

ORIGINAL ARTICLE

Evaluation of some Physiological and Morphological Characteristics of *Narcissus tazatta* Under BA Treatment and Nano-Potassium Fertilizer

Sulmaz Asgari^{*1}, Hossein Moradi², Hossein Afshari³

¹MS Student, Department of Agriculture, Damghan Branch, Islamic Azad University, Damghan, Iran.

²Assistant Professor, Department of Horticulture, Sari Agricultural Sciences and Natural Resources University, Sari, Iran.

³ Associate Professor, Department of Agriculture, Damghan Branch, Islamic Azad University, Damghan, Iran.

(Received: 23 June 2014 Accepted: 28 August 2014)

KEYWORDS

Nano –potassium
Benzyl adenine
Narcissus
Antocyanine

ABSTRACT: The aim of this study was to evaluate the physiological and morphological characteristics of *Narcissus tazatta* in response to benzyl adenine (BA) and nano-potassium fertilizer. This experiment was done as factorial with two factors of benzyl adenine hormone and nano-potassium fertilizer in a completely randomized design with ten replications. Benzyl adenine in four levels (0, 500, 750 and 1000 ppm) and nano-potassium in three levels (0, 1.5 and 2.5 gr/l) were applied as spraying the solution on plants. Results showed significant effect of benzyl adenine hormone on water absorption rate and the number of flowers in 1% probability level ($P < 0.05$). Besides, the effect of different levels of fertilizer on water absorption rate, diameter of the stem, length of stem, wet and dry weight of the flower and the number of flowers was significant. The maximum diameter of the stem was obtained with 1.5 gr/l nano-potassium fertilizers. In the interaction between hormone and fertilizer, maximum concentration of antocyanin was seen by 750 ppm BA and 2.5 gr/l nano-potassium with an average of 0.6 μg in a gram of wet weight of the plant. The highest water absorption rate was obtained through the application of 2.5 gr/lit nano-potassium and 500 ppm BA. Therefore, the results of this experiment indicate that hormone and fertilizer of nano-potash cause to increase quality of flower.

INTRODUCTION

Narcissus (*Narcissus tazatta*) is an onion plant of the Amaryllidaceae family flowering in the middle of winter

and early in spring [1]. This flower is one of the most important of garden plants that its species grow in any part of the world, except for tropical regions [2].

* Corresponding author: Arnica.soulmaz@yahoo.com (S.Asgari).

Narcissus not only used as cut flowers and Pot plants, but also have very pharmaceutical value because having some effective material such as alkaloid compounds like galantamine [3]. Galantamine is from alkaloids used in pharmaceutical industry to cure muscular weakness and nerve system disease and also Alzheimer [4]. Besides, flowers and onions of narcissus are used in cure of periodical fever and dysentery and its root is used in cure of abscess, pimples and skin diseases [5].

One of problems in part of production of ornamental flowers and plants is unsuitable nutrition since in our country, with its bright sun and various climate, it is one of the most suitable and appropriate regions for spread of part of ornamental flowers and plants [6]. Potassium is important and required elements for plants, so that enough and suitable nutrition with this element causes positive quantitative and qualitative changes in ornamental plants [7].

In recent years nano-particles has found wide application in biological science. Because nano-particles have less diameter than diameter of bore of cell membrane, therefore easily can pass bores on membrane. Moreover, in leaf level, they enter plant through leaf stomatal pore or crack foundations; they are transferred to different tissues [8]. Some researches related to nano in part of ornamental plants include using silver nano-particles to increase vase life of carnation flowers, Gerbera a rose that its result is to improve age after their harvests [9-10]. Results of existing studies state different reaction of different species of plants to foods provided in the form of nano [11]. There are limited reports about the positive effect of nano fertilizer on the growth of some plant such as peanut [12], pea [13], spinach [14], and sweet basil. Among cytokines, a number of artificial regulators exists that of them, 6 – benzyl amino purina can be indicated. Of the most important effects natural and artificial cytokines, it is delayed in aging and acceleration of transfer of food and organic material. There are main evidences that show before and during aging, major

reduction in rate of internal cytokine is done [16]. William Eisenger concluded that cytokinines cause to increase diameter blooming stem and persistence of polianthes [17]. Benzyl adenine hormone has increased length of stem, diameter of flower, diameter of blooming stem and acceleration of blooming of tuberose [18, 19]. In investigation of effect of regulators of plant growth on morphological traits and essence of narcissus, stated benzyl adenine hormone causes to meaningfully increase length of blooming stem, diameter of flower, number of flower in the inflorescence and causes to accelerate blooming [20]. Using benzyl adenine hormone caused to increase weight of a leaf, number of leave, leaf surface, and diameter of stem in Croton plant [21]. Pre-grooming with benzyl adenine at concentration of 150 p.p.m increase the number of flowers in any inflorescence and diameter of blooming stems. Benzyl adenine has improved quality, delay in aging and prevention of destruction of antocyanin of leaves of polianthes [22]. Jiberlic acid and benzyl adenine have increased blooming stem, diameter of flower, number of floweret and acceleration of blooming in polianthes [23]. Benzyl adenine and Jiberlic acid accelerate blooming and increase number of lower in lilium [24]. Use of benzyl adenine in less-leaved tuberose species obtained similar results about increasing number of floweret [25, 19]. Benzyl adenine transfer materials made of leave to sprouts and growing flowers, as a result it increases solution carbohydrates in calycle. Grooming soak of onion in benzyl adenine caused to delay reduction of wet weight as desirable, prevents falling and keeps antocyanin pigments and finally, increase length of age of groilasilvia flower [26]. The positive effect of benzyl adenine hormone has been seen in keeping quality and increasing length of age of anthurium flowers and miniature roses through increasing water absorption rate [27, 28]. High concentration of benzyl adenine causes to reduce leaf water due to further losing it from leaves by stimulating opening orifices [29]. Cytokinines may increase length of age of flowers by preventing reduction

of flowers sugar during stages of blooming and aging of them [30]. Kheiri[23] reported, benzyl adenine hormone has increased rate of tuberose essence, and this hormone has caused to increase length of blooming stem, diameter of flower, number of flower and acceleration of blooming in much-leaved tuberose species. Constructed researches on the effect of this hormone in tuberose by Negarja, et al. had similar results on mentioned results. In another research, it has been reported that benzyl adnine hormone has not effected on length of blooming stem of azalea [31]. Kiohi[24] stated, benzyl adenine hormone has caused to accelerate blooming and increase number of flower in lilium. Nagira, et al. [32] indicated relation among benzyl adenine hormone and antocyanin rate that hormonal grooming caused to increase the rate of this pigment. Linard and Dihetrog [33] stated that vegetal hormones increase growth traits of plants. Magnifico, et al. [34] obtained maximum wet and dry weight and number of flowers in the bush when they used 800 kg of sulfate potassium during one year. Arab, et al. [7] in investigation of effect of nitrogen and potassium on qualitative traits and persistence of age of wallflower, stated consumption of nitrogen and potassium meaningfully improved indices of growth like dry weight, wet weight, length of blooming stem, thickness of blooming stem, length of the inflorescence and the number of flowers in comparison with a control.

In addition, more consumption of potassium and less one of nitrogen caused to increase longevity of flower. The aim of this study was to evaluate the physiological and morphological characteristics of *Narcissus tazatta* in response to benzyl adenine (BA) and nano-potassium fertilizer.

MATERIALS AND METHODS

This research was conducted in the Research Greenhouse of the Faculty of Sari Agricultural Science And Natural Resources University, Iran, in 2012. The experiment was a pot experiment as factorial based on a completely randomized block design with grooming benzyl adenine

hormone in four levels and nano-potash fertilizer in three levels with 10 replications. Any repetition or test unit included one vase that contained one flower onion of narcissus tazetta species with a diameter of 4.5 to 5 cm. Bed of base planting was used from the silt of river, agricultural soil, leaf composts, and domestic animal fertilizer with a ratio of 2, 5, 1, and 2. After doing the same stages of growing , morphological traits like the diameter of the stem, length of stem, time of blooming, diameter of the inflorescence and the number of flowers were measured and finally, plant samples were transferred to investigate some phyto-chemical traits such as rate of calycle antocyanin, to the laboratory of Sari agricultural science and natural sources University.

Diameter of stem in different grooming, after opening flowers from soil level to a node that flowers exit from it, was measured in cm. Diameter of inflorescence was written in terms of the diameter of florets and their average was done in mm. After reaching the blooming stage, number of florets were counted and written in any inflorescence. To calculate a water absorption rate, and to calculate pure absorption rate of water, flowers were transformed to laboratory of Sari Agricultural Science And Natural Resources University after harvest. Agetwards, several samples of vase containing distilled water that lacked branches of flower, were placed in environment, so that water rate lost through evaporation was calculated. Pure absorption rate of water by lowering residual volume in the container was obtained from the primary volume of existing water in any bottle. By measuring the value of water evaporation from bottles, pure absorption of water was calculated.

To measure wet and dry weight of the flowers, harvested flowers were placed over weighing inside paper pocket and were dried in 80 °C oven for 48 h. After it, dried flowers were weighed, again and percentage of their dry substance was calculated. To measure antocyanin rate of calycles, firstly 0.5 g of calycle was crushed by using methanol extraction solution and 1 normal chloridric

acid. Then, obtained samples put in test tube h in 4 °C for 24 and after passing required period of time; samples were placed in 5000 rounds/min centrifuge for 5 min. Finally separated extract was read by using spectrophotometer in wavelength of 530 and 657 nanometers and rate of existing antocyanin was calculated in calculus by the method of Meng and Veng [34] as per the following formula:

$$\text{Antocyanin rate} = A_{530} - 1.4A_{657}$$

After ending stages of analysis of plant elements, obtained results were statistically analyzed by SAS software and comparison was done among grooming in LSD method and in 1% level.

RESULTS AND DISCUSSION

Morphological traits (diameter of stem, length of stem, diameter of inflorescence, number of flower)

Analysis of variance of data obtained from test showed that effect of fertilizer in narcissus on diameter of stem, length of stem and number of floweret of this plant in 1% probability level was meaningful (Table 1). Of traits of stem diameter, length of stem and the number of flowers, only number of floweret was affected by hormone, meaningfully (1% probability level) and on the other hand, interaction of hormone and fertilizer did not show a meaningful effect on any of mentioned morphological traits. Comparison of averages showed that maximum diameter of stem among different grooming of nano-potash fertilizer related to fertilizer grooming, 1.5 gr/l with average of 6.8 mm and grooming of 2.5 gr/l and control were placed in next levels, respectively. In trait of length of stem, maximum length was seen among different fertilizer grooming in grooming 2.5 gr/l and control with average of 33.86 cm and grooming 1.5 gr/l and control were placed in next levels (Table 2).

Table 1. Variance analysis of hormonal effects and nano-potash fertilizer on some morphological and physiological traits Amaryllis

S.O.V	Df	N. florets	D.Inflorescences (mm)	L.Stem (cm)	D. Stem (mm)	Dry weight (g)	Wet weight (g)	Water absorption	Petal anthocyanin $\mu\text{M}/\text{mgFW}$
Hormones	3	23.22**	16.6 ^{ns}	14.42 ^{ns}	0.71 ^{ns}	0.0002 ^{ns}	0.02 ^{ns}	17.62**	0.01 ^{ns}
Fertilizer	2	27.12**	34.1 ^{ns}	131.1**	3.69**	0.008**	0.71**	14.56**	0.03 ^{ns}
Hormones* Fertilizer	6	0.56 ^{ns}	18.3 ^{ns}	8.95 ^{ns}	0.5 ^{ns}	0.0008 ^{ns}	0.08 ^{ns}	11.21**	0.05*
CV%		19.18	7.22	14.57	13	17.93	22.02	1.66	22.36

NS, * and **: non significant and significant respectively at 1 and 5% probability level.

Comparison of averages showed that maximum number of floweret of this plant was obtained among hormonal grooming related to hormonal grooming, 1000 with average of 7.88 and minimum number was done in hormonal grooming that it had adoption with results of Petrid, et al. [22] and among different grooming of nano-potash fertilizer, maximum number of floweret related to

fertilizer grooming, 2.5 gr/l with average of 7.7 and groups of 1.5 and control were placed in a statistical group (Table 2). Though diameter of inflorescence was not affected by any of grooming (fertilizer and hormone) and no meaningful effect was seen in it but statistically, maximum diameter of inflorescence was obtained from 500 hormone grooming and nano-potash, 1.5 gr/l (Table

2). Hormones increase growth traits of plants, so that in the present research, benzyl adenine hormone has increased growth traits of plant, significantly and by increasing hormone to 750 p.p.m. and fertilizer at rate of 2.5 gr/l, length of blooming stem was increased, too. In a similar research, hormone of abscisic acid increased length of blooming stem, diameter of flower, number of floweret, and acceleration of blooming in species of much-leaved tuberose, constructed researches on effect of this hormone in tuberose by Negarja, et al. [19] had similar results on mentioned traits.

Physiological traits (calycle antocyanin, water absorption rate, wet weight and dry weight)

Results of variance analysis of data obtained from this research showed that effect of hormone, fertilizer and also, hormonal interaction and fertilizer on water absorption rate and effect of fertilizer on dry weight and wet weight in asphodel in 1% probability level and hormonal interaction and fertilizer on calycle antocyanin in 5% level had a meaningful difference (Table 1). In interaction of hormone and fertilizer, maximum concentration of antocyanin was seen in grooming (750 hormone and nano-potash, 2.5 gr/lit) with average of 0.6 µg in g of wet weight of plant (Table 3).

Among hormonal grooming, hormone 500 grooming had the highest average of water absorption, also among fertilizer grooming, in grooming of nano-potash, 2.5 gr/lit highest average water absorption (88.94) was seen (Table 2). In interaction of hormone and fertilizer, maximum water absorption rate in hormone 500 grooming and nano-potash, 2.5 gr/lit was placed in the highest level and it was seen that by increasing nano potash rate, water absorption rate was increased (Table 3). Setyajit, et al. [26] concluded that BA hormone caused to keep water absorption rate and delay in reduction of wet weight and keep antocyanin pigments that it has consonance with results obtained from this research. Synthesis of antocyanin in different parts of plant is under genetic control, this means that different genes along path should

be expressed and make enzymes that finally, antocyanins are made.

As expressed in results, by increasing hormone and fertilizer antocyanin rate was increased, vegetal hormones increased concentration of these pigments in most of pigments that in some case, depending on species, this hormone had positive and negative effect on these pigments. Fertilizer of nano-potash has increased with all pigments that this increase of concentration has been different depending on different species, too. Petridou, et al. [22] in gowan (*Chrysanthemum morifolium*) showed that benzyl adenine has caused to keep color of calycles of this flower. In a constructed research, benzyl adenine hormone has had a meaningful difference. With increase of nano-potash fertilizer rate, wet weight and dry weight were increased, and with increase of hormone to concentration of 500 p.p.m dry weight were increased. Magnifico, et al. (34). obtained highest wet weight and dry weight and number of flower in bush when they used 800 kg of sulphate potassium in a hectare, during one year.

In this research, adding hormone and fertilizer of nano-potash has caused to increase water absorption rate in this flower that age of persistency of flower is increased due to increasing water absorption, too. In general, there is a close relation among water absorption and persistency of flowers and any factor that improves water absorption rate, it will be effective on persistency of flowers that result of the test has adaption with results obtained from research of Negarja [19]. Comparison of averages showed that maximum average of wet weight has been 1.87 g and among fertilizer grooming, maximum average of wet weight of plant in grooming 2.5 has been 1.57 g, on average and grooming 1.5 and control were placed in next levels, respectively. In table 2, comparison of average is seen, maximum average dry weight was among fertilizer grooming in grooming 2.5 gr/l with average of 0.19 g and grooming 1.5 and control were placed in a level.

CONCLUSION

Hormone and fertilizer of nano-potash keep pigment of antocyanin and diameter of flower and water absorption

rate desirably, depending on type of species that these factors increase quality of flower.

Table 2. Comparison the average hormone and nano potash fertilizers on certain morphological and physiological traits narcissus

S.O.V	N. florets	D. Inflorescences (mm)	L.Stem (cm)	D. Stem (mm)	Dry weightv (g)	Wet weight (g)	Water absorption	Petal anthocyanin $\mu\text{M}/\text{mgFW}$
Hormones0	5.22c	57.68a	32.8a	66.61a	0.16a	1.55a	87.51c	0.56a
Hormones500	6.05bc	58.64a	31.95a	6.2a	0.17a	1.58a	89.8a	0.47a
Hormones750	6.83b	56.49a	31.24a	6.4a	0.16a	1.6a	88bc	0.59a
Hormones1000	7.88a	57.52a	33.25a	6.19a	0.16a	1.52a	88.61b	0.58a
Fertilizer								
Nano Potas0	5.7b	56.76a	29.62b	6.06b	0.51b	1.41b	87.57b	0.39b
Nano Potas1.5 gr/lit	6.08b	58.99a	33.45a	6.8a	0.15b	1.53b	88.91a	0.59a
Nano Potas2.5 gr/lit	7.7a	57.14a	33.86a	6.2b	0.19a	1.75a	88.94a	0.57a

Similar letters in each column indicating lack of significant difference between treatment

Table 3. Comparison the average effect of nano-potash fertilizer, hormones and some growth characters

S.O.V	Water absorption	Petal anthocyanin $\mu\text{M}/\text{mgFW}$
Hormones0*Nano Potas0	85.62b	0.43b
Hormones0*Nano Potas1.5 Per mill	88.25ab	0.55a
Hormones0 * Nano Potas2.5 Per mill	88.66ab	0.57a
Nano Potas0 Hormones500	90.75a	0.35c
Nano Potas1.5 Per mill Hormones500	88.33ab	0.55a
Nano Potas2.5 Per mill * Hormones500	90.33a	0.47b
Nano Potas0 * Hormones750	86.79b	0.45b
Nano Potas1.5 Per mill * Hormones750	89.58a	0.55a
Nano Potas2.5 Per mill * Hormones750	87.62b	0.61a
Nano Potas0 * Hormones1000	87.16b	0.5a
Nano Potas1.5 Per mill * Hormones1000	89.5a	0.5a
Nano Potas2.5 Per mill * Hormones1000	89.16a	0.4b

Similar letters in each column indicating lack of significant difference between Tymarhast

ACKNOWLEDGMENTS

The authors declare that there is no conflict of interests. This work was done by financial support of Islamic Azad University, Damghan Branch, Semnan, Iran.

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