

Effect Rapeseed Oil and Tryptophan in The Growth Characteristics of *Catharanthus Roseus* L.

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Abstract. A pots experiment was conducted in Baladrooz district, Diyala Governorate, Iraq in autumn season 2020 to study the effect of spraying with rapeseed oil and tryptophan on vegetative growth characteristics of Periwinkle *Catharanthus roseus*. A factorial experiment was applied with two factors, spraying of the rapeseed oil and tryptophan in three levels (0, 5 and 10 ml. l⁻¹) and (0, 100 and 200 mg. l⁻¹) respectively. The results show that each of rapeseed oil or tryptophan improved all studied characteristics, when they were sprayed separately, also the interaction between them was effective, Tryptophan 100 mg. l⁻¹ and rapeseed oil 10 ml. l⁻¹ gave the highest increase in number of vegetative branches 11.12 and the number of leaves 84.68, whereas the tryptophan 100 mg. l⁻¹ and rapeseed oil 5 ml. l⁻¹ gave the highest value of leaf area 22.36 cm², fresh weight of the shoot 28.26 g, dry weight of the shoot 7.23 g and dry weight of the root 2.34 g, the tryptophan 200 mg. l⁻¹ and rapeseed oil 5 ml. l⁻¹ gave the highest value of plant height 40.00 cm.

Keywords. Rapeseed oil emulsion, Tryptophan, *Catharanthus roseus*.

I. INTRODUCTION

Medicinal plants occupied an important place in agricultural and industrial production, also it is the main source of many medical drugs and active substances that are used in the manufacture of some important medicines, the World Health Organization has indicated that 80% of the world's population depend on medicines from various plant sources [1]. There are more than 50% of modern medical drugs are of natural origin, and plant drugs constitute more than 26% of the total medical drugs that are used in the treatment [2]. Periwinkle *Catharanthus roseus* L. is one of the medically important plants that belongs to Apocynaceae family, this plant contains many alkaloids, the most important are Vincristine and Vinblastine, which are used in the treatment of cancer [3]. It is a medicinal herb that blooms in all seasons of the year and mainly in spring and autumn and does not tolerate temperatures below 7 degrees Celsius, it contains more than 130 alkaloid compounds, which has great medical and economic importance [4]. Plants that contain alkaloids are among the most important groups in the world of medicine and phytotherapy because of their physiological effect on the organism, even if they are found in small quantities, alkaloids are usually found free or in the form of salts of some organic acids such as Tartaric acid, Tannic acid and Citric acid, alkaloids are widely spread in the plant kingdom may be found in some or all plant parts [5]. Rapeseed oil contains many important and effective compounds that may help increase plant growth Produce secondary compounds such as phytosterols, which are called Brassinosterols (BRs), including Brassinolide and sterols that permanently found in the seed oil, the content is in the range from 1.41- 15.57 g. kg⁻¹ oil according to the plant type, the content of sterols in rapeseed oil is in the range of 5.13- 9.79 g. kg⁻¹ oil [6]. Amino acids have multiple physiological roles, they are the basic units for building protein in cells, and their function is formation nucleotides of nucleic acids and protein [7]. It is one of the basic materials for the construction and produce many organic compounds such as hormones, enzymes and vitamins [8]. The present assay was undertaken to study the influence of spraying with an emulsion of rapeseed oil and tryptophan on the growth characteristics.

II.MATERIAL AND METHODS

The pots experiment was conducted at Baladroz district, Diyala Governorate, Iraq in the autumn season 2020. A factorial experiment was applied based on a randomized complete block design with three replications, first factor was three levels of spraying with rapeseed oil (0, 5 and 10 ml. l⁻¹), the second factor was three levels of spraying with tryptophan (0, 100 and 200 mg. l⁻¹).The transplants of Periwinkle plant (the local variety with purple flowers) were brought from one of Baghdad's nurseries in small pots 1 kg capacity containing a mixture soil, the transplants were in the same size and age (one month), placed in the plastic house at 6-11-2020,Ultrasol fertilizer of Jordanian origin and Rooter fertilizer of Mexican origin was added at a rate of 1 g per liter by watering. The spraying of plants with rapeseed oil and tryptophan was carried out two times to plants with 45 days of age. The period between the two spray was (21 days), the first spraying was at 12/11/2020 and the second spraying was at 3/12/2020, the spraying was started with tryptophan, then rapeseed oil after 72 hours, rapeseed oil or tryptophan was well dissolved in distilled water with the addition of 2-3 drops of liquid soap before spraying.

Studied traits: After 14 days from the last spraying, three plants were randomly selected for the following traits:

Number of vegetative branches (branch. plant⁻¹), number of leaves (leaf. plant⁻¹), leaf area (cm². leaf⁻¹), fresh weight of the shoot (g. plant⁻¹), dry weight of the shoot (g. plant⁻¹), dry weight of the root (g. plant⁻¹), plant height (cm) and chlorophyll content in leaves (Spad unit).

Statistical analysis: The results were analyzed using the (SAS) program 2003 and the averages were compared with Duncan's polynomial test at a probability level of 0.05 5 .

III.RESULTS

The effect of spraying with rapeseed oil and tryptophan on growth characteristics of Periwinkle plant was significant (Table 1). The tryptophan 100 mg. l⁻¹ was significantly superior and achieved the highest mean of number of vegetative branches 10.00 and a number of leaves/ plant 74.89,whereas the effect of rapeseed oil was significant too, thus the concentration of 10 ml. l⁻¹ expressed the highest mean of number of vegetative branches 9.82 and a number of leaves/ plant 76.00, The interaction of spraying between rapeseed oil and tryptophan was significant, where the treatment of tryptophan 100 mg. l⁻¹ and rapeseed oil 10 ml. l⁻¹ gave the highest increase in previous traits 11.12 and 84.68 respectively as compared with other treatments (Fig 1). The tryptophan 100 mg. l⁻¹ with rapeseed oil 5 ml. l⁻¹ gave a significant mean for the following traits, leaf area (21.21 and 20.96 cm²), fresh weight of the shoot (27.04 and 27.00 g), dry weight of the shoot (6.77 and 6.74 g), dry weight of the root (2.15 and 2.14 g) respectively with no significant differences between concentrations of rapeseed oil in dry weight of the shoot and root, whereas the interaction of spraying between tryptophan 100 mg. l⁻¹ and the rapeseed oil 5 ml. l⁻¹ gave the highest value of previous traits (22.36 cm², 28.26 g, 7.23 g and 2.34 g) respectively as compared with other treatments (Fig 2 and 3).The tryptophan 200 mg. l⁻¹ with rapeseed oil 5 ml. l⁻¹ gave a the highest mean of chlorophyll content in leaves (61.18 and 61.52 Spad) respectively as compared with other concentrations, no significant differences between concentrations of tryptophan in plant height, whereas rapeseed oil 5 ml. l⁻¹ gave the highest mean 39.37 cm, and the interaction of spraying between tryptophan 200 mg. l⁻¹ and the rapeseed oil 5 ml. l⁻¹ recorded the highest value of plant height 40.00 cm as compared with other treatments.

IV.DISCUSSION

The results showed that spraying with the amino acid tryptophan led to an improvement in the vegetative growth characteristics of Periwinkle plant such as plant height, number of vegetative branches, number of leaves and area of one leaf, the increase in growth indicators may be due to the role of amino acids in increasing plant growth and its efficiency in absorbing nutrients, where the released ions of amino acid give benefit to the plant, through its easily enter into the cytoplasm and composition many enzymes that play important role in an increase of the photosynthesis process, which leads to an increase in the manufacture of carbohydrates, thus an increase in vegetative growth [9,10]. The spraying of tryptophan on the plants leads to improvement of vegetative growth characteristics due to it activates the building of auxins inside the plant, which activates the growth of roots [11]. Where the auxin acts to increase the height of the plant, the number of leaves and the number of vegetative branches, as well as increase the leaf area, delays the destruction of chlorophyll and acts on building and forming proteins, beside many other functions [12,13]. Spraying rapeseed oil on the plants had a significant effect on plant growth characteristics such as plant height, number of vegetative branches and number of leaves, the reason for this may be attributed to the effect of the components of rapeseed oil from active compounds such as plant growth regulators and fatty acids, which play an active and effective role in increasing plant growth such as increasing cell divisions, cell expansion and building proteins and nucleic

acids. The increase in plant height and leaf area may be due to the role of brassinolide in stimulating the responsible processes for cell elongation and division, where Brassinosteroids participate in the regulation of many cellular and physiological processes that occur in plants, such as cell division and elongation, biosynthesis of cell wall components, the manufacture of DNA, RNA and various proteins, the organization of microtubules, nitrogen fixation, resistance to living and non-living stresses and other processes [14]. Accordingly, the increase in the vegetative growth characteristics of Periwinkle plant may be due to the increase in the efficiency of the photosynthesis process, which leads to an increase in the CO₂ represented in the leaf, which represents the basic unit for building carbohydrates [15]. Which is due to the possible effect of brassinolide on fixing CO₂ in the photosynthesis process through its effect on the activity of carbonic enzyme, and this enzyme stimulates the inter-transformation between CO₂ and HCO₃, which increases the availability of CO₂ for the Rubisco enzyme, which leads to an increase in the efficiency of the photosynthesis process [16]. The increased growth can also be attributed to the interaction of brassinolide with other endogenous hormones, which includes a synergistic response to auxin and a complementary effect by gibberellins [17].

V. CONCLUSION

Based on the results of the present assay, spraying with rapeseed oil and tryptophan by using different levels as separate or combined through the interaction resulted in an increase of vegetative growth traits of Periwinkle plants *Catharanthus roseus*, as that the treatment of tryptophan 100 mg. l⁻¹ and the rapeseed oil 5 ml. l⁻¹ was the best in improvement most of studied traits.

TABLE 1. Effect of spraying with rapeseed oil and tryptophan on growth characteristics of Periwinkle *Catharanthus roseus*.

Tryptophan (mg. l ⁻¹)	Number of vegetative branches (branch. plant ⁻¹)						Mean	
	Rapeseed oil (ml. l ⁻¹)							
	0		5		10			
0	7.45	f	9.89	c	8.12	e	8.49	C
100	8.67	d	10.22	b	11.12	a	10.00	A
200	8.78	d	7.11	g	10.23	b	8.71	B
Mean	8.30	C	9.07	B	9.82	A		
	Number of leaves (leaf. plant ⁻¹)							
0	67.00	f	73.34	d	64.33	g	68.22	C
100	63.67	gh	76.33	c	84.68	a	74.89	A
200	71.67	e	62.66	h	79.00	b	71.11	B
Mean	67.44	C	70.78	B	76.00	A		
	Leaf area (cm ² . leaf ⁻¹)							
0	18.55	e	19.87	cd	19.42	d	19.28	C
100	20.47	bc	22.36	a	20.81	bc	21.21	A
200	21.18	b	20.65	bc	19.48	d	20.43	B
Mean	20.28	B	20.96	A	19.90	B		
	Fresh weight of the shoot (g. plant ⁻¹)							
0	25.13	c	25.80	c	24.76	c	25.23	B
100	25.07	c	28.26	a	27.78	ab	27.04	A
200	27.64	ab	26.95	b	27.68	ab	27.42	A
Mean	25.95	B	27.00	A	26.74	A		
	Dry weight of the shoot (g. plant ⁻¹)							
0	5.84	d	6.46	bcd	6.31	bcd	6.20	B
100	6.20	cd	7.23	a	6.88	abc	6.77	A
200	7.01	ab	6.53	abcd	6.66	abc	6.73	A
Mean	6.35	A	6.74	A	6.62	A		
	Dry weight of the root (g. plant ⁻¹)							
0	1.77	c	1.89	bc	2.07	abc	1.91	B
100	2.06	abc	2.34	a	2.05	abc	2.15	A
200	2.07	abc	2.20	ab	2.33	a	2.20	A
Mean	1.97	A	2.14	A	2.15	A		
	Plant height (cm)							
0	37.44	c	38.78	abc	39.67	a	38.63	A
100	37.78	bc	39.33	ab	39.78	a	38.96	A
200	37.45	c	40.00	a	37.55	c	38.33	A

Mean	37.56	B	39.37	A	39.00	A	
Chlorophyll content in leaves (Spad unit)							
0	58.07	d	63.07	a	58.83	d 59.99	B
100	58.70	d	60.30	c	59.83	c 59.61	B
200	62.57	a	61.20	b	59.77	c 61.18	A
Mean	59.78	B	61.52	A	59.48	B	



FIGURE 1. Effect of spraying with rapeseed oil and tryptophan on the number of vegetative branches in Periwinkle plants.

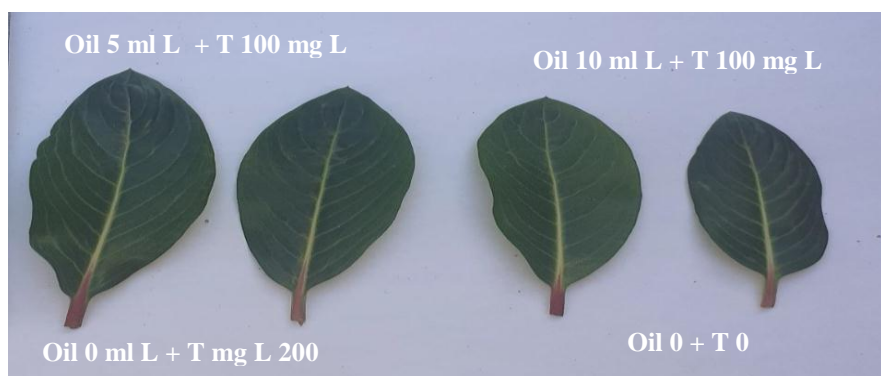


FIGURE 2. Effect of spraying with rapeseed oil and tryptophan on the leaf area (cm². leaf⁻¹) in Periwinkle plants.

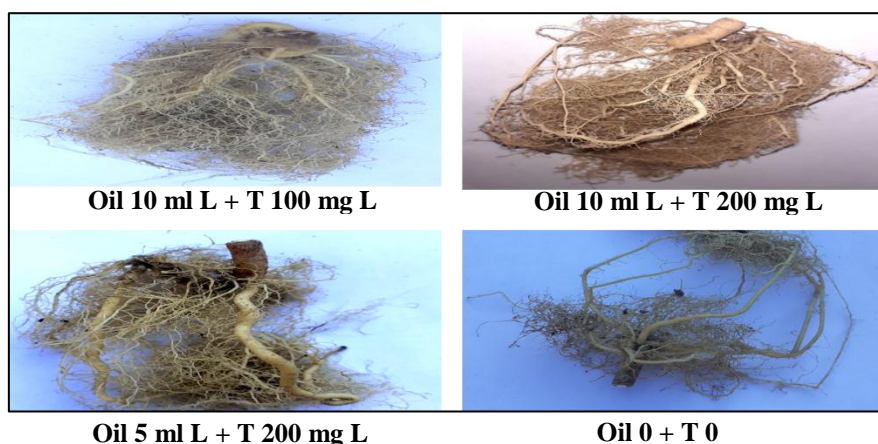


FIGURE 3. Effect of spraying with rapeseed oil and tryptophan on the root growth in Periwinkle plants.

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