TITLE: COMPARATIVE ECOPHYSIOLOGY OF THE ASSOCIATION BETWEEN ARBUSCULAR MICORRYZAL FUNGI AND RICE PLANTS OVER-EXPRESSING VACUOLAR H^+-PPase (AVP1OX)

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ABSTRACT:

The use of fungi that promote plant growth is an important strategy for the development of sustainable agriculture. Transgenic plants with overexpression of the AVP1 gene (AVP1OX), which encodes the vacuolar H^+-pyrophosphatase, induce similar responses to those promoted by arbuscular mycorrhizal fungi (AMF). Therefore, the use of AVP1OX plants inoculated with AMF can generate several benefits, such as increased productivity through increased nutrient uptake and tolerance to biotic and abiotic stresses. However, little is known about the specificity of AMF, the impact that transgenic plants may have on the rhizosphere and the function of these soil microorganisms. Thus, the objective of this work was to analyze microscopically the colonization process of wild-type (WT) rice (*Oryza sativa* L.) and transgenic (AVP1OX) rice by the AMF *Claroideoglomus etunicatum*, *Rhizophagus clarus*, *Acaulospora colombiana* and to correlate ultra-structural changes at the cellular level with the ecophysiological changes, through the analysis of photosynthetic and growth parameters. Four plants per treatment were randomly collected at 60 days after inoculation with the AMF to evaluate height and shoot dry matter. IRGA was used for the photosynthetic analyzes and ultra-structural changes were observed through optical microscopy with specific staining. WT plants inoculated with AMF showed significant changes compared to non-inoculated plants. AVP1OX plants showed greater carbon assimilation capacity and water use efficiency when compared to WT plants. Mycorrhizal colonization with vesicles formation were observed in the micrographs. We concluded that AVP1OX rice plants had higher photosynthetic rate and water use efficiency in relation to WT plants, but when inoculated with the *Rhizophagus clarus*, these plants showed lower photosynthetic parameters. On the other hand, WT rice plants inoculated with the same AMF, showed increased growth and photosynthetic parameters.

Keywords: arbuscular mycorrhizal fungus, H^+-pyrophosphatase, sustainable agriculture.

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