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Comparison of sugars and amino acids in nectar from *Scaevola taccada* and *Scaevola plumieri*

Scaevola plumieri (Goodeniaceae), a species of coastal shrub, is native to the Caribbean Islands, Florida, and South Africa. *Scaevola taccada*, a congener native to the Indopacific, was introduced to the Caribbean in the 1970s and was first recorded in Vieques, Puerto Rico in 2002 (Breckon, 2007). *S. taccada* has been reported to encroach upon and displace S. *plumieri* and other native species in the Bahamas and the Cayman Islands. *S. plumieri* is now listed as critically endangered in many Caribbean locations, like the Cayman Islands, and considered threatened in other locations (Cottam, 2009).

Since these species compete for similar resources in coastal habitats on the Puerto Rican islands, we are interested in exploring the possible impact the invasive *S. taccada* has on the pollination biology of the native species.

Scaevola attracts many potential pollinators including wasps, ants, birds and bees. Bees are believed to be *Scaevola*'s primary pollinators. Both *Scaevola plumieri* and *Scaevola taccada* produce nectar from nectaries located within small, white flowers. We are interested in noting the differences in these plants' nectar constituents and what effect this difference has on the pollinator preferences of both species. This plant-pollinator relationship plays a vital role in the overall reproductive success of both plants. Thus, we present preliminary data on the nectar constituents, specifically sugar concentrations and amino acid content, of these two species from Vieques Island, Puerto Rico.

Although there have been no previous studies on *Scaevola*, both sugar and amino acids are found within the majority of plant nectars. Pollinators use sugars as their primary energy source—a high concentration of sugar is thought to correlate with better pollinator fitness (Nicolson et al., 2007). Although the primary functions of amino acids in nectar is unknown, their common and diverse presence suggests varying functions, such as an important nitrogen source, microbial defense, or contributing to the nectars taste (Nepi et al., 2012, Terrab et al., 2007). Thus, the study of both these constituents should provide insight into possibly essential differences between the two species. Additionally, nectar volumes provided per flower from each species have been collected. Showing the differences in nectar volumes paired with amino acid and sucrose concentration data will allow a better understanding to whether one species is giving a better reward to pollinators—and thus will have a better chance of long-term success.

Nectar samples were collected on Vieques in 2015, 2016, and 2017 and from Ithaca College's greenhouse using micropipettes or glass microcapillary tubes. The nectar volume was measured from individual flowers, then pooled for sucrose and amino acid analysis. The sucrose percentage was analyzed using a digital refractometer and the amino acids were analyzed using reverse-phase high performance liquid chromatography (HPLC, Figure 1).

The nectar volumes and sucrose concentration of each species' nectar have proven to be highly variable based upon weather at the time of collection. However, when comparing the

common peaks between each sample's HPLC chromatograms (Figure 1), our experiments have shown that there are significant differences in amino acid content between *taccada* and *plumieri* (Figure 2). Although their profiles appear to look similar, when comparing the concentrations and testing for the p-value, we find that five distinct peaks (each peak is representative of a different chemical compound) have significantly different concentrations.

Having collected sucrose concentration and nectar volume in the field paired with the experiments to detect amino acid presence and identity, many novel characteristics about plant nectar, and specifically *Scaevola* nectar, have been exposed. Using these data, we will comparatively analyze and assess the impact these differences or similarities have on the success and competition between *Scaevola taccada* and *Scaevola plumieri*, and hopefully unveil some of the mystery surrounding the diverse array of chemicals within plant nectar.

Figures

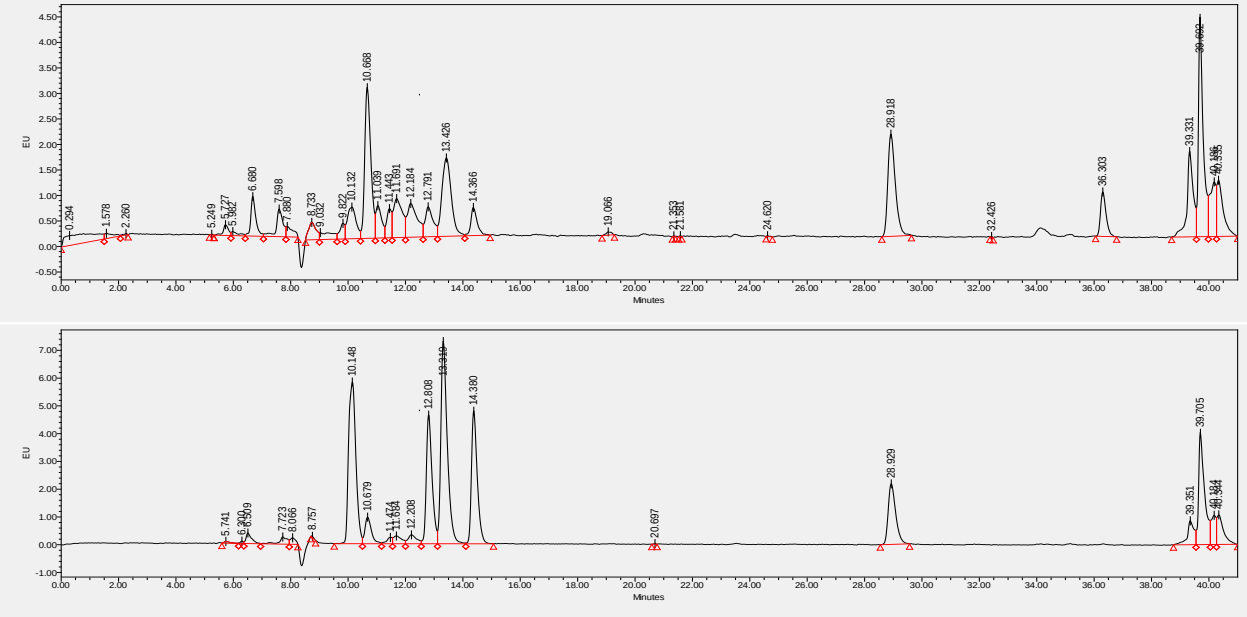

Figure 1: Chromatogram (compound concentration vs. retention time) of one sample of *Scaevola plumieri* (top) and one sample of *Scaevola taccada* (bottom) nectar via High-Performance Liquid Chromatography. Each peak represents a different chemical compound, specifically amine-group compounds which include both amino acids and non-protein amino acids.

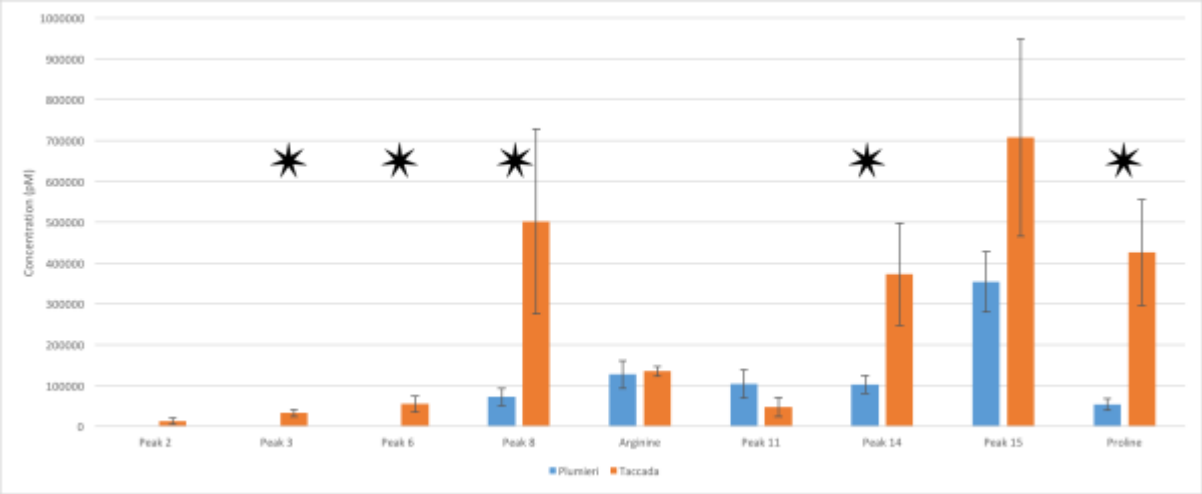

Figure 2: Comparison of compound concentrations between *Scaevola plumieri* and *taccada*. Data was collected by comparing the common peaks from each species chromatogram. The amino acid identity was recorded when possible, but the other peaks identities are unknown except to be amine-group containing compounds. The standard error has been plotted for each peak and species. The stars signify significance with a p-value of <0.05.

References

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