
ORIGINAL ARTICLE

The Effect of Indole Acetic Acid and Cycocel on Morphological Traits and Essential Oils of Geranium (*Pelargonium graveolens* L.cv Bourbon)

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ABSTRACT

To evaluation of the effect of indole acetic acid and cycocel morphological and geranium essential oils in the form of a factorial experiment randomized complete block investigated in 2011. Treatments in this experiment, four levels of IAA [0, 25, 50 and 100 mg l⁻¹] and CCC [0, 300, 600 and 1200 mg l⁻¹] were with three replication and the evaluated traits were, height, yield vegetative bodies of fresh and dry, glands density in surface and under the leaves and the value of essential oils. Survey results showed that the highest concentration CCC reduced height, yield vegetative bodies of fresh and dry and value of essential oil function and concentration 600 mg l⁻¹ of CCC highest high, yield dry vegetative body, glands density in surface and under the leaves and the value of essential oil found, also with increasing concentrations of IAA, increase height as well as non-significant and reduce yield fresh vegetative body and glands density in surface and under the leaves was observed.

Keywords: Essential oil, Indole acetic acid, Cycocel, Morphological traits, *Pelargonium graveolens*

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INTRODUCTION

Geranium (*Pelargonium graveolens*) belonged Geraniaceae that is a world known aromatic plant, It is mainly grown for its essential oil called Geranium oil which has pronounced rose like odour. It is native to cape province of South Africa. The rosy odour of the oil is primarily due to chief constituent sgeraniol and citronellol and linalol [1]. Geranium oil is one of the top 20 essential oil in the world which has wide application in perfumery, cosmetics, confectionery, medicinal and flavour industry [2]. Herbaceous drugs to cause have continuous combined with other materials from one state biological balance, do not accumulate in the body and there are no side effects, except the toxic plants that must use to order doctor [3]. With respect to difficulties and problems improve production and quality Secondary materials plants also diversity weather and brilliant history Iran in the medicine joined to the other main country manufacturer medicine plants [4]. In this context of growth regulators Indole acetic acid and cycocel has been used as the most important type of auxin is Indole acetic acid that used in physiological processes [cell elongation, apical dominance, Phototropism, etc.] [5] and cycocel [chlormequatchloride] the most widely used as a growth retarder soluble in water used to reduce lying and takes control of vegetative growth [6], also cycocel use causes strong inhibitory, few toxicity, most effect and absorption of both root and shoots [7].

MATERIAL AND METHODS

A pot experiment was conducted at the experimental greenhouse of Department of Horticultural in University of Zanjan, Iran during 2010/2011. The pots were arranged in factorial experiment based on completely randomized blocks design with two factors in four levels and three replicates. Irrigation was regularly carried out at intervals according to weather conditions to keep the moisture content of the soil. Plants were foliarly sprayed twice with IAA [0, 25, 50 & 100 mg^l⁻¹] and CCC [0,300,600 & 1200 mg^l⁻¹], the first spray was done after 40 days after cutting back, while the second spray was applied three week later after the first one. Control plants were sprayed with distilled water and the volume of the spraying solution was maintained just to cover completely the plant's foliage till don't drip.

Measurements

The plant herbage was cut 15 cm above the soil surface and data on height, yield of fresh and dry weight as well as value of essential oil of plant growth parameter was recorded, also measured glands density in surface and under the leaves of the method copy that prime fluffs leaves removed then measured glands density. Plant samples than of weight for calculate yield of fresh weight were dried, the same in shadow and temperature 24°C until constant dry weight was obtained. Dry samples were taken from each treatment for determination of essential oil content and yield of essential oil. Fifty gram of leaf material was used for oil extraction. Oil extraction was done by hydrodistillation method using clevengers apparatus for 6 hrs continuously. Data obtained were subjected to analysis of variance and the values of least significant differences (LSD at 5% level) were calculated to compare the means of Duncan's test.

RESULTS AND DISCUSSION

The Effect of Cycocel on Morphological Traits and Essential Oils of Geranium

According to the results obtained of tables 1 and 2 we find: Most concentration Cycocel decreased height, yield of fresh and dry weight and value of essential oil and application of 600 mg^l⁻¹ concentration Cycocel showed most height, yield of dry weight, glands density in surface and under the leaves and the value of essential oils [figure 1 and 2].

Figure 1. Effect of Cycocel levels on value of essential oils *Plargoniumgraveolens*

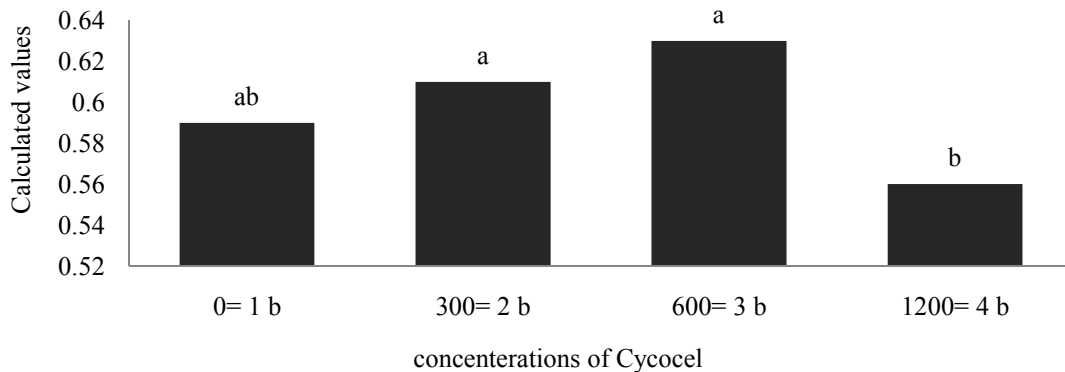


Figure 2. Effect of Cycocel levels on some morpho-physiological traits *Plargonium graveolens*

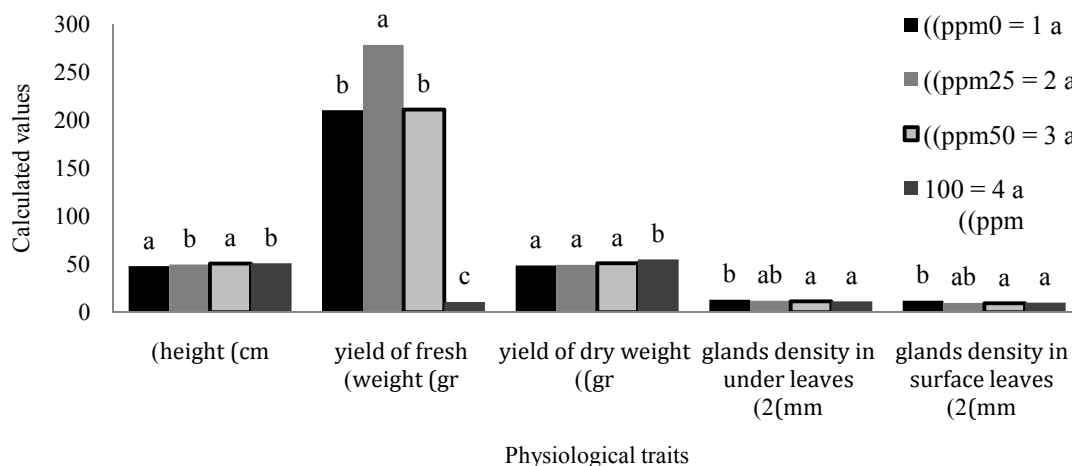


Table 1. Analysis of variance relate to Effect of foliar spray with Indole acetic acid and Cycocel levels on some morpho-physiological traits and value of essential oil of *Plargonium graveolens* plant

S.O.V	df	M. S.					
		Height [cm]	yield of fresh weight [gr]	yield of dry weight [gr]	glands density in under leaves [mm ²]	glands density in surface leaves [mm ²]	value of essential oils [ml]
A	3	25.0250	3163.899 ^{ns}	98.889 ^{ns}	9.910	18.889 ^{**}	0.001
B	3	279.150 ^{**}	29180.556 ^{**}	914.521 ^{**}	69.410 [*]	13.611 ^{**}	0.013 [*]
A×B	9	36.524	6136.111 [*]	222.757 [*]	2.891	7.463 [*]	0.003
Error	30	38.692	1762.639	94.055	15.457	2.761	0.004
% C.V.	-	12.50	18.03	19.04	20.35	16.34	10.00

n.s.= No significant difference, *, ** = Significant difference at p<0.05 and p<0.01 respectively.

Table 2. Effect of foliar spray with Indole acetic acid and Cycocel levels on some morpho-physiological traits and yield of essential oil of *Plargonium graveolens* plant

Treatme nt	height[c m]	yield of fresh weight [gr]	yield of dry weight [gr]	glands density in under leaves [mm ²]	glands density in surface leaves [mm ²]	value of essential oils [ml]
a ₁ b ₁	50.06 ^{abc}	210.0 ^{abc}	54.38 ^{bcd}	8.667 ^c	9.000 ^b	0.587 ^{ab}
a ₁ b ₂	49.11 ^{abc}	278.1 ^a	50.78 ^{bcd}	10.67 ^{bc}	11.33 ^{ab}	0.603 ^{ab}
a ₁ b ₃	49.11 ^{abc}	210.6 ^{abc}	48.56 ^{bcd}	12.67 ^b	14.67 ^{ab}	0.603 ^{ab}
a ₁ b ₄	42.89	10.50 ^d	40.81 ^{cde}	16.00 ^c	17.33 ^a	0.563 ^{ab}
a ₂ b ₁	50.61 ^{abc}	220.0 ^{abc}	43.38 ^{cde}	9.000 ^c	9.000 ^b	0.540 ^b
a ₂ b ₂	43.39	226.7 ^{abc}	47.75 ^{bcd}	9.000 ^c	11.33 ^{ab}	0.627 ^{ab}
a ₂ b ₃	59.06	256.7 ^{ab}	62.46 ^{ab}	11.00 ^{bc}	12.67 ^{ab}	0.640 ^{ab}
a ₂ b ₄	45.72	12.12 ^d	34.19 ^{cde}	9.667 ^{bc}	15.00 ^{ab}	0.557 ^{ab}
a ₃ b ₁	54.83	229.2 ^{abc}	56.68 ^{bc}	8.667 ^c	9.000 ^b	0.633 ^{ab}
a ₃ b ₂	49.33 ^{abc}	261.7 ^{ab}	46.90 ^{bcd}	10.00 ^{bc}	10.67 ^{ab}	0.587 ^{ab}
a ₃ b ₃	53.61 ^{abc}	165.0 ^c	65.44 ^{ab}	9.667 ^{bc}	12.00 ^{ab}	0.667 ^{ab}
a ₃ b ₄	44.33	12.12 ^d	34.90 ^e	8.333 ^c	13.00 ^{ab}	0.527 ^b
a ₄ b ₁	58.44	236.7 ^{abc}	74.26 ^a	9.000 ^c	8.667 ^b	0.593 ^{ab}
a ₄ b ₂	50.44 ^{abc}	240.0 ^{abc}	55.81 ^{bc}	9.667 ^{bc}	11.00 ^{ab}	0.637 ^{ab}
a ₄ b ₃	53.56 ^{abc}	186.7 ^{bc}	53.44 ^{bcd}	9.667 ^{bc}	12.33 ^{ab}	0.627 ^{ab}
a ₄ b ₄	41.94	210.0 ^{abc}	36.43 ^{de}	11.00 ^{bc}	12.67 ^{ab}	0.583 ^{ab}

means with different letters in each row have significant difference based on Duncan's significant range test, P<0.05.

Results obtained of experiment to research Already done by the other researchers on different plants corresponded: Gharibshahi [8] showed to 1000 and 2000 mg/l concentrations Cycocel and 1 mg/l CaCl₂ cause decreasing height of Zinnia and also 2000 mg/l concentration Cycocel and 1 mg/l CaCl₂ increasing yield of dry weight roots and leaves. l-Mokadem and Hadia [9] evaluation of the effect of growth retarders of *Encelia farinose* that result showed effect of retarder, Cycocel on plants than sample plant significance and most effect of 4000 mg/l showed to forms of deformation leaf and decreasing height. Similarly, Rabbi angorani [10] found that used CCC on Geranium decreased height and 2000 mg/l concentration Cycocel most effect on decreasing height, also with increase CCC concentration increased glands density in surface and under the leaves but most increasing showed that 2000 mg/l concentration Cycocel. Also Cycocel cause effect of growth retarder inhibitor to growth leaves and increased glands density in surface and under the leaves, and used Naphthalene acetic acid [NAA] and CCC together cause increasing of Coequal yield vegetative bodies of fresh and dry and the value of essential oils of geranium and best result calculated in treatments with levels 40 mg/l NAA and 500 and 1000 mg/l CCC. Foliar sprays with CCC and B-nine of *Erysimum arshallii* by Mushtaq et al. [11] showed that 500, 1000 and 1500 mg/l concentration Cycocel with 0/1 % toween 80 decreased height but CCC and B-nine together cause decreased height, Fresh and dry weight shoot, leaf and root. To evaluation of the effect of Gibberellic acid [GA₃] and CCC of geranium by Mohamed et al. [12] showed that CCC cause decreased height yield Fresh and dry weight but increased yield of essential oil. Most concentration Cycocel decreased height plants because growth retarders are organic compounds that to delay cell division and long cell of stem

tissues and regulate height of stem without deformation of leaves and stems, also commonly plants to influence with growth retarder have dark leaves and inhibitor to growth and to compact plants [5] and CCC to create disorder on biosynthesis cycle GA_3 and inhibitor to activity Ent-Kaurenesynthetase enzyme and decreased height plants that named to anti- Gibberellin[6].

The Effect of Indole acetic acid on Morphological Traits and Essential Oils of Geranium

According to the results obtained of tables 1 and 2 we find: Increasing concentration Indole acetic acid causes increased non-significant height and decreased yield of fresh weight and glandsdensity in surface and under the leaves [figure 3 and 4].

Figure 3. Effect of Indole acetic acid levels on some morpho-physiological traits of *Plargonium graveolens*

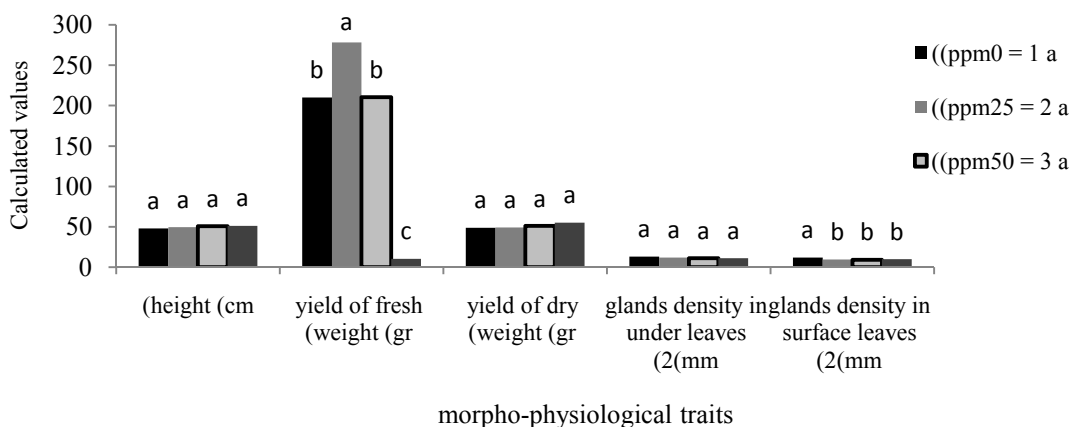
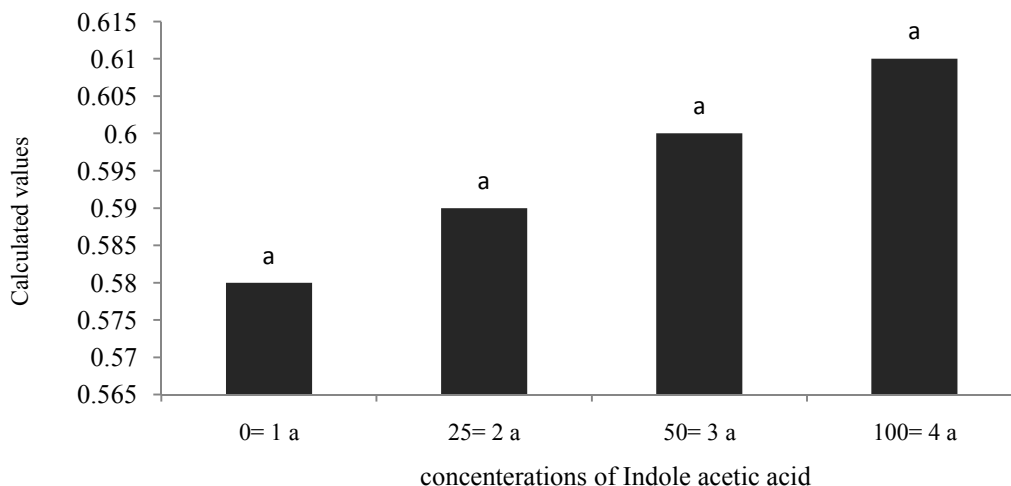


Figure 4. Effect of Indole acetic acid levels on value of essential oils of *Plargonium graveolens*



Results obtained of experiment to research Already done by the other researchers on different plants corresponded: Mostafa *et al.* [13] found that 50 mg/l⁻¹ concentration GA_3 and 2000 mg/l⁻¹ concentration IAA increased growth, height and yield of dry weight of *Balanitesa egyptiaca*. To evaluation of the effect of Gibberellic acid [GA_3] and IAA with 100 and 200 mg/l⁻¹ concentrations to three different times of soybean by Pulak Kumar *et al.* [14] showed that 100 mg/l concentration IAA increased height. IAA stimulated long cells of stem in region under terminal that cause increased growth and height plant [5]. Result calculated of thyme by Letchamo [15] showed that increasing number, size and glandsdensity in surface leaves increased yield of essential oil. Also positive relation between glandsdensity in surface and under the leaves showed that treatments the same influenced. Arvin *et al.* [7] showed that use of CCC increased dry weight on *Allium cepa* and use of Ethephon and CCC together cause decreased dry weight. Pazoki *et al.* [16] found that 100 mg/l concentration IAA and NAA on *Artemisia dracunculs* cause increased yield of essential oil. Koseva *et al.* [17] showed that IAA and NAA on peppermint increased yield of essential oil and Menthol.

CONCLUSIONS

Application of two plant growth regulator IAA and CCC showed positive effects and no deformation or disease plant, the balanced herbage yield of fresh and dry weight of is developed, that ingredients manufacturer and maintenance essential oil are in *Pelargonium graveolens* plants.

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