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Effect of organic media and seaweed extracts (seaweed - Fe) on the vegetative growth and flowering of *Narcissus tazetta* plant cv. Khatini.

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Abstract

A pot experiment has been carried out in College of Agriculture at Horticulture department nursery. Duhok University during the period from Oct., 1, 2015 to Apr., 1, 2016, to investigate the effect of three different organic media (Sheep manure + loam (3:1), poultry manure + loam (3:1) and peat moss + loam (3:1)) as volume and three concentrations of seaweed Fe extract (0, 2 and 3 ml L⁻¹) on the growth and flowering of *Narcissus tazetta* plant (cv. Khatini). The experiment was laid out in Randomized Complete Block Design (RCBD) of three factors in three replicates. The results showed that sheep and poultry manure media were significantly superior to peat moss medium which early in date of sprouting (85.10 and 85.46) days, and to obtain on the best characteristics of vegetative and flowering includes (leaf area, dry weight of leaves, date to flowering and number of florets/stalk flower). Seaweed extract also had a significant effect; this effect was increased with increasing of seaweed extract concentrations to 3 ml L⁻¹ on the growth characters of narcissus plant as compared with 2 ml L⁻¹ and control treatment in to accelerate the date of sprouting (85.48 days), gave a significant increase in leaves number. While 2 ml L⁻¹ of seaweed extracts was significantly superior on 0 and 3 ml L⁻¹ which accelerates the date of flowering (146.64) days and gave the high length of stalk flowers.

Introduction

Narcissus is a genus of hardy, spring blooming, bulbous plants belong to the family of Amaryllidaceae, and it is perennial herbaceous bulbiferous geophytes, dying back after flowering to an underground storage bulb. It regrows in the following year from brown-skinned ovoid bulbs with pronounced necks; there are thousands of named cultivars of narcissus grouped in divisions such as trumpet daffodils, chalice-cupped daffodils, poet daffodils, bunch-flowered daffodils, double daffodils, and jonquils depending on how they are classified. The species *Narcissus tazetta* derives its name from the word "Tazetta" which in Italian means "little cups" concerning the centrally placed little yellow corona cups. Bulbs are originated from Mediterranean and require sunny and warm places extending from Spain, Iran, and Kashmir to China and Japan [1]. *Narcissus*

genus in addition to being ornamental plants, outdoor flowers, potted and cut flowers, because of alkaloid compounds such as a gallant amine (Narciclasine, Lycorine, Crinine, Tazzatine) they have medicinal value [2]. Various kinds of growing media are currently used in the ornamental plant production industry. Organic media provides the necessities required by the plant throughout its life. Growth medium is known to have effect on value of potted ornamental plants and plays an important role in many other physiological parameters including plant height, number of leaves, spike length, number of florets per spike, spike diameter and yield. [3]. It should be emphasized, that to increase plant quality and productivity nutrients need to be available from the soil during a plant's growth period [4; 5; 6; 7] Show that the poultry and sheep manure is an excellent organic media; it adds organic matter to the soil which improves soil structures, nutrient retention, aeration, soil water holding capacity and water infiltration rate. Seaweed extract is one of the most important sea resources in the world, and the extracts are sold for many years as a fertilizer [8]. The seaweed is used in modern agriculture and in various forms which extracts liquid seaweed and seaweed liquid fertilizer etc... Seaweeds are used in many countries as a source of food for industrial application and as fertilizer [9; 10; 11] Clarified that seaweed fertilizers are preferred not only due to their nitrogen, phosphorus and potash content but also because of the presence of trace elements and metabolites similar to plant growth regulators.

This study was conducted to determine the most appropriate organic media to get the best growth of vegetative, flowering and to obtain the best concentrations of seaweed extracts (Seaweed Fe) for effect on the vegetative growth and flowering of for *narcissus tazetta* cv. Khatini plant.

Materials and Methods

The present study was conducted in Nursery of Horticulture Department. College of Agriculture. Duhok University during the growing season 2015 - 2016. The growth and flowering narcissus bulbs (cv. Khatini) (was obtained from Bnavi village in Brwary balla region – Duhok (N 37.24991° E 43.37830°). were studied in three different organic media includes sheep manure mix (sheep manure + loam 3:1), Poultry manure mix (poultry manure + loam 3:1) and Peat moss mix (peat moss + loam 3:1), Some of the physical and chemical characteristics for the growing media, before planting, were evaluated as shown in Table (1). At the first sprouting of foliage (sprouting of 2 real leaves), they were sprayed by seaweed extract ((Seaweed-Fe: Product character - Brown liquid, water soluble, specific gravity: 1.05 - 1.10, PH: 5-7. Main ingredient: Seaweed extract: 200 g L⁻¹, vegetable amino acid: 100 g L⁻¹, Fe (EDTA): 60 g L⁻¹. Manufactory: China Ocean University Organism Project Development Co., Ltd.)), at three concentrations (0, 2 and 3 ml L⁻¹) in every 15 days till flowering. The experiment was laid out in a factorial Randomized Complete Block Design (RCBD) with three factors. Each treatment consisted of 3 replicates and each replicate consisted of 5 pots with size 17 cm³. Plastic pots were filled with studied media, one bulb was planted in a pot, after it has been sterilized by (Goldtanol 50% fungicide) by dipping the base of bulbs in it for a few seconds. The studied measurements included date to sprouting of vegetative growth (days), leaves number\plant, leaf area (cm²), leaves dry weight (g/ plant), date to flowering (days), number of florets/stalk flower, stalk flower length (cm) and total chlorophyll content in leaves (spad unit). The data has been analyzed by using the computer through the SAS program, and means comparison was done by Duncan's Multiple Ranges Test under 5% [12].

Table -1: Some of the physical and chemical characteristics of the organic media.

Media	Media components %			Texture	pH	E.C dsm m ⁻¹	Water holding capacity (%)	Available nitrogen (mg Kg ⁻¹)	Available phosphor (mg Kg ⁻¹)	Available potassium (mg Kg ⁻¹)	Organic matter (%)
	Sand	Silt	Clay								
Poultry manure	72.52	13.4	14.07	Sandy loam	7.2	4.12	41.32	224	43.4	580	21.2
Sheep manure	72.52	13.5	13.97	Sandy loam	7.4	3.18	39.85	140	28.1	744	21
Peat moss	75.52	9.93	14.53	Sandy loam	7.1	1.08	44.46	70	13.8	208	26.7

Results and Discussions

A. Date of sprouting (day)

The data in (Table 2) show that the sprouting date of narcissus vegetative growth was significantly affected by different organic media, the bulbs which were planted in sheep and poultry manure accelerated sprouting date which required (85.10 and 85.46) days respectively, significantly differed with peat moss media which delayed sprouting to (90.00) days. These results were agreement with [13] on *Ranunculus* plant and [14] on *Vinca rosea* plant, and these results may be due to the amount of available nutrient likes N, P and K in sheep and poultry manure were highest as compared with peat moss media, these high quantities of N elements supply in sheep and poultry media which allow to grow larger and hence increase its surface area available for photosynthesis and allows the plant to grow faster, increase rate of metabolism, cell division, cell elongation and thereby stimulated apical growth as well as formation of leaves and adequate quantities of K which has substantial effect on enzyme activation, protein synthesis, photosynthesis, stomatal movement and water-relation in plant [15] and [16]. The different concentrations of seaweed extract had a significant effect on sprouting date, high concentrations of seaweed 3 ml L⁻¹ accelerate sprouting (85.48) days this may be due to the role of seaweed extract to improve vigor plant growth because of presence of some amino acids, organic materials, elements and plant growth regulators which improve nutritional status, vegetative growth, some of the flower quality. The interaction between organic media and seaweed extract concentrations showed significant differences in this characteristic and the early sprouting (81.23) days was recorded for unsprayed plants) and grown in poultry manure media.

Table -2: Effect of organic media and seaweed extract concentrations and their interaction on sprouting date (day) of *Narcissus tazetta* (cv. Khatini).

Organic media	Seaweed extracts conc.			Organic media mean
	0 ml L ⁻¹	2 ml L ⁻¹	3 ml L ⁻¹	
Poultry manure	81.23 ^d	88.25 ^b	86.90 ^{bc}	85.46 ^b
Sheep manure	89.07 ^b	82.98 ^{cd}	83.25 ^{cd}	85.10 ^b
Peat moss	95.17 ^a	88.53 ^b	86.30 ^{bc}	90.00 ^a
Seaweed extract conc. mean	88.49 ^a	86.59 ^{ab}	85.48 ^b	

Means with the same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Range test.

B. Number of leaves/plant

It can be seen from (Table 3) that organic media had no significant effect on the leaves number per plants. On the other hand, the leaves number increased significantly with increasing seaweed extract concentrations, the highest number of leaves (6.67) was recorded for 3 ml L⁻¹, while the least number (6.13) leaves was for untreated plants (control), the increase of leaves number might be due to the auxins content in the seaweed extracts which have an effective role in cell division and enlargement [17]. As for the dual interaction between organic media and seaweed extract concentrations also had a significant effect on the leaf number and the results showed that sprayed plants grown in poultry manure with 3 ml L⁻¹ of seaweed extract gave highest number of leaves (6.93) in comparison with the lowest number (5.95) for control in the same media.

Table – 3: Effect of organic media and seaweed extract concentrations and their interaction on a number of leaves/plant of *Narcissus tazetta* (cv. Khatini).

Organic media	Seaweed extracts conc.			Organic media mean
	0 ml L ⁻¹	2 ml L ⁻¹	3 ml L ⁻¹	
Poultry manure	5.95 ^b	6.63 ^{ab}	6.93 ^a	6.51 ^a
Sheep manure	6.07 ^{ab}	6.68 ^{ab}	6.85 ^{ab}	6.53 ^a
Peat moss	6.37 ^{ab}	6.40 ^{ab}	6.22 ^{ab}	6.33 ^a
Seaweed extract conc. mean	6.13 ^b	6.57 ^{ab}	6.67 ^a	

Means with the same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Range test.

C. Leaf area (cm²).

The data in (Table 4) noticed that the leaf area was significantly affected by uses of different organic media, the high value of leaf area (33.92 and 32.39) cm² was for that plant grown in sheep and poultry manure media respectively which were significantly superior to peat moss media (21.96) cm², maximum leaf area in sheep and poultry manure media was due to the fact that plants grown in this media produced larger leaves with a greater in number may be attributed to its water and nutrient holding capacity due to its high organic matter content which contributed positively to the growth of plants [18]. On the other hand, the different concentrations of seaweed extract had no significant effect on narcissus plants leaf area. Also the interaction between organic media and seaweed extract showed significant differences in this character and treated of plants grown in sheep manure media with 3 ml L⁻¹ of seaweed extract gave the best leaf area (38.95) cm².

Table - 4: Effect of organic media and seaweed extract concentrations and their interaction on leaves area (cm²) of *Narcissus tazetta* (cv. Khatini).

Organic media	Seaweed extracts conc.			Organic media mean
	0 ml L ⁻¹	2 ml L ⁻¹	3 ml L ⁻¹	
Poultry manure	33.57 ^b	34.97 ^b	28.65 ^d	32.39 ^a
Sheep manure	30.22 ^{bc}	32.58 ^{bc}	38.95 ^a	33.92 ^a
Peat moss	24.13 ^e	19.18 ^f	22.59 ^e	21.96 ^b
Seaweed extract conc. mean	29.30 ^a	28.91 ^a	30.06 ^a	

Means with the same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Range test.

D. Dry weight of leaves (g)

According to the data in (Table 5) it can be attained a significant variation in dry weight of leaves was noticed among the different organic media. The highest dry weight (1.97 g/plant) was for plants that planting in sheep manure media whereas the lowest weight (1.53 g/plant) was for that planting in peat moss media obtained results agreed with those of [19] show that nitrogen plays an important role in protein components and enzymes and organizes hormone activity which is important in cell division and stimulates biological processes. This may account for the higher plant height and leaf area of the plants that were planted in sheep manure led to increase the dry weight of leaves. Or this result might be due to the role of organic manure for continues supply of nutrients which improve some physical properties of soil and increase water retention [20; 21]. The leaves dry weight no affected significantly with all different concentrations of seaweed extract. The results of the dual interaction between organic media and seaweed extract showed a significant effect on this character, a spray of plants which grown in sheep manure media with 2 and 3 ml L⁻¹ of seaweed extract gave the best results of leave dry weight (2.02 and 2.06 g/plant).

Table – 5: Effect of organic media and seaweed extract concentrations and their interaction on leaves dry weight (g/plant) of *Narcissus tazetta* (cv. Khatini).

Organic media	Seaweed extracts conc.			Organic media mean
	0 ml L ⁻¹	2 ml L ⁻¹	3 ml L ⁻¹	
Poultry manure	1.59 ^{c-e}	1.88 ^{a-c}	1.91 ^{ab}	1.79 ^b
Sheep manure	1.83 ^{a-d}	2.02 ^a	2.06 ^a	1.97 ^a
Peat moss	1.62 ^{b-e}	1.43 ^c	1.54 ^{de}	1.53 ^c
Seaweed extract conc. mean	1.68 ^a	1.78 ^a	1.84 ^a	

Means with the same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Range test.

E. Date to flowering (day).

It can be seen from the data in (Table 6) that the flowering date was significantly different by organic media, it was (146.48) days for plants grown in poultry manure media while it was (149.07 and 150.23) days for those grown in each of sheep and peat moss media respectively, these results could be attributed to the role of poultry manure as organic fertilizer in improving soil texture, water holding capacity, and it creates good aeration in the soil. Also, to the slow release of the nutrients resulted from the poultry manure by the biodegrading of soil microorganisms which creates favorable conditions for nutrient uptake to plant roots and reflects better photosynthetic activity which in turn resulted in a higher vegetative growth followed by improvement in flowers features [19]. The spraying of plants with low concentration of seaweed extract accelerate the flowering date with untreated plants (control) required (148.20) days and didn't differ than 2 ml L⁻¹ which required (146.64) days to flowering this results agreement with [14] indicated in their study on the growth and flowering of *Vinca rosea* plant noticed that low concentrations especially 0.5 ml L⁻¹ was slightly better to increase the most of vegetative and flowering growth characteristics. The dual interaction data between organic media and seaweed extract concentrations, it showed significant differences in flowering date and the early flowering was recorded with unsprayed plants (control) in poultry and sheep manure media and was not different from those sprayed with 2 ml L⁻¹ of seaweed extract in poultry manure while the longest time (154.97) days was for unsprayed plant in peat moss media.

Table - 6: Effect of organic media and seaweed extract concentrations and their interaction on the date to flowering (day) of *Narcissus tazetta* (cv. Khatini).

Organic media	Seaweed extracts conc.			Organic media mean
	0 ml L ⁻¹	2 ml L ⁻¹	3 ml L ⁻¹	
Poultry manure	143.50 ^c	145.38 ^c	150.55 ^b	146.48 ^b
Sheep manure	146.13 ^c	150.58 ^b	150.50 ^b	149.07 ^a
Peat moss	154.97 ^a	143.97 ^c	151.75 ^{ab}	150.23 ^a
Seaweed extract conc. mean	148.20 ^b	146.64 ^b	150.93 ^a	

Means with the same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Range test.

F. Length of stalk flower (cm)

The data in (Table 7) demonstrated that the stalk flower length had no significant affected by different organic media and concentrations of seaweed extract. While the best significant results of the stalk flower length (24.61) cm was obtained from plants treated with 2 ml L⁻¹ of seaweed extract in sheep manure media.

Table (7). Effect of organic media and seaweed extract concentrations and their interaction on inflorescence length (cm) of *Narcissus tazetta* (cv. Khatini).

Organic media	Seaweed extracts conc.			Organic media mean
	0 ml L ⁻¹	2 ml L ⁻¹	3 ml L ⁻¹	
Poultry manure	24.50 ^{ab}	23.49 ^{a-c}	21.16 ^c	23.05 ^a
Sheep manure	21.81 ^c	24.61 ^a	22.88 ^{a-c}	23.10 ^a
Peat moss	22.90 ^{a-c}	22.22 ^{bc}	23.01 ^{a-c}	22.71 ^a
Seaweed extract conc. mean	23.07 ^a	23.44 ^a	22.35 ^a	

Means with the same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Range test.

G. Number of florets/stalk flower.

The results in (Table 8) indicated that a significant variation in florets number per stalk flower was noticed among the different organic media and the highest significant numbers (2.44) florets was for plants grown in poultry manure media, whereas the lowest number (2.19 and 2.08) florets was when planted in sheep manure and peat moss media respectively. On the other hand, the different concentrations of seaweed extract did not affect this parameter. The dual interaction between organic media and seaweed extract showed that the spray of plants with 3 ml L⁻¹ of seaweed extract after planting in poultry manure media significantly increased the number of florets/stalk flower to (2.59). Increasing the number of florets as a result of applying seaweed extracts may be due to the significant impact of the nutrients in organic extracts to stimulate growth regulators including auxins and gibberellins that play an important role in increasing percentage of pollination through the control of nutrients transport toward the flowers [22].

Table – 8: Effect of organic media and seaweed extract concentrations and their interaction on a number of florets/stalk flower of *Narcissus tazetta* (cv. Khatini).

Organic media	Seaweed extracts conc.			Organic media mean
	0 ml L ⁻¹	2 ml L ⁻¹	3 ml L ⁻¹	
Poultry manure	2.44 ^{ab}	2.28 ^{a-c}	2.59 ^a	2.44 ^a
Sheep manure	1.57 ^d	2.52 ^{ab}	2.17 ^{bc}	2.08 ^b
Peat moss	2.47 ^{ab}	2.15 ^{bc}	1.95 ^c	2.19 ^b
Seaweed extract conc. mean	2.16 ^a	2.32 ^a	2.24 ^a	

Means with the same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Range test.

H. Total chlorophyll content in leaves (SPAD unit).

The data in (Table 9) indicated that the organic media had a significant effect on the amount of total chlorophyll, the planting in sheep manure media gave the highest value (60.46 spad unit) while it decreased significantly to (52.89 spad unit) when planted in peat moss media. The use of sheep manure causes an improvement in all studied features that can be attributed to the high fertility which leads to the increasing of nutrients absorption, especially nitrogen which has a great role in activating many enzymes and plant growth hormones that can be attractive centers for nutrient materials, this interacts with many biological processes and as a result of promoting photosynthesis and improvement flower generation rather than increasing chlorophyll and green plastids formation [23;24]. No significant effect was obtained in the amount of total chlorophyll when sprayed plants sprayed with different concentrations of seaweed extract. The dual interaction between organic media and seaweed extract showed that the planting of narcissus bulbs in sheep manure media and sprayed with 2 ml L⁻¹ of seaweed extract gave significant best values (61.65 spad unit) as compared with other interactions except with that grown in the same media and 3 ml L⁻¹ of seaweed extract.

Table - 9: Effect of organic media and seaweed extract concentrations and their interaction on total chlorophyll content (SPAD unit) of *Narcissus tazetta* (cv. xatini).

Organic media	Seaweed extracts conc.			Organic media mean
	0 ml L ⁻¹	2 ml L ⁻¹	3 ml L ⁻¹	
Poultry manure	56.37 ^{cd}	58.37 ^{bc}	53.88 ^{de}	56.21 ^b
Sheep manure	58.68 ^{bc}	61.65 ^a	61.03 ^{ab}	60.46 ^a
Peat moss	53.48 ^e	52.28 ^e	52.90 ^e	52.89 ^c
Seaweed extract conc. mean	56.18 ^a	57.43 ^a	55.94 ^a	

Means with the same letter for each factor and interaction are not significantly different at 5% level based on Duncan's Multiple Range test.

Conclusions

The experimental results lead us to the conclusion that both the organic media and different concentrations seaweed extract had significant effects on the vegetative growth and flowering characteristics of *narcissus tazetta* plant. Regarding vegetative growth and flowers production, the sheep and poultry manure media provided the best results date to sprouting of vegetative growth, leaves the area, dry weight of leaves, date to flowering, florets number per stalk flower and chlorophyll content. As far as the spraying of sea weed

extract noticed this effect was increased with increasing of seaweed extract concentrations to 3 ml L⁻¹ where accelerate the date of sprouting and gave a significant increase in plant height and leaves number. While 2 ml L⁻¹ of seaweed extract accelerated date to flowering and gave the high length of stalk flowers.

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