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Water capture efficiency, use efficiency and productivity in sole cropping and intercropping of rapeseed, bean and corn

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Abstract

In order to evaluate water capture, use efficiency and productivity in sole and intercropping systems of rapeseed (*Brassica napus* L.), bean (*Phaseolus vulgaris* L.) and corn (*Zea mays* L.), an experiment was conducted in two growing seasons of 2007-2008 and 2008-2009 in research field of faculty of agriculture, Ferdowsi University of Mashhad, Iran. The experiment was conducted as a randomized complete block design with three replications and six treatments. Treatments included monoculture of rapeseed (sown 23 September), bean and corn (sown in 30 April) as sole cropping and also simultaneous double cropping of bean and corn (sown in 30 April), two stage relay intercropping of rapeseed (sown in 23 September) and corn (sown in 30 April) and finally three stage relay intercropping of rapeseed (sown in 23 September), bean (sown in 9 April) and corn (sown in 30 April). Intercropping combinations showed positive and significant ($P \leq 0.01$) effect on water capture efficiency compared with sole cropping treatments. Double cropping had the maximum value of this index as 0.56 mm/mm. There was superiority for double cropping in water use efficiency and productivity for species in treatments, also among treatments significantly ($P \leq 0.01$) because of its higher seed yield. The values of land equivalent ratio for intercropping combinations were more than one ($LER > 1$). This confirmed that they used land more efficient compared to sole cropping treatments from viewpoint of resources use and yield production. Rapeseed sole cropping and double cropping showed the highest values of economic productivity of irrigation water (EP) as 3.95 and 2.53 Tooman per ha production income/Tooman per ha water expense, respectively. Totally, it seems that double cropping in most cases was superior to other treatments.

Keywords: economic productivity of irrigation water (EP), fall sowing, land equivalent ratio (LER) seed yield.

1. Introduction

Water supply and its maintaining in the soil are influenced by environment, plant and management various factors (Soltani & Faraji, 2008). Management factors like applying of appropriate sowing date, proper density and using intercropping systems and plant breeding influence water use efficiency via affecting on yield, evapotranspiration (ET) or

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