

EFFECT OF FOLIAR FERTILIZATION ON INCREASING YIELD AND OIL CONTENT IN SUNFLOWER (*HELIANTHUS ANNUUS* L.) CULTIVATION

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Abstract: Foliar fertilization, which complements successful artificial fertilization, is becoming more and more widespread in Hungary as well, which provides the plant with a more reliable or additional supply of nutrients, especially in drier periods. In a year with a lack of rainfall - when the plant is not able to absorb the right amount of nutrients from the soil - the nutrient applied through the leaves can be a huge help, which can play an important role in its development, crop set, and content. Our research below serves to prove this, where in the case of sunflower we examined whether foliar fertilization results in an increase in yield and oil content in a year with a very low rainfall and atmospheric drought. The experiment was carried out in 2022 in Szarvas. In the experiment, in the case of 4 nutrient levels with different fertilizer doses, we also used additional foliar fertilization treatment, which was examined in 4 repetitions. The 4 different treatments were as follows: Control (without fertilization), Environmental protection level, Balance level, Genesis regional. In order to investigate the utilization of the applied nutrients, we carried out various yield tests and calculations, as well as internal content measurements. During the experiment, it was established that foliar fertilization resulted in a higher crop yield both in the case of no fertilization and in the case of the 3 nutrient levels, and it also increased the oil content of most treatments.

• Introduction

Today's increasingly extreme weather conditions increase the risk of sunflower cultivation (Szabó, 2013; Novák, 2015), however, adverse weather effects can be mitigated with appropriate agrotechnical responses, which also contribute to improving sunflower yield and quality (Szabó, 2014; Novák, 2015). Among other things, foliar fertilization, which complements successful artificial fertilization, is becoming more and more widespread in Hungary, which provides the plant with a more reliable or additional supply of nutrients, especially in drier periods. In a year with a lack of rainfall - when the plant is unable to absorb the required amount of nutrients from the soil - the nutrients applied through the leaves can be a huge help, which can play an important role in its development, crop set and content. Our research below serves to prove this, where in the case of sunflower we examined whether foliar fertilization results in an increase in yield and oil content in a year with a very low rainfall and atmospheric drought.

• 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 P64LE25 hybrid in a random block arrangement. During the experiment, the following 4 treatments received additional foliar fertilizer treatment: 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. One repetition was located in an area of 360m². In one repetition, the size of a plot was 90m², half of which received additional foliar fertilization treatment, so the foliar fertilized part per plot was 45m². The number of plants per hectare used was 50,000 plants/ha, and the row spacing was 75 cm.

Table 1 shows the dates of the foliar fertilizer treatments carried out during the experiment, the preparations applied in the different treatments, and their dosages and amounts of active ingredients. Table 2 summarizes the amounts of foliar fertilizer applied in the different treatments.

Table 1: The foliar fertilizer preparations used during the experiment, their dosage, amount of active ingredient, and the time of foliar fertilizer application

Date of treatment	Treatment	Name of preparation(s)	Dose (l/ha)	Amount of active ingredient (g/l)	Phenological phase of the plant
30.05.2022	Control	Nitrokén	3	150g N, 530g SO ₃	6-8 leaf condition
	Environmental protection level	Nitrokén	3	150g N, 530g SO ₃	
	Balance level	Nitrokén	3	150g N, 530g SO ₃	
	Genesis regional	Genesis Olajos BS	5	150g N, 50g SO ₃ , 20g B	
15.06.2022	Control				8-10 leaf condition
	Environmental protection level				
	Balance level				
	Genesis regional	Mikromix Zn + Mikromix Mg	2+2	50g Zn + 50g MgO, 50g Fe	
28.06.2022	Control	Péribór Extra	4	100g B	star bud state
	Environmental protection level	Péribór Extra	4	100g B	
	Balance level	Péribór Extra	4	100g B	
	Genesis regional	Péribór Extra	4	100g B	

Table 2: Amounts of active ingredients in foliar fertilizers applied in different treatments

Treatment	Control	Environmental protection level	Balance level	Genesis regional
Amount of active ingredient per treatment (g/ha)	N	450g	450g	750g
	SO ₃	1590g	1590g	250g
	B	400g	400g	500g
	Zn	-	-	100g
	MgO	-	-	100g
	Fe	-	-	100g
Total amount of active ingredients	2440g	2440g	2440g	1800g

• Results and discussions

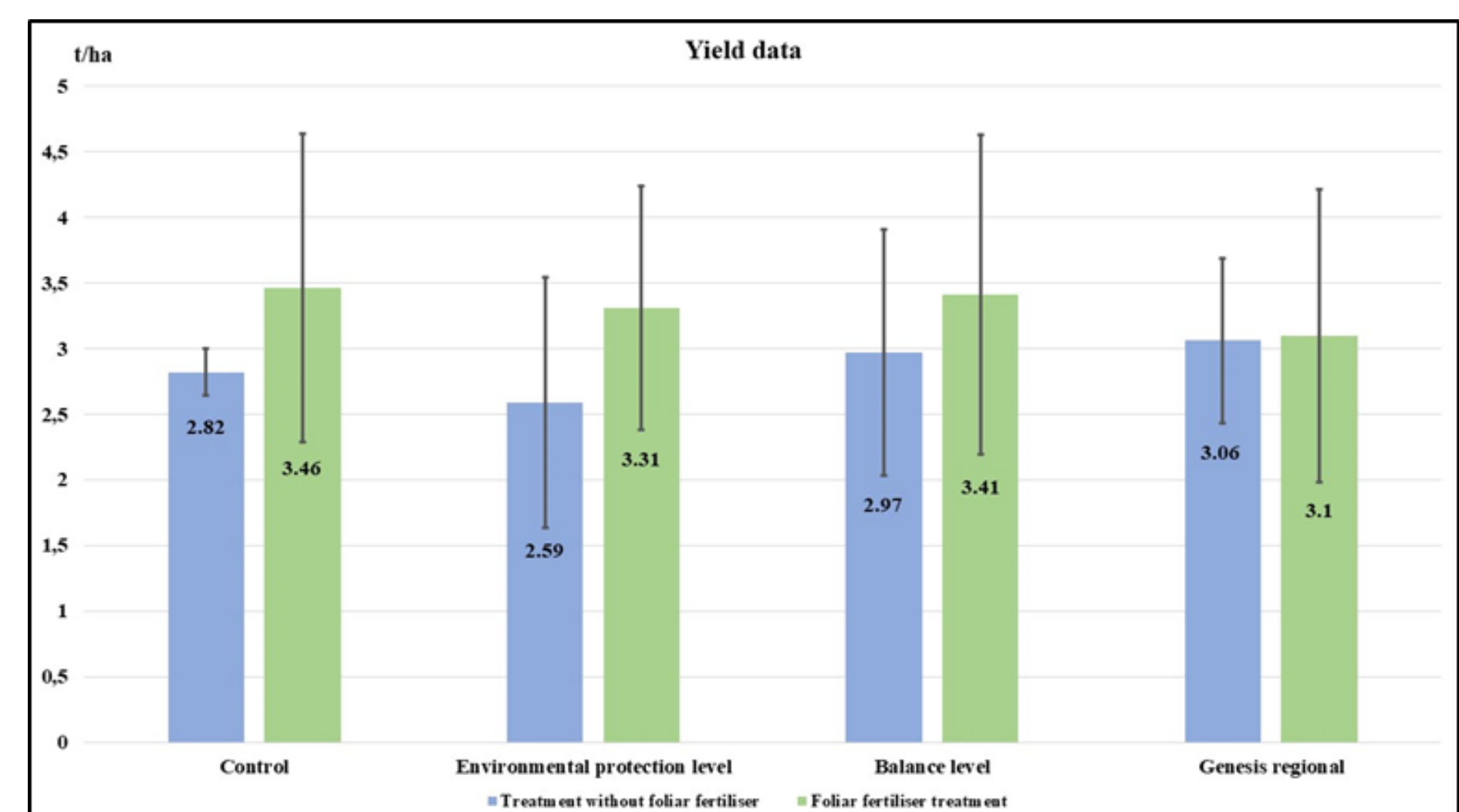


Figure 1: Aggregate yield data

Figure 1 shows the aggregated yield results of the different treatments, both in the case of treatments without foliar fertilizer and with foliar fertilizer. Figure 2 describes the results of the aggregated oil content analysis of the different treatments, both in the case of treatments without foliar fertilizer and with foliar fertilizer.

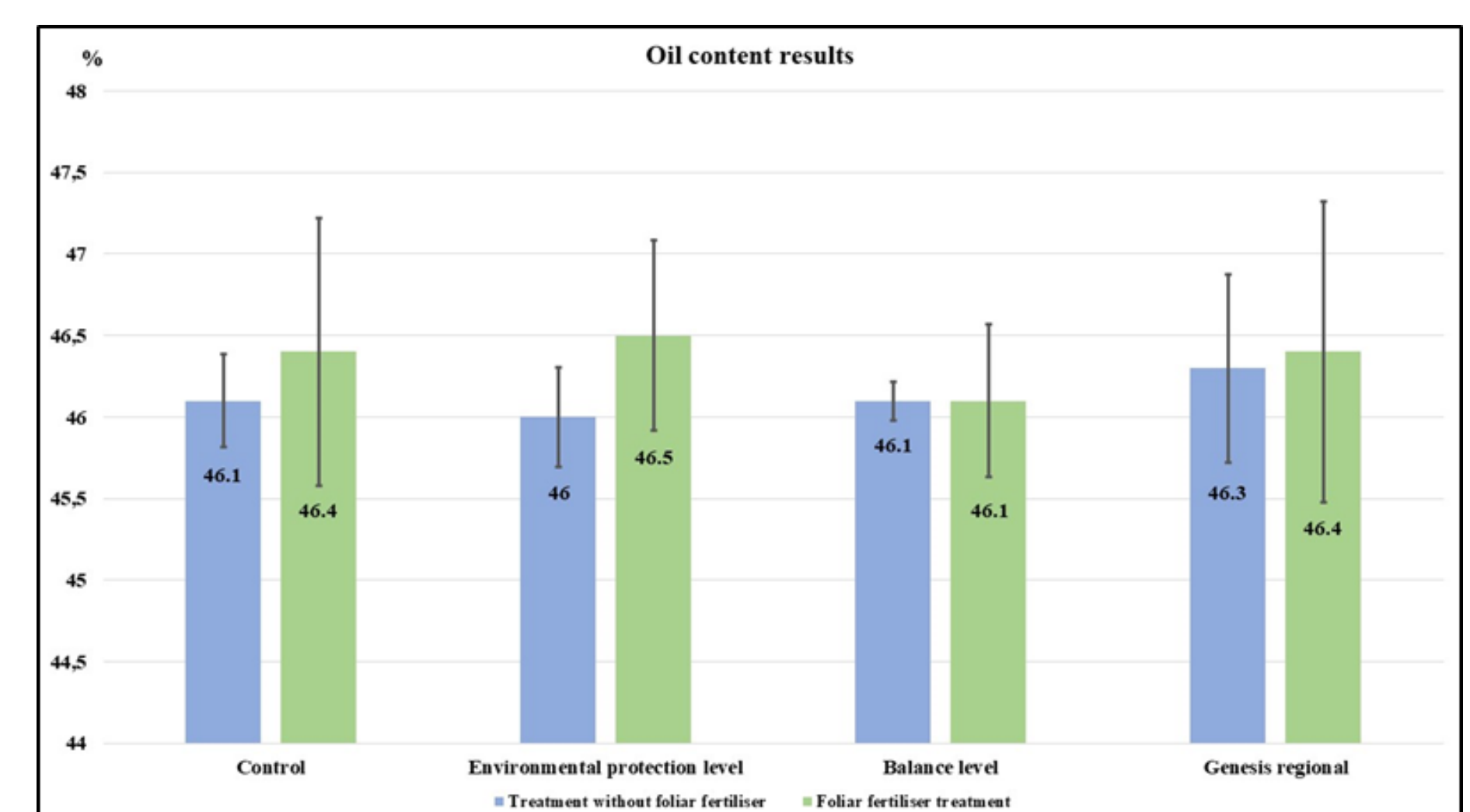


Figure 2: Aggregate oil content data

The sunflower in the Control plot, which had not received artificial fertilization for many years, required a great deal of nutrients, which it received during the growing season by applying foliar fertilizer. As a result, thanks to the diverse macro- and micronutrients found in the foliage fertilizer, we experienced a greater yield increase in this treatment. The yield-enhancing effect of supplementary foliar fertilization was the smallest in the Genesis regional treatment, and the increase in oil content was also minimal. Among all the nutrient levels, the Environmental protection responded best to the additional foliar fertilization treatment, both in terms of yield and oil content growth.

• Conclusions

Overall, greater differences were observed between the results of the parts without foliar fertilizer and those with foliar fertilizer at the lower nutrient levels. Therefore, it can be said that the additional foliar fertilizer treatment in order to increase yield can be useful in nutrient-poor farming, where fast and efficient nutrient replenishment is needed, and in such conditions it also has a greater effect on increasing the oil content than in the case of nutrient-rich farming. Overall, it can be said that in the case of a dry season, the additional foliar fertilizer treatment has a much more positive effect on the increase in yield than on increasing the oil content of sunflower.

