

MANAGEMENT OF FERTILIZATION AT SCD CB TÂRGU MUREŞ IN RELATION TO WHEAT CONTAMINATION WITH *FUSARIUM GRAMINEARUM*

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RESEARCH ARTICLE

Abstract

At the world level, currently, more and more emphasis is being placed on the development of techniques and methods to reduce the incidence of *Fusarium* head blight in cereals based on links in plant culture technology. In this context, the purpose of this work is to evaluate the reaction of some wheat varieties to NPK fertilization in connection with the risk of *Fusarium graminearum* contamination.

The experiments took place at SCD CB Târgu Mureş (Research and Development Station for Cattle Breeding), and the type of soil was Haplic Luvisol.

From the obtained results, it was found that the application of potassium fertilization, in the studied area, can lead to a reduction in the incidence of *Fusarium graminearum* attack.

Keywords: *Fusarium*, NPK fertilization, mineral content.

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INTRODUCTION

The degree of contamination of cereals with mycotoxins is influenced by several factors such as: weather conditions, cultivation methods, the degree of resistance of varieties and the method of harvesting cereals.

In recent years, worldwide, there is a desire to develop techniques and methods to reduce the occurrence of *Fusarium* head blight (FHB) in cereals based on links in plant culture technology (Miedaner et al., 2003, Bunta et al., 2011; Dana et al., 2021; Chiurciu et al., 2022).

Furthermore, a database containing information on the diversity of chemotypes occurring in European countries has been developed at the European level (Pasquali, 2016).

The minimum soil culture system increases the amount of inoculum of *Fusarium* spp., being the main reason for the increase in the level of infections in cereals.

Fusarium graminearum occurs frequently in areas with a warm climate, but also in

countries with a temperate climate, in seasons with high temperature and humidity.

Fusarium graminearum is the main cause of grain rot in North and South America, but also in Southern Europe and Asia (Humphreys et al., 2001; Liu and Anderson, 2003; Kazan and Gardiner, 2017; Taheri, 2018; Kamle et al., 2019). In this context, the objective of this work is to establish the reaction of some wheat varieties, cultivated in Romania, to NPK fertilization.

MATERIAL AND METHOD

The experiences at SCD CB Târgu Mureş were organized on two agricultural plots: one unfertilized and one fertilized with N₁₀₀, P₁₀₀, K₁₀₀. The varieties tested were: Glosa, Gruia, Delabrad, Faur and Dropia.

From these parcels were collected and analyzed soil and plant samples. The analyzes were made in accordance with RISSA methodology (1980, 1981) and the results were interpreted in relation with the optimal limits from literature (Bergmann, 1992).

RESULTS AND DISCUSSIONS

The plots studied are located North-West of the town of Târgu Mureș (Figure 1). The hills of Tîrnava Mică, the wide valleys of Mureș, to the north, and Tîrnava Mare, to the south and west, frame the central region of the

Transylvanian Depression, called the Hills of Tîrnava Mare. Geographical coordinates: longitude N - 46°34'12.6"; latitude E - 24°36'14.8"; absolute altitude - 324 m; soil type - Haplic Luvisol - Lvha (WRB-SR 1998).



Figure 1 **Experimental plots from SDCB Târgu Mureș**

Source: Google maps, GRIFOX Project

Soil agrochemical properties

The reaction of the soil is neutral-weakly alkaline, the sum of the bases and the cationic exchange capacity show medium values, and the hydrolytic acidity is very low. From the point of view of the degree of saturation with bases, the soil is below mesobasic - eubasic.

The state of supply with humus is low, and with nitrogen it is medium. The content of mobile phosphorus is high, and the content of mobile potassium is low. The soil is well supplied with micronutrients (Figures 2-3).

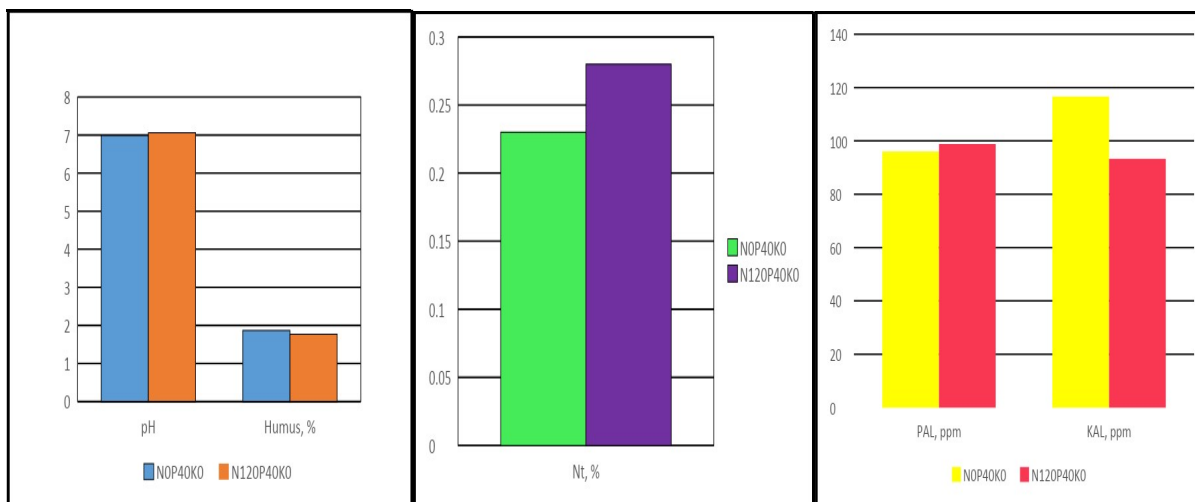


Figure 2 **The variation of the pH, the content of humus, nitrogen, phosphorus and potassium in the experimental plots from SDCB Târgu Mureș**

Source: own determination, GRIFOX Project

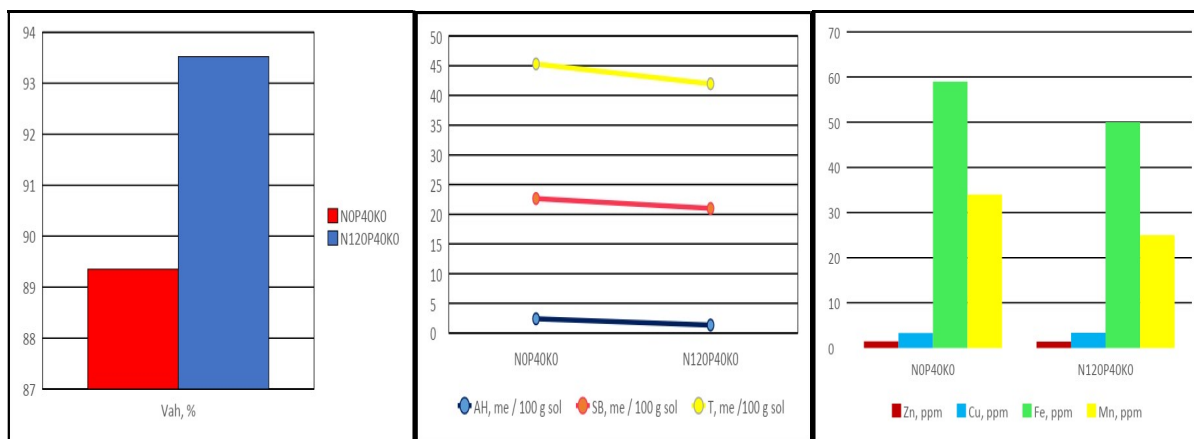


Figure 3 The variation of the degree of saturation with bases, the sum of the bases, the cation exchange capacity, the hydrolytic acidity and the content of micronutrients in the experimental plots from SCDCB Târgu Mureș

Source: own determination, GRIFOX Project

Favorability of lands on the territory of SCDCB Târgu Mureș

Based on the analysis of the bounty points, it can be observed that the lands on the territory of SCDCB Târgu Mureș present an average favorability (classes IV-V favorability) for all crops in the area (Table 1). For arable use, the bounty points place the land in the 6th favorability class, with values that vary

between 42 and 53 points.

For the wheat crop, most of the territory falls into the 5th class of favorability (52 points for H.E.T. 2 and 53 points for H.E.T. 1), and H.E.T. 3 falls into the 6th class favorability, with 47 points.

H.E.T.= homogeneous ecological territory

Table 1

Bounty notes of homogeneous ecological territory (H.E.T.) for arable land at SCDCB Târgu Mureș

No. H.E.T.	Current use	wheat	barley	maize	sunflower	potato	sugar beet	alfalfa	clover
1	Arable	53	53	53	43	43	53	48	52
2	Arable	52	52	42	38	33	37	47	52
3	Arable	47	47	41	37	41	41	37	52

Source: own determination, GRIFOX Project

Mineral nutrition status of plants

In the conditions of a neutral-weakly alkaline soil, the contents of macro (Figure 4) and micronutrients (Figures 5-6) in the dry matter of wheat plants, with the exception of K,

fall within the limits corresponding to normal nutrition. Higher values of the content of nutrients being recorded on the fertilized plot, compared to the unfertilized one.

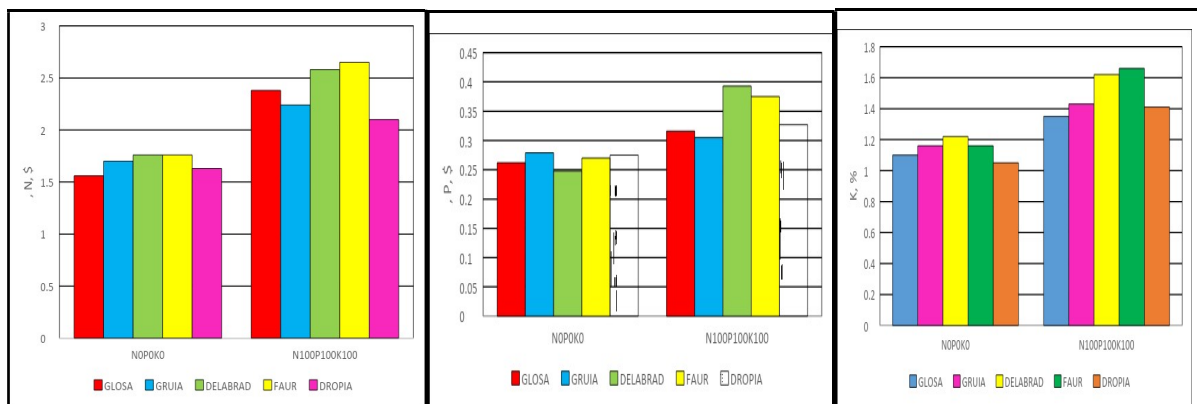


Figure 4 The content of nitrogen, phosphorus and potassium in the aerial part of winter wheat plants at the ear emergence-flowering stage

Source: own determination, GRIFOX Project

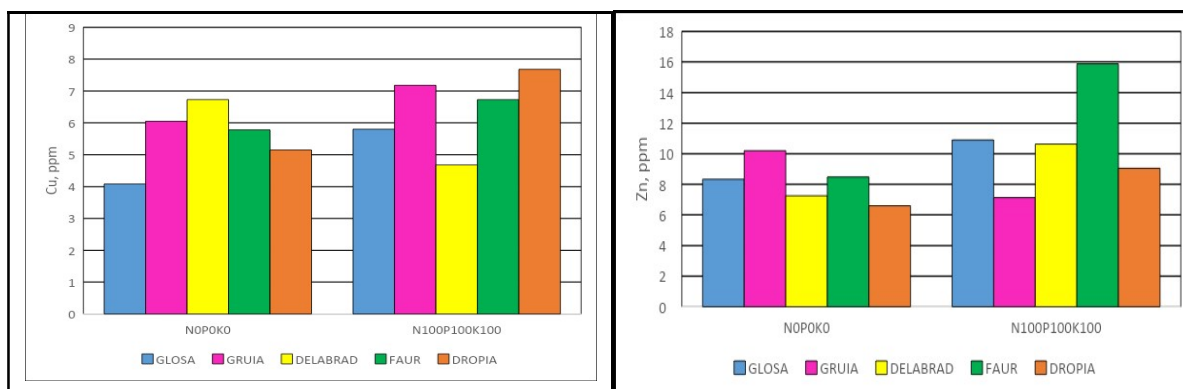


Figure 5 Copper and zinc contents in the aerial part of winter wheat plants at the ear emergence - flowering stage
Source: own determination, GRIFOX Project

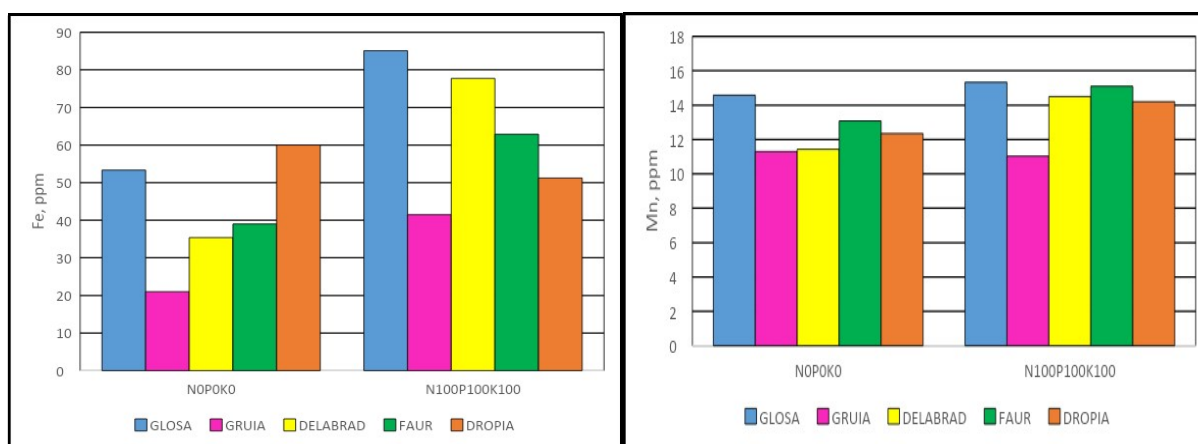


Figure 6 Iron and manganese contents in the aerial part of winter wheat plants, at the ear emergence-flowering stage
Source: own determination, GRIFOX Project

The relations between the content of N and the contents of P, K, Cu, Zn, Fe and Mn, in the dry substance of the plants, are presented in Figures 7-9. From Figure 7 it can be seen

that the P and K contents of the plants increase with the increase of the nitrogen content in the plants, under the conditions in which it is in the optimal range.

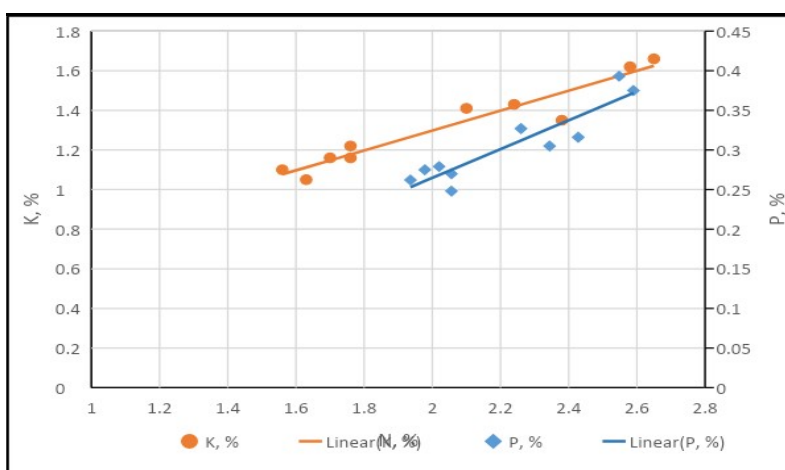


Figure 7 The relationship between the N content and the P and K content in the aerial parts of winter wheat
Source: own determination, GRIFOX Project

The iron, manganese and zinc contents of the plants (Figures 8-9) increase with the

increase of the nitrogen content of the plants, within the optimal nutritional limits.

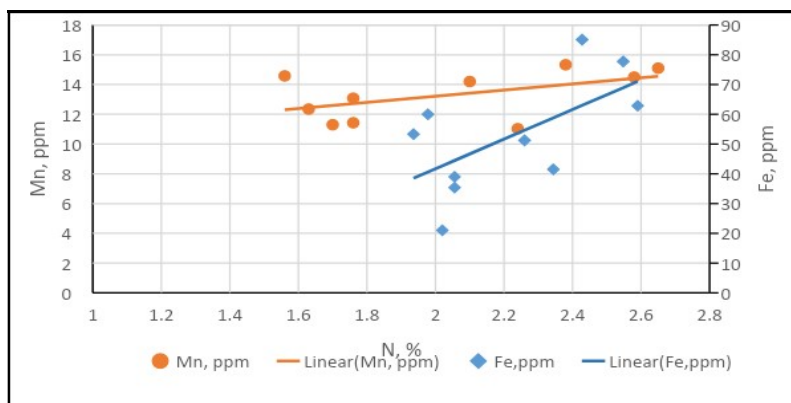


Figure 8 The relationship between the N content and the Mn and Fe content in the aerial parts of winter wheat
Source: own determination, GRIFOX Project

The application of a balanced fertilization with moderate doses of N, P, K, through the effect of optimizing and correcting plant nutrition, can constitute for the studied

area an effective means of reducing the incidence of *Fusarium graminearum* attack on wheat.

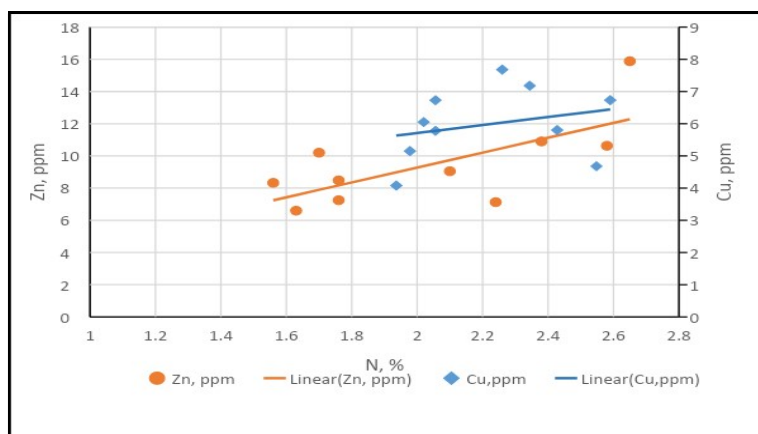


Figure 9 The relationship between the N content and the Zn and Cu content in the aerial parts of winter wheat
Source: own determination, GRIFOX Project

Supplementing plant nutrition with potassium represents a way to increase plant resistance to *Fusarium graminearum* infection, especially since in the studied area low contents of this element were reported both in the plant and in the soil.

CONCLUSIONS

In the conditions at SCDCB Târgu Mureș, the application of NPK fertilization in the soil determined the increase of macro and microelements contents in the aerial part of the winter wheat plants.

Only in the case of potassium, low contents were reported in soil and plant, which indicates the need to apply this element in order to reduce the degree of plant infestation with *Fusarium graminearum*.

Also, the contents of P, K, Fe, Mn and Zn increased in plants with increasing N content.

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