Growth and Flower Quality of Damascene Rose Under Different Media Treatments

Pertumbuhan dan Kualitas Bunga Mawar Damaskus di Bawah Perlakuan Media yang Berbeda

Angham Ayad Kamaluddin AL-Aloosi
Department of Horticulture and landscape, Gollege of Agriculture , Tikrit of University
Author's email: ainghamiiad@tu.edu.iq

Abstract
The research was conducted in in Horticulture and Landscape Department fields - College of Agriculture - Tikrit University during 2023 Spring Season for Damascene Rose *Rosa Damscena*. The study included two factors; the first one is the growing media with three levels, mixture soil, vermicompost and soil mixture 1: 1, vermicompost and soil mixture 2: 1. The second factor was spraying nano-fertilizer with two concentrations: without spraying as control treatment, and spraying with nanotechnology with a concentration of 1 g l^{-1} ,the experiment consisted of 6 factorial treatments from the above factors interaction and carried out with full random complete block design R.C.B.D and by three replications. The results showed the superiority of mixture of vermicompost: soil 2: 1treatment in the characteristics of plant height and dry matter percentage which gave 96.54 cm and 15.72 % and recorded the highest rate of flowers number for the interaction treatment between mixture of vermicompost: soil 2: 1 and non-spraying with nano-fertilizer which reached 22.36 flowers.

Introduction

Rosa genus is one of the ornamental plants , and has a great importance according to its multiple uses. Besides being ornamental plant, *Rosa damascina* is included in the medical preparations, as well as its use as a flavor in preparing food and in preparing tea as a drink and other uses. Belonging to the family of rosaceae, it is cultivated all over the world in order to produce perfumes firstly, and its name was taken from the Greek word "Rhodo", which means red, like the color of the blood of Aphrodite gods. Roses include 200 types and more than 1,800 varieties , the origin of Damascene rose from the multiplication of three old roses varieties (*R. moschata, R. Galica*, R. *fedschenoan* Regel) and the cultivated Damascene rose is a complex hybridization with number of fixed chromosome 2n = 4x = 28, . *Rosa damascena* Mill is one of the most important types of rose to produce essential oils, and others are widely grown in garden roses . Rose was considered an important plant for medical nutritional integration and had high edible and economic values. Sultani rose is famous for its pleasant aroma, and it has been shown through studies that rose oil can be produced and has a great economic income [1]. It contains a high percentage of polyphenols, vitamins of C, B, E, and carotenoids, which have a synergistic antioxidant effect. The plant is called the king of flowers, a symbol of love, purity, faith and beauty since ancient times. It originated in Iran and began extracting essential oil from its flowers. since the seventh century AD. It has been brought to Europe and planted in European countries. At present, Bulgaria and Turkey are considered the main countries producing the essential oil, and Bulgarian rose oil is the best known type The plant is grown to produce rose oil. This oil is considered the main raw material in the industry of the perfumes . In addition, its essential oil is involve in the industries of pharmaceutical,

cosmetics, and food. The economic use is also extended to manufacture rose water, absolute, and concrete . The plant oil contains various contents such as 2-phenylethanol, citronellol, and stearopten waxes etc. Furthermore, the use in soap, lotions, and creams production are some more instances of the plant economic benefits. In the traditional treatment, the oil is used in the anemia, exhaustion and asthma. Moreover, it is also used in relaxing and cooling agent due to its positive influence in the nervous system.

Growing media was proven to be effective for greater production in different crops. Good aeration, capacity of water holding, and more nutrients uptake are some properties of such media [2]. Vermicompost was recognized to be suitable for high value grown crops including rose plant . In combination with organic, higher advantages of ornamental plants can be obtained under different types of growing media. The organic material vermicompost, also known as worm manure, is an odorless, clean, and containing adequate minerals. It contains several macro and micronutrients that are necessary for plant growth and development [3] .

This material displays beneficial nutrients and activities of enzymatic microbial easing uptake by the plants [4]. Use of the new applications in agriculture has been well deliberated. Nano-fertilizers is the most technique used in such field [5]. Nano fertilizers was found to achieve one goal of global sustainable agriculture and crop production. This kind of fertilizers is mostly considered the best choice to moderate macro-and micro-nutrient lockage. In nano-fertilization, nutrients can be chained to provide gradual disassemble of nutrients. This increase nutrients uptake efficiency and crops production [6]. This technology resulted in essential changes. The surface area to volume ratio of such molecules are high, which enhances physical, chemical and biological properties [7]. This type of fertilizers can be added to the plant as a powder or liquid. Nano fertilizer enhanced various characteristics of flowering crops [8].

The effect of vermicompost as growing media and nanofertilizer were examined in this study. Their effect on growing and flowering characteristics was also tested [9], [10], [11].

Materials and methods.

The study was conducted during spring season of 2023 in one of the plastic houses belonging to the horticultural facility in Horticulture and Landscape Department of faculty of Agriculture, Tikrit University (34.6783° N, 43.6556° E, location longitude and latitude), that covered with saran with 50% shading. Pots of 25 cm diameter were prepared filled with three mixtures. The mixtures were soil only, vermicompost:soil 1:1, and vermicompost:soil 2: 1:. Plants were planted in pots at a height of 15 cm and containing 3 main branches. In the middle of February the experiment consisted two factors, the first factor was the growing media at three levels (mixed soil only, mixed soil, vermicompost 1:1, soil only, vermicompost 2:1) and the second factor - spraying with nano-fertilizer at two concentrations without spraying control treatment , spraying with nano-fertilizer at a concentration of 1 g l^{-1} . The experiment consisted of 6 factorial treatments from the interaction of above factors and was implemented in a completely randomized block design (R. C. B. D) with three replicates and 3 pots in each experimental unit. Thus, the experiment consisted of 54 pots. Plant height was measured from the media level to the highest point of the plant using tape measuring (cm). Dry matter percentage was calculated using the formula of (dry eight\ fresh weight) *100. Flower numbers were counted cumulatively from the first to last flower. Flower weight was determined using sensitive balance. In addition, the diameter of flowers selected was measured based on the widest points between each flower sides.

Results and Discussion

Effect of spraying nano-fertilizer and growing media on Damascus rose plant height (cm)

Through statistical analysis of the results (Table 1),is found that there are significant differences between spraying treatment and control treatment. The plant without nano-fertilizer gave the highest value of plant height (92.31 cm).The lowest value was given of the treatment with nano-fertilizer at a 1 g Ll^{-1} (98.36 cm) [12], [13], [14]. The growing media treatment showed significant effect where the largest value were recorded of the treatment of compost: soil: 2:1 (96.56 cm). The lowest value was recorded in the treatment of soil only(83.14 cm). The interaction treatment between the two factors recorded significant differences. The growing media treatment, compost: soil 2:1, and the control treatment of fertilizer gave the highest values (97.62 cm). In contrast, the soil treatment and spraying with nano-fertilizer showed the lowest value of this parameter (81.13 cm) [15], [16].

Table (1) Effect of spraying nano-fertilizer and growing media on Damascus rose plant height (cm)

Nano-fertilizer	Growing media			Nano-fertilizer Average
	soil only	vermicompost: soil 1:1	vermicompost: soil 2:1	
Zero	85.15 e	94.15 c	97.62 a	92.31 a
1	81.13 f	91.43 d	95.51 b	89.36 b
Growing media average	83.14 c	92.79 b	96.56 a	

Effect of spraying nano-fertilizer and growing media on dry matter percentage (%) of Damascus rose plants

The results in Table (2) showed that there were significant differences when nano fertilizer was used. The control treatment was superior giving the highest value (15.94%), while spraying treatment gave the lowest value (14.46%). Growing media treatment recorded significant differences. The treatment of 2:1 gave the highest value (15.74%), compared to soil only treatment, which gave the lowest value (14.16%) dry matter [17],[18], [19].

The interaction between treatments was also significant. The treatment of compost: soil 2:1 without nano fertilizer was superior giving the highest value (16.32%) dry matter.

Table(2)Effect of spraying nano-fertilizer and growing media on dry matter percentage (%) of Damascus rose plants

Nano-fertilizer	Growing media			Nano-fertilizer Average
	soil only	vermicompost: soil 1:1	vermicompost: soil : 2:1	
Zero	14.94 d	15.22 b	16.32 a	15.49 a
1	13.39 f	14.82 e	15.16 c	14.46 b
Growing media average	14.16 c	15.02 b	15.74 a	

Effect of spraying nano-fertilizer and growing media on flowers number (flower plant^{-1}) of the Damascus rose plant

The results of Table (3) showed that there were significant differences between spraying treatment. Control treatment was superior in the flowers number (20.80 flowers), while spraying treatment gave the lowest (19.79 flowers). Also, the growing media treatment recorded significant differences. The treatment of 2:1 compost: soil: , had the highest value (21.90 flowers), compared to mixed soil, which gave the lowest(19.01 flowers).

The interaction had superiority for the treatment of compost: soil 2:1 and control (without fertilizer). This treatment reached highest number of flowers (22.36 flowers), while soil only with nano-fertilizer showed the lowest (18.31 flowers).

Table (3) effect of spraying nano-fertilizer and growing media on flowers number (flower plant^{-1}) of the Damascus rose plant

Nano-fertilizer	Growing media			Nano-fertilizer Average
	soil only	vermicompost: soil 1:1	vermicompost: soil 2:1	
Zero	19.72 d	20.33 c	22.36 a	20.80 a

1 g l^{-1}	**18.31 f**	**19.63 e**	**21.44 b**	**19.79 b**
Growing media average	**19.01 c**	**19.98 b**	**21.90 a**	

Effect of spraying nano-fertilizer and growing media on flower weight (g) of Damascus rose plants

The results in Table (4) displayed that there were significant differences between nano-fertilizer treatments. The treatment of control was the highest in the values of flower weight (22.36 g). On the other hand,spraying nano-fertilizer gave the lowest value(21.53 g). Growing media treatment recorded large significant differences. The treatment of compost: soil 2:1 reached highest value (23.69 g), compared to the lowest in mixed soil (20.27 g) treatment [20], [22].

The interaction was significant between the two factors used. The highest value was recorded when treating growing media: compost: soil 2:1 without spraying of nano-fertilizer (23.92 g). In contrast, the lowest value was recorded under the interaction of soil and spraying nano-fertilizer (19.71 g).

Table (4) Effect of spraying nano-fertilizer and growing media on flower weight (g) of Damascus rose plants

Nano-fertilizer	**Growing media**			**Nano-fertilizer Average**
	soil only	**vermicompost: soil 1:1**	**vermicompost: soil 2:1**	
Zero	**20.83 e**	**22.34 c**	**23.92 a**	**22.36 a**
1	**19.71 f**	**21.43 d**	**23.45 b**	**21.53 b**
Growing media average	**20.27 c**	**21.89 b**	**23.69 a**	

Effect of spraying nano-fertilizer and growing media on flower diameter (mm) of Damascus rose plant

It was evident in the Table (5) that there were significant differences between spraying nano-fertilizer treatments. That control treatment had the highest value of flower diameter (81.58 mm),

while spraying treatment gave the lowest (80.14 mm) diameter. Growing media treatment also recorded high significant differences. The treatment of compost: soil 2:1 reached the highest value(84.05 mm), compared to the lowest in the mixed soil treatment (78.31 mm)**.**
The interaction between the treatments recorded significant differences. Compost: soil 2:1 without nano-fertilizer recorded the highest value (84.96 mm). In contrast, the lowest value was recorded under interaction treatment between soil only and spraying nano-fertilizer (77.15 mm).

Table (5) Effect of spraying nano-fertilizer and growing media on flower diameter (mm) of Damascus rose plant

Nano-fertilizer	Growing media			Nano-fertilizer Average
	soil only	vermicompost: soil 1:1	vermicompost: soil 2:1	
Zero	79.46 e	80.32 c	84.96 a	81.58 a
1	77.15 f	80.14 d	83.14 b	80.14 b
Growing media average	78.31 c	80.23 b	84.05 a	

It is found from statistical analysis results tables that all treatments in growing media, compost: soil 2:1, gave the highest values in most characteristics studied. pH had an important role in improving all vegetative and floral traits, including plant height and percentage of dry matter. The reason for this was that macro and micro-nutrients were ready for absorption by roots. This had positive effects on the growth and height of the plants. This was consistent with the study of [23], [24]. Dry weight increasing with compost: soil 2:1 treatment due to the fact that pH helps to absorb largest amount of necessary ketones and anions for growth and build plant tissues and accumulation of nutrients. This lead to an increase in dry matter percentage As for the floral characteristics, flowers number, flower weight, and diameter, it was also due to the fact that most of the nutrients were ready and easy to be absorbed by the plant, especially nitrogen, which increased plant growth and early flowering [25].The reason of the increase in flower diameter and flower numbers was due to adequate nutrition for the plant and increased vegetative growth including leaves and leaf area. In turn, increased in photosynthesis products that were directed to the vegetative buds and transformed into flower buds, in addition to the accumulation of nutrients due to better nutrition for the plant. Especially the proportion of carbohydrates lead to an increase in flowers number in the plant. This agreed with the results of.

Conclusion

The use of traditional type of fertilizers was reduced. A new technology has been recently used. Nano fertilizer was the technique that influence ornamental crops production. Growing media is another factor affects plant growth and development. The study examined these factors effects in some of the vegetative and floral characteristics of rose plant. The study was applied based on RCBD design. The results showed significant differences between treatments used. The study revealed promising outcomes in the field of ornamental crops production.

References

[1] Aljanabi, H. A. Y., "Effects of nano fertilizers technology on agriculture production," Annals of the Romanian Society for Cell Biology, pp. 6728–6739, 2021.
[2] Al-Rawi, Kh.i M., and Abdulaziz, Kh., Designing and analysis of agricultural experiments, University of Mosul Press, Iraq, 1980.
[3] Dobreva, A., and Kovacheva, N., "Daily dynamics of the essential oils of Rosa damascena Mill. and Rosa alba L.," J. Agric. Sci. Tech., vol. 2, pp. 71–74, 2010.
[4] European Pharmacopoeia, Maissonneuve Sainte Ruffine, vol. 3, p. 68, 1975.
[5] El-Saadony, M.T., et al., "The use of biological selenium nanoparticles..." Saudi J. Biol. Sci., vol. 28, pp. 4461–4471, 2021.
[6] Feng, M., et al., "Individual and synergistic effect of multi-frequency ultrasound..." Food Research International, vol. 163, p. 112120, 2023.
[7] Hegde, A. S., et al., "Edible rose flowers: A doorway to gastronomic..." Food Research International, vol. 162, p. 111977, 2022.
[8] Hussen, K. W., "Review paper on genetic diversity of damask rose..." Ukrainian Journal of Ecology, vol. 13, no. 2, pp. 11–14, 2023.
[9] Kahlel, A. M. S., et al., "Effect of Nano Fertilizers and Its Applying Methods..." IOP Conf. Ser.: Earth Environ. Sci., vol. 923, no. 1, p. 012003, 2021.
[10] Kamaluddin, A. A., et al., "Effect of NPK nano fertilizer on vegetative..." Tikrit J. Agric. Sci., vol. 22, no. 3, pp. 113–119, 2022.
[11] Kaushal, S., and Kumari, P., "Growing media in floriculture crops..." J. Pharmacogn. Phytochem., vol. 9, no. 2, pp. 1056–1061, 2020.
[12] Khalil, H.P.S.A., et al., "The role of soil properties and its interaction..." Renew. Sustain. Energy Rev., vol. 43, pp. 1006–1015, 2015.
[13] Kural, F., and Coşkan, A., "The Effect of Vermicompost Application..." Turk. J. Agric. Food Sci. Technol., vol. 11, no. 8, pp. 1310–1316, 2023.
[14] Rekha, G. S., et al., "Effects of vermicompost and plant growth enhancers..." Int. J. Recycl. Org. Waste Agric., vol. 7, pp. 83–88, 2018.
[15] Rusanov, K., et al., "Microsatellite analysis of Rosa damascena Mill..." Theor. Appl. Genet., vol. 111, pp. 804–809, 2005.
[16] Rusanov, K., et al., "Rosa x damascena Mill. (Rose)..." Springer, Cham, vol. 12, 2020. Available: https://doi.org/10.1007/978-3-030-38792-1_14
[17] Tsanaktsidis, C.G., et al., "Preliminary results on attributes of distillation..." PCBEE Procedia, vol. 1, pp. 66–73, 2012.
[18] Gao, H., et al., "Aerodynamic property and filtration evaluation..." Sep. Purif. Technol., vol. 251, p. 117293, 2020.
[19] Giray, F. H., and Omerci Kart, M. C., "Economics of Rosa damascena in Isparta, Turkey," Bulg. J. Agric. Sci., vol. 18, pp. 658–667, 2012.
[20] Gudin, S., "Rose: genetics and breeding," Plant Breed. Rev., vol. 17, pp. 159–189, 2000.

[21] Guenther, E., The Essential Oils, vol. 5, Robert E. Krieger Publishing Company, Malabar, Florida, USA, 1952.
[22] Iwata, H., Kato, T., and Ohno, S., "Triparental origin of Damask roses," Gene, vol. 259, no. 1–2, pp. 53–59, 2000.
[23] Landis, T. D., et al., "Growing media," The Container Tree Nursery Manual, vol. 2, pp. 41–85, 1990.
[24] Mahboubi, M., "Rosa damascena as holy ancient herb..." J. Tradit. Complement. Med., vol. 6, no. 1, pp. 10–16, 2016.
[25] Zhao, L., et al., "Nano-biotechnology in agriculture..." J. Agric. Food Chem., vol. 68, no. 7, pp. 1935–1947, 2020.