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Agricultural Water Management 29 (1996) 299–314

Agricultural
water management

Mungbean response to surface drainage when grown as a pre-rice crop on waterlog-prone ricelands

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Accepted 12 April 1995

Abstract

Large areas of the world's banded rainfed lowland ricelands could be planted to a pre-rice crop if waterlogging damage during the early wet season is prevented. To build understanding necessary to develop effective field drainage practices for pre-rice crops, pot and field studies were undertaken on a Typic Tropaquept lowland rice soil in the Cagayan Valley, Philippines. The objective of the studies was to quantify effects of excessive moisture on mungbeans (*Vigna radiata* (L.) Wilczek) encountering variable regimes of duration and elevation of water table height in the root zone during a short-term waterlogging event. Small differences in level and duration of the root zone water table markedly affected plant performance. Yields were reduced by 40–100% when the water table level reached the soil surface for 6 days compared with the unstressed treatment, but were reduced by only 12–17% when the water level was 5 cm below the surface for the same time period. Regression analysis revealed a 4% reduction in yield per centimetre increase in water table level between 5 cm below to 5 cm above the soil surface during the vegetative stage, and a 6.5% reduction per centimetre during the reproductive stage. Field experiments evaluated two prospective surface drainage techniques that farmers could employ to elevate the crop above the zone of saturation during waterlogging events. Planting in furrows, and subsequently hilling up (HU) to create ridges was unsuccessful in improving plant performance (as the base of the plant was not elevated). Planting on 25 cm high ridges formed by a plow dramatically improved growth and yield of mungbean ($\geq 360\%$ advantage compared with the other treatments) when subjected to a range of waterlogging stress events. Standing water occurred for 5–7 days on the soil surface of HU, broadcast seeded (B), and drilled (D) treatments, but was 5–6 cm below the base of the plants in the ridge treatment during the two flooding events. The ridging method was observed to be effective for farm-scale use in cultivating pre-rice mungbeans with either animal or tractor power.

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