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Substitution of Peat as Growth Media for Potted Plants of Sweet Peeper (*Capsicum Annum L.*)

Baber Ali[1], Muhammad Ilyas*[2], Waqas Khan[2], sayyad[3], Baber Ali[1], Asad Ullah[2], Muhammad Zakria[1], Majid Hissam[2], Waseem Zaman[2], Muhammad Jamal[2], Abdur Rahman[2] and Muhammadd Kashif[4]

[1]*Department of Horticulture, Abdul Wali Khan University, Pakistan*

[2]*Department of Horticulture, The University of Agriculture, Pakistan*

[3]*Department of Agronomy, The University of Agriculture, Pakistan*

[4]*Department of Biotechnology, Abdul Wali Khan University, Pakistan*

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***Corresponding author:** Muhammad ilyas Department of Horticulture, The University of Agriculture Peshawar, Pakistan, Tel: 923482412344; Email: muhammadalyas12322@gmail.com

Abstract

To compare effect of different growing mediums on yield of Sweet pepper (CapsicumannumL.) a pot experiment "substitution of peat as growth media for potted plants of sweet pepper " was carried out at National Agricultural Research Center (NARC) Islamabad, during June, 2016.The completely randomized design (CRD) were used with three replication and nine treatments include {T_0: Traditional practicing media (soil and farmyard manure in 2:1 ratio)}, (T_1: Peat), (T_2: compost), (T_3: Peat and compost 1:1), (T_4: Peat and compost 1:1/2),(T_5:Peat and compost1/2:1), (T_6: Peat and Traditional practicing media 1:1), (T_7: Peat and Traditional practicing media 1:1/2),(T_8: Peat and Traditional practicing media 1/2:1), (T_9: Peat, compost and Traditional practicing media 1:1:1).Maximum plant height(81.00 cm), Plant Spread (41.00 cm), and yield pot^{-1}(2528.7 gm) was recorded in response to T_9.While minimum plants height (36.00 cm), Plant Spread (23.33 cm), and yield pot^{-1}(1573.0 gm) was observed in response to T_0 .

Keywords: Sweet peeper; Potted; Substitution

Introduction

Sweet pepper (*CapsicumannumL.*) is an important vegetable in Pakistan. It is used both as salad and dried condiments. It has gained a high status due to its high cost [1-3]. In Pakistan, two of its groups namely *Capsicum annum* and *Capsicum frutescens* are acknowledged [4-7]. The hot types are source of the digestive stimulant capsici [8]. It contributes 1.5% share in the country's GDP. In Pakistan, it is grown on 73.8 thousand ha with total production of 187.7 thousand tones and average yield of 2.5 tons ha^{-1}. Khyber Pakhtunkhwa (KPK) Province contributes 0.6 thousand hectares with total production of 0.7 thousand tones and an average yield 1.2 tons per hectare [5]. Sweet pepper (*Capsicumannum L.*) is an annual plant, belongs to Solanaceae family and is native to Central America. Capsicum genus has comprises 30 species. Plant growing on soilless media started in the year 1960 by using organic media. Nowadays these systems are using various organic and mineral materials as media culture. Each material has individual properties. Totally, these materials must have high holding water capacity, sufficient aeration, suitable drainage and high cation exchange capacity (CEC) and must not have any bad and harmful effect on the plant. Peat is the most important medium because of having special properties but is expensive and search to find replacing materials is doing [7].

The immense horticultural, agricultural and biological diversity has helped to make chili or hot pepper globally important as a fresh and cooked vegetable (e.g. for salads, warm dishes, pickled, spices, flavor) and a source of food ingredients for sauces and powders and as a colorant, which is used as well in cosmetics [3]. Moreover, the spices are used medicinally, and provide the ingredient for a non-lethal deterrent or repellent to some human and animal behavior. Bell peppers are also cultivated ornamentally especially for their brightly glossy fruits with a wide range of colours [8-10]. Root and collar rot disease caused by *Phytophthoracapsici* Leonian, has become a serious threat to pepper production and up to 100% yield losses occur in commercial peeper fields [2] and is of great importance in different parts of the world including Pakistan. This disease is well established in the main pepper growing areas of KPK

[11]. It causes great losses to the crop and in many areas it has limited the cultivation of pepper to a few acres [10]. There is no systematic study conducted to find out the extent of this disease in these two divisions. In order to establish the benchmark for the prevalence of this problem, current study was initiated in these two divisions (Peshawar and Malakand) of Khyber Pakhtunkhwa Province of Pakistan in 2007. Iron deposits occur associatively with peat formation.

This implies huge geochemical significance of peat. We undertook the REE study of the peat vegetation to see if there is any characteristic signature different from the soil-grown plants. According to our survey [1] and earlier studies most of the soil-grown plants show similar REE patterns with slight differences in the slope of the overall patterns; seaweeds showed different REE signature from that of soil-grown plants; the soil-grown plants and the seaweeds showed a various magnitude of Ce anomalies. Here we have reported the REE pattern of peat moss and peat grass, which are the two typical vegetation of the peat land, from the Ozegahara peat land and a characteristic feature of patterns and its geochemical implication. In addition to peat, can be mention other type of culture media consist organic media such as peat moss, sphagnum peat moss, hipnum peat, cane and osier peat, humus peat, coco-peat, tree bark, pine bark, palm peat and inorganic media such as perlite, sand and pumice. Neamatolah-sani et al. 2009 in attention to healthy nutrition for consumers recommended development and extension of soilless cultures for growing of leafy vegetables. They showed that measured elements concentration in Basil, Persian Leek, Savory, Garden cress and Parsley were in the optimum range and consumption of these vegetables do not reveal malnutrition signs and or harmful effects of micro nutrient accumulation in consumers. The effect of culture medium on yield and absorption of some nutrients in greenhouse cucumber by hydroponic system showed that different media culture had significant influence on yield and the best nutrient concentration and yield obtained by coco-peat medium Mohammadi-ghahsareet al., 2010.

In order to determine suitable medium and cultivar in a hydroponic system for growing of sweet pepper evaluated three culture media consist vermiculite + sand (1:1), peat + perlite (1:1) and rock wool and obtained the highest yield in plant, fruit weight, fruit number in plant, length and diameter of fruit in the peat + perlite medium [1] studied the effect of various culture media on apparent and qualitative properties of sweet pepper. They found that addition of Zeolite to culture media improve qualitative properties of sweet pepper fruits. Zandi, et al. 2011 observed the lowest root volume in 100% perlite or soil media and the least diameter, fresh and dry weight of transplant of green house cucumber in soil medium. Ramteen, et al. 2009 observed the greatest root number, root length and stem length on cultured 'Sorkh Barge' cuttings in peat perlite medium compared to cultured cuttings in washed-sand medium. Walters, et al. 1990 and Botez, 1995 also in their research on peat media reported the positive effect of peat on the growth of asparagus, tomato and pepper and the reason on this subject explained the existence of more nutrients and ability of peat in more keeping of nutrients and water in this medium.

Objectives

In view of the importance of pepper and peat the present work was conducted while keeping in mind the following objectives:

a) To investigate the peat moss role in terms of growth related attributes of potted sweet pepper plants.

b) To study the effect of peat moss and traditional practicing soil media on sweet pepper.

c) To compare different combinations of peat, compost and traditional practicing media in order to select a suitable growing substrate for producing best quality sweet pepper potted plants.

Materials and Methods

The experiment "substitution of peat as growth media for potted plants of sweet pepper " was carried out at the experimental field of Vegetable Crops Research Program, Horticultural Research Institute, National Agricultural Research Centre (NARC) Islamabad during 2016. The experimental site was located at longitude 73.08 o east and latitude 33.42^0 north on the global scale. Elevation of site was 683 M (Mean Sea Level).

Experimental Material

Plants of sweet pepper hybrid (Excel) were raised in polythene bags, and the experiment was conducted inside plastic tunnel.

Experimental Treatments

a) T_0: Traditional practicing media (soil and farmyard manure in 2:1 ratio)

b) T_1: Peat

c) T_2: compost.

d) T_3: Peat and compost (1:1)

e) T_4: Peat and compost (1:1/2)

f) T_5: Peat and compost (1/2:1)

g) T_6: Peat and Traditional practicing media (1:1)

h) T_7: Peat and Traditional practicing media (1:1/2)

i) T_8: Peat and Traditional practicing media (1/2:1)

j) T_9: Peat, compost and Traditional practicing media (1:1:1)

Experimental Design

The experiment was laid out in completely randomized design (CRD) and replicated three times.

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Parameters

The data was recorded for the following parameters:

a) Plant height (cm): Pl

b) Plant Spread (cm): Plant spread was measured with the help of scale for 5 randomly selected plants.

c) Yield pot-1 (gm): A yield pot^{-1}of 5 randomly selected plant was recorded with the help of electronic balance and average was calculated for further statistical analysis.

d) Statistical Analysis: Analysis of the data for growth and yield of potted plants was performed according to Completely Randomized Design (CRD). Means of the examined traits were ranked according to Least Significant Difference (LSD) Test Steel, et al. 1997, by using statistical software statistix-8.1 and Microsoft excel.

Results and Discussion

In the present work substitution of peat as growth media for potted plant height, plant spread

and Yield pot-1 of sweet pepper was studied at National Agriculture Research center Islamabad. We recorded and analyzed data on different parameter. The details of each parameter are as:

Plant height (cm):

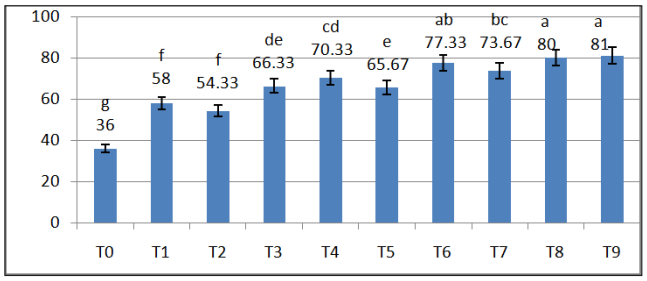

Figure 1: Effect of peat and peat substitutes on plant height of sweet pepper potted plants under plastic tunnel.

The data regarding effect of organic regimes on plant height is presented in (Figure 1), and the Analysis of Variance (ANOVA) is presented in (Table 4.1). The statistical analysis shows that the plant height of Sweet pepper hybrid (Excel) was significantly affected by substitution of peat, compost and Traditional practicing media (Figure 1). Maximum plant height (81.00 cm) was recorded in response to T_9 (1:1:1 ratio peat, compost and Traditional practicing media), while minimum plants height (36.00 cm) observed in response to T_0 (soil and farmyard manure 2:1 ratio). The interaction effect showed that Sweet pepper hybrid (Excel) subprime in T_9 (1:1:1 ratio peat, compost and Traditional practicing media) attained maximum number of plant height, while the Sweet pepper hybrid (Excel) in T_0 (peat, compost and Traditional practicing media) showed minimum number of plant height. \Plant height correlated with application of peat and compost dose because use for bio-fertilizers modifies soil texture, soil structure integrity, aeration and increase nutrient absorption. Peat and compost is a commercial product containing abundant nutrients improves soil fertility and increase the availability of nutrients to plants and thus it influences plant growth and yield (Bitonteet al., 2002).

Table 4.1: ANOVA table for the effect of peat and peat substitutes on plant height of sweet pepper potted plants under plastic tunnel.

Source of Variance	DF	SS	MS	F	P
Treat	9	5179.89	575.541	87.2	0.00
Error	20	132.00	6.60		
Total	29	5311.87			

Plant Spread (cm)

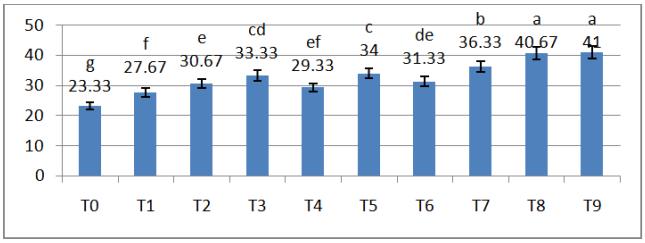

Figure 2 : Effect of peat and peat substitutes on plant spread of sweet pepper potted plants under plastic tunnel.

Table 4.2: ANOVA table for the effect of peat and peat substitutes on plant spreadof sweet pepper potted plants under plastic tunnel.

Source of variance	DF	SS	MS	F	P
Treat	9	834.03	92.67	59.2	0.00
Error	20	31.33	1.56		
Total	29	865.37			

The data regarding effect of organic regimes on plant spread is presented in (Figure 2), and the Analysis of Variance (ANOVA) is presented in (Table 4.2). The statistical analysis shows that the plant spread of Sweet pepper hybrid (Excel) was significantly affected by substitution of peat, compost and Traditional practicing media (Figure 2). Maximum plants spread (41.00 cm) was recorded in response to T_9 (1:1:1 ratio peat, compost and Traditional practicing media) while minimum plants spread (23.33 cm) observed in response to T_0 (soil and farmyard manure 2:1 ratio). The interaction effect showed that Sweet pepper hybrid (Excel) subprime in T_9 (1:1:1 ratio peat, compost and Traditional practicing media) attained maximum number of plant spread, while the Sweet pepper hybrid (Excel) in T_0 (peat, compost and Traditional practicing media) showed minimum number of plant spread.

Yield pot^{-1} (gm)

The data regarding effect of organic regimes on yield pot^{-1}is presented in Fig. 3, and the Analysis of Variance (ANOVA)

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is presented in (Table 4.3). The statistical analysis shows that the yield pot^{-1} of Sweet pepper hybrid (Excel) was significantly affected by substitution of peat, compost and Traditional practicing media (Figure 3). Maximum plants yield pot^{-1} (2528.7gm) was recorded in response to T_9 (1:1:1 ratio peat, compost and Traditional practicing media), while minimum plants yield pot^{-1} (1573.0gm) observed in response to T_0 (soil and farmyard manure 2:1 ratio). The interaction effect showed that Sweet pepper hybrid (Excel) subprime in T_9 (1:1:1 ratio peat, compost and Traditional practicing media) attained maximum number of plant height, while the Sweet pepper hybrid (Excel) in T_0 (peat, compost and Traditional practicing media) showed minimum number of plant height. Out results are in line with Gungor et al. (2013), who also observed that peat moss addition improve the quality, yield and growth of pepper.

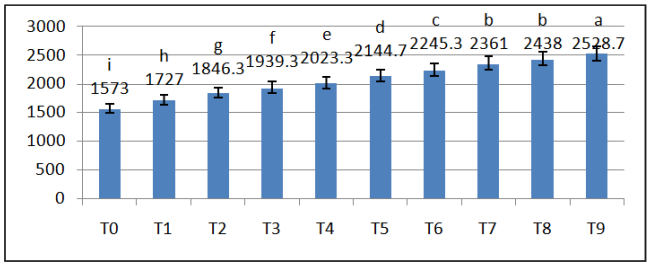

Figure 3 : Effect of peat and peat substitutes on yield pot-1 of sweet pepper potted plants under plastic tunnel.

Table 4.3: ANOVA table for the effect of peat and peat substitutes on yield pot-1 of sweet pepper potted plants under plastic tunnel.

Source of variance	DF	SS	MS	F	P
Treat	9	2697387	299710	129	0.00
Error	20	46594	2330		
Total	29	2743981			

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