Mass Production Techniques of Arbuscular Mycorrhizal fungus

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Introduction

Arbuscular mycorrhizal symbiosis is a "universal symbiosis," and the advantages of these relationships have been well investigated. Arbuscular Mycorrhizal (AM) fungi are members of the phylum Glomeromycota and are obligatory symbionts. The three parts of this symbiosis are the rhizosphere, the fungal component and the host plant. Their distinctive structures, vesicles and arbuscules, serve as a means of identification. Arbuscules are branched, haustoria-like structures found in cortical cells that facilitate the feeding of the host plant with nutrients. Storage organs known as vesicles come in a variety of forms, from globular to bean-shaped. Certain genera, like Gigaspora and Scutellospora also produce auxiliary cells in addition to arbuscules. By improving nutrient uptake, VAM fungus may independently improve plant health and productivity. Many nutrients, including phosphorus (P), nitrogen (N), potassium (K), calcium (Ca), sulphur (S), manganese (Mn), copper (Cu) and zinc (Zn) are absorbed by VAM fungi from the soil and subsequently transferred to the plants. The most constant and significant function is to enhance the uptake of nutrients that are immobile such as P, Cu and Zn.For the commercial manufacturing of the inoculum, a variety of culture techniques are available for the mass production of VAM fungus. Low-cost technologies must be developed in order to increase the production of these beneficial and commercially significant microorganisms.

Selection of VAM host Plants

More inoculum levels and VAM fungal sporulation are influenced by the choice of host plant utilised to grow VAM fungal species in pot cultures. The ability to withstand the growing conditions required to suit the chosen VAM fungal species is a fundamental consideration when selecting host plants. The chosen host plant species should be able to withstand relatively low phosphorus levels, have a short life cycle, grow a root system that is sufficient and be colonised by a large number of VAM fungus. Additional noteworthy attributes include a broad tolerance range for temperature and low sensitivity to infections, both of which are critical for optimising inoculum generation.

Due to its varying nutrient requirements, the host plant selection may affect the degree of colonisation of some VAM fungal species as well as the intensity of VAM fungal sporulation. The most appropriate host for mass production of certain VAM species was Eleusine coracana. Additionally, a greater quantity of VAM fungal entry sites was noted, which contributes to improved root colonisation in the carefully regulated culture conditions.

Root trap cultures

Selected plant species' roots are removed from the field, chopped into 1-cm pieces and inserted into a sterilised sand:soil (1:1) mixture with a diameter of 10–20 cm, at a depth of 5-8 cm. Pots are completely cleaned beforehand using cotton dipped in 100% pure alcohol. The containers are filled with 7 cm tall cuttings of a chosen host plant species that have been surface sterilised. The roots are examined for fungal colonisation by VAM within 28–45 days of plant growth, depending on the species of the host plant. For 58–190 days, the plants are kept in order to establish VAM fungal colonisation and sporulation. After the plants have dried off the roots are finely chopped and combined. The mixture is then placed in a zip-lock polythene bag, labelled and stored at 4 °C. This was used as inoculum for the preparation of monospecific VAM fungal cultures.

Plant trap cultures

The native habitat of small herbaceous plants or seedlings of shrubs or trees is carefully removed. Before planting in the sterilised sand, fine roots are completely cleaned of any clinging soil using a 20 cm diameter dirt:soil (1:1) mix. Trypan blue (0.05%) staining of the sample is used to determine whether VAM fungal root colonisation has occurred after 35–70 days of growth. Depending on the kind of VAM fungal species chosen, the plants are kept for 50–150 days in order to establish colonisation and maximise VAM fungal sporulation.

Soil as inoculum

Soil inoculum was made from rhizosphere soil from a plant's root zone that was home to VAM fungus. Inoculums derived from soil may not be dependable unless the quantity, variety, and activity of native VAM fungal species are understood.

Microenvironment

There was a unique microenvironment created to improve VAM mass production. Here, the potted plant was covered with a straightforward polythene bag. Cut a length of around 5 to 6 cm on one side of the polythene bag at the upper half. The polythene bag's open end is sealed. There are specified parameters (temperature of 25°C) and minimal watering (one a week). Because the polythene bags covering potted plants collect water droplets, the amount of water that the host plant needs to accomplish photosynthesis each day is decreased. This is kept up in a polyhouse setting. The host in this investigation was E. coracana. Maximum Value was compared to plants growing without a microenvironment, fugal colonisation was seen in plants exposed to one. Plants growing in a microenvironment likewise had the highest spore density.

Arbuscular Mycorrhizal fungi are a crucial part of a programme for establishment and managing nutrients that aid in the development of new plant species. Reducing the external P need of plants through better management of a balanced nutrient supply has a significant positive impact on the environment.

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