Volume 16(3), 120- 123, 2012
JOURNAL of Horticulture, Forestry and Biotechnology
www.journal-hfb.usab-tm.ro

The impact of the environmental factors and of the fertilization`s level on production of oil and oil content on sunflower hybrids in the west side Romania

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Abstract Sunflower is a oily plant of great economic importance. The seed content of fats (33-56%) and high quality of the resulting oil extraction makes this plant one of the main sources of vegetable oil (1,4,5,9) used in human nutrition, and the most important source of oil for Romania (7).

The paper " The impact of the environmental factors and of the fertilization`s level on production of oil and oil content on sunflower hybrids in the west side Romania" is trying to find the perfect formula for the cultivation of sunflower hybrids in Romania.

In order to try to reduce pollution of soil and underground water (6) , we studied the bond between the level of fertilisation, the hybrid used and the evironmental factors action and the content of oil and the oil production in sunflower crop.

We studied four variants of fertilisation : $V_1 = N_0P_0K_0$, $V_2 = P_{45}K_{45}N_{45}$, $V_3 = N_{60}P_{60}K_{60}$, and $V_4 = N_{90}P_{90}K_{90}$

We calculated: the oil content in sunflower seeds, the average oil production the difference from the witness , according the level of fertiliserz applied.

The studies about the weeds control at sunflower crop were made in the experimental field of University of Agricultural Science of Timisoara.

Key words

sunflower, f ertilisers, oil, production

Sunflower is a great consumer of chemical fertilizers, particularly phosphorus fertilizers. Particular emphasis should be given to the work of fertilization.

The amount of fertilizer recommended this culture varies depending on several factors such as the degree of soil nutrient supply (soil fertility), the degree of fertilization applied prior culture, culture run. In general, nitrogen and phosphorus ratio should be 1:1.

Sunflower recovered less fertilizer than other crops because its root system with a high capacity to extract nutrients and soluble harder combinations

Mineral fertilizers are less valued and that seed has a small share of the plant biomass is formed (sixth or seventh of biomass epigenous), and in some areas and in some years hydric soil improperly makes mineral fertilizers to be less valued by schrot seeds.

The first phase of vegetation is a critical period for nutrition with N, P and K, and the negative impact of their failure can not be corrected later, even if it provides the best nutritional conditions. Therefore, ensuring a good supply of sunflower plants with all the nutrients from the emergence is one of the main conditions for obtaining high yields.

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Materials and Methods

The experimental field was established in Timisoara, in three years of experimentation, from 2006 to 2008, applying crop technologies specific to sunflower crop. We applied different doses of fertilizers.. We oraganised a polyfactorial experience (3) and we placed it on a aluviosol soil type(2,8). The biological material used was: Mateol hybrid and Splendor hybrid .

The variants of fertilisation were disposed in the field by the method of randomisated blocks in three repetitions and four variants : $V_1 = N_0P_0K_0$, $V_2 = P_{45}K_{45}N_{45}$, $V_3 = N_{60}P_{60}K_{60}$, and $V_4 = N_{90}P_{90}K_{90}$

Table 1

Experimental Field

$N_0P_0K_0$	$N_{90}P_{90}K_{90}$	$N_{60}P_{60}K_{60}$	$N_{45}P_{45}K_{45}$	$N_{90}P_{90}K_{90}$	$N_0P_0K_0$	$N_{60}P_{60}K_{60}$	$N_{45}P_{45}K_{45}$
$N_{90}P_{90}K_{90}$	$N_{45}P_{45}K_{45}$	$N_0P_0K_0$	$N_{60}P_{60}K_{60}$	$N_{45}P_{45}K_{45}$	$N_{90}P_{90}K_{90}$	$N_0P_0K_0$	$N_{60}P_{60}K_{60}$
$N_{60}P_{60}K_{60}$	$N_0P_0K_0$	$N_{45}P_{45}K_{45}$	$N_{90}P_{90}K_{90}$	$N_0P_0K_0$	$N_{60}P_{60}K_{60}$	$N_{45}P_{45}K_{45}$	$N_{90}P_{90}K_{90}$
Mateol				**Splendor**			

Results

Comparing the annual average with the average years studied, we see that in 2007, with an annual average temperature of 12.51 ° C which exceeds the annual average of 11.93 ° C was the warmest and 2006 with an average annual temperature of 11.05 ° C was the most cool.

The rainfall included in the studied years had an irregular course, with more dry years than the annual average of 612.7 mm and the driest was in 2006 when he averaged 577.2 mm, followed by 2008 with 598,6 mm, and the most rainy was in 2007 when the average rate was 662 mm wich lead to a low oil content and a poor production of seeds.

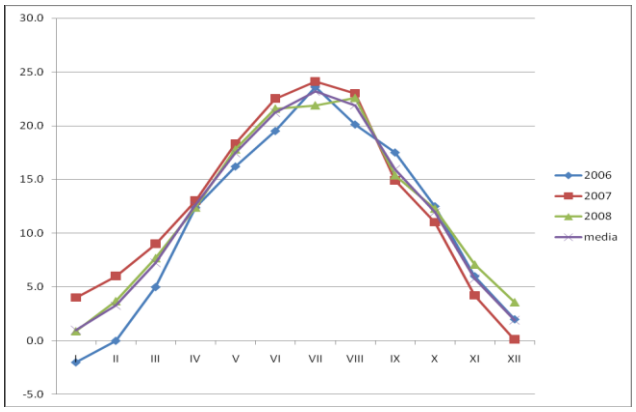

Fig. 1. The air temperature at Timişoara at Timişoara Meteorolohy Station in 2006-2008 (monthly and annual means)

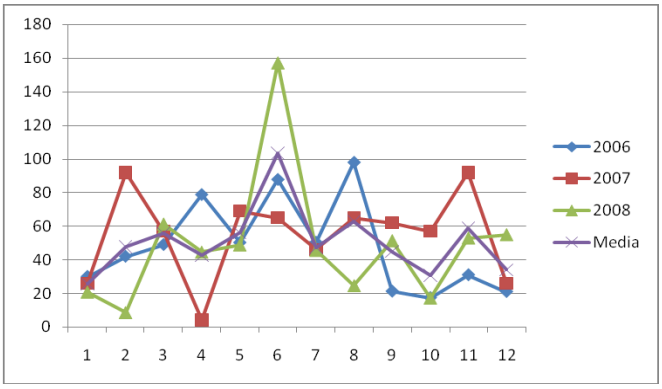

Fig..2. The amtospherical precipitation at Timişoara Meteorolohy Station in 2006-2008 (monthly and annual means)

At the Splendor hybrid culture, the highest oil content (%) or the average of most oil produced in 2006 is 49.76% and 1306.2 kg / ha in V4 (N90P90K90) followed by that of V3 (N60P60K60) of 49.06% respectively 1094.0 kg / ha, followed by that of V2 (N45P45K45) 44.84% and 878.0 kg / ha and the lowest production occurring in unfertilized control variant V1 (N0P0K0) 39.02% and 653.6 kg / ha. The average of the experience was worth 45.7% and 969.1 kg / ha.

Table 2

Content and production of oil at the studied hybrids in 2006

The hybrid	Fertilisation level	Oil content (%)	Average seeds production (kg/ha)	Average oil production (kg/ha)	The difference from the witness (kg/ha)	Average production relative (%)
Mateol	**V_1**- $N_0P_0K_0$	38.1	1525	581.0	0.0	100.0
	V_2 – $N_{45}P_{45}K_{45}$	45.5	1850	841.8	260.7	144.9
	V_3- $N_{60}P_{60}K_{60}$	50.4	2108	1062.4	481.4	182.9
	V_4 - $N_{90}P_{90}K_{90}$	49	2500	1225.0	644.0	210.8
	Average	45.8	1995.8	913.1	332.0	157.1
Splendor	**V_1**- $N_0P_0K_0$	39.02	1675	653.6	0.0	100.0
	V_2 – $N_{45}P_{45}K_{45}$	44.84	1958	878.0	224.4	134.3
	V_3- $N_{60}P_{60}K_{60}$	49.06	2230	1094.0	440.5	167.4
	V_4 - $N_{90}P_{90}K_{90}$	49.76	2625	1306.2	652.6	199.9
	Average	45.7	2122	969.1	315.5	148.3

The average of the experience had a value of 45.6% and 714.2 kg / ha, down significantly from the experimental year 2007.The results obtained in the experimental year 2007 were with 20% lower than in 2006 and 2008, due to the unproper climatic factors wich led to a increased number of weeds which led to a dramatic decline in the production of seeds (1).

Table 3

Content and production of oil at the studied hybrids in 2007

The hybrid	Fertilisation level	Oil content (%)	Average seeds production (kg/ha)	Average oil production (kg/ha)	The difference from the witness (kg/ha)	Average production relative (%)
Mateol	**V_1**- $N_0P_0K_0$	35.2	1140	401.3	0.0	100.0
	V_2 – $N_{45}P_{45}K_{45}$	40.7	1375	559.6	158.3	139.5
	V_3- $N_{60}P_{60}K_{60}$	48	1694	813.1	411.8	202.6
	V_4 - $N_{90}P_{90}K_{90}$	48.1	2025	974.0	572.7	242.7
	Average	43.0	1558.5	670.2	268.9	167.0
Splendor	**V_1**- $N_0P_0K_0$	39	1189	463.7	0.0	100.0
	V_2 – $N_{45}P_{45}K_{45}$	44.1	1390	613.0	149.3	132.2
	V_3- $N_{60}P_{60}K_{60}$	48.8	1635	797.9	334.2	172.1
	V_4 - $N_{90}P_{90}K_{90}$	50.4	2054	1035.2	571.5	223.2
	Average	45.6	1567	714.2	250.5	154.0

Under the influence of fertilizers applied fertilizer complex with various formulations NxPyKz Mateol hybrid culture, medium oil content (%) or the average of most oil produced in 2008 is 48.8% and 1184, 9 kg / ha in V4 (N90P90K90) followed by that of V3 (N60P60K60) of 48% and 1016.6 kg / ha, followed by that of V2 (N45P45K45) 43.4% and 782.9 kg / ha and the lowest production occurring in unfertilized control variant V1 (N0P0K0) 37.9% and 566.2 kg / ha. The average of the experience had a value of 44.5% and 887.7 kg / ha.

Under the influence of fertilizers applied fertilizer complex with various formulations NxPyKz Splendor hybrid culture, medium oil content (%) or the average of most oil produced in 2008 is 49.9% and 1291.9 kg / ha in V4 (N90P90K90) followed by that of V3 (N60P60K60) of 48.6% and 1127.5 kg / ha, followed by that of V2 (N45P45K45) 44.4% and 834.3 kg / ha and the lowest production occurring in unfertilized control variant V1 (N0P0K0) 39.1 % and 595.9 kg / ha. The average of the experience was worth 45.5% and 945.5 kg / ha.

Table 4

Content and production of oil at the studied hybrids in 2008

The hybrid	Fertilisation level	Oil content (%)	Average seeds production (kg/ha)	Average oil production (kg/ha)	The difference from the witness (kg/ha)	Average production relative (%)
Mateol	**V_1**- $N_0P_0K_0$	37.9	1494	566.2	0.0	100.0
	V_2 – $N_{45}P_{45}K_{45}$	43.4	1804	782.9	216.7	138.3
	V_3- $N_{60}P_{60}K_{60}$	48	2118	1016.6	450.4	179.5
	V_4 - $N_{90}P_{90}K_{90}$	48.8	2428	1184.9	618.6	209.3
	Average	44.5	1961	887.7	321.4	156.8
Splendor	**V_1**- $N_0P_0K_0$	39.1	1524	595.9	0.0	100.0
	V_2 – $N_{45}P_{45}K_{45}$	44.4	1879	834.3	238.4	140.0
	V_3- $N_{60}P_{60}K_{60}$	48.6	2320	1127.5	531.6	189.2
	V_4 - $N_{90}P_{90}K_{90}$	49.9	2589	1291.9	696.0	216.8
	Average	45.5	2078	945.5	349.6	158.7

Conclusions

- Although nitrogen fertilizers decreased oil content due to their positive effect on yields have increased oil production.
- Balanced fertilization with V_3-$N_{60}P_{60}K_{60}$ lead to increased oil content in achenes and to a lower level of pollution in underground and surface water.
- Interactions between environmental factors investigated in the experimental years 2006-2008, highlights the influence of climatic factors on oil content and yield of two sunflower hybrids in the study. Oil production in favorable years 2006 and 2008 recorded high values as opposed to 2007 when abundant rainfall regime because there were extremely low;
- The type of hybrid we used also influenced the oil content in sunflower seed : the Splendor hybrid recorded a higher oil content than the Mateol hybrid
- The oil content in sunflower seed is related to the environmental factors, to the used hybrid and to the fertilisation level applied.

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