The Effect of Nitroxin Biofertilizer, Vermicompost, and Nitrogen on Vegetative and Reproductive Spicifity of Stock (Matthiola incana L.)

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Abstract: A field experiment was carried out in 2011-2012 season at 5 kilometers northeast of Behbahan in order to investigate the effect of Nitroxin Biofertilizer, Vermicompost, and Nitrogen on vegetative and reproductive characteristics of stock (Matthiola incana L.). The study is of factorial experiments type which has been laid out using Randomized Complete Block Design (RCBD) with 4 replications. The studied factors include use of Vermicompost at three levels (0, 1, and 0.5 $kg.m^{-2}$), use of Nitroxin at three levels (without inoculation, with seed inoculation, and with seed inoculation along with irrigation water), and use of Nitrogen at three levels (20, 30, and 40 $gr.m^{-2}$).The studied traits were diameter and length of blooming stem, diameter and length of inflorescence, and number of florets on inflorescence. Seeds were cultivated on September 29th 2011 and the flowers were harvested on February 4th 2012. Results show that the effect of various levels of Vermicompost, Nitroxin, and Nitrogen use on vegetative and reproductive traits of the flower is significant. The diameter and the length of blooming stem, the diameter and the length of inflorescence, and the number of florets on inflorescence are influenced by Nitrogen and Vermicompost ($P<0.01$).Use of Nitroxin has a positive impact on vegetative traits of stock (Matthiolaincana)so that the maximum height (54.89 cm) belongs to the treatment of "use with seed inoculation along with irrigation"and the minimum height (51.80 cm) is observed in the case of "use without inoculation" treatment.The effect of studied factors on the number of leaves is not significant. The maximum length of inflorescence is gained when using 0.5 $kg.m^{-2}$ of Vermicompost along with Nitroxin in the case of "use with seed inoculation" treatment, whileits minimum amount is observed when 20 grams of Nitrogen fertilizer is used without use of Vermicompost and Nitroxin. On the other hands, a significant and positive increase in thickness of inflorescence is witnessed as use of Vermicompost is raised. There is no statistically-significant difference between two Vermicompost using levels of 0.5 $kg.m^{-2}$ and 1 $kg.m^{-2}$.Among the studied traits, the trait of floret number has the greatest correlation with the inflorescence diameter and length. According to the result, use of 30 grams of Nitrogen and 0.5 kilograms of Vermicompost in addition to use of Nitroxin withseed inoculation along with irrigationis recommended.
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Introduction

The importance and role of ornamental plants in non-oil foreign exchange incomes and job creation is abundantly clear to the authorities and politicians of the country. Iran's enjoyment of appropriate infrastructures to produce and export flowers such as production history, cheap, efficient, and skilled labor, climate diversity, rich genetic resources, andlow-cost energy can bring it a huge and outstanding capacity of flower production and may place it among the chief flower exporting countries in the world. Stock, with the scientific name "Matthiola incana L", is a member of "Brassicaceae" Family in the genus "Matthiola" which has been named in honor ofPietro Andrea Mattioli, an Italian botanist of 15th century (Michael and Griffiths, 1998).

Nowadays, biofertilizers are considered as a suitable alternative to chemical fertilizers in order to increase soil fertility and produce durable crops (Wu et al, 2005). The abundant and continuous use of chemical inputs and the long-time absence of appropriate host plant for symbiotic organisms have caused them not to be of desirable quality and quantity. Accordingly, theiruserequires use of theirinoculants (Sharma, 2002). Azosprillium and Azotobacter are capable of producing and secreting some biological substances in the surrounding environment of plant root such as B group vitamins, Nicotinic Acid, Pantothenic Acid, Biotin, Oxenes, Gibberellins and so on which have an effective and essential role in root's growth enhancement (Kader, 2002). Plants' response to Nitrogen use and contamination with Azosprillium and Azotobacterhas been reported to be in the form of increase in dry weight of plant, Nitrogen amount increment in seed, increase in number of tillers and spikes and fertile inflorescences, enhancement in number of seeds on per spike and 1000-seeds weight,plant height and leaf

length increment, and acceleration in shooting and blooming stages (Patriquin et al, 1983). Vermicompost biofertilizer preserves soil nutrients and prevents Nitrogen leaching, enhances bioactivity, improves soli structure, creates nutrients cycle and enhances their accessibility and absorption by providing a suitable environment for growth and development of microbial colonies in soil (Roesty et al, 2006). A study on chickpea plant showed that using three tons of Vermicompost per unit area, a considerable increase in number of pods per plant, biological yield and seed yield is observed (Jat and Ahlawat, 2006). In another work, use of Vermicompost has resulted in an improvement of biological yield of Sorghum bicolorplant (Cavender et al, 2003). According to the study by Paul and Savithri (2003) on Sesame, use of Azosprillium along with 50% traditional Nitrogen of regionresulted in an acceptable yield, but no significant difference was observed in comparison with complete Nitrogen treatment. This result was also observed for the treatment of Azotobacter along with 50% of traditional Nitrogen of the region. Considering the irregular use of chemical fertilizers and consequent problems, the importance of Stock flower as an ornamental plant which is highly compatible with Iran's climate, and the lack of any documented and comprehensive information about the vegetative reactions of this plant to non-chemical fertilizers, this study aims to evaluate the effect of bio-, organic, and chemical fertilizers as well as their mixtureon Stock flower in order to reduce the use and increase the efficiency of chemical fertilizers.

Materials and Methods

This study was carried out in 2011-2012 season ona 1000 m^2 farm at5 kilometers northeast of Behbahan city. The experiment design was factorial in the form of randomized complete block design (RCBD) with 4 replications. The first factor (N factor) involves use of traditional Nitrogen of the regionat three levels of 50, 75, and 100 percent (the amount of traditional Nitrogen of the regionis 40 grams per square meter). The used Nitrogen fertilizer was Urea fertilizer with 46% pure Nitrogen. The second factor (A factor) involves use of Nitroxin fertilizer at three levels of use without inoculation, use with seed inoculation (Nitroxin was sprayed over seeds (1 ml Nitroxin per gram of seeds) and then seeds were mixed and dried in shadow), and finally use with seed inoculation along with irrigation water two months after cultivation when the main plant was moved onto the farm (5 liters per hectare based on the instructions by producer company). The third factor (V factor) involves use of Vermicompost at three levels of 0, 1 and 0.5 $kg.m^{-2}$ (fertilizer was mixed well with soil before cultivation). Excel and SAS softwares were used for data analysis and statistical calculations, respectively. DUNCAN's test was also used to compare the averages at p=0.05.

Table 1.Physical and chemical characteristics of used farm soil

Soil texture	Sand percentage	Silt percentage	Clay percentage	Absorbable potassium (ppm)	Absorbable phosphorous (ppm)	Total Nitrogen percentage	Organic Carbon percentage(C)	Organic materials percentage OM	Total saturation reaction pH	Electrical conductivity 10^3*EC	Sample depth (cm)
loamy – sand	23/6	47/3	14/7	364/37	9/74	0/125	1/54	1/8	7/4	0/732	(0-30)

Length of Blooming Stem:

From the viewpoint of this trait, the effect of Vermicompost and Nitroxin ($p<0.01$) and the interaction of Vermicompost and Nitrogen ($p<0.05$) are significant (Table 2).The comparison of mean values of Vermicompost and Nitrogen interactions with stock's blooming stem length showed that their application has a positive and significant effect on plant's height so that the maximum height (59.01 cm) belongs to the treatment of using 1 kilogram Vermicompost per square meter along with 100% of traditional Nitrogen of the regionand the minimum height (53.58) was observed for the treatment of using just 50% Nitrogen. The results obtained for the effect of Nitroxin on stock's blooming stem length (Table 3) showed that Nitroxin inoculation has a positive and significant effect on plant's height so that the maximum height (54.89 cm) belongs to the treatment of Nitroxin inoculation when using with irrigation water, while the treatment of "without inoculation" resulted in the minimum height (51.80 cm). According to the results there is no statistically-significant difference between the levels of "without inoculation" and "with inoculation".

Table 2. Variance analysis of studied traits of stock under the influence of various amounts of Nitrogen, Vermicompost, and Biologic fertilizers

Mean squares					Degree of Freedom	Resources of Change
Floret Number	Inflorescence Diameter	Inflorescence Length	Stem Diameter	Plant's height		
49/98**	13/22**	42/16**	16/06**	22/19**	2	A(Nitrogen)
29/19**	6/83**	18/68**	2/69ns	216/64**	2	B(Vermicompost)
1/39ns	4/00*	5/81**	0/28ns	85/88**	2	C(Nitroxin)
4/06ns	0/66ns	1/12ns	1/23ns	28/55*	4	A * B
2/23ns	0/45ns	0/47ns	0/77ns	4/22ns	4	A * C
4/84ns	1/79ns	2/60*	2/49*	17/06ns	4	C * B
2/82ns	0/98ns	1/23ns	1/29ns	17/96ns	6	C * B* A
3/43	1/21	1/01	0/005	10/19	47	Study Error
10/96	12/86	6/86	6/23	5/99	(%)	Changes Coefficient

ns،** ،*respectively, illustrates significant and insignificant at p<0.01 and p<0.05

Diameter of Blooming Stem:

According to the results (table 2), the use of Nitrogen (p<0.01) and the mutual effect of Vermicompost and Nitroxin (p<0.05) on this trait are significant. By increasing the usedNitrogen amount up to 100% of its traditional amount in the region, the stem diameter showed an increasing trend so that its maximum amount was observed when 100% of traditional Nitrogen of the regionwas used, while its minimum amount was gained for using 50% of traditional Nitrogen of the region(figure 3). The mean values comparison showed that by using Vermicompost up to 0.5 $kg.m^{-2}$along with Nitroxin use withinoculation, stem diameter showed a significant increase and by decreasing the amount of Vermicompost to 1 $kg.m^{-2}$, a decrease in stem diameter was observed because of the abundance of available nutrients and subsequent increase of plant's height which, in turn, results in the reduction of stem diameter. Furthermore, there is no statistically-significant difference at all using levels of Vermicompost, Nitroxin with inoculation and Nitroxin with inoculation along with irrigation.

Length of Inflorescence

According to the results from analysis of variance (table 2), the effect of Nitrogen, Vermicompost, and Nitroxinon this trait is significant (p<0.01). The mutual effect of Vermicompost and Nitroxin is also significant in the case of this trait (p<0.05). The mean values comparison revealed a positive and considerable increase of inflorescence length by raising Nitrogen use (table 3) so that as the Nitrogen use was raised to 100% of its traditional level in the region, anincrease of 15.9% in inflorescence length was observed.The minimum amount of inflorescence length belongs to the treatment of using 50% of traditional Nitrogen of the region, while its maximum amount was observed for the treatment of using 100% of traditional Nitrogen of the region. Inflorescence length, as a quantitative trait, is important for stock producers and buyers. Thus, the longer the inflorescence is, the more desirable by market it is. On the other hand, the maximum inflorescence length belongs to the treatment of using 0.5 kilograms of Vermicompost per square meter along with Nitroxin use with seed inoculation, while its minimum amount was observed when Vermicompost and Nitroxin were not used.

Diameter of Inflorescence

According to the results (table 2), the effect of Nitrogen and Vermicompost (p<0.01) and also the effect of Nitroxin use (p<0.05) on this trait are significant. The mean values comparison revealed that the thickness of inflorescence is considerably increased as Nitrogen use was raised so that the maximum amount of inflorescence thickness (9.13 cm) was obtained in the case of using 100% of traditional Nitrogen of the region and its minimum amount (7.93 cm) was observed for the treatment of using 50% of traditional Nitrogen of the region. In addition, as the use of Vermicompost increased, a positive and significant increase in the diameter of inflorescence was observed. There is no statistically-significant difference between two Vermicompost using levels of 1 and 0.5 $kg.m^{-2}$. Based on the results from Nitroxin effect mean values comparison, the maximum (8.88 cm) and minimum (8.22 cm) amount of inflorescence thickness respectively belong to the treatments of Nitroxin use along with irrigation and not using Nitroxin.

Number of Florets on Inflorescence

Based on the results shown in table 2, the effect of Nitrogen and Vermicompost on this trait is significant (p<0.01). Use of Nitroxin showed no considerable effect on this trait. Mean value comparisons indicated a positive and significant increase of floret number with increasing Nitrogen use (figure 10). As it is obvious, the minimum

number of florets belongs to the treatment of using 50% of traditional Nitrogen of the region and increases with the raise of used Nitrogen amount so that it finally reaches its maximum level by using 100% of traditional Nitrogen of the region.Addition of Vermicompost has a positive and considerable effect on floret number in stock plant so that by raising the amount of Vermicompost from 0 to 1 $kg.m^{-2}$, a straight and considerable increase in floret number was observed. The minimum number of florets belongs to the treatment of not using Vermicompost, while its maximum amount was observed for the treatment of using 1 $kg.m^{-2}$ of Vermicompost. In addition, there is no statistically-significant difference between two Vermicompost using levels of 1 and 0.5 $kg.m^{-2}$.

Table 3. comparison of the mean values of Nitrogen, Vermicompost, and Nitroxin simple effects on the studied traits

Study Treatments	Plant Height	Inflorescence Length	Inflorescence Diameter	Floret Number	Stem Diameter
N1	$50/70^{c}$	$13/64^{c}$	$7/93^{b}$	$15/65^{c}$	$1/10^{c}$
N2	$53/51^{b}$	$14/67^{b}$	$8/66^{a}$	$17/03^{b}$	$1/13^{b}$
N3	$55/65^{a}$	$15/81^{a}$	$9/13^{a}$	$18/00^{a}$	$1/19^{a}$
V1	$50/59^{c}$	$13/88^{b}$	$8/13^{b}$	$15/89^{b}$	$1/13^{a}$
V2	$53/86^{b}$	$15/09^{a}$	$8/59^{ab}$	$17/16^{a}$	$1/16^{a}$
V3	$55/40^{a}$	$15/15^{a}$	$9/00^{a}$	$17/63^{a}$	$1/13^{a}$
A1	$51/80^{b}$	$14/26^{b}$	$8/22^{b}$	$16/77^{a}$	$1/13^{a}$
A2	$53/16^{b}$	$14/82^{a}$	$8/61^{ab}$	$16/79^{a}$	$1/14^{a}$
A3	$54/89^{a}$	$15/04^{a}$	$8/88^{a}$	$17/12^{a}$	$1/15^{a}$

Values with similar superscript letters in each column have no significant difference based on DUNCAN's test ($P \leq 0.05$).

References:

1. Cavender, N. D., Atiyeh. R. M., and knee. M. (2003). Vermicompost stimulates mycorrhizal colonization of roots of sorghum bicolor at the expense of plant growth. Pedobiologia. 47: 85-89.
2. FAO, 2002. FAO Stat-Agriculture. Food & Agriculture Organization of the United Nations. Available online at http://www.fao.org/site/408.
3. Jat, R. S. and Ahlawat. I. P. S. 2006. Direct and residual effect of vermicompost, biofertilizers and phosphorus on soil nutrient dynamics and productivity of chickpea-fodder maize sequence. Journal of Sustainable Agriculture. 28(1): 41-54.
4. Michael, P. and Griffiths, M. (1998. Shorter dictionary of gardening, 1st edn.London: Macmillan Ltd. England.
5. Patriquin, D. G., Dobereiner. J., and Jain. D. K. 1983. sites and processes of association between diazotrophs and grasses. Can. J. Microbiol. 29: 900-915.
6. Paul, K. and Savithri. E. 2003. Effect of biofertilizersvs perfected chemical fertilization for sesame grown summer rice fallow. Journal of Tropical Agriculture. 41: 47-49.
7. Roesty, D., R. Gaur and B. N. Johri. 2006. Plant growth stage, fertilizer management and bio-inoculation of arbuscularmycorrhizal fungi and plant growth promoting rhizobacteria affect the rhizobacterial. Community structure in rain-fed wheatfields, J. Plant Sci., 38: 1111-1120.
8. Sharma, A. K. (2002a). Biofertilizers for Sustainable Agriculture. Agrobios, India.
9. Wu, S. C., H. Z. Cao, Z. G. Li, K. C. Cheung and M. H. Wong. 2005. Effects of biofertilizers containing N-fixer, P and K solubilizer and AM fungi on maize growth: a greenhouse trail. Geoderma, 125: 155-166.

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