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Effect of Soil Media, on Seed Germination, Vegetative Growth and Survival Percentage on Transplanting of Annual Drumstick *(Moringa oleifera)* Variety PKM-2

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A B S T R A C T

The present study entitled "Effect of Different soil media, on seed germination, vegetative growth and survival percentage on transplanting of Annual drumstick *(Moringa oleifera)* cv. PKM-2" was undertaken in the Horticulture Research Farm, Department of Horticulture, Sam Higginbottom University of Agriculture Technology and Science, Prayagraj, 211007 during the *rabi* season of 2019- 2020. The Experiment was laid out in a Randomized Block Design with 10 treatments and 3 replications. Results concluded that the application of media's T1 (Vermicompost+sand) (3:1) responded with superior results in various parameters i.e. in germination percent (91.67%), minimum days taken to emergence (4.55days), stem diameter (1.04cm), plant height (45.66cm), shoot fresh weight (22.50gm), shoot dry weight (5.47gm), root fresh weight (18.50gm), root dry weight (4.60g), total fresh weight (40.67gm), total dry weight (10.23gm), shown maximum survivability percent (75 percent), leaf vitamin-c percent (0.17gm/100gm) while soil media T4 (Poultry manure + sand) (3:1) has highest leaf calcium percent (0.41gm/100gm), T5 (Poultry manure + sand) (2:1)(0.17gm/100gm) has highest leaf iron percent.

Introduction

Drumstick (*Moringa oleifera.* Lam) is an important vegetable crop belonging to the family Moringaceae having chromosome no. 2n = 28. It has tremendous economic and dietic importance. It is fast growing, drought - resistant tree, native to North-western India, and widely cultivated in tropical and subtropical areas where its young seed pods and leaves are used as vegetables. It has many medicinal values. Leaves, flowers and unripe fruits are used as vegetables, and roots and barks are used for medicinal purpose (Anwar *et al.*, 2007). The flowers, leaves and roots are used for the treatment of ascites, rheumatism and venomous bites and as a cardiac and circulatory stimulant in some folk cures. The root bark and the roots of young tree are rubefacient and vesicant. More than three

hundred diseases including cancer, diabetes and high blood pressure can be controlled or cured by *M. oleifera* (Anon. 2009). Flowers are traditionally used as a tonic, diuretic and abortifacient. Flowers are considered to be anthelmintic. Used to cure inflammations, muscle diseases, tumors and enlargement of the spleen. In India, juice pressed from the flowers is said to alleviate sore throat and catarrh. In Puerto Rico, an infusion of the flowers is used as eyewash and a decoction from the flowers has been used to treat hysteria. The flowers and root contain pterygospermin, a recognized antibiotic (Watt and Breyer 1962).The effect of compost and other organic amendment on crop growth and development may be the result of the interaction between the nutrients present and plant growth hormones, as compost and co-compost has been found to contain auxins, gibberellins and cytokinin (Miezah *et al*., 2008). Increased yield components of moringa trees following application of fertilization types where mineral and organic fertilization recorded 85% increase in all yield parameters of moringa trees over control, while mineral, organic and bio-fertilization recorded 86% over control (Attia *etal.*, 2014). Such studies will ensure high establish rates of the seed sown out as the seed has also proven to be very difficult to acquire. High initial seedling establishment results in increased production levels via different soil potting media's and its importance for building up the potentiality of moringa's production.

In Uttar Pradesh condition due to presence of heavy soil and poor drainage system survival percent is very poor, direct sowing of moringa seeds in the field occurred in high seed loss percentage and the destruction by termites and rodents also occur. Despite having highly nutritive value, tremendous economic importance very limited research work done on soil media response in drumstick. Therefore, keeping these points in view, the investigation was carried to enlighten the effect of different soil media, on seed germination, vegetative growth and survival percentage on transplanting of annual drumstick (*Moringa oleifera*) (cv. PKM-2).

Materials and Methods

The experiment was conducted during winter season of the year 2019-20 at Central Research field, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agricultural Technology and Sciences, Prayagraj. The area is situated on the South of Prayagraj on the right bank of Yamuna at Rewa road at a distance of about 6 km from Prayagraj city. The Experiment was conducted in a Randomized Block Design constituting of 10 treatments and 3 replications, total nine treatment and one treatment taken as control.T_0(Only Soil 100 percent (CONTROL), T_1(With vermicompost + sand (3:1), T_2 (With vermicompost + sand (2:1), T_3 (With vermicompost + sand (1:1), T_4 (With poultry manure +sand (3:1), T_5(With poultry manure +sand (2:1), T_6 (With poultry manure +sand (1:1), T_7 (With FYM + sand (3:1), T_8(With FYM + sand (2:1), T_9 (With FYM +sand (1:1).

Results and Discussion

The results obtained from the Effect of different potting media on seed germination, vegetative growth, survival percentage on transplanting on annual drumstick (*Moringa oleifera. L*) of variety PKM-2under open condition which were carried out in kharif season during 2019-20 has been presented in this chapter. The observations were recorded as per the schedule and the need of the study. The data was taken statistically analyzed in Randomized Block Design.

The results of the experiment are summarized below.

Germination parameter

Among all the treatments shown in Table-1, the highest germination percentage recorded in T_1(Vermicompost + sand) (3:1) (91.67percent) and least percent was recorded in the T_5 (Poultry manure + sand)(2:1) valued as (58.33 percent). The maximum days taken to emergence was observed in Treatment T_5 (Poultry manure + sand (2:1) (8.7 days), days taken to emergence was significantly influenced by the soil media and soil media T_1- (Vermicompost + sand) (3:1) taken minimum days to emergence (4.55 days) days taken to emergence, This results occurs may be due to integrated response of soil and vermicompost which are considered to be highly organic which increases the water and nutrient holding capacity of the media, therefore improving the water utilization capacity of the seed. The present results are in the conformity with the results of Bhardwaj (2013) who also observed that vermicompost along with the soil was found to be having least days of emergence and maximum germination percent in papaya.

Table.1 Impact of Different media and its interaction on Germination, Growth, and Survivality parameter of Plant after different DAS of Annual Drumstick

Treatment Symbol	Treatment Details	Germination percent 14 DAS	Days taken to emergence 14 DAS	Stem width (cm)35 DAS	Plant height (cm) 35 DAS	Survivality percent 90DAS
T_0	**Only Soil 100 percent (CONTROL)**	83.33	8.00	0.74	34.44	58.33
T_1	**With vermicompost + sand (3:1)**	91.67	4.55	1.04	45.66	75.00
T_2	**With vermicompost + sand (2:1)**	83.33	5.22	0.98	43.33	58.33
T_3	**With vermicompost + sand (1:1)**	83.33	6.78	0.81	44.11	50.00
T_4	**With poultry manure +sand (3:1)**	75.00	7.78	0.83	40.55	58.33
T_5	**With poultry manure +sand (2:1)**	58.33	8.77	0.82	40.22	33.33
T_6	**With poultry manure +sand (1:1)**	75.00	7.33	0.81	42.00	50.00
T_7	**With FYM + sand (3:1)**	83.33	5.67	0.86	43.22	66.67
T_8	**With FYM + sand (2:1)**	75.00	6.00	0.97	40.66	50.00
T_9	**With FYM +sand (1:1)**	66.67	6.66	0.90	37.20	41.67
S.Ed(±)		12.97	1.15	0.07	3.01	15.76
C.D@5%		26.53	2.35	0.15	6.16	32.24
Result		**NS**	**S**	**S**	**S**	**NS**

Table.2 Impact of different media and its interaction on, physiological parameter of plant after 35 DAS of annual drumstick

Treatment Symbol	Treatment Details	Shoot fresh weight (g) after 35 DAS	Shoot dry weight (g) after 35 DAS	Root fresh weight (g) after 35 DAS	Root dry weight (g) after 35 DAS	Total fresh weight of plant (g) after35 DAS	Total Dry weight of plant (g) after 35 DAS
T_0	Only Soil 100 percent (CONTROL)	16.17	4.07	8.83	2.17	25.00	6.23
T_1	With vermicompost + sand (3:1)	22.50	5.47	18.50	4.60	40.67	10.23
T_2	With vermicompost + sand (2:1)	18.00	4.73	14.50	3.57	32.50	8.30
T_3	With vermicompost + sand (1:1)	19.33	4.87	15.67	3.88	35.00	8.73
T_4	With poultry manure +sand (3:1)	21.17	5.37	17.00	4.23	38.00	9.60
T_5	With poultry manure +sand (2:1)	15.50	3.87	12.50	3.10	28.00	7.00
T_6	With poultry manure +sand (1:1)	19.33	4.87	15.67	3.87	35.00	8.73
T_7	With FYM + sand (3:1)	19.17	4.73	15.83	4.12	35.00	8.83
T_8	With FYM + sand (2:1)	18.00	4.50	13.50	3.33	31.50	7.83
T_9	With FYM +sand (1:1)	21.00	5.20	15.00	3.73	36.00	8.97
S.Ed(±)		1.77	0.45	1.22	0.33	2.51	0.65
C.D@5%		3.63	0.92	2.49	0.69	5.13	1.32
Result		S	S	S	S	S	S

Table.3 Impact of different media and its interaction on leaf quality parameter of plant after different DAS of annual drumstick

Treatment Symbol	Treatment Details	Iron percentage in leaf (/100g of leaf) after 90 DAS	Vit-C percentage in leaf (/100g of leaf) after 90 DAS	Calcium percentage In leaf (/100g of leaf)after 90 DAS
T_0	Only Soil 100 percent (CONTROL)	0.01	0.05	0.09
T_1	With vermicompost + sand (3:1)	0.12	0.17	0.13
T_2	With vermicompost + sand (2:1)	0.11	0.16	0.12
T_3	With vermicompost + sand (1:1)	0.10	0.14	0.10
T_4	With poultry manure +sand (3:1)	0.11	0.11	0.41
T_5	With poultry manure +sand (2:1)	0.17	0.13	0.18
T_6	With poultry manure +sand (1:1)	0.13	0.12	0.17
T_7	With FYM + sand (3:1)	0.11	0.10	0.11
T_8	With FYM + sand (2:1)	0.10	0.10	0.10
T_9	With FYM +sand (1:1)	0.09	0.09	0.10
S.Ed(±)		0.00	0.00	0.00
C.D@5%		0.00	0.00	0.00
Result		NS	NS	NS

Growth parameter

Among all the treatments shown in Table -1, soil media have significant effect on Plant height and width. The maximum stem diameter was recorded after 35 DAS in the variety T_1 (Vermicompost+ soil) (3:1) (1.04 cm) respectively. While it was recorded minimum T_0 (Only soil) (0.74cm) at 35 DAS, at, 35 days after sowing maximum plant height was observed in soil media T_1(Vermicompost+sand) (3:1) (45.66cm), while minimum plant height was observed in T0 (only Soil 100 percent) (34.44 cm), T_9 (FYM + sand) (1:1) (37.20 cm), then T_5 (Poultry manure + sand) (2:1) (40.22cm),The reason may be due to presence of humic acid (Arancon *et al.,* 2005) and macro, micro nutrients present in vermicompost (Atiyeh *et al.,* 2002) The organic manure applied in the form of FYM, Poultry manure, Vermicompost might have improved the soil physical and chemical properties leading to adequate supply of nutrients to the plants which might have promoted the maximum vegetative growth, while the minimum plant growth is due to non-availability of nutrients

Physiological parameter

Soil media have significant effect on Plant Freash weight and dry weight among all the treatments shown in Table-2,The maximum shoot fresh weight after 35 DAS was recorded in soil media T_1 (Vermicompost+sand) (3:1) (22.50 g) and soil media was showing minimum shoot fresh weight, T_5 (Poultrymanure+sand) (1:1) (15.50g), The soil media T_1 (Vermicompost+sand) (3:1) recorded significantly maximum shoot dry weight per plant (5.47) While the minimum shoot dry weight per plant (3.87g) was observed in soil media T_5 (Poultry manure+ sand) (2:1) (3.87g), The maximum root fresh weight was recorded in the soil media T_1 (Vermicompost+sand) (3:1) (18.50g) followed by T_4 (Poultry manure+sand) (1:1) (17g). Soil media T_0 (only Soil 100 percent) shown minimum root fresh weigh (8.83g). The soil media T_1 (Vermicompost+sand) (3:1) recorded significantly maximum root dry weight per plant (4.60g) which was followed by T_4 (Poultry manure+sand) (3:1) (4.23 g). While, the minimum root dry weight per plant was observed in T_0 (only soil 100 percent) (2.17g). The maximum total fresh weight was recorded in soil media T_1 (Vermicompost+ sand) (3:1) valued as (40.67g) followed by soil media T_4 (Poultry manure+sand) (3:1) (38g). Soil media T_0 (Only soil) shows minimum total fresh weight (25g) followed, the maximum total dry weight was recorded in soil media T_1 (Vermicompost+sand) (3:1) valued as (10.23g). Soil media T_0 (only soil 100 percent) shows minimum total dry weight (6.23g). The reason may be Vermicompost which is high in organic manure due to the presence of bioactive principles i.e. the abundance of earthworm population creates the symbiotic association with the soil and plant rhizosphere zone that influences the rate of influx of nutrients from soil and creates an impact on the root and shoot growth and development of the plant. These results are in the accordance with (Abirami *et al.,* 2010) and (Bhardwaj 2013).

Survivality percent

In Table-1, the soil media T_1 (Vermicompost+sand) (3:1) shown maximum survivability percent (75 percent), however, soil media T_5 (Poultry manure+sand) (2:1) showed minimum survivability percent (33.33 percent).

Leaf quality parameter

Leaf iron content maximum by the application of organic manures particularly in treatment T_5 (Poultry manure+sand) (2:1) (0.17g/100g). While, lowest iron content per

leaf was recorded in the treatment combination T_0 (only Soil100 percent) (0.01g/100g). The normal value of leaf iron content is (0.085g /100g), but in my treatment the iron percentage is increased. The reason may be due to solubilization of native forms of nutrients due to complexing of nutrients particularly of micronutrients highly available in Poultry manure. These results are in accordance with mainly (Varalakshmi *et al.*, 2005) for iron and calcium content. The highest ascorbic acid content of (0.17g/100g) was recorded in the treatment combination of T_1 (Vermicompost+sand) (3:1), & the least ascorbic acid per leaf was recorded in the treatment combination T_0 (only Soil 100 percent) (0.05g/100g), The normal value of leaf Ascorbic acid content is (0.22g /100g), but in my treatment the vit-c content is decreased. The highest vitamin -c content with vermicompost could be due to the essential elements present in it which enhanced vitamin-c synthesis, it consist of decomposed products by earthworm which contains various nutrients, essential elements, plant growth hormones and several enzymes present in it which influence vitamin-c synthesis results are conformity with Acharya *et al.,* (2020). Leafcalcium content maximum by the application of organic manures particularly in T_4 (Poultry manure+sand) (3:1) (0.41g/ 100g)**,**and, lowest calcium content per leaf was recorded in the treatment combination T_0 (only Soil100 percent) (0.09g/100g).the normal value of leaf calcium content is (0.40gm /100g), but in my treatment the calcium content is increased..

On the basis of present investigation, it is concluded that media T1 (Vermicompost+sand) (3:1) responded with superior results in various parameters i.e. in germination percent (91.67%), minimum days taken to emergence (4.55days), stem diameter (1.04cm), plant height (45.66cm), shoot fresh weight (22.50g), shoot dry weight (5.47g), root fresh weight (18.50g), root dry weight (4.60g), total fresh weight (40.67g), total dry weight (10.23g), shown maximum survivability percent (75 percent), leaf vitamin-c percent (0.17g/100g) while soil media T4 (Poultry manure+sand) (3:1) has highest leaf calcium percent(0.41g/100g), T5 (Poultry manure+sand) (2:1) (0.17g/100g) has highest leaf iron percent.

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