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Glandular trichomes as a barrier against atmospheric oxidative stress

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Glandular trichomes on leaves store and secrete high amounts of secondary metabolites and are thought to play an important role in plant defense against biotic and abiotic stress. However, little is known about the function of glandular trichomes with respect to oxidative stresses such as ozone stress. The aim of the present study was to characterize the morphology and density of trichomes in 15 species and to evaluate their antioxidant role against ozone stress. We investigated the structure and density of glandular trichomes and ozone-induced visible leaf damage and changes in physiological parameters such as net assimilation rate (An), stomatal conductance (gs), chlorophyll fluorescence and lipoxygenase pathway products (LOX products) emissions from leaves under ozone stress. We show that both peltate and capitate glandular trichomes play a critical role in reducing leaf ozone uptake. Species with low trichome density were more sensitive to ozone stress and more vulnerable to ozone damage compared with species with high trichome density, which are more ozone tolerant. These results demonstrate that glandular trichomes at the leaf surface constitute a major factor in reducing ozone toxicity stress and function as a chemical barrier which improves the ozone tolerance of plants.

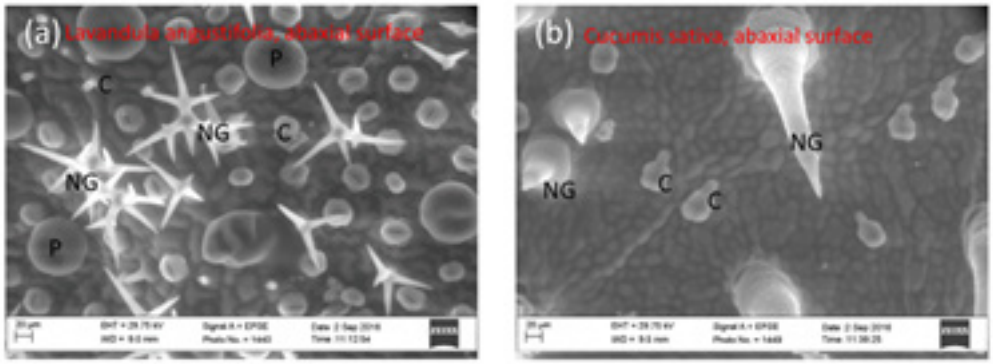

Figure 1: ESEM micrographs of a) Non-glandular (NG) and large peltate (P) and two types of capitate (C) glandular trichomes on abaxial surface of Lavandula angustifolia and b)Abaxial surface of Cucumis sativa containing non glandular (NG) and glandular capitate type trichomes (C). Scale bars on the left.

Biography

Shuai Li is currently working as a junior researcher at the Estonian University of Life Sciences. His research focuses on the impact of abiotic stress such as ozone, heat stress on the emissions of volatile organic compound (VOC) from leaves and flowers.

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