Título: INFLUENCIA DE LAS MICORRIZAS ARBUSCULARES (MA)SOBRE EL CRECIMIENTO Y LA CALIDAD NUTRICIONAL DE LECHUGAS (LACTUCA SATIVA L.) CULTIVADAS EN INVERNADERO

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Resumen: Influence of arbuscular mycorrhizal fungi (AMF) on yield and nutritional quality of greenhouse-grown lettuces (Lactuca sativa L.)
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Lettuce exhibits healthy properties due to the presence of antioxidant compounds (e.g vitamin C and E, carotenoids and polyphenols) together with a large fiber content and useful amount of some minerals. Lettuce is also the most used food crop for the so-called "Fourth Range" of vegetables. Arbuscular mycorrhizal fungi (AMF) colonize the roots of the majority of crops and horticultural species to the mutual benefit of both plant host and fungus. The establishment of this mutualistic association involves cellular and molecular dialogue between both symbionts that includes the activation of antioxidant, phenylpropanoid or carotenoid metabolic pathways. Furthermore, it is well-known that AMF can also increase the uptake of mineral nutrients that appear immobile in soils and are essential for plants.
The main objective of our study was to test if the inoculation of greenhouse-grown lettuce with AMF could benefit plant growth and increase the nutritional quality of this crop. This overall objective breaks down into a several partial aims: (1) to study the nutritional quality of various types of lettuce, green and red leaf, highly

commercialized and greatly appreciated for consumption in salads in Spain and Europe; (2) to test if the association of lettuce with AMF favored the accumulation of compounds with potential antioxidant properties (e.g., soluble phenolics, anthocyanins, carotenoids, vitamins C and E), minerals, proteins, sugars and water in leaves of different varieties of lettuce; and (3) to assess the influence of external factors (phosphorous fertilization, water regime, growing season and atmospheric CO2 concentration) on the effectiveness of AMF as possible agents for improving both yield and quality of lettuce.

The results obtained allowed to conclude that the interest dietary of different types of lettuce consumed as salads was due to the accumulation of some of the abovementioned compounds, which differed among distinct types of lettuce. Moreover, in some cases, antioxidant compounds potentially beneficial to human health appeared in greater quantities in the outer leaves, which are usually stripped off during the preparation of this vegetable for consumption.

The association of lettuce plants with AMF clearly benefited plant growth. In addition, mycorrhizal plants had higher concentrations of copper, iron and various antioxidant compounds (mainly anthocyanins, carotenoids and vitamin E) and, to a lesser extent, accumulated more total soluble phenolics. However, the benefit of AMF on yield and nutritional quality of lettuce depends on the species of AMF inoculated, the variety or cultivar of lettuce, the season in which this crop is grown and the type of phosphorus fertilization applied to plants. The application of AMF together with a moderate and prolonged water deficit can increase the accumulation of certain antioxidant compounds, mainly carotenoids and anthocyanins in leaves of lettuce without significant subsequent detrimental effects on lettuce production. Finally, it was found that the accumulation of mineral nutrients and nutraceutical compounds in lettuce leaves induced by AMF in leaves of lettuces grown in CO2-enriched atmosphere may diminish or even disappear, possibly due to the use of photoassimilates produced under elevated CO2 for improving shoot growth and spreading mycorrhizal colonization in roots in detriment to the secondary metabolism.