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Effects of Organic and Chemical Fertilizers on Growth of *Mentha Spicata* on Roof Top Garden Method.

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Abstract

The present study was conducted to determine the effect of organic and chemical fertilizers on growth of *Mentha spicata*. The study initiated with organic fertilizers such as Azospirillum, phosphor bacteria, vermicompost and farm yard manure. To compare organic on growth of mentha treatment consisted with chemical fertilizers (NPK). In terms of shoot length the result have shown the highest value in combined organic fertilizers (F+A+P, F+V+A) (31.0000e) Compared with other treatments. Likewise in all other parameters almost the highest values observed in (F+A+P, F+V+A). The Duncan multiple range test (DMRT) was used to compare treatment means at $p<0.05$. The promising combination was 100% of recommended organic in combined form produced the best response.

Keywords Organic manures, Biofertilizers, ANOVA, *Mentha spicata*,DMRT..

INTRODUCTION

Biofertilizers is a 100% natural organic material from the nutrient rich land of Costa-rica that could be easily applied with water over your plantations on any stages. A biofertilizers is a natural product carrying living micro organism derived from the root or cultivated soil. So they don't have any ill effect on soil health any environment. Besides their role in atmospheric N2 fixation and phosphorous solubilisation, these also help in stimulating the plant growth hormones providing better nutrient uptake and increased tolerance towards drought and moisture stress [1].

The nutrients amount in the growth environment of crops in one of the well-known aspects of agricultural research as well as in many industrial crops. Organic fertilizer is an effective agents for improving soil quality in the long term. In additional organic fertilizers from waste product reduce the cost for agricultural production [2].

Among the different agronomic practices nutrient management is one of the prime considerations for getting higher yield of any crop. In organic nitrogenous fertilizers are commonly used by most of the farmers because of quick availability of nitrogen to the plants. But their continuous use led to damage the ecosystem and soil health. Thus, there is a need to give emphasis on management of natural resources like bio fertilizers, etc.

There are many types of organic fertilizers such as manure compost, granular organic fertilizers. Vermicomposting is a simple biotechnological process of compositing, in which certain species of earth worms are used to enhance the process of waste conversion and produce a better end product. Vermicompost plays major role in improving growth and yield of different field crops, vegetables, flower, and fruit crops. The application of vermicompost gave higher germination (93%) of mung bean (vigna radiate) Compared to the control (84%) [3].

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The high cost of chemical fertilizers scare farmers and these fertilizers are no longer as readily available and economically feasible**.** Inorganic fertilizers are the most important sources of N adequate supply of N is associated with high photosynthetic activity, vigorous vegetative growth and a dark green color of the leaves [4]**.** Extensive use of inorganic fertilizer has a depressing effect on yield. This causes reduction in number of fruits, delays and reduces fruit setting, which subsequently delay ripening and leads to heavy vegetative growth [4,5]**.**NPK compound fertilizer to be applied before sowing, followed by application of nitrogenous fertilizer at 5 weeks at intervals up to flowering stage [6,7]**.** Organic matter also has been reported to acts as a reservoir of plant nutrients especially N, P, K and micronutrients and also prevents leaching of nutrients. Karim*et al.,* [8] reported that due to poor management and intensive manipulation of soils, organic matter content is getting reduced day by day. Farmyard manure has been used as a soil conditioner since ancient times and its benefit have not been fully harnessed due to large quantities required in order to satisfy the nutritional needs of crops [9]**.**

MATERIALS AND METHODS

Site Description

The experiment was conducted at PG &Research Dept. of Botany, Govt. Arts College, Dharmapuri-5, Tamilnadu.

Experimental Layout and Management

The experiment was established in December 2013 and laid out in cement tanks with 3 replications, where one level of chemical fertilizers treatment (T1), types of organic manures and control treatment. The shoot cuttings were raised in seed bed, convenient length. The shoot cuttings were shown with soil. The normal routine field management practices such as weeding, pest and disease control were carried out in this study. (Table -1)

The organic fertilizer types, and their control comprised the sub treatments; control (without addition of manure) Azospirillum (T2),Phosphobacteria (T3), Farmyard (T4),and Vermicompost (T5).

Data analysis

Analysis of variance (ANOVA) was done to determine the

Table.1: Treatment combinations of the chemical fertilizer and organic manures.

Treatments	T0	T1	T2	T3	T4	T5	T6	T7	T8
Treatment combination	Control	NPK	Azospirillum	Phosphobacteria	FYM	Vermicompost	F+V+P	F+V+A	V+A+P

FYM-Farmyard manure; F-Farmyard manure; V-Vermicompost; P-Phosphobacteria; A-Azospirillum

Table.2: Comparison means from different treatments from measured Menthaspicata - Root Breadth (cm)

Treatment		30th day	35th day	40th day	45th day	50th day	55th day	60th day	65th day	70th day	75th day	80th day
CONTROL	T0	.2667a	.5333a	.6000a	.6667a	.7000a	1.0000a	1.4000a,b	1.5000a,b	1.6667a	1.8333a	1.8667a,b
NPK	T1	.4667b	.6333a,b	.6667a	.7333a	.8333a	1.1667a,b	1.3000a	1.4333a	1.7000a	1.7000a	1.7667a
AZOS	T2	.5333b,c,d	.6667b,c	.6333a	.7333a	.8000a	1.2333b,c	1.4333a,b	1.5333a,b	1.8000a	1.7667a	1.9333a,b,c
PHOSPHO	T3	.5667b,c,d	.6667b,c	.7333a,b	.8000a,b	.8000a	1.2000b,c	1.4667a,b	1.5667a,b	1.7667a	1.7000a	1.7667a
FYM	T4	.6000b,c,d	.6667b,c	.9333b,c	.9667b,c	1.1667b	1.2333b,c	1.5667b	1.6333b	1.8333a	1.8000a	2.0333b,c,d
VERMI	T5	.5000a,b	.7333b,c	1.0333c	.9667c	1.1000b	1.4000c	1.4667a,b	1.5333a,b	1.7667a	1.8667a	2.1333d
F+V+P	T6	.6000b,c,d	.6333a,b	.7000a1	.0667c	1.1333b	1.4000c	1.4333a,b	1.5667a,b	1.8000a	1.8333a	2.0000b,c,d
F+V+A	T7	.6333c,d	.7000b,c	1.0333c1	.0000c	1.1000b	1.2000b,c	1.5000b	1.6000a,b	1.8333a	1.8667a	2.1667a
V+A+P	T8	.6667d	.7667c	1.0000c	1.0333c	1.1667b	1.2667b,c	1.5667b	1.6333b	1.7333a	1.8667a	2.0667c,d

Table.3: Comparison means from different treatments from measured Menthaspicata - Root length (cm)

Treatment		30th day	35th day	40th day	45th day	50th day	55th day	60th day	65th day	70th day	75th day	80th day
CONTROL	T0	.8667a	1.4000a	2.0333a	2.4000a	3.5667a	4.3667a	4.7667a	5.3333a	5.2333a	5.7667a	5.6333a
NPK	T1	.8333a	1.4667a	2.1667a,b	2.6333a	4.2000b	5.3667b	5.7000b	6.3333b	6.5333b	6.8333b	7.0333b
AZOS	T2	.8667b	1.4000a	2.3667b,c	3.6333b	5.2000c	5.7667c	6.1667b,c	6.8333c	7.2667c	7.5000c	7.6667c
PHOSPHO	T3	1.2333b	1.5000a	2.5333c	3.6333b	5.2000c	6.1000d	6.6667c,d	7.0000c,d	7.2667c	7.6000c	7.6667c
FYM	T4	1.4000b,c	1.1667c,d	3.1667e	5.1333c	6.2667e	6.7000e	6.6333c,d	7.2667c,d	7.7000d	7.7333c,d	7.7667c,d
VERMI	T5	1.4667c	2.3000d	3.2333e	5.1667c	5.6333d	6.6667e	7.0000d	7.0667c,d	7.3333c	7.5667c	7.9667d
F+V+P	T6	1.3333b,c	2.1333b,c,d	3.0000d,e	3.7333b	5.2333c	6.7667e	7.0000d	7.2333c,d	7.7333d	8.1000d,e	8.4000e
F+V+A	T7	1.3333b,c	1.9000b	2.8000d	3.73333b	5.2333c	6.4667e	6.8667d	7.2000c,d	7.9000d	8.2000e	8.3667e
V+A+P	T8	1.3667c	2.0333b,c	3.0333d,e	3.7000b	5.1000c	6.5000e	7.2000d	7.4000d	7.7333d	8.2333e	8.4667e

Table.4: Comparison means from different treatments from measured Menthaspicata - Root weight (cm)

Treatment		30th day	35th day	40th day	45th day	50th day	55th day	60th day	65th day	70th day	75th day	80th day
CONTROL	T0	.0400a	.0533a	.0767a	.1100a	.1333a	.1567a	.1800a	.2367a	.2667a	.3200a,b	.3433a
NPK	T1	.0567b	.0633a,b	.0833a	.1100a	.1400a	.1600a	.1867a	.2233a	.2767a,b	.3100a	.3567a
AZOS	T2	.0600b,c,	.0733b,c	.1000b	.1167a,b	.1433a	.1667a	.1967a	.2467a,b	.2800a,b	.3400b,c	.3567a
PHOSPHO	T3	.0733c,d	.0867c,d	.1267c	.1433b,c,d	.1700b	.2200b,c	.2600b,c	.2767b,c	.3000b	.3600c	.3633a
FYM	T4	.0800d	.0967d	.1300c	.1500c,d	.1867b	.2400c,d	.2667b,c	.3400d,e	.4000d	.4467d,e	.4767b
VERMI	T5	.0767d	.1100e,f	.1533d	.1633d	.1833b	.2433d	.2567b	.3067c,d	.3500c	.4333d	.4800b
F+V+P	T6	.0733c,d	.1133f	.1333c	.1500d	.1700b	.2100b	.2600b,c	.3067c,d	.3567c	.4700e	.5100c
F+V+A	T7	.0767d	.0900d	.1100c	.1300a,b,c	.1767b	.2433d	.2600b,c	.3000c	.3467c	.4467d,e	.4767b
V+A+P	T8	.0733c,d	.1000d,e,f	.1233c	.1233a,b,c	.1733b	.2567d	.2800c	.3433e	.4000d	.4433d,e	.5100c

Table.5: Comparison means from different treatments from measured Menthaspicata - shoot breadth(cm)

Treatment		30th day	35th day	40th day	45th day	50th day	55th day	60th day	65th day	70th day	75th day	80th day
CONTROL	T0	.4000a	.3667a	.4333a	.4667a	.4667a	.5667a	.7333a	.8667a,b	1.0333a	1.0667a	1.1667a
NPK	T1	.4000a	.3333a	.4333a	.3000a	.5000a	.6000a	.7667a,b	.8000a	1.0333a	1.2000a,b	1.2333a,b
AZOS	T2	.3333a	.3333a	.4000a	.4000a	.4667a	.6000a	.7667a,b	.8333a	1.0667a	1.3000,b,c	1.5333d
PHOSPHO	T3	.3333a	.3333a	.4000a	.3667a	.5000a	.6667a	.8000a,b	.8667a,b	1.1667a	1.2667b,c	1.3333b,c
FYM	T4	.4000a	.3667a	.3333a	.2667a	.4667a	.5667a	.8667b	.9333a,b	1.1667a	1.4000c	1.4333c,d
VERMI	T5	.3667a	.3333a	.3333a	.3667a	.4667a	.6667a	.8333a,b	1.0000b	1.1667a	1.3000b,c	1.4000c,d
F+V+P	T6	.3667a	.3667a.	.3333a	.3333a	.4333a	.6000a	.8333a,b	.9333a,b	1.2000a	1.4000c	1.5667c,d
F+V+A	T7	.3000a	.3667a	.3667a	.4000a	.4333a	.6333a	.7667a,b	.9000a,b	1.1333a	1.3667b,c	1.5667d
V+A+P	T8	.3667a	.3667a	.3667a	.3000a	.5333a	.6667a	.7667a,b	.8667a,b	1.2333a	1.4000c	1.5667d

Table.6: Comparison means from different treatments from measured Menthaspicata - shoot length(cm)

Treatment		30th day	35th day	40th day	45th day	50th day	55th day	60th day	65th day	70th day	75th day	80th day
CONTROL	T0	2.8667a	3.2667a	5.7333a	7.9333a	8.0333a	11.2667b	12.2667b	14.1333a	17.0000a	19.3333a	23.0000a
NPK	T1	7.0000d	7.3333d	8.6667c	11.0000b	11.2333c	11.2000b	12.2667b	14.7000a	18.7000a,b	18.9667a	23.6667a
AZOS	T2	3.8667b	5.1667b	6.1000a	8.0667a	9.0333b	10.2333a	10.8667a	141667a	18.3333a,b	20.0000a	25.0000c
PHOSPHO	T3	4.9333c	6.1333c	8.0333b	8.5333b	9.5000b	12.1000c	12.8000b	14.0000a	18.8667a,b	17.5000a	22.6667a
FYM	T4	10.6333f	10.6667f	10.7667d,e	11.3333b,c	12.0667d	14.2667d	16.4667c	18.5000b	18.1667a,b	19.6667a	27.6667d
VERMI	T5	10.3667f	10.6333f	11.1667e	12.1000d	13.6667f	15.1667e	16.7333c	20.3000c	201333b,c	24.3333b	25.6667b
F+V+P	T6	8.3333e	9.2667e	10.5333d	11.9333c,d	13.0333e	16.2667f	17.1667c	21.8333d	24.0000d	29.0000c	31.0000e
F+V+A	T7	10.3000f	10.6000f	12.3000f	13.8667e	15.1667g	17.7333g	19.1000d	25.0000f	24.0000d	30.6667c	31.0000e
V+A+P	T8	8.3667e	10.3000f	12.1333f	14.2000e	15.3667g	18.3333g	19.8333e	23.6667e	22.0000c,d	26.5000b,c	27.4000c

Table.7: Comparison means from different treatments from measured Menthaspicata - shoot weight (cm)

Treatment		30th day	35th day	40th day	45th day	50th day	55th day	60th day	65th day	70th day	75th day	80th day
CONTROL	T0	.0633a	.0800a	.1100a,b	.2133a	.2800a	.3733a	.4933a,b	.4700a	.4867a	.5400a	.5600a
NPK	T1	.0733a,b	.0800a	.1200a,b	.2633b	.3767b	.4300b	.5367a,b	.5400b	.5967b	.6233b	.6600b
AZOS	T2	.0800a,b	.8667a	.0967a	.2733b	.4100c	.4400b	.5300a,b	.55700c	.6567c	.6900c	.7100c
PHOSPHO	T3	.0933c	.1100a,b,c	.1400a,b,c	.3033c,d	.4200c	.4767b	.5267a,b	.5500a,b	.5967b	.6767c	.7367c
FYM	T4	.1500e	.1467c	.1800c.	.3233d,e	.4433d	.6800d	.7500b	.7800d	.8067d	.8167d	.8467d
VERMI	T5	.1167d	.1433b,c	.1567b,c	.3300e	.4633e	.6833d	.7600b	.7667d	.8067d	.8433d,e	.8733d,e
F+V+P	T6	.1200d	.1333a	.1500a,b,c	.3200d,e	.4700e	.6600c,d	.4667a	.7767d	.8267d	.8767e,f	.8567d
F+V+A	T7	.1100d	.0833a	.1600b,c	.2967c	.4300c,d	.6433c,d	.7033a,b	.7833d	.8367d	.8700e,f	.8933e,f
V+A+P	T8	.1233d	.1267a,b,c	.1500a,b,c	.3233d,e	.4300c,d	.6133c	.6533a,b	.7667d	.7367d	.8900f	.9167f

treatment differences in growth parameters. Using SPSS package. The Duncan Multiple range test (DMRT) was used to compare treatment means at $P<0.05$. [10].

Irrigation

The selected fertilizers were spread on the field area and allowed to irrigation, so that the fertilizer can be thoroughly mixed with the soil .The growth of the plant treated with fertilizers and untreated was monitored by measuring length and weight of the shoot and root at regular intervals (5 days).

RESULTS AND DISCUSSION

The following growth parameters such as shoot length, shoot breadth, shoot weight, root length, root breadth, and root weight were observed. There was a highly significant interaction between the rate of inorganic fertilizers and the organic manures on the shoot lengths (Table-6).

At 80th day the highest value was observed in F+V+A (31.0000e). At DMRT, ($P<0.05$). The similar trend was observed with shoot breadth T8) 1.5667d, shoot weight (T8) .9167f,shoot length(T7)31.0000e. In Root length the highest value was observed in T8 (8.4667e), In root breadth 2.1667a (T7), Root weight .5100c in T8 were also observed (Table-3-7).

The combination of different organic manures (T6, T7 and T8) resulted in mean plant height, weight, higher than the control (Tc), and chemical fertilizers.

This could be attributed to the fact that the nutrients in the organic manure are released gradually through the process of mineralization [11] maintaining optimal soil levels over prolonged periods of time. Some of the organic substances released during the mineralization may act as chelates that help in the absorption of iron and other micronutrients [12].

Organic fertilizers improve soil water holding capacity as well as the CEC and nutrients are released slowly to crop plants. Organic inputs have a number of effects on nutrients, availability. They added new organic matter to the soil and contribute to the maintenance of physical fertility, and result in better soil moisture status.

Mentha spicata are used widely through out the world as an important medicinal plant. Their oils are one of the most popular and widely used essential oils, mostly because of its components such as menthol and carvone [13]. In the present work the plant Mentha spicata was exposed to the different organic and chemical fertilizers in the soil. The DMRT was used to compare treatment means at $P<0.05$, from the above results it is evident that the organic manures are highly effective than chemical fertilizers.

In general all organic fertilizers were sufficient to encourage the capability of plants to produce high total yield and enhanced the leaf characters as compared to plants treated with inorganic fertilizers alone. The most favorable treatment combination was (F+A+P, F+V+A,V+A+P) compared with the other treatments. The superiority of the treatment may be due to increased uptake of N and P which resulted in increased plant weight due to increased number of and branches.

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REFERENCES

[1]Mohamed SB, Rania M Nassar A, Ahmed FA (2012) Response of sesame plant (seasmum orientale L.) to treatments with mineral and bio-fertilizers. Research Journal of agriculture and Biological sciences .8(2):127-137.

[2]Halvin JL, Beaton LD, Tisdale SL, Nelson WL(2005). Soil fertility and fertilizers: an introduction to nutrient management. Pearson Prentice Hall.New Jersey.515p.

[3]Gandhi M, sanwan V, Kapoor KK, Dhilbaghi N (1997) Composting of house hold wastes with and without earthwarms. Environment and ecology 15(2):432-434.

[4]John LW, Jamer DB, Samuel LT, Warner LW(2004). Soil fertility and fertilizers ,Pp:106-53.

[5]Aliyu L, Karikari SK, Ahmed MK (1992).Yield and yield components of egg plant as affected by data of trans planting ,intra-row spacing and nitrogen fertilization .J.Agric .Sci technol ., 2:7-12.

[6]Rice RP, Rice LW, Tindal HD (1986).Fruit and vegetables, production in Africa, Pp:221-2.

[7]Schipper RR(2000). African indigenous vegetables-An overview of the cultivated species. Chatham, UK:NRI /CAT.231.

[8]Karim Z, Miah MMU, Razia S(1994).Fertilizer in the national economy and sustainable environmental development .Asia pac.J.Environ.Dev.,2: 48-67.

[9]Makinde EA, Ayoda OT, Akande M (2007).Effects of nitrogen –mineral fertilizers application on the growth and yield of egusi melon. Australian J. Basic Apply Sci.,1:15-19.

[10]Suge JK, Omuyin ME, Omani EN(2011) Effect of organic and inorganic sourses of fertilizer on growth, yield and fruit quality of eggplant (Solanummelongiana L.)Archives of applied science research 3(6):470-479.

[11]Bationo A, Nandwa, Kinyangi JM, Bado BV, Lompo F, Kimani S, Kihanda F, Koala S (2004). Sustainable intensification of crop-livestock system through manure management in eastern and western Africa: Lessons learned and emerging research opportunities, p. 173-198.

[12]Schlecht E, Buerkert A, Tielkes E, Bationo A (2006). Nutrient cyc. Agroecosyst.76 (2-3): 109-136.

[13]Suleyman KIZIL (2010) mineral content, essential oil components and biological activity of two Mentha species.Turkish journal of field crops, 15(2):148-153

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