J. Agr. Sci. Tech. (2014) Vol. 16: 517-526

Effect of Cobalt Application on Seed Production in Red Clover (*Trifolium pratense* L.)

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ABSTRACT

A field experiment involving red clover varieties K-39, K-17, Una and Viola was established on an acidic (pH_{H2O} 4.8) soil to evaluate the effects of foliar application of cobalt (a beneficial nutrient for efficient nitrogen fixation) on seed yield, and on seed yield components. The foliar spray of the crop was carried out using cobalt nitrate [$Co(NO_3)_2$] with the treatments: one application at the intensive growth phase during the first growth, while two others during the second growth within the second year of cultivation. Seed yield and yield components were recorded from the second growth within the second year of the study. Regardless of foliar cobalt application, the varieties produced a significantly higher seed yield in 2011, when the rainfall received from the onset of flowering until seed maturation was recorded as lower than that in 2010. The foliar treatment with cobalt was in general accompanied by a positive effect on seed yield and seed yield components in all the varieties. As compared with control, a significant increase in seed yield, in the cobalt applied treatment, was obtained only in Viola, mostly due to the significant increase in flower number i.e. seed number per inflorescence. The more favorable response of Viola to foliar cobalt application may have been attributed to a greater percentage of foliage cover during the treatment, as compared with the other varieties. This suggests that foliar cobalt treatment in future studies should be performed at the early stages of development i.e. during intensive growth throughout the first and second cuts, in order to stimulate nodulation and have greater nitrogen fixation in a needed timely manner.

Keywords: Cobalt, Foliar spray, Moisture regime, Red clover, Seed yield, Yield components.

INTRODUCTION

In Southeast Europe, red clover (*Trifolium pratense* L.) seed crop is commonly established on acidic soils where certain macro- and micro-nutrients are less available to plants (Dear and Lipsett, 1987). Plant growth and metabolism, particularly on acidic soils, is greatly dependent upon cobalt (Co) concentrations in the soil rhizosphere (Palit *et al.*, 1994); and Co availability (Taylor and Quesenberry, 1996). Cobalt is considered to be a beneficial element to higher plants (Vyrodova, 1981). In legumes, cobalt is essential for the microorganisms' fixing of atmospheric nitrogen (Young, 1983). A sufficient supply of Co is important in a number of physiological responses in the crop during the photosynthetic process (Lipskaya, 1972), respiration (Palit *et al.*, 1994; Aleshin *et al.*, 1987), and cell growth as well (Lipskaya, 1970), thereby positively affecting plant organs' growth (Ahmed and Evans, 1960; Mathur *et al.*, 2006; Jayakumar *et al.*, 2007; Jayakumar and Jallel, 2009). Also, a good Co supply induces an increase in chlorophyll

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