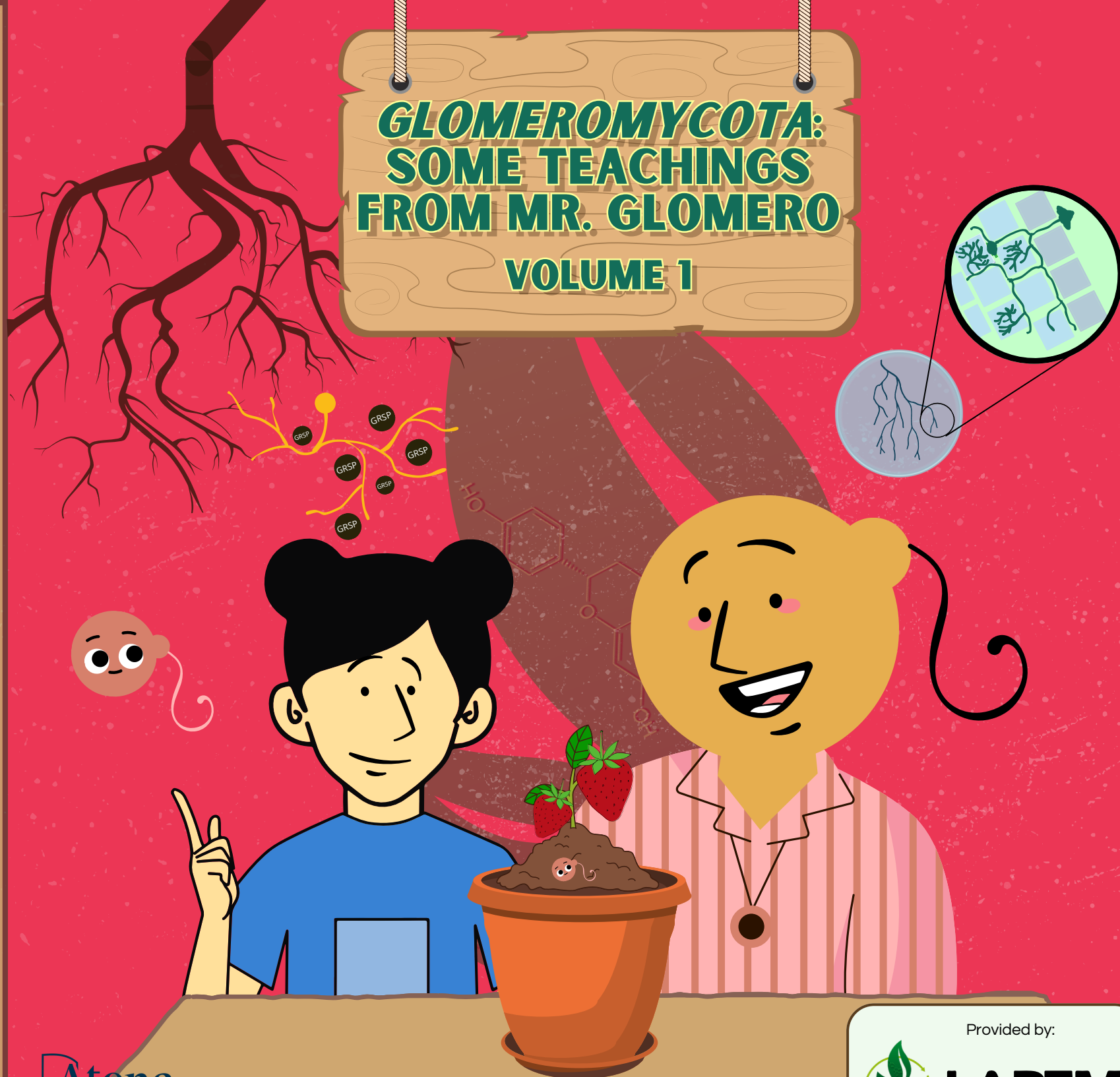


# GLOMEROMYCOTA: SOME TEACHINGS FROM MR. GLOMERO VOLUME 1



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# Glomeromycota: some teachings from Mr. Glomero - Volume 1

| Organizer:

Fábio Sérgio Barbosa da Silva

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# TEACHINGS FROM MR. GLOMERO

This booklet is the result of the scientific dissemination of basic information about arbuscular mycorrhizal fungi, in the shape of educational comics, on the Instagram profile of the Laboratory of Analysis, Research, and Studies on Mycorrhizae (LAPEM/UPE) - @lapem\_upe. This is a revised and translated version from Portuguese (DOI: 10.22533/at.ed.547241906).

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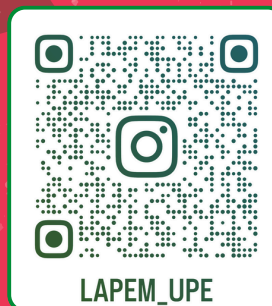
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DOI: Digital Object Identifier



# INTRODUCTION

Mycology is the science dedicated to the study of fungi. These organisms are used in various sectors, such as the food, pharmaceutical, and cosmetic industries. Among the different groups, arbuscular mycorrhizal fungi (AMF) stand out. These microorganisms, from the *Glomeromycota* phylum, can be used in agriculture, benefiting plant growth due to greater nutrient uptake, as well as improving soil health and fertility.

Given the relevance of these fungi, this booklet was developed to promote awareness about AMF and their potential application in plant cultivation. To this end, comic strips were created during 2021, in the context of the COVID-19 pandemic, and posted on the Instagram profile of the Laboratory of Analysis, Research, and Studies on Mycorrhizae (LAPEM/UPE) at the Institute of Biological Sciences, University of Pernambuco, LAPEM (@lapem\_upe).



# INTRODUCTION

To reach readers, we opted for a more accessible language, creating a series of comic strips featuring playful characters who discuss basic knowledge and curiosities about mycorrhizal technology. In this context, the idea arose to expand this approach into an educational booklet on AMF, compiling selected episodes that were previously published on Instagram in Portuguese. Now, this booklet is revised and translated into English to reach a broader audience.

In this first volume of the booklet, the symbiotic relationship between AMF and plants will be presented, how these fungi colonize the roots, and the mycorrhizal structures involved in each stage of the association. Finally, the benefits of AMF to plants and soil will be discussed, contributing to the dissemination of this sustainable agricultural alternative. To help with this task, we will have as characters Glomerospore, Mr. Glomero, and his student, Acaulosporilda.

Enjoy your reading!



**THE COMIC STRIPS ARE PRESENTED IN THE FOLLOWING WAY:**

**1**

**WHAT ARE ARBUSCULAR MYCORRHIZAL FUNGI (AMF)?**

**2**

**HOW IS THE RELATIONSHIP BETWEEN AMF AND PLANTS?**

**3**

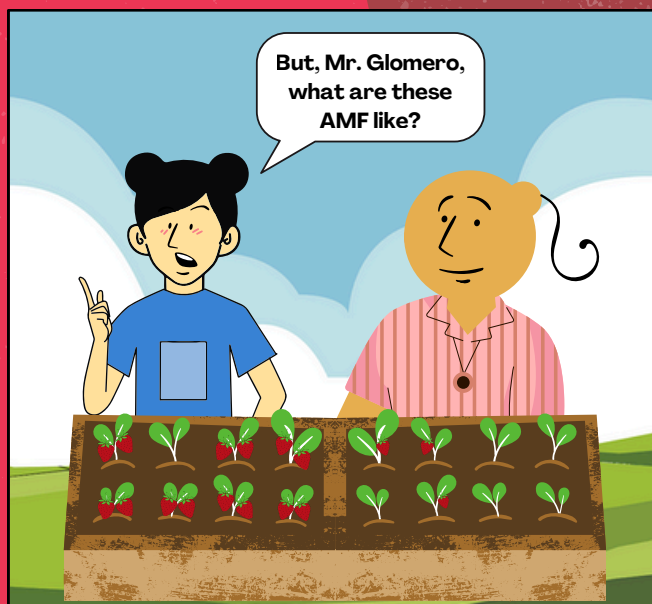
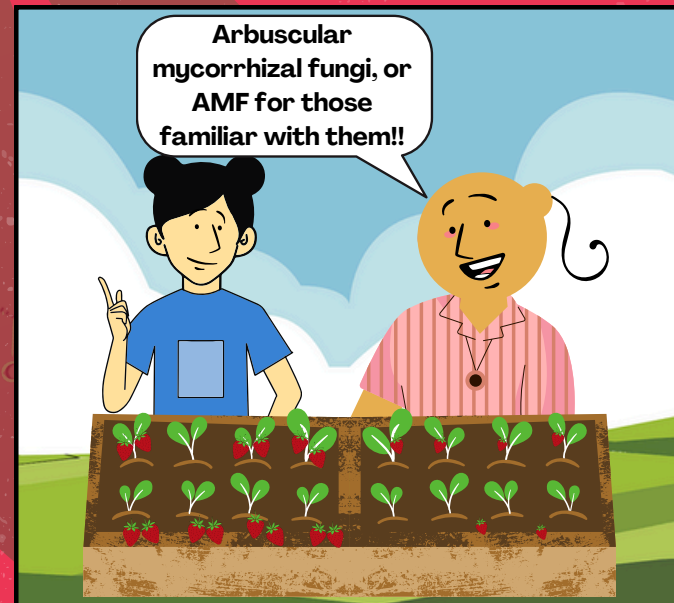
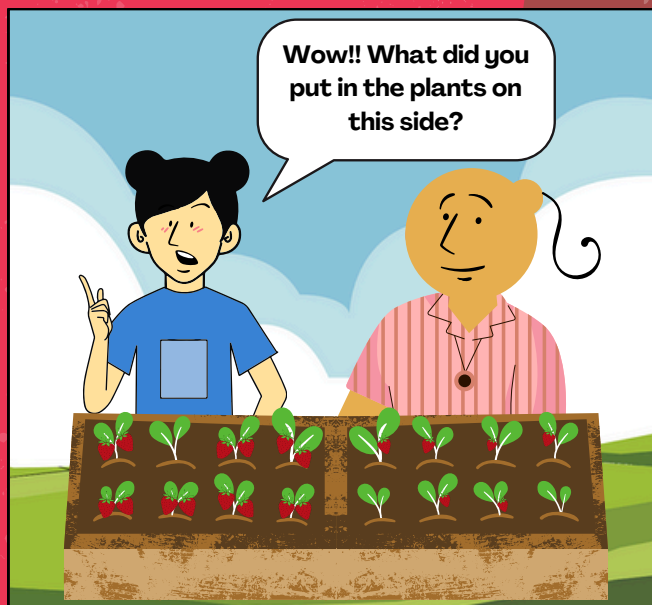
**HOW CAN THE AMF BENEFIT THE PLANTS AND SOIL?**



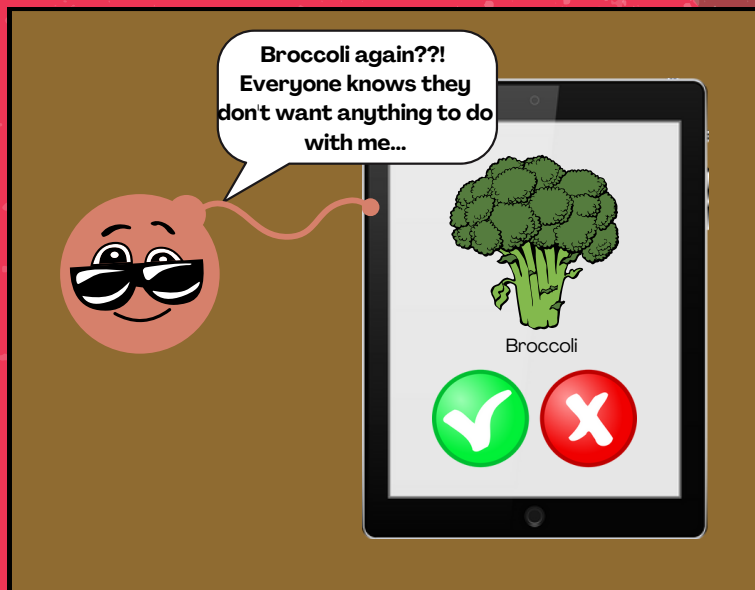
## Teachings from Mr. Glomero - Part 1

### WHAT ARE ARBUSCULAR MYCORRHIZAL FUNGI (AMF)?

Arbuscular mycorrhizal fungi (AMF) are a group of microorganisms found in soil and known for forming mutualistic symbiosis, a friendly relationship with plants. When these fungi establish this 'friendship', they provide a series of benefits to the plant, in addition to contributing to soil health. See how Mr. Glomero will introduce AMF to his student, Acaulosporilda.

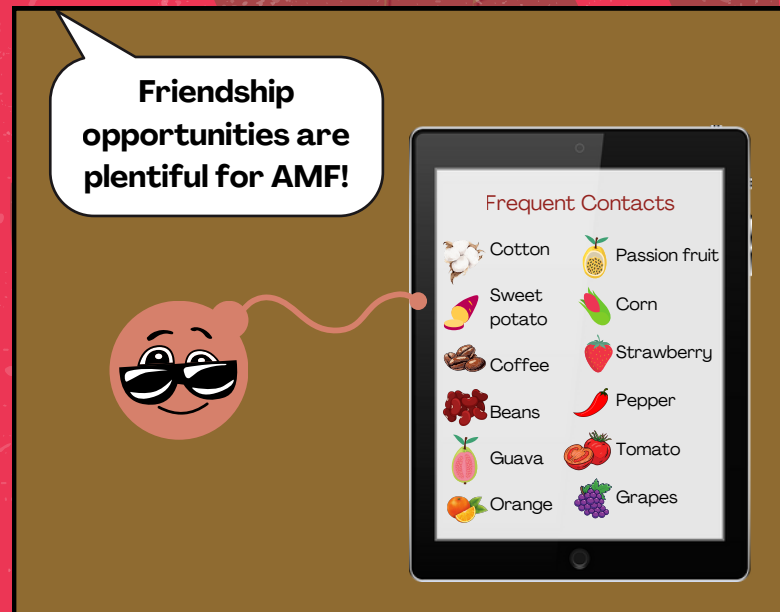
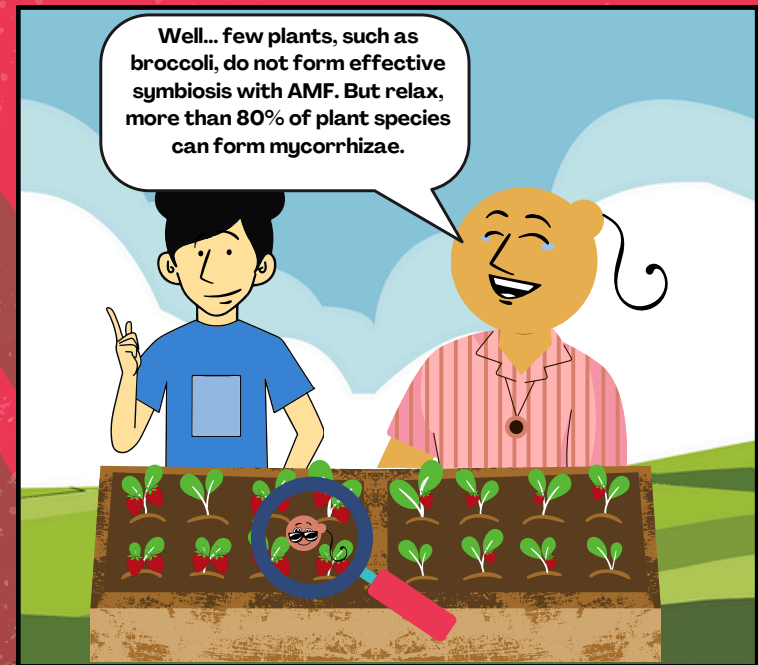
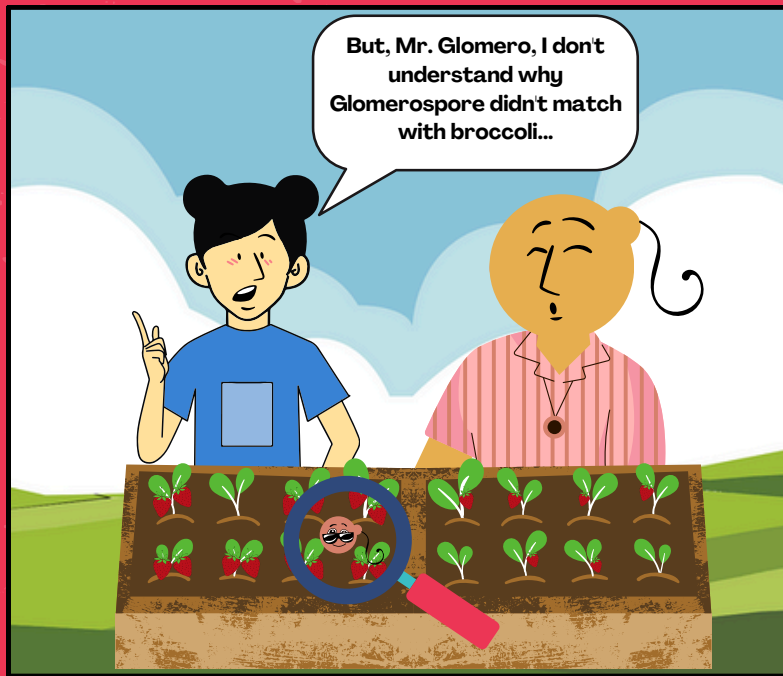



# Teachings from Mr. Glomero - Part 1





# Teachings from Mr. Glomero - Part 1



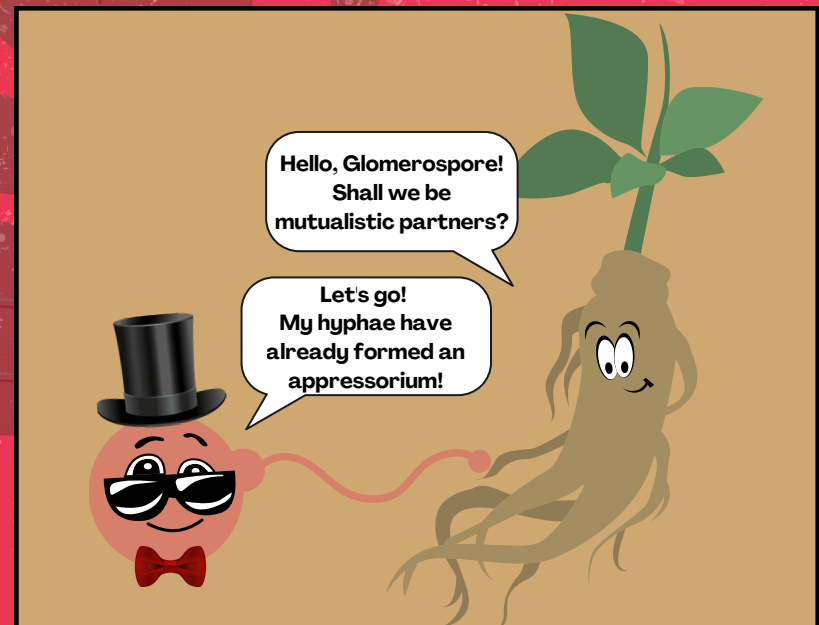
 For more information, access the references:

- SMITH, S. E.; READ, D. J. Mycorrhizal symbiosis. 3<sup>a</sup> Ed. London: Academic Press, 2008.
- BRUNDRETT, M. C.; TEDERSOO, L. Evolutionary history of mycorrhizal symbioses and global host plant diversity. New Phytologist, v. 220, p. 1108-1115, 2018.
- GENRE, A. et al. Unique and common traits in mycorrhizal symbioses. Nature Reviews Microbiology, v. 18, p. 649-660, 2020.

## Teachings from Mr. Glomero - Part 2

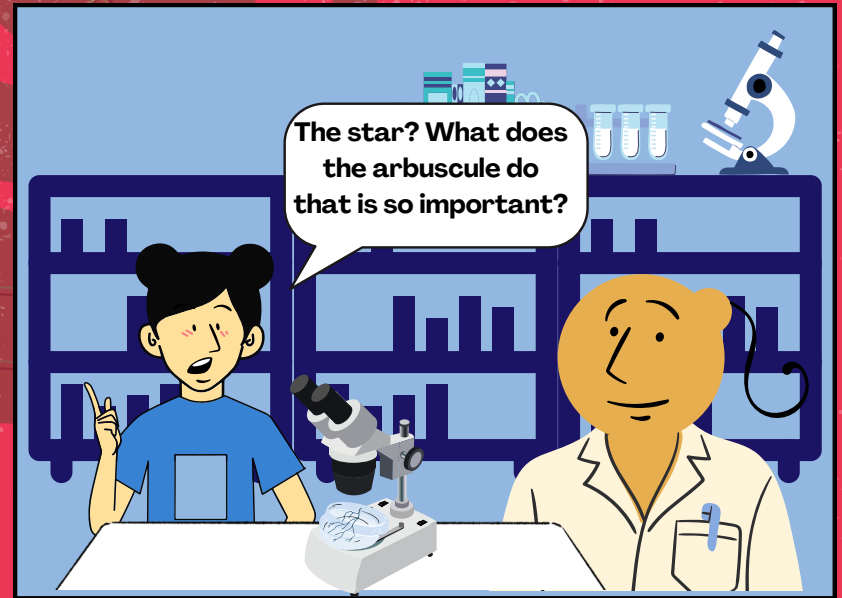
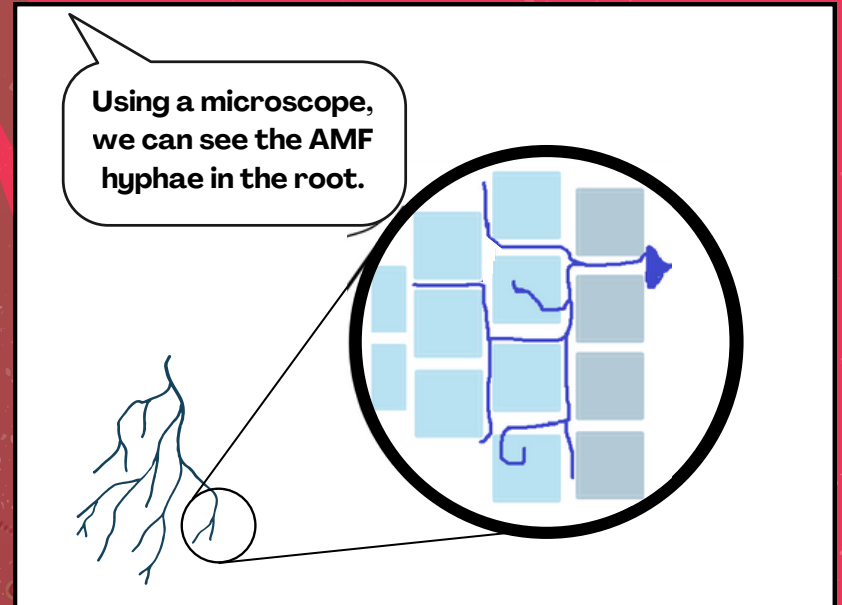
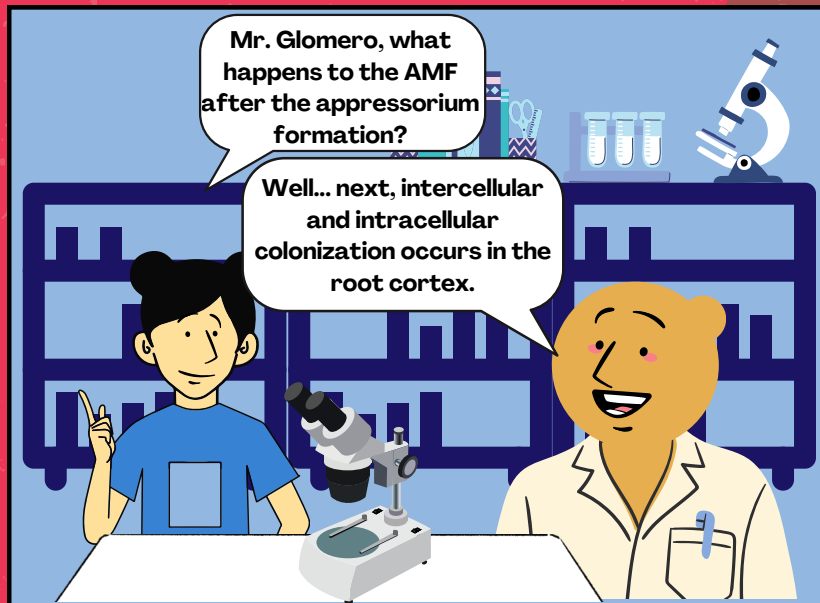
### HOW IS THE RELATIONSHIP BETWEEN ARBUSCULAR MYCORRHIZAL FUNGI AND PLANTS?

The symbiotic relationship between plants and AMF is formed when the hypha, one of the main structures of the fungus, modifies itself into an appressorium. The hypha then explores the intercellular and intracellular spaces of the root. The intraradicular hyphae undergo modifications, forming a tree-like structure known as an arbuscule. Thanks to arbuscules, exchanges of resources between the plant and the fungus occur. It is important to remember that AMF do not damage the plasma membrane, as this is a characteristic of fungi that cause disease in plants. See how this happens in the comic strip:

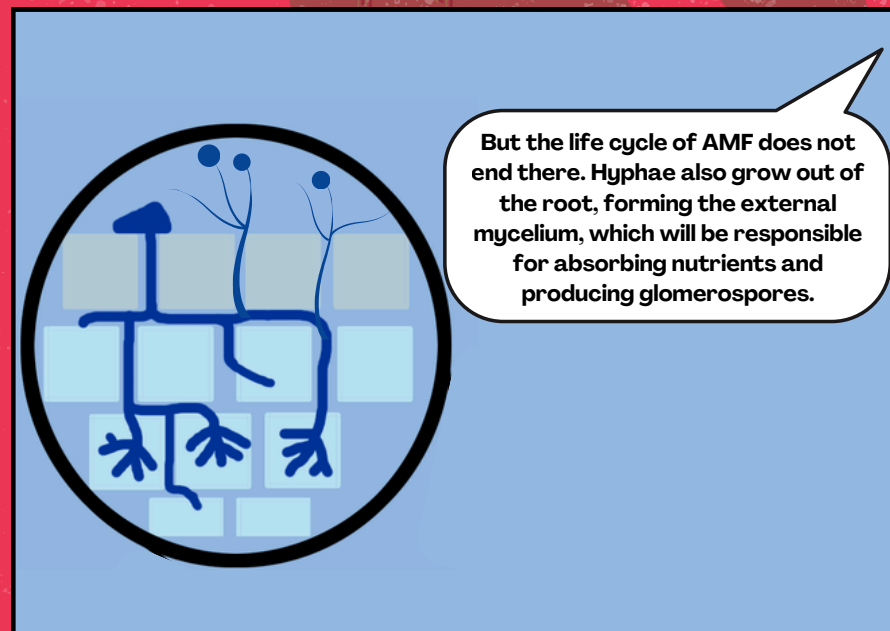
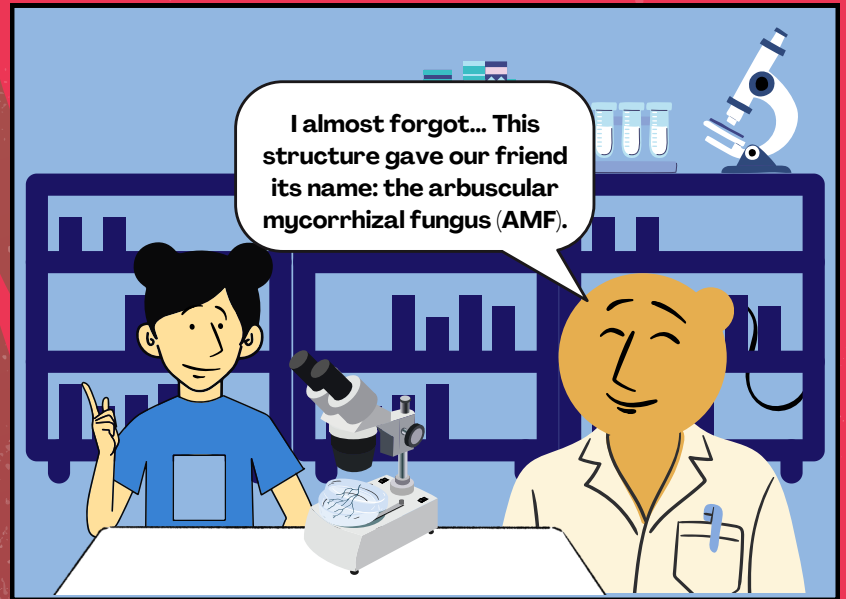
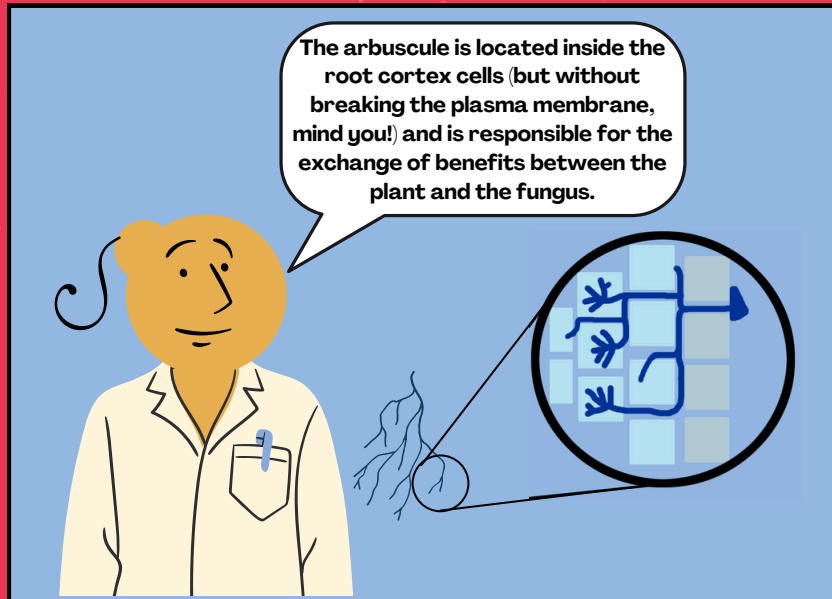




## Teachings from Mr. Glomero - Part 2



## Teachings from Mr. Glomero - Part 2



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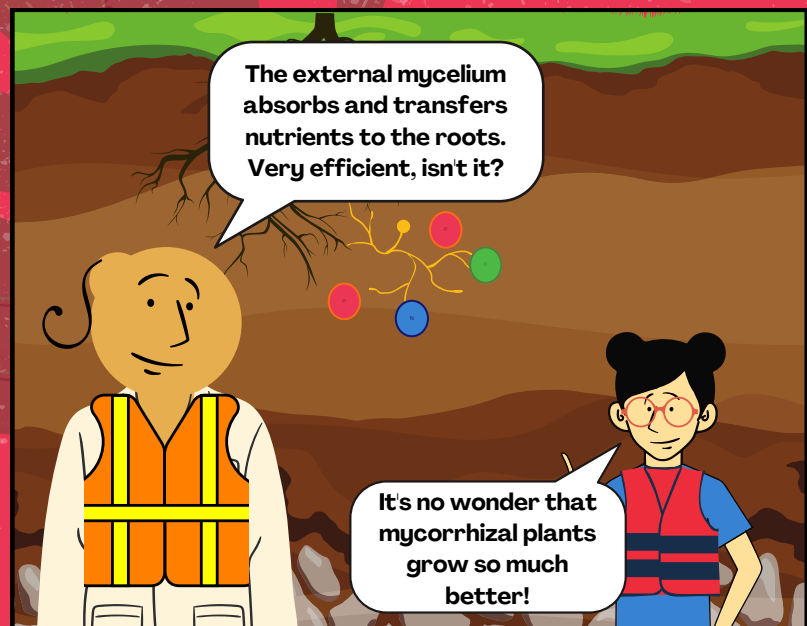
- BONFANTE, P.; GENRE, A. Plants and arbuscular mycorrhizal fungi: an evolutionary-developmental perspective. *Trends in Plant Science*, v. 13, p. 492–498, 2008.
- HART, M.; KLIRONOMOS, J. Colonization of roots by arbuscular mycorrhizal fungi using different sources of inoculum. *Mycorrhiza*, v. 12, p. 181–184, 2002.
- WILLIS, A.; RODRIGUES, B. F.; HARRIS, P. J. C. The Ecology of Arbuscular Mycorrhizal Fungi. *Critical Reviews in Plant Sciences*, v. 32, p. 1–20, 2013.



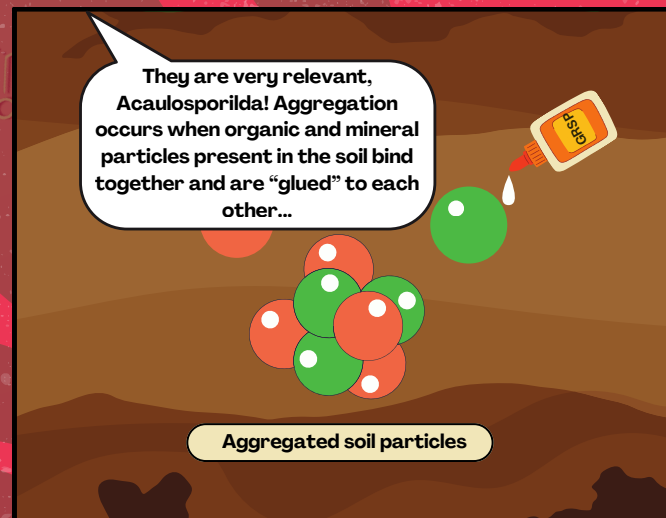
## Teachings from Mr. Glomero - Part 3

### HOW CAN THE AMF BENEFIT THE PLANTS AND SOIL?

With the establishment of a mutualistic symbiotic relationship between the host plant and AMF, several benefits can be observed in the plant; increased growth and improved mineral nutrition are some of the most common. To understand these mechanisms, it is important to know how AMF develop in the soil and what changes their presence can cause. In this regard, the following comic strip addresses the role of hyphae, which compose the external mycelium of AMF, and how their development in the rhizosphere can benefit the plant and the soil.



## Teachings from Mr. Glomero - Part 3



GRSP: Glomalin-Related Soil Proteins



For more information, access the references:

- PARIHAR, M. *et al.* The potential of arbuscular mycorrhizal fungi in C cycling: a review. Archives of Microbiology, v. 202, p. 1581–1596, 2020.
- SINGH, P. K.; SINGH, M.; TRIPATHI, B. N. Glomalin: an arbuscular mycorrhizal fungal soil protein. Protoplasma, v. 250, p. 663–669, 2013.
- SINGH, A. K. *et al.* The role of glomalin in mitigation of multiple soil degradation problems. Critical Reviews in Environmental Science and Technology, v. 52, p. 1604–1638, 2022.



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**WHAT DID YOU LEARN ABOUT THE AMF?**

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