RESEARCH REGARDING THE INFLUENCE OF BOTH FERTILIZATION AND CLIMATIC CONDITIONS, IN SUNFLOWER, UNDER DOBRUDJA REGION CONDITIONS

Liliana MIRON [1], Enuţă SIMION [1], Denisa SIMION [1]
[1] University „ Ovidius'' Constanța

Abstract

The sunflower gaines an important place in agriculture, on all over the world due to its undoubtly economic advantages. To increase the yield per hectare it is necessary to choose, for cultivation, hybrids adapted to pedoclimatic conditions of the area as well as to use a technology adequate to requirements of the utilized hybrid.
The present paper is in line with this objective, to establish the optimum fertilizer rates, in order to achieve the biological potential of the hybrid, but at the same time, economically efficient ones.
The researches were performed in two locations of Constanta county, respectively Nicolae Balcescu and Upper Pantelimonu, with different pedoclimatic conditions. In Nicolae Balcescu's area, the soil is typical chernozem, the air average temperature during sunflower vegetation period was of 18,3˚C, there were registered 198.8 mm rainfalls and 12 consecutive days with temperatures over 30˚C. In Upper Pantelimonu, the soil is kastanoziom (ground soil), the air average temperature during sunflower vegetation period was of 19,8˚C, there were registered 142.5 mm rainfalls. In both locations, the hybrid Favorit was used. In plot with no fertilizers, yield of 3200 kg/ha was achieved in N. Balcescu area, respectively 1690 kg/ha in Upper Pantelimonu area.
In plot fertilized with $N_{60}P_{60,}$ yield of 3470 kg/ha was achieved in N. Balcescu area, respectively 1860 kg/ha in Upper Pantelimonu area.
The sunflower crop was economical only in N. Balcescu area, with a benefit of 1195 ron/ha, under non-fertilization and 952 ron/ha under $N_{60}P_{60}$ fertilization.
The performed researches emphasized the fact that the temperatures and rainfalls during sunflower vegetation stages had a stronger influence on yield than fertilization, this being less utilized under drought conditions.

Key words: fertilizer, yield, sunflower, soil.

The sunflower gaines an important place in agriculture, all over the world, after the Second war, due to its undoubtly economic advantages: ability to achieve high oil yield per surface and time unit, favorable ratio, of 3:2, between oil and oil cakes, easy extraction of oil with simple and cheap equipments, high oil quality, as nutrition and as stability as well as main chemical and physical traits (Budoi, Gh., et al., 1996*;* Ciobanu, Gh., et al., 1989).

Economically speaking, the sunflower is one of the most efficient crop, the limit of rentability being registered at an average yield of 2000 kg/ha. The increasing of seed and oil yield, determined by introduction, at broad scale, of sunflower hybrids with high oil content, gives to this crop a „pol-position" vs. Others (Hera, Cr.,et al., 1989**)**.

During last years, the areas cultivated with sunflower raised especially in Dobrudja, this crop being one of the cropswhich could be utilized imediately after harvesting.

MATERIAL AND METHOD

To increase the sunflower yield per hectare it is necessary to choose for cultivation hybrids adapted to pedoclimatic conditions of the area as well as to utilize a technology which should correspond to crop requirements. The present paper has as aim to establish the fertilizer rate in order to achieve the biological potential of the hybrid but economically efficient, too.

The objective of the paper was the testing of sunflower hybrid Favorit, under two different areas as pedological conditions and climatic ones (temperatures and rainfalls), on an agro-background as compared to unfertilized plot.

The sunflower yield is largely influenced by hynrid, fertilization level as well as pedoclimatic conditions. Thus, the behavior of the sunflower hybrid Favorit, on $N_{60}P_{60}$ fertilization level as compared to unfertilized variant was tested under pedoclimatic conditions of areas Nicolae Balcescu and Pantelimonu.

Both areas has as preceding crop the winter wheat, applying the following tillages:

- Ploughing was performed in autumn, on 23-25 cm;

- First disking was applied in winter;
- Preparation of the germinative bed was performed by disking and combined tillages;
- To control weeds, the herbicide Harness – 2 l/ha was used, applied immediately after sowing;

Chemicals was applied in spring, as complex ones, in rate of $N_{60}P_{60}$, incorporated under disking;

- Sowing was made with sower equipment SPC-8, on 16th April (N.Bălcescu) and 20th April (Pantelimonu);
- Sowing depth was of 5 cm;
- There were performed two mechanical weedings;
- Harvesting was performed on 5-7 September, each yield variant being individually weighted.

The seed yield was determined at full maturity, by weighting the sample of plot after aeration and humidity standard parameters were presented (11%).

The economical efficiency was estimated depending on the expenses achieved according to expenses and incomes. The sale price of sunflower was of 0.8 lei/kg.

Based on achieved yield per hectare, yield value (RON/ha), expenses (RON/ha) and incomes (RON/ha), share of profit and profit were estimated.

Pedoclimatic conditions

In area Nicolae Bălcescu, the soil was typical chernozem.

In area Upper pantelimonu, sunflower was placed on kastanoziom, previously named as „ brown soils of dry steppe" or „ ground soils".

The area Nicolae Balcescu was characterized by average temperatures between 10.2ºC in April and 22.8 ºC in August (table1). During the sunflower vegetation period, there were registered temperatures over 30ºC, but for short periods. So, in June, July and August seven, five and respectively ten consecutive days with temperatures over 30ºC were registered, negatively influencing the grain formation and filling, leading to precocious maturation.

The area Upper Pantelimonu was characterized by temperatures raised with 0.3-2.7ºC as compared to area Nicolae Balcescu. During the sunflower vegetation period the average temperatures ranged between 11ºC in April and 25,2 ºC in July. The temperature difference between these two areas was of 1.4 ºC. The number of consecutive days with temperatures over 30ºC was higher: June-7 days, July-15 days, August-11 days, which together with high average temperatures strongly affected the sunflower yield.

Rainfalls from April in both two areas led to favorable conditions for germinative bed preparation, sowing, emergence and plant development. In Nicolae Balcescu area, the rainfall of April and May led to favorable evolution of sunflower crop (*table 2*).

In June, although were lower rainfalls, the reserve from May and moderate temperatures allowed a good development of the crop, followed by the same development due to rainfalls from next months. During sunflower vegetation period, 271.8 mm rainfalls were registered.

In Upper Pantelimonu area, the insufficient rainfalls (only 5 mm in three days) of the last decade of April, then 2.0 mm at the end of May affected the crop during the first vegetation stages.

June was a rainy month, with rainfalls in each decade (10.0; 26.0 and respectively 34.0 mm), stimulating the sunflower development. In July, there were no rainfalls and in August, 48.0 mm torrential rainfalls were registered in the first decade, after that, only 4.5 mm rainfalls in the third decade. The drought accentuated by heat strongly affected the sunflower yield.

During the entire sunflower vegetation period, 189.5 mm rainfalls were registered, with 82.3 mm less than in the Nicolae Balcescu area.

Table 1

Average temperatures registered during sunflower vegetation period - 2009

	Month	Nicolae Bălcescu	Upper Pantelimonu	Difference +/-
		Monthly average °C	Monthly average °C	
1.	April	10,2	11,0	0,8
2.	May	15,5	15,8	0,3
3.	June	20,6	23,3	2,7
4.	July	22,8	25,2	2,4
5.	August	22,5	24,5	2,0
6.	September	19,9	20,3	0,4
	Average	18,6	20,0	1,4

RESULTS AND DISCUSSIONS

1.Results achieved regarding the sunflower yield

Regarding the influence of fertilization on yield, one can ascertain that under no fertilization, an yield of 3200 kg/ha was achieved in the Nicolae Balcescu area and only 1690 kg/ha in the Upper Pantelimonu one. The yield difference between the two areas was of 1510 kg/ha, due to unfavorable climatic conditions of the Upper Pantelimonu area.

In the case of $N_{60}P_{60}$ fertilization, the yields raised to 3470 kg/ha in the Nicolae Balcescu area and 1730 kg/ha in the Upper Pantelimonu area (table 3). The yield difference between areas was of 1610 kg/ha.

Table 2

Rainfalls registered during sunflower vegetation period - 2009

	Month	Nicolae Bălcescu	Upper Pantelimonu	Difference +/-
		Monthly sum mm	Monthly sum mm	
1.	April	48,0	25,0	-23,0
2.	May	87,5	2,0	-85,5
3.	June	3,5	63,0	59,5
4.	July	25,3	0,0	-25,3
5.	August	34,5	52,5	18,0
6.	September	73,0	47,0	-26,0
	SUM	271,8	189,5	-82,3

Table 3

Influence of fertilization on Favorit hybrid yield, under different cultivation areas

Agro-background	AREA	Yield (kg/ha)
N_0P_0	Nicolae Bălcescu	3200
	Upper Pantelimonu	1690
	DIFFERENCE	-1510
$N_{60}P_{60}$	Nicolae Bălcescu	3470
	Upper Pantelimonu	1860
	DIFFERENCE	-1610

By the $N_{60}P_{60}$ fertilization, the sunflower yield raised with 270 kg/ha in the Nicolae Balcescu area and with 170 kg/ha in the Upper Pantelimonu area (Graph 1).

The yield differences between fertilized and no-fertilized variant from the Nicolae Balcescu area was low, because the soil is reach in nutrients and even under no-fertilization, yields of over 3000 kg/ha were achieved.

The yield increasing was low in the Upper Pantelimonu area due to drought which negatively influenced the fertilizer utilization.

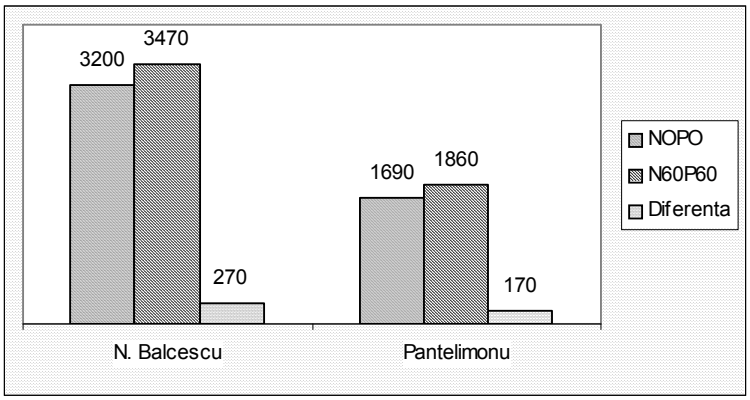

Figure 1 **Influence of both area and fertilization on Favorit hybrid yield**

Results obtained regarding the economical efficiency of sunflower

To organize and to lead the economical activity in agriculture, a great importance should be directed to knowing the yield expenses and their influence on yield level.

The yield expenses are passive elements of economical balance and represent the expression of goods and labor force total consumption and with a view to achieve a product, work or service.

Regarding the agriculture yield, the expenses consist of the following elements:

- material expenses;
- depreciation rate;
- rates to maintain the assets;
- ensuring rates;
- taxation, taxes, contributions;
- wages;
- interests;
- leasing.

Depending on the way of involvment into product unitary cost, the expenses could be direct and indirect.

The total income expresses the value of goods and services for sale achieved in an agricultural exploitation.

The profit represents the compensation of an entrepreneur and it is estimated as difference between total incomes and expenses.

The profit rate is a relative indicator which expresses the level of profit achieved per each 100 lei as expenses.

The 2009, unfavorable year for sunflower in Upper Pantelimonu area, due to accentuated drought and heat during vegetation period, determined low yields. There were achieved 1690 kg/ha in unfertilized variant and 1860 kg/ha in $N_{60}P_{60}$ fertilized variant.

The expenses were scored accordind to technological schedule (table 4); the unfertilized variant registered a total expenses of 1.635 lei/ha, while the $N_{60}P_{60}$ fertilized one registered 1824 lei/ha.

Table 4

Technological schedule of sunflower crop

Specification	N0P0	N60P60
TOTAL technological expenses	1365	1824
A. Expenses with mechanical tillages	650	680
-ploughing	200	200
-basic fertilization	-	30
-disking	160	160
-combinator	80	80
-sowing	60	60
-preemergent herbicide application	30	30
-postemergent herbicide application	30	30
-first mechanical weeding	50	50
-second mechanical weeding	40	40
B. Expenses with materials	250	640
-seeds	90	90
-chemicals	-	390
-herbicides	160	160
C. Supply expenses (10% din B)	25	64
D.Expenses with labor force	40	40
E. Expenses for rent, leasing	400	400

By the deduction of expenses from yield value, a profit has resulted, which was maximum in Nicolae Balcescu area, of 1195 lei/ha, in unfertilized variant and 952 lei/ha, in fertilized one *(table 5*).

The share profit was of 87.5%, in unfertilized variant and of 52,2%, in fertilized one. Due to high yields/ha, sunflower crop was profitable under both crop conditions. In $N_{60}P_{60}$ fertilized plots, share profit was lower due to high cost of chemical fertilizers.

In Upper Pantelimonu area, at an yield below 2000 kg/ha, sunflower crop was not profitable. Due to both low yields/ha and very low price of crop, sunflower was not profitable (*tab. 5*).

Table 5

Economical efficiency of sunflower depending on fertilization and cultivation area

Agro-background	Area	Yield (kg/ha)	Yield value (lei/ha)	Total expenses (lei/ha)	Profit (lei/ha)	Share profit (%)
N_0P_0	N.Bălcescu	3200	2560	1365	1195	87,5
	Pantelimonu	1690	1352	1365	-13	-1,0
$N_{60}P_{60}$	N.Bălcescu	3470	2776	1824	952	52,2
	Pantelimonu	1860	1488	1824	-336	-18,4

CONCLUSIONS

Based on processing the data regarding the climatic conditions of the 2009, under both Nicolae Balcescu and Upper Pantelimonu areas, general conclusions for researches performed were achieved.

Behavior of sunflower hybrids is the result of interaction between their genetic peculiarities and those of environment of cultivation.

In Nicolae Balcescu area, the soils and climate are favorable to cultivate sunflower, which gave high yields, over 3200 kg/ha.

In Upper Pantelimonu area, the soils are favorable to cultivate sunflower, but the climate negatively influenced the sunflower yield potential.

The hybrid Favorit proved a good yield stability no matter of fertilization level.

The sunflower economical efficiency depended on the yield level and its determination factors, but also by the economical-financial state released by both variation (increasing) of technological costs and profitability of yield.

Under ongoing increasing of technological costs, especially fertilizer ones, it is necessary to

choose the unfertilized variant or that fertilized with moderate rates.

To interest farmers in land cultivation, the state should take measures to subsidy some expenses and to increase the price of utilization the crop.

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