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Nitrogen Management in Cereals through Leaf Color Chart

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Nitrogen fertilizer is as one of the key inputs in cereals, in particular rice and wheat production in India. Amongst the nutrient management techniques, Nitrogen management is the main concern in rice production. Nitrogen holds a distinguishing prominence amongst the nutrient elements and is known as the "mineral of life" for rice. It is the utmost needed input that restricts rice production in irrigated environment. The continuous use of high levels of chemical fertilizers is adversely affecting the sustainability of agricultural production and causing environmental pollution. In order to maintain food security, agricultural profitability and environmental quality, nitrogen use efficiency in cereal-based agriculture foods to be improved substantially. In most of the cereals crops in India, nitrogen fertilizer has been managed generally following blanket recommendations consists of fixed rate and timing of two or three pre-set split applications of the total nitrogen. Due to large field to field variability of soil nitrogen supply, efficient use of fertilizer N is not possible by following blanket application of fertilizer nitrogen. The main reason for low nitrogen uses efficiency is inefficient splitting of N applications and use of N in excess to the requirements, which is analogous with uncertainty faced by the farmers in deciding fertilizer N to be applied. The concentration of nitrogen in leaf is highly correlated with chlorophyll content and it can be measured using devices like leaf colour chart (LCC), SPAD, at LEAF+ of chlorophyll or nitrogen. As the devices are expensive and unavailable with all farmers, LCC provides prospects to the farmers for estimating plant nitrogen requirement in actual time for effective fertilizer use and augmented rice yields.

Leaf Color Chart is a diagnostic tool for monitoring the relative greenness of a rice leaf as an indicator of the plant N status, a plastic ruler - shaped strip containing four/more panel that range in colours from yellowish green to dark green.

How to use leaf colour chart

Step:1- Select plants for testing

Randomly select at least 10 disease-free rice plants or hills in a field, where plant population is uniform.

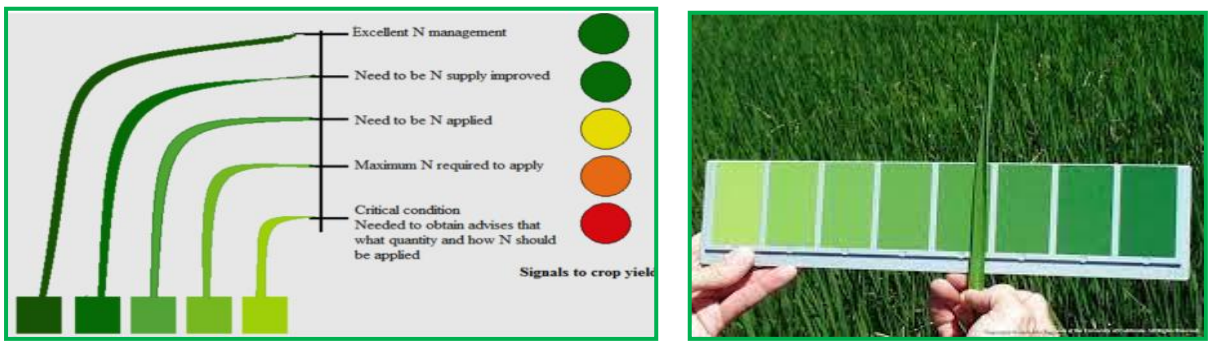

Fig.1: Leaf Color Chart (LCC)

Step:2- Match the leaf to the chart

Select the topmost, youngest, fully expanded leaf from each hill or plant. This part best reflects the N status of the plants.

Place the middle part of the leaf on the LCC and compare its color with the color panels. Do not detach or destroy the leaf.

Step: 3- Measure the leaf colour

Measure the leaf color under the shade of your body. Direct sunlight affects leaf color readings.

If possible, the same person should read the LCC at the same time of the day, every time.

If the color of a rice leaf is in between two shades, take the average of the two values as the reading. For example, if the color is in between 3 and 4, the reading should be 3.5.

Step:4- Determine the average LCC

Take the reading of the 10 leaves, and determine the average. If the color is more or less than 3, N fertilizer top dressing is needed.

- **Eco-Friendly Tool:** Successful adoption and use of LCC would promote timely and efficient use of nitrogen fertilizers in rice and wheat and some costly fertilizers and minimize the fertilizer related pollution of surface and ground water. Thus, LCC is a promising eco-friendly and inexpensive tool in the hands of farmers which indicates a close link between chlorophyll and N content of leaf hence can be used as a quick and reliable tool for assessment of leaf nitrogen status of crop at different crop growth stages. It contains gradients of green colour from yellowish green to dark green based on wavelength characters of rice leaves and can guide for nitrogen top dressing.

Advantages

1. LCC is an uncomplicated and effortless tool for the farmers to measure nitrogen status of the leaf and to identify the instance for top dressing of N to paddy.
2. LCC based nitrogen application enhances productivity and profitability of transplanted rice.
3. Reduce the excessive application of N fertilizer by farmers.
4. Reduce NO, pollution in ground water.
5. It is inexpensive and portable thus, making it easy to carry to field for estimating N status of the leaf.
6. It is a non-destructive thus avoids leaf sampling, laboratory analysis, and delay in receiving results method.
7. Any specific knowledge or skill is not required for using LCC because it depends only in comparing the colour and computing the scale of the leaf with standard chart.

Demerits

1. LCC fail to identify minor variations in leaf greenness as the colour shades lies in between two shades.
2. The comparative accurateness of LCC to measure the leaf N status can be estimated only when it is equated and interrelated with chlorophyll meter readings and adjusted accurately with the plant groups.
3. LCC is resorted only to adjust the top-dressed N but fail to adopt the basal N appliance by LCC.
4. LCC can be better suited in site-specific nutrient management approach wherein to realise optimal reaction to N fertilizer, other nutrients need not be restricting.
5. Hence, sufficient levels of other nutrients need to apply on basis of soil tests results.
6. P or K deficits make dimmer leaf colour leading to inaccurate LCC interpretations.

Conclusion

It is can be concluded that leaf colour chart (LCC) is a stress-free, user friendly and economical tool for assessing chlorophyll content of rice leaf. LCC centric nitrogen supervision aids farmers to assess the actual time N requirement of the crop and guarantees N saving without conceding their production. Over application of N in rice leads to low N recovery efficiency and risk of NO3 pollution of ground water. The chlorophyll meter also known as SPAD meter, is a simple, portable diagnostic tool for identifying crop N status. These tools are inevitable guidelines in deciding the top-dressed N requirements and synchronize fertilizer N application with actual crop need. Thus, LCC proves best over the conventional method of N estimation which is very tedious and emphasis over based N application to the crops.

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