of solanum microcarpon and applying NPK 15-15-15 at the rate of 300 to 400kg/ha is adequate for the optimum shoot yield production of this vegetable.

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