Effects of Mycorrhiza Fungus and Licorice on Vegetative Growth of Lemon Grass *Cymbopogon Citatus* L. Plant

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Abstract. A field experiment was carried out in the wooden canopy of the Department of Horticulture and Garden Engineering, College of Agriculture, University of Anbar. Mycorrhiza and licorice were added to the seedlings of lemongrass plant in order to increase some of the physiological and chemical characteristics in the plant, three levels of Mycorrhiza fungus 10 and 20 grams were added to the media, as for licorice, it was added at a rate of 0, 50 and 100 grams per pot. The highest rate of studied parameters (plant height, number of branches and chlorophyll rate in leaves) was obtained for the high combination of Mycorrhiza and licorice (4 grams of Mycorrhiza and 100 grams of licorice per pot) with a significant difference from the rest of the other combinations.

1. Introduction:

Cymbopogon citratus, also known as lemongrass, or oil weed, is a plant species that follows the genus of the citrus fruit of the grass family. The plant is tropical, native to Southeast Asia, and has medicinal importance [1]. Lemongrass is a perennial herbaceous plant, growing in dense clusters, branching out from a bulbous base with a spread of about 1 meter and about 3 feet in height [2]. Its green, striped, rough leaves give off a lemon-like scent when rubbed. The main chemical component in it is citral or lemon, and it is responsible for unique aldehydes that give off the scent of lemon [3]. It has pathological antimicrobial and anti-fungal properties. In addition, its parts contain other components of essential oils such as myrcene, citronellol, methyl, geraniol, limonene, geraniol acetate, nerol, etc. These compounds are known for their effectiveness against irritation, itching, and redness as well as a repellant effect. Insecticide, and anti-fungal [4].

The collateral damage caused by chemical fertilizers has led researchers to think of cheap and environmentally safe alternatives, such as the use of biological fertilizers to increase agricultural production [5], especially in nutrient-poor soils. In supplying plants with part of their various nutritional needs, and the mycorrhizal fungus is among the most important types of microorganisms used as an effective biological fertilizer [6]. Mycorrhizae is a term used to describe an evolving relationship between a group of fungi and plants, and for the Arbuscular Mycorrhizal Fungi, the ability to form a relationship with about 80% is one of the plant species as it is characterized by its being unable to grow in cultivated areas in the form of pure farms, but it is possible to grow and multiply on the roots of its plant families forming branches in dendritic form that represent the sites of food exchange between the fungus and its plant partner in a symbiotic manner. These fungi, in symbiosis with the host plant, improve growth and increase production [7]. The modern trend in agriculture is to move away from
the use of chemical fertilizers, chemical growth regulators, and pesticides of various types and combinations, due to their toxic and harmful effect on human life, animals and plants. Therefore, specialists in agriculture have replaced the use of safer materials in the development of seedlings and fruit trees through the use of organic fertilizers and extracts of marine and herbaceous plants. And from these plants the extract of the licorice plant was used in this direction [8]. Licorice (Liquorices) is a plant that belongs to the leguminous family, which includes more than 20 species, and the most important types of licorice plant is the type glabra, which is a perennial herbaceous plant that is wild in Iraq on the banks of rivers and has increased its spread in Asia and Europe as it grows in many countries such as Spain and Italy Turkey, Greece, Iran, and Syria. Spain is one of the largest countries that produce licorice in the world [9].

2. Materials and Methods:
The experiment was conducted in the wooden canopy of the Department of Horticulture and Gardening Engineering at the College of Agriculture, Anbar University, to study the effect of adding licorice (extract) and microscopic powder to lemon grass (seedling). The experiment was carried out on the lemon grass plant, was imported from Jordan, as it is not present or rare in Iraq, because people did not know its concepts and its medical role in many diseases, the most important of which is cancer, where lemon grass was used as an anti-cancer cell. The plants (seedling) were planted in pots with a diameter of 30 cm and filled with peat moss + a mixture of river and organic matter by one plant in each pot. The experiment included mixing 0, 10 gm and 20 gm of Mycorrhiza pollen with the agricultural medium before starting the planting of seedlings, at a depth of 5 cm per pot. The second factor is the addition of licorice powder with the agricultural medium at rates of 20 and 30 grams per pot with the comparison treatment (no addition). Also Mycorrhiza after planting was added to the agricultural medium in one batch, in contact with the roots of the plant, while licorice powder was added in two batches, the first planting (with the addition of Mycorrhiza), the second batch one month after planting. The experiment was carried out according to the randomized complete block design (RCBD), so that the experiment includes 9 treatments in three replicates, each of which counted two pots as an experimental unit.

3. Result and Discussion:
3.1. Plant height (cm)
The vegetative growth is an active stage of cell division and growth. Plant height is one of the vegetative characteristics that are affected negatively or positively by environmental factors [10]. The data in Table (1) shows significant differences between the levels of the two studied factors in this characteristic, the addition of Mycorrhizae caused significant differences, as the treatment 10 gm achieved the highest rate (98) cm compared to the control treatment (water spraying) which It reached 71.20 cm, and the same figure (table) also showed that treating plants with licorice powder gave a significant increase in plant height, as it gave each of the two treatments at a concentration of 100 mg. L\(^{-1}\) and at a concentration of 200 mg. L\(^{-1}\) averaged 101.57 and 110.97 cm for this characteristic, respectively. The results indicate that the interaction between the addition of Mycorrhiza and licorice powder acid has a significant effect on the characteristic of plant height, as the interaction treatment was characterized by a concentration of 10 g. Mycorrhiza and licorice powder each had 200 mg liters, with the highest rate for this characteristic, which was 119.13 cm, surpassing the mean height of other treatments.
Table 1: Effect of Mycorrhizae fungus and licorice powder on the plant height (cm)

| Mycorrhizae fungus(gm) | licorice powder gm | Mean     |
|------------------------|--------------------|----------|
| 0                      | 0                  | 71.20    |
|                        | 100                | 101.57   |
|                        | 200                | 110.44   |
| Mean                   |                    | 94.40333 |

LSD (0.05) Mycorrhizae fungus = 3.8, licorice powder = 3.8

Mycorrhizae fungus(gm) licorice powder gm Mean
0 9.67 13.54 16.33 13.18
5 14.00 17.33 19.77 17.03
10 14.67 17.89 20.33 17.63
Mean 12.78 16.25 18.81
LSD (0.05) licorice powder = 1.8, Mycorrhizae fungus = 1.8

3.2 The number of branches per plant:
The characteristic of the branches in the plant is an important indicator and indication of the abundance of the vegetative growth of the plant, and thus its ability to manufacture carbohydrates, which are necessary materials for the completion of its various vital activities [11]. Table 2 shows significant differences between the averages of the number of branches, as the effect of adding Mycorrhizae fungus(gm) and licorice powder appeared with their interactions in the averages of the number of branches in the plant. The treatment of 10 g Mycorrhizae. That gave an average of 14.67 branches, plant-1, and the treatment of 5 g Mycorrhizae, didn't show any significant difference, as it gave an average of 14.00 branches.plant-1. The same table showed that spraying the plant with licorice powder affected the number of branches per plant, as the treatment at a concentration of 10 gm.L-1, gave a significant difference by giving an average of 16.33 branches per plant compared to the comparison treatment, which recorded an average of 9.67 branches.Plant-1, however, the two treatments at a concentration of 10 gm. Liter-1 licorice powder at a concentration of 20 gm.Liter-1, weren't significantly different from each other.

As for the interaction between the additive Mycorrhizae and licorice powder, a significant increase in the characteristic of the number of leaves resulted in the treatment at a concentration of 10 g. Both microscopic and licorice powder had the highest rate of 20.33 branches per plant.

Table 2: Effect of Mycorrhizae fungus and licorice powder on the number of branches per plant

| Mycorrhizae fungus(gm) | licorice powder gm | Mean     |
|------------------------|--------------------|----------|
| 0                      | 0                  | 9.67     |
|                        | 100                | 13.54    |
|                        | 200                | 16.33    |
| Mean                   |                    | 13.18    |

LSD (0.05) Mycorrhizae fungus = 1.8, licorice powder = 1.8

3.4 Leaf total chlorophyll content (mg. L-1):
Chlorophyll is one of the important and basic pigments found in plants, and by its presence the photosynthesis process takes place as it absorbs light energy and uses it in the production of chemical energy that benefits the plant.

Table 3 shows significant differences between the arithmetic mean of the total chlorophyll trait. Table 3 shows the total chlorophyll rates according to their susceptibility to Mycorrhizae.
fungus (gm) and licorice powder and their interactions, as the table showed significant differences for the two microscopic parameters and their positive effect on the total chlorophyll levels, as the rate of this trait was 1.157 mg\(^{-1}\) soft weight of the treatment 10 grams which didn't differ significantly from the rate of treatment 5gr, which amounted to 1.077 mg\(^{-1}\) soft weight, but they differed significantly from the rate of the comparison treatment, as evidenced by the same figure. The highest was 1.470 mg\(^{-1}\). The fresh weight of the treatment was 200 mg.

The two-way interaction between Mycorrhiza and licorice powder resulted in an increase in the total chlorophyll content of all treatments. The highest content was obtained from treatment T6, which amounted to 2.340 mg\(^{-1}\) fresh weight, which was significantly higher than the rest of the other treatments.

Table (3) Effect of Mycorrhizae fungus and licorice powder on the number of Leaf total chlorophyll content (mg.\(^{-1}\) soft weight)

| Mycorrhizae fungus (gm) | licorice powder gm | Mean |
|-------------------------|-------------------|------|
| 0                       | 0.879             | 1.156|
| 5                       | 1.077             | 1.663|
| 10                      | 1.157             | 2.003|
| Mean                    | 1.037             |      |

LSD (0.05) licorice powder = 0.82
Mycorrhizae fungus = 0.83
licorice powder × Mycorrhizae fungus = 1.12

4. Conclusion:
Mycorrhizae has a significant effect on plant growth and development. A significant response to the addition of licorice powder was also recorded, the results of the research showed that there was a significant agreement between Mycorrhizae and licorice, which had a significant effect on all vital plant activities.

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