

High Yields of Mechanically Harvested Snap Beans as Induced by Moderate Water Stress during Flowering

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Abstract

Irrigation guidelines obtained from laboratory experiments and open field trials in subtropical conditions systematically fail when applied for snap bean (*Phaseolus vulgaris* L.) cultivation under temperate climate conditions in a one pass mechanical harvest, which accounts for the main acreage of snap bean production. During the period 1997-2000, 14 experimental fields on loam and sandy loam served to determine the appropriate irrigation scheduling strategy for the cultivation of snap beans. The treatments consisted of irrigation at different soil matric potentials (-30 kPa, -50 kPa, -80 kPa and -200 kPa) in the upper 30 cm soil layer, which were either maintained during the entire growth period or related with specific growth stages (vegetative development, flowering and pod ripening). The irrigation control was based on a water balance method, regularly checked by gravimetric water content and TDR measurements. Although high irrigation frequencies generally favoured strong vegetative development and stimulated the generation of flowers and pods, moderate drought stress during flowering induced yield rises of 30 to 70% as compared to frequently irrigated snap beans. A detailed analysis of plant structure, pod development and ripening indicated that the higher yields were related to a shorter flowering stage, a more homogeneous pod development and an advanced ripening of the pods. For irrigation scheduling purposes, postponing irrigation until reaching -200 kPa of soil moisture tension did not cause any yield reductions when the beans were mechanically harvested in a single pass. Moreover, irrigation of snap beans at soil moisture tensions of -30 kPa or -50 kPa during flowering resulted in more heterogeneous pod development but lower yields.