

Suitability of Different Rooting Media and Length of Cuttings on Growth and Yield Performance of Mint (*Mentha* spp.)

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Abstract: Mint (*Mentha* spp) is an aromatic perennial herb. It belongs to the family Lamiaceae due to the specific aroma which is popular in world. It's not cultivated commercially in Northern part of Sri Lanka. The present experiment was conducted to evaluate the suitability of different rooting media and cutting lengths on growth and yield performance of Mint (*Mentha* spp) at Department of Agronomy, Faculty of Agriculture, Ariviyal Nagar, Kilinochchi during January to March 2019. Two factor factorial experiment was carried out in Complete Randomized Design (CRD) with five replicates, where factor one was rooting media and factor two was cutting length. Six potting media (cattle manure, compost, coir dust, partially burnt paddy husk, goat manure and top soil) and four length of cuttings (6 cm, 9 cm, 12 cm, and 15 cm) were used as treatment combinations. Weather, growth and yield parameters and chemical properties were recorded and data were analyzed in ANOVA using SAS 9.1 package. The means were compared by using Duncan Multiple Range Test. Management practices were performed according to the farmer practices. Growth parameters such as plant height, number of leaves, leaf area, branch number, root length and shoot length, yield parameters such as fresh weight of shoot, fresh weight of root and number of stolon) and chlorophyll content of the leaves were significantly different among rooting media and cutting length. The highest plant height, leaf area, length of shoot, fresh weight of shoot and number of stolon were recorded in the media contain goat manure. Number of leaves, number of branches, root length, fresh weight of root and chlorophyll content were highest in compost containing media. Compost and goat manure containing media showed best performance and gave the highest yield. Among these two media, goat manures gave more yield than compost containing media. Fifteen centimeter length of cutting showed the best performance and gave the highest yield. According to the results, it can be concluded, that 15 cm cutting planted in goat manure containing media is best for mint growth and yield in pots.

Keywords: Lamiaceae, Length of cutting, Mint, Parameters, Rooting media

Introduction

Mint is an aromatic perennial herb and scientifically known as *Mentha*. The genus *Mentha* comprise 25 - 30 different species and known for its antimicrobial, antiviral and insecticidal activity (Karicheri and Antony, 2016). *Mentha* (Mint) belongs to Lamiaceae (Labiatae) family and the order of Lamiales. It shows erect habit with short, branched, square stem and creeping rhizomes and produce long thin rhizomes commonly called as stolon and grow up to 60 to 100 cm in height.

Mint is an important leafy vegetable used in very small quantities for their distinct aroma due to the presence of essential oil and their ability to enhance the digestion. Essential oil of mint are extensively in toiletry, food and pharmaceutical industries due to its aromatic, stimulant and carminative nature. Its leaves are widely used for oil extraction, flavoring soups, sauces, beverages and in chutneys and for ayurvedic and unani medicines. It is small perennial herb a being grown as garden herb and cultivated extensively for food seasoning and household remedy. Mint is a shallow rooted plant and requires loose textured soil for easy penetration. It grows well in full sun light to partial shade and prefers well moist soil for its growth and development

Good container management and media composition are basic concept for the sufficient and quality yield. Good

growing medium structure must be soft and porous enough for easy root penetration into medium and it able to provide nutrition, anchorage and support for the plant (Utobo *et al.*, 2015). Different raw materials used for prepare the growing medium to achieve the correct balance of air and water holding capacity for plants to well growth and long term stability of medium (Bilderback *et al.*, 2005). There is a need to select good growing medium rather than soil due to its infective nature (Egunjobi and Ekundare, 1981).

Many techniques are introduced to farmers with the aim of increasing production while considering suitable rooting media. In Sri Lanka, there are several studies conducted regarding mint propagation but very few is related to selection of media and size of the cuttings. None of the study was done in Northern part of Sri Lanka. By considering this gap, this present study was conducted to evaluate the effect of different rooting media and cuttings lengths on growth and yield performance of mint. The specified objective are,

- 1) To find the suitable medium for mint growing and its multiplication.
- 2) To identify the suitable length of mint cutting for yield optimization.

Material and Methods

The experiment was carried out at Faculty of Agriculture, Ariviyal Nagar, Kilinochchi during the period of January to May 2019 to evaluate the suitability of

different media and length of cuttings on growth and yield of mint (*Mentha* spp) in two factor factorial complete randomized design (CRD) with five replicates. In this experiment six rooting media and four

length of cuttings were used as treatment combinations (Table 1). The rooting media was mixed in 1:1 ratio. According to the Rajeswara rao *et al.*, 2001, the 9 cm cutting was used as control.

Table 1: Treatment Combinations of Different Rooting Media and Length of Cuttings

Treatments	6 cm(L ₁)	9 cm(L ₂)	12 cm(L ₃)	15 cm(L ₄)
Cattle manure + Top soil (M ₁)	M ₁ L ₁	M ₁ L ₂	M ₁ L ₃	M ₁ L ₄
Compost + Top soil (M ₂)	M ₂ L ₁	M ₂ L ₂	M ₂ L ₃	M ₂ L ₄
Coir dust+ Top soil (M ₃)	M ₃ L ₁	M ₃ L ₂	M ₃ L ₃	M ₃ L ₄
Partially burnt paddy husk+Top soil (M ₄)	M ₄ L ₁	M ₄ L ₂	M ₄ L ₃	M ₄ L ₄
Goat manure + Top soil (M ₅)	M ₅ L ₁	M ₅ L ₂	M ₅ L ₃	M ₅ L ₄
Top soil (M ₆)	M ₆ L ₁	M ₆ L ₂	M ₆ L ₃	M ₆ L ₄

Good quality planting materials were selected from Cargill's mint suppliers. The good quality reverse osmosis (RO) water was used for rooting for 7 days. Cattle manure, compost, coir dust, partially burnt paddy husk, goat manure was used for preparation with top soil in 1:1 ratio and treated with fungicide. Then

media were cover by black polythene and incubated for 7 days. After 7 days pots were filled with media .Two cuttings were planted in each pot with the spacing of 10 cm. 50 % shade was provided to the plants. Pots were arranged in the spacing of 30 cm × 30 cm (Plate 1).



Plate1: Arrangement of Pots

Management practices were performed according to the farmer practices. Harvesting was done 60 days after planting in the pots, when the leaves reached proper maturity. Growth parameters such as plant height, number of branches per plant, leaf area, shoot and root length, yield parameters such as fresh weight of shoot and root, and quality parameter, chlorophyll content (SPAD value) were measured in the experiment. The ANOVA was performed by using the SAS 9.1 computer software package. Mean separation was done using Duncan's Multiple Range Test at $p=0.05$ level.

Results and Discussion

Growth Parameters

Plant Height

There is an interaction effect between rooting media and length of cuttings on plant height. Plant height was significantly differed between the rooting media and length of cutting (Figure 1). The highest height of 42.88 cm was recorded in 15 cm length of cutting (L_4) planted in the goat manure containing medium (M_5) and the lowest height of 17.26 cm was recorded in 6 cm length of cutting (L_1) planted in coir dust containing medium (M_3) on 8th week after planting.

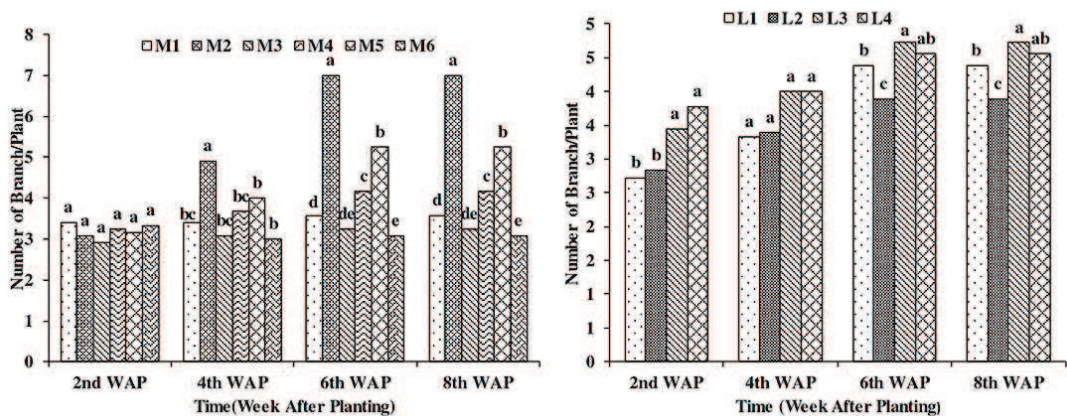


Figure 1: Average plant height of mint in different rooting media and length of cutting at two weeks interval. Means with the same letter within a given treatments are not significantly different at $p=0.05$.

Among the treatment combinations, 15 cm length of cutting (L_4) planted in the goat manure containing medium (M_5) was the best. Growth and yield parameters of amaranthus such as plant height, number of leaves, stem girth, marketable yield increased with level of goat manure

(Akanni and Ojeniyi, 2008). Kaymak *et al.*, (2008) stated 15 and 20 cm cuttings showed better performance than the other treatments in mint.

Number of Leaves

The interaction between rooting media and length of cuttings on number of

leaves was significant (Figure 2). The maximum leaves number (238) was obtained in 15 cm length of cutting (L_4) planted in the compost containing media (M_2) and minimum (14) was obtained in 6 cm length of cutting (L_1) planted in coir dust containing media (M_3) on the 8th week

after planting. Among the treatment combinations, 15cm length of cutting (L_4) planted in the compost containing media (M_2) was the best. Sanni, (2016) reported plant height, stem girth, number of leaves and leaf length were high in application of compost to *A.hybridus*.

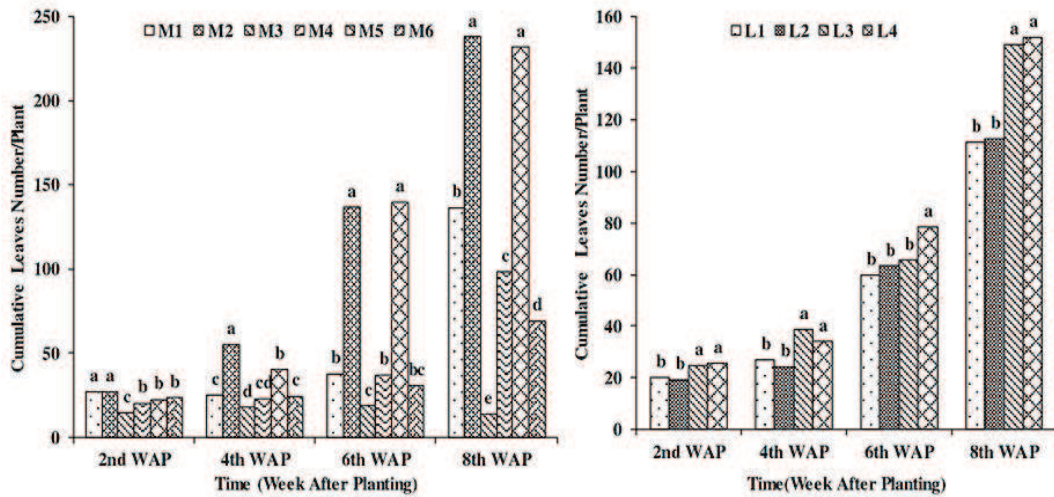


Figure 2: Effect of different rooting media & length of cutting on leaf number at weekly interval. Means with the same letter within a given treatments are not significantly different at $p=0.05$

Number of Branches

There was an interaction effect between rooting media and length of cuttings on number of branches (Figure 3). Among the treatment combinations, 12cm length of cutting (L_3) planted in the compost containing medium (M_2) was the best. Compare the rooting media and length of cutting the highest number of branches (7) was recorded in 12 cm length of

cutting (L_3) planted in the compost containing media (M_2) and lowest (3) was recorded in 9cm length of cutting (L_2) planted in the coir dust containing media (M_3) on 8th week after planting. Dada *et al*, (2017) stated application of compost to nutrient deficient soil promoted growth, fresh shoot, and dry matter yield of *A.cruentus*.

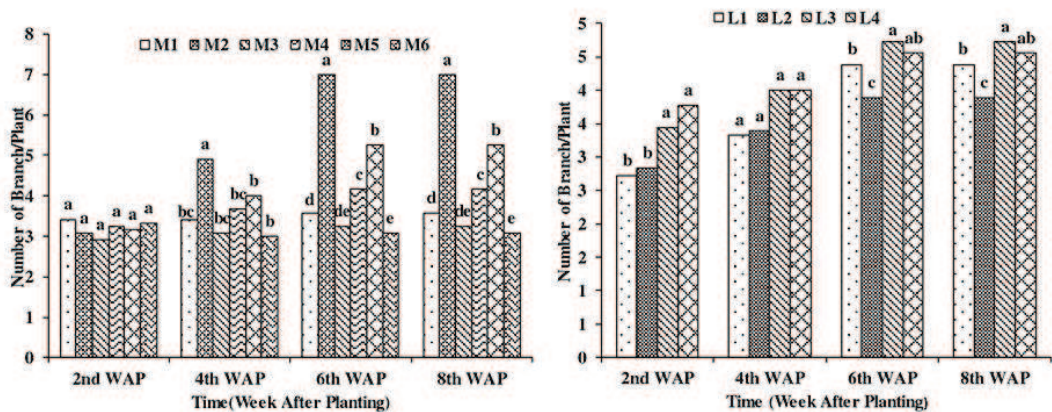


Figure 3: Effect of different rooting media & length of cutting on branch number of mint at biweekly interval. Means with the same letter within a given treatments are not significantly different at $p=0.05$

Leaf Area

There is an interaction effect between rooting media and length of cuttings on leaf area. Compare the rooting media and length of cutting the highest leaf area (18.87 cm^2) was recorded in 15 cm length of cutting (L_4) planted in the goat manure containing media (M_5) and lowest (3 cm^2) was recorded in 9cm length of cutting (L_2) planted in the coir dust containing media (M_3) on 8th week after planting. Among the treatment combinations, 15cm length of cutting planted (L_4) in the goat manure containing media (M_5) was the best. Odiete *et al.* (1999) had found similar result goat manure significantly improved growth and yield of okra, Amaranthus, celosia and maize in south west Nigeria.

Length of Root

There was an interaction effect between rooting media and length of cuttings on

root length. Compare the rooting media and length of cutting, the maximum length of 31.18 cm was recorded in 9 cm length of cutting (L_2) planted in the compost containing media (M_2) and lowest length of 15.55 cm was recorded in 12 cm length of cutting (L_3) planted in the coir dust containing media (M_3).

Length of Shoot

There was an interaction effect between rooting media and length of cuttings on shoot length. There was significant difference among the media. Compare the rooting media, the maximum shoot length (46.75 cm) was recorded in 15 cm length of cutting (L_4) planted in the goat manure containing medium (M_5) and lowest (14.75 cm) was recorded in 6 cm length of cutting (L_1) planted in the coir dust containing medium (M_3).

In the study of Leif Marvin *et al.* (2015) revealed used of goat manure as raw material for compost was greatly influenced on fresh weight of leafy

vegetable. According to the study of Awodun *et al.* (2007) that, goat manure was quite high in organic matter and had more N than K, Ca and Mg.

Fresh Weight of Shoot

There is an interaction effect between rooting media and length of cuttings(Figure 4).

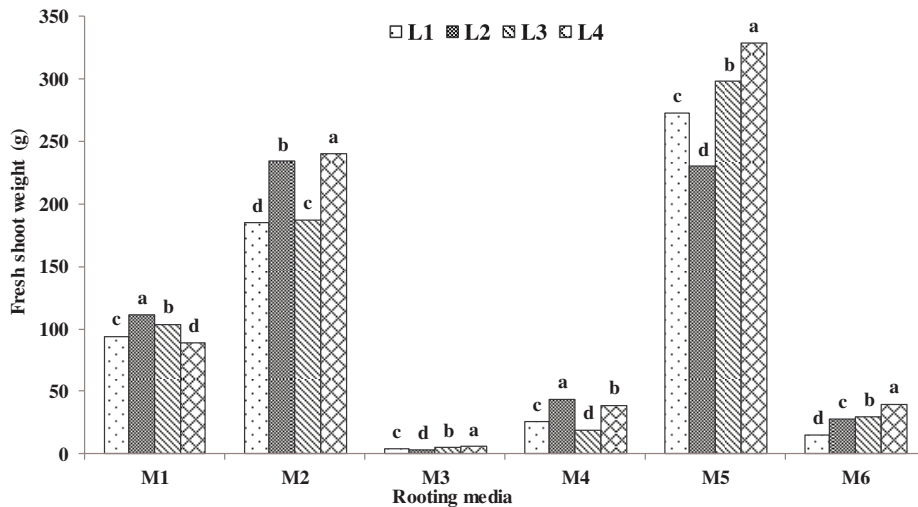


Figure 4: Effect of different rooting media on fresh weight of shoot for different length of cuttings. Means with the same letter within a given treatments are not significantly different at $p=0.05$

Compare the rooting media and length of cuttings, the highest fresh weight of shoot (286.42 g) was recorded in 15 cm length of cutting (L_4) planted in the goat manure containing medium (M_5) and lowest (6.17 g) was recorded in 6 cm length of cutting (L_3) planted in the coir dust containing medium (M_3). Among the treatment combinations, 15 cm length of cutting (L_4) planted in the goat manure (M_5) containing medium was the best. Seiso and Materechera (2012) stated both cattle manure and goat manure improve growth and biomass yield of African indigenous

leafy vegetables but the effect of goat manure was superior to that of cattle manure. Kaymak *et al.* (2008) reported 15 and 20 cm cuttings were showed better performance in mint growth.

Fresh Weight of Root

There is an interaction effect between rooting media and length of cutting in fresh weight of root(Figure 5). Compare the rooting media and length of cutting, the highest fresh weight of root (97.33 g) was recorded in 15 cm length of cutting (L_4) planted in compost containing

medium (M₂) and lowest (1.75 g) was recorded in 6cm length of cutting (L₁) planted in the coir dust containing

medium (M₃). Among the treatment combinations, 15cm length of cutting planted in the compost containing media was the

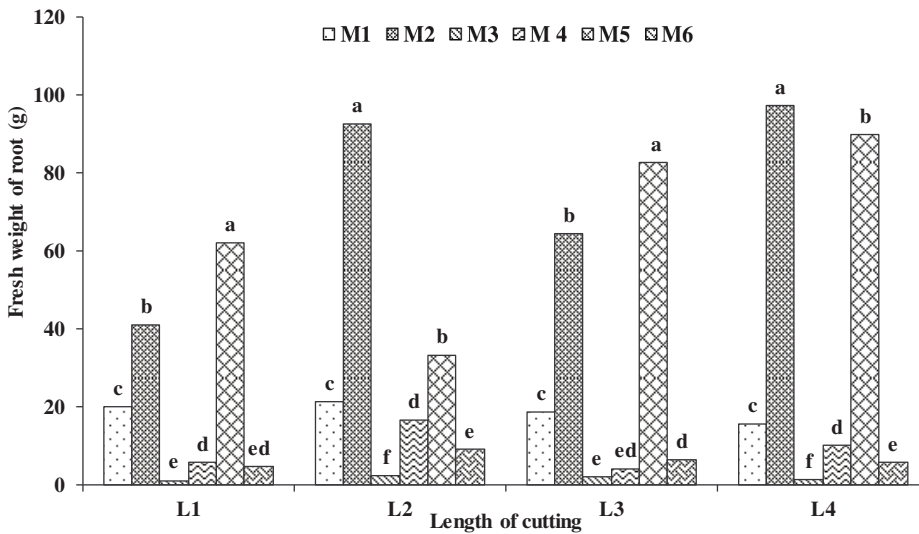


Figure 5: Effect of different length of cutting on fresh weight of root. Means with the same letter within a given treatments are not significantly different at $p=0.05$.

Number of Stolon

There is an interaction effect between rooting media and length of cuttings in number of stolon (Figure 6). Compare the rooting media and length of cutting the highest number of stolon (5) was

recorded in 9 cm length of cutting (L₂) planted in goat manure containing media (M₅) and lowest (1.16) was recorded in 12 cm length of cutting (L₃) planted in the coir dust containing media (M₃).

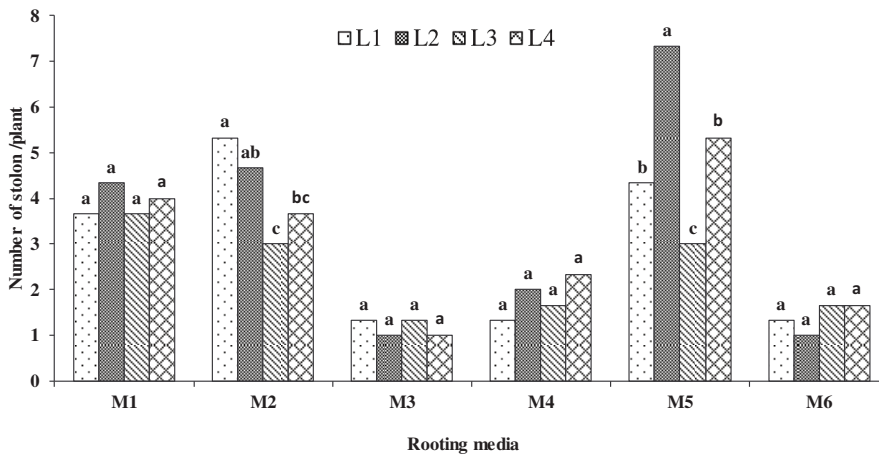


Figure 6: Effect of different rooting media on number of stolons. Means with the same letter within a given treatments are not significantly different at $p=0.05$

Quality Parameter

Chlorophyll Content

It was significantly differed between the rooting media. Compare the rooting media, the highest chlorophyll content (42.5 SPAD value) was recorded in compost containing medium (M₂). The highest chlorophyll content (37.16 SPAD value) was recorded in 15 cm length of cutting (L₄) on 7th week after planting. Among the treatment combinations, 15cm length of cutting planted in the compost containing media was the best. Akhtar *et al.* (2010) had reported linear relationship between quality of constituents of compost and vegetative development and nutrient uptake in lettuce and *Amaranthus*. Similarly, superior chlorophyll content recorded in compost suggests abundance synthesis by the leaves and other tissue resulting from nutrient supply and other precursors of chlorophyll.

Conclusions

Growth and yield performance of mint grown in pots were affected by the composition of rooting media and length of cuttings. It can be concluded that 15 cm length of cutting planted in the goat manure containing medium could be recommended as suitable length of cuttings and medium for obtaining quality and high yield in mint.

Suggestions

Carry out the research with the length of cutting should be more than 15 cm. Future

research can be conduct in alternative media.

References

- Akanni, D.I. and Ojeniyi, S.O. 2008. Residual Effect of Goat and Poultry Manures on Soil Properties Nutrient Content and Yield of *Amaranthus* in Southwest Nigeria. *Research Journal of Agronomy*. 2 (2):44-47.
- Akhtar, J.M., Young, I., Irvine, R.J. and Sturrock, C. 2010 Assessing nitrogen supply potential and influence on growth of lettuce and amaranthus of different aged composts. *Pak. J. Bot* 42(1):527–536
- Awodun, M.A., Omonijo, L.I. and Ojeniyi, S.O. 2007. Effect of Goat Dung and NPK Fertilizer on Soil and Leaf Nutrient Content, Growth and Yield of Pepper. *International Journal of Soil Science*, 2: 142-147.
- Bilderback, T.E., Warren, S.L., Owen, J.J.S. and Albano, J.P. 2005. Healthy substrates need physicals too. *Hort Technology*. 15: 747-751.
- Dada, O. A., Imade, F. and Anifowose, E. M. 2017. Growth and proximate composition of *Amaranthus cruentus* L. on poor soil amended with compost and arbuscular mycorrhiza fungi, *International Journal of Recycling of Organic Waste in Agriculture*. Springer Berlin Heidelberg, 6(3) : 195–202.

- Egunjobi, O.A. and Ekundare, O.O. 1981. The cassava peeling as a soil amendment and its effects on maize yield in soil infested with *Pratylenchus bractyams*. Nig J Plant Prod 5 : 80-87.
- Karicheri, R. and Antony, B. 2016. Antibacterial and Antibiofilm Activities of Peppermint (*Mentha piperita* Linn) and Menthol Mint (*Mentha arvensis* Linn) Essential Oils on Aggregatibacter Actinomycetemcomitans Isolated From Orodonal Infections, European Journal of pharmaceutical and Medical Reasearch, 3 (7), pp. 37.
- Karicheri, R. and Antony, B. 2016. Antibacterial and Antibiofilm Activities of Peppermint (*Mentha piperita* Linn) and Menthol Mint (*Mentha arvensis* Linn) Essential Oils on Aggregatibacter Actinomycetemcomitans Isolated From Orodonal Infections, European Journal of pharmaceutical and Medical Reasearch, 3(7), pp. 37.
- Kaymak, H.C., Yarali1, F., Guvenc, I. and Figen Donmez, M. 2008. The effect of inoculation with plant growth rhizobacteria (PGPR) on root formation of mint (*Mentha piperita* L.) cuttings African Journal of Biotechnology 7(24):4479-4483.
- Odieta, I., Ojeniyi, S.O., Akinola, O.M. and Achor, A.A. 1999. Effect of goat dung on soil chemical composition and yield components of okra, amaranthus and maize. Proceedings of the 25th Conference of Soil Science Society of Nigeria, November 21-25, 1999, Benin, pp: 174-184.
- Rajeswara Rao, B.R., Kaul, P.N., Syamasundar, K.V. and Ramesh, S. 2002. Water soluble fractions of rose-scented geranium (*Pelargonium* species) essential oil. Bioresource Technology 84: 243-246.
- Sanni, K.O. 2016. Effect of compost, cow dung and NPK 15-15-15 fertilizer on growth and yield performance of Amaranth (*Amaranthus hybridus*). International Journal of Advances in Scientific Research Volume 2(03):076-082.
- Seeiso, M.T. and Materechera, S.A. 2012. Yield Response of the African Indigenous Leafy Vegetable Cleome gynandra to applocation of Cattle and Goat Kraal Manure and Harvesting Techniques. J.Food Agric Environ, 10,789-794.