Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

European Journal of Experimental Biology, 2013, 3(2):139-147

ISSN: 2248 –9215
CODEN (USA): EJEBAU

The possibility using some organic wastes as growth medium and nutrition method on the growth of English daisy *(Bellis perennis)*

Taher Deljooy-e-Tohidi*, Ali Mohammadi Torkashvand and Davood Hashemabadi

Department of Horticulture, Rasht Branch, Islamic Azad University, Rasht, Iran

---

ABSTRACT

The possibility using of some organic wastes as the growth media and nutrition method on the growth of English daisy plant was investigated by a factorial experiment with two factors (growth media and nutrient solution) based on completely randomized block design with 45 treatments in three replications. This study was conducted in a farm located in the village of Lakan, Rasht. The first factor was the different growth media and the second factor was three methods of fertilization including without fertilization, fertilization with spraying and soil fertilization. Results showed that the maximum growth was observed in medium contains soil, municipal waste compost, Azolla compost at $\frac{1}{3}$ ratio for every substrate and medium contains soil and municipal waste compost in a 1:1 ratio. Azolla compost, alone, was not suitable for English daisy plant because was not obtained appropriate results in most indices of growth. Although the effect of nutrition method was not significant on most indices of growth in this experiment, soil fertilization had the better impact than other methods. In conclusion, it seems that the combination of soil, municipal soil waste compost, Azolla compost (each on $\frac{1}{3}$ of volume) are suitable substrates for growth of English daisy plant that along with soil fertilization caused to increase the growth of plant.

Keywords: Azolla compost, English daisy, Lakan, Municipal wastes, Nutrition, Tea wastes

---

INTRODUCTION

Commercial production of ornamental plants is an international agriculture. Economical value of these plants has increased in past 2 decades and there's such high ability for continuous raise in national and international markets [1]. Different media are used in the cultivation of ornamental plants such as. Bark of trees, saw dust, mushrooms compost, municipal waste compost [2, 3, 4, 5]. Choosing cultivation bed, is an important factor for quality of seeding sapling [6]. appropriate bed are high chemical stability, lightness, cheapness, free of all calamity, source abundancy [7]. On the other hand agricultural bed must be penetrable. Capability of agricultural bed for maintenance of water, gas transference for preserving plant quality is of significant importance [8]. Tea wastes are produced in tea production factories of the north part of IRAN that it's compost can be a suitable bed for ornamental plant's [9]. Municipal waste has been increased due to the increase in population a, So only in Mashhad, is daily produced 1200 tones of municipal wastes [10]. One the most suitable way for management of these wastes is recovering and changing it to compost [11]. Combination of initial materials can influence produced compost quality. For example compost made of sewage sludge prepares faster growth in one type of viburnum suspensum as compared with the compost made from lower nitrogen like garbage and yard trimming [12]. Guilan suitable climate has led to appropriate growth of Azolla in marsh and river basing and being rich in nutrition elements, Azolla is of green compost [13]. Azolla is being used in international rice institute of Phillipin as green compost since middle 1970s [14, 15]. Azolla approximately has 3.5% Nitrogen, 3.8% Potassium and 0.06% Magnesium without lead, Mercury or Arsenik [16, 17]. In a experiment, effect of different composts on marigold was investigated and concluded that the beds including 50, 75% Azolla in combination with tree peel had better effect on growth index of marigold [9]. In an experiment to study the effects of manure vermicompost on the growth of Marigold, it is found that the highest stem diameter, size, stem dry weight obtained at 60% vermicompost bed with 30% sand and 10% soil. The highest plant height obtained at 60% peat and 40% perlite [18]. There's evidence that shows unlike peat, components composts have the plant growth regulators [19, 20]. When plants are grown in peat substrate, it's difficult to maintain a favorable climate diet. In order to create a favorable condition and a more favorable diet for plants peat with perlite and vermiculite is combined [6]. English Daisy native perennial grass that's abundant through great Britain is essentially as a shorter plant [21]. Wild English Daisy flowers is often common in grasslands and they are generally in shady habitats [22]. there's a considerable diversity in the flower marguerite [22]. Several varieties of ornamental aster has grown with flowers in white amethystine [23]. The flowers growth is in soil with pH higher than 5.5, but pH 7.5 - 8.5 has been preferred [23]. English Daisy flowers from March to October and if the winter is mild, it flowers all year round. Basically it flowers from April to June [22]. Because of peat unlimited resources in IRAN and since peat imported with a high cost, using municipal waste compos, tea waste and Azolla az media and substituting peat is necessary. Since good nutrition method for cultivation of English Daisy has been introduced and all common space in urban green spaces is bed garden soil (mixture of soil and manure and leaf composts) and plant has not a good growth in the space. In the present study possible use of the waste in the form of compost as a bed following soil Fertilization on Bellis Perennis growth has been assessed.

MATERIALS AND METHODS

In this study, different composts including municipal solid waste compost, tea wastes compost, Azolla compost and common bed in landscape were considered as the growth media substrates. Municipal solid waste compost was purchased from recycling factory in Lakan of Rasht. Tea waste compost was prepared from research station in northern part of IRAN and Azolla compost was purchased of agricultural rice research station in Rasht. After preparing the compost, they were first passed through a 5mm sieve and were combined in different rations. The compounds were poured from 4-liter pots and placed in a landscape weather conditions in Rasht. Treatments is shown in table 1.

A factorial experiment was tested with two factors including growth media and fertilization method based on randomized complete block design with 45 treatments and 3 replications. English Daisy was purchased from Farid company in Tehran and cultivated in garden soil in 2011.9.1 (20% soil + 20% manure compost + 10% leaf soil + 10% sand) and seedling was produced. Before transferring, seedling, pots containing different substrates were sterilized with fungicide. produced Seedlings had the same size and was transferred into 4-litter pots at 5-6 leaves stage After bed preparation, 3 seedlings were planted and removed to the farm and was placed in open air. After transferring the seedlings to the pots and after one month, they were spared. Two plants in each pot was maintained until the end of the growing season. Treatment was including soil fertilization, fertilization with spraying and without fertilization. Liquid fertilizer of Megafol was used for fertilization whose compound is shown in table 2. Fertilization was done 3 times at intervals of 15 days in both soil and spray.

The plant height number of leaves, monthly during growing season and flowering stem was measured. Three leaves were selected from each pot and chlorophyll content was measured by chlorophyll meter and average of 3 leaves was then signed up to get lasting score, 3 flowers were marked in each pot. Time to change the color of the petals were recorded and average of 3 numbers was recorded. 3 flourishing flower were selected from each pot and the diameter was measured using a digital caliper and the average was calculated and noted down. At the end of the growth period, the plants were removed from pots. Shoots from the crown removed and their fresh weight was recorded. Weight of the root was measured after washing and at the end the shoots and roots were placed separately in different pockets. They were dried during a day in an oven in 105ºc and dry weight was measured. For measuring total N, method of Kjeldahl was used. For measuring Phosphorus, Potassium and Sodium, first the beds was extracted by the liquid ammonium without Carbon dioxide, Ethylene tri – amine penta acetic acid (AB +DTPA). Then in produced extract, the Phosphorus was measured with the phosphomolybdate method and by Spectrophotometer model Apel – PD – 303 UV in the wave 470 nonometer. Sodium and Potassium were measured with the Film photometer model Jenway. pH and EC the were measured in extract 1:5 dried material to water. pH was measured with PH meter model elmetron and EC was measured with Jenway. Organic carbon was measured by walkey-black method [24]. Statistical analyzing was done with SPSS and MSTATC and comparing mean data were compared by least significant Difference (LSD) test.

RESULTS AND DISCUSSION

Results of analyzing the data belonging to English Daisy growing index (Tables 3 and 4) showed that influence of Fertilizing (without fertilization, spraying leaves and soil application) on English Daisy growth including plant height , peduncle height , fresh weight of shoot at 1% level, as well as number of flowers , dry weight of the shoot at 5% level, number of leaves , flower diameter, flower lasting , fresh weight of the root , dry weight of root and chlorophyll was not significant. Influence of media (Tea wastes compost , municipal compost and Azolla compost) on English Daisy growth indexes includes number of leaves , plant height , peduncle height , number of flowers , fresh weight of root , fresh weight of shoot , dry weight of shoot and chlorophyll at 1% level , as well as flower diameter at 5% level. Dry weight of root and flower longevity was not significant. Interaction effect of organic compounds and fertilizing on English Daisy including plant height , number of flowers and chlorophyll was significant at 5% level.

Table 1. The characteristics of media used in the experiment

Treatment Number	Treatment	Symbol
1	Control: 100% garden soil	G_1
2	100% tea waste compost	T_1
3	100% municipal waste compost	M_1
4	100% Azolla compost	A_1
5	50% garden soil + 50% tea waste compost	$G_{0.5}\ T_{0.5}$
6	50% garden soil + 50% municipal waste compost	$G_{0.5}\ M_{0.5}$
7	50% garden soil + 50% Azolla compost	$G_{0.5}\ A_{0.5}$
8	50% tea waste compost + 50% municipal waste compost	$T_{0.5}\ M_{0.5}$
9	50% tea waste compost + 50% Azolla compost	$T_{0.5}\ A_{0.5}$
10	50% municipal waste compost + 50% Azolla compost	$M_{0.5}\ A_{0.5}$
11	33.33% garden soil + 33.33% tea waste compost + 33.33% municipal waste compost	$G_{\frac{1}{3}}\ T_{\frac{1}{3}}\ M_{\frac{1}{3}}$
12	33.33% garden soil + 33.33% tea waste compost + 33.33% Azolla compost	$G_{\frac{1}{3}}\ T_{\frac{1}{3}}\ A_{\frac{1}{3}}$
13	33.33% garden soil + 33.33% municipal waste compost + 33.33% Azolla compost	$G_{\frac{1}{3}}\ M_{\frac{1}{3}}\ A_{\frac{1}{3}}$
14	33.33% tea waste compost + 33.33% municipal waste compost + 33.33% Azolla compost	$T_{\frac{1}{3}}\ M_{\frac{1}{3}}\ A_{\frac{1}{3}}$
15	25% garden soil + 25% tea waste compost + 25% municipal waste compost + 25% Azolla compost	$G_{0.25}\ T_{0.25}\ M_{0.25}\ A_{0.25}$

Table 2. The compounds of nutrient solution used experiment

N (%)	K_2O (%)	Amino acid (%)	Fe (%)	Organic N (%)	Organic C (%)	P_2O_5 (%)
4.5-5.6	2.9-3.6	28-35	0.05-0.06	4.5-5.6	15-18.7	0.04-0.05

Table 3. The variance analysis related to the growth indices of English Daisy
***significant at 1% level*, * *significant at 5% level*, ^{ns} *Non significant at 5% level*

Variation Sources	Mean Squared						
	Freedom Degree	Leaf number	Plant height	Flower diameter	Flower stem Height	Flowers number	Flower durability
Media (A)	14	19.9**	16.7**	24.4*	7.5**	412.06**	7.59^{ns}
Nutrition method (B)	2	7.5^{ns}	8.6**	16.5^{ns}	8.3**	176.36*	6.36^{ns}
Interaction (A*B)	28	6.5^{ns}	2.1*	9.5^{ns}	0.7^{ns}	90.89*	7.76^{ns}
Error	90	5.4	1.2	12.3	1.7	67.33	5.41
CV (%)		20.8	18.7	9.4	17.2	30.99	13.86

Table 4. The variance analysis related to the growth indices of English Daisy
***significant at 1% level*, * *significant at 5% level*, ^{ns} *Non significant at 5% level*

Variation Sources	Mean Squared					
	Freedom Degree	Fresh root weight	Dry root weight	Fresh shoot weight	Dry shoot weight	Chlorophyll
Media (A)	14	673.47**	3.98^{ns}	44936.24**	180.75**	62.13**
Nutrition method (B)	2	72.06^{ns}	0.67^{ns}	11764.83**	74.45*	11.58^{ns}
Interaction (A*B)	28	72.63^{ns}	0.98^{ns}	1967.54^{ns}	13.63^{ns}	19.28*
Error	90	95.62	3.05	1685.12	18.75	13.29
CV (%)		29.19	43.51	36.81	33.48	32.90

Table 5. The chemical properties of media add experiment

Treatment Number	N (%)	P (Mg/Kg)	K (Mg/Kg)	Na (Mg/Kg)	OC (%)	C/N	pH (1:2.5)	EC(dSm^{-1}) (1:2.5)
1	0.25	6	24	50	2.93	17.72	6.92	0.85
2	2.80	120	82	62	18.04	6.44	4.85	5.69
3	3.22	208	660	590	22.91	7.11	8.00	16.36
4	2.73	26	102	80	23.40	8.58	6.09	3.94
5	2.99	80	62	40	11.70	3.91	5.06	1.64
6	1.89	72	320	260	15.60	8.25	7.68	8.55
7	0.70	14	56	90	9.75	13.93	6.50	1.47
8	3.71	156	540	420	21.94	5.91	7.60	11.73
9	3.50	44	146	110	18.53	5.29	4.90	7.65
10	2.94	248	290	100	20.96	7.13	7.65	10.74
11	1.96	80	300	110	15.60	7.96	7.15	8.52
12	1.89	48	104	80	9.75	5.16	4.95	2.60
13	1.94	56	420	440	8.78	4.53	7.60	5.23
14	2.85	104	510	420	21.45	7.53	7.35	8.80
15	2.17	88	340	300	18.53	8.54	7.22	6.28

Table 6. The effect of nutrition methods on the growth indices Of English Daisy

Nutrition method	Leaf number	Plant height (cm)	Flower diameter (mm)	Flower stem Height (cm)	Flowers number	Flower durability (day)
Without fertilization	12.58*	9.16 b	38.10 *	8.46 b	31.69 b	17.45 *
Fertilization with spraying	12.69	9.28 b	38.27	8.32 b	34.18 ab	18.06
Soil fertilization	13.33	9.97 a	39.23	9.13 a	35.60 a	18.13

**not significant*

Table 7. The effect of nutrition methods on the growth indices Of English Daisy

Nutrition method	Fresh root weight (g)	Dry root weight (g)	Fresh shoot weight (g)	Dry shoot weight (g)	Chlorophyll
Without fertilization	40.78 *	3.87 *	200.15 b	16.46 b	13.67 *
Fertilization with spraying	43.31	3.78	220.46 a	17.85 ab	13.83
Soil fertilization	42.12	3.63	232.09 a	19.03 a	12.88

**not significant*

Chemical properties of Media

Table 5 shows chemical properties of the bed used in cultivating English Daisy. Results showed that the most amount of nitrogen belongs to $T_{0.5}$ $M_{0.5}$ and the least amount of Nitrogen belongs to G_1 that has less amount of organic materials. Chemical properties must be considered since it affect on the quality of plant [25]. Nitrogen was increased with replacing organic compost v.s garden soil. It matches with the idea of Grigatti et al., [26]. They reported increasing the nitrogen with adding manure compost to replace the peat in potting media. Phosphorus increased with increasing amount of replacing organic compost (Tea wastes, Azolla, Municipal waste). Compost and organic compost increased growth index of boiled beet and caused to increase phosphorus and Potassium uptake [27]. Potassium in organic compost (Tea wastes, Azolla, Municipal waste) increased in comparison with garden soil. The most amount of potassium (660 ppm) belongs to M_1 and the least amount of potassium (24 ppm) belongs to G_1. The results of the test matches with Riberio et al., [28] foundings. Their finding reported the most amount of potassium density in Muunicipal waste compost. $C/_N$ Ratio in media of tea wastes compost, municipal compost and Azolla compost was less than what was allowed for growing ornamental plants ($C/_N$ = 30). Davidson et al., [29] reported that compost having $C/_N$ ration less than 20 are not suitable for plant production. $C/_N$ decreased fllowing increasing amount of compost that this was according with Gayasinghe et al., [30]. Decreasing $C/_N$ was result of increasing amount of nitrogen following increasing compost. The most pH (8.0) belongs to M_1 and the least pH (4.8) belongs to T_1 and other beds are placed in suitable area of pH for growing ornamental plants. This matches with idea of Abad et al., [31], suitable pH for suitable growth is 5.3 – 6.5. some suitable factors like size and plant appearance are important criteria for determining salinity of ornamental plants. The most amount of EC (16.36 dSm^{-1}) belongs to M_1 and the least amount of EC (0.85 dSm^{-1}) belongs to G_1. pH and EC will be increased following replacing compost this matches with findings of Grigatti et al., [26] they reported increasing amount of pH and EC following increasing amount of green waste compost in ratio 25,50,75,100 Percent.

Growth indices of English Daisy

Comparing average of data belonging to influence of fertilizing (without fertilization, spraying leaves and soil application) (table 6,7) on growing index of English Daisy showed that when method of soil consumption used, number of leaves, plant height flower diameter, peduncle height, number of flowers, flower lasting, fresh weight of shoot and dry weight of shoot will be increased in comparison with conditions of spraying leaves and soil consumption. fresh weight of the root and chlorophyll in spraying leaves increased in comparison without fertilization and soil consumption. without fertilization method hadn't a appropriate result in comparison with spraying methods and soil consumption. Increasing growth index in soil consumption was the result of availability nutrients. This matches with findings of Clemens and Morton [32].Their findings was about growing Heliconia Golden Torch because of soil consumption of chemical compost and increasing number of leaves.

Table 8. The effect of growth media on the growth indices of English Daisy

media	Leaf number	Plant height (cm)	Flower diameter (mm)	Flower stem Height (cm)	Flowers number	Flower durability (day)	Fresh root weight (g)	Dry root weight (g)	Fresh shoot weight (g)	Dry shoot weight (g)	Chlorophyll
G_1	13.67 ab	7.93 ef	40.00 a	7.61 cd	30.67 cd	17.74*	31.98 de	3.36*	127.81 fg	11.79 de	11.99 bc
T_1	11.67 bcd	9.46 bcd	38.82 ab	9.27 ab	34.22 bcd	17.52	42.41 bcd	3.98	228.02 cd	16.63 bc	13.79 bc
M_1	11.67 bcd	8.92 cde	35.26 b	6.37 d	26.11 de	16.85	26.74 e	2.55	170.47 ef	15.04 cd	21.84 a
A_1	9.78 d	7.29 f	35.25 b	8.07 bc	20.78 e	18.85	33.32 de	4.33	98.39 g	9.63 e	10.74 c
$G_{0.5}\,T_{0.5}$	14.00 ab	8.40 def	38.18 ab	8.39 abc	34.22 bcd	16.82	47.06 b	3.79	200.00 de	17.36 bc	12.14 bc
$G_{0.5}\,M_{0.5}$	15.00 a	10.92 a	38.67 ab	8.98 abc	46.33 a	17.78	33.86 de	2.74	282.11 b	23.79 a	13.24 bc
$G_{0.5}\,A_{0.5}$	12.44 abc	7.64 f	37.42 ab	7.62 cd	28.00 de	19.56	35.44 cde	4.10	139.77 f	13.70 cde	12.32 bc
$T_{0.5}\,M_{0.5}$	13.22 abc	11.04 a	38.76 ab	8.94 abc	37.67 abc	18.78	39.13 bcd	3.03	268.17 bc	20.44 ab	15.18 b
$T_{0.5}\,A_{0.5}$	13.78 ab	8.97 cde	38.51 ab	9.00 abc	32.78 bcd	17.82	46.82 b	4.89	168.73 ef	14.18 cd	11.74 bc
$M_{0.5}\,A_{0.5}$	14.44 a	10.51 ab	38.37 ab	9.34 ab	43.89 a	16.74	49.56 b	4.52	292.37 ab	20.69 ab	12.80 bc
$G_{\frac{1}{3}}\,T_{\frac{1}{3}}\,M_{\frac{1}{3}}$	12.67 abc	10.08abc	38.50 ab	9.43 ab	34.56 bcd	17.89	44.36 bc	3.42	274.47 b	22.61 a	14.86 b
$G_{\frac{1}{3}}\,T_{\frac{1}{3}}\,A_{\frac{1}{3}}$	11.00 cd	8.23 def	40.26 a	8.33 bc	28.00 de	17.26	42.39 bcd	4.09	150.76 f	14.63 cd	12.60 bc
$G_{\frac{1}{3}}\,M_{\frac{1}{3}}\,A_{\frac{1}{3}}$	14.89 a	11.30 a	41.23 a	9.82 a	40.11 ab	19.11	49.76 b	3.40	322.72 a	22.18 a	14.26 bc
$T_{\frac{1}{3}}\,M_{\frac{1}{3}}\,A_{\frac{1}{3}}$	11.89 bcd	10.80 a	40.11 a	9.40 ab	32.11 bcd	16.82	59.42 a	4.26	272.81 b	21.98 a	12.88 bc
$G_{0.25}\,T_{0.25}\,M_{0.25}\,A_{0.25}$	12.89 abc	10.54 ab	38.64 ab	8.97 abc	37.89 abc	18.63	48.77 b	3.96	266.90 bc	22.05 a	11.56 bc

*not significant

Comparing average of data belong to influence of growth bed (table 8) and interaction influence of bed and nutrition method (table 9) on English Daisy growth index showed that the most number of leaves belongs to $G_{0.5}$ $M_{0.5}$ that were in equal group with $G_{\frac{1}{3}}$ $M_{\frac{1}{3}}$ $A_{\frac{1}{3}}$ and $M_{0.5}$ $A_{0.5}$. Vleeschauwer et al., [33] reported that using 50% of municipal waste compost and 50% of all other tree peels or peat as media has the most influence on the growth of Dieffenbachia , Codiaeum, Cordylin, Fastia, Cattleya orchid. The least number of leaves belongs to A_1. This didn't match with the results of Khalighi and Padasht Dehkaei [9] regarding using Azolla compost in the amount of 75 and 100% in increasing growing index of French marigold. interaction influence of bed and nutrition method, $G_{0.5}$ $M_{0.5}$ and nutrition method of soil consumption after $M_{0.5}$ $A_{0.5}$ and method of fertilization were in second rank and least number of leaves belongs to A_1 and nutrition method of spraying leaves. The results showed that garden soil and Azolla compost seperatelyor in a combination are not suitable bed for plant growth but these beds in combination with municipal waste compost are a good answer to growing index because of securing nutrition materials for the plant. The most height was made in $G_{\frac{1}{3}}$ $M_{\frac{1}{3}}$ $A_{\frac{1}{3}}$ that are in a group $G_{0.5}$ $M_{0.5}$ and $T_{0.5}$ $M_{0.5}$. Riberio et al., [28] and Vleeschauwer et al., [33] reported that using municipal waste compost in quantity of 20 and 50% in combination with all media increases all growth indexes of cranesbill, Dieffenbachia , Codiaeum, Cordylin, Fastia, Cattleya orchid. The least amount of the height of the plant was seen in A_1. The results didn't match with Khalighi and Padasht Dehkaei [9] findings regarding 75% and 100% Azolla compost on growing index of French marigold and height. On the other hand $G_{0.5}$ $A_{0.5}$ showed the least amount of height. interaction influence of bed and nutrition method on plant height was significant and the most amount of height was shown in $G_{\frac{1}{3}}$ $M_{\frac{1}{3}}$ $A_{\frac{1}{3}}$ and nutrition method of spraying leaves and soil consumption. Suitable results of the bed in relation with the plant height is the result of combination of municipal waste compost with Azolla compost and garden soil. Municipal waste compost because of high pH and EC can't be a good bed for plant growth, but municipal waste compost in combination with Azolla compost and garden soil ($G_{\frac{1}{3}}$ $M_{\frac{1}{3}}$ $A_{\frac{1}{3}}$) can be a suitable combination for plant growth because of stabilizing pH and EC, increasing nutrition material. Garcia-Gomez et al., [34] reported that bed including 20 to 50% municipal waste compost will increase growing index and over 50% will decrease growing. Some beds including municipal waste compost increases growing of English Daisy because of pH 7-8 which's needed for English Daisy. This plant prefers a pH abuot 7.5 to 8.5 is preferred [23]. Bigger flowers will add more peauty to the plant so this feature is significant. The most amount of diameter was made in $G_{\frac{1}{3}}$ $M_{\frac{1}{3}}$ $A_{\frac{1}{3}}$ that was in a group with $G_{\frac{1}{3}}$ $T_{\frac{1}{3}}$ $A_{\frac{1}{3}}$ and $T_{\frac{1}{3}}$ $M_{\frac{1}{3}}$ $A_{\frac{1}{3}}$ and the least diameter belongs to A_1. In this experiment, interaction influence of bed and nutrition method on flower diameter didn't have significant difference but $G_{\frac{1}{3}}$ $M_{\frac{1}{3}}$ $A_{\frac{1}{3}}$ and nutrition method of spraying leaves had the most amount of diameter. Based on the reports of Sharaf and El-Naggar [35], Pal and Biswas [36] and Mahghub et al., [37], spraying had positive effects on flowers like Rose, chrysanthemum, tuberose.

Table 9. The interaction of growth media and nutrition method on the growth indices of English daisy

media	Nutrition method	Leaf number	Plant height (cm)	Flower diameter (mm)	Flower stem Height (cm)	Flowers number	Flower durability (day)	Fresh root weight (g)	Dry root weight (g)	Fresh shoot weight (g)	Dry shoot weight (g)	Chlorophyll
G_1	Without fertilization	11.67*	7.27 cdef	39.41*	7.40*	23.00fgh	17.00*	28.48*	3.19*	110.02*	11.49*	14.39 bcdef
G_1	Fertilization with spraying	14.67	7.47bcdef	39.10	7.27	31.33cdefg	16.67	33.07	3.43	111.70	10.79	12.01 bcdef
G_1	Soil fertilization	14.67	9.07 abcd	41.51	8.17	37.67bcdef	19.56	34.38	3.46	161.70	13.10	9.57 ef
T_1	Without fertilization	11.00	9.43 abc	38.35	9.20	31.67cdefg	17.11	40.74	3.33	218.58	16.88	15.29 bcdef
T_1	Fertilization with spraying	12.00	8.83 abcd	39.33	8.63	41.33bcde	18.11	35.38	3.78	204.93	13.72	14.43 bcdef
T_1	Soil fertilization	12.00	10.10 ab	38.77	9.97	29.67cdefg	17.33	51.10	4.82	260.57	19.27	11.65 cdef
M_1	Without fertilization	12.67	8.10abcdef	37.24	6.87	27.00efg	16.55	26.42	2.63	171.73	14.11	19.24 b
M_1	Fertilization with spraying	10.33	9.00abcd	31.31	4.93	22.67fgh	16.00	25.00	2.47	144.47	12.68	28.34 a
M_1	Soil fertilization	12.00	9.67ab	37.21	7.30	28.67cdefgh	18.00	28.80	2.55	195.22	18.32	17.94 bc
A_1	Without fertilization	9.67	6.57ef	33.83	7.23	13.00h	19.00	32.97	4.69	67.72	7.07	10.08 def
A_1	Fertilization with spraying	9.00	6.00f	35.99	7.77	20.33gh	19.34	29.36	3.72	82.06	7.92	9.44 ef
A_1	Soil fertilization	10.67	9.30abc	35.93	9.20	29.00cdefgh	18.22	37.63	4.57	145.37	13.88	12.70 bcdef
$G_{0.5}\ T_{0.5}$	Without fertilization	13.33	8.80abcd	34.37	8.13	28.00cdefgh	14.11	46.95	4.21	187.29	15.51	13.38 bcdef
$G_{0.5}\ T_{0.5}$	Fertilization with spraying	13.67	8.33abcde	40.65	8.67	34.33cdefg	18.00	48.31	3.79	197.05	17.50	10.76 cdef
$G_{0.5}\ T_{0.5}$	Soil fertilization	15.00	8.07abcdef	39.51	8.37	40.33bcde	18.33	45.93	3.38	215.66	19.08	12.27 bcdef
$G_{0.5}\ M_{0.5}$	Without fertilization	14.67	12.10 a	40.14	8.97	38.67bcdef	15.11	36.90	2.87	302.12	25.14	12.02 bcdef
$G_{0.5}\ M_{0.5}$	Fertilization with spraying	14.33	9.40 abc	39.51	8.33	42.67abcde	18.78	40.26	3.20	285.71	23.99	14.95 bcdef
$G_{0.5}\ M_{0.5}$	Soil fertilization	16.00	11.27 ab	36.34	9.63	57.67a	19.45	24.42	2.14	258.51	22.23	12.75 bcdef
$G_{0.5}\ A_{0.5}$	Without fertilization	13.67	7.03 def	35.14	6.93	27.33efgh	20.00	32.09	4.53	122.93	12.77	17.45 bcd
$G_{0.5}\ A_{0.5}$	Fertilization with spraying	11.00	7.00 def	37.92	7.80	27.67defgh	19.78	41.64	4.47	128.56	13.00	8.14 f
$G_{0.5}\ A_{0.5}$	Soil fertilization	12.67	8.90 abcd	39.20	8.13	29.00cdefgh	18.89	32.61	3.29	167.83	15.32	11.37 cdef
$T_{0.5}\ M_{0.5}$	Without fertilization	12.33	10.47 ab	40.14	8.60	35.67cdefg	20.56	38.56	2.87	247.87	19.19	14.65 bcdef
$T_{0.5}\ M_{0.5}$	Fertilization with spraying	12.00	11.27 ab	35.35	9.10	44.67abc	16.78	43.43	3.30	290.44	21.96	15.88 bcde
$T_{0.5}\ M_{0.5}$	Soil fertilization	15.33	11.40 ab	40.79	9.13	32.67cdefg	19.00	35.40	2.93	266.21	20.17	15.00 bcdef
$T_{0.5}\ A_{0.5}$	Without fertilization	12.67	8.60 abcde	38.78	8.87	33.00cdefg	17.78	46.41	5.55	152.65	13.32	10.28 def
$T_{0.5}\ A_{0.5}$	Fertilization with spraying	15.00	8.70 abcde	37.41	8.70	32.67cdefg	19.22	47.93	4.48	155.13	13.46	12.35 bcdef
$T_{0.5}\ A_{0.5}$	Soil fertilization	13.67	9.60 ab	39.34	9.43	31.67cdefg	16.44	46.14	4.65	198.41	15.74	12.58 cdef
$M_{0.5}\ A_{0.5}$	Without fertilization	17.33	9.90 ab	37.18	9.00	44.33abcd	16.34	46.83	4.98	257.21	17.11	12.94 bcdef
$M_{0.5}\ A_{0.5}$	Fertilization with spraying	15.00	10.60 ab	38.20	9.27	52.33ab	18.22	49.66	4.55	312.84	21.63	11.31 cdef
$M_{0.5}\ A_{0.5}$	Soil fertilization	11.00	11.03 ab	39.73	9.77	35.00cdefg	15.67	52.20	4.03	307.05	23.34	14.14 bcdef
$G_{\frac{1}{3}}T_{\frac{1}{3}}M_{\frac{1}{3}}$	Without fertilization	11.00	10.10 ab	38.27	8.80	33.33cdefg	16.22	41.26	3.01	251.46	19.44	15.24 bcdef
$G_{\frac{1}{3}}T_{\frac{1}{3}}M_{\frac{1}{3}}$	Fertilization with spraying	12.00	11.43 ab	38.47	9.50	35.33cdefg	19.00	51.62	4.02	324.22	27.28	15.20 bcdef
$G_{\frac{1}{3}}T_{\frac{1}{3}}M_{\frac{1}{3}}$	Soil fertilization	15.00	8.70 abcde	38.78	10.00	35.00cdefg	18.44	40.21	3.23	247.73	21.10	14.14 bcdef
$G_{\frac{1}{3}}T_{\frac{1}{3}}A_{\frac{1}{3}}$	Without fertilization	11.67	7.83 abcdef	40.06	8.93	26.67efgh	17.55	42.91	4.90	135.12	12.62	9.94 ef
$G_{\frac{1}{3}}T_{\frac{1}{3}}A_{\frac{1}{3}}$	Fertilization with spraying	11.33	7.67 bcdef	40.18	7.87	27.67defgh	18.78	34.96	2.88	144.55	15.90	12.68 cdef
$G_{\frac{1}{3}}T_{\frac{1}{3}}A_{\frac{1}{3}}$	Soil fertilization	10.00	9.20 abcd	40.55	8.20	29.67cdefg	15.44	49.31	4.48	172.61	15.36	15.19 bcdef
$G_{\frac{1}{3}}M_{\frac{1}{3}}A_{\frac{1}{3}}$	Without fertilization	14.00	10.33 ab	41.47	9.80	42.67abcde	20.44	48.72	3.90	300.25	22.82	14.90 bcdef
$G_{\frac{1}{3}}M_{\frac{1}{3}}A_{\frac{1}{3}}$	Fertilization with spraying	15.00	11.83 a	41.98	9.43	35.33cdefg	15.67	53.04	3.41	354.97	22.90	14.94 bcdef
$G_{\frac{1}{3}}M_{\frac{1}{3}}A_{\frac{1}{3}}$	Soil fertilization	15.67	11.73 ab	40.25	10.23	42.33bcde	21.22	47.53	2.89	312.94	20.82	12.95 bcdef
$T_{\frac{1}{3}}M_{\frac{1}{3}}A_{\frac{1}{3}}$	Without fertilization	12.00	10.70 ab	39.80	9.57	29.67cdefg	16.22	60.05	4.04	268.89	20.92	11.40 cdef
$T_{\frac{1}{3}}M_{\frac{1}{3}}A_{\frac{1}{3}}$	Fertilization with spraying	12.00	10.77 ab	40.59	8.57	32.33cdefg	16.78	62.50	4.41	280.01	22.98	15.46 bcdef
$G_{0.25}\ T_{0.25}\ M_{0.25}\ A_{0.25}$	Soil fertilization	14.67	10.57 ab	40.52	9.30	41.33bcde	18.45	50.42	3.67	302.06	25.65	9.24 ef

**not significant*

The least amount of diameter belongs to M_1 and nutrition method of spraying leaves. It's because of the salinity that's caused by municipal waste compost and the plant has remained small because of deficiency in growing period. It goes to procreative phase and produces smaller flower. The result didn't match with Garcia-Gomez et al., [34] findings regarding rasing marigold in beds including 75% compost which leads to increasing salinity and lack of equilibrium. In $G_{\frac{1}{3}}\ M_{\frac{1}{3}}\ A_{\frac{1}{3}}$ the plant had complete growth because of preparing conditions away from stress and completing growing period. So it produced bigger plant and bigger flower. Riberio et al., [28] tested 10,20,30,40,50% municipal waste compost. So the best result belonged to crane's bill index in low amount of compost (10,20%). The most and least height of peduncle belongs to $G_{\frac{1}{3}}\ M_{\frac{1}{3}}\ A_{\frac{1}{3}}$ and M_1. $G_{\frac{1}{3}}\ M_{\frac{1}{3}}\ A_{\frac{1}{3}}$ following soil consumption of compost had the most height of peduncle. It matches with findings of Bani Jamali [38] regarding positive effects of spraying on peduncle of chrysanthemum. M_1 because of having high EC and problem of salinity led to low growth of the plant and shortening the peduncle. But in $G_{\frac{1}{3}}\ M_{\frac{1}{3}}\ A_{\frac{1}{3}}$, because of combination of garden soil, municipal waste compost and Azolla compost, problem of salinity in municipal waste compost removed and the plant had a positive reflection to this compound. The most number of flowers belonged to $G_{0.5}\ M_{0.5}$ that was in a group with $M_{0.5}\ A_{0.5}$ and had same results. Being rich in nutrition materials was the cause of increasing flowers in $G_{0.5}\ M_{0.5}$. lack of nutrition materials in A_1 and increasing amount of EC and salinity in M_1 was the cause of decreasing number of flowers. Eklind et al., [39] reported that falling of growth and decreasing number of flowers in high amount of compost in combination with peat is result of high salinity in bed growth of English Daisy. interaction influence of bed and nutrition method of flower index is significant so the most number of flowers is in $G_{0.5}\ M_{0.5}$ and nutrition method of soil fertilization. The most fresh weight of root was in $T_{\frac{1}{3}}\ M_{\frac{1}{3}}\ A_{\frac{1}{3}}$ and nutrition method of spraing leaves and the least wet weight of root belongs to M_1 and nutrition method of soil fertilization, spraing leaves and without fertilization. Increasing fresh weight of root in $T_{\frac{1}{3}}\ M_{\frac{1}{3}}\ A_{\frac{1}{3}}$ caused by suitable conditions including bed permeability, suitable ventilation that by using Azolla compost and tea wastes compost led to better growth of the root. Tea waste is better be used as a combination with other cultivation surrouding specially perlite because of having high EC and turning to black mud after water absorption [9]. Decreasing fresh weight of the root in M_1G_1 can be caused by lack of suitable ventilation. Moreover, in municipal waste compost, high number of materials and lack of suitable permeability leads to a bed growth and low spreading of the root. Increasing fresh weight of the root in $T_{\frac{1}{3}}\ M_{\frac{1}{3}}\ A_{\frac{1}{3}}$ and nutrition method of spraying leaves can be caused by suitable ventilation and permeability and spraying leaves method. It can lead to better spreadings of the leaf surface, and increasing photosynthesis and transferring these materials for spreading the root because of better and fast uptake of needed material of the plant. The most amount of dry weight was seen in $T_{0.5}\ A_{0.5}$ and $M_{0.5}\ A_{0.5}$. The least amount of dry weight was in M_1. Decreasing dry weight in M_1 was caused by salinity and lack of aeration and suitable permeability that led to decreasing fresh and dry weight of the root. Lopez-Real et al., [40] reported that weight of cranesbill root, petunia hybrida and the anemone increased to 50% following increasing sewage ratio and crude compost. But with 75% compost this number decreased. Using municipal waste compost in high degree in sugar beet fields led to low growth of the root [41]. One important factor for assessing beds and nutrition method, dry weight of the shoot. In the experiment the most amount of dry weight of the shoot belongs to $G_{0.5}\ M_{0.5}$ that's in a group with $G_{\frac{1}{3}}\ T_{\frac{1}{3}}\ M_{\frac{1}{3}}$. Mutual influence of bed and nutrition method was not meaningful in this index but $G_{\frac{1}{3}}\ T_{\frac{1}{3}}\ M_{\frac{1}{3}}$ and nutrition method of spraying leaves had better effects on dry weight of the shoot. El-Naggar [42] During his trial examined foliar spray on growth and flowering carnation and the results indicate that the parameters of floweing such as diameter and fresh and dry weight of flowering rose while days of flowering decreased. Length, diameter, fresh and dry weight and fresh and dry weight of leaves increased significantly. Length, diameter and fresht and dry weight of peduncle, number, fresh and dry weight of leaves had also a significant increase. A_1 and nutrition method without fertilization has the least dry weight of the shoot. This is due to the lack of nutrition materials in Azolla compost. Based on the reports, spraying on flowering and growth of anemone [43], rose [35], Tuberose [36] and white lily [37] had positive effects. Although $G_{\frac{1}{3}}\ T_{\frac{1}{3}}\ M_{\frac{1}{3}}$ had more dry weight of the shoot but had less flower as compared with other beds. This implys that materials made from photosynthesis in spite of growing organs and plants, had less flowers. The most amount of chlorophyll was seen in M_1 that had a significant difference with other beds. The most amount of chlorophyll was seen in A_1. interaction of bed and nutrition method was so significant on this index that the most amount of chlorophyll was seen in M_1 and all other 3 nutrition methods without fertilization, spraying leaves, soil fertilization and the least amount of chlorophyll belongs to $G_{0.5}\ A_{0.5}$ and nutrition method of spraying leaves. High amount of chlorophyll in M_1 is due to municipal waste compost because there are many nutrition materials in this bed specially Nitrogen that had a direct role in making leaf chlorophyll. Lack of chlorophyll of leaf in A_1 is due to lack of nutrition materials and lack of making chlorophyll in leaves. El-Naggar [42] was treated in six different experimental foliar spray that contains 4 elements of macro and micro elements on the growth and flowering of six cloves and chemical analysis was investigated and the results of the analysis indicate that the chlorophyll a,b, Carotenoids, Carbohydrates and Minerals in the leaves like N, P, K, Zn, Cu were significantly increased.

CONCLUSION

Results of the experiment showed that all basic beds (Tea waste compost, municipal waste compost, Azolla compost and garden soil) have not the ability for growing English Daisy, separately. The plant could have a suitable growth in different combinations of the bed. The best function in media is made of two or 3 combinations. In Indexes belonging to number of leaves, number of flowers and dry weight of the shoot in $G_{0.5}$ $M_{0.5}$ best results were seen. Indexes belonging to height, diameter, height of peduncle and fresh weight of the shoot was made in $G_{\frac{1}{3}}$ $M_{\frac{1}{3}}$ $A_{\frac{1}{3}}$. Although the amount of chlorophyll in bed M had the best results and showed no significant differences with other beds, but other factors such as the height of flowering stems, fresh and dry weight of the root was not a suitable result. Azolla compost alone is not suitable for plant growth because growth parameters such as length, diameter, number of leaves, plant height, number of flowers, fresh weight and dry weight and chlorophyll were no suitable results. Increased composting organic waste into plant growth media led to an increase in the index of English Daisy. Most of the growth parameters of the replacement value of 33.3% and 50% of municipal solid waste compost on plant growth was better. Increasing amount of municipal solid waste compost more than 50% replacement led to reduction in plant growth parameters of English Daisy, because the weight of municipal solid waste compost in large quantities as a major limiting factor leads advance effects, so with some beneficial effects such as proper nutrient, it acts as a limity factor. So no more than 50% of municipal solid waste compost can be used in bed. Azolla compost inspite of having the appropriate pH and EC and air permeability but due to lack of nutrients, is not suitable for growth plants. And best of Azolla compost in amount of 33.3% and 50% were mixed with municipal solid waste compost. Because Azolla compost with a suitable ventilation of bed and municipal solid waste compost as a nutrient supplier are a suitable supplement for each other and suitable combination for growing ornamental plants. English Daisy is among the plants outdoors that are used in operating margin and for beauty requires more flowers and more flower diameter and longer flower stems and long lasting flowers. At this level 33.3% and 50% 0f municipal solid waste compost and composted Azolla along fertilization is achieved. Adding fertilizer to the bed with little compost led to increase in growing index. It can be recommended as a supplement to the growth in this context. Composition of the substrate must be considered fertilization. As was observed in substrates containing a high percentage of waste, municipal solid waste compost and compost tea does not affect fertilization. But in beds like Azolla fertilization increased plant growth. Fertilization is recommended when the media is nutrient poor. Low ratios of municipal solid waste compost(33.3% and 50% replacement) due to favorable chemical and physical properties of the substrates can substitute for common garden soil litter in urban green spaces and also imported and expensive peat. EC higher than the optimal in the substrates containing municipal solid waste compost for growth ornamental plants that have a low threshold of tolerance to salinity should be considered.

REFERENCES

[1] Rout G R, Mohapatra A, Mohan Jain S, *Biotechnology Advances*, **2006** 24: 531-560.
[2] Pool R T, Conover C A, Joiner J N, *Soil Science*, **1981**, 132 (2): 179 - 202.
[3] Qi-Xiao W, Li-Li C, Shu-lian S, Azolla Utilization (IRRI), **1987**, 241-254.
[4] Chen Y, Ibar Y, Harda Y, *Forest Production Journal*, **1988**, 22(1): 36-39.
[5] Fred D R, Hariss H M, Watanabe R, Stanley R W, *Horticulture Research Note*. University of Hawaii. 4 pp.**1997**.
[6] Jankauskiene J, Brazaityte A, *Lithuanian Institute of Horticulture Kauno*, **2008**, 27: (2) 285-294.
[7] Ercisli S, Esitken A, Cangi R, Sahin F, *Plant Growth Regulation*, **2003**, 4: 133-137.
[8] Dresboll D B, *Scientia Horticulturae*, **2010**, 126: 56-63.
[9] khaligi A, padasht-Dehkayee M N, *Iranian J. Agric. Sci*, **2000**, 31 (3): 557-565 (in Persian).
[10] Bahmani F, M. Sc. Thesis, Faculty of Agriculture. Ferdowsi University Of Mashhad (Mashhad, Iran, **2004)**.
[11] Khoshgoftar Manesh A, Kalbasi M, *Journal Of Science And Technology Of Agriculture And Natural Resource*, **2002**, 6(3): 141-148 (in Persian).
[12] Fitzpatrick G E, Verkade S D, *Proceedings of the Florida State Horticultural Science*, **1991**, 104:308-310.
[13] Mahbob Khomami A, Padasht- Dehkayee M N, *Seed And Plant Production Journal Agricultural*, **2009**, 2-25(4): 417- 430 (in Persian).
[14] Joiner J N, *Foliage plant production*. Prentice Hull, Inc. 614 pp. **1981**.
[15] Larson R A, *Introduction to floriculture*. North Carolina State University, Academic Press Inc. 636 pp. **1992**.
[16] Lumpkin T A, *Azolla Utilization* (IRRI), **1987**, 89-98.
[17] Aldima M S, Mendoza R, Nageraja K S, *International Rice Research Newsletter*, **1987**, 12 (5): 37-38.
[18] Shadanpour F, Mohammadi Torkashvand A, Hashemi Majd K, *Annals of Biological Research*, **2011**, 2 (6) : 109-115.
[19] Lumsden R D, Millner P D, Lewis J A, *Plant Dis*, **1986**, 70: 197-201.
[20] Atiye R M, Edwards C A, subler S, Metzger J D, *Biores. Technol*, **2001**, 78: 11-20.
[21] Stace C, *New Flora of the British Isles*. 2nd edition. Cambridge University Press, Cambridge, UK, **1997**.

[22] Grime J P, Hodgson J G, Hunt R, *Comparative Plant Ecology*, Unwin Hyman Ltd, London, UK, **1988**.
[23] Mitich L W, *Weed Technology*, **1997**, 11: 626-628.
[24] Paye A L, Miller R H, Keeny D R, Part II. SSSA Inc .Madison, WI, **1984**.
[25] Robert D W, Browder J F, *Hort Science*, **2005**, 40(5): 1513-1515.
[26] Grigatti M, Giorgioni M E, Ciavatta C, *Bioresource Technology*, **2007**, 98:3526-3534.
[27] Walker D J, Bernal M P, *Bioresource Technology*, **2008**, 99: 396 - 403.
[28] Riberio H M, Vasconcelos E, Dos santos J Q, *Bioresource technology*, **1999**, 73: 247-249.
[29] Davidson H, Mecklenburg R, Peterson C, Nursery management: administration and culture. third ed. Englewood Cliffs, NJ, USA: Prentice Hall, **1994**.
[30] Gayasinghe G Y, Liyana Arachchi I D, Tokashiki Y, *Resources Conservation and Recycling*, **2010**, 54: 1412–1418.
[31] Abad M, Noguera P, Bures S, *case study in Spain. Biores . Technol*, **2001**, 77, 197-200.
[32] Clemens J, Morton R H, Amer. *Soc. Hort. Sci*, **1999,** 124(6): 713-718.
[33] Vleeschauwer D De, Verdonck O, Boodt M De, *Acta Horticulture*, **1980**, 148: 149-155.
[34] Garcia-Gomez A, Bernal M P, Roig A, *Bioresource Technology*, **2001**, 83: 81–87.
[35] Sharaf A I, El-Naggar A H, *Alex. J. Agric. Res*, **2003**, 48(1): 147-158.
[36] Pal A K, Biswas B, *J. Interacademicia*, Nadia, India, **2005**, 9(1): 33-36.
[37] Mahgoub H M, Rawia A, Bedour A, *J. Appl. Sci. Res*, **2006**, 2(11): 899-903.
[38] Bani Jamali S M, *First National Seminar And Festival IRAN Cut Flower*. Tehran, Pakdasht, October, 74 pp. **2004**.
[39] Eklind Y, Salomonsson L, Wivstad M, Ramert B, *Biol. Agric. Hortic*, **1998**, 16, 269–290.
[40] Lopez-Real J M, Witter E, Midmer F N, Hewett B A O, *Water Sci. Tech*, **1989**, 21: 889–897.
[41] Ghiamati G, Astaraei A, Zamani G, *Iranian Journal Of Research*, **2009**, 7 (1): 153-162 (in Persian). [42] El-Naggar A H , *World Jornal of Agriculture Sciences*, **2009**, 5 (5): 622-630.
[43] Pislornik M, *Acta Agraia et Silvestria Series Agraria* (Poland), **1985**, 24: 175-185.