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Growing media affects germination and seedling growth of peruvian ground cherry (*Physalis peruviana* L.)

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An experiment was conducted to find out the effect of growing media on seed germination and seedling growth of *Physalis peruviana* L. Eight growing media were formulated using soil, sand and FYM in different proportion including soil in alone as control. The mixture media had significant effect on seed germination and growth of the seedlings. Maximum germination (86.86 %), seedling length (36.59cm) and dry matter accumulation *i.e.* total dry weight of seedling (87.82mg) were recorded with soil + sand + FYM (1:1:1) treatment. The leaf area and stem diameter of seedlings were maximum with soil + sand + FYM (2:1:2), but it was statistically at par with soil + sand + FYM (1:1:1) treatment. Treatments having FYM as a component of growing medium showed better growth of the seedlings. Minimum germination, length as well as dry weight root and shoot, leaf area and stem diametre were noted in control (soil).

Key words : *Physalis peruviana* L., Growing media, Germination, Seedling growth

INTRODUCTION

The Peruvian ground cherry (*Physalis peruviana* L.) belongs to family Solanaceae is an annual as well as perennial herb characterized by their persistent calyx which completely encloses the golden yellow colour fruit. The crop is said to be native of Peru and Chile and reportedly cultivated in South Africa, Kenya, India, Egypt, New Zealand, the Caribbean, South East Asia, California, Columbia and Hawaii (Legge, 1974; Klinac, 1986; Chattopadhyay, 1996). It is commonly called as '*Poha*' in Hawaii, 'Golden berry' in South Africa '*Rasbhari*', '*Makoi*' or '*Tepari*' in India (Gupta and Roy, 1980). In India, it is a minor fruit which fetches very high price in market. The chief source of commercial supply of fruits is reported from Uttar Pradesh, Punjab, Andhra Pradesh, West Bengal and Madhya Pradesh, Rajasthan especially from peri-urban areas. The ripe fruits are eaten fresh or can be used for preparation of excellent quality of jam for which it is also called the 'Jam Fruit of India' (Majumdar, 1979).

The Peruvian ground cherry being a quick growing short duration herbaceous shrub can be grown as pure crop or an intercrop in orchards. The crop seems to have wide adoptability of soil and climatic conditions and said to be grown wherever the tomatoes are in cultivation (Morton, 1987). As annual crop, *Physalis peruviana* is raised through seed in nursery and thereafter transplanted in well prepared field. Healthy and vigorous seedling is the prerequisite of better growth and development of plant in field condition. Several factors of nursery conditions significantly influenced the seed germination and seedling growth. Besides physiological condition of seed, light, moisture etc., the growing medium is considered most important factor. Seedling raised in soil showed poor growth due to poor aeration and compactness of soil. Sand provides good aeration but lack of essential nutrients restricts the seedling growth. Other viable option is the addition of FYM in growing medium that may improve the nutrient content, its availability as well as physical conditions of the soil. As the growing medium is conducive of the growth and vigour of the seedlings, the present investigation was conducted to find out the effect of growing media on seedling growth of Peruvian ground cherry.

MATERIALS AND METHODS

The experiment was conducted at Regional Research Station and Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Wadura, Sopore (Jammu & Kashmir) during Spring, 2009. The growing media treatments were: T_1 –

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soil (control), T_2 - soil + sand (1:1), T_3 - soil + FYM (1:1), T_4- sand + FYM (1:1) T_5 - soil + sand + FYM (1:1:1), T_6 -soil + sand + FYM (2:1:1), T_7 - soil + sand + FYM (2:2:1) and T_8 - soil + sand + FYM (2:1:2). Soil, sand and FYM were mixed well by volume as per the treatment. The experiment was laid out in randomized block design with four replications. Two hundred seeds of Peruvian ground cherry were sown in each growing medium in lines at 10 cm spacing on 30th March, 2009. All the beds were mulched with paddy straw till germination starts. After germination, thinning was done for maintaining the seedling to seedling distance at 5 cm. Other nursery practices adopted were similar for all the treatments. Per cent germination was noted at 20 days after sowing. Seedling height, root length, stem diameter, number of leaves per seedling, leaf area and dry matter accumulation of seedlings (dry weight of shoot, root and total seedling dry weight) were recorded at 40th day after sowing. Data recorded in the experiment were statistically analysed as per standard procedure suggested by Panse and Sukhatme (1989).

RESULTS AND DISCUSSION

Perusal of data presented in Table 1 revealed that the different growing media significantly influenced the seed germination. Data showed that the sand and FYM used as mixture in growing media improved the germination of the seeds. Highest germination (86.86 %) was recorded with Soil + sand + FYM (1:1:1) media, however, it was statistically at par with soil + sand + FYM (2:1:1) and Sand + FYM (1:1) treatments. The lowest germination (67.10 %) was noted in the control. Addition of FYM in growing media improved the physical condition of soil like porosity, water holding capacity, and maintaining soil temperature (Srivastava, 1998) and better aeration due to sand might be responsible for higher seed germination. Mixture media had significant effect on number of leaves per seedling. The number of leaves was also maximum (5.3) with soil + sand + FYM (2:1:1) while it was lowest (4.8) in control (soil). Addition of sand and FYM in growing media significantly increased the photosynthetic area of seedlings. Seedlings grown in soil + sand + FYM (2:1:2) medium had maximum leaf area (61.80 cm^2) followed by soil + sand + FYM (1:1:1), Soil + FYM (1:1), sand + FYM (1:1) and Soil + sand + FYM (2:1:1) while in control (soil) it was only 34.60 cm^2. Results revealed that seedlings grown in mixture media of soil + sand + FYM had thick stem as compared to control. Maximum stem diameter (0.42 mm) was measured with soil + sand + FYM (2:1:2) and Soil + FYM (1:1) treatments and it was minimum (0.27) with sand. The stem diameter in control (soil) was 0.30mm. Increased photosynthetic area and stem diameter might be due to increased availability of plant nutrients for better plant growth. Yadav *et al*. (2006) reported that the application of FYM in soil increased essential plant nutrients and organic matter in soil and enhanced nutrient availability to the plants.

It is obvious from data (Table 2) that the mixture media had significant effect on growth parameters of seedlings. Maximum shoot length (17.57cm) was

Table 1: Effect of growing media on seed germination, no. of leaves per seedling, leaf area and stem diameter of Peruvian ground cherry seedlings

Treatment	Germination (%)	Number of leaves per seedling	Leaf area (cm^2)	Stem diameter (mm)
Soil	67.10	4.8	34.60	0.30
Soil + sand (1:1)	74.20	5.0	30.57	0.27
Soil + FYM (1:1)	80.34	5.1	57.83	0.42
Sand + FYM (1:1)	84.45	5.0	52.73	0.37
Soil + sand + FYM (1:1:1)	86.86	5.3	60.60	0.40
Soil + sand + FYM (2:1:1)	84.50	5.2	50.00	0.37
Soil + sand + FYM (2:2:1)	83.00	5.0	42.40	0.32
Soil + sand + FYM (2:1:2)	80.00	5.0	61.80	0.42
S.E.±	1.06	0.09	1.25	0.02
C.D. (P=0.05)	3.15	0.28	3.72	0.07

Table 2: Effect of growing media on shoot length, root length and total length of Peruvian ground cherry seedlings

Treatments	Shoot length (cm)	Root length (cm)	Seedling length (cm)
Soil	13.54	14.36	27.90
Soil + sand (1:1)	12.10	15.83	27.93
Soil + FYM (1:1)	16.20	17.75	33.95
Sand + FYM (1:1)	15.20	18.20	33.40
Soil + sand + FYM (1:1:1)	17.57	19.02	36.59
Soil + sand + FYM (2:1:1)	16.00	18.10	34.10
Soil + sand + FYM (2:2:1)	15.00	16.50	31.50
Soil + sand + FYM (2:1:2)	16.17	18.54	34.74
S.E.±	0.29	0.32	0.78
C.D. (P=0.05)	0.85	0.96	2.32

measured with Soil + sand + FYM (1:1:1) followed by soil + FYM (1:1), soil + sand + FYM (2:1:2), soil + sand + FYM (2:1:1), sand + FYM (1:1) and soil + sand + FYM (2:2:1) treatments. The lowest shoot length (12.10cm) was recorded in soil + sand (1:1) medium. The root length was also in similar pattern as the shoot length except in two treatments *viz.*, soil + sand (1:1) and soil (control), where the root length was more in the former medium. All the mixture media treatments significantly increased the seedling length. Maximum length of seedling (36.59cm) was recorded in treatment soil + sand + FYM (1:1:1) treatment which was significantly superior over rest of the treatments. The minimum seedling length (27.90cm) was recorded when seed raised in soil medium. Significant results on growth parameters of seedling might be due increased absorption of plant nutrients and better physical condition of soil needed for seedling growth as Srivastava (1998) reported that the application of FYM enhanced nutrient availability and physic chemical property of soil.

Dry matter accumulation (dry weight of shoot, root as well as total dry weight) of the seedlings was influenced by mixture media (Table 3). Results revealed that the treatments having FYM as a component in the growing medium resulted significantly higher dry matter accumulation. Maximum shoot dry weight (76.46mg) was recorded with soil + sand + FYM (1:1:1) followed by soil + sand + FYM (2:1:2) which were significantly superior as compared to other treatments. Lowest shoot weight (51.80mg) was noted with in control (soil) condition. Maximum root weight (11.76mg) was found in soil + sand + FYM (1:1:1) treatment but it was found at par with soil + sand + FYM (2:1:2). Lowest root weight (8.23mg) was recorded in control (soil). Total dry weight of the seedlings was increased significantly due to mixture media over control. The value was recorded maximum (87.82mg) with soil + sand + FYM (1:1:1) treatment which was found significant over rest of the treatments. The values of total dry weight of the seedlings in treatment Soil + sand + FYM (2:1:2) was recorded statistically at par with soil + sand + FYM (2:2:1), Soil + FYM (1:1), soil + sand + FYM (2:2:1) and soil + sand (1:1) treatments. The lowest dry weight of seedlings was recorded in control (60.13mg). Higher dry matter content of seedlings in FYM added treatments might be the results of better plant growth due increased availability of nutrients and physical condition of growing media.

Table 3: Effect of growing media on dry matter accumulation of Peruvian ground cherry seedlings

Treatment	Shoot weight (mg)	Root weight (mg)	Total dry weight of seedling (mg)
Soil	51.80	8.23	60.13
Soil + sand (1:1)	54.05	8.50	62.55
Soil + FYM (1:1)	69.80	10.40	80.20
Sand + FYM (1:1)	64.13	10.22	74.35
Soil + sand + FYM (1:1:1)	76.46	11.36	87.82
Soil + sand + FYM (2:1:1)	71.78	10.40	82.18
Soil + sand + FYM (2:2:1)	65.30	10.13	75.43
Soil + sand + FYM (2:1:2)	72.68	10.98	83.66
S.E.±	0.89	0.15	1.05
C.D. (P=0.05)	2.65	0.45	3.12

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