

Amelioration of pseudogley soil using different ameliorants and fertilizers

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Abstract

This study evaluates the effect of different ameliorants (phosphorus fertilisers, Njival Ca lime fertiliser and manure) on pseudogley fertility and yield of small grains. The largest positive effect on major agrochemical properties of acid pseudogley was produced by Njival Ca lime fertiliser and manure. The combined use of lime fertiliser, manure and NPK led to a reduction in soil acidity, a substantial increase in available phosphorus levels (6.9 to 10.4 mg 100⁻¹g) and, partly, potassium levels, and a decrease in mobile Al (down to 0.4 mg 100⁻¹g) and available forms of Fe and Mn. Grain yield of small grains, particularly wheat and barley, considerably increased with the use of Njival Ca lime fertiliser and manure.

Key words: amelioration, fertiliser, "Njival Ca", pseudogley, soil

Introduction

Acid soils limit crop production in 30-40% of the total world's arable land and 70% of potentially arable land (Eswaran et al., 1997). Acid soils in the Republic of Serbia account for more than 60% of total arable land (Stevanović et al., 1995).

The low pH of these soils and a deficiency of major biogenic nutrients, primarily P and Ca, are factors constraining high stable yields of cultivated plants. Apart from the acid reaction, these soils are often characterised by an increased content of toxic forms of Al, Fe and Mn, and a deficiency or reduced availability of P, Ca, Mg and certain micronutrients, Mo, Zn and B in particular (Sumner, 2004).

Different ameliorants are used to improve soil properties and increase yields of cultivated plants (Vakalis et al., 2005; Caires et al., 2008). Acid soil neutralisation leads to an increase in soil pH and exchangeable Ca level, as well as to a decrease in mobile Al level down to a soil depth of 60 cm (Caires et al., 2008).

Pseudogley and other types of acid soils occupy large land area in Central Serbia. Therefore, it was deemed important to evaluate the effect of certain ameliorants in improving major agrochemical properties of acid pseudogley and increasing yield of winter small grains.

Material and methods

A field trial was conducted over a period of three years (2008-2010) to study fertilisation on pseudogley soil. The trial included an untreated control and three ameliorative fertilisation treatments: NPK+1 (120 kgNha⁻¹; 160 kgP₂O₅ha⁻¹; 53 kgK₂Oha⁻¹), NPK+2 (120 kgNha⁻¹; 80 kgP₂O₅ha⁻¹; 53 kgK₂Oha⁻¹+5 t "Njival Ca"ha⁻¹) and NPK+3 (120 kgNha⁻¹; 80 kgP₂O₅ha⁻¹; 53 kgK₂Oha⁻¹+5 t "Njival Ca" ha⁻¹+20 t manure ha⁻¹). Fertilisation treatments were set up in a randomised block design with three replications. The experimental plot was 50 m². The fertilisers applied included complex NPK fertiliser (8:24:16), superphosphate (17% P₂O₅) and ammonium nitrate (AN=17% N) applied as a nitrogen fertiliser towards the end of winter. Maize was used as the preceding crop. Four different genotypes of winter small grains (wheat, barley, triticale and rye) were

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