ZN FERTILISATION OF WHEAT. HIGHER PROTEIN, LOWER CARBOHYDRATE CONTENT

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Introduction

Winter wheat (Triticum aestivum L.) is the crop that is grown on the largest part of the arable land of Hungary. From marketing point of view one of the most important aspects is quality. The quality of flour within a particular variety is influenced by numerous factors, such as soil type and quality, soil management, technology, plant nutrition, weather, etc. (Szentpétery et. al. 2005).Hungarian researchers achieved significant results in studying and determining the quality parameters of wheat (Pekár, 1881). Cserháti drew the attention to the importance plant nutrition and to the role of some macro and trace elements in forming wheat quality already in 1894. In recent years also several scientific papers were published dealing with the possible alternatives of agricultural production, outlining the dilemma of mass production or producing quality products. (Jolánkai et.al. 2005., Schmidt and Szakál, 2005., Pepó et.al.2005.). Zn came in to the centre of interest in the 1950-ies in Hungary. The mobility of Zn in the soil and its availability to plants decreases with the increase of pH, Ca-, and P-content of the soil. In high sodium content soils Na-Zn compounds are forming and generally increase the amount of plant-available Zn. Induced Zn deficiency can occur even in soils relatively well supplied with Zn, therefore we can get exact information only by plant analysis. (Kádár 2005.).

A significant proportion of Hungarian soils are deficient in zinc. Due to original or induced zinc deficiency the zinc nutrition of plants may not be sufficient on about two third of the arable land of the country. As a result of plants' uptake, leaching, erosion, etc. the annual deficit is about 1000 tons (Tölgyesy, 1978., Schmidt, Szakál 2005). Zn plays important roles in biochemical processes. For lack of Zn the development of plants is hindered, the yield will be reduced, the quality inferior. Zn is essential for the functioning of more than 200 enzymes.

Zn deficient plants, fruits and foodstuffs are unfavourable for human nutritional point of view as well. (Kádár, 1995). Most of our cultivated plants are sensitive to zinc deficiency. In recent times more and more research works deal with the role of Zn in plant production, its effect on yield and crop quality. Zn is also essential form human nutritional point of view therefore we should safeguard a sufficient level of Zn in agricultural produce by proper Zn nutrition of plants.

We can supply Zn through the soil or in the form of foliar fertilisers. As foliar fertilisers Zn is generally applied in the form of complex compounds for promoting better uptake and utilisation. If Zn is replaced through the soil relatively large amounts should be used and the high price of Zn compounds often prevents farmers choosing this method. In our experiments we studied the effect of zinc-tetramine complex on winter wheat.

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Materials and methods

The plot experiments were carried out in 2002, at Solum Farm Ltd. in Komárom on Danube alluvial soil with the winter wheat variety GK-Kincső. The treatments were applied in the phenological phase of booting. The size of the plots was 10 m^2, the Zn doses applied were as follows: 0,1, 0,3, 0,5 1,0, 2,0 kg^{-1}. The arrangement of the experiment was a randomised block design, with four repetitions. The harvest was done with a plot harvester. We measured the yield and carried out flour quality tests. The results were evaluated with analysis of variance.

Table 1 Soil analysis results. Komárom SOLUM Farm Ltd., 2002

pH		K_A	$CaCO_3$	Humus %	AL-soluble $mgkg^{-1}$			Mg mg/kg	EDTA-soluble $mgkg^{-1}$			
H_2O	KCl				P_2O_5	K_2O	Na		Zn	Cu	Mn	Fe
7,7	7,3	42	5,1	2,1	228	205	51	58	1,2	0,9	18	19,7

Results and discussion

Yield

The Zn treatments carried out in the phenological phase of booting increased the yield up to the Zn dose of 1.0 kg ha^{-1}. The 2 $kgha^{-1}$ Zn dose proved to be slightly toxic and decreased the yield a little, compared to the highest value. The 1 kg ha^{-1} Zn dose increased the yield significantly ($LSD_{5\%}$ = 0.54). At the Zn-dose of 1$kgha^{-1}$, the yield was 0.6 t ha^{-1} higher than in the case of the control.

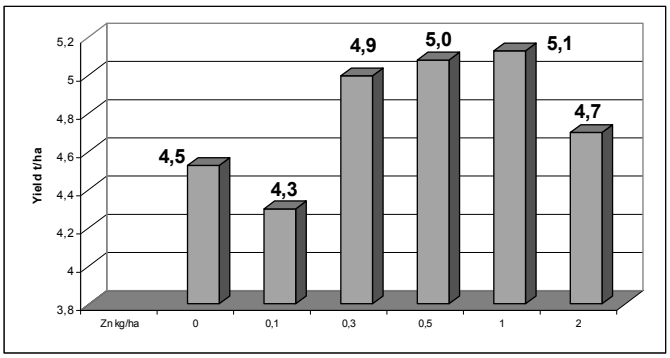

Figure 1. The effect of Zn on the yield

Raw protein content

Due to the Zn treatments the protein content increased continuously. The maximum value of the protein content could be detected at the 2.0 $kgha^{-1}$ Zn dose. The Zn doses higher than 0.3 kg ha^{-1} increased the raw protein content significantly ($LSD_{5\%}$ = 0.84). As a result of the 1.0 kg ha^{-1} Zn dose the raw protein content decreased slightly. The 2 kg ha^{-1} Zn-dose decreased the yield already, but it still had a positive effect on the raw protein content. This increase in the raw protein content was more than 10% compared to the control.