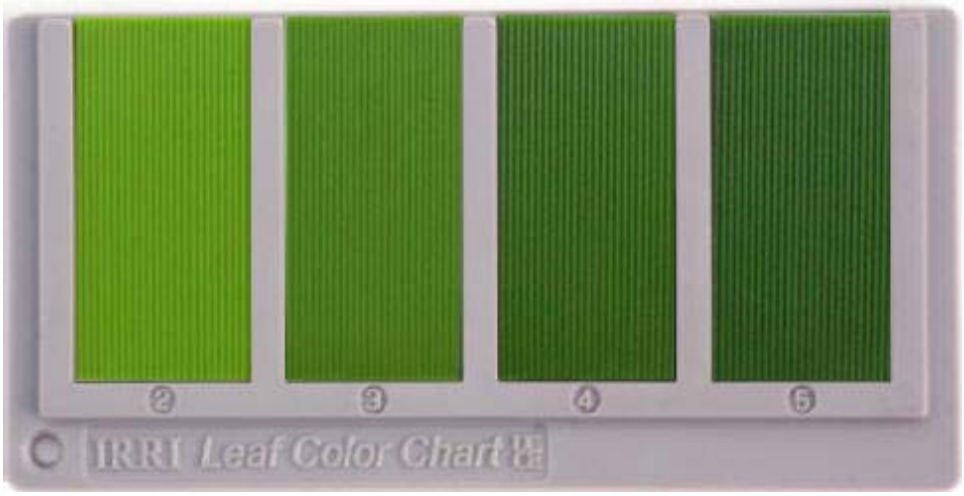
Leaf Color Chart (LCC) for Fertilizer N Management in Rice



A standardized leaf color chart for assessing leaf N status.

The leaf color chart (LCC) is an easy-to-use and inexpensive diagnostic tool for monitoring the relative greenness of a rice leaf as an indicator of the plant N status (Alam et al. 2005).

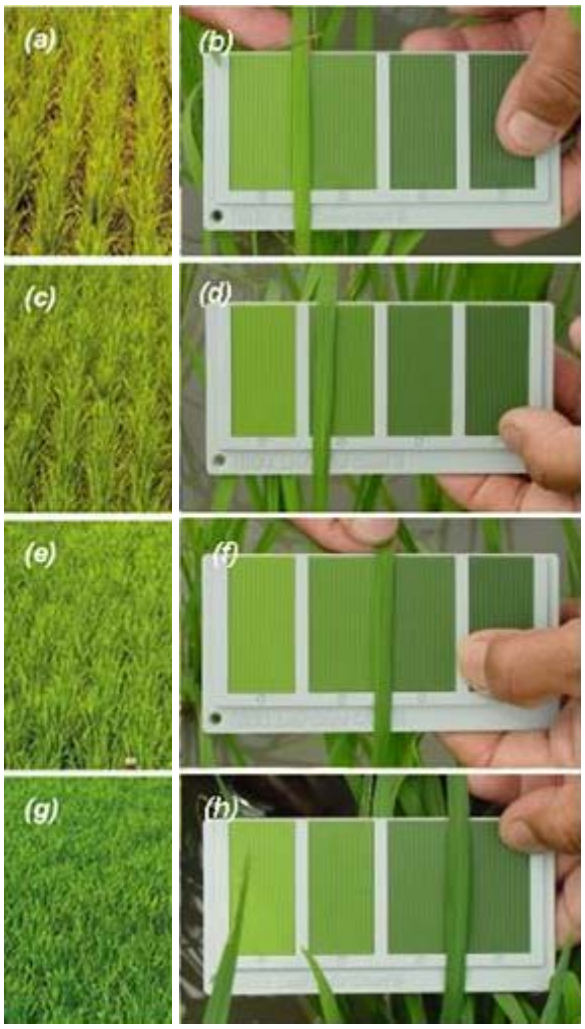
Leaf N status of rice is closely related to photosynthetic rate and biomass production, and it is a sensitive indicator of changes in crop N demand within a growing season. A tool to rapidly assess leaf N status and thereby guide the application of fertilizer N to maintain an optimal leaf N content can consequently be vital for achieving high rice yield with effective N management. A chlorophyll meter provides a rapid and non-destructive method for estimating leaf N content (Peng et al. 1996), but its high cost prevents its use by farmers. The LCC is an inexpensive and easy-to-use alternative.

The LCC is usually a plastic, ruler-shaped strip containing four or more panels that range in color from yellowish green to dark green. Several types of LCCs with varying shades of color have been developed and distributed to rice farmers. This created uncertainties regarding which LCC to use and led to requests for a standardized LCC that serves as a reference in cross calibrating threshold values among LCCs. In October 2003, the External Review Panel of the Irrigated Rice Research Consortium recommended “standardization of the LCC with harmonized color formula accompanied by calibration with local rice leaf characteristics and training of extension workers and farmers to use the LCC … as soon as possible”. IRRI in collaboration with the University of California Cooperative Extension soon afterwards released a standardized LCC with improved quality assurance for the reproducibility of colors and enhanced matching of the colors to the reflectance spectra of rice leaves (Witt et al. 2005). The standardized LCC (photo above) is five inches long, made of high-quality plastic, consisting of four color shades from yellowish green (No. 2) to dark green (No. 5). The color strips are fabricated with veins resembling rice leaves.

How to use the LCC

1. Randomly select at least 10 disease-free rice plants or hills in a field with uniform plant population.
2. Select the topmost fully expanded leaf from each hill or plant. Place the middle part of the leaf on a chart and compare the leaf color with the color panels of the LCC. Do not detach or destroy the leaf.
3. Measure the leaf color under the shade of your body, because direct sunlight affects leaf color readings. If possible, the same person should take LCC readings at the same time of the day every time.
4. Determine the average LCC reading for the selected leaves.

Using the LCC



Photos from Witt et al. (2002)

The above photos illustrate the use of the standardized LCC to assess leaf N status and adjust N applications to rice:

In photo (a) plants without N application are yellowish. Nitrogen deficiency is confirmed in photo (b) because the LCC reading is between panels 2 and 3.

At low fertilizer N rates in photos (c) and (d) the plants look better, but the low LCC reading still indicates N deficiency. At higher fertilizer N rates in photos (e) and (f) the plants look well developed and the canopy is closed. The LCC reading is between panels 3 and 4, which is the critical range for most transplanted rice.

In photos (g) and (h) plants with a high N rate are dark green. Leaf color is darker than the LCC panel no. 4 indicating a surplus of fertilizer N.

References

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