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Arbuscular mycorrhizal fungi for sustainable agriculture

Los Hongos micorrícicos arbusculares para una agricultura sustentable

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Currently, modern agriculture uses agrochemicals to generate higher yields in its production, which leads to soil degradation, consequently the loss of diversity of biota, especially beneficial soil microorganisms.

The use of pesticides increased 75 % between 2000 and 2017, and in 2018 about 109 million tons were applied of synthetic nitrogen fertilizers around the world, motivating that since the beginning of the 21st century Increase the production of agrochemicals to 2.3 billion tons and it is expected to increase by 85 % in 2030. Annual global production of industrial chemicals has doubled since the beginning of century XXI. The FAO and UNEP assessment predicted that soil and environmental pollution would continue to worsen unless there was a change in the patterns of production, consumption, and a greater political commitment that supports sustainable management and fully respects nature[1].

Soil pollution causes a chain reaction, altering the biodiversity of the soil, reducing the organic matter, its ability to act as a filter, pollutes the water stored in the soil and wáter underground, causing an imbalance of its nutrients. Among the most common soil pollutants are find heavy metals, persistent organic pollutants, and emerging pollutants[1].

For this reason, it is a priority from the economic and ecological point of view, the search for alternatives such as the use of biofertilizers, including arbuscular mycorrhizal fungi (AMF), efficient microorganisms (EM), N_2-fixing bacteria and/or phosphorus solubilizers, among others, that are friendly to the environment, do not generate negative impacts and contribute to the development of sustainable and competitive agriculture, based on agroecological principles.

Especially AMF, according to various studies has been very efficient as a substitute for mineral fertilizer due to its ability to combine with organic matter, it is attributed to greater efficiency, as it has an effect synergistic[2]. Thus, the AMF contribute to improving the productivity and quality of the crops, for this, it is necessary to have to take into account the introduction of these in the rhizosphere of the plant, of highly efficient species and to carry out practices management to optimize the benefit of native species and improve soils.

The use of AMF association in agriculture reduces production costs, healthy crops are obtained and productive, early harvests, is totally biological, increases crop yields by up to 30 %, increases the health of the crop and the soil, reduces water consumption, improves water use by up to 30 %, improves the plant from the root, promotes the absorption of environmental nitrogen, helps solubilization of essential nutrients such as phosphorus

and potassium, stimulates the formation of hormones that help to create a larger root system[3], they are found naturally in the soil, they do not contaminate the ground, nor harm to man. These microorganisms act as soil quality improvers and environmental conservatives[4].

Several countries are using and producing AMF inoculums in crops: Argentina in grasslands, Bolivia, Colombia, Cuba in important crops such as rice, cotton, corn, wheat, soybeans, beans, and sunflower, on average of all crops, a 43 % increase in yield was achieved. Brazil, Costa Rica, Spain, States States, France, Mexico, Chile, among others.

Research work is being carried out on the production of AMF inocula and the use of these in different crops in the field, which will contribute to reducing the use of agrochemicals, improving the quality and crop production.

The adoption of this practice would mean the development of sustainable agriculture in the high Andean areas of the South American countries that still hold the title of being organic producers.

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