Studies on Gracilaria salicornia: Zinc Oxide (ZnO) Sunscreen Exposure and Use as Agricultural Fertilizer

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Limu (seaweed) is critical to Native Hawaiian ecosystems and culture. With limited prior research, the first part of this study examined the effects of ZnO mineral sunscreens on endemic Hawaiian Gracilaria coronopifolia (Limu Manauea) and invasive Gracilaria salicornia (Gorilla Ogo). For three months, samples were measured twice weekly for length and apical tip counts. The higher ZnO concentrated sunscreen significantly decreased the percent change in length of the endemic G. coronopifolia, while also significantly increasing the apical tip number of the invasive G. salicornia, when compared to the control. Due to the invasive G. salicornia being so abundant in Hawaiian ecosystems, for the second part of the study, four fertilizers were developed: two created from fermented G. salicornia: 10% and 25% concentrations, two from desiccated G. salicornia: 1.0% and 2.5% concentrations. Corn, green bean, and romaine lettuce seeds were treated and observed (number germinated and radicle length of germinated seeds). The 10% liquid fertilizer was found to significantly increase the radicle length of all tested seeds, while the 2.5% dry fertilizer had detrimental effects. Next, broccoli, lettuce, and pepper plants were treated and observed (height, number of leaves, leaf surface area). For the broccoli plant experiment, two additional fertilizers (1.0% GF and 2.0% GF) were composed of desiccated G. salicornia as an improvement to the dry fertilizers. The 10% liquid fertilizer again increased growth of all tested plants when compared to the control. Future research is necessary to determine the biochemical basis for the contrast in outcomes between the liquid vs. dried/gel fertilizers, which could provide new insights into fertilizer development.

Awards Won:
Fourth Award of $500
National Oceanic and Atmospheric Administration - NOAA: Taking the Pulse of the Planet First Award
Arizona State University: Arizona State University ISEF Scholarship (valued at up to $52,000 each)