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The role of arbuscular fungi on crop quality

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It is well known that *mycorrhizal* symbiosis can improve plant growth and productivity under limited supply of phosphorus, water, or other nutrients. We have started studies to investigate if the *mycorrhizal* symbiosis would also affect food quality by changing the levels of polyphenols/flavonoid in different plant species. In addition, we are examining changes in polyphenol levels of a cultivar when inoculated with different species a plant. Using UHPLC/UV-MS, our initial studies, with leeks have identified eight species of kaempferol glycosides in the leek shoots. In addition to different numbers of hexose residues attached to kaempferol, we also identified hexuronic acid, malonyl, feruloyl, coumaroyl moiets attached to agylcone. Of these flavonoids, five occurred in significantly higher amounts in *mycorrhizal* plants compared to control. The levels of two flavonoid species were found lower, and one unchanged in *mycorrhizal* plants compared to controls. It was interesting to note that some of these flavonoid glycosides increased substantially even in the presence of full nutrient supply under which condition there was no overall increase in plant growth of the *mycorrhizal* plants compared to controls. Thus, indicating the direct involvement of mycorrhizae in plant secondary metabolism changes in polyphenol levels due to different species of fungi and different cultivars is being investigated.

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Spatial distribution of mercury and gold in roots of cassava (*Manihot esculenta*) by micro-PIXE

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Removal of mercury (Hg) by plant species offer new options to clean up Hg-contaminated sites and at the same time harvest gold (Au). Localization of Hg and Au in root tissues of a potential phytoremediator, cassava (*Manihot esculenta*), was investigated by micro-proton induced X-ray emission (micro-PIXE) spectrometry to gain a better understanding of Hg and Au uptake. Cassava cuttings were grown in a hydroponic culture for one week under controlled conditions and then exposed to different concentrations of Hg and Au solutions for six days. Qualitative elemental micro-PIXE analysis revealed that Hg was found all over the root cross-section but mainly localized in the endodermis and the root vascular bundle, for both low (50 μM Hg) and high (100 μM Hg) Hg treatments. The same is true for both the low-Au (50 μM Au) and high-Au (100 μM Au) treatment, with less localizations of Au in the former. Interestingly, plant exposure to equimolar concentrations of Hg and Au (50 μM Hg+50 μM Au) revealed both elements to be localized only in the epidermis, which was not the case when the plants were exposed to either Hg or Au alone. This suggests a plausible uptake competition between the two metals. Lastly, in the treatment where the Hg concentration is increased relative to the Au concentration (100 μM Hg+50 μM Au), Au was found to be strongly localized in the epidermis while Hg was found in all parts of the plant tissue, further confirming the hypothesis the Hg and Au could possibly be competing for uptake at the epidermal level.

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