Middle-East Journal of Scientific Research 10 (6): 718-722, 2011
ISSN 1990-9233

Effect of Three Different Culture Media on Some Generative and Vegetative Characters of *Polyanthus tubersa* in Hydroponics Culture

[1]F. Moraghebi and [2]H. Mohebbi

[1]Department of Biology, Faculty of Sciences,
Shahr-e-Rey Branch, Islamic Azad University, Shahr-e-Rey, Iran
[2]Department of Agriculture, Faculty of Agriculture,
Shahr-e-Rey Branch, Islamic Azad University, Shahr-e-Rey, Iran

Abstract: *Polyanthus tubersa* is a marketable ornamental species. Its mass and low cost production is much studied and the aim of this study was to investigate and compare the effects of three different culture media on some generative and vegetative characters of *Polyanthus tubersa* in hydroponics culture. Bulbs were planted in pots (60*20*20 cm) with three different culture media including sand, perlite and sand-perlite (1/1) and irrigated with the same nutrient solution twice a day. Four Bulbs were planted in six repetitions. Measured characters were the number of flowered bulbs, the length of flowering stem and flower axis, the number of florets, the diameter of flowering stem and the diameter of bulbs as well as the number of produced bulb lets and the percentage of live bulbs. Results indicated that planted bulbs in sand-perlite medium matured earlier. There was a significant difference ($p<0.05$) between sand bed and two other beds in length of plant and length of flower axis. There was no significant difference in other characters. In conclusion, there was no significant difference between sand and perlite beds therefore use of cheaper bed (washed sand) for decreasing expenses and cost is advised.

Key words: Culture media · Generative · Hydroponics · Polyanthus tuberose · Vegetative

INTRODUCTION

Ornamental flower production is one of the most important ways of making money in some countries such as the Netherlands. Bulbous plants (Geophytes) are considered to sell as flowers and to plant in parks and gardens. Production of these plants has increased three times more in comparison with 20 years ago. During the mentioned period, different specific fairs were in different countries. Recently, there is an increasing consideration about these plants in Iran for internal consumption as well as export to other countries. Polyanthus was exported to different countries in The Persian Gulf region but for the first time it was exported to other countries in central Asia, France, Germany, Ukraine, Netherlands and England in 2005. According to area of greenhouse, Iran has the seventieth place in the world but is ranked 117th in plants and flowers exports. Tuberose, Chrysanthemum, Carnation, Lily, Narcissus, Anthurium, Alestromeria Esterlitzia and Gerbera are common ornamental flower in Iran. Tuberose is one of the most important flowers that is marketable during all of the year because of its suitable odor and its long stability. This flower is planted in gardens, parks and pots [2, 3].

Hydroponics system is the cultivation without use of soil, which is considered especially in lands with limitation in natural resources such as soil and water. This method can be a substitute for the traditional cultivation system. Hydroponics culture is economic to cultivate ornamental plants and vegetables especially in lands with low amount of water and suitable soil. Hydroponics culture needs less water and can be effective in development of the region [4, 5].

Iran located in a semi-dry region and is confronting with shortage of water resources. Then finding ways to have high production with less use of water is very much a concern. The aim of this study was to 1) study and compare the generative and vegetative characters of *Polyanthus tubersa* in hydroponics culture and 2) suggest a cheaper culture media in hydroponics culture of Polyanthus *tubersa* for decreeing of cost production and economize its mass production.

Corresponding Author: F. Moraghebi, Department of Biology, Faculty of Sciences, Shahr-e-Rey Branch, Islamic Azad University, P.O. Box: 19978-14553, Shahr-e- Rey, Iran.

MATERIALS AND METHODS

Place: Bulbs were planted in pots (60*20*20 cm) containing sand, perlite and a mixture of sand and perlite (1:1). Four bulbs were planted in six repetitions.

Methods: Bulbs were irrigated twice a day (9 am and 4 pm) for 15 minutes with nutrient solution. Nutrient solution was composed of macro elements and micro elements including N(12%), P(12%), K(36%), Br(25%), Cu(1%), Fe(7%), Mn(4%) and Zn (25%). The ratio of elements was justified according to plants requirements. The different vegetative and generative characters were measured including the number of flowered bulbs, the length of flowering stem and flower axis, the number of florets, the diameter of flowering stem and the diameter of bulbs as well as the number of produced bulb lets and the percentage of live bulbs. These measurements were done in two different times, the first after flower harvesting and the second, two months after removing bulbs from soil. The collected results were compared by T test and grouped according the Duncan method.

RESULTS

Blossoming: The percentage of blossoming in sand, perlite and sand- perlite beds was 50, 70 and 50, respectively that shown in tables 1-3. There was no significant difference among treatments (Table 7).

Length of Stem: The average of stem length in sand, perlite and sand-perlite treatments were 95.12, 95.82 and 100.58, respectively (Tables 1-3). Results indicated cultivated plants in sand-perlite were longer than those of planted in sand and perlite beds. The difference among three treatments was significant ($p < .05$). Plants planted in perlite and sand-perlite beds belonged to group a.

The Length of Flower Axis: The average length of flower axis in sand, perlite and sand-perlite beds were 18.54 18.93 and 23.9423, respectively (Tables 1-3) There was a significant difference ($p<0.05$) between treatments Results indicated planted flowers in perlite bed had longer flower axis and belonged to group a, but two others belonged to group b.

The Number of Florets: The average of florets numbers in sand, perlite and sand-perlite treatments were 22, 21.43 and 22.7, respectively (Tables 1-3). Mean comparison showed no significant difference in florets numbers (Table 8) and all plants belonged to the same group.

Table 1: Vegetative characters of cultivated polyanthus in sand bed

Sand	Plant length (cm)	The length of flower apex (cm)	Number of florets	Stem diameter in 50 cm (%)
1	94.5	15	16	6
2	104	22	24	7
3	89	18.5	26	6.5
4	96	18.5	22	6.5
5	98	20	24	6.5
6	94	17	2	6
7	100	20	26	7
8	97	18	20	6
9	89	16	18	6.5
10	82	17	18	6
11	103	23	26	7
12	95	17.5	24	7

Table 2: Vegetative characters of cultivated polyanthus in perlite bed

	Plant length (cm)	The length of flower apex (cm)	Number of florets	Stem diameter in 50 cm (%)
1	94.5	15	16	6
2	104	22	24	7
3	89	18.5	26	6.5
4	104	20	24	6
5	100	19	18	6
6	92	16	16	7
7	85	22	28	6
8	95	15	20	7.5
9	100	20	18	6
10	96	19	22	6.5
11	94	18	20	6
12	93	17	20	6
13	99	20	24	7
14	98	19	18	6
15	88	19	18	6
16	95.5	18.5	22	6.5
17	102	21	25	7

Table 3: Vegetative characters of cultivated polyanthus in sand-perlite bed

Sand	Plant length (cm)	The length of flower apex (cm)	Number of florets	Stem diameter in 50 cm (%)
1	105	24.5	20	5
2	106	25.5	25	6.5
3	66	8	7	3 (removed from statistical analysis)
4	100	20	20	5
5	108	27	26	6.5
6	106	26	24	6
7	102	22	22	5
8	98	20	18	5
9	102	23	22	5.5
10	105	27	24	6
11	105	25	26	6.5
12	104	24	24	5.5

Table 4: Generative characters of cultivated bulbs in sand bed

Repetition		Diameter	Bulbuls
	1	9	25
	2	5	15
	3	5	12
First repetition	4	5	9
	1	5	15
	2	5	10
	3	4.5	14
Second repetition	4	-	-
	1	5	13
	2	5	17
	3	3	2
Third repetition	4	5.5	21
	1	2.5	2
	2	4	11
	3	5	20
Fourth repetition	4	5	22
	1	4	15
	2	4	13
	3	2	5
Fifth repetition	4	2.5	7
	1	3.5	12
	2	4	9
	3	3	6
Sixth repetition	4	-	-

Table 5: Generative characters of cultivated bulbs in perlite bed

Repetition		Diameter	Bulbuls
	1	4	14
	2	3.5	11
	3	3	7
First repetition	4	2.5	6
	1	4	14
	2	3	6
	3	3	8
Second repetition	4	5	13
	1	3.5	9
	2	3.5	13
	3	3.5	8
Third repetition	4	4	14
	1	5	23
	2	3.5	7
	3	5.5	18
Fourth repetition	4	6	10
	1	4	4
	2	4	7
	3	5	16
Fifth repetition	4	5	12
	1	8	19
	2	6	25
	3	5	16
Sixth repetition	4	5	15

Table 6: Generative characters of planted bulbs in sand-perlite bed

Repetition		Diameter	Bulbuls
	1	9	21
	2	6	23
First repetition	4	6	25
	2	4.5	14
	3	5	16
Second repetition	4	5	13
	1	3	8
	2	4	7
	3	3.5	8
Third repetition	4	3	14
	1	4	7
	2	5	13
	3	4	6
Fourth repetition	4	4	14
	1	5	19
	2	3.5	4
	3	3	6
Fifth repetition	4	6	7
	1	4	15
	2	5	8
	3	3	8
Sixth repetition	4	4	11

Stem Diameter in 50 Cm of Apex: The average of stem diameter in 50 cm of apex in sand, perlite and sand-perlite treatments were 0.65, 0.6 and 0.55 cm, respectively (Tables 1-3). Mean comparison showed that there was no significant difference among treatments ($p<.05$) (Table 8) and all plants belonged to the same group.

The Diameter of Bulblets: The average of bulblet diameter in sand, perlite and sand-perlite treatments were 4.36, 4.35 and 4.5 cm, respectively (Tables 4-6). Mean comparison showed no significant difference among treatments ($p<.05$) (Table 8) and all plants belonged to the same group

The Number of Bulblets: The average of bulblets number in sand, perlite and sand-perlite treatments were 12.3, 12.3 and 12.5, respectively (Tables 4-6). Mean comparison showed no significant difference among treatments ($p<.05$) (Table 8) and all plants belonged to the same group

The Percentage of Survival Rate: The percentage of survival rate in sand, perlite and sand-perlite treatments were 91.6; 100 and 95.8, respectively. The difference among treatments was not significant ($p<0.05$) and all of plants which planted in different beds belonged to the same class.

Table 7: T test analysis for blossoming percentage

RT	N	Mean	Std Dev	Std error	Variance	T	df	Pro>ITI
PS	6	0.83333	0.7528	0.3073	Unequal	1.7461	9.7	0.1123
	6	2.0000	0.8944	0.3651	Equal	1.7461	10	0.1114

df= (5.5), F=1.41 and Prob F= 0.7144.

Table 8: Mean comparison of different characters in different treatments (P<0.05)

Treatment	Plant length	Length of flower apex	Floret number	Stem diameter	Bulbuls diameter	Bulbuls number
S	95.125[a]	18.5417[a]	22.0000[a]	0.649667[a]	4.36175[a]	12.333[a]
P	96.063[b]	18.9375[b]	21.4375[a]	0.637000[a]	4.3542[a]	12.333[a]
SP	103.720[a]	23.9423[b]	22.7200[a]	0.566333[a]	4.6042[a]	12.250[a]

DISCUSSION

Hydroponics culture can be done in different bed but the effect of bed composition on yield is different. Finding a cheaper bed composition with high yield makes profit. Even if the cheap and accessible bed composition does not increase the yield, it will be useful if just use of it decreases the expenses and provides opportunity to work in large scale in field or green house. The effect of perlite as a bed composition was studied on some of physiological responses such as photosynthesis, evaporation and stomata capacity in Gerbera [6-8]. The effect of some soil microbial flora was studied in hydroponics culture by use of sand as a bed composition. Sand was used for determining of heavy metals absorption in plants [9].

Bed composition is not only a place for plant establishment but also is effective on symbiotic microbes, microbial flora and absorption of nutrients by them. The quantitative assessment of a product is easier than qualitative assessment. In this investigation, some of quantitative characters were studied. The percentage of bulbuls, which flowered in perlite treatment, was 70 but this percentage for two other treatments was 50. This difference was not significant. Another important assessed character was stem length. Because of lightness of sand and perlite, very long plants distort and need support to stand right. Therefore being very long for a plant in sand and perlite is a negative parameter. Results indicated that planting polyanthus in sand–perlite bed produced very long plants.

However, produced plants in sand and pelite bed were shorter that considered as an advantage. The length of inflorescence axis and number of florets are important characters because they show accumulation of flowers in area unite. The numbers of flowers were the same in three different treatments but the axis of flower was longer in sand-perlite treatments. Then the accumulation in area unite was less and considered as a negative parameter. Polyanthus is sold as separated branches then its strength is very important. The diameter of stems was measured in 50 cm of apex because plants are cut in 50 cm of apex to be suitable to place in vase Results indicated that according to stem diameter, planted plants in perlite and sand beds belonged to class a and those planted flowers in perlite-sand bed belonged to class b. On the other hand, this meant that these plants had weak, narrower stems that are negative parameter in selling them. Measurements were done in two periods during harvesting and two months after harvesting when bulbs are removed from soil. Removing of bulbs two months after harvesting causes storing of nutrients in bulbs. Stored nutrients provide better condition for next year growth [9-10]. Second analysis was done in 1 November. Survival rate of maternal bulbs was measured Results indicated that all plants belonged to the same class.

The diameter of maternal bulb lets was measured that shows the volume of bulbuls and amount of stored nutrient. Although, there were differences among measurements but all plants belonged to the same class according to the statistical analysis. The selling of produced bulbuls is a way of making money for farmers so the number of them is important. Results indicated the treatments were not effective in production and all plants belonged to same class. In the light beds, the diameter of bulbs increases with decreasing of environmental pressure. Although the condensation of three beds was different but this difference was not enough to cause difference in the number of produced bulb lets [7-13].

CONCLUSION

In conclusion, there was no significant difference between sand and perlite treatments. The expense of this is important in choosing them to grow Polyanthus.

Therefore, the use of perlite bed for hydroponics culture of polyanthus is not advised because of its low condensation. A Perlite bed cannot support establishment of bulbs and plants fall because of wind. The use of supporter is needed when the bed composition is perlite. This increases the expense of culture and is considered as a negative parameter. Overall, there was no difference between three treatment especially sand and perlite. According to cheapness of washed sand, the use of it will be economic.

REFERENCES

1. Thmasbi, O., 2005. News. Flower work, grass (lawn) and Green Space Publication, pp: 90.
2. Anonymous, 2000. Survey of plant and flower production, Office of plant and flower. Jahad-e-agriculture Ministry, pp: 187.
3. Zabihallahei, V., 2005. Mahallati flower Market, Flower work, grass (lawn) and green space Publication, pp: 107.
4. Tavallaee, M., 2002. Hydroponics culture of greenhouse plants, Agriculture Training Publication, pp: 243.
5. Nxawe, S., C.P. Laubscher and P.A. Ndakidemi, 2009. Effect of regulated irrigation water temperature on hydroponics production of Spinach (*Spinacia oleracea* L). Afr. J. Arg. Res., 4(12): 1442-1446.
6. Wahome, P.K., T.O. Oseni, M.T. Masarirambi and V.D. Shongwe, 2011. Effects of Different Hydroponics Systems and Growing Media on the Vegetative Growth, Yield and Cut Flower Quality of Gypsophila (*Gypsophila paniculata* L.). World J. Agric. Sci., 7(6): 692-698.
7. Thomas. S., Y. Traianos, O. Michael and E. Athanasios, 2004. Photosynthetic response and peroxides in relation to water and nutrient deficiency in gerbera. Environ. Exp. Bot., 52(1): 23-31.
8. Krishnasamy, R., D. Jegadeeswari, U. Surendran and C. Sudhalakshmi, 2005. Screening of Sorghum (*Sorghum bicolor*) Genotypes for Their Iron Efficiency. World J. Agric. Sci., 1(1): 98-100.
9. Rodka, M., V. Miroslov and G. Milan, 2003. Effects of inoculation with Glomu*s* in tranadices on lead uptake by *Zea mays* l. and agnastic cupillarisal. Appl. Soil Ecol., 23(1): 55-67.
10. Nasseri, M. and M.G. Ebrahimi, 1998. Physiology of geophytes. Published by Jahade Danesghahi of Mashhad University, Mashhad, Iran, pp: 152.
11. Moyo, D.Z. and C. Chimbira, 2009. The Effect of Single and Mixed Treatments of Lead and Cadmium on Soil Bioavailability, Uptake and Yield of *Lactuca sativa* Irrigated with Sewage Effluent under Green House Conditions. Am-Euras. J. Agric. Environ. Sci., 6(5): 526-531.
12. Abeer H.E.A., 2009. Using Actinomycetes on Controlling Bacterial Contamination of Date Palm During Different Stages *In Vitro*. J. Hort. Sci. Ornam. Plants, 1(3): 92-99.
13. Khalili A., N. Akbari and M.R. Chaichi, 2008. Limited Irrigation and Phosphorus Fertilizer Effects on Yield and Yield Components of Grain Sorghum (*Sorghum bicolor* L. var. Kimia). Am-Euras. J. Agric. Environ. Sci., 3(5): 697-702.