

Additional fertilizing with nitrogen in red clover forage production on acid soil

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Abstract

In relation with efforts to reduce energy consumption, environmental pollution and intensify systems of sustainable agriculture, the possibility of increasing areas under forage legumes should be considered. With rational fertilization and exploitation of the forage legumes, it is possible to obtain high and stable yields of good quality forage. As the soils with low pH have limited process of nitrogen fixation, the aim of this study was to analyze the impact of additional fertilizing with nitrogen fertilizers on the yield of forage, hay yield of red clover and the weeds share in the total yield on acid soil. The field experiment was set up in 2011 in Čačak (Serbia), on alluvial soil, with acidic reaction ($\text{pH}_{\text{H}_2\text{O}}$ 4.8), using a randomized block design with three replications and the size of experimental plot was 5x1m. With the primary tillage in the fall and at the end of each growing season the land was entered with 300 kg ha⁻¹ of N₁₅P₁₅K₁₅. The red clover cultivar K-39 was planted at the interrow spacing of 20 cm and the seeding rate was 18 kg ha⁻¹. In the experiment there were two treatments applied: without fertilization (control) and nitrogen application (KAN – 27 % N) in an amount of 40 kg ha⁻¹ in the spring of 2012 and 2013 before the start of vegetation. Additional application of nitrogen significantly increased the forage and hay yield of red clover only in the first cut at the second production year, as the average forage yield was the highest. Ratio of weeds in the first cutting of first and the second year of growing significantly increased with additional nitrogen fertilizing. In the third year, the crop of red clover was sparse and exhausted and the yield was very low in the both variants. In such conditions, the additional nitrogen fertilization resulted in a significant decrease in the share of weeds. This is probably due to less intense symbiotic activity in the third compared to the previous two years.

Key words: nitrogen application, red clover, weeds

Introduction

Forage production in the Republic of Serbia is mainly realized in natural meadows and pastures, and partly in the sown crops of red clover, alfalfa, mixtures of grasses and legumes, etc. Along with efforts to reduce energy consumption, environmental pollution and to intensify sustainable agriculture systems, the possibility of increasing area under forage legumes should be considered. In this way, the use of mineral nitrogen fertilizers is reduced, and thus the possibility of loss of nitrogen from the soil by leaching or gas emission (Ledgard et al., 1999). According to Winther and Jensen (1999), the symbiotic nitrogen fixation at legumes is a fundamental process for maintaining soil fertility and continuous productivity of the organic growing systems. Legumes increase the biological value of the soil by the symbiotic nitrogen fixation by bacteria of the genus *Rhizobium* and thus provide a significant amount of readily available nitrogen (Wheeler, 1998). Increased biological value affects the intensification of the process of mineralization of organic matter in the soil (Wheeler, 1998), which contributes to more intensive growth and the achievement of higher yields of next crops. However, on acid soil *Rhizobia* bacteria survival is difficult and reproduction is slow, which results in lower yields of legumes (Nutman, 1976; Edmeades et al., 1981; Wheeler, 1998). In the period of 2001-2005. the average hay yield in

