

## Influence of irrigation systems and water treatments on growth, yield, quality and water use efficiency of bean (*Phaseolus vulgaris L.*) plants

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**Abstract:** Two Field experiments were carried out during two consecutive seasons (2012 and 2013). The experiments were conducted at Shalakan Experimental Farm of the Faculty of Agriculture, Ain Shams University, Kalubia Governorate (30.13° N, 31.4° E and 14 m above sea level). The experimental site represents the old alluvial soil of the Nile Delta. The aim of this investigation was to study the effect of irrigation treatments (40%, 60%, 80% of available soil moisture) and drip irrigation systems (surface and subsurface) on growth, yield quality and WUE of bean crop (*Phaseolus vulgaris L.*), Contender and Bronco varieties under the Egyptian conditions.

Results exhibited that increasing irrigation up to 80% of available soil water (A.W) increased significantly vegetative growth (plant height, branches no., leaves area, and pods no. as well as dry matter of stems, leaves, pods, roots and total plant and green pods yields kg/fed. Pod length exhibited its highest significant value when plants were subjected to (80% A.W.). While, irrigation at 60 or 40% of available water (A.W.) showed the lowest values of the growth parameters of bean plants.

Generally, subsurface drip irrigation (SSDI) with 80% of available water (A.W.) increased significantly vegetative growth, yield and pod quality as well as dry matter of stem, leaves, roots, pods and total plant.

It could be concluded that in both bean varieties, the interaction influence was significant on green pods yield kg/ fed and pod thickness, whereas pod weight was not significantly affected by the interaction for the two varieties. A similar trend of the interaction in both varieties was obtained in pod quality indicating that quality parameters showed their highest significant values when bean plants were irrigated by subsurface drip irrigation system (SSDI) at 80 % of available water.

Moreover, the aforementioned characters showed their lowest interaction values parameters when bean plants were irrigated by surface drip irrigation system (SDI) at 40 % of the available water. The effect of interaction on pod weight was not significant for the two varieties as well as pod length for Contender variety.

**Keywords:** *Phaseolus vulgaris*, irrigation treatments, surface drip irrigation, subsurface drip irrigation, yield and quality, crop coefficient and evapotranspiration.