A protocol for measuring canopy temperature of sugarcane plots in the field using a thermal imager embarked in an UAV

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Thermal imagers are the most suitable commercially available equipment for measuring plant canopy temperature in large areas by remote sensing. However, its use under field conditions presupposes overcoming two challenges related to image capture speed and measurement precision: 1. to increase the size of the area and the number of plants simultaneously imaged; 2. to isolate the target object, that is, the plant canopies from possible contaminants in the thermal image. Thus, for measuring the canopy temperature of six sugarcane genotypes aiming at discrimination for drought tolerance under field conditions, a thermal camera was embarked in an unmanned aerial vehicle (UAV). A gimbal was developed for camera support and stabilization. Also, a device was developed for camera focus adjustment and triggering. An equipment that simultaneously generates thermal and RGB images, captured by different sensors was used. The imaging processing consisted in the alignment of both images, followed by segmentation of corresponding pixels to the plants. For this, RGB image was used to produce a color mask which was applied to the thermal image by means of a program developed in Python language. Thus, the pixels presented in the green channel a value 5% higher than the red channel were selected as "plant". Based on this assumption, it was possible to segment the pixels corresponding to plants from those of soil. Finally, canopy temperature of the sugarcane genotypes in each plot could be determined.

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