PROBLEMS OF APPLE GROWTH AND NUTRITION ON PSEUDOGLEY SOIL

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Abstract

The paper analyses the results from three experiments at the same lowland location on a pseudogley soil under a humid climate. They had various goals: the examination of characteristics of the non-ameliorated pseudogley with natural vegetation and effects of amelioration during the 9th and 13th years after their application in the apple plantation; the characteristics of the growth and productivity of apples during the period of full fertility under various air-water regimes of the ameliorated lowland pseudogley, and chemical analyses of the apple parts for basic mineral elements in such conditions. This research should improve understanding of factors affecting apple production and help overcome problems experienced during the growth and development of apples on such hard soils of the pseudogley type.

Key words: Pseudogley, growth and development, apple

Introduction

Pseudogley belongs to the group of low-productive soils that are rather inappropriate for agricultural production. At the same time, it is also one of the most represented types of soils within the category of hard soils in the Republic of Srpska. The pseudogley is a hard clay and unstructured soil, with an acid to highly acid pH, which falls within the group of epigleae soils. This soil is characterized with a layer impermeable to water, most often at a depth of 30 to 40 cm. Under climatic conditions where a surplus of precipitation occurs, and the pseudogley is located on flat fields, water stagnation occurs on surface horizons. Furthermore, in the case of full water saturation, water is maintained at the very surface of this soil. The water, which is periodically maintained in surface horizons, has an impact upon pedogenetic processes, owing to the alternation of the wet, damp and dry phases (Ćirić, 1984; Resulović, 1983).

In the wet phase of the pseudogley, the soil pores are filled with water and oxygen is used rapidly, due to uptake by plant roots and microorganisms. Access to soil with further supplies of oxygen is prevented, because the pores are filled with water in which oxygen has a rather weak diffusion: only 10^{-4} in relation to that in air (Fitter and Hay, 1993).

In this phase, the soil becomes anaerobic. In the stratum where the water is maintained, the redox potential declines and manganese and iron are reduced, resulting in Fe and Mn being solubilised as organic-mineral complexes. All this leads to the appearance of characteristic marbling with highly visible grey and rusty, rarely black zones and Fe-Mn concretions of a dark brown to black colour (Rowe and Beardsell, 1973). Under rather more acid variants of pseudogley with hidromorphic humus, aluminium is also mobilized. The aluminium is stable in solution and does not deposit with an increase of the redox potential, in the same way as manganese and iron do. This leads to a lack of physiologically active magnesium and calcium because of the interaction between ions of aluminium and