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The response of Mathiola plant to the foliar application of Thiamine and Roselle extract on some vegetative and floral growth parameters

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ABSTRACT

The experiment was conducted during the agricultural season 2020-2021 in lath house covered with saran belonging to the Najaf Directorate of Agriculture / Horticulture and Forestry nursery, to know the response of *Matthiola incana* L plant to spraying with thiamine and Roselle extract in growth indicators and for flowering. The seedlings were transported in plastic pots with a diameter of 25 cm and a height of 22 cm, with an agricultural medium consisting of soil (river mixture) and peat moss in a ratio of 1:3. The experiment consists of the effect of two factors, the first is thiamine at four concentrations (90,60,30,0) mg.l^{-1}. The second is Roselle extract at four concentrations (0,2,4,6) g.l^{-1}. Thiamine and Roselle extract were sprayed by two sprays, between the first and second sprays, 21 days.The experiment was factorial, consisting of three replicates, and the experiment was conducted according to a randomized complete block design (R.C.B.D) 4×4×3=48. The mean was compared according to the least significant difference (L.S.D) test and at the probability level (0.05). The most important results can be summarized: Thiamine at a concentration of 90 mg.l^{-1} with Roselle extract at a concentration of 6.4 g.L^{-1} was significantly excelled to the study indicators, where the plant height, number of leaves, dry weight of vegetative growth, number of days to flowering, number of inflorescences and floret diameter increased. The number of florets was 17.06 cm and 45.40 leaves. Plant^{-1} and 4.14 g and 97.00 days and 5.00 inflorescence. Plant^{-1} and 3.56 cm and 18.33 flowers plant^{-1} compared to the control treatment, it was 9.46 cm and 18.90 leaves.plant^{-1} and 1.81 g and 105.33 days and 1.00 inflorescence.plant^{-1} and 1.80 cm and 10.67 flowers.plant^{-1} and 13.88 days respectively.

Key words : *Mathiola, Thiamine, Roselle, extract*

Introduction

Mathiola plant or Gilliflower (*Matthiola incana* L.) belongs to the Brassicaseae or Cruciferae family. It is one of the winter annual plants, its leaves are lance-shaped, alternating with a few fluff, with a green-silver color. The flowers are conducted on a long stem, clustered in shape, of multiple colors and used in home garden decoration for the beauty of its flowers, their bright colors, and their distinctive aromatic scent (Al-Chalabi and Al-Khayat, 2013). It is a widespread plant in the areas of the Mediterranean basin and the Canary Islands, which is its origin Country (Dirmenci *et al*., 2006 and Abdel-Aziz *et al*., 2011). It prefers the soil that tends to alkaline and does not grow in the shade and needs direct sunlight to a large extent (Al-Batal, 2010). The use of Organic Stimulators is one of the most important trends in recent studies. As vitamins, hormones and microorganisms are used to encourage plant growth and

improve cellular metabolism (Al-Taey, 2017; Al-Khafajy *et al.,* 2020). Organic Stimulators reduce the need for fertilizers, improve plant growth and increase productivity (AL-Taey *et al*., 2019). Thiamine B1 is one of the water-soluble vitamins with chemical structure C_{12} H_{17} N_4O_5 and it is considered an antioxidant (Lukienko *et al.,* 2000). This vitamin is formed in the leaves in the presence of light and then transmitted to the roots (Martinis *et al.,* 2016). It also has a role in improving plant growth through its effect on increasing cytokinin and gibberellins and the metabolism of carbohydrates and amino acids in plants (Yousief and Talaat, 2003). Plant extracts also have an important role in stimulating the germination process and improving plant growth, in addition to reducing the need to add fertilizers, thus reducing soil pollution. Many organic stimulators , such as plant extracts and hormones, improve the state of cellular metabolism, which positively affects functional performance and thus increases growth and productivity (Manea *et al.,* 2019; Hasan *et al.,* 2019; Jasman *et al.,* 2019). Among those extracts is Roselle *Hibiscus Sabdriffa* L. which is an important source of some vitamins, nutrients, compounds and amino acids (Alaa, 2012).This was confirmed by Al-Nuami (2012) that spraying Roselle extract on the Mathiola plant led to a significant increase in the indicators of vegetative and flowering growth.The study aims to improve the vegetative and flowering growth of Mathiola plant by spraying with vitamin B1 and Roselle extract.

Materials and Methods

The experiment was conducted in Najaf province during the autumn season 2020-2021 to show the response of the Mathiola plant (*Matthiola incana* L). to spraying with thiamine and Roselle extract on growth and flowering indicators. Where the transfer of seedlings in plastic pots with a diameter of 25 cm and a height of 22 cm, containing river soil and peat moss, as shown in Table 1 Soil analysis

The experiment included the effect of spraying two factors:

Table 1. Soil Analysis

Traits	Units	Values
N	$mg.kg^{-1}$	5.00
P	$mg.kg^{-1}$	2.00
K	$mg.kg^{-1}$	32.00

The first factor: Thiamine in four concentrations (90,60,30.0) $mg.l^{-1}$

The second factor: Roselle extract with four concentrations (6,4,2,0) $g.l^{-1}$. It was sprayed twice for the factor and the second time after 21 days from the first spraying and the plants were fertilized with compound fertilizer (K.P.N) granular at an average of (1 g).The treatments were distributed in a factorial experiment with two factors, each factor with four concentrations and three replicates. The experiment was applied using the Randomized Complete BlocK Design (R.C.B.D) (Al-Rawi and Khalaf Allah, 2000). ANOVA was performed and The mean was compared according to the least significant difference (L.S.D) test and at the probability level (0.05) using Gen Stat Release 12.1 program.

Studied traits

First: vegetative growth Indicators

1. Plant height (cm)
2. Total number of leaves (leaf. $plant^{-1}$)
3. Dry weight of the vegetative growth (g)

Second: Indicators of flowering growth

1. Number of days needed for flowers (day)
3. Number of inflorescences (Inflorescence. $plant^{-1}$)
4. Floret diameter (cm)
5. The number of florets (floral $inflorescence^{-1}$)

Results and Discussion

Table 2 confirm that thiamine at a concentration of 90 $mg.L^{-1}$ with Roselle extract at both concentrations 6 and 4 $g.l^{-1}$ led to a significant increase in the study indicators, where the height of the plant, the number of leaves and the dry weight of the vegetative growth increased. The number of days needed for flowers, the number of inflorescences, the floret diameter and the number of florets was 17.06 cm and 45.40 leaves. $Plant^{-1}$, 4.14 g, 97.00 days, 5.00 inflorescence. Compared to the control treatment, it was 9.46 cm and 18.90 leaves. $Plant^{-1}$, 1.81 g, 105.33 days, and 1.00 inflorescences. $plant^{-1}$, 1.80 cm, 10.67 flowers, $plant^{-1}$ and 13.88 days, respectively. A significant increase in vegetative and flowering growth traits when sprayed with thiamine compared to the control treatment, may be due to the role of thiamine in increasing the efficiency of the photosynthesis process and the absorption of nutrients and increasing the levels of both cytokinins and gibberellins (Youssef and Talaat, 2003).Thiamine also has a role in increasing the transfer of photosynthesis products

Table 2. The interaction effect of thiamine spray and Roselle extract on some vegetative and flowering indicators

Interaction between thiamine mg.L^{-1} with Roselle extract g.L^{-1}		Plant height (cm)	Total number of leaves (leaf. plant^{-1})	Dry weight of the vegetative growth (g) (day)	Number of days needed for flowers	Number of inflorescences (Inflorescence. plant^{-1})	Florets diameter (cm)	The number of florets (floret inflorescence^{-1})
B1. 0	0	9.46	18.90	.1.81	105.33	1.00	1.80	10.67
	2	10.40	26.43	2.37	103.33	2.66	3.10	15.33
	4	12.46	27.86	2.20	102.00	3.00	3.13	14.00
	6	12.70	30.30	2.42	100.67	2.33	3.93	14.33
B1 . 30	0	11.36	33.13	2.48	101.67	2.00	2.13	14.33
	2	13.43	34.50	1.95	101.00	2.00	2.13	16,33
	4	13.53	35.56	2.16	100.67	2.66	3.10	13.67
	6	13.70	36.06	2.34	101.33	2.66	3.13	12.67
B1. 60	0	14.13	36.83	2.86	99.67	2.66	3.20	15.00
	2	15.16	38.23	2.60	100.33	2.33	3.03	16.00
	4	15.46	34.60	2.39	101.67	3.00	3.13	13.33
	6	15.36	39.23	3.01	102.33	3.00	3.10	15.33
B1 . 90	0	13.23	42.50	3.68	99.00	4.33	3.36	17.33
	2	16.16	43.43	3.86	98.00	4.33	3.33	17.67
	4	17.06	45.40	3.82	99.33	4.66	3.30	17.33
	6	14.43	41.93	4.14	97.00	5.00	3.56	18.33
L.S.D.(P≤0.05)		0.352	0. 815	0.745	1.333	0.923	0.122	2.123

from the leaves to the developing tops, and this role of thiamine facilitates the transfer of nitrogenous compounds such as amino acids from the leaves to the plant. When sugar is oxidized, thiamine enters as an enzymatic companion within the group of respiratory chain enzymes, releasing a large amount of energy. Thiamine acts as an antioxidant by scavenging free radicals O–2/OH– and rebuilding vitamin C, thereby improving plant nutrient synthesis and availability (Asensi-Fabado and Munne-Bosch, 2010; and Subki *et al.*, 2018).

Roselle extract also participates in promoting vegetative growth by containing many other substances such as water, protein, fat, fiber, calcium, phosphorous and iron in addition to carotene, riboflavin, niacin and ascorbic acid, vitamin B2 and D, anthocyanin, flavonoids and polyphenols, which have important and effective roles in metabolism, carbohydrate synthesis, regulation of cell division, and increase in the expansion of plant cells, which leads to an increase in the average of plant growth in general and a significant increase in vegetative and flower traits (Zuraida *et al.*, 2015). Roselle extract has a role in breaking the apical dominance through its stimulating effect in removing the inhibitory substances of auxin present in the developing apex, which leads to the promotion of plant cell division, which increases the size of the vegetative growth (Smirnoff and Wheeler, 2014).

References

Abdel-Aziz, Nahed G., Azza A. Mazher; and Mona, H. Mahgoub, 2011. Influence of using Fertilizer on Vegetative Growth, Flowering and Chemical Constituents of Mathiola incana Plant growth under saline water irrigation. *World J. of Agric. Scin.* 7(1) : 47-54.

Alaa, G. and AL_hashimi, A.G. 2012. Antioxidant and antibacterial activities of Hibiscus sabdariffa L. extracts. *African Journal of Food Seince.* 6(21) : 506-511.

Albatal, Nabil Naim, 2005. Indoor Ornamental Plants. faculty of Agriculture. Damascus University Publications. Al-Ajlouni Press. Syria

Albatal, Nabil Naim. 2010. Outdoor Ornamental Plants. faculty of Agriculture. Damascus University Publications. Rawda Press. Syria.

Al-Khafajy R.A., AL-Taey D. K.A. and AL-Mohammed M.H.S. 2020. The impact of Water Quality, Bio fertilizers and Selenium Spraying on some Vegetative and Flowering Growth Parameters of *Calendula officinalis* L. under Salinity Stress. *Int. J. Agricult. Stat. Sci*. 16, Supplement 1: 1175-1180. https://connectjournals.com/03899.2020.16.1175

Al-Nuaimi, Sala Bassem Ismail Mustafa, 2012. *Effect of gibberellin and some aqueous plant extracts and heparin on growth, yield and active ingredient of Matricariachamomilla* L. Ph.D. Thesis, College of Agriculture, University of Baghdad. The Republic of

Iraq.

Alrawi, Khashie Mahmoud and Abdel Aziz Khalaf Allah. 2000. Design and analysis of agricultural experiments. Dar Al-Kutub for Printing and Publishing, University of Mosul, Ministry of Higher Education and Scientific Research. Iraq.

AlTaey, D. K. A. 2017. Alleviation of Salinity Effects by Poultry Manure and Gibberellin Application on growth and Peroxidase activity in pepper. *International Journal of Environment, Agriculture and Biotechnology.* 2(4) : 1851-1862 http://dx.doi.org/10.22161/ijeab/2.4.49

Al-Taey, D.K.A., Al-Shareefi, M.J.H., Mijwe L, A.K., Al-Tawaha, A. RZ. and Al-Tawaha, A. RM. 2019. The beneficial effects of bio-fertilizers combinations and humic acid on growth, yield parameters and nitrogen content of broccoli grown under drip irrigation system. *Bulgarian Journal of Agricultural Science.* 25 (5): 959–966.

Asensi Fabado, M.A. and Munne Bosch, S. 2010. Vitamins in plants: Occurrence, biosynthesis and antioxidant function. *Trends Plant Sci.* 15 : 582–592.

Dirmenci, T., Satýl, F. and Tümen, G. 2006. A new species of *matthiola* R.Br. (Brassicaceae) from Turkey . *Botanical Journal of the Linnean Society*. 151 (3) : 431–435.

Hasan, A.M., Mohamed Ali, T.J. and Al-Taey, D.K.A. 2019. Effects of Winter Foliar Fertilizing and Plant Growth Promoters on Element and Carbohydrate Contents on the Shoot of Navel Orange Sapling. *International Journal of Fruit Science.* 19(1)1-10. https://doi.org/10.1080/15538362.2019.1668331

Jasman A.K., Slomy , A.K. , Sahib, M.R., AL-Taey, D.K.A. and Abd Ali, A. 2019. Evaluation of *Mirabilis jalapa* and *Conocarpus erectus* Extracts against Bemisiatabaci and Myzuspersicae on Solanummelongena Plants under Laboratory and Field Conditions. *Biopestic. Int.* 15(1) : 39-44.

Lukienko, P.I., Mel'nichenko, N.G., Zverinskii, I.V., and Zabrodskaya, S.V. 2000. Antioxidant properties of thiamin. *Bull Exp. Biol. Med.* 130 : 874–876.

Manea, A.I., AL-Bayati, H.J. and AL-Taey, D.K.A. 2019. Impact of yeast extract, zinc sulphate and organic fertilizers spraying on potato growth and yield. *Res. on Crops.* 20 (1) : 95-100. DOI : 10.31830/2348-7542.2019.013

Martinis, J., Gas-Pascual, E., Szydlowski, N., Crèvecoeur, M., Gisler, A., Bürkle, L. and Fitzpatrick, T.B. 2016. Long-distance transport of thiamine (vitamin B1) is concomitant with that of polyamines. *Plant Physio.* 171: 542–553.

Smirnoff, N. and Wheeler, G.L. 2000. Ascorbic Acid in plant : biosynthesis and function. *Biochemistry and Molecular Biology.* 35(4) : 291–314.

Subki, A., Abidin, A. and BaliaYusof, Z.N. 2018. The role of thiamine in plants and current perspectives in crop improvement. In B Group Vitamins—Current Uses and Perspectives; Intech Open: London, UK, pp. 33–44.

Youssef, A.A. and Talaat, I.M. 2003. Physiological response of rosmary plant to some vitamins. *Egypt Pharm. J.* 1 : 81-93.

Zuraida, Z., Yerizel, E. and Anas, E. 2015. Pengaruhpemberianekstrakrosela (*Hibiscus sabdariffa Linn*) terhadapkadarmalondialde hiddanaktivitaskatalasetikusyangterpapar karbontetraklorida. *Andalas J. Health* 4 : 795-802.