

## Rice growth and nitrogen uptake as influenced by water management

### ABSTRACT

Rice (*Oryza sativa* L.) is grown in Malaysia mainly under flood irrigation. As water becomes increasingly scarce, demand for available water from urban and industrial sectors is likely to receive priority over irrigation. It is, therefore, necessary to adopt rice production practices that reduce water input without any adverse effects on rice growth and yield. A greenhouse study was conducted to evaluate the effects of water management practices on the growth and nitrogen (N) uptake of rice. The three water management practices studied on rice variety MR 84 and Siam were flooded, non flooded (NF)-saturated and NF field capacity. Nitrogen in the form of  $^{15}\text{N}$ -labelled urea (2.52% atom excess) was applied at a rate of 100 kg ha<sup>-1</sup> in three splits. Tiller production, plant height, root growth and grain yield were adversely affected when rice was grown under NF-field capacity soil condition. Grain yield was 57.6 and 54.4% lower under NF-field capacity than flooded and NF-saturated soil condition, respectively. The lower grain yield from NF-field capacity soil resulted from few panicles, less spikelets per panicle and lower 1000-grain weight. However, maintaining soil at a NF-saturated level did not seriously affect rice growth. Rice growth, grain yield and N uptake from NF-saturated soil were comparable to rice grown under flooded condition. A lower nitrogen uptake and fertilizer N recovery under NF-field capacity were attributed to smaller root system, lower above-ground dry matter yield and greater N losses from alternate wetting and drying soil condition. These results showed that irrigated rice could be grown under reduced water input at saturated soil condition throughout the growth period without affecting growth, N uptake and yield.

**Keyword:** Rice; Flooded; Saturated; Field capacity; Yield; Nitrogen uptake