

The effect of sulphur on formation of winter wheat yield

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Introduction

In recent years the sulphur supply has decreased in many agricultural areas. The main reasons for that are as following: the atmospheric concentrations of sulphur compounds have decreased; sulphur-rich simple fertilizers have been replaced by sulphur-poor compound fertilizers; increased yields take up more sulphur from the soil. In addition to sulphur needy crops even crops needing less sulphur, including cereals, start suffering more and more from sulphur deficiency (McGrath et al, 1996). Sulphur deficiency reduces the yielding ability of cereals and the effectiveness of mineral fertilizers, in particular that of nitrogen (Järvan & Adamson, 2004; Feger, 2005). It has become evident that sulphur fertilization improves the baking properties of wheat and the biological value of proteins (Marschner, 1997; Järvan et al., 2006). The aim of this research was to identify the effect of sulphur fertilization on the formation of yield of winter wheat (*Triticum aestivum*) and on the elements of yield structure.

Materials and methods

The research was based on four field trials with 10 variants that were conducted in the years 2004 and 2005 with winter wheat (variety "Lars") according to the same trial scheme at two different locations. In North-Estonia in Saku (59°17'N, 24°35'E) the trials were established on break-stony sod-calcareous soil and in South-Estonia in Auksi (58°27'N, 25° 35'E) on slightly acid loam. The trials were conducted at the nitrogen background of N 100 kg ha⁻¹ that was applied at the stage of sprouting in two doses (N60+N40). Sulphur at the rate S 4 till 26 kg ha⁻¹ was applied together with nitrogen by using different solid NS- and N-fertilizers. The control variant was fertilized only with ammonium salpeter.

From sample sheaves taken prior to harvesting the average number of productive sprouts per plant, the average number of grains per ear and the 1000-grains mass were determined taking into account all formed grains. Wheat yields were calculated to 14% moisture. Data were processed by dispersion and regression analyses.

Results and discussion

The formation of yield is affected by the content of chlorophyll in leaves. A typical sign of sulphur deficiency is the decrease of chlorophyll in young leaves. In the trials on break-stony soil there was a clear distinction between the variants of sulphur fertilized and non-fertilized trial plots.

At the ear emergence stage the chlorophyll content of wheat leaves increased due to different sulphur application rates in the conditions of 2004 by 42-54% and in 2005 by 14-26%.

Of yield structure elements the number of productive sprouts, the number of grains per ear and the 1000-grains mass are of importance, as they affect the yield. The effect of different sulphur application rates on the yielding ability of winter wheat and its yield structure has been depicted in figures (Figure 1-2).

The most effective trial variant was the one that was fertilized on both application times with the nitrogen sulphur ratio 10:1. It is important to satisfy the sulphur need of wheat already at early development stages. The sulphur rate S 10 kg ha⁻¹ increased the yield of winter wheat on two-year-average by 27% on the break-stony soil of North-Estonia and by 43% on the

loam of South-Estonia. Sulphur fertilization improved productive sprouting on both soils, at the rate S 10 kg ha⁻¹ it increased by 44-47%.

The average number of grains per ear was increased by sulphur on break-stony soil by 25% and on loam almost by 13%. On some occasions the increase in the number of productive sprouts and grains per ear can mean that not all grains reach full growth. Thus, on break-stony soil S 10 reduced the 1000-grains mass on average by 11.5%.

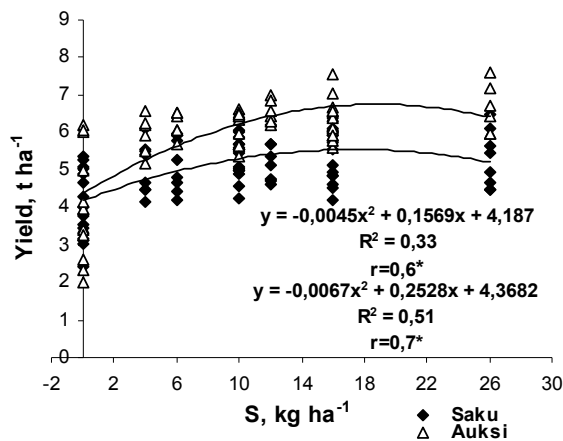


Figure 1. The effect of the sulphur on the yield of winter wheat

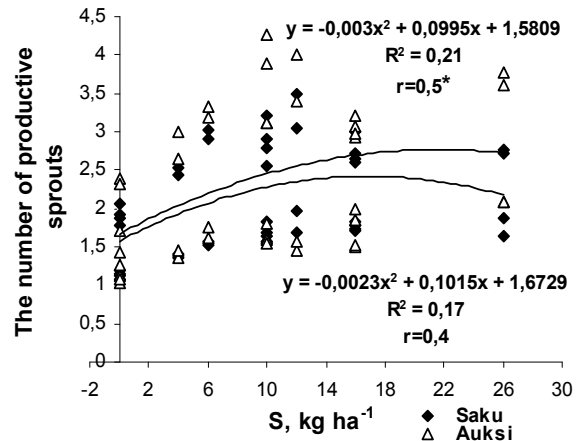


Figure 2. The effect of the sulphur on the number of productive sprouts of winter wheat

Conclusions

Fertilization of winter wheat with sulphur enhances the emergence of productive sprouts and increases the number of grains per ear, increasing thus considerably the yielding ability. According to the preliminary data it is recommended to apply 1 kg sulphur per each 10 kg of nitrogen.

References

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