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The Effect of Mycorrhizafungus on Growth and Some Physiological Parameters of the Plant of *Salviasclera*

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Abstract
Mycorrhiza fungi stimulate the growth and increase the biomass of host plants by absorbing water and minerals. In order to investigate the effect of mycorrhiza fungus on growth and some physiological characteristics of *Salviasclera*, a randomized complete block design with treatment of plants inoculated with fungi and plants, the results showed that shoot length, root length and plant dry weight in plants Fungal inoculation was significantly higher than control plants. The results of this study showed that inoculation of the plant with mycorrhiza fungus increased the amount of chlorophyll a, chlorophyll b and carotenoids pigments compared to the control plant and this increase was significant only in chlorophyll b and carotenoids. Also, the coexistence of plants with fungi can play an important role in increasing cold tolerance in seedlings by increasing the dry weight of shoots and roots as well as increasing photosynthetic efficiency.
Keywords: Mycorrhiza,*Salviasclera*,effect,physiological,plant

Introduction

Given that humans today have caused a lot of damage to the plant community through their inappropriate interventions, finding a way to deal with these problems can be a significant help to the environment and increase agricultural production. One of these suggestions is studies on the coexistence of microorganisms with plants.Coexistence in one definition means the life of things together in a close relationship in which both things benefit. The coexistence of plants with microorganisms and other living organisms leads to the preservation and stability of plant species. This has led to extensive studies on the diversity of symbiotic fungi and the complex relationships between plant communities. Mycorrhiza is one of the most beneficial symbionts in which the host plant and the coexisting fungi benefit from each other.*Salviasclarea* is one of the

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most appreciated medicinal herbs native to Mediterranean countries, and widely used in medicine and cooking [1], as well as in cosmetics, perfumery and the pharmaceutical industry [2]. Plants from this genus are renowned for their biological activities such as antibacterial, antioxidant, antitumor, antidiabetic, antimicrobial, anxiolytic, sedative and anti-inflammatory activities [3].Today, mycorrhiza has been shown to directly improve plant nutrition through nutrient uptake as well as increase plant water uptake and indirectly reduce biological stresses and plant (and non-biological) diseases, salinity, drought, heavy metals, etc. Increase the growth of the host plant[4].

Coexistence is a special form of life in which two living things of different species live together for almost a long time through physical contact. The amount and dispersion of populations is affected by coexistence. When the plant is inoculated with various microorganisms called symbiosis, the plant is also protected against fungi due to its coexistence with fungal species such as mycorrhiza fungi and rhizospores[5]. Various studies have shown that mycorrhizacontamination is beneficial for plant growth and activity and one of its benefits is to increase the solubility of low soluble phosphorus compounds and some trace elements in soil. And this is the mycorrhiza dependence between different plants[6] Mycorrhiza coexistence is one of the correct and useful methods for development and completion in agricultural industries and increase its sustainability[7].

Material and Methods

Some fungi are separated from the surface of the culture medium by a scalpel and spherical bodies and mycelium of the fungus can be observed under a light microscope using Fuchsin staining. Production of fungal inoculum to contaminate the plant roots requires a sufficient number of fungal spores, so by preparing a sufficient number of pterides containing a complex culture medium containing micro, macro and salts, the fungal isolate is cultured at a temperature of 23-25 ° C. It was kept in an incubator for 4 weeks. After the required time for spore production has elapsed, in order to prepare the inoculum, 20-30 ml of 20-aqueous solution is added to each pteridish and after collecting the fungal spores in each poultry by the number of pestles Use of counted neobar slide. In order to prevent any possible contamination, all equipment, containers, solutions and culture medium were disinfected before use, and also all the mentioned steps are performed under the laminar hood and next to the flame.

Then the fungus is propagated on artificial culture medium which contains high consumption materials and then the seeds are cleaned and dried and the desired soil is sterilized using an autoclave and then the seeds are planted, then from seeds that two to Isolate the grown 3 cm and then inoculate and transfer the pots to the greenhouse for the growth period and then extract the whole plant after cleaning and finally dry weight measurements, Aerial and root height, proline content, chlorophyll pigment measurement are measured and data analysis is performed using SAS software.

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Results and Discussion

According to the problem, it can be said that this fungus increases the dry weight of the plant by its ability to coexist with plants and absorb useful nutrients and trace elements. Also, the positive effect of this fungus on plant biomass can be clearly shown[8, 9], reported that P. indica increased plant growth and yield.Researchers on the artichoke plant Cynarascolymus L. showed that the fungusP. indica causes a significant increase in their growth and yield through coexistence with plant roots. Ghasemnezhad also reported that root and stem length, weight, leaf area size and seed production inSpilanthes and Withaniasomnifera Medicinal plants grow in the presence of P. indicaMycorrhiza fungi are able to coexist peacefully with the roots of most plants. Most of the plants identified on Earth are able to coexist with these fungi, although this coexistence is different based on the root of the host plant and the morphological characteristics of the symbiotic fungus[10].In many studies, the amount of photosynthetic pigments increased under the influence of Mycorrhizafungus P. indica and this increase in chlorophyll b and carotenoids is significant. According to reports, inoculation of P. indica with artichoke showed that increasing leaf width, in fact, leads to an increase in chlorophyll content and ultimately leaf photosynthesis, and in addition to directly increasing the yield of vegetative organs. Also, with increasing photosynthesis, there is an increase in intermediates, most of which are either directly in the secondary material group or eventually convert to secondary metabolites. The increase in photosynthetic pigments by mycorrhiza inoculation was previously confirmed by [11]. Photosynthetic pigments in plants are important for light absorption and crop yield. The increase in chlorophyll and carotenoid content of leaves due to mycorrhiza coexistence is due to increased absorption of phosphorus from soil by these fungi. Increased levels of chlorophyll and carotenoids in various plants under the influence of coexistence with mycorrhiza fungi have been reported.

Proline is one of the most stable amino acids that resists oxidative acid hydrolysis and has the least inhibitory effect on cell growth among all amino acids ,Proline levels in inoculated plants.P. indica showed a statistically significant increase compared to control plants, which indicates the effect of the fungus on increasing the proline content of plants, and this shows that inoculation of the plant with P. indica has an increasing and positive effect on growth. It has the function of plants. Studies have shown that P. indica, in addition to having a direct effect on plant growth by increasing growth and stimulating the immune system, increases plant resistance to disease and drought . Considering that the increase of proline in plants during stress is a kind of defense mechanism and the accumulation of proline helps the plant to survive in a short period after the application of stress and the plant can recover its growth after the release of stress, so the positive effect On plant yield and growth.

The effect of this fungus on the size of aerial part length, root length and dry weight of plants inoculated with the fungus compared to the control plant showed a significant increase that in many studies can be obtained mycorrhizal fungus considered an effect on plant biomass. There is a significant increase. The effect of this mycorrhizal fungus on photosynthetic pigmentation of

chlorophyll, carotenoid of plants, in the group inoculated with the fungus was significant compared to the control group. Also, the effect of the fungus on the proline content of plants in the experimental group was significantly different from that of the control group, which indicates that the plants are more resistant to drought stress after inoculation with P. indica. According to the results of experiments and tests performed in studies, inoculation of mycorrhiza fungus Piriformosporaindica with plants showed that these plants are able to establish a symbiotic relationship with the fungus.

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