 Egypt. J. Hort. **Vol. 47**, No. 2. pp. 193-203 (2020)

Egyptian Journal of Horticulture
https://ejoh.journals.ekb.eg/

Field Performance of Eggplant and Pepper Transplants Raised in Different Potting Media

Mohamed F. Mohamed, Marwa M. Soliman, Mohamed H. Dokashi and Ayman K. Metwally
Department of Vegetable Crops, Faculty of Agriculture, Assiut University, Assiut, 71526, Egypt.

A FIELD experiment was conducted to study the response of vegetative growth and fruit yield of eggplant (*Solanum melongena* L.) cv Classic Roomy and chili pepper (*Capsicum annuum* L.) cv Omega F1 hybrid transplants produced using different growing media. The growing media were the spent mushroom compost and peat moss, in addition to their 1,1 (v/v mixture. The study was conducted in the Vegetable Research Station, Faculty of Agriculture, Assiut University, Assiut during 2016 and 2017. The 40-day-old eggplant and chili pepper transplants were transferred to the open field and arranged as randomized complete-block design. Data recorded on some main growth and yield traits showed no influence of growing media on field productivity of pepper plants. Likewise was the eggplant, except a marginal total yield difference that was in favor of transplants grown in the spent mushroom compost growing media. The increment in fruit weight for eggplant was noticed in one year only for those plants derived from transplants grown in the spent mushroom compost growing medium. These results suggests the feasibility of spent mushroom compost substitution to imported peat moss as growing media for production of eggplant and pepper seedlings and may also be used for other horticultural species.

Keywords : Eggplant, Pepper, Peat moss, Spent mushroom compost, Seedlings growing media, Vegetable seedlings production technology, New media resource.

Introduction

Advances in vegetable transplants production are considered as one of the main technologies that lay behind enhanced production of vegetable crops. High quality transplants can be raised in certain growing media and supplemented with adequate nutrition in facilities under control/semi controlled climatic conditions. Such transplants have shown to be advantageous and usefully influence plant growth and development giving enhanced early and total yields and crop quality (Markovic et al., 1995). Transplants production is the most common practice for vegetables such as tomato, pepper, cucumber and eggplant hybrids. Due to their advantages, there is an increasing demand for the transplants of various vegetables (Kasim et al., 2006) and the use of transplants has increased (Demir et al., 2010). Recently the production of vegetable crops by transplants has been extended to variety of vegetable crops such as okra, cabbage, cauliflower, lettuce and many others.

Seedlings growing media is a crucial factor in production of high quality and ready to grow transplants (Sterrett, 2001). Researchers have given a great attention to study the effects of different seedlings growing media (Rippy et al., 2004, Moldes et al., 2007 and Ostos et al., 2008). Peat is the most widely used growing media for vegetable transplants production in containers since a long time (Ribeiro et al., 2007). Due to the tremendous spread of vegetable production by transplants, there is a consequently increasing

Corresponding author, Mohamed F. Mohamed, E-mail, mofouad@yahoo.com.
(*Received* 29/10/2020, *accepted* 31/12/2020)
DOI. 10.21608/ejoh.2020.46354.1150
©2020 National Information and Documentation Centre (NIDOC)

demand on imported peat, therefore, it is much expensive. Prompting price increases and diminishing availability are occurring as it is a non-renewable resource. There has been an interest in substitution of peat with other locally available growing media (Raviv 1998, Granberry et al., 2001 and Sterrett 2001), using eco-friendly recyclable materials not derived from non-renewable sources such as peat bogs (Handar et al., 1985, Raviv et al., 1986 and Verdock 1988).

Specifications of candidate growing media should include both availability and affordable costs (Demir, 2017). Different types of materials were used as seedlings growing media. Numerous studies have shown that well composted mushroom spent can be used instead of peat (Siminis and Manios 1990, Pryce 1991, García-Gomez and Bernal 2002 and Benito et al. 2005). A huge amount of mushroom spent remains and thrown away after mushroom production process (Mohamed et al., 2020). This by product represents an environmental problem that must be safely discarded. Converting the mushroom spent into growing media has, therefore, a dual benefit. On one side it lessens the dependency on peat, while on the other side it recycles mushroom spent. Composted mixture of cereal straw and manure (poultry and/or horse manure), calcium sulfate, soil and inorganic nutrients (Medina et al., 2009) was reported to be competitive alternative growing media for production of various vegetable seedlings.

Mushroom spent compost may be utilized alone or in mixture with peat moss. Islam et al. (2014) obtained greater plant height, number of leaves/plant, leaf length, leaf breadth, days for curd initiation, crown length, diameter and weight of primary curd/plant, number and weight of secondary curds/plant and total yield of broccoli plants using spent mushroom. Moreover, Peksen and Uzun (2008) founded that the mixture of spent mushroom compost and commercial peat or spent mushroom compost alone can be used as vegetable seedling growing media for both kale and broccoli. Marques et al. (2014) found that top quality lettuce seedlings, high quality marketable heads and quality improvement can be brought about by the addition of spent mushroom substrate. Sönmez et al. (2016) stated that the spent mushroom compost used as growing media for eggplant transplants production, especially aged one, can be used as an alternative to the peat media. In contrast, Lopes et al. (2015) studied the effect of using different proportions of *Agaricus subrufescens* spent compost in tomato seedlings production. They noticed a decrease in all studied parameters including fresh mass of root, size of root and total fresh weight in the production of the tomato seedlings compared to commercial control. In a study conducted by Medina et al. (2009) used different proportions of spent mushroom compost mixed with peat in the production of the tomato, courgette and pepper transplants. They reported that a mixture contained up to 75% of spent mushroom compost blended with peat 25% was adequate for seed germination and growth in these vegetable species.

The current study was conducted to investigate the impact of pure peat moss as a growing media medium in contrast to pure spent mushroom compost and their mixture (1,1, v/v) on growth, yield and quality of eggplant and pepper plants.

Materials and Methods

Plant material and growing media

This study was carried out during 2016 and 2017 in the Vegetable Research Station, Faculty of Agriculture, Assiut University, Assiut Governorate, Egypt. Two organic materials and their mixture at rate of 1,1 (v/v) ratio were examined as seedling growing media. These two materials were oyster (*Pleurotus ostreatus*) spent mushroom compost and the peat moss. Some main chemical properties of the three growing media used in the study are shown in Table 1.

Spent mushroom material was of a rice straw substrate. It was provided by the Mushroom Research Laboratory of the Vegetable Crops Department, Faculty of Agriculture, Assiut University. Spent mushroom compost was prepared utilizing rice straw spent as a base material. The spent mushroom compost was made of chopped rice straw mixed with chicken manure and clay soil (4,1,1, v/v/v) as demonstrated by Mohamed et al. (2016). The mixture was piled up outdoors and kept moistened. The heap was kept for 2 weeks. Then, the pile was turned weekly to provide fresh air and prevent overheating. The composting process continued under these conditions for 12 weeks. Afterwards, mature compost was used as transplants growing media.

The transplants of eggplant and pepper were grown in a local commercial nursery. Eggplant (*Solanum melongena* L.) cv Classic Roomy and chili pepper (*Capsicum annuum* L.) cv Omega F1 hybrid were used in the present assessment. In the local commercial nursery, seeds were sown in 209 cell Styrofoam seedling trays filled with different organic materials utilized as growing media with a capacity of one seed per cell. Then the Styrofoam seedling trays were maintained in the nursery greenhouse and cared by regular practices for 40 days where the transplants became 10 to 12 cm tall. The emerged seedlings were fertilized two times a week with ammonium nitrate (0.5 g/l) phosphorus (1.5 g/l), potassium sulfate and magnesium (1.5 /l).

Transplanting, experiment design and measurements

Well-developed 40-day-old transplants (with 3 or 4 true leaves) were transplanted into the open field on the northern side of 3 m long and 70 cm wide rows at 30 cm apart for pepper and 50 cm apart for eggplant. The soil in the experimental site was clay type. Soil analysis of the experimental site is shown in Table 2. The plants were fertilized with 200 kg NH_4NO_3 (33.5 %N), 300 kg super phosphate (15.5% P_2O_5) and 25 kg potassium sulfate (48% K_2O). NH_4NO_3 was applied at three equal doses (vegetative, flowering and fruit-set stages). The super phosphate was applied at two equal amounts during soil preparation and at plant flowering stage. The potassium sulfate was applied once at fruit-set stage. The analysis of irrigation water (Nile water) quality is shown in Table 3. Two experiments were conducted, one for eggplant and the other for pepper. Each experiment was arrangement as randomized complete-blocks (RCB) with four replicates and each treatment per replicate contained 3 rows. The open field grown eggplant and pepper plants were evaluated in terms of plant height, number of branches/plant, total fruit yield (Mt/feddan), average fruit weight (g) and fruit length (cm). Additionally, the number of leaves/plant and fruit diameter (cm) were recorded for eggplant only.

TABLE 1. The pH value and the content of some nutrient elements of the studies potting materials.

(A)				
Media	**pH**	**Soluble-S (mg/ kg)**	**Total N %**	**Available – P (mg/ kg)**
(Spent mushroom compost (SMC	6.52	259.05	0.3	150
(Peat moss (PM	7.92	147.32	0.6	433.33
SMC/PM) mixture) 1,1	7.82	214.5	0.6	333.33
(B)				
Media		**Available –K (mg/ kg)**	**Total- Fe (mg/ kg)**	**Total – Mg (mg/ kg)**
(Spent mushroom compost (SMC		4562.3	37875	54096.15
(Peat moss (PM		2152.4	57060.4	16833.310
SMC/PM) mixture) 1,1		2900.3	38937.4	19891.53

TABLE 2. Some main physical and chemical characteristics of the soil in the experimental site .

Macro elements ((ppm			**Soluble anions (milliequiva- (lents /100 g soil**			**Soluble cations (mil- (liequivalents /100 g soil**				**Calcium Carbonate %**	**EC**	**pH**
k	**p**	**N**	**SO_4**	**Cl**	**HCO_3**	**K**	**Na**	**Mg**	**Ca**			
432	4.3	15	0.05	0.5	0.5	0.07	0.7	0.5	1	1.6	0.34	7.2

(Micro elements (ppm			
Cu	**Zn**	**Mn**	**Fe**
4	1	14.8	14.2

TABLE 3. Some characteristics of the irrigation water in the experimental site.

Soluble anions (milliequivalents /l)			Soluble cations (milliequivalents /l)				EC	pH
SO_4	Cl	HCO_3	K	Na	Mg	Ca		
1.1	2.5	7.5	0.44	2.7	7.5	2.5	1.43	7.2

Statistical Analysis

Data were statistically analyzed using analysis of variance (ANOVA) procedure for each year separately and homogeneity of error variances was assured. Subsequently, combined ANOVA analysis was tested over the two years (Gomez and Gomez, 1984). Useful mean comparisons were determined through the status of significance of the different total variance partitions. Means were separated using the Least Significance Difference (LSD) test at 0.05 level of probability.

Results

Performance of eggplant

Mean performance of total fruit yield over all harvests that were produced by eggplant using transplants raised employing different growing media is exhibited in Table 4. A significant effect of growing medium existed. The interaction of growing media with years was not significant. Accordingly, the highest total crop yield of eggplant was produced by those plants that were derived from transplants raised in composted mushroom spent growing medium. However, the significance of growing medium effect was merely marginal.

Table 5 shows the means of the fruit yield for each of three harvests in 2016 and four harvests in 2017. In both years a significant effect due to harvest frequency and its interaction with growing media was detected. In 2016, the highest crop yield was produced in the first harvest by eggplant plants derived from transplants raised on composted mushroom spent growing media. No differences were found among the three examined media in the second harvest. The fruit yield of the third harvest was the lowest for eggplant derived from transplants raised on composted mushroom spent growing media. On the other hand, fruit yield was higher for transplants raised in each of peat moss and the mixture media. In 2017, there were no differences among the three examined media for the fruit yield produced in the first harvest. Transplants of eggplant grown on the spent mushroom compost gave the highest yield in the second harvest followed by the mixture medium. While, for the third harvest, transplants of eggplant produced in spent mushroom compost or peat moss had a higher fruit yield. In the fourth harvest, the highest fruit yield was obtained from the transplants of eggplant produced in mixture medium.

The average fruit weight was significantly influenced by the harvest frequency in both years but the medium type only in 2016 (Table 6). The means performance in 2016 revealed a higher fruit weight for eggplant of transplants produced in spent mushroom compost than the other two growing media. The average fruit weight, in 2016, significantly decreased in the third harvest while remained similar in the other two harvests. In 2017, the average fruit weight of eggplant decreased successively in the four harvests. The fruit diameter was also affected by both harvests frequency and its interaction with growing media type in both years of the study (Table 7). As shown by means presentation, no differences in 2016 were detected among various harvest frequencies for each growing media except in the third harvest of transplants raised on the mixture medium. In 2017, significant differences were found in the fourth harvest for spent mushroom compost used as a growing media for transplants production

The fruit length (Table 8) was directed by the effect of harvest frequency in both years and its interaction with growing media only in 2017. Means indicate an existence of a decrease with the progresses of harvest frequency. Accordingly, the least fruit length was obtained from the third harvest. As shown in Table 8, significant differences were found in the third harvest. On the other hand, the greatest fruit length was found with peat moss while, spent mushroom compost and the mixture media were similarly performed. No difference existed for plant height (Table 9) and the number of both branches/plant and leaves/plant regardless the growing media and the harvest frequency.

TABLE 4. Average performance of total fruit yield overall harvests produced by eggplant transplants raised using different nursery potting media in 2016 and 2017.

Nursery potting media	Total fruit yield Mt/feddan)(2)		
	2016	2017	Mean
Spent mushroom compost (C)	27.113	32.252	29.682 a (1)
Peat moss (P)	26.620	28.402	27.511 b
Mixture 1,1 (C/P) v/v	25.065	29.693	27.379 b
Mean	26.266	30.115	

(1) Means within column followed by the same letter(s) are not significantly different at 0.05 probability level using the Least Significant Difference test (LSD).

TABLE 5. Average performance of total fruit yield for every harvest produced by eggplant transplants raised using different nursery potting media in 2016 and 2017.

Potting media	Total fruit yield (Mt/feddan) 2016 (3)				
	1st Harvest	2 nd Harvest	3 rd Harvest		Mean
Spent mushroom compost (C)	12.202 a (1)	9.510 a	5.450 b		9.054
Peat moss (P)	8.797 b	9.580 a	8.260 a		8.879
Mixture 1,1 (C/P) v/v	9.540 b	9.243 a	6.298 a		8.360
Mean	10.180	9.444	6.669		
$LSD_{0.05}$(2) = 2.06					
Potting media	**2017(3)**				
	1st Harvest	2 nd Harvest	3 rd Harvest	4 th Harvest	Mean
Spent mushroom compost (C)	10.10a(1)	9.807a	6.682a	5.669b	8.064
Peat moss (P)	9.480a	7.095c	6.595a	5.235b	7.101
Mixture 1,1 (C/P) v/v	9.406a	8.698b	5.252b	6.344a	7.425
Mean	9.662	8.533	6.176	5.749	
$LSD_{0.05}$(2) = 0.70					

(1) Means within column followed by the same letter(s) are not significantly different at 0.05 probability level using the Least Significant Difference Test (LSD).
(2) To compare means within the same row.
(3) Variance for the interaction of potting media and harvest frequency was significant.

TABLE 6. Mean performance of average fruit weight for every harvest produced by eggplant when the transplants were raised using different nursery potting media in 2016 and 2017.

Potting media	(A) Average fruit weight (g) 2016(2)				
	1st Harvest	2 nd Harvest	3 rd Harvest		Mean
Spent mushroom compost (C)	516.000	514.375	354.825		461.733 a(1)
Peat moss (P)	455.075	444.675	241.950		380.567 b
Mixture 1,1 (C/P) v/v	451.525	476.125	269.400		399.017 b
Mean	474.20 A (1)	478.392 A	288.725 B		
Potting media	**2017(2)**				
	1st Harvest	2 nd Harvest	3 rd Harvest	4 th Harvest	Mean
Spent mushroom compost (C)	319.975	232.750	207.275	178.250	234.562
Peat moss (P)	340.925	258.800	226.550	172.150	249.606
Mixture 1,1 (C/P) v/v	369.025	272.000	199.675	145.575	246.569
Mean	343.31A(1)	254.517 B	211.16 C	165.325 D	

(1) Means followed by small letters within the same column and those followed by the same capital letter(s) within same row are not significantly different at 0.05 probability level using the Least Significant Difference Test (LSD).

TABLE 7. Mean performance of average fruit diameter for every harvest produced by eggplant when the transplants were raised using different nursery potting media in 2016 and 2017.

Potting media	(A) Average fruit diameter (cm)				
	2016[2]				
	1st Harvest	2 nd Harvest	3 rd Harvest		Mean
Spent mushroom compost (C)	36.450 a[1]	34.325 a	27.000 a		32.592
Peat moss (P)	34.525 a	33.400 a	31.875 a		33.267
Mixture 1,1 (C/P) v/v	36.975 a	33.850 a	22.250 b		31.025
Mean	35.983	33.858	27.042		
$LSD_{0.05}$[4] = 5.57					
	2017[2]				
Potting media	1st Harvest	2 nd Harvest	3 rd Harvest	4 th Harvest	Mean
Spent mushroom compost (C)	29.45 a[1]	28.725 a	23.550 a	27.325 a	27.262
Peat moss (P)	28.800 a	29.525 a	29.250 a	20.975 b	27.137
Mixture 1,1 (C/P) v/v	30.125 a	26.575 a	26.975 a	21.675 b	26.337
Mean	29.458	28.275	26.592	23.325	
$LSD_{0.05}$[4] = 4.84					

[1] Means followed by small letters within the same column are not significantly different at 0.05 probability level using the Least Significant Difference Test (LSD).
[2] Variance for the interaction of potting media and harvest frequency was significant.
[4] To compare means within the same row.

TABLE 8. Mean performance of fruit length for every harvest and plant height and both leaf and branches number for eggplant when the transplants were raised using different nursery potting media in 2016 and 2017[1].

Potting media	Average fruit length (cm)				
	2016				
	1st Harvest	2 nd Harvest	3 rd Harvest		Mean
Spent mushroom compost (C)	15.925	12.900	8.825		12.550
Peat moss (P)	16.825	14.200	9.775		13.600
Mixture 1,1 (C/P) v/v	15.650	13.200	8.025		12.292
Mean	16.133 A[1]	13.433 B	8.875 C		
	2017				
Potting media	1st Harvest	2 nd Harvest	3 rd Harvest	4 th Harvest	Mean
Spent mushroom compost (C)	13.80 a[1]	11.525 a	9.900 b	10.500 a	11.431
Peat moss (P)	13.525 a	13.000 a	13.175 a	9.700 a	12.350
Mixture 1,1 (C/P) v/v	13.575 a	13.325 a	9.800 b	9.925 a	11.656
Mean	13.633	12.617	10.958	10.042	
$LSD_{0.05}$[5] = 1.59					

[1] Means followed by small letters within the same column and those followed by the same capital letter(s) within same row are not significantly different at 0.05 probability level using the Least Significant Difference Test (LSD).
[2] To compare means within the same row.

TABLE 9. Mean performance of plant height and both leaf and branches number for eggplant when the transplants were raised using different nursery potting media in 2016 and 2017[(1)].

Potting media	Plant height (cm)		
	2016	**2017**	Mean
Spent mushroom compost (C)	75.200	78.250	76.725
Peat moss (P)	73.225	76.900	75.062
Mixture 1,1 (C/P) v/v	73.375	71.675	72.525
Mean	73.933	75.608	
Significance	ns[(1)]	ns	
	Number of branches/plant		
Potting media	**2016**	**2017**	Mean
Spent mushroom compost (C)	3.350	4.725	4.038
Peat moss (P)	3.425	4.200	3.812
Mixture 1,1 (C/P) v/v	3.800	4.525	4.163
Mean	3.525	4.483	
Significance	ns	ns	
Nursery potting media	**Number of leaves/plant**		
	2016	**2017**	Mean
Spent mushroom compost (C)	32.125	37.025	34.575
Peat moss (P)	32.600	40.650	36.625
Mixture 1,1 (C/P) v/v	30.750	39.400	35.075
Mean	31.825	39.025	
Significance	ns	ns	

(1) Insignificant

Performance of pepper

Mean performance of total fruit yield, average fruit weight, fruit length, plant height and the number of branches are exhibited in Tables 10 and 11. As shown by the year based individual ANOVA, there were no significant effects due to growing media of the transplants on any of the studied traits. The error variance of the separate year ANOVA for various traits showed a clear homogeneity. Subsequent combined ANOVA over years in the different traits displayed no significant effects due to growing media or its interaction by years (seasons). This suggests similar season trends of response to the non-influential growing medium treatments.

Discussion and Conclusion

Exploiting renewable resources of growing media materials is a key issue for high quality transplants and crop production in containers. Traditionally, peat moss has been an excellent widely utilized substrate for potted culture. However, it is a non-renewable natural resource and additionally there is an environmental concern on its utilization (Sendi et al., 2013). Furthermore, diminishing its reserves has led to price increases. Researchers have, therefore, given a great and renewable interest to find out alternative growing materials. In this study, oyster mushroom (*Pleurotus ostreatus*) spent was evaluated as a growing substrate that may replace peat moss (PM) for the transplants production in eggplant (*Solanum melongena* L.) and pepper (*Capsicum annuum* L.). Use of spent mushroom wastes as a substrate component will certainly contribute to their disposal in an environment friendly way and will simultaneously reduce dependence on peat moss. The seedlings growth media used here showed that pH was 6.52 for spent mushroom compost (SMC) while 7.92 and 7.82 for the peat moss and SMC/PM 1,1 (v/v) mixture, respectively. However, total nitrogen (N) and available phosphorus appeared much lower in SMC than in PM and SMC/PM mixture. On the other hand, potassium and sulfur were appreciably high in SMC. The current data are largely in line with those reported by others (Eudoxie and Alexender, 2011, Sendi et al., 2013), where macronutrients, P and K were found higher in SMC than PM, while N and Ca were higher in PM than in SMC.

TABLE 10. Average performance of fruit total yield and fruit weight of pepper plants when the transplants were raised using different nursery potting media in 2016 and 2017 [(1)].

Potting media	Total fruit yield (kg/feddan)		
	2016	2017	Mean
Spent mushroom compost (C)	1798.000	2081.500	1939.750
Peat moss (P)	1775.750	1976.000	1875.875
Mixture 1,1 (C/P) v/v	1839.500	2147.250	1993.375
Mean	1804.417	2068.250	
Significance	ns[(1)]	ns	
Potting media	**Average fruit weight (g)**		
	2016	**2017**	Mean
Spent mushroom compost (C)	5.150	5.700	5.425
Peat moss (P)	5.425	5.500	5.462
Mixture 1,1 (C/P) v/v	5.425	5.550	5.487
Mean	5.333	5.583	
Significance	ns[(1)]	ns[(1)]	

[(1)] Insignificant

TABLE 11. Average performance of fruit length, plant height and number of branches produced by pepper plants when the transplants were raised using different nursery potting media in 2016 and 2017 [(1)].

Potting media	Fruit length (cm)		
	2016	2017	Mean
Spent mushroom compost (C)	4.525	5.350	4.938
Peat moss (P)	4.350	5.100	4.725
Mixture 1,1 (C/P) v/v	4.175	4.850	4.513
Mean	4.350	5.100	
Significance	ns[(1)]	ns [(1)]	
Potting media	**Plant height (cm)**		
	2016	**2017**	**Mean**
Spent mushroom compost (C)	44.875	46.200	45.537
Peat moss (P)	44.025	42.922	43.474
Mixture 1,1 (C/P) v/v	46.925	46.250	46.587
Mean	45.275	45.124	
Significance	ns[(1)]	ns[(1)]	
Potting media	**Number of branches per plant**		
	2016	**2017**	**Mean**
Spent mushroom compost (C)	4.700	4.575	4.638
Peat moss (P)	4.525	5.050	4.787
Mixture 1,1 (C/P) v/v	4.325	4.675	4.500
Mean	4.517	4.767	
Significance	ns[(1)]	ns[(1)]	

(1) Insignificant

Undeniably, nutrient status of a growing media depends on the base material. The SMC used in the present study was rice straw based material. Sendi et al. (2013) used rubber sawdust based spent mushroom (*Pleurotus sajor-caju*). They suggested that one of the reasons for poor nitrogen (N) in the medium was the rubber sawdust. As wood products can tie up N and cause nitrogen deficiency in plants. Furthermore, the microorganisms in the soil use nitrogen to break down the wood and instead of the nitrogen going to the plant, it goes to the bacteria (Sendi et al., 2013). Generally, researchers largely agree on the notion that spent mushroom compost (SMC) may not be used alone as growing media due to its inadequate nutrient content and, therefore, supplements of NPK fertilizers is highly recommended. In this context, aged SMC is superior to short time composted ones (Handar et al., 1985, Sönmez et al., 2016).

According to Munita (2001), primary nutrients like nitrogen, phosphorus, and potassium as well as secondary elements like Ca and Mg are more available at pH 5.5–6.5 for organic and mineral substrates. With the increasing pH, the solubility of many nutrients is reduced and some nutrients are precipitated as solid materials that plant cannot use (Altland, 2006). It has been reported that high salinity of SMC limits its use as successful growing media (Castillo et al. 2004, Eudoxie and Alexender, 2011). The employment of a mixture between PM and SMC can reduce EC and pH values. In our study, however, no abnormality was noticed among transplants produced regardless of the growing media used. This may be attributed to the application of macro- and micro elements fertilizer amendments before seed planting and during seedling development in the growing media (Medina et al., 2009). Also, the transplants were grown in an open field soil that had suitable EC, pH and microelements while NPK macro elements were supplemented (Idowu and Kadiri, 2013). Medium that contains an adequate balanced supply of nutrients is essential for plants to attain potential growth and crop outcome. Here, there was no significant difference found among pepper plants in plant height and number of branches/plant and each of the fruit yield, average weight and length. Significance was detected in one season only for the average fruit weight in eggplant. An appreciable difference was exhibited for total fruit yield in the combined analysis of variance over the two growing seasons. Such difference was not found in the individual analysis of variance conducted for each season separately. Most likely, this resulted as the consequence of the increased degrees of freedom in the combined analysis of variance. None of the studied growth (plant height, number of branches/plant and the number of the leaves/plant), crop yield and fruit characteristic (fruit weight, diameter and length) were affected.

In conclusion, it seems feasible to replace peat moss partially or completely by spent mushroom compost as a growing media for eggplant and pepper transplants production. It is also suggested that spent mushroom waste may be further exploited as a potential nursery growing medium possibly through amendment of essential nutrient elements in the formulation.

Acknowledgment: The authors would like to deeply appreciate the support provided by the Faculty of Agriculture, Assiut University, Egypt.

Funding statements: The authors received no external funding for this study.

Conflict of interest: The authors declare that they have no conflict of interest.

References

Altland, J.E. (2006) Substrate pH, a tricky topic. *Digger,* **50**, 42–47.

Benito, M., Masaguer, A., De Antonio, R., and Moliner. A. (2005) Use of pruning waste compost as a component in soil-less growing media, *Bioresource Technology,* **96**, 597–603.

Castillo J.E., Herrera, F., López-Bellido, R.J., López-Bellido, F. J., López-Bellido, L., and Fernández, E.J. (2004) Municipal solid waste (MSW) compost as a tomato transplant medium, *Compost Science and Utilization,* **12**, 86–92.

Demir, H., Polat E, Sönmez İ, Yılmaz E. (2010) Effects of different growing media on seedling quality and nutrient contents in pepper (*Capsicum annuum* L. var. *longum* cv. Super Umut F1), *Journal of Food, Agriculture & Environment,* **8**(3&4), 894-897.

Demir, H. (2017) The effects of spent mushroom compost on growth and nutrient contents of pepper seedlings, *Mediterranean Agricultural Science,* **30**(2), 91-96.

Eudoxie, G.D. and Alexender, I.A. (2011) Spent mushroom substrate as a transplant media replacement for commercial peat in tomato seedling production, *Journal of Agricultural Science,* **3**,41–49.

Garcia-Gómez A and Bernal R.A. (2002) Growth of ornamental plants in two composts prepared from agroindustrial wastes, *Bioresource Technology,* **83**, 81–87.

Gomez, K.A. and Gomez, A.A. (1984) *Statistical procedures for Agricultural Research.* 2nd ed. John Wiley & Sons, NY. 680 p.

Granberry D.M., Kelley, W.T., Langston, D.B., Diaz-Perez, J.C., Rucker, K.S. (2001) Testing compost value on pepper transplants, *Biocycle,* 42(10), 60–62.

Handar, Y., Inbar, Y. and Chen, Y. (1985) Effects of compost maturity on tomato seedling growth, *Scientia Horticulturae,* **27***,* 199–208.

Idowu, O. O. and. Kadiri, M. (2013) Growth and yield response of okra to spent mushroom compost from the cultivation of *Pleurotus ostreatus* an edible mushroom, *Academic Journal of Agricultural Research,* **1***,*39–44.

Islam, Md. M., Kaium, A., Shahriar, S., Hossain, Md. E., Amin, R., Islam, Md. S., bin Zaher, Md. A and Nizam R. (2014) Growth and Yield Potential of Broccoli Influenced by Organic Manures, *Bangladesh Research Publications Journal,* **10**(2), 145-150.

Kasim, M.U., Kasim, R., Caand O. (2006) Basic Principles of Vegetable Culture. *Kocaeli Universty. Press.Public.No. 220 of 222, Kocaeli, Turkey.*

Lopes, R.X., Zied, D.C., Martos, E.T., de Souza, R.J., da Silva, R., Dias, E, and quio, S. (2015) Application of spent *Agaricus subrufescens* compost in integrated production of seedlings and plants of tomato, *International Journal of Recycling of Organic Waste in Agriculture,* **4**, 211–218.

Markovic, V., Takac, A. and Ilin, Z. (1995) Enriched zeolite as a substrate component in the production of pepper and tomato seedlings. *Acta Horticulturae,* **396**, 321-328.

Marques, E.L.S., Martos, E.T., Souza, R.J., Silva, R., Zied, D.C. and Souza, D. E. (2014) Spent mushroom compost as a substrate for the production of lettuce seedlings. *Journal of Agricultural Science,* **6**(7), 138-143.

Medina, E., Paredes, C., Pérez-Murcia, M.D. Bustamante, M.A. and Moral, R. (2009) Spent mushroom substrates as component of growing media for germination and growth of horticultural plants, *Bioresource Technology* **100**, 4227-4232.

Mohamed, M.F., Hamed, H.A., El-Shaikh, Kh. A.A. and Hosseny, M.H. (2020) Upcycling of oyster mushroom spent through reuse as substrate in sequential production cycles of mushroom, *Egypt. J. Hort.* **47**(1), 69-79.

Mohamed, M.F., Refaei, E.F.S., Abdalla, M.M.A., Abdelgalil, S.H. 2016. Fruiting bodies yield of oyster mushroom (*Pleurotus columbinus*) as affected by different portions of compost in the substrate, *Int. J. Recycl Org. Waste Agric.* **5**,281–288.

Moldes, A., Cendon, Y. and Barral, M.T. (2007) Evaluation of municipal solid waste compost as a plant growing media component by applying mixture dosing, *Bioresource Technology,* **98**, 3069-3075.

Munita, J. J. (2001) Characteristics and classification of soils, in Chemical and Mining Company of hile, 11th ed. Santiago, Chile.

Ostos, J.C., Lopez-Garrido R, Murillo, J.M., Lopez, R. (2008) Substitution of peat for municipal solid waste and sewage sludge-based composts in nursery growing media, Effects on growth and nutrition of the native shrub *Pistacia lentiscus* L. *Bioresource Technology* **99,** 1793-1800.

Peksen, A and Uzun, S. (2008) Effect of chemical compositions of seedling media prepared by spent mushroom compost on seedling growth and development of Kale and Broccoli. *Asian Journal of Chemistry,* **20**(4),3002-3008.

Pryce, S. (1991) Alternative to peat. *Professional Horticulturae* **5**, 101–106.

Raviv, M., Chen, Y. and Inbar, Y. (1986) Peat and peat substitutes as growth media for container-growth plants. In, Chen, Y. and Avnimelech, Y. (Eds.), The Role of the organic matter in modern agriculture. Martinus NijhoV Publishers, Dordrecht, pp. 257–287.

Raviv, M. (1998) Horticultural uses of composted material. *Acta Horticulturae* **469,** 225–234.

Ribeiro, H.M., Romero, A.M., Pereira, H., Borges, P., Cabral, F. and Vasconcelos, E. (2007) Evaluation of a compost obtained from forestry wastes and solid phase of pig slurry as a substrate for seedlings production. *Bioresource Technology,* **98**, 3294–3297.

Rippy, J.F.M., Peet, M.M. Louws, F.J., Nelson, P.V., Orr, D.B. and Sorensen, K.A. (2004). Plant development and harvest yields of greenhouse tomatoes in six organic growing systems. *HortScience,* **39**, 1-7.

Sendi, H., Mohamed, M.M.T.M., Anwar, P. and Saud, H. M. (2013) Spent mushroom waste as a media replacement for peat moss in Kai-Lan (*Brassica oleracea* var. Alboglabra) production. The Scientific World Journal, Vol 2013, Article ID 258562, 8 pages http,//dx.doi.org/10.1155/2013/258562.

Siminis, H.I. and Manios, V.L. (1990) Mixing peat with MSW compost. *Biocycle (Nov),* 60–61.

Sönmez, I., Kalkan, H. and Demir, H. (2016) Effects of spent mushroom compost on seedling quality and nutrient contents of eggplant (*Solanum melongena*) grown in different growing media., *Acta Horticulturae, Proceedings of the VI Balkan Symposium on Vegetables and Potatoes,* **1142,** 403-408.

Sterrett, S.B. (2001) Compost as horticultural substrates for vegetable transplant production. In, StoVella, P.J., Kahn, B.A. (Eds.), Compost utilization in horticultural cropping systems. *Lewis Publication, Boca Raton, FL, pp.* 227–240.

Verdock O. 1988. Compost from organic waste materials as substitutes for the usual horticultural substrates. *Biological Wastes,* **26**, 325–350.

الأداء الحقلي للشتلات المنتجة على بيئات مختلفة في الباذنجان والفلفل

محمد فؤاد محمد ، مروه محمد سليمان ، محمد حمام الدقيشى و ايمن قطب متولى
قسم الخضر - كلية الزراعه – جامعة اسيوط – اسيوط ٧١٥٢٦ - مصر.

أجريت هذه الدراسة في الموسم الصيفي لعامي ٢٠١٦ و ٢٠١٧ بالمزرعة البحثية لقسمالخضر بكلية الزراعة جامعة أسيوط ، وذلك بهدف التعرف على استجابة شتلات الباذنجان والفلفل التي زرعت ونميت في صواني فوم على بيئات مختلفة ، شملت البيتموس (كنترول) ، كمبوست (بقايا بيئات زراعة عيش الغراب المحاري) . وكذلك خليطهما بنسبة ١,١ حجماً وبعد بلوغ الشتلات متوسط طول حوالى ١٠ سم أى بعد حوالى ٤٠ يوم من زراعة البذرة بالصوانى تم شتلها بالحقل المفتوح وسجلت بيانات بعض صفات النمو والمحصول ومكوناته وقد اظهرت النتائج عدم وجود تأثير معنوي لاختلاف البيئات في صواني الشتلات على كل الصفات التي درست في الفلفل ، وكان الباذنجان كذلك فيما عدا حدوث زيادة طفيفة بالمحصول الكلي وربما يرجع ذلك لتأثير معاملة كمبوست بقايا بيئة نمو عيش الغراب المحاري وظهور تأثير مماثل بمتوسط وزن الثمرة ولكن في عام واحد فقط. وحيث انه لم يتم مشاهدة اي تفوق للبيتموس على الكمبوست الخاص بعيش الغراب المحاري ، فقد يكون من الممكن استبدال البيتموس بكمبوست مخلفات زراعة عيش الغراب في إنتاج شتلات الباذنجان والفلفل ، وقد تصلح هذه البيئة أيضا لأنواع بستانية أخرى وذلك لمواجهة شح البيتموس وارتفاع أسعاره نظرا لأنه من المصادر الطبيعيه غير المتجدده وتستورد من الخارج.