RESEARCH CONCERNING THE IMPACT OF CHEMICAL AND FOLIAR FERTILISERS ON THE MORPHOLOGICAL FEATURES OF THREE SUNFLOWER (*HELIANTHUS ANNUUS*) HYBRIDS IN THE CONDITIONS OF TIMIŞOARA

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Abstract. *By properly applying all cultivation technological steps specific to sunflower, agriculture becomes more sustainable and performing. As in any crop, spectacular progress by the Company Limagrain in Romania, these last years, ask for deeper research of the main features of the sunflower hybrids of the Clearfield type, their behaviour under the differentiate impact of chemical and foliar fertilisation with further implications on achenes' morphological features. The main goal of this paper was to establish the impact of the fertilisation system on the morphological features of sunflower seeds in the soil and climate conditions of Timişoara, in three sunflower hybrids. The sunflower hybrids of the Clearfield type from the Company Limagrain and the cultivation technology they supply support scientifically the idea that their introduction into cultivation is the best solution for the farmers. In this paper we point out aspects concerning the importance of sunflower hybrids of the Clearfield type in Romania, the role of chemical and foliar fertilisers on oil content in achenes and of oil production per area unit. These sunflower hybrids can be cultivated with small efforts if we take into account that they can be treated with herbicides post-emergently when broad leave weeds are in the rosette phase and sunflower plants have 3-4 leaves. Cultivating this type of sunflower hybrids makes possible the control of a species of weeds that is extremely damaging to sunflower crops, a weed that is extremely difficult to control through the classical system of herbicides in common genotype sunflower hybrids. The sunflower hybrids resistant to imidazoline developed by the Company Limagrain are: Rimisol (approved for cultivation in Romania since 2004), F 30008, and Hidalgo. Sunflower is cultivated for its seeds used as raw material in the food industry, supplying 9% of the amount of raw materials processed in the world annually in the oil industry, and 12% of the world oil production. Though our results speak for just one year, they are particularly valuable for the agricultural practices and point out the efficacy of chemical and foliar fertilisers.*

Key words: *floarea soarelui, hibrizi, însuşiri fizice*

INTRODUCTION

Sunflower represents one of the most important crops in Romania from the point of view of the area cultivated, ranging 3rd after maize and wheat.

In this paper, we point out the aspects concerning the importance of sunflower hybrids of the Clearfield type (resistant to the herbicides of the imidazoline group) in Romania, the role of chemical and foliar fertilisers on the growth and development of the sunflower plants with further implications on the morphological features of achenes, optimal rates of nitrogen, phosphorus, and potassium fertilisers in the soil and climate conditions of Timişoara.

The sunflower hybrids chosen for the experiment were tested on four different

agri-funds*:* $N_0P_0K_0$, $N_{60}P_{60}K_{60}$, $N_{90}P_{60}K_{60}$, and $N_{60}P_{60}K_{60}$ + foliar fertiliser (Fertitel).

Though our results speak for just one year, they are particularly valuable for the agricultural practices and point out the efficacy of chemical and foliar fertilisers on productivity elements.

MATERIAL AND METHODS

The bifactorial experiment was set on the experimental field of the Banat University of Agricultural Science and Veterinary Medicine in Timisoara, on a cambic chernozem, moist phreatic (poorly gleyed), poorly decarbonated, on loessoid deposits, clay loamy-dusty/clayish-loamy, with chemical features that point to a medium fertility soil.

The experimental variants were set after the randomised block method with three replications.

Fertilisation was done by using complex fertilisers of the type 15:15:15, applied on preparation of the germination bed for the agri-funds $N_{60}P_{60}K_{60}$, $N_{90}P_{60}K_{60}$, and $N_{60}P_{60}K_{60}$ + foliar fertiliser (Fertitel). For the agri-fund $N_{90}P_{60}K_{60,}$ completing nitrogen up to the level of 90 kg of active substance per ha was done by applying before the first weeding the amount of 50 kg of active substance per ha (ammonia nitrate).

We have studied three sunflower hybrids resistant to herbicides of the imidazoline type developed by the Limagrain Company: Rimisol (approved for cultivation in Romania since 2004), F 30008, and Hidalgo. The sunflower hybrids mentioned above were tested on four different agri-funds: $N_0P_0K_0$, $N_{60}P_{60}K_{60}$, $N_{90}P_{60}K_{60}$, and $N_{60}P_{60}K_{60}$ + foliar fertiliser (Fertitel).

RESULTS AND DISCUSSIONS

The volume of 1,000 grains is a particularly important indicator in the production of the sunflower hybrids.

Results concerning the volume of 1,000 grains in the three sunflower hybrids are shown in Table 1 and in Figure 1.

Analysing results shows that, in the climate conditions of the experimental year 2009, the sunflower hybrid yielded a mean volume of 1,000 grains of 73 g compared to the 57 g in the control sunflower hybrid Rimisol, an increase of 16 g that is statistically ensured as very significant.

The sunflower hybrid Hidalgo yields a mean volume of 1,000 g of 65 g, with an increase compared to the control sunflower hybrid Rimisol (8 g) statistically ensured as very significant.

Analysing the value of the three sunflower hybrids tested points out the fact that fertilisation stimulates the value of the volume of 1,000 grains determining its growth.

The highest values of the volume of 1,000 grains are on the agri-fund fertilised with $N_{90}P_{60}K_{60,}$ where the sunflower hybrid Hidalgo reaches a volume of 1,000 grains of 76 g, followed by the sunflower hybrid F 30008 with 70 g compared to the control sunflower hybrid Rimisol with 57g. It is important to note that foliar fertilisation has a positive impact on the volume of 1,000 grains in all three sunflower hybrids studied, i.e. 57-76 g.

As far as the agri-fund is concerned, we can see that the highest mean value of the volume of 1,000 grains (68 g) was on the agri-fund $N_{90}P_{60}K_{60}$, followed by 67 g on

the agri-fund $N_{60}P_{60}K_{60}$. The increase compared to the control variant is statistically ensured as very significant.

Table 1

Weight of 1000 grains of three sunflower hybrids under the influence of differential fertilization at Timisoara in the experimental year 2009

Factorul B (The hybrid)	Factorul A – agri-fund				Means of the factor B			
	Unfertilized	$N_{60}P_{60}K_{60}$	$N_{90}P_{60}K_{60}$	$N_{90}P_{60}K_{60}$ + Fertitel	Mean value (g)	Relative yield (%)	Dif. ± related to control MT	Signific.
Rimisol	54	59	57	57	57	100	-	
F 30008	54	68	70	68	65	114	8	***
Hidalgo	66	74	76	76	73	128	16	***

DL 5% = 4 kg/ha
DL 1% = 6 kg/ha
DL 0.1% = 7 kg/ha

Means of the factor A

Mean value (g)	58	67	68	67
Relative yield (%)	100	116	117	116
Dif. ± related to control MT	-	9	10	9
Signification		***	***	***

DL5%= 2 kg/ha DL 1%= 3 kg/ha DL 0,1% = 4 kg/ha

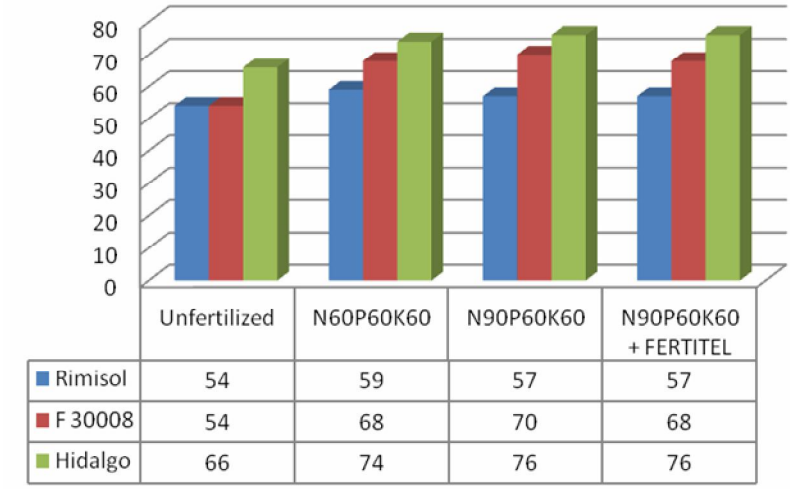

Figure 1 The mean values of the 1000 grain weight in three sunflower hybrids under the influence of fertilization in Timisoara in 2009

Results concerning the hectolitric volume are shown in Table 2 and Figure 2.

Analysing these results we can see that sunflower hybrids have mean values of the hectolitric volume ranging between 40 kg/hl and 43 kg/hl.

Hectolitric volume is an important quality element.

In the year 2009, the sunflower hybrids F 30008 and Hidalgo yielded a hectolitric volume of 43 kg/hl, compared to the only 40 kg/hl of the control sunflower hybrid Rimisol. Analysing the hectolitric volume in the three sunflower hybrids we can

see that in years with precipitation deficits the studied sunflower hybrids yield enough seeds in the achenes which confirms their high degree of adaptability.

Depending on the control agri-fund, where the mean hectolitric volume was 39 kg/hl, on the agri-funds $N_{90}P_{60}K_{60}$, $N_{60}P_{60}K_{60}$ + foliar fertiliser, hectolitric volume reaches 43-44 kg/hl, 13% more than the mean value of the control. This increase of the hectolitric volume supports the idea that fertilisation ensures yield increase and improvement of physical features.

Table 2

Hectolitric weight of three sunflower hybrids under the influence of differential fertilization at Timisoara in the experimental year 2009

Factorul B (The hybrid)	Factorul A – agri-fund				Means of the factor B			
	Unfertilized	$N_{60}P_{60}K_{60}$	$N_{90}P_{60}K_{60}$	$N_{90}P_{60}K_{60}$ + Fertitel	Mean value (kg/hl)	Relative yield (%)	Dif. ± related to control MT	signification
Rimisol	37	40	40	42	40	100	-	
F 30008	40	43	44	44	43	108	3	
Hidalgo	40	44	44	44	43	108	3	

DL 5% = 4 kg/hl
DL 1% = 5 kg/hl
DL 0.1% = 6 kg/hl

Mediile factorului A				
Mean value (kg/hl)	39	44	43	43
Relative yield (%)	100	113	113	113
Dif. ± related to control MT	-	5	4	4
signification		***	**	**

DL5%= 2 kg/hl DL 1%= 3 kg/hl DL 0,1% = 4 kg/hl

We need to point out that the new sunflower hybrids F 30008 and Hidalgo are superior to the control sunflower hybrid Rimisol, as shown in Figure 2.

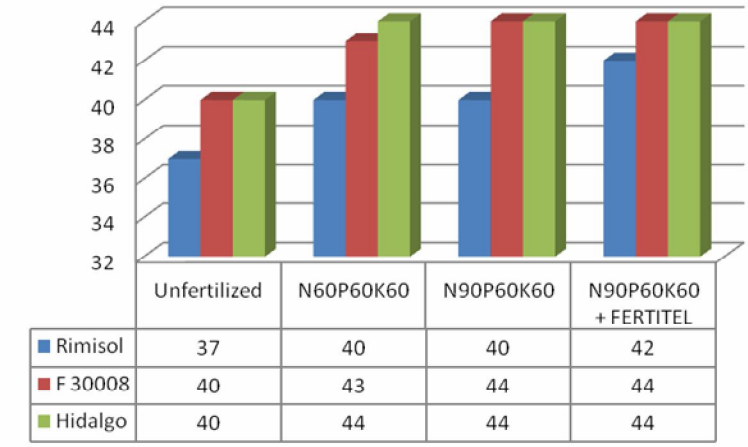

Figure 2 The mean value of the hectolitric weight realized by three sunflower hybrids studied in conditions of Timisoara in 2007 under agro-background influence

CONCLUSIONS

On the ground of the results obtained in the experimental year 2009, we can draw the following conclusions:

1. Physical features of the volume of 1,000 grains and of hectolitric volume are little influenced by the cultural conditions and enough high compared to the climate conditions of the year, which supports the idea that sunflower hybrids are highly adaptable to less favourable conditions in sunflower.

2. Fertilisation impacted, in the climate conditions of 2007, less hectolitric volume which is controlled mainly genetically.

3. Analysing the volume of 1,000 grains in the three sunflower hybrids we can see that chemical and foliar fertilisation results in an increase of this indicator.

4. In the climate conditions of the year 2007, the sunflower hybrids we studied show a good production of seeds in the achenes.

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