# RESEARCH REGARDING THE INFLUENCE OF THE SOWING PERIOD ON THE YIELD AND QUALITY OF SWEET CORN HYBRIDS CULTIVATED IN THE WESTERN PLAIN OF ROMANIA

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***Abstract.*** *The research was conducted in the Banat Plain, located in the west part of Romania. This area is favourable for the sweet corn crop especially due to climate and soil conditions. The soil type in the experimental field is a mild eutricambosoil, moderately gleaned, moderately decarbonated, on medium /coarse fluvial deposits, medium clay, with weak acidic reaction, a 6.10 pH value in the 0-27 cm horizon, the humus content is medium to good (2.58%), the supply with phosphorus and potassium is medium to good. The climate is temperate continental, with an average annual temperature of 10.6 °C and an average precipitation value of 605 mm. The experiments were bi-factorial, factor A - the sowing season (season I, 10-15 April, season II, 20-25 April, season III, 1-5 May), and factor B - the hybrid cultivated (Prima, Summer Delight and Estival created at SCDA Turda). Fertilisation was done uniformly with N 150 P 80 K 80. The summary of the harvest results shows that, on average, the yield of corncobs harvested at maturity for the three hybrids was 12,786 kg / ha in season I, 14,374 kg / ha in season II, and 13,817 kg / ha in season III. The yields of the hybrids for the three sowing seasons were 14 123 kg / ha for Prima hybrid, 13 478 kg / ha for Summer Delight hybrid and 13 376 kg / ha for Estival hybrid. At harvest, measurements were made regarding the water content of the kernels, the carbohydrates content, the protein and fatty substances, the results being presented in the paper according to hybrids and sowing seasons, as well as the results of physical analyzes at MMB and the yield of raw kernels.*

***Keywords***: *sweet corn, hybrids, crops, chemical composition*.

## INTRODUCTION

Sweet corn (*Zea mays, saccharata Sturt sin. Zea mays rugosa Banat*) was taken into consideration rather late in our country, the first concerns for improving this variety dating back to 1959 at ICCPT Fundulea [1,2]. A programme has been created at SCDA Turda since 1971, as well. [3,4,5]

The production potential of current hybrids can exceed, under irrigation conditions, over 20 t/ha corncobs harvested at maturity. The short period of vegetation of 70-90 days, the chemical composition of kernels, the special taste qualities and good capitalization prices explain the high demands from consumers and canning factories. There are a few elements that motivate the areas' growth year by year, especially over the past decades.

## MATERIAL AND METHOD

The hybrids under study, Prima, Summer Delight and Estival, created at SCADA Turda, can be grown in all areas favourable for maize in Romania. The production potential mentioned by the breeder is 14,2 - 17,8 t / ha for the simple Prima hybrid, 15,8 - 20 t / ha for the simple Summer Delight hybrid and 12 - 20 t / ha for the trilinear Estival hybrid.

The experiments were bi-factorial, with three repetitions, where factor A was the sowing season with three graduations (season I, 10-15 April, season II, 20-25 April and season III, 1 - 5May), and factor B - the hybrid cultivated with three graduations (simple Prima hybrid, simple Summer Delight hybrid and trilinear Estival hybrid). All hybrids under study belong to the FAO 100-200 maturity group (Prima 75-80 days, Summer Delight 80-90 days and Estival 80-85 days), the vegetation period, until reaching maturity.

Fertilisation was done uniformly with N150 P80 K80 [6]. The cultivation technology was crop-specific, noting that the research was conducted in non-irrigated crops, and the crop density was 60.000 plants/ha.

Harvesting took place during kernel maturity phase. [7] At harvest, measurements were made regarding kernel humidity, 1000-grains weight, yield of raw kernels, and chemical analyses concerning the carbohydrates, protein and fats content. [8,9]

**RESULTS AND DISCUSSION**

Table 1 presents the summary results obtained in the experimental cycle 2015-2017 concerning the corncobs crop harvested at maturity, respectively the milk-wax of kernels.

*Table 1*

Summary of the harvest results obtained in the experimental cycle 2015 - 2017.

| Factor A | Averages of factor B | | Averages of factor A | | | |
|---|---|---|---|---|---|---|
| | Hybrid | | | | | |
| Sowing season | Production (kg/ha) | | Production (kg/ha) | % | Difference (kg/ha) | Significance |
| Season I | Prima | 13 324 | 12 786 | 100 | | |
| | Summer Delight | 12 492 | | | | |
| (10-15 April) | Estival | 12 542 | | | | |
| Season II | Prima | 14 787 | 14 374 | 112 | 1588 | xxx |
| | Summer Delight | 14 246 | | | | |
| (20-25 April) | Estival | 14 089 | | | | |
| Season II | Prima | 14 258 | 13 817 | 107 | 1031 | xx |
| | Summer Delight | 13 696 | | | | |
| (1-5 May) | Estival | 13 499 | | | | |

Dl 5%=473kg/ha; Dl 1%=999 kg/ha; Dl 0,1%=1383kg/ha.

*Table 2*

Averages of B factor

| Specification | Prima | Summer Delight | Estival |
|---|---|---|---|
| Production (kg/ha) | 14 123 | 13 478 | 13 376 |
| % | | 95 | 94 |
| Difference | | -645 | -747 |
| Significance | | o | O |

Dl 5%=429 kg/ha; Dl 1%=808 kg/ha; Dl 0,1%=1189 kg/ha.

Analysing the influence of the sowing season for the crop, it is estimated that under the climate and soil conditions in which the research was carried out, the best results were obtained when sowing was carried out between 20-25April, when on average, the yield for the three hybrids was 12% higher, achieving a difference of 1588 kg / ha, which is statistically very significant compared to the sowing season between 10-15 April. The explanation is that in the sowing season II the emergence occurred over a short period of time, and the growth rate of the plants in the early stages of vegetation was more alert.

The yield from the sowing season 1 - 5 May was also superior to the control variant by 7%, namely a significant difference of 1031 kg / ha was obtained. The fact that during the sowing season 1 - 5 May the yield was inferior to that of 20-25 April was due to the loss of soil water on a depth of 1 - 10 cm, which led to the uneven emergence of the plants and reduced their growth rate.

Among the hybrids with the highest yield was the Prima hybrid, with 14.123 kg / ha, 5% higher than the yield obtained for the Summer Delight hybrid, and 4% higher than the yield for the Estival hybrid. The fact that for the three hybrids the yield was over 13 380 kg / ha leads to the conclusion that the hybrids under study are adapted to the climate and soil conditions in the Banat Plain.

Tables 1 to 6 show the results of the measurements made on the crops regarding the main quality indicators.

*Table 3*.

Kernel humidity content at harvest

| Kernel humidity % | 82 | 81 | 81 | 83 | 82 | 80 | 80 | 81 | 81 |
|---|---|---|---|---|---|---|---|---|---|
| Sowing season | E1 | E2 | E3 | E1 | E2 | E3 | E1 | E2 | E3 |
| Hybrid | PRIMA | | | SUMMER DELIGHT | | | ESTIVAL | | |

–Sowing season 10 – 15 IV
- Sowing season 20 – 25 IV
- Sowing season 1 – 5 V

At the time of harvest at maturity, the kernel humidity content for the three hybrids varied between 80-83%.

*Table 4.*

Variation of MMB according to hybrid and sowing season

| MMB g | 248 | 257 | 255 | 232 | 238 | 236 | 231 | 235 | 233 |
|---|---|---|---|---|---|---|---|---|---|
| Sowing season | E1 | E2 | E3 | E1 | E2 | E3 | E1 | E2 | E3 |
| Hybrid | PRIMA | | | SUMMER DELIGHT | | | ESTIVAL | | |

The 1000-grains weight, determining for the Prima hybrid varied between 248 and 257 grams, followed by the Summer Delight hybrid, with values ranging between 232 g and 238 g, and significantly lower in the Estival hybrid ranging between 231 g and 235 g.

*Table 5.*

Yield of raw kernels

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Kernel yield % | 66 | 69 | 67 | 61 | 63 | 62 | 60 | 63 | 61 |
| Sowing season | E1 | E2 | E3 | E1 | E2 | E3 | E1 | E2 | E3 |
| Hybrid | PRIMA | | | SUMMER DELIGHT | | | ESTIVAL | | |

The yield of raw kernels for all three hybrids was higher in the sowing variant 20 – 25 April, variant for which the corncobs yield was the highest.

The results of the measurements regarding the main chemical compounds of the kernels at harvest are shown in Tables 6, 7 and 8.

*Table 6*

Variation of carbohydrates content

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Carbohydrates % | 4.3 | 4.5 | 3.9 | 4.1 | 4.2 | 4.2 | 4 | 4.1 | 4 |
| Sowing season | E1 | E2 | E3 | E1 | E2 | E3 | E1 | E2 | E3 |
| Hybrid | PRIMA | | | SUMMER DELIGHT | | | ESTIVAL | | |

The carbohydrates content had similar values on average during sowing seasons for the three hybrids, which was explained to be part of the same early emergence group and cultivated with the same technology.

*Table 7*

Variation of protein substances content

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Protein substances % | 3.1 | 3.3 | 3.4 | 3.2 | 3.5 | 3.4 | 3.3 | 3.3 | 3.4 |
| Sowing season | E1 | E2 | E3 | E1 | E2 | E3 | E1 | E2 | E3 |
| Hybrid | PRIMA | | | SUMMER DELIGHT | | | ESTIVAL | | |

Protein content in the studied field had similar values in the field of experimental variants under study, with a variation between 3.1 and 3.5%.

*Table 8*

Variation of fatty substances content

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Fatty substances % | 1.2 | 1.3 | 1.3 | 1.1 | 1.3 | 1.3 | 1.3 | 1.4 | 1.3 |
| Sowing season | E1 | E2 | E3 | E1 | E2 | E3 | E1 | E2 | E3 |
| Hybrid | PRIMA | | | SUMMER DELIGHT | | | ESTIVAL | | |

The fatty substances content was slightly influenced by environmental factors, the accumulation being done in a protected manner in the sample, the variation limits being between 1.1 and 1.4%.

## CONCLUSIONS

1. Sweet corn has favourable growing conditions in the Banat Plain, both in terms of temperature, this variety being more temperature sensitive than the hybrids cultivated for kernels, and in terms of providing the necessary water supply in most of the years.
2. The soil on which the researches were conducted, moderately gleyed eutricambosoil, moderately decarbonated on middle /coarse fluvial deposits, medium clay, has a good fertility status, which is important for sweet corn, which is more demanding in comparison with the maize grown for kernels.
3. The sweet corn hybrids under study- First, Summer Delight and Estival - belong to the FAO 100-200 early ripeness group; they are suitable for the fauna and have a high production potential of up to 20 t/ha corncobs harvested at maturity, respectively milk-wax of kernels.
4. Under the climate conditions of the Banat Plain, the area where spring comes early, in order to prolong the optimum harvest period, sowing can be done in good conditions throughout April and the first decade of May. The best yields are obtained between 20-25April, the average yield for the hybrids under study was 12% compared to the sowing between 10-15April, and can continue in the first decade of May, the yield remaining at a high value, at 7% compared to the period at the beginning of April.
5. The highest yield of raw kernels is between 66-69% and the highest weight of 1000 kernels was obtained for the Prima hybrid. Between the sowing seasons, for all hybrids, the most favourable values were obtained for the sowing season between 20-25 April.
6. The carbohydrates content ranged between 3.9 - 4.5% for the Prima hybrid, between 4.1 - 4.2% for the Summer Delight hybrid and between 4.0-4.1% for the Estival hybrid.
7. The protein substances content ranged between 3.1-3.4% for the Prima hybrid, between 3.2% - 3.5% for the Summer Delight hybrid and between 3.3-3.4% for the Estival hybrid.

8. The fatty substances content ranged between 1.2-1.4% for the Prima hybrid, between 1.1-1.3% for the Summer Delight hybrid and between 1.3-1.4% for the Estival hybrid.
9. It results that, from the point of view of the chemical composition, under the conditions of uniform fertilisation with N150 P80 K80 and cultivation in the same density of 60 000 plants/ha, there were no obvious differences between the three hybrids, but between the sowing seasons, season II, namely 20-25 April stood out.

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