

## EFFECT OF LIMING AND FERTILIZATION ON YIELD AND QUALITY OF OAT (*AVENA SATIVA* L.) ON AN ACID LUVISOL SOIL

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### ABSTRACT

The uplands and highlands in Western Serbia are the most important oat production regions in Serbia. An experiment was conducted on a Luvisol soil in the Mt. Radočelo region (southwestern Serbia) in order to evaluate the effect of soil ameliorative operations (liming and humification) and fertilization on grain yield, test weight, 1000-grain weight and grain protein content in oat. The combined use of NPK fertilizers (120 kg N ha<sup>-1</sup>, 80 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup>, 80 kg K<sub>2</sub>O ha<sup>-1</sup>), lime (5 t ha<sup>-1</sup>) and manure (30 t ha<sup>-1</sup>) provided an optimum supply of major nutrients, resulting in maximum grain yield (5.443 t ha<sup>-1</sup>). The combined use of NPK, lime and manure induced a significant increase in test weight and protein content, and a moderate increase in 1000-grain weight. NPK fertilization increased grain yield and test weight, but showed no effect on 1000-grain weight and grain protein content. Nitrogen application resulted in a significant but lower increase in grain yield and quality, which was not likely to provide a significant economic benefit. The combined use of chemical ameliorative operations (liming and humification) and fertilization, especially with adequate rates of nitrogen and phosphorus, facilitate the optimization of the yield and quality of grain having a high market value.

**Key words:** Oat, acid soil, liming, fertilization, yield, quality, protein content.

### INTRODUCTION

Oat (*Avena sativa* L.) stands out among small grains, but also among forage crops, for its specific and good quality chemical composition of both grain and straw. The chemical composition of oat grain and straw is highly variable due to genetic, climatic and edaphic factors, and the cultural operations applied. The quality and chemical composition of oat grain are closely associated with oat yields, being an important trait in terms of the production efficiency of oat in general and its use as a forage crop in particular (Nikolić et al., 2004). Compared to other cereal crops, oat is reputed to be better suited for production under marginal environments, including cool wet climates and low fertility soils (Hoffmann, 1995; Buerstmayr et al., 2007; Ren et al., 2007).

Soil acidity frequently affects agricultural production in Serbia, as in many other areas worldwide. The low content of calcium (Jelić,

1996) and aluminum toxicity (Arsenijević-Maksimović et al., 2001) affect root growth and the absorption of water and nutrients by plants, usually causing crop yield reduction in acid soils (Sumner et al., 1986). In acid soils, poor plant growth may result from phytotoxic substances such as soluble Al and Mn, nutrient deficiencies (P, Ca and Mg), and reduced uptake of nutrients (Beckie and Ukrainetz, 1996).

Oat is widely grown in Western Serbia for the milling, horse feed, and feed grain markets. Despite the relative importance of oat in this region, limited information is available regarding optimum fertilization. Both yield and quality, and thus the economic value of oat, may be strongly influenced by fertilizer management. For example, oats meeting specific quality standards, such as a high test weight and a low percentage of thin kernels, may garner price premiums in specialized milling and horse feed markets. The oat industry in Serbia has made very



















