



ISSN (E): 2320-3862
ISSN (P): 2394-0530
NAAS Rating 2017: 3.53
JMPS 2017; 5(3): 284-287
© 2017 JMPS
Received: 21-03-2017
Accepted: 22-04-2017

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Journal of Medicinal Plants Studies

www.PlantsJournal.com

Influence of vermicompost with FYM and soil on propagation of marjoram (*Majorana hortensis* L.) and oregano (*Origanum vulgare*) with green cuttings

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Abstract

Vegetative propagation of medicinal and aromatic herbs with green cutting is mainly used because of seed low germination percentage and duration of such reproduction. The aim of the investigation was to determine the effect of vermicompost with FYM and soil on marjoram (*Majorana hortensis* L.) and oregano (*Origanum vulgare*) green cutting. The investigation was conducted in the green house of Central Institute of Medicinal and Aromatic Plants Research Centre, Purara, Bageshwar (Uttarakhand), India during March till May of 2015. The experiment consisted of two variants. Vermicompost, FYM and soil (1:1:1) are used as a growing media in treatment (A2) and soil was used as control (A1). Morphological properties such as, number of leaves, plant height, root length, fresh and dry weight of plants were recorded. The treatment with vermicompost: FYM: soil (1:1:1) resulted in significantly higher values of all morphological parameters tested. Therefore, it is highly recommendable as growing media for successful production of marjoram and oregano cutting.

Keywords: Propagation, vermicompost, FYM, soil, *Majorana majorana* L., *Origanum vulgare*

Introduction

Use of natural medicinal and aromatic plants is increasing rapidly and getting more importance each day. By the World Health Organization (WHO), it is estimated that approximately 80% of the world population uses traditional medicine for the treatment of various diseases (Farnsworth *et al.*, 1986) [3]. The incorporation of fresh herbs into foods has become more and more popular amongst consumers due to their growing expectation of the richness of flavour in everyday meals (Capecka 2012) [1]. Sensory impressions connected with fresh and dried herbs are often different, which results from differences in quality and quantity of specific chemical compounds determining taste and aroma (Jambor and Czosnowska 2001) [5].

Marjoram (*Majorana majorana* L.) belongs to the family Lamiaceae. It is a perennial herb and a sweet marjoram. It is a native of southern Europe. Now it is grown widely in Europe, USA, China, Russia, Morocco, North Africa and India. The plant height is 30-60 cm and develops a large number of leafy stalks with small leaves. Leaves are light grayish green reaching around 21 mm in length and 11 mm breadth. Its dried leaves and flower tops constitute the spice. The sweet marjoram is characterized by a strong spicy pleasant odour. It is best when added shortly before the end of cooking. The aromatic seeds are used in confectionery. Marjoram is considered as a carminative, expectorant and tonic, leaves and seeds are astringent. It is used in the preparation of homeopathic mother tincture. Marjoram oil is used as an external application on sprains, bruises, stiff and paralytic lymph and toothache. Sweet Marjoram tea is used to settle the stomach and to relieve minor digestive upset. Marjoram's stomach-settling properties have led to its use in preventing motion sickness. The tea is also added to bathwater to help relieve congestion and hay fever as well as aches and pains. Marjoram tea has been used historically for relief from symptoms of hay fever, sinus congestion, indigestion, asthma, stomach pain, headache, dizziness, colds, coughs, and nervous disorders. It is used in treating high blood-pressure and heart conditions, as it dilates the arteries, thereby reducing strain on the heart. The same action on the tiny capillaries just beneath the skin produces a feeling of local warmth when Marjoram is used in massage oil, and this is one of the reasons why it is so valuable in massaging tired, tight and painful muscles, especially after heavy physical exertion.

Oregano (*Origanum vulgare*) is also belonging to Lamiaceae family. It is native to warm temperate western and south western Eurasia and Mediterranean region. Oregano is perennial herb; plant height is 20-80 cm with opposite leaves 1-4 cm long. Oregano is related to the herb marjoram, sometimes being referred to as wild marjoram. It is cultivated in Central Asia, Iran, India, Turkey, Afghanistan and Pakistan. Oregano is an important culinary herb, used for the flavour of its leaves, which can be more flavorful when dried than fresh. It has an aromatic, warm and slightly bitter taste, which can vary in intensity. Among the chemical compounds contributing to the flavor are carvacrol, thymol, limonene, pinene, ocimene, and caryophyllene. There, it is most frequently used with roasted, fried or grilled vegetables, meat and fish. The herb is widely used for flavoring meat, especially for mutton and lamb. The dried leaves are most often used to add flavor to salad, and is usually added to the lemon-olive oil sauce that accompanies fish or meat barbecues and casseroles. In the myths of folk medicine, Hippocrates used oregano as an antiseptic, as well as a cure for stomach and respiratory ailments.

Medicinal and aromatic herbs are characterized by low seed viability and low germination capacity as a result of the lack of seed selection and processing programs. Although application of some bio stimulants can seed germination. Therefore, the vegetative propagation is widely preferred rather than propagated by seed cutting is one of the most important means of vegetative plant propagation. Cutting propagation is fast, simple and does not require special techniques and methods use such are used in grafting, budding or micro propagation. Also, one parent plant can provide great number of quality cuttings further more each cutting can become a plant with desirable genetic properties same as a parent plant (Hartmann *et al.*, 1997) [4]. In Lamiaceae family, a lot of species had stems able to form roots in cases of contacts with soil or water which enables the propagation with cuttings to be performed (Craker and Simon, 1987) [2]. Organic manure such as vermicompost with the FYM and soil (1:1:1) are used as growing media to increase the percentage of cuttings which form roots, reduce the time of root initiation, increase number of roots produced per cutting and to increase uniformity of rooting. The aim of this study was to determine the influence of combination of vermicompost with FYM and soil (1:1:1) on the root length fresh and dry weight of marjoram and oregano cuttings.

Material and method

The investigation was carried out in a green-house at the Central Institute of Medicinal and Aromatic Plants Research Centre, Purara, Bageshwar (Uttarakhand), India during March till May of 2015. Plant cutting of marjoram (*Majorana*

majorana L.) and oregano (*Origanum vulgare*) were used as a material (figure 1). The experiment was set out for each species consisted of two variants with 3 replications where each replication had 10 plants. Softwood terminal cuttings of each species were harvested and pruned to a 6-7 cm length. About two third of the leaf surface of each cutting were removed to limit the transpiration.



Fig 1: Cuttings of *Origanum vulgare* and *Majorana hortensis* L

Experimental treatment comprised with the soil (A1) and vermicompost with FYM and soil in ration of 1:1:1 (A2). Transplanting of cutting was done in poly bags, prepared as per treatments. Plants were irrigated regularly by hand depending on whether conditions and development stage of plants. The average daily air temperature during rooting period of the investigated plants ranged from 10.9 to 23.7 °C, while relative humidity ranged from 60 to 70 %. After 14 weeks plants were taken out of the poly bags. Roots of each plant were cleaned and washed with water and dried. During this stage, root length, plant fresh weight, plant height and number of leaves were recorded. Plant dry weight was recorded after plants were being dried at 70 °C during 48 h to a constant weight. Analysis of variance was carried out and differences between treatments were judge by the t test using SAS 9.05 statistical package.

Results and discussion

Number of leaves was under significant influence of vermicompost: FYM: soil (1:1:1). The highest average number of leaves of oregano and marjoram was under significant (Table 1 and 2). The highest number of leaves on both spices was recorded in the A2. Highest number of leaves of marjoram and oregano was 8.12 and 38 respectively. Whereas significantly lower number of leaves in marjoram and oregano i.e. 6.20 and 30 respectively, was recorded in control plants. Similar result was also reported by Verma Prawal P S *et al.* (2015) [11] working on pyrethrum seedling where media containing vermicompost: FYM: soil produced vegetative and root growth better than soil, sand and other growing media.

Table 1: Values of investigated parameter of *Majorana hortensis* L. under influence of vermicompost: FYM: soil (1:1:1).

Treatment variant (A)	Number of leaves	Plant height (cm)	Root length (cm)	Fresh weight of plant (g)	Dry weight of plant (g)
Control (A1)	6.20	31.22	8.10	0.92	0.49
Treatment (A2)	8.12	34.18	10.16	1.13	0.65
Average	7.16	32.70	9.13	1.02	0.57
CD at 95%	2.284	2.267	2.772	0.022	0.022

Plant height of marjoram and oregano was under significant influence of vermicompost: FYM: soil (1:1:1), in table 1 and 2. The highest plant height of both species was recorded in the treated plants (A2). Higher plant height of marjoram and

oregano was 34.18 cm and 36 cm. whereas significantly lower plant height in marjoram and oregano i.e. 31.22 and 29 respectively, was recorded in control plants.

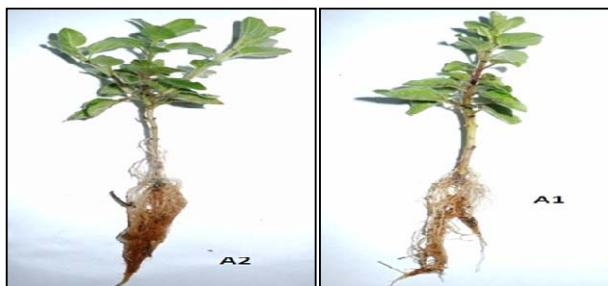


Fig 2: Development of *Origanum vulgare* cuttings (A2) vermicompost: FYM: soil (1:1:1) and (A1) soil.

The reason for the best performance of vermicompost with the FYM and soil are high organic matter content, which increases the water and nutrient holding capacity of the medium, which improve water utilization capacity of the plant. The higher available well decomposed organic matter (Vermicompost) may preserve soil humidity, increase nutrient content and improve soil structure which increase water absorption and maintain the cell turgidity, cell elongation and increase respiration at optimum level, leading to favorable root initiation in cuttings. Vermicompost + soil + FYM (1:1:1) affects the properties of soil physics, chemistry and biology, since organic matter acts glue for soil aggregate and source of soil nutrient (Prasad 1997) [10].

Table 2: Values of investigated parameter of *Origanum vulgare* under influence of vermicompost: FYM: soil (1:1:1).

Treatment variant (A)	Number of leaves	Plant height (cm)	Root length (cm)	Fresh weight of plant (g)	Dry weight of plant (g)
Control (A1)	30.00	29.00	6.20	1.81	0.86
Treatment (A2)	38.00	36.00	11.20	1.95	0.98
Average	34.00	32.50	8.70	1.88	0.92
CD at 5%	2.267	2.267	2.278	0.022	0.022

Table 3: Comparative study of *Majorana hortensis* L. and Oregano (*Origanum vulgare*) under influence of vermicompost: FYM: soil (1:1:1).

Marjorum (<i>Majorana hortensis</i> L.)								
Variable	(A1) Control	S.E.	S.D.	Treatment (A2)	S.E.	S.D.	T Test	Probability
Number of Leaves	6.200	0.580	1.005	8.120	0.583	1.010	2.334	0.080
Plant Height	31.220	0.574	0.995	34.180	0.580	1.005	2.334	0.022
Root Length	8.370	0.817	1.414	10.160	0.574	0.995	2.334	0.147
Fresh Weight	0.920	0.006	0.010	1.130	0.006	0.010	2.334	0.000
Dry Weight	0.490	0.006	0.010	0.650	0.006	0.010	2.334	0.000
Oregano (<i>Origanum vulgare</i>)								
Variable	(A1) Control	S.E.	S.D.	Treatment (A2)	S.E.	S.D.	T Test	Probability
Number of Leaves	30.000	0.577	1.000	38.000	0.577	1.000	9.798	0.001
Plant Height	29.000	0.577	1.000	36.000	0.577	1.000	8.573	0.001
Root Length	6.200	0.580	1.005	11.200	0.580	1.005	6.093	0.004
Fresh Weight	1.810	0.006	0.010	1.950	0.006	0.010	17.146	0.000
Dry Weight	0.860	0.006	0.010	0.980	0.006	0.010	14.697	0.000

Root length of the both investigated species was also under significant influence of vermicompost Vermicompost + soil + FYM in ratio is 1:1:1. The highest root length recorded on marjorum was 10.16 cm and 11.20 cm on oregano compared to significantly lower value of 8.10 cm and 6.20 cm in the control plants, respectively (figure 2). Vermicompost granules may develop soil aggregate and its granulating. Soil aggregation will improve permeability and air flow in the polybags. Vermicompost may decrease fluctuation of soil temperature further root initiation and root growth become easier to the particular depth so that plant grows well and may absorb more water and nutrients (Jo 1990) [6]. Organic matter may also improve nutrient availability and improve phosphorus absorption (Karana and manwan 1990) [7].

Fresh and dry weight of marjorum were under significant influence of vermicompost with the FYM and soil in ratio of 1:1:1 the highest fresh weight of plant of 1.13 gm was recorded in A2 treatment plants, whereas significantly lower fresh weight of plant was recorded in control plant(0.92 gm). The highest weight of dry plants 0.65 gm was also recorded in A2 treatment compared to significantly lower dry weight of the control plant (0.49 g) in table 1.

The weight of fresh oregano plant was under significantly influence of the A2 treatment resulted significantly higher plant fresh weight (1.95 gm) compared to the control (1.81 gm) (Table 2). Plant dry weight (0.86) of oregano was also significantly influenced by A2 treatment (Table 2).

Conclusion

Application of vermicompost with the FYM and soil in ratio of 1:1:1 on propagation was positively affected on marjorum and oregano cutting growth and development. Thus, treated plants had significantly higher values of each parameter investigated compared to untreated plants. The average number of leaves was higher by 30.96 % for marjorum and 26.66 % for oregano in treated plants compared to the control plant, respectively. The average plant height was higher by 9.48 % for marjorum and 24.13 % for oregano in the treated plants compared to control plants, respectively. Also significantly higher root length was recorded in the treated plants of both species with relatively increased values up to



Fig 3: Root development of *Majorana hortensis* L. cuttings with (A2) vermicompost: FYM: soil (1:1:1) and (A1) soil.

20.27 % for marjorum and 80.64 % for oregano. Finally fresh and dry weight of marjorum and oregano plants increased under the influence of A2. Fresh weight of marjorum and oregano plant increased by 22.82 % and 7.73 %, respectively. Dry weight of marjorum and oregano plant increased by 32.65 % and 13.95 %, respectively. Finally it can be concluded that application of vermicompost with the FYM and soil (1:1:1) as growing media positively affects the growth and developments of marjorum and oregano cuttings. Therefore it is highly recommended as growing media for early and healthy production of marjorum and oregano cuttings.

Acknowledgements

The authors are thankful to Director of CSIR-Central Institute of Medicinal and Aromatic Plants (CIMAP), Lucknow for their kind cooperation to providing facilities for carried out successful research work.

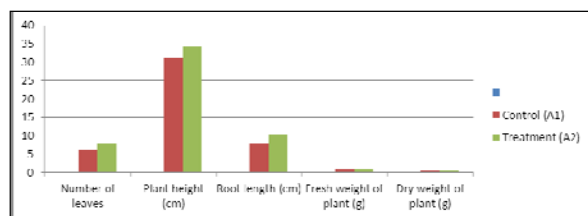


Fig 4: Values of investigated parameter of *Majorana hortensis* L. under influence of vermicompost: FYM: soil (1:1:1).

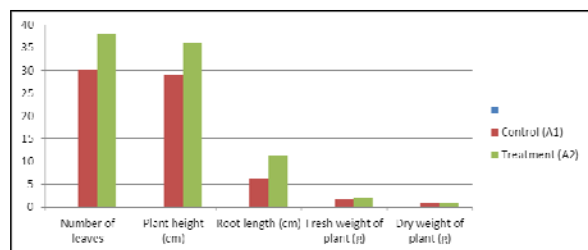


Fig 5: Values of investigated parameter of *Origanum vulgare* under influence of vermicompost: FYM: soil (1:1:1).

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