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# The impact of the method of weed control on the production of oil on sunflower hybrids Mateol and Splendor in Timis County

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**Abstract** Sunflower is a plant susceptible to weeds in the early stages of vegetation (1,5,9). The paper " The impact of the climatic factors and method of weed control on the production of oil on sunflower hybrids Mateol and Splendor in Timis County" is trying to find the perfect formula for the weed combat in sunflower crop. In order to try to reduce pollution of soil and underground water, we studied the bond between the method of combat (herbicides and hoeings), the remanence of the herbicides in soil and the evironmental factors action and the content of oil and the oil production in sunflower crop.
We studied five variants of weed control :
$V_1$ = no herbicides, no hoeings,
$V_2$ = 2manual hoeings and 2 mechanical hoeings ,
$V_3$ = Guardian 2l/ha,
$V_4$ = Dual Gold 960 CE 1.5l/ha and
$V_5$ =Stomp 330CE 5l/ha
We calculated: the oil production the difference from the witness , according the applied method. 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, weeds, herbicides, oil, production

The seed fat content (33-56%) and the high quality of the resulting oil extraction plant makes the sunflower one of the main sources of fats used in human nutrition, and the most important source of oil for Romania.
As a source of vegetable oil worldwide, sunflower ranks fourth, after soybean, palm and rapeseed. The oil from sunflower achenes is semi drying and is characterized by color, taste and pleasant smell, high in vitamins (A, D, E, K) and aromatic substances in addition sunflower oil is highly conserved well over a longer period.
Sunflower oil is one of the most balanced in terms of fatty acids it contains. It is used both "cold" and "hot" cooking.
High food value of sunflower oil, due to the rich content in unsaturated fatty acids, mainly represented by linoleic acid (44-75%) and oleic acid (14-43%) and low presence linilenic acid (0, 2%) components which confers stability and long storage capacity, superior to other vegetable oils.

Sunflower oil is generally considered a premium oil because of its light color, high level of unsaturated fatty acids and lack of linolenic acid, bland flavor and high smoke points.

Nutritional function sunflower oil is enhanced by the presence of pro-soluble vitamins A, D, E, phosphatides as vitamins B4, B8, K. oil also contains sterols (about 0.04%) and tocopherols (antioxidant fraction vegetable oil, approx. 0.07%).
Successful sunflower production is endangered by apparition of the weeds .At sunflower crops the damages level is very high if we don't eradicate weeds in firsts weeks of vegetation. A high weed level can decrease the production of seeds and oil.

## 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 methodes of weed control (6.7)and we studied the impact of herbicides remanence on the soil (8) and underground water (2). We oraganised a polyfactorial experience (4) and we placed it on a aluviosol soil type (3,10).

The biological material used was: Mateol hybrid and Splendor hybrid .

The hybrid Mateol is created and promoted by KWS Group with headquarters in Einbeck, Germany and the hybrid Splendor is created by the National Institute for Research and Development Fundulea.

The variants of weed control were disposed in the field by the method of randomisated blocks .in three repetitions and five variants The herbicides used were: Guardian , Dual Gold 960 CE and Stomp 330 CE 5l/ha, one variant with 2 manual hoeings and 2 mechanical hoeings ant the witness not hoed , not herbicided.

## Results

Under the influence of fertilization level and of the method of weed control applied to the culture of hybrid Mateol, the largest average yield obtained in 2006 is obtained at the $\mathbf{V_4}$ - $N_{90}P_{90}K_{90}$ herbicided with **V4** = Dual Gold 960 CE 1.5 l/ha and the porest results were found in the $\mathbf{V_1}$ = not hoed, not herbicided variant were we havent applied any fertilizers ($\mathbf{V_1}$- $N_0P_0K_0$).

Table 1

**Content and production of oil at the Mateol hybrid , in 2006**

| Nr crt. | Weed control method | $\mathbf{V_1}$- $N_0P_0K_0$ (kg/ha) | $\mathbf{V_2}$ – $N_{45}P_{45}K_{45}$ (kg/ha) | $\mathbf{V_3}$- $N_{60}P_{60}K_{60}$ (kg/ha) | $\mathbf{V_4}$ - $N_{90}P_{90}K_{90}$ (kg/ha) |
|---|---|---|---|---|---|
| 1. | $\mathbf{V_1}$ = not hoed, not herbicided | **428.2** | 634.5 | 825.1 | 990.7 |
| 2. | $\mathbf{V_2}$ = 2 manual hoeings + 2 mechanical hoeings | 763.2 | 1156.3 | 1343.6 | 1332.3 |
| 3. | $\mathbf{V_3}$= Guardian | 493.1 | 787.3 | 1021.2 | 1122.8 |
| 4. | $\mathbf{V_4}$ = Dual Gold 960 CE | 625.2 | 877.6 | 1164.9 | **1348.7** |
| 5. | $\mathbf{V_5}$ = Stomp 330 CE | 603.7 | 822.1 | 971.4 | 1255.1 |
| 6. | **Average** | 582.68 | 855.56 | 1065.24 | 1209.92 |

Analyzing the influence of weed control methods applied to Mateol hybrid culture, at the highest level of fertilization $\mathbf{V_4}$ - $N_{90}P_{90}K_{90}$ it was observed that the highest average yield obtained in 2006 is 1348.7 kg / ha in $\mathbf{V_4}$ = Dual Gold 960 CE followed by $\mathbf{V_2}$ = 2 manual hoeings + 2 mechanical hoeings with 1332.3 kg / ha, followed by $\mathbf{V_5}$ = Stomp 330 CE with 1255.1 5 kg / ha, followed by V3 = Guardian (2 l / ha) 1122.8 kg / ha and lower production occurring in the weed control variant V1 = Not herbicided , not hoed with 990.7 kg/ha.

The average of the experience was worth the 1209.92 kg / ha.

Table 2

**Content and production of oil at the Mateol hybrid , in 2007**

| Nr crt. | Weed control method | $\mathbf{V_1}$- $N_0P_0K_0$ (kg/ha) | $\mathbf{V_2}$ – $N_{45}P_{45}K_{45}$ (kg/ha) | $\mathbf{V_3}$- $N_{60}P_{60}K_{60}$ (kg/ha) | $\mathbf{V_4}$ - $N_{90}P_{90}K_{90}$ (kg/ha) |
|---|---|---|---|---|---|
| 1. | $\mathbf{V_1}$ = not hoed, not herbicided | **317.4** | 428.6 | 677.9 | 887.8 |
| 2. | $\mathbf{V_2}$ = 2 manual hoeings + 2 mechanical hoeings | 459.3 | 659.8 | 906.8 | **1084.6** |
| 3. | $\mathbf{V_3}$= Guardian | 367.8 | 546.3 | 744.9 | 868.6 |
| 4. | $\mathbf{V_4}$ = Dual Gold 960 CE | 446.3 | 570.7 | 891.2 | **1068.9** |
| 5. | $\mathbf{V_5}$ = Stomp 330 CE | 418.5 | 596.7 | 845.4 | 956.0 |
| 6. | **Average** | 401.86 | 560.42 | 813.24 | 973.18 |

The best results were found in the variant $\mathbf{V_2}$ = 2 manual hoeings + 2 mechanical hoeings combined with the level of fertilization $N_{90}P_{90}K_{90}$ , followed by the variant herbicidede vith Dual Gold 960 CE 106.9kg/ha and $\mathbf{V_2}$ = 2 manual hoeings + 2 mechanical hoeings fertilised with $N_{60}P_{60}K_{60}$ 906. kg/ha. The poorest results were found at the witness variant $\mathbf{V_1}$ = not hoed, not herbicided , not fertilised $N_0P_0K_0$ 317.4 kg /ha.

In 2007 the oil production is diminuated because of the climatic factors , such as in increased level od precipitations that favorized the weeding degree that led to a dramatic decrease in the production of seeds and thus the production of oil.

Table 3

**Content and production of oil at the Mateol hybrid, in 2008**

| Nr crt. | Weed control method | $V_1$ - $N_0P_0K_0$ (kg/ha) | $V_2$ – $N_{45}P_{45}K_{45}$ (kg/ha) | $V_3$ - $N_{60}P_{60}K_{60}$ (kg/ha) | $V_4$ - $N_{90}P_{90}K_{90}$ (kg/ha) |
|---|---|---|---|---|---|
| 1. | $V_1$ = not hoed, not herbicided | **467.9** | 648.6 | 893.0 | 1042.0 |
| 2. | $V_2$ = 2 manual hoeings + 2 mechanical hoeings | 677.9 | 910.1 | 1156.2 | **1341.2** |
| 3. | $V_3$= Guardian | 497.6 | 681.7 | 891.9 | 1127.9 |
| 4. | $V_4$ = Dual Gold 960 CE | 605.7 | 892.6 | 1129.3 | **1260.6** |
| 5. | $V_5$ = Stomp 330 CE | 420.6 | 586.1 | 814.2 | 944.7 |
| 6. | **Average** | 533.94 | 743.82 | 976.92 | 1143.28 |

Analyzing the influence of weed control methods applied to Mateol hybrid culture, it was observed that the highest average yield obtained in 2008 is in $V_2$ = 2 manual hoeings + 2 mechanical hoeings fertilized with $V_4$ - $N_{90}P_{90}K_{90}$ 1341.2 kg / ha followed by $V_4$ = Dual Gold 960 CE fertilized with $V_4$ - $N_{90}P_{90}K_{90}$ with 12606.6 kg / ha, followed by $V_2$ = 2 manual hoeings + 2 mechanical hoeings fertilized with $V_4$ - $N_{60}P_{60}K_{60}$ with 1156.2 kg / ha

The lower production was occurring in the control variant V1 = Not herbicided , not hoed not fertilizes $N_0P_0K_0$ with 467.9 kg/ha.

Table 4

**Content and production of oil at the Splendor hybrid, in 2006**

| Nr crt. | Weed control method | $V_1$ - $N_0P_0K_0$ (kg/ha) | $V_2$ – $N_{45}P_{45}K_{45}$ (kg/ha) | $V_3$ - $N_{60}P_{60}K_{60}$ (kg/ha) | $V_4$ - $N_{90}P_{90}K_{90}$ (kg/ha) |
|---|---|---|---|---|---|
| 1. | $V_1$ = not hoed, not herbicided | **466.5** | 667.5 | 866.5 | 966.1 |
| 2. | $V_2$ = 2 manual hoeings + 2 mechanical hoeings | 811.7 | 1043.9 | 1362.6 | **1669.4** |
| 3. | $V_3$= Guardian | 546.9 | 760.7 | 992.5 | 1166.6 |
| 4. | $V_4$ = Dual Gold 960 CE | 738.4 | 882.4 | 1072.8 | 1295.2 |
| 5. | $V_5$ = Stomp 330 CE | 700.3 | 1044.0 | 1177.8 | **1438.4** |
| 6. | **Average** | 652.76 | 879.7 | 1094.44 | 1307.14 |

The best results were found in the variant $V_2$ = 2 manual hoeings + 2 mechanical hoeings combined with the level of fertilization $N_{90}P_{90}K_{90}$ with 1669.4 kg/ha , followed by the variant $V_5$ herbicided vith Stomp 330 CE 1438.4 kg/ha and $V_2$ = 2 manual hoeings + 2 mechanical hoeings fertilised with $N_{60}P_{60}K_{60}$ 1326.6 kg/ha. The poorest results were found at the witness variant $V_1$ = not hoed, not herbicided , not fertilised $N_0P_0K_0$ 466.5 kg /ha.

Table 5

**Content and production of oil at the Splendor hybrid, in 2007**

| Nr crt. | Weed control method | $V_1$ - $N_0P_0K_0$ (kg/ha) | $V_2$ – $N_{45}P_{45}K_{45}$ (kg/ha) | $V_3$ - $N_{60}P_{60}K_{60}$ (kg/ha) | $V_4$ - $N_{90}P_{90}K_{90}$ (kg/ha) |
|---|---|---|---|---|---|
| 1. | $V_1$ = not hoed, not herbicided | **326.5** | 391.3 | 609.2 | 715.9 |
| 2. | $V_2$ = 2 manual hoeings + 2 mechanical hoeings | 530.3 | 695.2 | 853.8 | **1180.9** |
| 3. | $V_3$= Guardian | 387.7 | 552.7 | 695.4 | 878.3 |
| 4. | $V_4$ = Dual Gold 960 CE | 537.6 | 727.4 | 978.6 | **1226.5** |
| 5. | $V_5$ = Stomp 330 CE | 546.5 | 722.5 | 856.8 | 1177.3 |
| 6. | **Average** | 465.72 | 617.82 | 798.76 | 1035.78 |

Analyzing the influence of weed control methods applied to hybrid Splendor culture, it was observed that the highest average yield obtained in 2007 is 1226.5 kg / ha in V4 = Dual Gold 960 EC

followed by $V_2$ = 2 manual hoeings + 2 mechanical hoeings with 1180.9 kg / ha, followed by $V_5$ = Stomp 330 CE with 1177.3 kg / ha, followed by V3 = Guardian (2 l / ha) 878.3 kg / ha and lower production occurring in the control variant V1 = Not herbicided , not hoed 326.5 kg/ha.

Table 6

**Content and production of oil at the Splendor hybrid, in 2008**

| Nr crt. | Weed control method | $V_1$ - $N_0P_0K_0$ (kg/ha) | $V_2$ – $N_{45}P_{45}K_{45}$ (kg/ha) | $V_3$- $N_{60}P_{60}K_{60}$ (kg/ha) | $V_4$ - $N_{90}P_{90}K_{90}$ (kg/ha) |
|---|---|---|---|---|---|
| 1. | $V_1$ = not hoed, not herbicided | **489.6** | 651.2 | 840.4 | 966.7 |
| 2. | $V_2$ = 2 manual hoeings + 2 mechanical hoeings | 702.7 | 1040.1 | 1453.8 | **1624.7** |
| 3. | $V_3$= Guardian | 502.4 | 733.5 | 1002.7 | 1185.5 |
| 4. | $V_4$ = Dual Gold 960 CE | 653.6 | 906.1 | 1119.2 | 1299 |
| 5. | $V_5$ = Stomp 330 CE | 670.7 | 857.4 | 1237 | **1391.1** |
| 6. | **Average** | 603.8 | 837.66 | 1130.62 | 1293.4 |

The best results were found in the variant $V_2$ = 2 manual hoeings + 2 mechanical hoeings combined with the level of fertilization $N_{90}P_{90}K_{90}$ with 1624.7 kg/ha , followed by the variant $V_5$ herbicided vith Stomp 330 CE 1391.1 kg/ha and $V_2$ = 2 manual hoeings + 2 mechanical hoeings fertilised with $N_{60}P_{60}K_{60}$ 1453.8 kg/ha. The poorest results were found at the witness variant $V_1$ = not hoed, not herbicided , not fertilised $N_0P_0K_0$ 489.6 kg /ha.

## Conclusions

- The best results of oil production relating the method of weed control chosen were found on the variants with 2manual hoeings and 2mechanical hoeings and also in the variant hebicided with Dual Gold 960 CE 1,5 l/ha.
- Although nitrogen fertilizers decreased oil content due to their positive effect on yields have increased oil production.
- We recomand the use of hoeings instead of herbicides in order to prevent of pollution in underground and surface water and to increase the oil production.
- Interactions between environmental factors investigated in the experimental years 2006-2008, highlights the influence of climatic factors on oil production 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 production in sunflower seed : the Splendor hybrid recorded a higher oil production than the Mateol hybrid
- The production of oil in sunflower seed is related to the environmental factors, to the used hybrid and to the method of weed control applied.

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