

PRECISION AGRICULTURE TECHNIQUES IN THE MANAGEMENT OF NITROGEN IN SUGARCANE CROP

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Abstract

This research aimed to evaluate various nutritional conditions of sugarcane fertilized with different nitrogen rates applied in different periods after harvesting using active optical sensors, biometric evaluation and calculation of sugarcane yield.

Key words: Optical Sensor, NDVI, SPAD.

Introduction

Research using Optical Active Sensor (SOAT) were performed in order to measure the levels N in sugarcane crop. The reflectance index followed an upward trend with the doses of N, thus demonstrating the possibility of the sensor be used in detecting nitrogen deficiency in the crop¹. Similar results considering the use of SOAT to detect N deficiency in sugarcane were also observed by other authors in Brasil². In the USA works with SOAT in sugarcane, showed positive correlation exists between NDVI and sugarcane yield (TSH) compared the treatments with N application at a variable rate, and without the application of N³. Five nitrogen rates (0, 50, 100, 150 and 200 kg ha⁻¹) were applied in five different periods after ratoon harvest (2nd cut) - immediately after harvesting and 30, 60, 90 and 120 days after harvest – (DAH). We evaluated the nutritional status of the crop at 30, 60, 90, 120 and 150 days after installation of the treatments in order to apply diagnostic techniques associated with the ideal stage of plant development for monitoring "on-the-go" demand of N by sugarcane.

Results and Discussion

Based on the data obtained for each dose of nitrogen applied at different periods after harvesting, it was found that the canopy reflectance sensor, (ACS-430 Crop Circle), presented sensitivity to different plant nutrition condition being able to detect the different N doses and application periods. In general, according with the growing stage of the sugarcane, in the periods of application, the vegetation index (NDVI and NDRE) increased linearly in relation to the development of the plant, and the fertilization done to 90 DAH had higher NDVI and NDRE when compared with other periods of application. The analysis performed at 30 and 60 days after harvest of ratoon cane presented better NDVI and NDRE indices for nitrogen dose of 150 kg ha⁻¹ of N, while at 90 and 120 DAH the vegetation indexes were better for

dose 100 kg ha⁻¹ N, as well as the same response were obtained at 150 DAH evaluation.

Conclusions

It was verified that the sensor is able to assist the nitrogen fertilization in the management of sugarcane. As NDVI and NDRE values increased linearly with the development of sugarcane, it follows that the sensor has a sensitivity to detect the different stages of plant development. It was also observed that the evaluations carried out in the field in different periods of development of sugarcane, in the first five months, the highest rates of NDVI and NDRE were obtained for the doses of 100 and 150 kg ha⁻¹. In addition, among all the application periods studied, the highest rates of NDVI and NDRE occurred at 90 days after harvest. Thus, it can be expected to be achieved higher rates of NDRE and NDVI when applying a dose of nitrogen between 100 and 150 kg ha⁻¹ at 90 days after harvest of ratoon cane, which may result in a higher amount of stems at this dose. However, despite these results have coincided with results obtained previously, this type of research is particularly dependent on climatic factors and therefore, it should be performed repeatedly until it can be confirmed the dose and the ideal time of application of N.

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