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Impact of Growing Media and Compound Fertilizer Rates on Growth and Flowering of Cocks Comb (*Celosia argentea*) Plants

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ABSTRACT

The present study was conducted during consecutive seasons of 2016 and 2017 seasons in a private nursery belonging to Sakha Horticulture Research Station at Kafr El-Sheikh Governorate, Egypt. This study aimed mainly to investigate the effect of growing media including different mixture of peat moss and sand as 1:1, 2:1 and 1:2 v/v and NPK fertilizer at rates of 0 , 1.5, 3 and 4.5 g/pot and their interaction on growth, flowering and chemical composition of cocks comb (*Celosia argentea*) plants. The results revealed that growing media containing peat + sand (2:1) had significant positive effect on number of leaves and branches/plant, number of inflorescences and chlorophyll content (SPAD) as well as leaf chemical composition parameters (total carbohydrate, N, P and K %) in both seasons. Applying the complete fertilizer of NPK at 4.5g/pot was the best treatment for vegetative growth, flowering and chemical constituents of leaves. The maximum beneficial effect on the vegetative growth characteristics, number of inflorescences/plant and chlorophyll content (SPAD) and total carbohydrate as well as leaf, N, P and K % were obtained for plants grown in in peat + sand (2: 1 v/v) and fertilized by NPK (20: 20: 20) at rate of 4.5 g/pot. It can be recommended that to produce high inflorescences with a good quality of *Celosia argentea* plants for different purposes in the gardens by planting them in the mixture of peat moss + sand at 2: 1 v/v and fertilizing with complete fertilizer NPK (20:20:20) at rate 4.5g/pot four times stating after one month from transplant and then 2 weeks intervals.

Keywords: *peat, sand, inflorescences, Celosia argentea, cockscomb, growth*

INTRODUCTION

Cockscomb (*Celosia argentea)* is a herbaceous plant of tropical origin grows well in both humid and a rid conditions. It is a common garden plant of the amaranth family (Amaranthaceae).It produces dense undulating inflorescences that resemble the red combos on the heads of roosters, hence it common name, the colors range from white to orange, red and purple. The inflorescences are used as cut flowers because they can't last up to 8 weeks and can be dried to use in floral arrangement. So, it has a great economic value as a cut flower and flowering pot (Surse *et al.,* 2014).

Planting media and nutritional requirements are one of the major factors that affect vegetative growth, flowering behavior and quality. Growing media play an important role in plant support, serve as a source of water and essential plant nutrients and permit the diffusion of oxygen to the roots. Growing media also provide a number of functions additions to support for the above ground part-functions that often appear mutually exclusive. The materials of growing media consist of clay soil and sand as fully, or replaced it partially by one or more from various materials such as peat moss, leaf mould, farm yard manure, municipal sewage sludge, vermicompost etc., which led to alter the physico-chemical characteristics of the growing mixtures and affect plant growth, root system and nutritional status of the plant (Habib, 2012).

With respect to the effects of growing media on vegetative growth, Nabih (1991) and Mazhar *et al.,* (2010) indicated that, sand + compost and sand + clay media for ornamental plants produced best vegetative growth in terms of plant height, leaf number/plant and leaves dry weight. In this respect, Abd El Sattar *et al.,* (2010) and El Naggar and El Nasharty (2009) reported that sand/compost medium for *Polianthes tuberosa* and *Hippeastrum vittatum* was the best for increasing most vegetative growth characteristics. As for the effect of growing media on flowering, Mohamed (1994) and Badawy (1998) reported that, *Polianthes tuberosa* plants grown in 1: 1: 1 loam/ sand/ peat (v/v) or 1: 1: 2 loam / sand/ peat (v/v) had generally taller spikes than those in other mixtures. In addition, the greatest number of flowers/spike was obtained from plants grown in 1: 1: 1 loam/ sand/ vermiculite (v/v), whereas the lowest values were recorded on plants grown in 1: 2: 1 loam/ sand/ peat (v/v).

Compound fertilizer (NPK) plays an important role in nutritional status, growth development and flower production of ornamental plants. Ojo (1998) on *Celosia argentea* cv. TLV8 found that application of NPK (15-15-15) had a remarkable effect on most vegetative growth traits, the optimal rate was 90 kg/ha of NPK for fresh shoot weight, plant height, branch number, stem girth and productivity. El Naggar and El Nasharty (2009) and Habib (2012) revealed that using composted peanut as growing medium with 4 g/plant NPK (14:7:37) significantly increased vegetative growth parameters such as plant height, stem diameter, thickest shoots, number of leaves and leaf area as well as fresh and dry weight of shoots and roots compared with that recorded for plants grown in clay, peat moss and sand as individual medium. Moreover, Caryota seedlings grown in composted peanut and peat moss medium plus 4 g/plant NPK gave the highest values of chlorophyll content in the leaves.

The aim of the present investigation was to evaluate three combinations between sand and peat moss as growing media and four rates of compound NPK (20-20-20) on growth, flowering and chemical composition of cockscomb (*Celosia argentea*) plants.

MATERIALS AND METHODS

The present study was carried out at a private nursery belonging to Sakha Horticulture Research Station at Kafr El-Sheikh Governorate, Egypt. during 2016 and 2017 seasons in order to study the effect of growing media including peat moss and sand and NPK fertilizer on vegetative growth, flowering and chemical composition of cockscomb (*Celosia argentea*) plants.

The following materials and treatments were used:

Seeds:

The seeds of *C. argentea* were obtained from Flora Co., Giza. The seeds were sown on 15th March in 84-cell seedling trays. After five weeks (20, on April) seedlings were transplanted into pots (20cm) containing a different mixture of peat moss and sand. Each pot contained one seedling.

Growing media and NPK fertilizer treatments:

One hundred and eighty seedlings were selected as uniform as possible in vigor. The experiment was designed as a split plot in randomized complete blocks as follows:

A- Growing media with three mixture of peat moss and sand as volume / volume were allocated in main plots as follows

1- 1:1 peat moss / sand (v/v)
2- 2:1 peat moss / sand (v/v)
3- 1:1 peat moss / sand (v/v)

The chemical analysis of the growing media including different mixture of peat moss and sand used in this study are presented in Table 1.

Table 1. Chemical analysis of the growing media as the average of the two growing seasons.

Growing media Peat : Sand	Ec (mmohs/ cm)	pH	Available nutrients (ppm)		
			N	P	K
1:1	2.4	7.81	60	20	65
2:1	3.0	7.86	80	25	70
1:2	1.37	8.18	50	19	51

B- Four doses e.g. 0, 1.5, 3 and 4.5 g/pot of compound fertilizer NPK (20:20:20) were allocated in subplots.

The chemical fertilizer NPK (20:20:20) was applied after one month from transplanting (20th , May in both seasons) and then at two weeks interval until reaching the flowering stage. The plants received regular agricultural practices of irrigation.

During the growing season for each year, the following measurements and determinations were carried out:

Vegetative growth parameters:

Vegetative growth parameters included number of leaves per plant and branch number per plant were recorded at flowering stage.

Total chlorophyll (total green color)

Twenty mature leaves were sampled from each treatment to determine total chlorophyll by SPAD meter reading according to Netto *et al.,*(2005).

Number of inflorescences per plant

Chemical analysis

Twenty mature leaves were sampled from each treatment were dried at 70°C to a constant weight, and then 0.5 g powder from dried leaves was taken to determine total carbohydrates according to Doubis *et al.,* (1956). Dried leaves were ground and digested according to Jackson (1967) by using the mixture of concentrated sulfuric acid (H_2SO_4) + per chloric ($HClO_4$) (5: 1) to determine the elements of N, P and K. Total nitrogen % was determined by using the micro-Kjeldahl method as described by Pregl (1945), phosphorus % was determined colorometrically as described by Murphy and Riley (1962), potassium % was estimated by using flame photometer as described by Brown and Lillelland (1974).

Statistical analysis

The data were statistically analyzed as analysis of variance according to Snedecor and Cochran (1990), Duncan's multiple range test (Duncan, 1955) at 5% level was used to compare the means.

RESULTS AND DISCUSSION

Vegetative growth:

Results presented in Table (2) clear that number of leaves and branches per plant were positively affected by different growing media in both seasons. Plants grown in peat + sand (2:1) had significantly higher values of number of leaves and branches per plant than that on peat + sand (1:1) and peat + sand (1:2) in both seasons. On the other words, plants grown in peat + sand (2:1) recorded maximum number of leaves and branches, while peat + sand (1:1) media gave intermediate values in both seasons. On the other hand, the lowest number of leaves and branches per plant was found in plants grown in peat + sand (1:2) medium, this result was true in both seasons. Similar results were obtained by Riaz *et al.,* (2014) and Sardoei and Shahdadneghad (2015) on Zinnia. In this respect, Dubey *et al.,* (2013) concluded that soil + sewage sludge as growing media for petunia have high positive effect and significantly improved most vegetative growth character included number of leaves and branches per plant.

With regard to the effect of NPK fertilization, it was evident that number of leaves and branches per plant were significantly affected by NPK rates as shown in Table (1). In other words, both growth parameters were significantly increased by increasing NPK rate from 0.0 to 4.5 g/pot in both seasons. These findings are in line with those of Ojo (1998) and Yagi *et al.,* (2014) on *Celosia* plants. In this respect, El Mokadem and Sorour (2014) reported that *Petunia hybrida* fertilized with 5g/pot complete fertilizer of NPK (19:19:19) gave the best growth parameters in terms of plant height, number of branches and leaf area as well as dry weight of shoots and roots.

Also, a great influence was found between growing media and NPK fertilizer on growth parameters in terms of number of leaves and branches per plant as shown in Table (2).The highest values occurred in plants grown in peat + sand (2:1) medium and fertilized with 4.5 and 3 g/pot NPK in both seasons, respectively. In contrary, the lowest values of both parameters were found in plants grown in peat + sand (1:2) without NPK fertilization. These results are in accordance with those obtained by El Naggar and El Nasharty (2009) and Singh *et al.,* (2017). Also, Hassan *et al.,* (2016) found that the highest values of growth parameters were obtained from *Gladiolus grandiflorus* L. plants which received NPK at 16g/pot and grow in a medium of sand + peat as 1:1 compared to other media and fertilizers.

Generally the growth of cocks comb plants were significantly improved by using growing media (2:1 peat+ sand) and fertilized with 4.5g/pot NPK. These findings are in accordance with those of Riaz *et al.,* (2008) as they concluded that Zinnia plants gave the best vigour growth and produced more number of flowers in media containing more amounts of organic materials such as peat, manure and compost. Increasing vegetative growth of *Celosia*

cristata L. plants as a result of the effect of growing media and NPK fertilization maybe due to the balance between water content and gaseous exchange, which improve in soil cation exchange capacity (CEC) and porosity due to bulkiness in nature, which in turn helped the plant root development and enhanced the uptake of available nutrients resulting in faster cell division and cell elongation; and consequently increased plant growth and size. These observations were corroborated with the findings of Khobragade *et al.,* (1997) on tuberose plants , Younis *et al.,* (2008) on *Dahlia coccinea* and Dressboll (2010) on roses (*Rosa sp.*) .

Table 2. Effect of growing media and rates of NPK fertilizer on number of leaves and branches of Cocks comb plants during 2016 and 2017.

Growing media Peat : Sand	Number of leaves /plant					Number of branches/plant				
	Season, 2016									
	NPK rate (g)				G- mean	NPK rate (g)				Mean A
	0	1.5	3	4.5		0	1.5	3	4.5	
1:1	19.33h	68.00e	78.00d	102.33c	66.91b	0.00g	15.00d	18.66c	25.33d	14.75b
2:1	19.00h	72.33dc	126.00b	153.33a	92.66a	1.00g	25.00b	27.66ab	29.00a	20.66a
1:2	16.33h	35.66g	53.33f	64.33e	42.41c	0.00g	8.66f	12.00a	12.66de	8.83c
Mean B	18.22d	58.66c	85.77b	106.66a		0.33d	16.22c	19.44b	22.33a	
	Season, 2017									
Peat : Sand	NPK rate (g)				A- mean	NPK rate (g)				Mean A
	0	1.5	3	4.5		0	1.5	3	4.5	
1:1	22.33h	70.33e	85.00d	116.66c	73.58b	0.00g	16.66d	21.66c	24.66bc	15.75b
2:1	21.66h	85.33d	129.33b	161.66a	99.50a	1.33g	27.66b	32.66a	34.66a	24.08a
1:2	19.66h	39.66g	58.66f	64.00ef	54.50c	0.00g	8.33f	13.00b	14.33de	8.91c
Mean B	21.22d	65.11c	91.00b	114.11a		0.44d	17.55c	22.44b	24.55a	

Data in a column followed by the same symbol are not significant different according to Duncan's multiple range test (DMRT)

Inflorescences parameters:

Results presented in Table (3) revealed that, inflorescences parameters (number of inflorescences /plant and fresh and dry weight of inflorescences) were significantly increased due to using peat + sand (2:1) followed by peat + sand (1:1) as growing media in plantation. On the other hand, plants grown in peat + sand (1:2) gave the lowest values in this respect . The differences were significant among the different growing media in both seasons. These results were similar to those obtained by Ahmad *et al.,* (2012), Dubey *et al.,* (2013) and Popescu and Popescu (2015) on Gerbera and petunia plants, respectively.

As for the effect of NPK fertilization, it is clear from data presented in Table (3) that all NPK fertilization rates significantly increased inflorescence parameters compared to control (without fertilizer) in both seasons. The highest values of these parameters were found in plant fertilized with NPK at 4.5g/pot followed by 3g/pot in both seasons. These results are in agreement with those found by Hassan *et al.,* (2016). In this respect, Singh *et al.,* (2017) revealed that increasing rates of NPK increased number of flower/stem of Alstroemeria cv. Capri plants.

Plants grown in peat + sand (2:1) and received NPK at rate of 4.5g/pot improved inflorescence parameters more than the other combination treatments in both seasons. Similar results were obtained by Bhatia *et al.,* (2004) and Metwally *et al.,* (2013) on carnation plants.

Generally, it is obvious from Table (3) that the parameters of inflorescences were significantly increased over control with the application of NPK fertilizer rates under the different growing media. The combination between Beat + sand (2:1) and NPK fertilization at rate 3 and 4.5 g/pot improved inflorescences more than the other treatments this may be due to improving the vegetative growth such number of branches/plant as shown in Table (2) which led to increase the amount of carbohydrates in plant tissue (Table, 4) that are important to initiate many flowering buds. Similar results were obtained by Hassan *et al.,* (2016) and Singh *et al.,* (2017).

Table 3. Effect of growing media and rates of NPK fertilizer on fresh, dry weight and inflorescence number of cocks comb plants during 2016 and 2017 seasons.

Growing media Peat : Sand	Number of inflorescences /plant					Inflorescences fresh weight (g)					Inflorescences dry weight (g)				
	2016 season														
	NPK rate (g)				G- Mean	NPK rate (g)				G-mean	NPK rate (g)				AMean
	0	1.5	3	4.5		0	1.5	3	4.5		0	1.5	3	4.5	
1:1	1.00f	14.00cd	17.33c	22.00b	13.58b	0.97gh	2.98f	4.22d	5.68b	3.46b	0.173g	0.530f	0.770d	1.003b	0.619b
2:1	1.00f	16.33c	22.00b	27.00a	16.58a	1.19g	4.08d	5.59b	6.74a	4.40a	0.207g	0.723de	0.983b	1.180a	0.774a
1:2	1.00f	9.00e	12.66d	17.00c	9.91c	2.88h	2.74f	3.77e	4.69c	3.02c	0.157g	0.483f	0.677e	0.850c	0.542c
B-mean	1.00d	13.11c	17.33b	22.00a		1.01d	3.27d	4.53b	5.70a		0.179d	0.579c	0.810b	1.010a	
	2017 season														
Peat : Sand	NPK rate (g)				A- mean	NPK rate (g)				A- mean	NPK rate (g)				A-Mean
	0	1.5	3	4.5		0	1.5	3	4.5		0	1.5	3	4.5	
1:1	1.33h	15.66e	19.33d	23.33b	14.91b	1.18g	3.11f	4.56d	5.84b	3.67b	0.213g	0.557f	0.813d	1.043b	0.650b
2:1	1.66h	16.00e	22.33bc	28.66a	17.16a	1.38g	4.29de	5.79b	6.75a	4.55a	0.253g	0.767de	1.033b	1.203a	0.814a
1:2	1.00h	9.66g	13.33f	20.66cd	11.16c	1.09g	3.06f	4.21e	4.97c	3.33c	0.197g	0.550f	0.753e	0.893c	0.598c
B-mean	1.33d	13.77c	18.33b	24.22a		1.22d	3.49c	4.85b	5.85a		0.221d	0.624c	0.867b	1.047a	

Data in a column followed by the same symbol are not significant different according to Duncan's multiple range test (DMRT)

Leaf total chlorophyll and carbohydrates contents:

Regarding the effect of growing media, results presented in Table (4) clearly showed that, total chlorophyll (SPAD) and total carbohydrates % were significantly affected by using different growing media in both seasons. Cocks comb plants grown in peat + sand (2:1) medium recorded the highest values of total chlorophyll and total carbohydrate in both seasons. Similar results were in harmony with those obtained by Popescu and Popescu (2015) on *Petunia grandiflora* and *Nicotiana alata* plants . The increment in leaf chlorophyll and carbohydrate contents as a result of growing media might be due to soil application of peat moss which led to increasing sand soil organic matter, improves soil structure and increases the water-holding capacity, which reflected to improve availability of macro and micronutrients such as nitrogen, magnesium and others. Also, the increment in carbohydrates may be attributed to increase number of leaves and branches as well as leaf chlorophyll content, consequently the rate of photosynthesis process would be increased, as a result the percentage of total carbohydrates in the leaves is increased. This explanation agree with our data in Tables (2 and 4) and El Naggar and El Nasharty (2009) as they concluded that composted leaves or sand + composted leaves tended to improve leaf total chlorophyll content on *Hippeastrum vittatum*.

In regarding to NPK fertilization, data presented in Table (4) showed that, applying different fertilization rates to plants significantly increased total chlorophyll (SPAD) and total carbohydrates% compared to untreated plants in both seasons. The positive effect of NPK fertilizer rates was pronounced at 4.5g/pot followed by 3 and 1.5g/pot, respectively. Similar results were obtained by to El Mokadem and Sorour, (2014) and Hassan *et al.,* (2016).

Concerning the interaction between growing media and NPK rates, it is clear that the interaction effect on leaf total chlorophyll and carbohydrates were significant in both seasons (Table 4). However, the highest values of total chlorophyll and carbohydrates were found on plants grown in the media and received NPK at 4.5g/pot without significant differences among them in both seasons. However, the least values belonged to zero NPK rate under the different growing media, especially peat + sand (1:2) in both seasons. So, the limiting factor for increasing chlorophyll and carbohydrate is NPK fertilization rates. This result agree with those obtained by Rathore *et al.,* (1985) as they concluded that higher nitrogen and phosphorus application rates increased leaf chlorophyll and carbohydrate contents. Also, El- Sallami (1996) revealed that the leaf contents of chlorophyll showed a positive relationship with growth for the mix of peat+ clay.

Table 4. Effect of growing media and rates of NPK fertilizer on leaf total chlorophyll (SPAD) and total carbohydrates % of cocks comb plants during 2016 and 2017 seasons.

Growing media Peat :Sand	Total chlorophyll (SPAD)					Total carbohydrates %				
	Season 2016									
	NPK rate (g)				A-mean	NPK rate (g)				A-mean
	0	1.5	3	4.5		0	1.5	3	4.5	
1:1	19.43h	36.13e	39.43c	41.40ab	34.10b	9.84fg	10.47efg	11.99d	15.29a	11.90b
2:1	27.16g	37.10de	40.10bc	42.40a	36.69a	10.21fg	11.12e	13.56bc	16.07a	12.70a
1:2	17.80h	33.90f	38.16cd	39.80bc	32.41c	9.62g	10.57ef	12.92c	14.26b	11.84b
B-mean	21.46d	35.71c	39.23b	41.20a		9.89d	10.72c	12.82b	15.20a	
Season 2017										
Peat : Sand	NPK rate (g)				A-mean	NPK rate (g)				A-mean
	0	1.5	3	4.5		0	1.5	3	4.5	
1:1	21.90g	36.96de	39.96bc	41.83ab	35.16b	10.11g	11.06de	12.65c	15.09a	12.23b
2:1	26.53f	37.26de	40.33abc	42.63a	36.70a	10.48fg	11.47d	13.54b	15.46a	12.74a
1:2	20.43g	35.33e	38.23cd	39.96bc	33.44c	9.20h	10.79ef	12.88c	15.03a	11.97b
B-mean	22.95d	36.45c	39.51b	41.47a		9.93d	11.11c	13.02b	15.19a	

Data in a column followed by the same symbol are not significant different according to Duncan's multiple range test (DMRT)

Leaf N, P and K %:

Results presented in Table (5) showed that leaf N, P and K % were significantly increased as a result of using peat + sand (2:1) in comparison with the other media. On the other hand, the lowest values of leaf N, P and K % were obtained from using peat + sand (1:2) in plantation. Similar results were obtained by Younis *et al.,* (2008) on *Dahlia coccinea*, Riaz *et al.,* (2014) on Zinnia and Soltani and Naderi (2016) on Carnation plants. They indicated that growing media contain 50% or more organic materials produce the best plants for leaf N, P and K %. This result might be due to increasing availability of these nutrients under organic materials, which would enhance uptake rate by plants.

Also, the results presented in Table (5) revealed that, increasing NPK rate from 0.0 to 4.5 g/pot significantly enhanced percentages of N, P and K in leaves of in both seasons. These results are similar with those reported by El Mokadem and Sorour (2014) who revealed that using NPK fertilizer at rate of 5g/pot produced the highest significantly values of leaf N, P and K % compared with plants without fertilization.

The interaction between the two factors revealed that, treatment of peat + sand (2:1) and NPK rate at 4.5g/pot gave the highest values of N, P and K followed by peat + sand (2:1) and NPK rate 3.0g/pot, respectively,. whereas, the lowest values belonged to peat + sand (1:2) and without NPK in both seasons. The results are in agreement with those of El Naggar and El Nasharty (2009) and Habib (2012) who reported that, leaf N, P and K % were significantly increased as a result of supplemental NPK fertilizer and growing media of 50% peat moss + 50% clay.

Table 5. Effect of growing media and rates of NPK fertilizer on leaf minerals % of Cocks comb plants during 2016 and 2017 seasons.

Growing media Peat : Sand	Leaf mineral contents														
	N					P					K				
	2016 Season														
	NPK rate (g)				G-mean	NPK rate (g)				A- mean	NPK rate (g)				A-mean
	0	1.5	3	4.5		0	1.5	3	4.5		0	1.5	3	4.5	
1:1	2.16f	2.37d	2.56c	2.81b	2.47b	0.18fg	0.22e	0.26cd	0.30b	0.24b	1.58f	1.82de	1.95bc	1.99b	1.83b
2:1	2.24ef	2.48c	2.76b	3.16a	2.66a	0.20ef	0.26cd	0.32b	0.37a	0.28a	1.85cd	1.93bcd	2.03b	2.39a	2.05a
1:2	2.00g	2.29de	2.49c	2.70b	2.37c	0.17g	0.21e	0.25d	0.27c	0.22c	1.27h	1.38gh	1.48fg	1.72e	1.46c
B-mean	2.13d	2.38c	2.60b	2.89a		0.18d	0.23c	0.27b	0.31a		1.57d	1.71c	1.82b	2.03a	
	2017 season														
Peat : Sand	NPK rate (g)				A-mean	NPK rate (g)				G-mean	NPK rate (g)				A-Mean
	0	1.5	3	4.5		0	1.5	3	4.5		0	1.5	3	4.5	
1:1	2.25g	2.50a	2.59de	2.76c	2.52b	0.20de	0.23d	0.30bc	0.34ab	0.27b	1.60f	1.84de	1.97cd	2.03c	1.86b
2:1	2.40f	2.64d	2.90b	3.38a	2.83a	0.25cd	0.30bc	0.36a	0.39a	0.32a	1.95cde	2.00c	2.28b	2.56a	2.20a
1:2	2.10h	2.36f	2.61d	2.75c	2.45c	0.17e	0.21de	0.25cd	029bc	0.23c	1.36g	1.52f	1.63f	1.81e	1.58c
B-mean	2.25b	2.50c	2.70b	2.96a		0.20d	0.25c	0.30b	0.34a		1.64d	1.79c	1.96b	2.13a	

Data in a column followed by the same symbol are not significant different according to Duncan's multiple range test (DMRT)

CONCLUSION

From the obtained results, it could be concluded that to produce high inflorescences with a good quality of Cocks comb (*Celosia argentea*) plants for different ornamental purposes planted showed be grown in the mix of peat + sand (2: 1 v/v) and applying 4.5g/pot complete fertilizer NPK (20:20:20) during growing season.

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تأثير بيئة النمو و معدلات من السماد المركب على نمو و إزهار نباتات عرف الديك

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تم إجراء هذة التجربة فى الصوبة الزراعية الخاصة بمحطة بحوث البساتين بسخا محافظة كفر الشيخ مصر و ذلك لدراسة تأثير بيئات النمو المختلفة وهى مزيج من البت موس والرمل بنسب مختلفة هى 1: 1 ، 2: 1 و 1: 2 (حجم/حجم) و التسميد بسماد مركب 20: 20: 20 بمعدل 0.0 ، 1.0 ، 3.0 ، 4.5 جرام لكل اصيص تضاف ثلاث مرات خلال موسم النمو و التفاعل بينهما على النمو ، والإزهار ، وتحليل الأوراق الكيميائية لنباتات عرف الديك *Celosia argentea* خلال عامى 2015 و 2016 . أشارت النتائج إلى أن استخدام بيئات النمو المختلفة وخاصة المزج بين البت موس و الرمل بنسبة 2: 1 كان له تأثير إيجابي كبير على عدد الأوراق الافرع / النبات وعدد النورات و التركيب الكيميائي للورقة وهو الكلوروفيل الكلي ، الكربوهيدرات الكلية %، % من النيتروجين و الفوسفور و البوتاسيوم في كلا الموسمين. كان لمعدلات التسميد NPK تأثير كبير على كل القياسات المستخدمة في هذه الدراسة. ، كان لأعلى مستوى للسماد المركب (4.5 جم /اصيص) أفضل تاثير على النمو الخضري والزهرى والمواد الكيميائية المكونة للأوراق. إن استخدام السماد المركب NPK (20:20:20) بمعدل 4.5 جم / نبات مع بيئة النمو المكونة من البت موس + الرمل (2: 1 v / v) أعطى أقصى تأثير مفيد على خصائص النمو الخضري ، عدد النورات / النبات و محتوى الاوراق من الكلوروفيل الكلى والكربوهيدرات الكلية وكذلك تركيز الأوراق من النيتروجين و الفسفور و البوتاسيوم. لذلك يمكن التوصية لكى نحصل على أعلى إنتاج من النورات ذات النوعية الجيدة من نباتات *Celosia argentea* وذلك لاستخدامها فى الأغراض المختلفة في الزينة و ذلك عن طريق زراعتها في خليط من البت موس والرمل بنسبة إثنين بيت موس الى واحد رمل و التسميد بالسماد المركب NPK 20:20:20 بمعدل 4.5 جرام لكل اصيص تضاف الاولى بعد شهرين من الشتل بفاصل اسبوعين بين المرة والاخرى بمعدل ثلاث مرات خلال موسم النمو.