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Thermal Situation of Plant Reproductive Organs Affected by Gravity and Light Intensity

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Abstract

Temperature increases in plant reproductive organs could cause fertility impediments and thus produce sterile seeds under artificial lighting conditions without adequately controlled environments in closed plant growth facilities. The thermal situation of the plant reproductive organs as affected by gravity levels of 0.01 and 1.0 g for 20 seconds each during parabolic airplane flights was determined under different light intensities in order to make an estimation of temperature increases in the reproductive organs under microgravity in space. Thermal images of reproductive organs of rice, wheat and tomato were captured using infrared thermography. Temperatures of glumes of rice and wheat and anthers of tomato increased by 1.1, 0.7 and 0.4°C, respectively, over 20 seconds as gravity decreased from 1.0 to 0.01 g at an irradiance of 150 W m^{-2}. Restricted free air convection under microgravity conditions in space would cause the aberration of the reproductive growth of plants by retarding heat exchanges between the reproductive organs and the ambient air.