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Real Time Nitrogen Management of Maize using CCM 200 Plus During Dry Season in Eastern Coastal Plains of India

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ABSTRACT

Despite the increasing availability of chlorophyll meters in the market, their adoption remains limited due to the absence of region-specific thresholds. One such meter, the CCM 200 plus produced by Opti-Sciences Inc., stands out for its non-destructive nature, cost-effectiveness and reliability. However, specific thresholds for this meter in the eastern coastal plains of India, particularly for maize crops, are lacking. The current study was carried out at the P.G. Research Farm, MSSSoA during summer season of 2022-23 encompassing three chlorophyll content indices (CCI<35, CCI<40, CCI<45) with and without basal nitrogen applications, alongside fixed-time nitrogen management (FTNM) and Absolute N Control (no nitrogen) which were allocated in randomized block design with three replications. The findings indicated that both CCI<45 with basal nitrogen application and CCI<40 with basal nitrogen application demonstrated statistically similar maize grain yields, surpassing FTNM by 18.1% and 12.4%, respectively. However, adopting CCI<40 with basal nitrogen application resulted in savings of 30 kg N/ha compared to CCI<45 with basal nitrogen application for maize cultivation in the Eastern Coastal Plains of India.

Key words: Basal N application, CCM-200 plus, Chlorophyll content index (CCI), FTNM, Threshold.

Globally, maize (*Zea mays* L.) plays a crucial role in meeting the demands for both food and fodder (Shiferaw *et al*., 2011) due to its efficient ability to thrive under various biotic and abiotic stresses (Waqas *et al*., 2021). To ensure food security for the expanding population amidst shifting climate patterns, it is imperative to embrace efficient crop management strategies that boost crop productivity while preserving the environment. The crop productivity is significantly influenced by the timing and application of nutrients, particularly nitrogen (Singh *et al*., 2016, Yu *et al*., 2012, Mathukia *et al*., 2014). Nitrogen, being mobile in soil, is prone to losses, leading to low nitrogen use efficiency, which typically ranges from 30 to 40% (Kumar *et al*., 2021). To effectively tackle this problem, it is necessary to synchronize nitrogen application with the crop's nitrogen demand during its growth period and this is possible through the adoption of optical sensors (Boregowda *et al*., 2019). These sensors utilize leaf colour as an indicator to measure the need for fertilizer nitrogen thus enabling realtime monitoring at regular intervals to optimize nitrogen requirement (Sagar *et al*., 2024).

Research findings suggest that implementing real-time nitrogen management using chlorophyll meters has shown to enhance nitrogen use efficiency in crops (Sagar *et al*., 2023, Singh *et al*., 2011). The SPAD 502 chlorophyll meter has been extensively studied and is commonly used to assess crop nitrogen demand (Singh *et al*., 2016). However, newer chlorophyll meters like the CCM-200 plus by Opti-Sciences Inc. and the atLEAF CHL PLUS by FT Green LLC are gaining traction due to their cost-effectiveness while operating on the same principle as the SPAD 502 developed by Konica Minolta, Inc. Nevertheless, there is a lack of exploration regarding the optimal chlorophyll content index (CCI) threshold observed by CCM-200 plus for scheduling nitrogen topdressing in maize in the Eastern Coastal Plains of India. Hence, this study aims to address this gap in research.

During the summer season of 2022-23, a study was carried out at P.G. Research Farm located at 18°48′18″N and 84°10′44″E at an elevation of 88 m MSL. The experimental site featured sandy loam soil with a slightly acidic pH. Further, it exhibited lower levels of organic carbon and soil available nitrogen while demonstrating moderate levels of soil available phosphorous and potassium. The experiment was laid out in randomized block design (RBD) and replicated thrice. The "Hybrid Corn Seed 4226" of VNR seed company was sown at a spacing of 60 cm × 25 cm by dibbling the seed. The treatments consisted of absolute N control (No N), Fixed time nitrogen management (FTNM) and six real time nitrogen management (RTNM) treatments having three chlorophyll content indices (CCI) <35, CCI<40, CCI<45 with and without basal N application thus constituting eight treatments. The recommended dose of fertilizers (120:60:60 kg N, P_2O_5, K_2O per ha respectively) was applied

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