



21-22 November 2024

Effect of nutrient supply on maize (*Zea mays* L.) yield

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Abstract: In Hungary the maize is one of our most important field crops, which is also indicated by the fact that, next to wheat, corn is the crop grown in the largest area. In the future, the primary task in maize cultivation is to create the stability of the cultivation, to moderate the fluctuation of the annual yield averages, thus to increase the yield security. The amount of precipitation falling during the growing season has been unfavorable in recent years, and this was especially true for this year, because due to the poor weather, a drought has developed in a large part of our country. That is why it is necessary to select hybrids adapted to the place of production and use hybrid-specific cultivation technology, during which efforts must be made to apply the optimal amount of nutrients according to the needs and to ensure the appropriate nutrient ratio.

During the experiment, in addition to the control treatment, I examined the corn hybrid P9363 at three different nutrient supply levels. During the tests, I looked for the answer to which nutrient supply level the tested hybrid gives the highest yield, and how the difference in yield (amount of grain yield, thousand grain weight,) of the different treatments can be explained. The harvested grain yield varied between 2.02 and 4.35 t/ha as a result of different fertilization treatments.

In summary, it can be concluded that the N-P-K fertilization applied during the different treatments in the 2022 vintage resulted in a yield increase compared to the control treatment.

• Introduction

Corn requires several key nutrients for optimal growth and development, including nitrogen (N), phosphorus (P), potassium (K), zinc (Zn), copper (Cu), iron (Fe), and sulfur (S) (Shashidhar et al., 2009; Ashoka et al., 2011; Nadeem et al., 2011; Kaur et al., 2023). Among the listed elements, nitrogen, phosphorus, and potassium are essential for the growth of corn, with nitrogen being a critical factor in yield formation (Shashidhar et al., 2009; Singh et al., 2023; Szczepaniak et al., 2014). Adequate phosphorus (P) nutrition during early stages is critical for maize growth, and seed P reserves play a significant role in maize nutrition during early growth stages (Nadeem et al., 2011). Optimizing nutrient application in maize is essential for timely nutrient supply and improved nutrient use efficiency, resulting in enhanced growth, productivity, and nutrient use efficiency (Szczepaniak et al., 2014; Sairam et al., 2023).

• Material and method

The experiment was set up in Szarvas, on the School Field of the Department of Irrigation and Land Improvement of the Institute of Environmental Sciences of the Hungarian University of Agricultural and Life Sciences. During the experiment, we examined the P9363 hybrid in a random block arrangement (Figure 1). During the experiment, we applied the following 4 treatments: Control, without artificial fertilization; Environmental protection level; Balance level; Genesis regional. The experiment took place in an area of approx. 2000m². The 4 different treatments mentioned above were tested in 4 repetitions. The corn was sown on May 10th. The number of plants per hectare used was 70,000 plants/ha, and the row spacing was 75 cm.

The total amounts of NPK active ingredients applied in the different treatments are illustrated in Table 1. The following active ingredients were all applied in the form of fertilizer.

Table 1: Total amount of NPK active ingredients applied in the different treatments

	Control	Environmental protection level	Balance level	Genesis regional
N active ingredient (kg/ha)	0	160,11	180,09	170,5
P active ingredient (kg/ha)	0	0	0	30,6
K active ingredient (kg/ha)	0	0	0	30,6



Figure 1: The experimental area is in Szarvas

• Results and discussions

Based on Figure 2, it is clearly visible that during the experiment, without fertilization, the corn grain yield reached 2.02 t/ha on soil with medium nitrogen supply, in a drought year, with irrigation. At the same time, the lowest yield was also recorded here. The highest yield was achieved in the Genesis regional treatment, with a value of 4.35 t/ha.

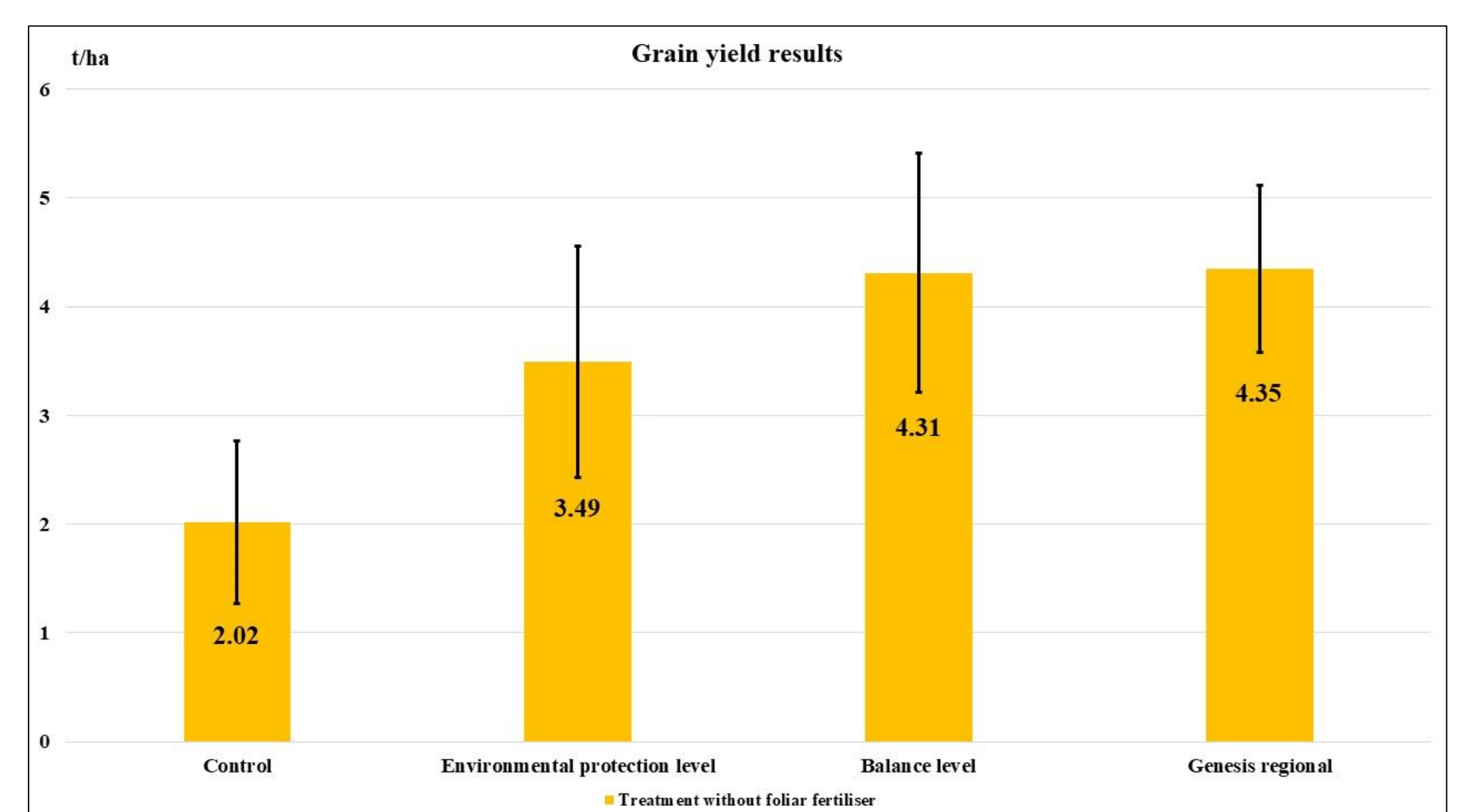


Figure 2: Grain yield results

During the experiment, the amount of cob yield also followed a similar pattern to the grain yield under the influence of different nutrient treatments, as illustrated in Figure 3. The lowest amount of cob yield was also recorded in the unfertilized control treatment, at 0.37 t/ha. The amount of cob yield was the highest in the Genesis regional treatment, at 0.72 t/ha.

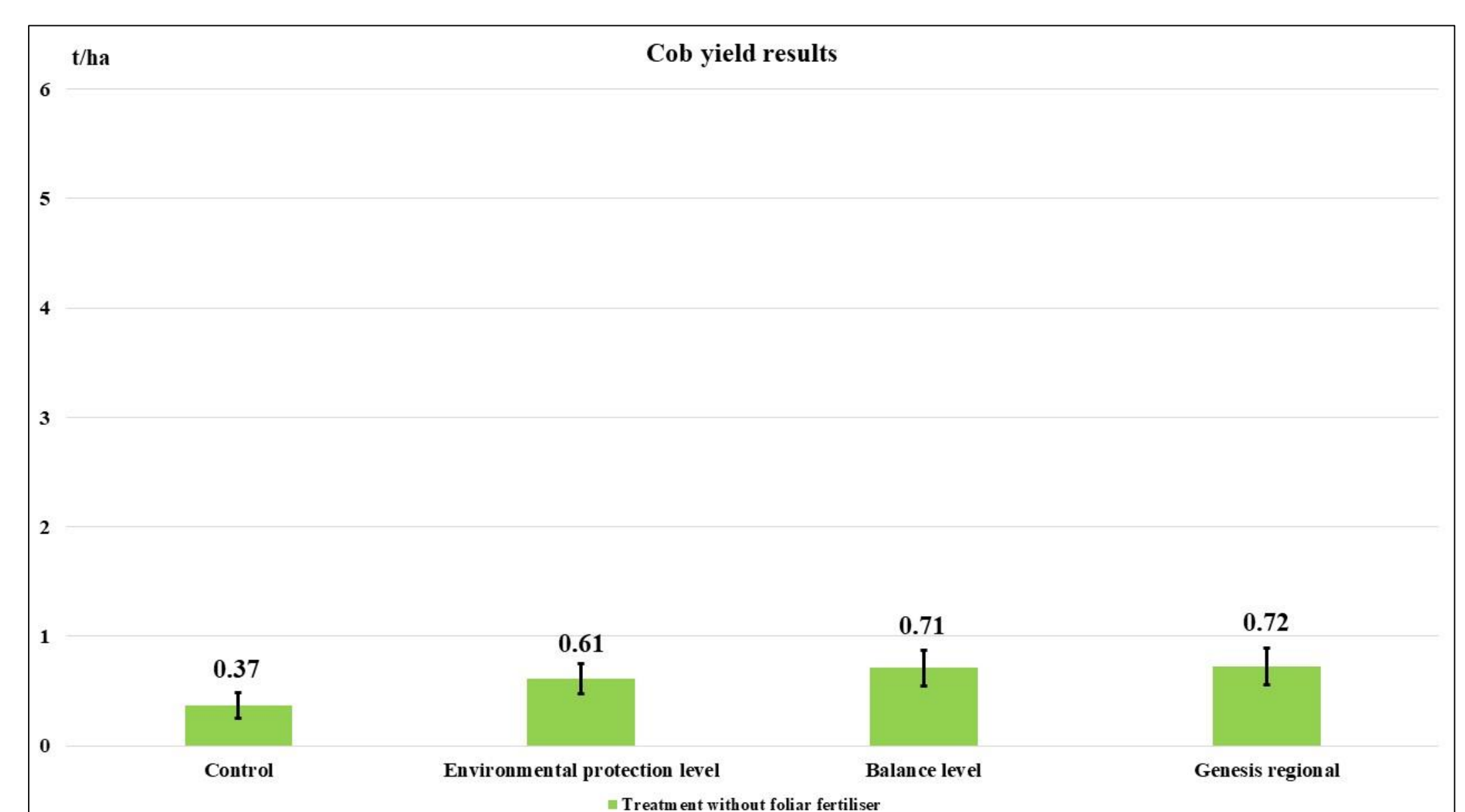


Figure 3: Cob yield results

• Conclusions

Based on the results obtained during the experiment, it can be concluded that the values of grain and cob yields increased with the rate of nitrogen application, even during drought periods with irrigation.