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Phyllochron of Lowland Rice Does Not Depend on Temperature Alone

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Abstract

Developing cropping calendars to accommodate newly introduced crops requires flexibility in planting dates of the members of the existing crop rotation. In the midhills of Nepal, changing planting dates exposes the crop to new thermal environments changing both the overall duration and the speed of crop establishment. Crop establishment depends on the speed of leaf appearance and the longevity of individual leaves, which have been shown to be temperature depending. At eight planting dates staggered at 15 day intervals six lowland rice genotypes were planted in a rice garden in Lumle, Nepal. The appearance and development of successive leaves was observed up toleaf number 12. Germination was linearly and phyllochron was quadratically correlated with the phyllochrons' mean air temperature. Genotypes differed in their optimum temperature for leaf appearance. However, with each succeeding leaf appearance the influence of temperature on the phyllochron was less pronounced and ceased entirely after the appearance of leaf number five. For later leaves and particularly at later planting dates leaf appearance rate decreased independently of temperature and leaf development rate slowed down. With limited resources plants need to balance sinks against sources. The development stage of a leaf was expressed as a normalised senescence level or source-status. These were added-up for all existing leaves on the main tiller. The resulting figure was used as an overall senescence indicator for the tiller. Independent of planting date leaves were initiated at a genotypic level of tiller senescence after leaf number eight. The higher the level, the slower was the leaf turnover in the canopy. For early planting dates genotypes having a low optimum temperature for leaf appearance need to be selected, whereas for later planting dates where early leaf development is fast due to higher temperature, leaf longevity becomes an important factor for a sustainable source for grain filling.

Keywords: Cropping calendars, leaf appearance, phenology, phyllochron, planting date, plastochron, rice

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