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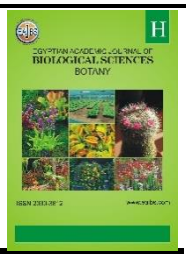

Response of Narcissus Constantinople 'Double Roman' Plants of Some Natural And Chemical Fertilizers

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ABSTRACT

Ornamental plants are divided into several plant groups, such as flowering bulbs, cut flowers, aquatic and semi-aquatic plants etc. All of them are indispensable in the design and landscaping of botanical gardens. Also, each of them has an aesthetic role as well as a major environmental role. For example, freshwater submerged aquatic macrophytes have multiple uses since time immemorial. Their utilization as an amendment to soil properties and its fertility is a well-known tradition especially in both agriculture and horticulture, as a means of safe disposal and is a way to manage the invasive aquatic plant wastes resulting from the phenomenon of ' Eutrophication'. Meanwhile, their survival is a means of preserving the biological aquatic ecosystem. Also, macrophytes have the capability of chelating the highest amount of each macro, micronutrients and adsorb the organic ingredients and then these plants are called 'phytochelatins'.

Thus, this experiment aimed to make a comparison between the chelated chemical fertilizer of "Nutricomplex 20-20-20" as spraying and organic compost from a mix of two plants from the type of submerged freshwater aquatic macrophytes, which are *Potamogeton pectinatus* L. 'Sago pondweed' and *Ceratophyllum demersum* L. "Hornwort", and employ their environmental impact to use them as eco-friendly organic fertilizers and/or 'biochelator' plants. So, using their extracts either foliar spray fertilizers or drenching soil. All of these impacts on the criteria of growth bundle, flowering, marketability of bulbs and chemical constituents of *Narcissus tazetta* L. var. Constantinople "Double Roman" plants.

This study was carried out at El-Harrery village, Montaza - Alexandria- Egypt during two consecutive cropping seasons, from fall 2014 to spring 2015and the same at the second till spring 2016. The dosages of chelate fertilizer "Nutricomplex 20-20-20" were foliar spray (NFS) at the rate of 1g/l at 3 times at 3phases. Preparing the organic compost or "soil amendments" was hand-made compost, not an industrial product. The additions were two dosages (250g Com. /pot single) and/or (100g Com. /pot with other additions). But the wateral extracts were added with two applications either as a Soil Drench (MSD) or Foliar Spray fertilizer (MFS) in the three aforementioned stages for chemical fertilizer. The transactions were Control (without fertilization), (NFS), (100g Com.+MFS+MSD), (MFS+MSD), (NFS+MSD), (100g Com. + NFS), (100g Com. + MFS) and (250g Com.) only. In any case, most of the results indicated that the transactions of 100g Com.+MFS+MSD and/or 100g Com.+ MFS achieved the highest significant criterion in the bundle's growth, flowering characteristics, marketability of bulbs and chemical constituents, without a match.

INTRODUCTION

Ornamental plants are divided into several plant groups, such as flowering bulbs, cut flowers, aquatic and semi-aquatic plants etc. All of them are indispensable in the design and landscaping of botanical gardens. Also, each of them has an aesthetic role as well as a major environmental role.

This study aimed to experiment with two plants from the type of submerged freshwater aquatic macrophytes, which are *Potamogeton pectinatus* L. and *Ceratophyllum demersum* L., and employ their environmental impact to use them as eco-friendly green fertilizers and/or 'biochelator' plants compared with chemical chelates fertilizer "Nutricomplex 20-20-20" on the criteria of both of growth bundle, flowering quality, marketability of bulbs and chemical constituents of *Narcissus tazzeta*L., var Constantinople 'Double Roman'. Because *Narcissus tazzeta* L. is one of the most famous and important spices of Narcissi plants belongs to the family "Amaryllidaceae". And it is including several verities like 'Double Roman'. Some breeders say that its common name is 'Constantinople' to distinguish it from other varieties, so it is characterized by the fact that the interior parts of the perianth (crown/cup) of flower consist of malty appendages, colored between cream and golden yellow. It has a sweet fragrance, used in the landscaping of botanical garden as the flowering bulbs or in beds, borders, cut flowers and indoor pot plants for the beauty of its flowers (Kirby, 1914).

Aquatic plants or the term 'seaweeds' are the common terms for the countless species of "Hydrophytes" that grow in the seas and oceans and are called "Marine Macrophytes". They also grow in rivers, lakes and freshwater bodies are called "Freshwater Macrophytes". They different from "Mesophytes" plants in that they absorb water and nutrients from the surrounding water through all their tissues, as they do not have a complex root system. It is different from algae in that it can photosynthesize via all its tissues and create its own food "Autotrophic"(PRNSA, 2013).

Potamogeton pectinatus L. 'Sago pondweed' is a submersed perennial macrophyte of nearly a global presence, belongs to the family Potamogetonaceae, native to a range of fresh, alkaline, and brackish waters in marshes, lakes and canals. The plant is divided into root, stem, and thin real leaves that resemble pin leaves, and has fruits, tubers, or starchy rhizomes called 'turions'. It is a favorite food for waterfowls and a shelter for fish and amphibians. Although its thick growth can clog the small irrigation canals, it is used as an ornamental plant in the aquarium and artificial lakes, but under controlled management (Kantrud, 1990 andSprecher *et al.,* 1998).

Ceratophyllum demersum L., theplant is a dicotyledonous, submerged aquatic angiosperm belonging to the family Ceratophyllaceae. The common name for this plant in Egypt is known "nghshushalhut" which means "Gills of Whale", also called "Hornwort" in some countries. This plant has a midi green leaves that turn dark green when containing high levels of starch at the end of summer and early fall when dormancy has developed and lateral branching has stopped. Sometimes the plant can branch but one for each node. The branches are brittle and easily broken, can grow apart, lack roots, or are present as capillaries. The flowers are unisexual; both staminate and pistillate on the same plant. The fruit is anachene, oval in shape, having one oblong seed 4-6 mm long, with the spineless lateral edges but having 1-2 basal spines (Abu, 2017). The plant grows in the aquarium for the beauty of vegetative growth, but in nature, it grows in slow-flowing freshwater for lakes, canals and ponds with a high percentage of oxygen. The plant tolerates high alkalinity water or excess of carbohydrates, potassium (K) and sulfur (S), and is greedy for absorbing N and P. It also has a high ability to absorb trace/heavy metal from water and sediments such as Fe, Mn, Cu and Ni (Ali and Soltan, 1999 and Ali *et al.,* 1999). They are essential minerals for the

physiological and biochemical processes during the plant life cycle within the permissible limits (Cempel and Nikel, 2006). The extraction of *C. demersum* plant has antimicrobial properties; also, this plant will help in developing and discovering many biopharmaceutical products (Malathy and Stanley, 2015 and Abu, 2017). This confirms that the ancient Egyptians used the macrophytes in the treatment of some cancerous tumors, while the ancient Romans used them to treat sores, burns and rashes (NOAA, 2018 and Bast, 2014).

Thus, the aquatic plants are no longer used for ornamental and/or decorative purpose, aquarium and for artificial fish ponds, but also for purification water from the excess of organic and metallic nutrients or "phytoremediation" (Mitsch and Jorgensen, 1989; Mays and Edwards, 2001; Shaltout and Khalil, 2005 and Shaltout *et al.,* 2009). Phytoremediation is biological treatment of eco-system, includes several mechanisms such as 'phytoaccumulation' or bioaccumulation, when the plants attract mineral ions and convert them into biological compounds either benefit can be useful or safe and easy to dispose of it, and /or they keep them in their tissues until they are needed in the form of enzymes, antioxidants, phytohormones, osmoprotectants, vitamins, amino acids, nanoparticles and chelating components (with inorganic/organic ligands), then these plants are called 'phytochelatins' (Reed and Gadd, 1990; Rai, 2009; Tripathi *et al.,* 2015; Nabti*et al.,* 2016; Sarwar *et al.,* 2017; Kushwaha *et al.,* 2018 and Lead *et al.,* 2018). By the way, one of the most well-known forms of chelates via plant is the binding of Mg into the structure of the chlorophyll compound (Rauser 1999).

The phytochelatins or 'biochelator plants' use these mechanisms to protect the elements from sedimentation for a longer period. Some scientists assert that these phytochelatins are not a means of defense by the plant to tolerate toxicity with elements, but rather a response to its presence (El-Wahibi 2006 and Pavlis 2020). So, the macrophytes can also be used to fertilize plants that suffer from a lack of absorption of these elements. It does not have any risks to the soil, unlike chemical fertilizers that cause soil toxicity in the longrun. Hence, the fertilization by aquatic macrophytes has been a known tradition since the dawn of time, especially in nearby areas of the shores of rivers and/or seas, in both agriculture and horticulture (Verkleij, 1992 and Zopade, 2001).

However, with an excess of organic and inorganic nutrients in the water, which leads to a phenomenon of "eutrophication", eco-scientists are re-using the hydrophytes as the green fertilizers that are safe and eco-friendly, trends toward organic farming. It is also one of the safe disposal methods for invasive plants with huge mass production to avoid hindering navigation and fisheries (Baldantoni *et al.,* 2004). This increasing of weeds mass may have a dangerous indirect effect on agriculture in the event of blockage of channels and drains as a result of them, which cause the emergence of soil salinity or alkalinity problems. So, it must be under controlled management (Datta, 2009).

But the exuberant mass is an important and necessary characteristic of phytoremediation or/and phytochelatins plants like many species of *Ceratophyllum sp.* and *Potamogeton sp.,* as they have the capability of chelating the highest amount of each macro, micronutrients and adsorb the organic ingredients (Shaltout *et al.,* 2009). Thus, they are rich in proteins, carbohydrates, and hormones such as growth stimulations, root formations, cytokinins and antibiotics that give high resistance diseases to the plants, and resistant to different climatic and eco-stress conditions. And they also rich in organic matters and fibers, which improve the texture of the soil when used as compost and /or soil conditioners, dry addition or mulch, crush the weeds or juice to reap the liquid nutrients either mixing with water as spraying and/or soil drench, or granules and powders that are directly mixed into the soil. The results of use are increased crop yield, plant health (Ghobrial *et al.,* 2007; Eyras *et al.,* 2008, Datta *et al.,* 2009; Malathy and Stanley, 2015, Nabti *et al.,* 2016 and Grant, 2018). It also stimulates the microorganisms in the soil during the fermentation processes to

release the non-absorbable nutrients into a form that is easily absorbed via the plant. Whereas industrial compost is subjected to high heat to eliminate pathogenic organisms, it eliminates the beneficial organisms as well as the seeds of weed, on the contrary, as the compost of aquatic plants has no way to infect the soil (Fawler, 2016 and Harris, 2020).

As for chemical chelating fertilizers, they are compounds that make the essential trace elements in a form capable of being absorbed by the plant, whether through the tissues of the leaves or through the roots, if added to the soil. The use of fertilizing with the microelements necessary for the growth of plants in the form of chelates is the best application in order to protect these elements from fixing in soil and converting them into a form that is not absorbable by the plant. Because most of the physiological diseases of plants are due to a lack of trace elements absorption which resulting from the high alkalinity of soil (Rizk and Elngar, 2020). Also, they recommended that, to achieve the highest quantity and quality of the vegetative growth, flowering characteristics, bulb production and chemical composition of *Narcissus tazetta* L. subsp. “Italicus" plant, it is preferable to add the combined leaf compost "El-Zahra compost" (10% from the volume of the pot) to the growing media with the addition of foliar spray and soil drench with either chelating agents "Nutricomplex 20-20-20" or seaweed extracts "Algifert" at the rate of 1g/l. Same, Gabra, 2010 recorded that the application of biostimulants such as seaweed extracts in agriculture could be an effective and eco-friendly alternative to chemical fertilizers. Thus, the use of seaweed extracts "Promex" as a foliar application (1g/l), was reduced the dosage of NPK chemical fertilizers to three quarters when the combination between them was added to fertilize *Narcissus tazetta* L. cv. "Polyanthus Narcissus", and achieved the highest significantly growth parameters, flowering characters, and bulbs productivity and chemical compositions. While, Abbas *et al.,* 2020 recommended that the application of 0.5% of seaweed extracts as a foliar spray caused a significant increase in TSS, mineral content (N, P and K), bulb weight and yield of four onion cultivars. While the foliar spray with 3% (the highest concentration of seaweed extracts), increased ascorbic acid in different onion cultivars. Also, Li and Mattson, 2015 experimented that the foliar sprays of seaweed extracts "rockweed" had significantly increased (shoot fresh and dry weight, rotation and total chlorophyll) of petunia and tomato transplants by increasing the concentration of foliar spray rate up to 5 ml/l, but did not change significantly with further higher foliar spray rates. But, substrate drenches significantly improved drought tolerance of both petunia and tomato transplants compared with the control and the rate of 5-10 ml/l increased number and postharvest of flowers in both plants.

Fortuna *et al.,* 2005 they founded that one mega-gram (1000 kg dry weight) of composted mix-spices including (*C. demersum*) of lake weeds contained 0.37 kg of P and 2.5 kg of K and other micro-elements. But the plant-available N (PAN) supplied from lake weeds were (570, 960, and 1200 kg PAN/ha) available for growth of crops in a single growing season resulted from the rates of 96, 161 and 206 Mg/ha of lake weeds. Application of lake weeds significantly increased plant-available soil moisture of sands, reduced fertilizer inputs for growers of sod (Kentucky Blue-grass) and significantly enhanced sod establishment and its density. They concluded that this information can be of value to environmental regulatory agencies in determining the safe and proper use of such waste materials. However, Haroon, 2009 investigated that the concentrations of all analyzed elements in *C. demersum* were significantly higher than those in *P. pectinatus*, except N content which showed no significant difference between the two species. Also, P and Cu were highest concentrations in samples of *P. pectinatus* than in *C. demersum*.

Wile *et al.,* 1978 experimented the compost fertilization from aquatic plants (*Myriophyllum spicatum* L.) mixed with many organic additives to reduce moisture levels and balance carbon-nitrogen ratios. The aerobic decomposition was successful after 7 days.

The aquatic plant compost was tested in a greenhouse to study their effect on the growth of several seedlings such as chrysanthemums, tomatoes, muskmelon, coleus cuttings, pentunias, geraniums, white cedar and turf grasses including creeping red fescue, marionkentuky bluegrass and perennial ryegrass. The mixture of soil greenhouse was sandy loame with high levels of salt and pH. At first, the tested seedlings were suffered and then gradually recovered with decreased salinity during irrigation until their growth values equaled with control plants growing in the standard greenhouse media. But, Lata and Veenapani, 2011 studied the effect of soil addition of water hyacinth manure compost on *Brassica juncea* 'Indian mustard' seedlings. They founded that the growth behavior of seedlings was more pronounced with 50% water hyacinth manure and the productivity was increased with 100% water hyacinth manure treatment compared with that of the seedlings grown in control.

Tavallali, 2018 recorded that the mineral nutrient concentrations, total phenolic, ascorbic acid contents and antioxidant activity were the highest in *Portulaca oleracea* L. Purslane plants treated with the Fe-ALA (amino-levulinic acid) nano-complex. The shoot Fe, Zn, N, Mg, Ca and K contents were also higher in the plants treated with the Fe nano-complex than in both the control group and the plants treated with Fe-EDDHA. While, Chohura *et al*., 2012 explained that the fertilization treatments with different iron chelates sources like [Fe 8 Forte (EDTA+HEEDTA), Fe 9 Premium (DTPA), Fe 13 Top (EDTA) and Librel Fe DP7 (DTPA) applied in 3 doses 50, 75,100 mg Fe/l $dm^3$of growing media] had the same effect in early yield of tomato plants. The favorite treatment of marketable yield of tomato fruits was Fe 9 Premium (DTPA), but the lowest has resulted from the treatment with Fe 13 Top (EDTA) chelate. The optimal dose of these nutrients for marketing quality and early yield was 50 mg Fe/l dm^3. Whereas, Khalifa *et al.,* 2011 recorded that the foliar spraying of zinc sulphate (1.5g/l, 3.0g/l and 4.5g/l) or boric acid alone at all rates (5ppm, 10 ppm and 20 ppm) and as combinations had significantly increased growth parameters of Iris bulbs, flowers characteristics and bulblet number and yield/plant as compared with the control treatment, also leaves carbohydrate, nutrients, i.e. N, P, K, Fe, Mn, Zn and B content. The best results were obtained from the treatment of Zn at 4.5g/l combined with 20 ppm of B.

In another experiment, Datir *et al*., 2010, the amino acid micronutrient chelates were prepared organically in Vetro and experimented with foliar spray with 0.4 to 2.0% solutions on 15 and 30days after plantation of Okra var. Phule Utkarsha seeds. The results investigated that all the treated plants were a significant increase in growth and productivity of okra compared to control. And the highly significant yields resulted from the treated plants with 1.2, 1.6 and 2.0 % sprays of chelated micronutrient solution. Meanwhile, Saeedi *et al*., 2015 found that the treated 'Cinderella Lime' lisianthus plants with calcium amino acid chelates were significantly higher flower numbers, fresh and dry weight of stem flowers and enhanced vas life of cut flowers compared with the control treatment without amino acids and calcium.

MATERIALS AND METHODS

This study was conducted during two consecutive cropping seasons, from fall 2014 to spring 2015and the same at the second till spring 2016. The experiment was carried out at El-Harrery village, Montaza - Alexandria- Egypt. The aim of the study was to make a comparison between the chelating chemical fertilizer of "Nutricomplex 20-20-20" as spraying and organic compost from some aquatic plants [*Potamogeton pectinatus* L. and *Cyratophylum demersemum* L.] and use their extracts either foliar spray fertilizers or drenching soil. All of these impacts on the criteria of growth bundle, flowering, marketability of bulb and chemical constituents of *Narcissus tazetta*L. var. Constantinople "Double

Roman" plants. The mean of mother bulbs circumference was12-13.5 cm and weights were 35.5- 40 g for each season. The bulbs were imported from the Netherlands and obtained from the nursery of the Faculty of Agriculture Kafr El-Sheikh University, Egypt. And, these were planted on 25th and 27th September 2014 and 2015 in 10-12 cm depth from soil surface of plastic pots of 20cm diameter, which filled with 5kg of sand-clay mixture soil at a rate of 2:1 by volume. The analysis of the soil mixture before planting is shown in Table (1).

The chelating chemical fertilizer is represented by "Nutricomplex 20-20-20" component from Tradecorp A ROVENSA Company. The doses were foliar spray (NFS) at the rate of 1g/l at 3 times at 3phases, the first phase after bulbs sprouting when the foliage length at 10cm, the second after flower buds emergences and the last after the flowers picking stage. The analysis of 'Nutricomplex 20-20-20' is shown in Table (2).

As for the compost, it was hand–made compost, not an industrial product, from mix 1:1w/w of freshwater aquatic macrophytes like *Potamogeton pectinatus* L. and *Cyratophylum demersemum* L. as organiccompost or "soil amendments" and makes wateral extracts from a mix of them in the ratio 1:1 to spraying or/ and drenching the Narcissus plant. The aquatic weeds were harvested (collected) from Edku Lake, by the National Institute of Oceanography and Fisheries, El- Anfoushi, Qaitbay, Alexandria, Egypt before 30 days of experiment cultivation. Preparing the compost was required drying the weeds by aeration, dividing them into small pieces, then crushing them and adding the powder to the pile of soil mixture with stirring for 30 days before using. The compost additions were two dosages (250g Com. /pot single) and/or (100g Com. /pot with other additions).

Also, the organic mixture of macrophytes extract was added with two applications either as a Soil Drench (MSD) or Foliar Spray fertilizer (MFS). This extract was prepared fresh by putting each 0.5kg of wet weeds weight in 2.5 l of tap water for one day in open and ventilated plastic jars with the same capacity. After that, these macrophytes were squeezed by mixer into their water and these were filtered and the filtrate was taken at the rate of 1:5 w/v. Table (3) appears the chemical components of aquatic weeds compost and wateral extract of mixing them. All foliar spray and/or drenching treatments were added in the three aforementioned stages for chemical fertilizer. This was followed by irrigation and agriculture practices were done whenever plants needed.

The CRD (Complete Randomized Design) design was the statistical analysis of the experiment, and the comparison between the different transaction means was using 'Duncan´s Multiple Range Test' according to (Snedecor and Cochran, 1974) as 3replicat and 3pots for both of them inter 8 transactions as a follow:

1- Control (without fertilization).
2- Nutricomplex '20-20-20' Foliar Spray (NFS) 1g/l at 3 times.
3- 100g Com. + MFS+MSD
4- MFS+MSD
5- NFS+MSD
6- 100g Com. + NFS
7- 100g Com. + MFS
8- 250g Com. Only

The data were determined as follow:

1- The criteria of bundle growth were [leaf length (cm), number of leaves, leaf diameter (cm), leaf area (m²), bundle fresh and dry weight (g)].

2- And the criteria of flowering were [shown color date (day), number of florets/scapes, perianth diameter (cm), pedicel length (cm) and tube length (cm), inflorescence length(cm), scape length(cm), scape circumference(cm), inflorescence fresh and dry weight (g)].

3- The criteria of bulbs marketability were recorded after pre-yellowish of leaves at the end of May in both 2016 and 2017. The data were [bulb circumference (cm), number of bulbs, total bulbs fresh and dry weight (g) and roots dry weight (g)].
4- The chemical compositions such as total chlorophyll [mg/g fresh weight of leaves] were determined during the flowering stage for each season due to Moran (1982) using a spectrophotometer. And N, P and K% were determined in dry leaves, by a colorimetric method according to Evenhuis and Deward (1980), Trough and Meyer (1939) and Brown and Lilliland (1946), respectively. Also, Fe and Zn were estimated [in dry leaves] by atomic absorption according to Chapman and Pratt (1978).

Table 1: The mean physical and chemical analysis of initial soil mixture in both seasons 2014/15 and 2015/16.

The physical analysis		**The chemical analysis**								
Sandy-loam soil		Organic Matter	Total N	Total P	K	Fe	Zn	Cu	pH	Ec
Sand	60.15%	%	%	%	%	mg/kg				dS/m
Clay	27.71%	0.961± 0.03	0.102±0.014	0.0295±0.004	0.593±0.03	1.051±0.03	0.905±0.05	0.33±0.06	8.1	1.38±0.1
Silt	12.14%									

Table 2: Chemical analysis of "Nutricomplex 20-20-20" fertilizer.

Total N	20 %	**EDTA**	**Fe**	0.06	% w/w
P2O5	20 %		**Mn**	0.04	
K2O	20 %		**Zn**	0.02	
Stable interval of pH for chelated fraction	4 -10		**Cu**	0.01	
			B	0.02	
			Mo	0.003	

Table 3: The chemical components of mix compost from *P.pectinatus*and *C. demersemum* plants, and wateral extract of mixing them.

The chemical components	**Unit**	**The mix compost from aquatic plants**	**The wateral extract from mix of aquatic plants**
pH		7.2 ± 0.3	6.43 ± 0.2
Ec	dS/m	2.63 ± 0.3	1.28±0.05
Fatty acids	mg/100g dw	11.04±2.0	3.75±0.11
Carbohydrate	%	29.08	16.45
Ash		42.97±4.2	25.64
Proteins		13.47 ± 1.0	11.55 ±1.1
Total N		2.28 ± 0.17	2.93 ± 0.24
Total P		0.79 ± 0.05	0.57±0.04
K		4.13 ± 0.23	3.68 ± 0.22
Fe	mg/g	2.89 ± 0.52	2.55 ± 0.06
Zn	µg/g	74.40 ± 12.52	63.52±11.7
Mg		2.13 ± 0.14	2.65±0.21
Cu		26.07 ± 0.10	34.06 ± 3.3
C/N		10.06 ± 1.7	9.37±1.4

RESULTS AND DISCUSSION

The experiment aimed to study how to respond to *Narcissus tazetta*L. var. Constantinople "Double Roman" plants of some natural fertilizers from the type of submerged freshwater aquatic macrophytes such as *Potamogeton pectinatus* L. and *Cyratophylum demersemum* L. as an organic compost "soil amendments" and chelating chemical fertilizers like "Nutricomplex 20-20-20", and their effects on criteria of each bundle growth, flowering, bulbs productivity and chemical constituents.

The Criteria of Bundle Growth:

Data in Table (4) have appeared that the bundle growth criteria of *Narcissus tazetta*L. var. Constantinople "Double Roman" during both of cropping seasons 2014/15 and 2015/16. All the different transactions of fertilization were given highly significant values than control plants. These values such as bundle length (cm), number of leaves/ bundles, leaf diameter (cm), leaf area (m^2) and bundle fresh and dry weights (g). Then, the treatments of foliar application or drenching with aquatic macrophytes extract were achieving the exultant results compared with the others. But the unique transaction was 100 g compost+ MFS+MSD [100gcompost of *Potamogeton pectinatus* L. and *Cyratophylum demersemum* L. plants with foliar spray and soil drench application of their wateral extracts] on all criteria of bundle growth in both seasons followed by the treatment of 100g Compost+MFS. Thus, there were no significant differences between them in some criteria like bundle length, number of leaves/ bundles, leaf diameter and leaf area in doth seasons. It comes after them in the third-place the transaction of 100Com.+ NFS [100g compost + foliar spray with chemical chelates fertilizer "Nutricomplex 20-20-20"] in some cases like the number of leaves/ bundles in the first season and leaf diameter in each season. That means that the abundance of nutrients are slowly released from macrophytes compost colloids as an application of poor soil in addition to the elements and nutrients in the form of spraying or drenching of the soil, had easier and direct penetration and spread through the plant tissues of either the root or the shoot system. Especially that the aquatic plants are rich in the assimilation of macro and microelements in their molecular, compound, or chelate forms, which necessary for the physiological and biological processes of plants. This is consistent with the results of Ghobrial *et al.*, 2007; Eyras *et al.*, 2008, Datta *et al.*, 2009; Tripathi *et al.*, 2015; Nabti *et al.*, 2016; Sarwar *et al.*, 2017 and Rizk and Elngar, 2020.

Table 4: Effect of fertilization transactions on the criteria of bundle growth of *Narcissus tazetta* L. var. Constantinople "Double Roman" for both cropping seasons 2014/15 and 2015/16.

Fertilization transactions	Bundle length (cm)		No. of leaves/bundle		Leaf diameter (cm)		Leaf area (m^2)		Bundle F.W. (g)		Bundle D.W. (g)	
	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S
Cont	28.5d	30.58e	16.2e	15.50g	2.06 d	2.13e	6.08e	6.01e	24.12d	26.6f	2.14e	2.06e
NFS	34.01c	34.67d	18.0 de	18.33e	2.35bc	2.42d	6.42d	6.98cd	33.5c	34.9e	2.83d	2.78d
100Com.+MFS+MSD	44.50a	43.01a	23.0 a	24.67 a	2.8 a	2.95a	9.17a	9.13a	45.20a	44.59a	4.68a	5.79a
MFS + MSD	39.51b	38.33bc	19.33cd	20.33cd	2.4bc	2.69bc	7.5c	7.62bc	34.85c	38.6bcd	3.15cd	4.43b
NFS + MSD	39.12b	35.94cd	20.17bc	19.0 d	2.4bc	2.71abc	7.27c	7.42bc	34.13c	36.7cde	3.11cd	3.22c
100 Com. + NFS	38.0b	39.23b	22.0ab	21.00c	2.72a	2.8ab	8.31b	8.01b	39.5b	39.47bc	3.28c	4.56b
100Com. + MFS	43.5a	40.67ab	23.5a	23.00b	2.7a	2.9ab	9.05a	9.10a	40.15b	41.33b	4.23b	4.75b
250 Com.	37.13b	33.5d	17.5de	16.10f	2.25c	2.47cd	6.79cd	6.49de	33.91c	35.9de	3.23c	2.95cd

The Criteria of Flowering:

What came from the information in Table (5 &6) refers to the trend of significant elevation in measurements of flowering in both of [early flowering is expressed in the number of days from the date of planting to the shown color of the florets (day), number of florets/scape, perianth diameter (cm), pedicel length (cm) and tube length inflorescence

length(cm), scape length(cm), scape circumference(cm), inflorescence fresh and dry weight (g)] was due to the superiority of the transactions of 100g compost+ MFS+MSD and 100 Com.+ MFS and the absence of significant differences between them in most cases, except that the latter mentioned was undisputedly superior in both criteria of perianth diameter and inflorescence dry weight in 1st season. While the significant values were equal between all the spraying treatments, whether with chemical chelates or macrophytes extracts added to drenching the soil or alone, as in the characteristics of perianth diameter and scape circumference in 1st season and pedicel length, tube length and inflorescence dry weight in both seasons and inflorescence fresh weight in 2nd season. All the promising results in the characteristics of flowering are due to the importance of the role of microelements in the metabolism of the plants as Cempel and Nikel, 2006; Ali and Soltan, 1999 and Ali *et al.*, 1999; Khalifa *et al.*, 2011; Chohura*et al*., 2012; Saeedi*et al*., 2015 and Tavallali, 2018. In addition, hydrophytes extract contains many components like carbohydrates, hormones or growth stimulations, cytokinins, vitamins, amino acids and enzymes, all of which are necessary and essential for plant flowering processes as mentioned by Wile *et al.*, 1978; Reed and Gadd, 1990; Fortuna *et al.*, 2005; Haroon, 2009; Rai, 2009; Tripathi *et al.*, 2015; Nabti*et al.*, 2016; Sarwar *et al.*, 2017; Kushwaha *et al.*, 2018 and Lead *et al.*, 2018. (cm),

Table 5: Effect of fertilization transactions on the criteria of the flowering stage of *Narcissus tazetta* L. var. Constantinople "Double Roman" for both cropping seasons 2014/15 and 2015/16.

Fertilization transactions	Shown color (day)		No. of florets /scape		Perianth diameter (cm)		Pedicel length (cm)		Tube length (cm)	
	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S
Cont	126.7a	125.7a	3.00e	3.01e	2.90d	3.00f	4.00d	4.03d	2.40d	2.30e
NFS	114.3b	115.bc	3.33de	3.75d	3.20c	3.23ef	4.23bcd	4.25bcd	2.77bc	2.88c
100Com.+MFS+MSD	105.7d	103.3e	4.33ab	5.9a	3.50b	3.92a	4.55a	4.58a	3.00ab	3.18a
MFS + MSD	112.6bc	114.3bc	3.67cd	4.75b	3.32bc	3.41cd	4.27bc	4.47ab	2.90b	2.98bc
NFS + MSD	112.3bc	113.0bc	3.50d	4.0cd	3.38bc	3.31de	4.40ab	4.43abc	2.80bc	2.93bc
100 Com. + NFS	110.7bcd	111.7cd	4.0bc	4.33bc	3.43bc	3.62bc	4.44ab	4.48ab	2.90b	3.03abc
100Com. + MFS	109.0cd	110.0d	5.33a	4.5bc	3.93a	3.80ab	4.47ab	4.52a	3.17a	3.08ab
250 Com.	115.3b	117.0b	3.33de	3.5de	3.17cd	3.19ef	4.10cd	4.18cd	2.60cd	2.68d

Table 6: Effect of fertilization transactions on the criteria of the flowering stage of *Narcissus tazetta* L. var. Constantinople "Double Roman" for both cropping seasons 2014/15 and 2015/16.

Fertilization transactions	Inflorescence length (cm)		Scape length (cm)		Scape circumference (cm)		Inflorescence F. w.(g)		Inflorescence D. w. (g)	
	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S
Cont	20.95e	19.5e	12.33f	11.67e	1.50c	1.52e	3.25f	2.08e	0.213e	0.228d
NFS	24.33d	22.7de	15.33de	14.5d	1.62c	1.59de	3.58ef	3.63cd	0.269cd	0.313b
100Com.+MFS+MSD	35.67a	31.5a	25.50a	25.18a	1.81ab	2.0a	5.54a	4.66a	0.301bc	0.320b
MFS + MSD	27.11c	25.0c	19.67bc	18.17c	1.78ab	1.75bd	4.21cd	3.88bc	0.299bc	0.347ab
NFS + MSD	27.04c	24.0cd	16.33d	16.65cd	1.77b	1.69cde	4.0d	3.78bc	0.291bc	0.321b
100 Com. + NFS	29.80b	28.5b	17.5cd	20.67b	1.80ab	1.77bc	4.498c	4.26ab	0.315b	0.350ab
100Com. + MFS	31.65b	27.5b	20.68b	20.17bc	1.87a	1.85ab	5.06b	4.53a	0.359a	0.360a
250 Com.	23.81d	21.6de	13.98ef	14.62d	1.60c	1.63cde	3.95de	3.19d	0.247de	0.257c

The Criteria of Bulbs Marketability:

Table (7) shows the marketability of bulbs represented by bulb circumference (cm), number of bulbs, total bulbs fresh and dry weight (g) and roots dry weight (g). It also indicates that the transaction was unique to the utmost moral significance was 100g Compost+ MFS+MSD with the exception of the bulb circumference and roots dry weight in both seasons, where the treatment of 100g com. + MFS was exceeded. As a general, it becomes clear that all the compost treatments with a spray of chemical chelates or with phytochelatins extract were better than other transactions. These results are attributed to the

important role of essential macro and micronutrients in metabolic processes and cell division and enlargement. Also, organic matter and fibers improve the soil texture and in addition proteins, carbohydrates, and hormones such as growth stimulations, root formations and cytokinins which come from the utilization of hydrophytes compost and their extracts and or chelators. All of these had similar findings obtained by Eyras *et al.,* 2008; Datta *et al.*, 2009; Haroon, 2009; Lata and Veenapani, 2011; Malathy and Stanley, 2015; Nabti *et al.*, 2016; Fawler, 2016; Grant, 2018 and Harris, 2020.

Table 7: Effect of fertilization transactions on the criteria of bulbs marketability of *Narcissus tazetta* L. var. Constantinople "Double Roman" for both cropping seasons 2014/15 and 2015/16.

Fertilization transactions	Bulb circumference (cm)		No. of bulbs		Total bulbs fresh weight (g)		Bulbs dry weight (g)		Roots dry weight (g)	
	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S
Cont	10.24e	10.41e	3.54e	4.07f	30.50e	35.79e	9.02d	9.10d	1.44e	1.42e
NFS	11.44de	11.58d	4.7d	5.12de	35.15d	36.16de	9.85d	9.91cd	1.48de	1.59e
100Com.+MFS+MSD	13.23bc	14.09ab	7.01a	6.69a	49.35a	46.19a	14.08a	14.36a	2.48b	2.59b
MFS + MSD	12.33cd	12.63c	5.33c	5.93bc	37.99bcd	38.73bc	10.29d	11.86b	2.26bc	2.15d
NFS + MSD	11.86cd	12.07cd	5.29c	5.65cd	36.78cd	38.50bcd	10.10d	10.46c	2.05c	2.07d
100 Com. + NFS	13.65b	13.89b	6.33b	6.17abc	41.03b	40.58b	12.95bc	12.03b	2.30bc	2.30bcd
100Com. + MFS	14.66a	14.98a	6.44b	6.50ab	39.46bc	44.45a	13.03b	12.51b	2.31bc	2.41bc
250 Com.	12.51c	12.84c	4.67d	5.00e	36.20cd	36.72cde	12.26c	10.31c	3.46a	3.10a

Chemical Compositions:

It is noticed from data in Table (8) that the used fertilization transactions had remarkable effects on chemical compositions such as total chlorophyll (mg/g), N %, P%, K% and Fe and Zn (mg/100g) in dry leaves. The fertilized plants with 100g Com.+ MFS+MSD were given the highest values in both seasons. The main reason for these significant results is due to the high amount of nutrients available for plant absorption from the application of foliar spraying and soil drench in the presence of hydrophytes compost. As well as the ease of penetration of Fe and Zn through plant tissues, also led to the balance between its components. Totally are consistent withDatir *et al*., 2010; Khalifa *et al.,* 2011; Chohura *et al*., 2012; Saeedi *et al*., 2015; Li and Mattson, 2015; Tavallali, 2018; Abbas *et al.,* 2020 and Rizk and Elngar, 2020.

Table 8: Effect of fertilization transactions on chemical constituents of *Narcissus tazetta* L. var. Constantinople "Double Roman" for both cropping seasons 2014/15 and 2015/16.

Fertilization transactions	Total chlorophyll		N %		P %		K %		Fe mg/100g		Zn mg/100g	
	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S	1st S	2nd S
Cont	1.91e	1.89f	1.39	1.37	0.203	0.211	1.10	1.12	1.30	1.34	0.119	0.117
NFS	2.012de	2.106de	1.89	1.99	0.258	0.262	1.64	1.67	2.26	2.35	0.305	0.313
100Com.+MFS+MSD	2.63a	2.61a	2.27	2.24	0.327	0.341	1.96	2.0	2.93	3.02	0.457	0.461
MFS + MSD	2.25bc	2.27c	2.15	2.10	0.274	0.318	1.82	1.81	2.71	2.72	0.372	0.393
NFS + MSD	2.195cd	2.197cd	2.01	2.05	0.266	0.297	1.76	1.69	2.66	2.51	0.335	0.351
100 Com. + NFS	2.35bc	2.44b	2.20	2.08	0.297	0.329	1.91	1.87	2.74	2.68	0.433	0.412
100Com. + MFS	2.45b	2.48b	2.25	2.21	0.310	0.335	1.94	1.98	2.85	2.76	0.429	0.441
250 Com.	2.155cd	2.07e	1.78	1.82	0.241	0.236	1.51	1.59	2.19	2.29	0.318	0.288

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ARABIC SUMMARY

استجابة نباتات النرجس المجوز الرومي لبعض معاملات الاسمدة الطبيعية والكيماوية

جورجينا وهيب رزق جبرة
مركز البحوث الزراعية، معهد بحوث البساتين، قسم الحدائق النباتية- حدائق أنطونيادس- بالاسكندرية ، مصر.

تقسم نباتات الزينة الي عدة مجموعات نباتية مثل أبصال الزينة وزهور القطف والنباتات المائية والنصف مائية ... إلخ. كلا منهم لا غني عنه في تصميم وتنسيق الحدائق النباتية وكما أن لكلا منهم دور جمالي كذلك له دور بيئي هام ورئيسي. عل سبيل المثال نباتات المياه العذبة المغمورة لها استخدامات عديدة منذ فجر التاريخ. أما عن استخدامها كمحسنات لخواص التربة وخصوبتها فهو تقليد معروف في اغراض الزراعة والبستنة فهو وسيله للتخلص الامن منها وطريقة لادارة المخلفات النباتية المائية المنتشرة الناتجة عن ظاهرة "الاتخامية". في نفس الوقت يعتبر بقاءها وسيلة لحفاظ على التنوع البيولوجي للنظم البيئية المائية. كما ان للنباتات المائية القدرة علي خلب كلا من المغذيات الكبري والصغري وامتزاز الجسيمات العضوية لذا تدعي هذة النباتات " بالمخلبيات النباتية" .

ومن ثم فكان الهدف من هذة التجربة هو اجراء المقارنة بين أسمدة المخلبيات الكيماوية متمثلة في "النيوتريكومبلكس 20-20-20" كسماد ورقي بالرش و الكمبوست العضوي من خلط نباتين من مجموعة نباتات المياة العذبة المغمورة وهي نبات " شعر الحصان'*Potamogetonpectinatus* L. 'Sago pondweed" ونبات "نخشوش الحوت"Hornwort" .L*Ceratophyllumdemersum*. وتوظيف دورهما البيئي بإستخدامهما ككمبوست عضوي صديق للبيئة أو كمخلبيات نباتية بإستخدام مستخلصهما كرذاذ ورقي أو ري للتربة. وتأثيركل هذا على معايير نمو الحزمة الخضرية لنبات النرجس الرومي وصفات التزهير والصفات التسويقية للأبصال والمكونات الكيميائية.

هذة الدراسة تم تنفيذها في قرية الحريري بالمنتزة بمحافظة الاسكندرية مصر حيث أجريت خلال موسمين محصوليين منذ خريف 2014 لربيع 2015 وبالمثل حتى ربيع 2016. جرعات السماد الكيميائي المخلبي " نيوتريكومبلكس 20-20-20" كانت بالرش الورقي بمعدل 1جرام/لتر 3 مرات علي ثلاث مراحل. أما تجهيز الكمبوست العضوي أو محسنات التربة فكان محضر يدويا وليس مستحضر صناعي. جرعتي الإضافة كانتا (250جرام كمبوست / إصيص وحدها) أو (100جرام كمبوست / إصيص مع إضافات أخري). أما بالنسبة للمستخلص المائي فكانت الإضافة إما في صورة ري للتربة أو رش ورقي وتمت في نفس المراحل الثلاثة السابق ذكرها في التسميد الكيماوي. و كانت المعاملات هي الكنترول " بدون تسميد" و الرش الورقي بالسماد المخلبي (NFS) و (100جم كمبوست + الرش + الري بمستخلص النباتات المائية) و (الرش +الري بمستخلص النباتات المائية) و(الرش بالسماد المخلبي + الري بمستخلص النباتات المائية) و (100 جرام كمبوست + الرش بالسماد المخلبي) و (100 جرام كمبوست + الرش بمستخلص النباتات المائية) واخيرا (250 جرام كمبوست) فقط. علي كل الاحوال فمعظم النتائج تشير ان معاملتي (100جم كمبوست + الرش + الري بمستخلص النباتات المائية) و/أو (100 جرام كمبوست + الرش بمستخلص النباتات المائية) حققت أعلي معايير معنوية دون نظير لنمو الحزم وصفات التزهير والصفات التسويقية للأبصال وتحليل المكونات الكيميائية.

الكلمات المفتاحية: نرجس تازيتا ، الأبصال المزهرة، التسميد المخلبي، مستخلص النباتات المائية، محسنات التربة، المخلبيات النباتية ، الإتخامية و المعالجة النباتية.