EFFECT OF IRRIGATION AT DIFFERENT PHYSIOLOGICAL STAGES ON THE GROWTH AND YIELD DETERMINATION OF MUNGBEAN AND SOYBEAN IN THE LOW COUNTRY DRY ZONE OF SRI LANKA

By

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ABSTRACT

Determining the physiological basis of yield is important when considering ways of maximizing yield of legumes growing in the dry zone of Sri Lanka. Irrigation is essential to achieve high yields in mungbean (*Vigna radiata* (L.) Wilczek) and soybean (*Glycine max* (L.) Merrill). When water supply is limited, manipulation of the timing of irrigation is one way of maximizing yield gains per unit of water applied. Therefore, the one of the objectives of this study was to identify the critical stages and thereby determine the optimum water management for two representative grain legumes, namely mungbean (var. MI-5) and soybean (var. PB-1). The other objective was to elucidate the physiological basis of yield determination of these two-grain legumes under varying irrigation regimes and thereby give recommendations to breeders for varietal improvement.

Experiments were done during yala seasons of 1995 and 1996 at Maha-Illupallama (DL1) on a Reddish Brown Earth (Rhodustalfs) soil. Three phenological stages, namely, vegetative, flowering and pod filling were identified. Eight treatments were defined as irrigation/non-irrigation during all possible combinations of the above stages. Growth, radiation interception and conversion, flowering and podding behaviour, and yield and yield components were quantified.

Experimental results showed that in both mung bean and soybean, the critical stage for irrigation was the flowering stage. When irrigation is limited to one growth stage, due to less availability of water, the yield gain would be greatest when the flowering stage is irrigated. When the availability of irrigation water is higher, in both

crops, irrigating two growth stages produced a significant yield advantage over irrigating only one stage. When two stages are irrigated, the yield gain did not depend on the specific combination of stages irrigated. In soybean, irrigating all growth stages produced a significant yield advantage over irrigating two stages. But, no such advantage was observed in mung bean.

Based on the physiology of yield determination, the following characters are recommended to plant breeders as criteria for screening the existing mungbean and soybean germplasm during the selection of parents for hybridisation programmes: (a) Greater final pod number per plant; (b) Greater initiation of flowers and pods; (c) Lower shedding of flowers and young pods; (d) Greater harvest index; (e) Greater translocation of assimilates stored in vegetative organs to seeds during pod filling; (f) Faster leaf initiation and leaf expansion to achieve optimum LAI within the shortest possible time; (g) Greater radiation use efficiency through higher photosynthetic capacity (i.e. higher light saturated maximum photosynthetic rates). In addition, yield stability of mung bean should be improved by breeding for varieties with a greater capacity for yield stabilisation through yield component compensation.