

Effect of soil liming on forage production of red clover (*Trifolium pratense* L.)

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Abstract

The paper describes investigation of the influence of acid soil liming ($\text{pH}_{\text{H}_2\text{O}}$ 4.8) on forage and hay yield of red clover and the proportion of red clover and weeds in the total hay yield. The analyzes were conducted on red clover cultivar K-39. The research comprised two levels of soil liming (control – no CaO and variant with 3t ha^{-1} CaO) during the three years of growing (2011-2013). Soil liming had a significant impact on increasing the total yield of forage and hay per hectare in the year of sowing, while in the following years the differences between varieties were not significant. At the same time, the soil liming has reduced the share of weeds and increased the proportion of red clover in the first and the third year of cultivation.

Key words: red clover, liming, soil, share of weeds

Introduction

Production of enough amounts of forage with high nutritive value, is one of the prerequisites for intensifying livestock production. The lack of use of cultural practices is the main reason for low and unstable yields and poor forage quality (Dubljević, 2007.). The soil acidity is one of the factors that complicates growing of many cultural plants (Wheeler, 1998.). Acid soils constrain agricultural production in more than 1.5 Gha worldwide (Edwards et al., 1991.). The scope of the problem is likely to increase as the result of acid rain, long-term N fertilization and legume N-fixation (Robson and Bottomley, 1991.; Von Wexell and Mutert, 1995.; Graham and Vance, 2000.). It is known that soil pH affects all phases of plant growth, disease resistance, resistance to low temperatures, the lifetime of crops, forage yield and quality. Besides the lack of Ca, acid soils are characterized by a high prevalence of easily mobile form of Al, Fe, Mn, and decreased content of readily available P, K and Mo (Su and Evans, 1996.). Furthermore, acidity limits both survival and persistence of nodule bacteria in soil, nodule formation and nitrogen fixation (Stevović et al., 2010.). According to Mc Kenny et al. (1993.) red clover showed higher tolerance to Al than other legumes, but it is sensitive to the toxic effects of Mn. Satisfactory yields of crops on acid soils can be achieved if we perform the repair by entering lime fertilizers (Grewal and Williams, 2003.). Since acid soils occupy large areas of the Republic of Serbia, the aim of this study was to examine the impact of liming of such soils on forage yield of red clover.

Material and methods

The field experiment was conducted in the period 2011-2013 in Čačak ($43^{\circ}54'39.06''$ N, $20^{\circ}19'10.21''$ E, 246m a.s.l.) in alluvial soil type, with acid reaction ($\text{pH}_{\text{H}_2\text{O}}$ 4.8) which contains 3.18 % of organic matter, 0% CaCO_3 , 22.08 mg P_2O_5 , K_2O 30.0 mg per 100 g of soil (Gupta, 2008.). Before the primary tillage of soil and after the end of each growing season fertilization was done with 300 kg ha^{-1} $\text{N}_{15}\text{P}_{15}\text{K}_{15}$. The field experiment was established as completely randomized block system with three replications with the size of experimental plot of 5m^2 ($5\times 1\text{m}$). For the analysis was used red clover cultivar K-39 (Institute for Forage Crops, Kruševac). The researches comprised two levels of soil liming (control – without CaO and

