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STUDIES ON USING DIFFERENT SUBSTRATE MIXES FOR PRODUCING GREEN ONION ON THE ROOF

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ABSTRACT

This study was carried out on the roof of the Arid Land Agricultural Graduate Studies and Research Institute (ALARI), Faculty of Agriculture – Ain–Shams University, Shobra El- Khima, Cairo, Egypt., during 2007and 2008. Green onion (*Allium cepa*) cv. Giza 20 was used in this study. Green onion transplant planted on 15th of February in 2007 and 2008 both seasons into horizontal containers (capacity 12L) were made from soft wood as 58 plant/ container. The final plant spacing was 5 cm in the row and 5 cm between rows. Five substrates mixes were used in this study as follows: perlite, mixture of sand and rice husk (1:1 v: v), mixture of sand and peanut chills (1:1 v: v), mixture of sand and rice husk and peanut chills (1:1:1v: v: v) and mixture of peat moss perlite (1:1v: v) were tested. Plant height, number of leaves/plant, bulb diameter and total yield, total chlorophyll, fiber, total carbohydrate and NPK percentage were recorded. The obtained results showed that rice husk: sand (1:1 v/v) substrate mixture gave the highest total yield this was reflected from the best vegetative growth characters as number of leaves, plant height and bulb diameter. On the other hand, the lowest vegetative growth characters and total yield were obtained using peanut chills: sand (1:1 v/v) substrate mixture comparing with the other treatments. Sand: rice husk: peanut chills (1:1:1 v/v/v) mixture substrate gave the highest N percentage in the green onion plants. There was no significant difference among all treatments regarding P and K percentages as well as chlorophyll reading in green onion plant. Using sand and peanut chill (1:1 v/v) gave the highest percentage of fiber than the other

treatments, the lowest value were recorded in peat moss and perlite (1:1 v/v) treatment.

Keywords: roof garden, green onion, substrate mixes, sand, perlite, peat moss, peanut chills, rice husk

INTRODUCTION

Onions are poor competitors against weeds because it takes a long time for them to achieve ground cover. Hand weeding can be very destructive to the root system of onions. Therefore, proper selection of effective pre-emergent and post emergent herbicides is available. Abdalla (1992) reported that onion production has suffered serious problems that are most due the infection with white and neck rot diseases. And the reductions in onion export. El-Gamili (1996) reported that onion is one of the most important vegetable crops grown in Egypt, the government is pressing hard to increase the tonnage of onion bulbs produced to meet the rapid increase in world demand and local consumption. The yield of onion bulbs could be increased by increasing the onion plant population per unit area to increase the competition between the economic plants, i.e., onion and the associated weeds with governing the efficiency of economic plants in absorbing nutrients and utilizing solar energy. Barakat, (2002) reported that there are decrease in onion exports which is likely due to the reduction in onion growing area, total yield per feddan and bulb quality. In A.R.E., hand holding is still the main method for weed control. However, due to the acute shortage of manpower, and to increases the plant density, the chemical control become an urgent need. Numerous chemicals have been used in recent years to control the weeds in onion plants. Onions exhibit greater susceptibility to weed competition than other crops. (Shaheen and El-Habbasha, 1985) Hideo Ikeda (2007) reported that soilless culture is the most environment- friendly technique, because it can decrease the use of chemical pesticides and realize the efficient use of natural resources and is a low load cultural system to the soil. Environmental concerns intensified in the UK and some organizations have announced anti-peat measures although these groups have sized on the opportunity provided by these proposals to further their case against peat use. So the environment lobby in UK has stimulated research into alternatives to peat. Proposal has also been made that producers of growing media

may examine other potential sources of peat (Carlile, 2004). Rice husks are available at low cost in most areas and are light in weight. Rice husks contain SiO_2, many pores and have high stability as a growing medium (Kang *et al.*, 2004).

Therefore the aim of this study was to determine the best substrate mix suitable for green onion production on the roof.

MATERIALS AND METHODS

This study was carried out on the roof of the Arid Land Agricultural Graduate Studies and research Institute (ALARI), Faculty of Agriculture – Ain Shams University, Shobra El- Khima, Cairo, Egypt, during 2007 and 2008. Green onion (*Allium cepa*) cv. Giza 20 was used in this study. The study was conducted in the open field. Transplants were planted during the second week of February in both 2007 and 2008 seasons. Onion seeds were sown in the nursery, 60 day before transplanting. Horizontal containers (capacity 12L) made from soft wood 58 plants for each container. The final plant spacing was 5 cm in the row and 5 cm between the rows. Five substrates were used in this study as follows: perlite (Pr) (control), mixture of sand and rice husk (1:1v: v) (SRh), mixture of sand and peanut chills (1:1v: v) (SPn), mixture of sand and rice husk and peanut chills (1:1:1v: v: v) (SRhPn) and mixture of peat moss perlite (1:1v: v) (PePr). The nutrient solution used in this experiment was as described by El-Behairy (1994). The electrical conductivity of the nutrient solution was adjusted between 2 to 2.2 $mS.cm^{-1}$ and the pH was adjusted to 5.5- 6 by using HNO_3. At the end of the season (after 60 days from planting) recorded data were: plant height, number of leaves/plant, bulb diameter, total yield, total chlorophyll in the green onion plants measured using Minlolta chlorophyll meter (SPAD- 501), fibers (determined on dry weight basis according to A.O.A.C., 1984), The total carbohydrate (determined on dry weight basis according to Mgnetski *et al.*, 1959) and N,P and K percentages were determined in green onion plants as described in A.O.A.C., (1975)

The collected data were analyzed using ANOVA statistical analysis as described by Snedecor and Cochran (1980). Means between treatments were compared by LSD method.

RESULTS AND DISCUSSION

Results

Effect of different substrate mixes on vegetative growth characteristics and total yield of green onion plants is presented in Table (1). Data showed that using rice husk: sand (1:1 v/v) gave the highest number of leaves, plant height, bulb diameter and total fresh yield comparing with the other treatments. The lowest results were obtained using sand mixed with peanut chills. The differences among the treatments were significant. On the other hand, using the other substrate except sand mixed with rice husk reduced all vegetative growth and yield characters. Similar trends were obtained in the second season.

Effect of substrate mixes on the chemical composition of green onion is illustrated in Table (2). Data showed that using SRhPn mix increased N percentage in the onion leaves comparing with control. On the other, using the other substrates reduced N percentage in the leaves comparing with control. Regarding P percentage, K percentage and chlorophyll percentage, data in Table (2) showed that there were no significant differences among all the treatments. Regarding carbohydrates percentage, data showed that using SRh and SPn gave higher carbohydrates percentage comparing with control, in the first season. On the contrary, using PePr and SRhPn mixes reduced carbohydrates percentage comparing with the other treatments in both seasons. Concerning fiber percentage data showed that using all substrates increased fiber percentage comparing with control. On the other hand, using SPn mix gave the highest fiber percentage followed with SRhPn mix comparing with the other treatments.

Table (1): Effect of different substrate mixes on vegetative characteristics and total yield of green onion plants.

Treat.	No. Leaves/ plant	Plant Height(cm)	Bulb Diameter(cm)	Total yield(F.W) Kg/m2
		First Season		
Pr	6.22	38.67	2.15	7.40
SRh	6.67	39.11	2.50	10.84
PePr	5.44	35.11	2.00	6.37
SPn	4.89	30.00	1.50	5.28
SRhPn	5.44	33.56	2.13	6.37
L.S.D	0.36	0.41	0.005	0.62
		Second Season		
Pr	6.00	38.44	2.10	7.50
SRh	6.78	39.00	2.17	10.94
PePr	5.33	34.78	1.90	6.47
SPn	4.89	30.00	1.50	5.38
SRhPn	5.69	33.56	1.96	6.47
L.S.D	0.26	0.64	0.005	0.62

Table (2): Effect of different substrate Mixes on chemical composition of green onion plants.

Treat.	N%	P%	K%	Carbohydrate%	Fibers%	Chlorophyll%
			First season			
Pr	2.03	0.58	3.53	15.38	7.50	62.56
SRh	1.96	0.57	3.51	16.28	9.30	59.33
PePr	1.96	0.66	3.53	12.21	8.21	62.89
SPn	1.94	0.51	3.45	15.38	10.54	60.89
SRhPn	2.10	0.57	3.57	13.14	10.16	59.22
L.S.D	0.03	N.S	N.S	0.005	0.065	N.s
			Second Season			
Pr	2.05	0.54	3.41	16.28	7.50	58.78
SRh	1.96	0.59	3.31	16.28	8.11	60.22
PePr	1.96	0.66	3.28	12.21	8.69	59.44
SPn	1.96	0.55	3.39	16.28	10.71	61.78
SRhPn	2.24	0.60	3.73	14.92	10.14	58.78
L.S.D	0.024	N.S	N.S	0.005	0.013	N.S

Discussion

From the overall results, it is clear that using the rice husk: sand (1:1 v/v) substrate produced more total yield and higher green onion quality comparing with the other treatments. This could be a result of improving the growing conditions in the root zone resulted from better physical and chemical properties of the growing media which increase water and nutrient uptake. The raw materials are calibrated in different fractions before being used in mixtures, by using two different materials we can make growing media with higher volume of air and with the same water availability (Verdonck and Demeyer, 2004). Rice husk is a promising cheap, mixable matrial with high cation exchange and water holding capacities and is used in soilless culture techniques which are sterile (Inden and Torres, 2004). Rice husk has a good aeration and a good drainage can improve it's water holding by mix it with sand, the air capacity is also markedly lowered by fine sand (Willson, 1985) It was also found that high yield was obtained from peanut chills substrate when mixed it with sand which improved the physical and chemical characters of peanut chills. perlite is very porous, has a strong capillary action and can hold 3-4 times its weight of water. The most commonly used grade has 1.5 to 3.0 mm in diameter and a weight of 80-100 kg/m^3. perlite substrates, or mixtures containing perlite as a major component, are therefore well drained and well aerated (Olympios, 1992). All these characters of perlite made it a suitable substrate for producing green onion. Peat is often mixed with another media in order to save it since it is in shortage, or to increase water conductivity of the substrate, its wetable and bulk density (Strojny and Nowak, 2004)

Conclusion

From the results of this work, it can be concluded that mixing sand with rice husks can be a good substrate for producing high yield and quality of green onion on the roof.

REFERENCES

A.O.A.C, 1984. Official method of analysis of the association of official analytical chemists, verginia, USA.

Abdalla, G. Abdalla. 1992. Effect of soil moisture stress and nitrogen fertilization on onion plant. Ph. D thesis, faculty of agriculture, Ain shams university p:156.

Barakat, S.A.M. 2oo2. Effect of some fertilizer treatments and harvesting dates on yield and quality of onions and It's relation to efficiency of experimental designs. Ph. D thesis, faculty of agriculture, Ain Shams university p:126.

Carlile, W.R. 2004. Growing media and the environment lobby in the UK 1997- 2001. acta hort. 644: 107- 113.

El-Behairy, U.A. 1994. The effect of levels of phosphorus and zinc in the nutrient solution on macro and micronutrients uptake and translocation in cucumber (*Cucumus sativus L.*) grown by the nutrient film technique. Ph.D thesis , London university p:2990

El- Gamili, A.E. 1996. Onion bulb production as spacing between rows (plant density). Menofiya J. agric. res. 21 (5): 1323-1330.

Hideo Ikeda, 2007. Environment- friendly soilless culture and fertigation technique. acta hort. (ISHS) 761: 363-369.

Inden, H. and A.Torres. 2004. Comparison of four substrates on the growth and quality of tomatoes. acta hort. (ishs) 644: 205-210.

Kang, J.Y.; H.H. Lee and K.H. Kim, 2004a. Physical and chemical properties of organic horticultural substrate used in Korea. acta hort. 644: 231-235.

Mgnetski, K.P.; Y.A. Tsugarov and B.K. Malkov. 1959. New method for plant and soil analysis. agricultural academy press manometric techniques. u.m.p., bell burris Stauffer. (C.F. Khalil, M.A.I. Ph.D. thesis. Fac. Agric., Zagazig univ., 1982).

Olympios, C.M., 1992.Soilless media under protected cultivation rockwool, peat, perlite and other substrate. acta hort. 323: 215-234.

Strojny, Z. and J.S. Nowak. 2004. Effect of different growing media on the growth of some bedding plants. acta hort. (ishs) 644: 157-162.

Snedecor R.G. and W.G.Cochran 1980. Statistical methods. sixth edition, iowa state univ.press , ames.lowa, USA, 689 pp

Shaheen, A.M. and K.M. El-Habbasha. 1985. Weed control and plant population for bulb yield of onion (Allium cepa L.). Egypt. J. Hort. 12(2): 131-141.

Verdonck, O. And P. Demeyer, 2004. The infuence of the particle sizes on the physical properties of growing media. acta hort. 644: 99- 101.

Wilson, G.C.S., 1985. Effects of additives to peat on the air and water capacity. acta hort. 172: 207-209.

دراسات على استخدام خلطات من البيئات لإنتاج البصل الأخضر فوق الأسطح

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أجريت هذه التجربة فوق اسطح مبانى مزرعة معهد الدراسات العليا والبحوث للزراعة في المناطق القاحلة- كلية الزراعة – جامعة عين شمس- شبرا الخيمة- جمهورية مصر العربية- تحت ظروف الحقل المكشوف خلال موسمى ٢٠٠٧و ٢٠٠٨ وذلك لدراسة تاثير استخدام خلطات من البيئات لأنتاج البصل الأخضر . وقد تم إستخدام صنف جيزة ٢٠ وتمت زراعة الشتلات فى صناديق من الخشب الناعم وذلك فى ١٥ فبراير ٢٠٠٧و ٢٠٠٨ فى كلا الموسمين وتم زراعة النباتات على مسافات 5 سم بين النباتات داخل الصف و 5 سم بين الصفوف حيث تم إختيار خمس بيئات هى : (١) بيرليت، (٢) خليط من البرليت والبيتموس ١ : ١ حجماً ، (٣) خليط من سرس أرز: رمل ١ : ١ حجما، (٤) خليط من مجروش قشر الفول السودانى: رمل ١ : ١ حجما، (٥) خليط من سرس أرز: رمل: مجروش قشر الفول السودانى١: ١ : ١ حجماً ولقد تم تسجيل القياسات الخضرية وتم إجراء التحاليل الكيميائية بعد انتهاء الحصاد وفيما يلى القياسات الخضرية التى تم قياسها:عدد الأوراق لكل نبات ــ إرتفاع النبات ــ قطر البصلة – الوزن الكلي الطازج للمحصول وقد وقد اوضحت النتائج ان بيئة خليط من سرس الأرز: رمل ١ : ١ حجماً أنتجت أعلى نمو خضري وأعلى محصول في حين اوضحت النتائج ان بيئة خليط من مجروش قشر الفول السودانى: رمل ١ : ١ حجما أنتجت اقل نمو خضري واقل محصول.