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RESPONSE OF *Coriandrum sativum*, L. PLANTS TO CUTTING , AS WELL AS, GLYCINE AND SALICYLIC ACID TREATMENTS

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ABSTRACT

A field experiment was conducted during the two successive seasons of ٢٠٠٧/٢٠٠٨ and ٢٠٠٨/٢٠٠٩ to determine the influence of cutting , salicylic acid, glycine and the interaction treatments on vegetative growth, yield, volatile oil (percentage & yield) of *Coriandrum sativum*, L plants. Obtained data showed that branch number, herb dry weight, umbels number, seed yield (plant & fed.) and volatile oil (percentage & yield/plant and per fed.)were augmented as a result of cutting treatment. Glycine and salicylic acid, treatments increased plant height, branch number, herb dry weight, umbels number, fruit yield/plant and per fed., volatile oil (percentage & yield). The highest values of the previous parameters were observed with the high concentration of either glycine or salicylic acid. The combined effect between cutting , glycine , salicylic acid and the interactions treatments on *Coriandrum sativum*, L. plants was statistically significant.The addition of high concentration of glycine or salicylic acid plus cutting treatment was the most effective treatments in increasing these parameters.

INTRODUCTION

Coriander, *Coriandrum sativum*, L. plants are considered as one of the most important medicinal and aromatic plants. It is belonging to Family Apiaceae (Umbellifera), widely grown in eastern Mediterranean countries, especially Malta and Egypt. It is cultivated widely in middle Egypt, especially in Minia and Assiut Governorates as an annual plant. The coriander seeds contain ٠.٢-١.٠ % essential oil, which contain ٦٥-٧٠٪ linalool (coriandrol) and pinene. The fruits are used for flavoring food products, pharmaceutics and perfumes.

Aromatic leaves of coriander are used as garnish and in salsas and guacamoles. They enhance the flavor of salads, tacos and burritos. The essential oil of coriander is used for flavoring the liqueurs and alcoholic beverages. It stimulates the flow of digestive secretion which is useful as carminative and in the treatment of intestinal disorders and has antispasmodic and expectorant properties.

Recently, husbandry inputs involve the use of antioxidant (free radical scavengers) which may play a role in the regulation of plant development, flowering and chilling or disease resistance had been studied (Elad, ١٩٩٢; Raskin ١٩٩٢ and Walker and Mc Kersie, ١٩٩٣).

The antioxidants are very effective in stimulating and improving the vegetative growth traits, yield components, oil percentage and yield, as well as, chemical composition of different plant species including medicinal and aromatic plants. So using salicylic acid was suggested by many authors as stimulative factor for improving different plant growth and production characteristics. Many authors studied the effect of salicylic acid on vegetative growth parameters of different plant species; Xiong *et al.,* (١٩٩٩) treated *Allium sativum*, L. with salicylic acid at ٥×١٠٤ m. Arun *et al.,* (٢٠٠٠) studied the effect of salicylic acid at ٥٠, ١٠٠ and ١٥٠ ppm and found

that salicylic acid improved vegetative growth parameters. Youssef (٢٠٠٠) found that the tallest potato plants were obtained from salicylic acid as foliar spray at ٠.١ mm. Nawar (٢٠٠١) treated potato plants with acetyl salicylic acid (Asprinin at ٥٠ m/L.) and obtained the highest value of the plant dry weight. Zaghloul *et al.,* (٢٠٠١) stated that treating *Phaseolus vulgaris* plants with salicylic acid at ٥ mm resulted in increasing the fresh and dry weights of plant compared to unsprayed plants. Benavides-Mendosa *et al.,* (٢٠٠٢) reported that the highest values of plant height, number of leaves, fresh and dry weights/plant were obtained as a result of treating the seeds of chili plant with salicylic acid sulfo salicylic acid at $١٠^{-٥}$ and $١٠^{-٣}$ compared with unsprayed plants. Ali (٢٠٠٤) showed that the highest values of plant height, branch number and herb dry weight of *Tagetes minuta* plants were obtained due to salicylic acid at ١٠٠ ppm. Baradisi (٢٠٠٤) found that salicylic acid at ٥٠٠ ppm gave the maximum values of plant height, leaf number, diameter of both neck and bulb, as well as, the dry weight/plant over the control garlic plants. Al-Shreif (٢٠٠٦) reported the application of salicylic acid at ١٠٠ ppm led to an increment of plant height, stem diameter, branch number/plant and herb dry weight/plant of *Carum carvi*, L plant compared with the other concentrations (٠, ٢٠٠ or ٣٠٠ ppm). Abd El-Latif (٢٠٠٧) found that treating borage plants with salicylic acid at ١٠٠, ٢٠٠ and ٣٠٠ ppm increased plant height, stem diameter, branch number/plant and herb dry weight/plant compared with untreated plants.

MATERIALS AND METHODS

The present work was carried out at the Floriculture Experimental Farm - Faculty of Agriculture, Al-Azhar University, Assiut, Egypt during the two successive seasons of ٢٠٠٧/٢٠٠٨ and ٢٠٠٨/٢٠٠٩. The objectives of this work was to study the responses of *Coriandrum sativum*, L plants to salicylic acid (S), glycine (G) and cuttings (٥٠ day after planting date) as well as their interactions. Salicylic acid and glycine were obtained from SIGMA chemical company. The experiment followed the split-plot design with four replicates. Herb cutting factor was distributed in the main plots, while salicylic acid and glycine treatments were occupied the sub plots. On ٥th November, fruits of coriander were sown in experimental units, each was ٣.٦ × ٣.٢ square meter including ٦ rows with ٦٠ cm apart and each row contained eight hills at ٤٠ cm distance on one side. After five weeks, the thinning was done leaving two seedlings/hill. The plants were sprayed with salicylic acid (S) and glycine (G) at the concentrations of ١٠٠ and ٢٠٠ ppm, three times at two week intervals starting on December, ٢٠th for both seasons. All agricultural practices were performed as usual. At the end of the experiment (April ٢٠th and April ١٥th for the first and second seasons, respectively, the following data were recorded: plant height, number of branches/plant, herb dry weight (g)/plant, number of umbels/plant, seed yield (g)/plant and kg/fed. was calculated.Volatile oil percentage in coriander fruits was determined following the procedure described by Pearson (١٩٦٢). The volatile oil yield/plant and per feddan were calculated. Statistical analysis was carried out according to the method of Snedecor and Cochram (١٩٨٢).

RESULTS AND DISCUSSION

Vegetative growth

Plant height:

Data in Table ١ reveal that plant height of coriander was significantly influenced by cuttings treatment in the two experimental seasons. Plant height decreased significantly on applying cut of plants in the two seasons. Untreated plants by cuttings augmented plant height by ٢٢.٤٦ and ٢٥.٨٩ % more than cutting plants in the first and the second seasons, respectively.

Glycine and salicylic acid treatments, had significant effect on plant height of coriander for both seasons. It appeared that both concentrations of glycine and salicylic acid significantly increased plant height in both seasons. Also, plant height increased significantly by increasing the concentrations used. The tallest plants were recorded due to spraying the plants with salicylic acid at high concentration as it reached ٩.٣١ and ٧.٣٨ % over unsprayed ones in the two seasons, respectively, (Table ١)

The interaction between plant cuttings and glycine and salicylic acid treatments had significant effect on plant height in both seasons. The most effective treatments on plant height were not plants cutting and spraying salicylic acid at high concentration treatments in the two seasons (Table ١).

Number of branches:

Table ١ shows that cutting treatment increased branch number of coriander plants in the two experimental seasons. Cutting treatments significantly increased branch number compared to the untreated plants (٤٨.٩٧ and ٤٨.٠٤ % in the two growing seasons, respectively).

Glycine and salicylic acid treatments, significantly augmented branch number of coriander plants. Increasing glycine or salicylic acid concentrations, the number of branches increased significantly. Spraying with high concentration of salicylic acid gave the maximum value of branch number as ranged ٣٢.٣٣ and ٣٤.٤٤ % over untreated control in the two experimental seasons, respectively.

Table ١ reveals that combined effect of glycine, salicylic acid and cutting treatments on branch number was significant in both seasons. It is clear that cutting of plants plus foliar spray with salicylic acid at high concentrations gave the highest number of branches in comparison to the other treatments in the both seasons.

Herb dry weight:

Data in Table ١ point out that herb dry weight of coriander plants was significantly affected by cutting treatments, as plants cutting gave the highest value of herb dry weight of coriander plants as increased it by ٢٣.٩٠ and ٢٣.٢٨ % over the untreated plants in the two seasons, respectively.

Response of *Coriandrum sativum*, L. plants to some treatments

Glycine and salicylic acid treatments. had significant effect on herb dry weight of coriander plants in the two seasons. These treatments at both concentrations caused a significant increase in herb dry weight in the two seasons. the heaviest herb dry weight was noticed on spraing the plants with high concentration of salicylic acid at which increased herb dry weight by ٣٢.٢٦ and ٣١.٣٤ % over the unsprayed ones (Table ١).

The interaction between the two factors on herb dry weight of coriander plants was significant in both seasons. It was found that cutting the plants plus foliar spraying with salicylic acid at high concentration gave the highest herb dry weight compared to other combination treatments in the two seasons, (Table ١)

Fruit parameters:

Umbels number/plant:

Umbels number of coriander plants was significantly affected by cutting treatment as cutting resulted in a significant increase in the number of umbels by ٢٧.١٨ and ٢٧.٠٠ %) over the untreated plants in the two seasons, respectively, (Table ٢).

Glycine and salicylic acid treatments. significantly influenced the umbels number of coriander plants compounds in the two seasons. Increasing the concentration of both significantly augmented umbels number. However, foliar spraying with salicylic acid at high concentration gave in maximum value of umbels number (١٣.٤٢ and ١٣.٢٤ % than untreated plants) in both seasons.

The combined effect of the two factors on umbels number of coriander plants was significant in the two seasons. The most effective treatment was detected with cutting the plants plus foliar spraying with

salicylic acid at high concentration in the two experimental seasons compared with the other combination treatments (Table ٢).

Response of *Coriandrum sativum*, L. plants to some treatments

Fruit yield (plant & fed.):

Data presented in Table ٢ indicate that fruit yield/ plant and per fed. of coriander plants increased significantly as resulted of cutting treatment in the two experimental seasons. Cutting the plants significantly augmented fruit yield/ pant and per fed, as it reached ١٤.٥١ and ١٤.١٢ % more than the untreated plants in the two seasons, respectively. Cutting plants produced ١٢١٠.٠٩ and ١١٣٢.٠٩ kg/fed. while untreated plants gave ١٠٥٦.٥٠ and ١٠٠١.٩١ kg/fed. in the two seasons, respectively.

Glycine and salicylic acid treatments, had significant effect on fruit yield/plant and per fed. of coriander plants in the two seasons. Fruit yield /plant and per fed. was significantly augmented by increasing the concentrations of glycine and salicylic acid. However applying salicylic acid at high concentration produced the highest value of fruit yield/ plant and per fed. The increased was ٣٧.٧١ and ٤٢.٢١ % over the unsprayed plants in the two consecutive seasons, respectively. This treatment yielded ١٣٠٠.٠١ and ١٢٥٣.٢٠ kg/fed. while the control treatment produced ٩٤٣.٨٥ and ٨٨١.٢٤ kg/ fed. fruit in the two seasons, respectively.

The interaction between the two factors had significant affect on fruit yield/plant and per fed. in both seasons. Cutting the plants and foliar spraying with salicylic acid at high concentration recorded the maximum value of fruit yield /plant and per fed. This treatment produced ١٣٧٨.٢٨ and ١٣٢٨.٢٨ kg/ fed. fruit while control produced ٨٦٤.٤١ and ٨٠٤.١٩ kg/fed .fruit in the first and the second, respectively (Table ٢).

Volatile oil percentage:

Table ٣ shows that volatile oil percentage of coriander was significantly influenced by cutting treatment in the two experimental seasons. It is clear that cutting the plants led to a significant increase in volatile oil percentage reaching ١٦.١١ and ٢٠.٢١ % more than the untreated plants in the two seasons, respectively.

Response of *Coriandrum sativum*, L. plants to some treatments

Glycine and salicylic acid treatments, had a significant effect on volatile oil percentage of coriander plants in both seasons. Increasing glycine or salicylic acid concentrations significantly augmented volatile oil percentage in the two seasons. The highest value of volatile oil percentage was obtained by spraying the plants with high concentration of salicylic acid. The increase was by ٣٨.٢٨ and ٤٣.٢٠ % over the unsprayed ones in the two seasons, respectively, (Table ٣).

The combined between cutting treatment, glycine and salicylic acid treatments, significantly increased volatile oil percentage of coriander in the two seasons. The most effective treatment was cutting plants plus foliar spraying with salicylic acid at high concentration in comparison with other combination treatments in the two consecutive seasons.

Volatile oil yield (plant & fed.):

Obtained results showed that cutting plants significantly increased volatile oil yield/pants by ٣٤.٢٩ and ٣٤.٨٣ % more than the untreated plants in the two seasons, respectively. This treatment yielded ٣.٧١١ and ٤.٠٠١ L/fed. volatile oil while the untreated plants produced ٣.٥١١ and ٢.٩٤٩ L/fed. volatile oil in both seasons, respectively.

It is clear that both concentrations of glycine and salicylic acid significantly augmented volatile oil yield/ plant and per fed. in the two growing seasons. Moreover increasing the concentration used of the two compounds augmenters the volatile oil yield / plant and per fed. was Maximum volatile oil yield /plant was obtained by spraying coriander plants with high concentration of salicylic acid as ranged from ٩٠.٣٦ to ٩٥.٧١ % over the control in the two seasons, respectively, yielded ٥.٢٧٨ and ٤.٥٥٧ L/fed. volatile oil while the

control treatment produced ٢.٧٧٨ and ٢.٣٣٣ L/fed. volatile oil in both seasons, respectively.

The interaction between the two factors on volatile oil yield / plant and per fed. was significant in the two experimental seasons. Cutting the plants and foliar spraying with high concentration of salicylic acid recorded the highest volatile oil yield / plant and per fed. in the two seasons. This combination treatment yielded ٦.٠٠٠ and ٥.٢٢٣ L/fed. volatile oil while the control gave ٢.٤٤٣ and ٢.٠٠٠ L/fed. volatile oil in the two seasons, respectively (Table ٣).

DISCUSSION

The obtained results, clearly demonstrated that cutting treatment led to a high production of herb (Cutting inhibit apical dominance). This treatment stimulated lateral branches and increased fruit yield.

Treating coriander plants with salicylic acid cased significant enhancement of vegetative growth, yield components, chemical composition and fruit and oil yield production compared with the untreated plants. In that respect, the gradual increase of antioxidant resulted in a gradual augment of the above-mentioned characteristics.

The enhancing effect of antioxidant on coriander plants could be explained in the light of their biological and physiological roles. Salicylic acid was found to have an antioxidant effect and could be overcome the deleterious effect of different stresses on plant by acting as chelating agent and protecting the reproductive organs from stress; (Oata, ١٩٧٢). Salicylic acid was also found to induce flowering, increase flower life, retard senescence and increase cell metabolic rate. The sustained level of salicylic acid may be a prerequisite for the synthesis of auxin and/or cytokinines; (Metwally *et al.* ٢٠٠٣).

Salicylic acid has been identified as an important signaling elements involved in establishing the local and systemic diseases resistance response of plants after pathogen attack; (Alvarez, ٢٠٠٢). Moreover, application of salicylic acid might improve physiological performance in terms of application of photosynthesis, total oil and dry matter yield which can be related to increase in nutrient uptake by salicylic acid-treated plants.

REFERENCES

Abd El-Latif, M. T. M. (٢٠٠٧): Effect of some fertilization and antioxidant treatments on borage plants. M. Sc. Thesis Fac. of Agric. Minia Univ. Egypt.

Ali, A. F. (٢٠٠٤): The benefits of using some natural sources of phosphate and salicylic on *Tagetes minuta*, L plants. Minia J. Agric. Res. &Develop. ٢٤(٤):٦٢١-٦٤٨.

Al- Al-Shreif, A. M. O. (٢٠٠٦): Response of caraway plants grown in sandy soil under drip irrigation system to some biofertilization and antioxidant treatments. M. Sc. Thesis Fac. of Agric. Minia Univ. Egypt.

Alvarez, M. E. (٢٠٠٠): Salicylic acid in the machinery of hypersensitive cell death and disease resistance. Plant Mol. Biol., ٤٤:٤٢٩-٤٤٢.

Arun, D. S.; A. D. Ashok and P. Rengasamy (٢٠٠٠): Effect of some growth regulating chemicals on growth and flowering of rose c.v. First Red under greenhouse conditions. Journal of Floriculture (New series), ٣(١):٥١-٥٣. (C.F. Hort. Abst., ٢٠٠١, ٧١(٣):٢٦١٠).

Baradisi, A. (٢٠٠٤): Influence of vitamin C and salicylic acid as foliar application on of garlic plants under sandy soil conditions. I. Growth and Plant Chemical compostion. *Zagazig J. Agric. Res., ٣١(٤A): ١٣٣٥١٣٤٧.*

Benavides-Mendosa, A.; F. Ramiris-Godina; V. Robled-Torres; H. Ramierz-Rodringuez and R. Maiti (٢٠٠٢): Chilli seed treatment with saliysilic and sulfosalysilic acid modifies seedling epidermal anatomy and cold stress tolerance *(C. F. Hort. Abst., ٢٠٠٣, ٧٣(٣): ٢٥٠٧).*

Elad, Y. (١٩٩٢): The use of antioxidant (Free radical scavengers) to control gray mould (*Botrytis cinerea*) and white mould (*Sclerotina sclerotoirum*) in various crops. Plant Pathology, ٤١٢:٤١٧-٤٢٦.

Metwally, A.; I. Finkemerier; M. Georgi and K. J. Dietz (٢٠٠٣): Salicylic acid alleviates the cadmium toxicity in barley seedlings. Plant Physiology, ١٣٢:٢٧٢-٢٨١.

Nawar, D. A. S. (٢٠٠١): Studies on tissue culture in potato crop. M. Sc. Thesis Fac. of Agric. Zagazig Univ. Egypt.

Oata, Y. (١٩٧٢): The response of lemma gibba $GA_٣$ to a singl long day in the response of EDTA. Plant Cell Physiology, ١٣:٥٧٥-٥٨٠.

Pearson, D (١٩٦٢): The chemical analyses of food.pp ٢٣٠-٢٣٣. J.A. Shurchill Ltd. ١٠٤ Gloucester place. London. W.I. Sifts.Ediation.

Response of *Coriandrum sativum*, L. plants to some treatments

Raskin, I. (١٩٩٢): Role of salicylic acid in plant. Ann. Rev. Plant Physiol. Plant Mol. Biol., ٤٣:٤٣٩-٤٦٣.

Snedecor, G.W. and W.G., Cochram (١٩٨٢) Statistical Methods. The Iowa State Univ., Press, Ames., Iowa, U.S.A., ٥٠٧ pp.

Walker, M. A. and B. D. Mc Kersie (١٩٩٣): Role of the ascorbate-glutathione antioxidant system in chilling resistance of tomato. J. Plant Physiology, ١٤١(٢):٢٣٤-٢٣٩.

Xiong, Z.; Z. X. Shijun; L. Gaogieng and H. Boahan (١٩٩٩): Stimulatory effects of Me, JA and SA on bulb formation of Allium sativum, L. in vitro. Acta Horticulturae Sinica. ٢٦(٦):٤٠٨-٤٠٩. (C. F. Hort. Abst., ٧٠(٦):٤٩٨٤).

Youssef, N. S. (٢٠٠٠): Response of potato plants grown conventionally and in tissue culture to some antioxidant treatments. Ph. D. Thesis Fac. of Agric. Minia Univ. Egypt.

Zaghlool, S. A. M.; S. I. Ibrahim and H. A. M. Sharaf El-Deen (٢٠٠١): The effect of naphthalene acetic acid (NAA), Salicylic acid (SA) and their combination on growth, fruit setting, yield and some correlated components in dry bean (*Phaseolus valugaris*, L.). Annals Agric. Sci. Ain Shams Univ., Cairo, ٤٦(٢):٤٥١-٤٦٣.

استجابة نباتات الكزبره لمعاملات القرط والرش بحامضي الجليسين والساليسليك

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أجريت هذه التجربة في مزرعة كلية الزراعة – جامعة الأزهر – أسيوط خلال موسمين متتاليين ٢٠٠٧ / ٢٠٠٨، ٢٠٠٨ / ٢٠٠٩ علي نبات الكزبره وكان الهدف من هذا البحث هو دراسة تأثير قرط العشب والرش بحامضي الجليسين و الساليسليك بتركيزات ١٠٠ و ٢٠٠ جزء في المليون لكليهما وكذا التداخل بينهما على النمو الخضري والمحصول والنسبة المئوية للزيت الطيار ومحصول الزيت الطيار.

أوضحت النتائج المتحصل عليها أن عدد الأفرع ووزن العشب الجاف وعدد النورات ومحصول الثمار للنبات وللفدان والنسبة المئوية ومحصول الزيت الطيار قد زاد نتيجة قرط العشب. أما جميع تركيزات حامضي الجليسين و الساليسليك قد أدت إلى زيادة النمو والمحصول والنسبة المئوية للزيت الطيار ومحصول الزيت الطيار، والرش بتركيز ٢٠٠ جزء في المليون قد أعطي أفضل النتائج لجميع الصفات تحت الدراسة.

وفي معظم الحالات كان التداخل بين العاملين معنويا على تلك الصفات وبصفة عامة اتضح أن قرط العشب مع الرش بالتركيز العالي من حامض الساليسليك (٢٠٠ جزء في المليون) قد سجل أكبر التأثير على صفات النمو والمحصول والمكونات الكيميائية.