EFFECT OF DRIP DEFICIT IRRIGATION AND MULCHING MATERIALS ON GROWTH OF COMMON BEAN PLANT, WATER USE EFFICIENCY AND SOIL SALINITY

By

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ABSTRACT

The present investigation was planned to determine the effect of mulching materials, deficit irrigation and mulch layer thickness on commonbean yield, its components, water use efficiency, yield response factor and soil salinity under drip irrigation system. Two field experiments were conducted during the two growing seasons (2014 and 2015) at the private farm; AnsarAlkharigin village IhnasiyaSdmentEl-Gabal Center, BeniSuef Government, Egypt.

Twenty-four treatments comprising of two mulching materials (Rice straw mulch (RSM) and Farmyard manure mulch (FYM)), three irrigation treatments ($I_{100\%}$ =100%, $I_{85\%}$ =85% and $I_{70\%}$ = 70% of crop evapotranspiration (ETc) and four mulch layer thicknesses ($MLT_{0,\ 3,\ 6}$ and $_{9}$ cm) were studied each season under drip irrigation system.

The results showed that the effects of mulching materials, irrigation treatments and mulch layer thickness on yield and WUE were significant.

The average bean yield values of FYM treatment were increased by 8.78 % and 7.64 % than that for RSM treatment in two seasons, respectively.The highest dry seed yield of bean (948.8 and 941.5kg fed^{-1}) was obtained with the no-deficit treatment ($I_{100\%}$).The lowest yield (723.0and 720.3kg fed^{-1}) was obtained with treatment ($I_{70\%}$) in the first and second season, respectively. The average bean yield value of MLT_9 was increased by 8.81, 23.87 and 43.71 % than those of $MLT_{6,\ 3}$ and $_{0}$, respectively, in the first season. Corresponding values in the second season were 10.53, 26.68 and 47.89 %.

The lowest value of soil salinity was obtained under ($I_{100\%}$), while the greatest one was obtained from ($I_{70\%}$). The average soil salinity value of

($I_{70\%}$) was increased by 28.26 and 13.50 % than those of $I_{100\%}$ and $I_{85\%}$, respectively. The highest soil salinity value was observed under MLT_0 (no mulch) compared to another treatment. The average EC value of MLT_0 was increased by, 12.80, 18.86 and 28.75% than those of $MLT_{3,\ 6}$ and $_9$, respectively.

The highest WUE (0.77 kg m^{-3}) value was recorded under FYM compared to (0.71 kg m^{-3}) under RSM. The highest WUE (0.76 and 0.76 kg m^{-3}) value was obtained under $I_{70\%}$ compared to (0.70 and 0.69 kg m^{-3}) under $I_{100\%}$, in two seasons, respectively. The average WUE values of MLT_9 were increased by 46.54, 26.65 and 9.89 % than those of MLT_0, MLT_3 and MLT_6 respectively.

The reductions in relative yield value was increased with increasing reduction in irrigation water applied, under all treatments, yield response factor (Ky) values for $I_{70\%}$ were always higher than those of $I_{85\%}$ and $I_{100\%}$. The Ky usually indicates a linear relationship of the relative reduction in water that was consumed with a relative reduction in yield. The average crop response factor for different treatments throughout the bean growth was 0.77 and 0.73 for 2014 and 2015 seasons, respectively

It could be considered as a suitable under environmental conditions of study area, the treatment (I_{100} × FYM× MLT_9) proved to be the most suitable for producing high dry seeds of bean crop. Under limited irrigation water, application of (I_{85} ×FYM×MLT_9) treatment was found to be favorable to save 15% of the applied irrigation water with on reduction in bean crop yield.

Key Words: Drip Deficit irrigation, Mulching material, Mulch layerthickness, Common bean yield, and itscomponents,Water use efficiency, Soil salinity, Yield response factor.

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