Kirkuk University Journal for Agricultural Sciences
ISSN:2958-6585
https://kujas.uokirkuk.edu.iq

RESEARCH ARTICLE
https://doi.org. 10.58928/ku24.15323

Physiological role of foliar application of thiamine (B1) on active chemical compounds percentages of Petunia flowers (*Petunia hybrida* L.).

Media Mikhail Laazar Kefaia Ghazi Saeed Al-Saad[1] Mohsin Omar Mohammed[2]
[1]*Department of Horticulture and land scape design, College of Agriculture, University of Kirkuk, IRAQ.*
[2] *Department of chemistry, College of science, University of Kirkuk, Kirkuk, IRAQ.*
*Corresponding Author: Akgh21m011@uokirkuk.edu.iq.

Received: 20/06/2024 Revised: 29/07/2024 Accepted: 08/08/2024 Published: 01/09/2024

ABSTRACT

From October 23, 2022, to June 4, 2023, the study was done in the Lath house of the Department of Horticulture and Landscape Design at the University of Kirkuk/Agricultural Research and Experimentation Station/Al-Sayadah. The aim was to find out the Physiological role of the growth regulator thiamine was sprayed at (0, 150, and 300) mg. l^{-1} In terms of the percentages of effective chemical compounds in petunia flowers, the factorial experiment was designed according to R.C.B.D. Using organic solvents, the Soxhlet method was used to extract the effective chemical compounds from the flowers. A rotary evaporator was used under vacuum pressure to evaporate the solvent and obtain the essential oils. Then the gas chromatography-mass spectrometer device is used to detect the basic chemical components and estimate their percentage in plant flowers. The results for extracting and finding chemical compounds showed that the amounts of common substances in plant flower samples changed depending on the treatments. For example, 300 mg of thiamine was sprayed on the flowers. L^{-1} gave the best results regarding the percentages of active chemicals in the plant flowers compared to the control treatment flowers.

***Keywords*:** Petunia hybrida , thiamine.

INTRODUCTION

The Petunia plant, *Petunia hybrida* L., belongs to the Solanaceae family. It is an annual winter herbaceous plant native to South America. Its flowers are bell-shaped or trumpet-shaped and bloom in spring and summer. The petunia flowers spread in gardens are of the hybrid type between Petunia axillarisa and Petunia integrifolia, multi-coloured from pink and red to purple and blue, and many types of them differ in their shapes and sizes. These plants are used for decoration, particularly on anvils and hanging baskets. They are also grown on docks, balconies, baskets, or small tubs. [1]. They are among the most common. Popular plants are used in landscaping gardens because of their ability to grow in conditions of lack of water and high temperatures in summer. The flowers are aromatic and take the longest possible flowering period, approximately 8 months. All of these factors have given this plant significant economic value. [2]. Thiamine B1 is one of the growth regulators that stimulates cell growth and division, meaning it improves plant growth. [3]. The concentration of thiamine increases in highly active areas of the plant. It is believed that this vitamin is produced in the leaves and depends on light for its formation. The roots also require it for their growth. [4] Given the importance of thiamine, this study sheds light on its effect in detecting the most important chemical compounds active in plant flowers and estimating their proportions.

MATERIALS AND METHODS

The research was conducted in the wooden canopy of the Department of Horticulture and Landscape Engineering, University of Kirkuk, Agricultural Research and Experimentation Station, Al-Sayadah, from October 23, 2022, to June 4, 2023. The pots in which the seedlings were to be planted were filled with the agricultural medium consisting of 2 zamig and 1 peat moss. The seedlings were rotated on October 23, 2022, from plastic pots with a diameter of 10 cm to larger plastic pots with a diameter of 20 cm, with a capacity of 6.5 kg of growing medium, and a weekly preventive program was followed consisting of the fungicide (Scor) spray and the insecticide Tagros FLASH 10%. EC Vasapermethrin (10%) is the active ingredient. **[5]** approved spraying on the leaves as a preventive measure to prevent plants from being infected with fungal and insect pathogens. In two sprays, the plants were sprayed with the growth regulator thiamine at three concentrations (0.0, 150.0, and 300.0 mg/l^{-1}). The first was a week after applying nanofertilizer, and the second was a week after the first spray. The experiment was designed as a factorial experiment, utilizing the Randomised Completely Block Design (R.C.B.D.) to create three randomly selected sectors. Weeding operations were followed whenever necessary, and the plants were irrigated regularly. Vegetable oils were extracted by placing crushed and dried powder from petunia flowers in a special filter paper called Thumbel, then placing it inside the tube of a Soxhlet device containing about 90 ml of hexane and 30 ml of ethyl acetate for 3 hours. The solvent was removed from the extract using... The rotary evaporator was weighed and stored in a vial until further chemical analysis was conducted. Gas chromatography and mass spectra were analyzed. The active substances were analysed using an Agilent Technologies 7890ANGC device in the Department of Chemistry/College of Education for Pure Sciences/University of Basra, an Agilent Technologies 7890ANGC device with a fixed column. Non-polar ZB-5 (apparent) detector. The column parameters were 30 meters long, 0.25 mm inner diameter, and 0.25 microns. The carrier gas used was helium (99.99% purity) with a flow rate of 1.5 ml/min until it reached 80 °C. (Constant for 10 minutes) and then increased by 4 degrees Celsius/minute until the temperature of Tharawat reached 250 degrees, which also coincided with the injection and detection temperatures.

RESULTS AND DISCUSSION

A soxolite device was used to extract Petunia oil from nine different samples. The extracts were weighed, and the percentage yield was calculated according to the equation:

(Product % = (extracted oil weight)/(dry material weight) * 100%)

As shown in the table below, only models for spraying treatments with thiamine were taken from it.

Table (1) shows the solvent and the percentage of the product

Model symbol	Solvent	Weight of dry substance(g)	Weight of oil	% of product
M1	hexane: ethyl acetate	1.9	0.247	13
M2	hexane: ethyl acetate	2.3	0.23	10
M3	hexane: ethyl acetate	2.5	0.3	12

Each model's gas chromatographic analysis revealed several total ion peaks. Below is an explanation of the components. The active substance for each model and the components were identified using computer matching of the mass spectra obtained. According to the research conducted for the study, we took samples of the studied treatments and sprayed them with the growth regulator thiamine at concentrations of (0.0, 150, 300) mg/l^{-1}. He then indicated the coefficients using the following symbols:

M1: Spraying with nano-fertilizer at a concentration of (0.0) g. l^{-1} and spraying with the growth regulator thiamine at a concentration of (300) mg. L^{-1}

M2: Spraying with nano-fertilizer at a concentration of (0.0) g. l^{-1} and spraying with the growth regulator thiamine at a concentration of (0.0) mg. L^{-1}

M3: Spraying with nano-fertilizer at a concentration of (0.0) g. l^{-1} and spraying with the growth regulator thiamine at a concentration of (150) mg. L^{-1}

Sample M1

The sample's gas chromatographic analysis (M1) revealed several peaks in the form of a total ion current chromatogram (TIC). As shown in Figure 1, these peaks represent an important tool for determining the basic components of the active substances in their measured form. The figure shows more than ten active substances based on the peaks. The percentage of area covered by individual peaks, the retention time, scientific name, and molecular weight of the chemical compounds in this sample are shown in Table 2.

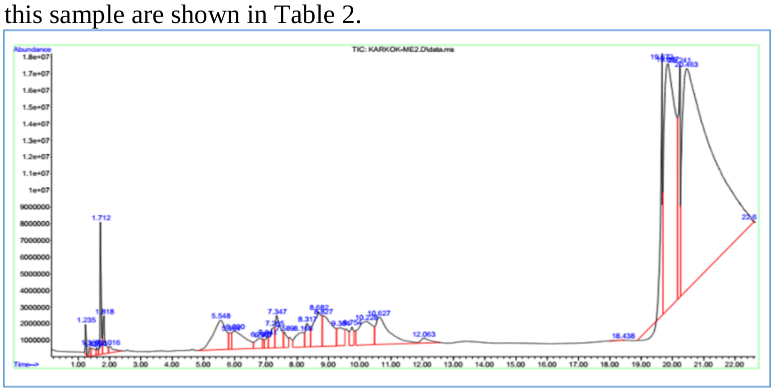

Figure (1) GC-Mass chromatogram for sample (M1) showing the percentage content (%) versus the detention time (min).

Table (2) shows the compounds identified from the sample M1

Signal No.	Compound Name	Retention time	Molecular weight	Area %
1	Carbon dioxide	1.237	44	0.20
2	2-Amino-1-(o-hydroxyphenyl) propane	1.366	165.2322	0.12
3	Acetic acid, [(aminocarbonyl)amino] oxo-	1.426	180.16	0.22
4	1,2,5-Oxadiazol-3-carboxamide, 4,4 '-azobis-, 2,2'-dioxide	1.589	284.15	0.09
5	Trichloromethane	1.709	119.37	1.07
6	Acetic acid	1.821	60.05	0.62

7	Silver acetate	2.018	166.91	0.23
8	Butanoic acid, 2-methyl-	5.545	102.13	2.83
9	Hexanoic acid, 2-methyl-	5.862	130.18	0.32
10	Butanoic acid, 2-methyl-	6	102.13	1.80
11	Undecanoic acid, 2-methyl-	6.798	200.3178	0.52
12	Pentanoic acid, 4-methyl-	6.909	116.160	0.10
13	Hexanoic acid, 2-methyl-	7.038	130.18	0.25
14	Butanoic acid, 3-methyl-	7.261	170.2487	0.70
15	Benzyl alcohol	7.347	108.14	1.33
16	Hexanoic acid	7.587	116.16	0.41
17	Octyl-. beta. -D-glucopyranoside	8.171	292.37	0.95
18	Phenylethyl Alcohol	8.317	122.01	0.77
19	Heptanoic acid	8.686	130.18	2.11
20	Methyl-. beta. -D-arabinopyranoside	8.823	164.16	2.28
21	Pentanoic acid, ethyl ester	9.381	130.1849	0.95
22	2-Deoxy-D-glucose	9.758	164.16	0.53
23	1,2-Ethanediol, monoacetate	10.230	104.1045	2.49
24	2-Methoxy-4-vinylphenol	10.625	150.17	2.82
25	Dodecane, 1-fluoro-	12.067	188.3253	0.32
26	Arsenous acid, tris (trimethylsilyl) ester	18.434	342.49	0.01
27	l-(+)-Ascorbic acid 2,6-dihexadeca noate	19.670	652.9	2.64
28	Oleic Acid	19.858	282.5	20.58
29	cis-Vaccenic acid	20.245	282.5	3.47
30	Hop-22(29)-en-3. beta. -ol	20459	426.7	49.17
31	Dimethyl {bis [(4,8,8-trimethyldecah ydro-1,4-methanoazulen-9-yl) methox y]} silane	22.605	500.9	0.09

Sample M2

The sample's gas chromatographic analysis (M2) revealed several peaks in the form of a total ion current chromatogram (TIC). As shown in Figure 2, these peaks represent an important tool for determining the basic components of the active substances in their measured form. The figure shows more than ten active substances based on the peaks. Table 3 shows the percentage of area covered by individual peaks, retention time, scientific name, and molecular weight of the chemical compounds in the sample.

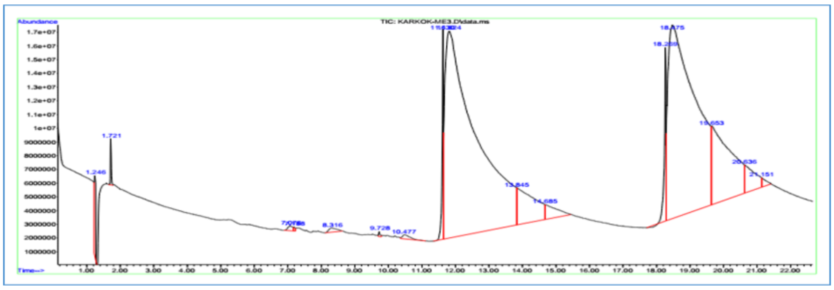

Figure (2) GC-Mass chromatogram for sample (M2) showing the percentage content (%) versus the detention time (min).

Table (3) shows the compounds identified from the sample M2

Signal No.	Compound Name	Retention time	Molecular weight	Area %
1	Methanimidamide, N, N-dimethyl-N'-p henyl-	1.246	148.2050	0.80
2	Trichloromethane	1.718	119.37	0.27
3	Octanoic acid	7.073	144.21	0.15
4	d-Gluco-heptulosan	7.185	210.18	0.04
5	9-Octadecenoic acid, (E)-	8.317	282.4614	0.22
6	Decane, 3,8-dimethyl-	9.725	170.33	0.04
7	Phenol, m-tert-butyl-	10.480	150.2176	0.23
8	cis-Vaccenic acid	11.630	282.5	1.45
9	Oleic Acid	11.827	282.5	43.10
10	2-Dodecen-1-yl (-) succinic anhydrid	13.844	266.38	4.20
11	9,19-Cyclolanost-23-ene-3,25-diol,3-acetate, (3. beta.,23E)-	14.685	484.8	1.12
12	trans-13-Octadecenoic acid	18.272	282.5	1.62
13	Hop-22(29)-en-3. beta. -ol	18.478	426.7	34.64
14	2-Isopropenyl-4a,8-dimethyl-1,2,3, 4,4a,5,6,8a-	19.653	204.3511	10.03

	octahydronaphthalene			
15	9,19-Cycloergost-24(28)-en-3-ol, 4 ,14-dimethyl-, acetate, (3. beta.,4. alpha.,5. alpha.)-	20.640	468.7541	1.86
16	(-)-Isolongifolol, methyl ether	21.155	236.39	0.25

Sample M3

The sample's gas chromatographic analysis (M3) revealed several peaks in the form of a total ion current chromatogram (TIC). As shown in Figure 3, these peaks represent an important tool for determining the basic components of the active substances in their measured form. The figure shows more than ten active substances based on the peaks. The percentage of area covered by individual peaks, the retention time, scientific name, and molecular weight of the chemical compounds in this sample are shown in Table 4.

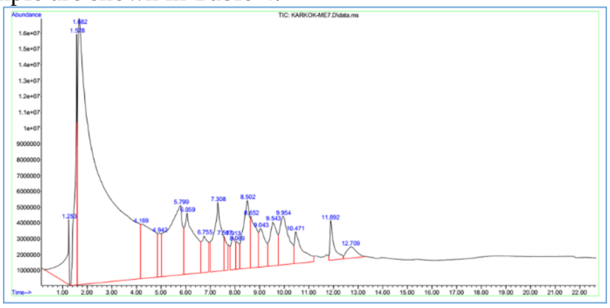

Figure (3) GC-Mass chromatogram for sample (M3) showing the percentage content (%) versus the detention time (min)

Table (4) shows the compounds identified from the sample M3

Signal No.	Compound Name	Retention time	Molecular weight	Area %
1	Benzeneethanamine, 4-methoxy-. alph a.-methyl-	1.254	151.2056	2.33
2	trans-13-Octadecenoic acid	1.580	282.5	3.81
3	i-Propyl 11-octadecenoate	1.683	324.5	46.59
4	Spiro [4.5] dec-6-en-8-one, 1,7-dime thyl-4-(1-methylethyl)-	4.172	220.3505	5.91
5	11,13-Dimethyl-12-tetradecen-1-ol acetate	4.944	282.4614	1.20
6	Butanoic acid, 2-methyl-	5.802	102.1317	8.21
7	Methyl valerate	6.060	116.16	5.10
8	3,6-Diazaoctane-1,8-diol, 3,6-bis(t-butoxycarbonyl)-	6.755	348.43	1.81
9	Pentanoic acid	7.304	102.1317	4.14
10	Ethanone, 1-(4,5-dihydro-2-thiazol yl)-	7.570	129.180	0.83
11	beta. -l-Arabinopyranoside, methyl	7.913	164.16	1.11
12	. alpha. -D-Glucopyranoside, methyl	8.068	194.18	0.73
13	Heptanoic acid	8.506	130.18	3.53
14	. alpha. -d-Ribopyranoside, methyl	8.651	164.16	2.43
15	n-Octanoic acid isopropyl ester	9.046	186.2912	1.99
16	Octanoic acid	9.544	144.21	2.53
17	1,2,3-Propanetriol, 1-acetate	9.956	134.1305	3.60
18	2-Methoxy-4-vinylphenol	10.471	150.17	1.96
19	Dihydrocoumarin, 4,4,5,7,8-pentame thyl	11.895	218.29	1.28
20	4,6-Dihydroxy-2-methylpyrimidine	12.710	126.11	0.90

Table (5): Percentages of identified and similar chemical compounds in some plant flowers

No.	Compound name	% compound		
		M1	M2	M3
1.	Trichloromethane	1.07	M2	0.92
2.	Heptanoic acid	2.11	0.27	9.4
3.	2-Methoxy-4-vinylphenol	2.82	-	3.32
4.	Hexanoic acid, 2-methyl-	0.41	-	-
5.	Octanoic acid	-	-	-
6.	Butanoic acid	2.83	0.15	20.73
7.	1,2-Ethanediol	2.49	-	6.95
8.	Phenylethyl Alcohol	0.77	-	-
9.	Oleic Acid	20.58	-	-
10.	Hop-22(29)-en-3.betaol	49.17	43.1	-

The table above shows the difference in the percentages of common substances in plant flower samples depending on the treatments used. It was noted that spraying with a high concentration of thiamine was 300 mg. L^{-1} has yielded superior results in terms of the concentration of active substances. This could be attributed to the beneficial effects of thiamine, particularly its role in promoting cell growth and division, which in turn enhances plant growth [3]. Numerous researchers, including [6], [7] have demonstrated the positive impact of thiamine on growth and flowering characteristics, a trend that was positively reflected in the active chemical compounds in the flowers.

Conclusion

The effect of spraying with the growth regulator thiamine on increasing the percentage of active chemicals in the flowers increased when the spraying concentration was increased to 300 mg. l^{-1} contrasted with the plants in the control treatment, which displayed the lowest percentages.

REFERENCES

[1.] Gerats T. And Vandenbussche, M. (2005). Amodel System For comparative research: petunia Trends in plant Science Vol.10 No.5.

[2.] Shamshiri, M.H., Mozafari, V., Sedaghati, E., Bagheri, V.(2011). Response of Petunia Plants (Petunia hybrida cv. Mix) Inoculated with Glomus mosseae and Glomus intraradices to Phosphorous and Drought Stress , Vol. 13:929-942.

[3.] Nahed, G. Abdel Aziz, A.A., Mazher, M. and Farahat, M.M. (2010). Response of vegetative growth and chemical constraints of Thuja orientalis L. plant to foliar application of different amino acids at Nubaria. J. of American Sci., 6(3):295-301.

[4.] Mohammed, A. A. K. and M. A. A. (1991). Fundamentals of Plant Physiology, Part III. Ministry of Higher Education and Scientific Research, University of Baghdad, College of Agriculture, Republic of Iraq.

[5.] AL- Saad, K. G. (2010). The effect of planting dates, gibberellic acid and licorice root extract on the growth and yield of Gladiolus hybrida. PHD Thesis. College of Agriculture. University of Mousel. Iraq.

[6.] Namdar, A. Q. and AL- Saad, K. G. (2017). The effect of spraying with thiamine and alar on the growth, flowering, and production of bulbs for two varieties of Iris sp., Master Thesis, College of Agriculture. University of Kirkuk, Iraq.

[7.] Hama, S. B.. (2019). The effect of spraying with thiamine and gibberellic acid on the growth and flowering of Geranium plant Pelargonium hortorum L. ,Master Thesis, College of Agriculture. University of Kirkuk. Iraq.

الدور الفسيولوجي للرش الورقي بمنظم النمو الثيامين (B1) في النسب المئوية للمركبات الكيميائية الفعالة في ازهار نبات البيتونيا *Petunia hybrida* L.

ميديا ميخائيل لعازار كفاية غازي سعيد السعد [1] محسن عمر محمد [2]

جامعة كركوك ،كلية الزراعة،جامعة كركوك،كلية الزراعة ،جامعة كركوك،كلية العلوم ، كركوك،العراق.

الخلاصة

اجري البحث في الظلة الخشبية التابعة لقسم البستنة وهندسة الحدائق /جامعة كركوك / محطة البحوث والتجارب الزراعية / الصيادة ، للفترة من ***23*** تشرين الأول 2022 و لغاية حزيران 2023، بهدف دراسة الدور الفسيولوجي لمنظم النمو الثيامين الذي تم رشه بالتراكيز (0، 150، 300) ملغم. لتر$^{-1}$و تأثيره في النسب المئوية للمركبات الكيميائية الفعالة في ازهار البتونيا ، تم تصميم التجربة العاملية وفق نظام ***R.C.B.D***، و استخدمت المذيبات العضوية بطريقة السكسوليت لاستخلاص المركبات الكيميائية الفعالة في الأزهار، وتم استخدام المبخر الدوار تحت ضغط الفراغ لتبخير المذيب للحصول على الزيوت الأساسية، ومن ثم تم استخدام جهاز كروماتوغرافيا الغاز – مطياف الكتلة للكشف و فصل المكونات الكيميائية الأساسية وتقدير نسبتها في أزهار النباتات، أظهرت النتائج أن النسب المئوية للمركبات الكيميائية الفعالة في عينات ازهار النباتات أظهرت تباينا تبعا لاختلاف المعاملات. اذ تفوق الرش بالتركيز 300 ملغم.لتر$^{-1}$ من منظم النمو الثيامين في أعطاء أفضل النتائج للنسب المئوية للمركبات الكيميائية الفعالة في أزهار النبات مقارنة بأزهار نباتات معاملة المقارنة.

كلمات المفتاحية: البتونيا ، ثيامين.