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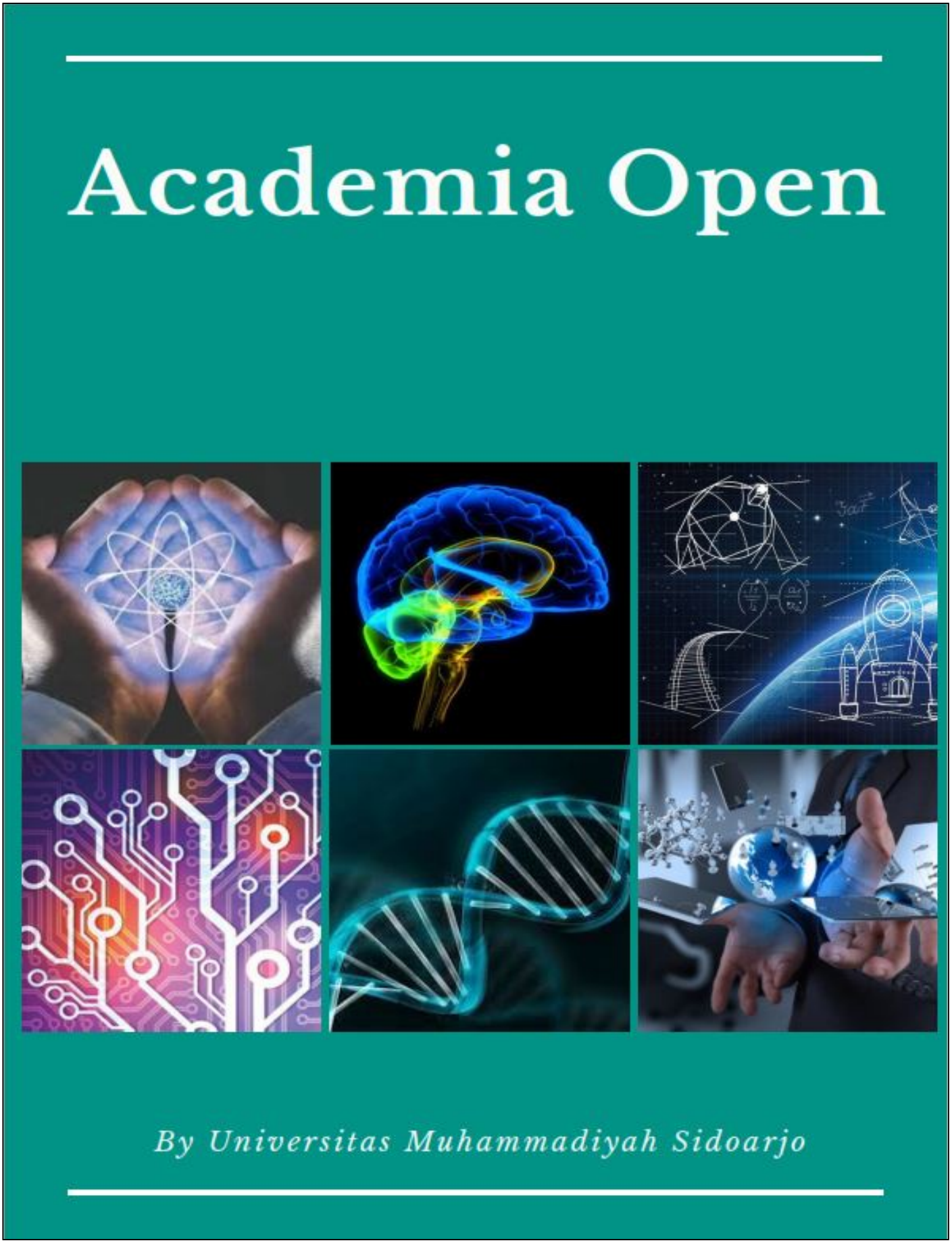

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Effect of Methyl Jasmonate Spraying on Growth and Yield of Vicia faba L. Plant

Pengaruh Penyemprotan Metil Jasmonat terhadap Pertumbuhan dan Hasil Tanaman Vicia faba L.

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Abstract

This agricultural experiment was conducted in the Department of Life Sciences' plant house at the University of Diyala's College of Education for Pure Sciences. In order to investigate the effects of spraying methyl jasmonate at five different concentrations—0, 25, 50, 75, 100 mg. Plastic pots that could hold 7 kg of mixed soil were used in this experiment to produce bean plants. Three replications and a completely randomized design were used in the experiment's design. At a 0.05 level of probability, the means were compared. Two seeds were put in each pot after the soil had been prepared and cleaned of impurities. The germination rate was 100% at the beginning of the experiment, but seven days later it dropped to one plant. Two sprays of varying concentrations of jasmonate were applied to the plants; the first was one month after germination, and the second was one month following the first. Since the concentration of methyl jasmonate exceeded 25 mg L-1 in every characteristic examined, the results demonstrated that there were distinct variations between the various quantities of the molecule. Plant height, stem diameter, number of leaves, number of branches, number of pods, weight of pods, and number of seeds in pods are some of these attributes. 60.40 cm, 7.73 cm, 27.33 sheets were attained. Branch 3.02 of Plant 1. 2.33 pods per plant. Plant-1, 6.33 seeds, 11.01 g. Pod-1, in turn. On the other hand, 75 mg was the stated concentration. In comparison to the control treatment, L-1 exhibits lower averages for the majority of the attributes.

Highlights:

- Experiment tested methyl jasmonate effects on Spanish bean plants' growth.
- Five concentrations: 0, 25, 50, 75, 100 mg L^{-1} evaluated.
- Results showed optimal growth at 25 mg L^{-1}, decline at 75 mg.

Keywords - Beans plant; Methyl Jasmonate; Field crops; Vicia faba

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Introduction

A significant annual winter crop in the Leguminosae family of legumes is the broad bean (Vicia faba L.). In many parts of the world, it is extensively grown. Its seeds are a diverse food and medicinal source since they are high in proteins, carbs, oils, minerals, vitamins, and numerous other components with medical significance (1,2). Because of its biological impact brought about by the activities of the root nodule bacteria Rhizobium, it plays a significant part in enhancing the soil (3). Methyl Jasmonates is a volatile chemical molecule that is utilized in many distinct growth processes, including senescence, flowering, fruit ripening, root growth, and seed germination, as well as in plant defence. (4). In reaction to a variety of biotic and abiotic stressors, particularly wounds, plants generate jasmonates, which can trigger the production of a wide range of defence substances, including plant alexins, which have antibacterial properties (5). Modern plant growth regulators known as jasmonates are distinguished by their remarkable capacity to impede the growth of plant tissues. They are among the most significant, prevalent, and extensively utilized substances because they are responsible for several physiological changes in plant tissues, as well as morphological changes in laboratory-grown plant parts, and for rearranging plant cells to produce primary and secondary compounds by encouraging the expression of genes involved in their biosynthesis (6). The production of certain medicinal compounds and the stimulation of the emergence of somatic embryos in certain economically valuable plants in isolation from the living body are just two examples of the practical applications of compounds like jasmonates in plant tissue culture (7). The study sought to determine the influence of spraying with the substance methyl jasmonate on the growth and production of bean plants since organic compounds are crucial in decreasing the usage of chemical compounds and their detrimental effects on the environment and plants.

Methods

The experiment was conducted in the Department of Life Sciences' plant house at the College of Education for Pure Sciences/University of Diyala during the winter agricultural season of 2023–2024. use mixed soil and pots weighing seven kilograms per square meter. Five different methyl jasmonate concentrations—0, 25, 50, 75, and 100 mg—were used in the experiment. L-1: Each treatment has three replicates. I put two bean seeds in each pot and soaked them in water for a whole day. Seven days after germination, the seeds thinned down to form a single plant.In the plant house of the Department of Life Sciences at the College of Education for Pure Sciences/University of Diyala, the experiment was conducted during the winter agricultural season of 2023–2024. utilizing pots weighing seven kilograms per square meter and mixed soil. Five different amounts of methyl jasmonate—0, 25, 50, 75, and 100 mg—were used in the experiment. L-1: Three copies of every treatment. Two bean seeds were sown in each container, immersed in water for 24 hours, and seven days after germination, they thinned out to one plant..

Result and Discussion

100 mg.l-1	75 mg.l-1	50mg.l-1	25mg.l-1	Distilled water	Attributes
50.70a	59.66a	52.66a	60.40a	52.56a	Plant height(cm)
5.90a	6.43a	6.33a	7.73a	7.30a	Leg diameter(cm)
23.33a	26.66a	24.66a	27.33a	26.0a	Number of leaves (leaf.plant-1)

Table 1. *The effect of spraying with different concentrations of the compound methyl Jasmonate on the characteristics of plant height (cm), stem diameter (cm), and number of leaves (leaf.plant-1) of the bean plant Vicia faba L.*

100 mg.l-1	75 mg.l-1	50mg.l-1	25mg.l-1	Distilled water	Attributes
2.66a	2.33a	2.34a	3.02a	3.0a	Number of branches (branch. plant-1)
22.33a	21.66a	22.33a	26.0a	27.0a	Number of nodes (node. plant-1)
6.33a	3.66a	8.00a	7.33a	7.66a	Number of flowers (flower. plant-1)

Table 2. *Effect of spraying with different concentrations of the compound methyl Jasmonate on the number of branches (branch. plant-1), number of nodes (node. plant-1), and number of flowers (flower.plant-1) of the bean plant Vicia faba L.*

100 mg.l-1	75 mg. l-1	50mg.l-1	25mg.l-1	Distilled water	Attributes
1.00a	0.66a	1.33ab	2.33b	2.33b	Number of pods (pod. plant-1)
6.64a	4.80a	6.90a	11.01a	6.149a	weight of the pod (g)

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4.0a	2.33a	4.33a	6.33a	5.33a	number of seeds in the pods (seed.pod-1)

Table 3. *Effect of spraying with different concentrations of the methyl Jasmonate compound on the number of pods (pod. plant-1), weight of the pod (g), and number of seeds in the pods (seed.pod-1) of the bean plant Vicia faba L.*

The means of plant height, stem diameter, and leaf count for the bean plant do not differ significantly, according to the results in Table (1). According to the results in the above table, the average plant height, stem diameter, and leaf count decreased after treatment with high concentrations of the compound jasmonate. For each of them, the treatment with the lowest average was the one with a concentration of 100 mg l-1. In contrast to the control treatment, the therapy with a concentration of 25 mg L-1 produced the greatest average.

The findings shown in Table (2) indicate that the average number of branches, nodes, and flowers on the bean plant do not differ significantly. The preceding table's data demonstrated that 75 mg concentrations were used in the treatment. The averages for the number of branches, nodes, and flowers decreased with L-1 of the compound jasmonate; the lowest averages ever reported were 2.33 branches.plant-1, nodes 21.66.plant-1, 3.66. corresponding to Flower.Plant-1 for each of them.

Low quantities of this chemical and the control treatment showed greater averages for these attributes. This decline could be explained by the chemical jasmonate's ability to lower plant height, stem diameter, and leaf count at high concentrations (Table 1). This thus lowers the quantity of nutrients and processed components required for its synthesis, which is represented in the decline of each of the attributes in the above table.

With increasing concentrations of the substance Jasmonate, the number of pods decreased directly and significantly, whereas the weight of the pod and the number of seeds within the pods decreased non-significantly, according to the results in Table (3). 75 mg of the treatment's concentration. The treatment with a concentration of 25 mg had the lowest average for each of the aforementioned parameters, with L-1 recording the lowest average of 0.66 pods per plant, 4.809 grams, and 2.33 seeds per pod, respectively. In comparison to the control treatment, L-1 had the greatest average of 2.33 pods per plant, 11.01 grams, and 6.33 seeds per pod, respectively.

This decline in these traits could be explained by jasmonate's function in lowering the quantity of flowers (Table 2) and leaves (Table 1). Because the pod was storing fewer materials, the weight of the pod and the number of seeds within it decreased. This was a result of the same treatment having a negative impact on the quantity of nutrients produced by photosynthesis, such as proteins and carbohydrates

Conclusion

1- Treatment with a concentration of 25 mg. L-1 of the compound Jasmonate caused an increase in the averages of all traits.

2- Treatment with high concentrations of the compound Jasmonate led to a decrease in all the studied traits.

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