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Application of Plant Growth Promoting Filamentous Fungi in Fertilizing Pastures for Animal Consumption

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Introduction

Fungi are a diverse group of heterotrophic eukaryotic organisms that lack phagotrophy and have cellulose, chitin, or both as their cell walls. These organisms lack chlorophyll, are not photosynthetic, do not have a nucleus, reproduce sexually or asexually (through spores), and have branched, filamentous somatic structures. There are microscopic fungi (mycelial fungi, also known as molds) that cannot be observed with the naked eye and macrofungi, also known as macrofungi. They can be composed of a single cell (unicellular) or a large number of cells. Fungi have conquered numerous ecological niches and established an entire world of interactions with other living organisms thanks to their morphological characteristics and extremely high metabolic diversity. With approximately 120,000 species of fungi already described, it is estimated that there are 2.2 to 3.8 million species of fungi on our planet. Fungal habitats include soil, water, and extreme environments. Contributing to the decomposition of organic matter and participating in biological cycles, fungi are essential to the ecosystem's functioning. Different types of fungi, such as saprotrophs, symbionts, neutrals, or parasites, can live in the same environment. Due to their ecological plasticity, some species can adapt to hostile environments, while others are cosmopolitan. They have a variety of pre-adaptations, such as asexuality, the production of pigments like melanin, and flexible morphologies, that make it easier for them to persist and adapt to harsh environments. Fungi also focus on developing abilities that enable them to exploit the natural or xenobiotic resources that are available under the constraints to which they are exposed when they are exposed to extreme environmental conditions and low competition [1].

Description

All existing life forms and, as a result, all ecosystems are affected in some way by these organisms. The vitally environmental connections of parasites are with different growths, protozoa, creatures, and plants. Fungi have caused diseases in both animals and plants within these ecological relationships, making research, diagnosis, treatment, and control a constant challenge. However, given their high potential to replace the use of synthetic chemical products, the wide variety of fungi has also made it possible to investigate their use as tools in the management of plant diseases (fungal biocontrol agents). Due to a sophisticated genomic network, fungi also have remarkable metabolic characteristics and are necessary for the production of biotechnological compounds that have a significant impact on our society in numerous ways (products that are useful in industry and medicine secondary metabolites, vitamins, plasma substitutes, anticancer agents, healing accelerators, proteins, polysaccharides, and organic acids).

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However, despite the fact that several species of filamentous fungi naturally form positive, neutral, and negative associations with pastures, the use of filamentous fungi to encourage the growth of forage pastures has received little attention. In the quest for environmentally friendly farming methods, the use of filamentous fungi that encourage the growth of forage pastures has recently been considered an alternative to synthetic fertilizers. It has been reported that the inoculation of forage pastures with filamentous fungi has assisted plants in coping with salinity stress, enhanced pasture growth, and enhanced pasture quality as forage, all of which contribute to improved nutrition for animals. Therefore necessary to address the problem of soil fertility with the inclusion of microorganisms that promote plant growth, together with phosphorus-solubilizing microorganisms and nitrogen-fixing bacteria, in production programs for pastures intended for animal consumption, the use of microorganisms being made a viable alternative to excessive fertilizer use in order to reduce the costs and environmental impacts they cause, such as increasing the risk of soil and water contamination by nitrates. Therefore, it is of great importance to develop agricultural practices that allow the maintenance of the production of forage pastures with greater sustainability [2-5].

Conclusion

For a number of decades, various fungal groups associated with grasses that are pathogens, commensalists and mutualists have been reported. The genetic factors in each of the two partners are highly variable and have a variety of effects on plant fitness. In addition, both biotic and abiotic factors have the potential to alter the natures of these relationships. Endophytic fungi of the leaves, endophytic fungi of the roots, and mycorrhizae are examples of fungi that associate with grasses. Through the promotion of a level of jasmonic acid that is antagonistic to the salicylic acid pathway in the plant, some of these fungi provide their grass hosts with advantages such as (1) resistance to grazing herbivores, (2) resistance to nematodes, (3) resistance to pathogenic fungi, (4) higher photosynthetic rates, (5) drought tolerance, (6) protection against extreme environmental fluctuations caused by climate change, and (7) persistence in the field. The Ascomycota family is home to the majority of the fungi that are associated with grasses. These fungi grow systemically and intercellularly in the aerial parts of grasses, and the asexual symbionts of this division are vertically transmitted to grasses. This information suggests that there is still a lot to learn about the positive interactions between forage pastures and filamentous fungi. These fungi offer alternatives to chemical fertilization, which has the drawback of reducing soil fertility and contaminating soil and water bodies. Chemical fertilizers have also recently seen an increase in cost as a result of the conflict between Russia and Ukraine. Several of these filamentous fungi are naturally associated with forage pastures, so they could be a sustainable and less expensive resource for the production of pastures (Figure 6), assisting in the raising of animals without affecting soil fertility.

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