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“Bridging the gap between increasing knowledge and decreasing resources”

Nutrient 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 nutrient capture efficiency, use efficiency and productivity in sole cropping and intercropping systems of rapeseed (*Brassica napus* L.), bean (*Phaseolus vulgaris* L.) and corn (*Zea mays* L.), an experiment was conducted in the growing seasons of 2007–2008 and 2008–2009 at the Research Field of Faculty of Agriculture, Ferdowsi University of Mashhad, Iran.

The experiment was conducted as a randomised complete block design with three replications and six treatments including monoculture of rapeseed (sown 23 September) (I), monoculture of bean (sown in 30 April) (II) and monoculture of corn (sown in 30 April) (III) as sole cropping and also simultaneous intercropping of bean and corn (sown in 30 April) (IV), two-stage relay intercropping of rapeseed (sown in 23 September) and bean and corn (sown in 30 April) (V) and finally three-stage relay intercropping of rapeseed (sown in 23 September), bean (sown in 9 April) and corn (sown in 30 April) (VI). In this investigation, the indices of capture efficiency, use efficiency and productivity (based on total dry matter and seed yield) for nitrogen, phosphorus and potassium, and the land equivalent ratio were calculated. Sole cropping and simultaneous intercropping of bean and corn (III and IV) showed positive effects ($P \leq 0.01$) for all three indices as compared to the relay intercropping systems (V and VI). Nitrogen productivity for bean and corn was highest for the simultaneous intercropping system, 4.3 kg kg^{-1} and 20.4 kg kg^{-1} , respectively, and significantly different ($P \leq 0.01$) to the relay intercropping systems. Phosphorus productivity for rapeseed, bean and corn was highest in the sole cropping systems, 31.6 kg kg^{-1} , 22.5 kg kg^{-1} and 77.1 kg kg^{-1} , respectively, as compared to the relay intercropping systems ($P \leq 0.01$). Overall, the results indicated that among intercropping combinations, simultaneous intercropping showed superiority compared to relay intercropping combinations ($P \leq 0.01$) in terms of nitrogen productivity and phosphorus productivity in corn and nitrogen productivity in bean. It is recommended to use simultaneous intercropping farming systems rather than sole cropping in this region to take advantage of its benefits.

Keywords: Capture efficiency, capture productivity, nitrogen, phosphorus, potassium, use efficiency