Relationships of leaf color chart and SPAD values to leaf N content of Jasmine rice in northeast Thailand

Rationale

Strong correlations among the leaf color chart (LCC) and chlorophyll meter (SPAD) readings provide the basis for simple and economical methods for indirectly determining leaf N content, making them a valuable tool for real time N management in modern varieties. The effectiveness of LCC and SPAD readings for N management in traditional varieties, such as Jasmine rice, which often bring high economic gains to farmers, has yet to be investigated.

Objective

This study aimed to determine whether LCC and SPAD could be used to indicate leaf N status of Jasmine rice.

Materials and methods

- Field experiments were conducted in farmers' fields using KDML 105 in Kha Khom village, Ubon Ratchathani (15º15′N, 104º52′E), and in Chumphae Rice Experiment Station, Khon Kaen (16º26′N, 102º50′E) in June-November 2003.
- Experimental treatments (Fig. 1) included five N levels (farmers' practice, 0, 60, 120, and 150 kg N ha^{-1}) in Ubon Ratchathani and six N levels (0, 19, 38, 56, 75, and 113 kg N ha^{-1}) in Khon Kaen.

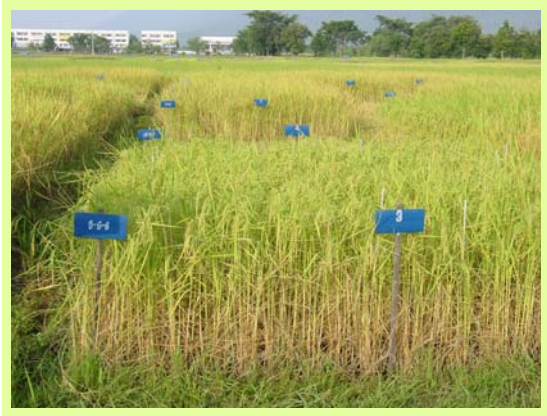

Fig. 1. Experiment layout in Chumphae Rice Experiment Station, Khon Kaen.

- For both sites, treatments were laid out in randomized complete block design (RCBD) with four replications under well-watered conditions.
- From planting to flowering, LCC and SPAD readings were taken on the youngest fully expanded (penultimate) leaf of 16 plants in each experimental plot, weekly for Ubon and every 15 d for Khon Kaen. For both sites, the same leaves of the 16 plants were destructively taken to determine leaf N content using Kjeldahl procedure.

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Results and discussion

- Leaf N content ranged from 1.7 to 3.5% (Fig. 2), which was lower than that found in modern varieties (2.0 to 4.8%), SPAD reading ranged from 27 to 43, which was similar with modern varieties.

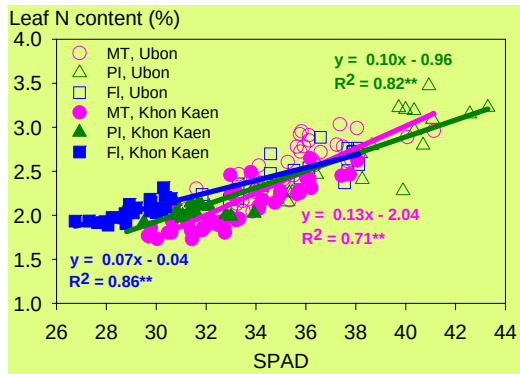

Fig. 2. Relationship between leaf N content and SPAD readings for three crop growth stages in Ubon Ratchathani and in Khon Kaen, June-November 2003. MT=maximum tillering, PI=panicle initiation, and Fl=flowering.

- There was a linear relationship between leaf N content and SPAD (R^2 range of 0.71–0.86, P<0.01) and the slopes of the regression lines decreased as the plant aged. These findings were similar with those observed in modern varieties.
- For any given SPAD reading, KDML 105 has a lower leaf N content than modern varieties.
- LCC reading ranged from 1.5 to 4.0 (Fig. 3), which was lower than that of modern varieties (2.0–4.3).

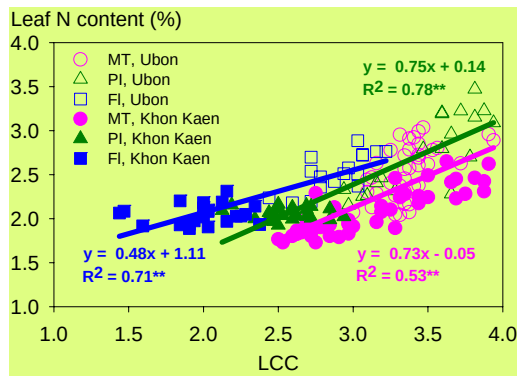

Fig. 3. Relationship between leaf N content and LCC readings for three crop growth stages in Ubon Ratchathani and in Khon Kaen, June-November 2003. MT=maximum tillering, PI=panicle initiation, and Fl=flowering.

- There was a linear relationship between leaf N content and LCC readings (R^2 range of 0.52–0.77, P<0.01) and the slopes of the regression lines differed among growth stages.
- The linear relationships between leaf N content and LCC readings in KDML 105 were weaker than those noted in modern varieties (R^2 range of 0.83–0.94).

Conclusions

SPAD and LCC readings reliably estimated leaf N content of KDML 105. The SPAD and LCC can be used for site-specific N management of Jasmine rice in northeast Thailand. Since the LCC color grade varies among versions, further studies must be done to establish the threshold values for N management.

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