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SHORT COMMUNICATION

Influence of potting media on growth and development of *Solanum marcocarpon* L.

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ABSTRACT

Solanum macrocarpon L., popularly known as African eggplant is an indigenous vegetable which is highly medicinal and nutritious. This study was conducted to evaluate the effect of different potting media on the growth and development of *Solanum macrocarpon*. Six different potting media including topsoil (100%), river sand (100%), sawdust (100%), topsoil and river sand (50:50), topsoil and sawdust (50:50), and river sand and sawdust (50:50) were used for growing *S. macrocarpon*. The experiment was laid out in Complete Randomized Design (CRD) with four replicates. It was found that potting media ($p>0.05$) significantly affected the leaf length, leaf breadth, leaf number, stem diameter and plant height of plant. Plants grown in topsoil showed the highest performance in the leaf area, plant height, stem diameter and leaf number. These parameters observed in plants grown in topsoil were significantly different ($p<0.05$) from those grown in other media. The present study revealed that type of media significantly affects the growth parameters and as such selection of the appropriate medium for the cultivation of the species is necessary for optimum growth and development. Further, the growth of *S. macrocarpon* can be better enhanced using topsoil as the potting media.

Keywords: Development, Growth, Potting media, *Solanum macrocarpon*, Vegetables

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1. INTRODUCTION

Solanum macrocarpon L. is an indigenous vegetable that belongs to Solanaceae. It is commonly known as African eggplant or Gboma and "Igbagba" among the Yoruba ethnic group in Southwestern Nigeria. It is an erect, herbaceous perennial herb and grows up to about 1-1.5 m tall. It is thought to be a native of Africa although it is now widely distributed in different ecological zones. This plant is found growing naturally in the wild and sometimes in residential areas. The leaves are broad with pointed apex and arranged in an alternate pattern. The shape of the leaves can be said to be oval and lobed with a wavy margin, both sides of the leaves are hairy with simple hairs. Prickles are usually found along the mid-rib and can grow up to a length of 13mm. The flowers are usually of about 2-3.5 cm and of purple colour, fruits are fleshy, round and flattened at the bottom and contain numerous seeds used for propagation (Oboh *et al*., 2005). The leaves of this vegetable contain vitamins, minerals and appreciable amounts of antioxidants which fight against diseases and contribute to growth and maintenance of good health.

Potting media are soils or materials similar to soil that physically support plants grown in them (Ekpo and Sita, 2010). Different combinations of media like sewage sludge, sawdust, spent mushroom compost, coconut coir dust, rice husk and varying soil types are currently being used in different parts of the world as potting media. It is important to note that phyisco-chemical properties and composition of potting media are determinants of plant growth and production, and therefore should be given proper consideration (Riaz *et al.*, 2008). Pore spaces, cation exchange capacity, water holding capacity, bulk density, pH, soluble salts and distribution of the particles size are important physical and chemical properties to be considered before choosing a medium (Riffat *et al.*, 2011).

Stated that a good media must provide the needed oxygen which will support plant optimum development; it must also be light, cheap and easily available. A suitable environment with sufficient water and nutrient availability must be provided by the growing medium to enable the plant to develop excellent roots system that favour the luxurious growth (Neelam and Ishtiaq, 2001). Researchers have employed a wide range of growth media in vegetable production (Indriyani *et al*. 2011, Nair *et al*. 2011, Vaughn *et al*. 2011, Bhat *et. al*. 2013) and these are either natural or artificial in origin, the use of organic potting media substrate however offers a great advantage over the conventional topsoil (Olle *et al*., 2012).

Potting media can be formulated in such a way that it produces better results than the conventional topsoil which is mostly used by farmers. Therefore, the aim of this study therefore was to investigate the best potting media necessary for optimum growth and development of *S. macrocarpon*.

2. MATERIALS AND METHODS

2. 1. Study site

The study was conducted in the open nursery of the Department of Plant Science and Biotechnology, Ekiti State University, Ado Ekiti. The University is located between latitude 24°33'S and longitude 25°54'E and elevated 994 m above sea level.

2. 2. Experimental design, sampling and planting

The study was laid out in a completely randomized design (CRD) with six treatments replicated four times. The treatments included topsoil (TS, 100%), river sand (RS, 100%), sawdust (SD, 100%), topsoil and river sand (TS+RS, 50:50), topsoil and sawdust (TS+SD, 50:50), and river sand and sawdust (RS+SD, 50:50). Experimental pots of 3kg size perforated at the bottom were filled with the respective potting media after which seeds of *Solanum macrocarpon* were sown.

2. 3. Cultural practices

Seedlings were watered evenly throughout the duration of the study. Manual weeding was carried out weekly to remove unwanted plants. Seedlings were frequently examined for pest and disease incidents.

2. 4. Data collection

Weekly observations were made to determine the effects of the six potting media on the germination of seeds of *S. macrocarpon*. Measurement of growth parameters began three weeks after planting (3WAP). Data were collected for early seedling growth parameters such as plant height, stem collar diameter, leaf number, leaf length and leaf breadth. Plant height, leaf length and breadth were measured using a meter rule, stem diameter measured with the aid of a digital Vernier Caliper while leaf number was obtained by physical counting. Leaf area was determined using the non destructive method (Saxena and Singh, 1965) and computed using the formula:

$$\text{Leaf area} = 0.75\ (\text{Leaf Length} \times \text{Leaf Breadth})$$

2. 5. Statistical analysis

Data obtained from various treatments were subjected to statistical analysis using SPSS 20. A one way analysis of variance was used to compare the means of each treatment. Means were segregated using Duncan's Multiple Range Test. The means were treated as significantly different at $p < 0.05$

3. RESULTS

3. 1. Leaf area

The effect of the potting media on plant leaf area is presented in Table 1. Although there were no significant differences ($p < 0.05$) among the mean leaf area from 3rd to 7th WAP, the result showed significant differences from the 8th week to the 9th week WAP. The result shows that the highest mean leaf area was recorded in the topsoil media which had 31.53 cm^2 at 9th WAP, while the lowest was recorded in the Sawdust (1.79 cm^2) in the 3rd week. Regression analysis with leaf area as the dependent variable and weeks (plant age) as the regressor showed a coefficient of determination (R^2) of 15.64 % and P-Value of 0.002 indicating that plant age had a significant effect on leaf area.

3. 2. Plant height

The plant height increased as the weeks progressed and the results are presented in Table 2. There were significant differences in the mean from the 5th week to the 9th WAP. The result showed that the highest mean plant height was recorded in the topsoil media which had 4.63 cm at 9th WAP, while the lowest was recorded in the RS and TS + SD media (1.42 cm). Regression analysis with leaf area as the dependent variable and weeks (plant age) as the regressor showed a coefficient of determination (R^2) of 30.90% and P-Value of 0.000 indicating that plant age had a significant effect on plant height.

3. 3. Stem diameter

The effect of growth media on stem diameter is presented in Table 3. The mean stem diameter was significantly different in all the weeks except the 5th WAP. The mean leaf area was highest in the TS and RS media (0.95 mm) and lowest in RS + SD medium (0.41 mm). Regression analysis with leaf area as the dependent variable and Weeks (plant age) as the regressor showed a coefficient of determination (R^2) of 13.67 % and P-Value of 0.000 indicating that plant age had a significant effect on stem diameter.

3. 4. Leaf number

The result of the effect of potting media on leaf number is presented in Table 4. There were significant differences in the mean in the 3rd, 4th, 7th, 8th and 9th WAP except for the 5th and 6th WAP. The result showed that the highest mean leaf number was in both TS and TS + RS media (6.25) at the 9th WAP, while the lowest was recorded in SD and TS + SD media (1.50). Leaf number increased consistently in the TS and TS + RS media throughout the trial period. However, in other media the leaf number reduced as the trial progressed, in the RS and TS + SD media, the leaf number increased up to the 7th WAP and later declined, in the RS + SD media, the leaf number increased up to the 6th WAP and continued to decline till the end of the experiment.

Table 1. Effect of potting media on leaf area (cm^2) of *Solanum macrocarpon* L.

	Plant age		WAP*				
	3	4	5	6	7	8	9
TS	0.55±0.11	1.48±0.33	2.29±0.69	6.09±2.48	10.41±5.08	19.70±10.04[a]	31.53±14.50[a]
RS	0.62±0.12	1.25±0.18	2.19±0.74	3.59±2.13	5.96±3.65	9.26±6.22[a]	9.85±6.30[a]
SD	0.52±0.03	0.69±0.11	0.93±0.18	1.45±0.42	1.79±0.47	1.89±0.49[a]	1.79±0.54[a]
TS + RD	0.75±0.11	1.46±0.17	1.97±0.29	4.77±1.64	6.68±2.29	9.32±3.34[ab]	25.17±10.57[ab]
TS +SD	0.54±0.16	1.08±0.33	1.51±0.30	1.55±0.33	2.28±0.50	2.44±0.54[ab]	3.17±129[ab]
RS + SD	0.59±0.16	0.91±0.22	1.23±0.29	1.72±0.39	1.90±0.46	2.21±0.37[b]	3.10±0.96[b]

* WAP: Weeks after planting. Values shown are mean ± S.E. Means with different letters along the same column represent significant differences at $p < 0.05$.

Table 2. Effect of potting media on plant height (cm) of *Solanum macrocarpon* L
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	Plant age			WAP*			
	3	4	5	6	7	8	9
TS	1.88±0.23	2.23±0.19	2.52±0.22[bc]	3.02±0.40[a]	3.40±0.48[b]	4.30±0.66[b]	4.63±0.66[b]
RS	1.42±0.14	1.98±0.14	2.10±0.11[abc]	2.38±0.09[abc]	2.80±0.25[ab]	2.70±0.33[a]	3.08±0.81[a]
SD	1.45±0.26	2.08±0.11	2.20±0.09[abc]	2.42±0.25[ab]	2.83±0.21[ab]	2.95±0.18[a]	2.45±0.33[a]
TS + RD	1.75±0.17	1.70±0.54	2.63±0.21[c]	2.95±0.39[b]	3.20±0.38[ab]	3.33±0.40[ab]	4.15±0.82[ab]
TS +SD	1.42±0.05	1.55±0.05	1.80±0.18[a]	1.85±0.23[a]	2.17±0.25[a]	2.33±0.24[a]	2.40±0.33[a]
RS + SD	1.85±0.14	2.00±0.15	2.05±0.16[b]	2.15±0.21[ab]	2.23±0.23[a]	2.32±0.23[a]	2.40±0.33[a]

* WAP: Weeks after planting. Values shown are mean ± S.E. Means with different letters along the same column represent significant differences at $p < 0.05$.

Table 3. Effect of potting media on stem diameter (mm) of *Solanum macrocarpon* L.

	Plant age		WAP*				
	3	4	5	6	7	8	9
TS	0.53±0.09[c]	0.54±0.08[c]	0.72±0.16	0.87±0.13[b]	0.91±0.14[b]	0.93±0.14[b]	0.95±0.14[b]
RS	0.36±0.10[abc]	0.39±0.10[abc]	0.67±0.13	0.89±0.14[b]	0.92±0.14[b]	0.94±0.13[b]	0.95±0.13[b]
SD	0.46±0.06[bc]	0.46±0.03[bc]	0.67±0.08	0.47±0.10[a]	0.50±0.10[a]	0.53±0.11[a]	0.54±0.10[a]
TS + RD	0.31±0.02[ab]	0.33±0.03[ab]	0.46±0.10	0.52±0.13[a]	0.55±0.13[a]	0.58±0.13[a]	0.59±0.13[a]
TS +SD	0.29±0.05[ab]	0.31±0.05[ab]	0.40±0.09	0.37±0.04[a]	0.39±0.04[a]	0.43±0.05[a]	0.45±0.05[a]
RS + SD	0.21±0.02[a]	0.24±0.01[a]	0.36±0.10	0.33±0.06[a]	0.36±0.07[a]	0.39±0.07[a]	0.41±0.07[a]

* WAP: Weeks after planting. Values shown are mean ± S.E. Means with different letters along the same column represent significant differences at $p < 0.05$.

Table 4. Effect of potting media on leaf number of *Solanum macrocarpon* L.

	Plant age		WAP*				
	3	4	5	6	7	8	9
TS	3.00±0.00[b]	4.00±0.00[b]	4.00±0.00	3.50±0.50	4.25±0.75[c]	4.50±0.87[b]	6.25±0.85[b]
RS	2.25±0.25[a]	3.50±0.29[ab]	3.75±1.03	3.50±0.29	4.00±0.41[bc]	3.00±0.71a	3.75±1.03[ab]
SD	2.00±1.00[a]	2.75±0.48[a]	3.50±0.29	3.25±0.25	2.50±0.29[ab]	2.00±0.41[a]	1.50±0.50[a]
TS + RD	3.00±0.00[b]	4.00±0.00[b]	4.00±0.00	3.50±0.50	4.25±0.75[c]	4.50±0.87[b]	6.25±0.85[b]
TS +SD	2.25±0.25[a]	3.50±0.29[ab]	3.75±0.25	3.50±0.29	4.00±0.41b[c]	3.00±0.71[ab]	3.75±1.03[b]
RS + SD	2.50±0.29[ab]	3.50±0.29[ab]	3.25±0.48	3.25±0.48	2.25±0.25[a]	1.50±0.29[a]	1.50±0.29[a]

* WAP: Weeks after planting. Values shown are mean ± S.E. Means with different letters along the same column represent significant differences at $p < 0.05$.

4. DISCUSSION

The increase in leaf area is a function of soil nutrient availability (Peter-Onoh, 2014), and appropriate potting media greatly influences a plant quality and quantity. Okunomo *et al.* (2004) in their study of effect of growth media on *Dacryodes edulis* reported significance difference among treatments in the 7th to 9th week of their experiment. This is also similar to the result obtained in this study where significant difference was observed in mean leaf area in the 8th to 9th WAP. Topsoil medium produced the highest leaf area in the current study. Measurement of leaf area is important in monitoring plant vigour and growth and also determines a plant's photosynthetic ability. Potential plant yield, nutrient and water use dynamics can be better understood by considering the leaf area of plant species.

Topsoil possesses air spaces and high moisture retention capacity that support plant growth (Awodoyin *et al.*, 2001). In this experiment, seedlings in the topsoil medium produced the highest plant height (4.63 cm) while the lowest was obtained in the sawdust medium (2.40 cm). Sawdust undergoes improper decomposition and contains growth inhibitors which hinder plant development. Okunomo *et al.* 2009 reported the highest plant height (12.8 cm) in the topsoil medium as compared with the other media using *Persea americana* as a test plant. In order to achieve sustainable plant production, plant height is a major determinant of plant yield (Saeed *et. al*. 2001) especially in large scale vegetable production. The opined that plants grow in height and diameter through the activity of meristematic tissues which could be made possible by nutrient availability. This may explain the insignificant difference observed during the 3rd and 4th WAP in the current study.

Seedlings of *Solanum macrocarpon* grown in topsoil medium and river sand medium produced the highest stem diameter of 0.95 mm. Bvenura and Afolayan (2014) reported a much higher stem diameter in *Solanum nigrum* (7.35 mm), in the same vein Onideki *et. al.*

(2011) also reported 6.65 mm stem diameter in *Solanum scarbum*. However, it is important to note that these authors applied fertilizer in order to enhance plant growth, hence the relatively high stem diameter. As stated earlier, meristematic tissue activity which leads to increased stem diameter is better improved by adequate soil nutrients. Healthy plant stems are important to aid transport of fluids between root and shoot, store nutrients, support leaves and flowers as well as produce new tissues.

In the current study both topsoil (6.25) and topsoil and river sand media (6.25) produced the highest number of leaves while the lowest was recorded in sawdust medium (1.50). In a similar study, Akintoye *et. al.* (2013) reported that river sand + sawdust media (RS + SD) least supported leaf production of *Begonia erythrophylla* among the other growth media used. The study also reported that a combination of topsoil, river sand and poultry manure produced the highest number of leaves per plant. The performance of topsoil medium significantly increased the number of leaves produced in this study and this is mostly likely encouraged by the adequate nutrients present in the medium which enhances plant growth and development. The low leaf production, yellowing of leaves and incessant leaf abscission in SD, RS + SD media may be said to be directly proportional to the low nutrients in the media. Sawdust contains high cellulose and lignin and posses insufficient Nitrogen as such can be said to be depleted in plant nutrients that sustain plant growth (Ekpo and Sita, 2010). Furthermore, Olosunde and Fawusi (2003) also reported that river sand has a reduced drainage and aeration capacity in addition to high Carbon-Nitrogen ratio which lead to poor plant growth.

5. CONCLUSION

In conclusion, plants grown on topsoil medium performed better than those on other media used in this experiment. It is therefore recommended that topsoil, since it is easily available, should be employed in the cultivation of *Solanum macrocarpon* so as to enhance its growth and development.

References

[1] Akintoye H.A., AdeOluwa O.O., Akinkunmi O.Y. 2013. Effect of different growth media on the growth and fl owering of beefsteak begonia (*Begonia erythrophylla*). *J. Appl. Hort.* 15(1): 57-61

[2] Awodoyin R.O., Ogunyemi S. Ladipo D.O. 2001. Studies on some nursery management techniques for *Irvingia wombulu* (Syn. *Exolia*) ex. Okafor. *Nig. J. Ecol.* 3: 24-28.

[3] Bhat N.R., Suleiman M.S., Thomas B., Lekha V.S., George P., Ali I.S. 2013. Growing substrate for organic lettuce production in Kuwait. *World J. Agric. Sci.* 9(2): 143-147.

[4] Bvenura C., Afolayan A.J. 2014. Growth and physiological response of *Solanum nigrum* L. to organic and/or inorganic fertilizers. *J. Appl. Bot. Food Qual.,* 87: 168-174.

[5] Ekpo M.O., Sita S.K. 2010. Influence of growing media on stem diameter and ecological characteristics of *Pinus patula* seedlings in Switzerland. *World J. Agric. Sci.* 6(6): 652-659.

[6] Indriyani N.L.P., Hadiati S., Soemargono, A. 2011. The effect of planting medium on the growth of pineapple seedling. *J. Agric. Bio. Sci*. 6(2), 43-48.

[7] Nair A., Ngouajio M., Biernbaum J. 2011. Alfalfa based organic amendment in peat-compost growing medium for organic tomato transplant production. *Hort. Sci.* 46(2): 253- 259.

[8] Neelam A., Ishtiaq M. 2001. Response *of Eucalyptus camaldulensis* seedlings to different soil media. *Sarhad J. Agric.* 17(1): 75-79.

[9] Oboh G., Ekperigin, M.M., Kazeem, M.I. 2005. Nutritional and haemolytic properties of eggplants (*S. macrocarpon*) leaves. *J. Food Compos. Anal*. 18(2): 153-160.

[10] Olle M., Ngouajio M. Siomos A. 2012. Vegetable productivity as influenced by growing medium: A review, *Agric.* 99(4): 399- 408.

[11] Olosunde O.M., Fawusi M.O.A. 2003. Effect of growing media on rooting of Queen of Philippines (*Mussaenda philippica* A. Rich). *Proceedings of the 21st Annual Conference of Horticultural Society of Nigeria.* Pp 121-126.

[12] Ondieki M.J., Aguyoh J.N., Opiyo A.M. 2011. Fortified compost manure improves yield and Growth of African nightshades. *Int. J. Sci. Nat.* 2: 231-237.

[13] Okunomo, K., Oghenerhoro, E.O., Ojeifo, I.M. 2004. Effect of soil type on germination and seedling growth of *Dacryodes edulis* (Don. G. Lam H.J.). *J. Sustain. Trop. Agric. Res* 12: 46-50.

[14] Okunomo K., Ogisi D.O., Bosah B.O. 2009. Effect of growth media on germination and seedling growth of *Persea americana* (Mill.), *J. Food Agric. Env.* 7(1): 111-113.

[15] Peter-Onoh C.A., Obiefuna J.C., Ngwuta A.A., Onoh P.A., Ibeawuchi I.I., Ekwugha E.U., Emma-Okafor, L. C., Nze, E. O., Orji, J. O. and Onyeji, E.C. 2014. Efficacy of Five Different Growth Media on Seedling Emergence and Juvenile Phenology of *Monodora myristica* (African nutmeg, *Ehuru*) in the Nursery. *IOSR J. Agric. Vet. Sci.* 7(5): 60-63.

[16] Riaz A., Arshad M., Younis A., Raza A., Hameed M. 2008. Effects of Different Growing Media on Growth and Flowering of *Zinnia elegans* cv. Blue Point. *Pak. J. Bot.* 40(4): 1579-1585.

[17] Riffat A., Noreen F., Misbah R., Khalid M.Q., Ishfaq A., Khalid S.K. Atif K. 2011. Influence of different growth media on the fruit quality and reproductive growth parameters of strawberry (*Fragaria ananassa*). *J. Med. Plants Res*. 26: 6224-6232.

[18] Saeed I.M., Abbasi R. and Kazim M. 2001. Response of maize (*Zea mays*) to nitrogen and phosphorus fertilization under agro-climatic condition of Rawalokol, Azad Jammu and Kaslim and Kashmir, *Pak. J. Bio. Sci.* 4: 949-952.

[19] Saxena M.C., Singh Y. 1965. A note on leaf area estimation of intact maize leaves. *Indian J. Agron.* 10: 437-439.

[20] Vaughn S.F., Deppe N.A., Palmquist, D.E., Berhow M.A. 2011. Extracted sweet corn tassels as renewable alternative to peat in greenhouse substrates. *Ind. Crop Prod.* 33(3): 514-517.