Effect of Mimosa Plant Phytochemicals on the Stress Response Pathways of Caenorhabditis elegans

Voia, Anna (School: College Jean-de-Brebeuf)

The touch-sensible plants of the Mimosa genus are a factory of phytochemicals that could prolongate lifespan and treat autoimmune diseases such as diabetes. While its phytochemical flavonoids quercetin and myricetin have been studied in the development of natural adjuvants to treat autoimmune diseases linked to high levels of reactive oxygen species (ROS), the triterpenoid lupeol has not been characterized in model organisms. The current research employed C. elegans to assess whether lupeol elicits antioxidant response in vivo. The nematodes were treated with quercetin, myricetin, and lupeol, as well as with combinations of the prooxidant paraquat. The intensity of ROS in the pharynx and the expression of several stress response genes activated downstream the IIS and p38 PMK-1 MAPK pathways were measured using two microscopy reporter assays. Data were analyzed with a one-way ANOVA test. Lupeol reduced ROS and gst-4 levels from paraquat-induced stress ($p<0.0001$), increased skn-1 levels from a normal state ($p<0.001$), and led to cytoplasmic translocation in 27% more daf-16 nematodes than normal. Results demonstrated that flavonoids and lupeol act similarly in C. elegans, downregulate the DAF-16/FOXO transcription factor, and have potential to reduce ROS through the modulation of SKN-1/Nrf2 in response to oxidative stress. Therefore, this study showed, for the first time, that lupeol is a potent antioxidant in vivo in C. elegans. This finding gives insight into how phytochemicals from a common weed could reduce inflammatory response and shows promise in the development of natural and accessible adjuvants to treat autoimmune diseases linked to high ROS levels.

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