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THE EFFECT OF FOLIAR APPLICATION OF COBALT ON THE FORAGE YIELD OF RED CLOVER IN THE COMBINED FORAGE-SEED PRODUCTION

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Abstract

The crops of red clover (*Trifolium pratense* L.) are generally established on acid soils in which some of the trace elements are heavily accessible to the plants. In such conditions, the proper mineral nutrition can positively affect the yield of perennial legumes. The aim of the study was to analyze the effect of foliar treatment with cobalt on the forage yield of red clover on acid soil. The field experiment with varieties of red clover K-39, K-17, Una and Viola was set up in 2019, 2010 and 2011 in Čačak on alluvial soil type with pH(H_2O) 4.8. The experiment was designed using a randomized block design with four replications, with the plot size of 5x1 m. Sowing was carried out at 20 cm of inter-row distance and with seed rate of 18 kg ha^{-1}. The analyses were carried out on the first growth during the second year of cultivation, which in combined production forage-seed is mainly used for forage production. Foliar application of cobalt ($Co(NO_3)_2$ in concentration 0.033 g L^{-1}) was performed in the phase of intensive growth in the first growth in the second year of cultivation. The highest forage and hay yield in the control treatment was recorded in 2010, and the lowest in 2012, while on the variant with foliar application of cobalt there was no significant difference in the forage yield between 2011 and 2012. In the control treatment in all of the years, the variety Una had a significantly higher forage yield as compared to the varieties K-39 and Viola, while on the treatment with cobalt, the variety Una had a significantly higher forage yield only as compared to the variety Viola.

Key words: *red clover, cobalt, yield, forage, hay.*

Introduction

Given the economic and agro-tehnical importance of red clover *(Trifolium pratense* L.*)*, in the combined production of forage-seed, it is necessary to apply appropriate agro-tehnical practices to the potential for forage and seed yields a maximum realized. Proper mineral nutrition can have a positive effect on yield of perennial legumes, especially on acid soils (Dear and Lipsett, 1987). According to Taylor and Quesenberry (1996), acid soils are characterized by a high presence of easily accessible forms of aluminum, iron and manganese and reduced content of easily accessible phosphorus, calcium, and molybdenum. On acid soils, Al and H inhibited the growth of the root system, reducing its capacity for uptake of mineral nutrients and thereby reduces the resistance of plants to drought (Horst, 1991).

Growth and metabolism of plants to a large extent depend on the concentration of cobalt in the rhizosphere and soil (Palit and Sharma, 1994). Cobalt plant supply is essential for normal range of physiological reactions in the process of photosynthesis (Lipskaya, 1972), respiration (Palit et al., 1994; Aleshin et al., 1987), cell growth (increasing the amount of active form of auxin) (Lipskaya, 1970), which affects the rapid growth of plant organs (Ahmed and Evans, 1960; Mathur et al., 2006; Jayakumar et al., 2007; Jayakumar and Jallel, 2009). The positive effect of cobalt supply to plants is manifested through increased chlorophyll content (Lipskaya, 1972; Ozanne et al., 1963), increased thickness of palisade tissue, increased number and size of chloroplasts (Lipskaya, 1972). Cobalt significantly increases nitrogen