

The Effects of Gaseous Ozone and Nitric Acid Deposition on Two Crustose Lichen Species From Joshua Tree National Park

Elizabeth C. Hessom¹, Pamela E. Padgett², David R. Parker¹

Lichens lacking root systems, are dependent on atmospheric deposition for the majority of their water and nutrients. This reliance however, makes lichens highly sensitivity to atmospheric conditions and pollutants. It is this sensitivity that often allows lichens to be used as bioindicators for air quality. While studies have shown that epiphytic (tree dwelling) lichens show much promise as bioindicators, virtually nothing is known about crustose (rock dwelling) lichens. The atmospheric pollutants ozone (O₃) and nitric acid (HNO₃) are two major pollutants found within the Los Angeles Basin. Ozone has been shown to not significantly affect lichen; however HNO₃ has not been extensively studied, and seems to be phytotoxic to some lichen. Both of these pollutants are deposited downwind from the L.A. basin into Joshua Tree National Park. A gradient of these pollutants in the Park has been demonstrated by previous research. We studied two lichen of particular interest from Joshua Tree National Park, *Lobothallia praeradiosa* (Nyl.) Hafellner, and *Acarospora socialis* H. Magn., both of which are crustose species with unknown sensitivities to ozone, as well as unknown and hypothesized tolerances to nitrogen compounds, respectively. Little research exists for either species, possibly because of how difficult it is to work with crustose lichen. This research attempts to expand the background knowledge of these species by fumigating them with varying levels of ozone and nitric acid, to ascertain physiological responses to the pollutants. Because of the lack of knowledge, it is difficult to predict their responses to the fumigations, however based on previous research; it is fair to postulate that both species may not be affected during the O₃ fumigation exposures. Additionally, based on *Acarospora*'s nitrophilous response to nitrogen pollutants, it is postulated that *Acarospora* will exhibit a positive response to the HNO₃ fumigation, when compared to *Lobothallia*'s response, however, since nitric acid has been shown to be phytotoxic, it is postulated that at higher fumigant exposure treatments, both species will exhibit negative physiological responses. To determine physiological responses, chlorophyll fluorescence, dark respiration, and microscopic imaging will be measured throughout the fumigations. Lichen washes and ambient nitrogen deposition samplers placed in the park will be used to determine the deposition levels the lichen are experiencing before and during the fumigations. Overall, this research seeks to broaden the background of these two unstudied California crustose species' sensitivity to ozone and nitric acid in the hopes of using them as bioindicators in the future.

¹University of California, Riverside, Riverside, CA, USA

²USDA Forest Service, Pacific Southwest Research Station, Riverside, CA, USA

Contact information for primary author

Email: elizabeth.hessom@email.ucr.edu

Phone: (909) 456 – 0553

Mail: 600 Central Ave., Apt. 238, Riverside, CA 92507