Evaluating the Impact of UVB Light Exposure on the Growth of Red Malabar Spinach

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The world is facing a crisis as the ozone layer thins and allows more UV rays to pass through. Specifically, as of 2019, all UVC (λ = 100-280 nm) is absorbed by Earth's atmosphere, and the UV rays that do penetrate are approximately 95% UVA (λ = 285-315 nm) and 5% UVB (λ = 315-400 nm); these percentages are increasing as the ozone layer thins. The increased UVB levels have been shown to stunt plant growth and increase mortality for some species. This experiment compares the effects of increased UVA and UVB intensity on Red Malabar spinach (Basella alba), a super food grown in Southeast Asia. The plants were grown for two trials in three chambers (white light, UVA + white light, and UVA + UVB + white light). For trial 2, the UVA and UVB lights were moved to be half as far from the plants for increased UV light intensity. The trial 1 and 2 data were analyzed in RStudio using Anova and Tukey programs to determine if there was a statistically significant difference between the UV and control groups. The results indicated there was a significant increase in plant height (p=0.0309 *) and leaf area (p=2.5e-07 ***) in the UVA group compared to the control and UVB group. Additionally, there was a statistically significant increase in leaf number (p=2.11e-6 ***) in the UV groups compared to the control. This experiment highlights the inhibitory effect of UVB on Malabar Spinach height and leaf area and the stimulatory effect of UVA and UVB light on leaf number. Moreover, this study illuminates the potential for the agriculture industry to promote Red Malabar Spinach growth and potentially other crops by researching materials that can filter out UVB more efficiently or creating indoor structures to isolate UVA light.

Awards Won:
Arizona State University: Arizona State University ISEF Scholarship (valued at up to $52,000 each)
University of Arizona: Renewal Tuition Scholarship