Light Sensitive Turntable: Effects on Brassica rapa

Lim, Cheaheon (School: Northfield Mount Hermon School)

Auxin polarization induced by PIN3 genes is critical in effectuating plant phototropism. Upon activation by phototropins that detect light and inhibit the activity of the PINOID kinase (PID), PIN auxin efflux carriers act as auxin transporters, stimulating the elongation of cells in the plant quartile opposite to the light source. To survey the effects of potential energy loss from auxin-induced asymmetrical development in Brassica rapa, the present study examined the yield and growth of test subjects under a unidirectional lightsource in two treatment groups. B. rapa in the control group were cultivated on a stationary platform, and bioassays examining average stem cell lengths and macroscopic analyses of angles sample stems made with the xy-plane yielded substantive evidence of phototropism in the plant canopies under observation. Phototropism was inhibited in the other treatment group by cultivating B. rapa on a photosensitive turntable. Quantitative analysis revealed that B. rapa receiving the turntable treatment demonstrated superior physiological health indicators in the areas of leaf and flower development compared to that of samples in the control group, producing approximately 58.171% to 90.492% greater yields. Multivariable regression planes constructed to further examine the energy efficiency of phototrophic growth indicated that heightened leaf stalk development had a greater stake in diminishing B. rapa yields than the asymmetrical elongation of sample stem cells. Such results demonstrate the promising impact the genetic manipulation of phototropism in staple crops can have on maximizing crop yields in agricultural ventures that are limited by intercrop shading.

Awards Won:
Fourth Award of $500