Ecofarming
e-Magazine for Agriculture and Allied Sciences
http://www.ecofarming.rdagriculture.in
e-ISSN: 2583-0791

NITROGEN MANAGEMENT

FOR CROPS BASED ON LCC AND SPAD METER

1. **D. Gokul**
Department of Soil Science and Agricultural Chemistry, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India
Email: gokuldharmalingam0@gmail.com
2. **S. Kalaiselvan**
Department of Horticulture, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India
3. **R. Pungavi**
Department of Entomology, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamil Nadu, India

Received: August, 2023; Accepted: September, 2023; Published: October, 2023

Introduction

Chlorophyll content in plant leaves is one of the most essential physiological traits which provides fundamental information about the crop's potential for photosynthesis and is thus strongly related to nitrogen content in plants. Nitrogen is so vital because it is a major component of chlorophyll. It is also a major constituent of proteins, amino acids, nucleic acids, enzymes, vitamins, alkaloids and hormones. Nitrogen is a component of energy-transfer compounds, such as ATP. Nitrogen is a significant component of nucleic acids such as DNA, the genetic

material that allows cells to grow and reproduce. There wouldn't be life as we know it without nitrogen.

Plants absorb nitrogen from the soil as both NH_4^+ ions (ammonical form) and NO_3^- ions (nitrate form). But nitrification is so pervasive in agricultural soils, most of the nitrogen is taken up as nitrate form. Nitrate is easily transported to plant roots as they take up water. Once inside the plant, NO_3^- is reduced to an NH_2 form and is assimilated to produce more complex compounds. Because plants need a lot of nitrogen, having a deep root system is necessary for unrestricted uptake. The major deficiency symptom includes yellowing or chlorosis of plant leaves, early senescence of older leaves and reduction in flowering, and crop yield.

We must monitor using a wide range of ways to determine the nitrogen status of standing crops. Thereby, techniques like the use of leaf-colour chart and SPAD meter as nutrient experts, a computer-based decision support tool for nitrogen management. Nitrogen rates and application schedule adjusted as per crop demand using leaf colour chart and chlorophyll meter (SPAD meter) under site-specific nutrient management (SSNM) system.

Leaf Colour Chart (LCC)

The development of a leaf colour chart, which can be used for precise nitrogen delivery, is perfect for farmers as a visible and arbitrary indicator of the crop's nitrogen levels. The leaf colour chart is a 12-15 inch long chart. It is an easy method to determine nitrogen levels in leaves and an inexpensive tool to increase nitrogen use efficiency in rice and other cereal crops (Elanchezhian, 2020). Leaf spectral qualities can be visually observed by using a leaf colour chart to quickly and accurately monitor the level of leaf greenness. It serves as better guidance for farmers to apply nitrogen thoughtfully and at the appropriate time. It is manufactured with four colours called four panels LCC, and six colours called six panels LCC. The leaf colour chart contains six-panel means, six green shades horizontally ranging from yellowish green to dark green fabricated with veins resembling those of leaves that are used to compare with a leaf in the same light conditions.

The LCC threshold is 4.0 for rice and wheat, whereas the LCC threshold is 5.0 for maize along with basal doses of fertilizers (Ramesh Naik and Hemalatha 2021).

Table 1: LCC readings with nitrogen management (Source : USAID, Cambodia)

LCC readings for rice (four panels)	Nitrogen status
Between panels 2 and 3	Plants without N application
Between 3 and 4	High N rate, leaves are dark green colour
4	Surplus of fertilizer N
	Nitrogen management
1	Immediately apply nitrogen
2	Apply nitrogen very soon
4	Do not apply nitrogen

Fig. 1. Leaf colour chart

SPAD meter

SPAD (Soil Plant Analysis Development) meter or chlorophyll meter serves as an efficient tool for monitoring the crop nitrogen status of leaves. SPAD meter is the more effective option to boost crop output and nitrogen use efficiency. The chlorophyll meter offers an alternative to the nitrogen nutrition index in a non-destructive way. It is a simple portable diagnostic tool and developing need-based variable rate nitrogen application. The SPAD meter determines the relative amount of chlorophyll present by measuring the absorbance of the leaf in two wavelength regions (650 and 940). Using this method, it is possible to determine whether and how much nitrogen has to be applied by measuring a dimensionless SPAD value and comparing it to a threshold value (table 2). Technical skills are needed for using the SPAD meter.

Table 2: SPAD threshold level for different crops (Raja and Balachandra, 2021)

Crop	SPAD threshold level	Location
Rice	35	Philippines
	37.5	Pakistan
	35	Bangladesh
	36	Bihar, India
Wet DSR	32 and 29	
Wheat	42	Punjab, India & Pakistan
	44	Bangladesh
	37	IGP, India
Maize	50	China
Sweet corn	50	Karnataka, India

Fig. 2. SPAD meter

Conclusion

Need-based nitrogen management through leaf colour chart and SPAD meter effectively enhances the crop yield and optimizes threshold level. Nitrogen is more important than other nutrients because the efficiency depends on the time of

application. Leaf colour chart and SPAD mater-based nitrogen management greatly assist farmers in adapting nitrogen input to real crop conditions and nutrient needs. These tools provide more advantages over conventional methods of nitrogen determination. Leaf colour chart and SPAD meter are efficient tools for improving the nitrogen use efficiency of crops.

References

1. Elanchezhian, R. 2020. Leaf colour chart (LCC) for nitrogen management in crops. Soil Health Management: Knowledge. 3(1): 18-22.
2. Raja, D. and Y. Balachandra. 2021. On the go sensors for recommendations of fertilizers for field crops in different agro ecological regions. In ResearchTrends in Agriculture Sciences; Naresh, R.K., Ed.; Aki Nik Publications: New Delhi, India, Volume 10: 135–142.
3. Ramesh Naik, M. and S. Hemalatha. 2021. Precision Nitrogen Management Using Leaf Colour Chart. *Chronicle of Bioresource*, 5(2):059-062.