

THE INFLUENCE OF TECHNOLOGICAL FACTORS ON THE LEVEL OF SOME SWEET CORN HYBRIDS PRODUCTION IN THE TRANSYLVANIAN CONDITIONS

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Abstract. This paper presents the results of research on the influence of some technological factors on the level of production at irrigated sweet corn, in the conditions of Henig - Alba Iulia, in 2020. As a result of research it was found that irrigation and fertilization applied to sweet corn have a favorable influence on the production obtained. Among the hybrids analyzed, the best results were obtained for the hybrid Deliciul Verii, to which a basic fertilization + additional fertilization with NPK was applied. The results show that in both the irrigated and the non-irrigated version, the differences between the yields obtained by Deliciul Verii and Estival hybrids are significant compared to the Dulcin (control) hybrid. In the case of Deliciul Verii hybrid, the yields obtained are distinctly significant compared to the yields obtained from the Dulcin hybrid, and in the case of the Estival hybrid, the yields obtained are negatively very significant compared to the yields obtained from the Dulcin hybrid.

Keywords: irrigation, fertilization, biological material, production

INTRODUCTION

The sweet corn crop (*Zea mays* L. *saccharata*) is one of the most popular crops for human consumption in countries such as the USA and Canada and is becoming popular in India and Asian countries. In the USA and Canada, this culture is considered a symbol of summer, in some regions even festivals are celebrated, in which the latest achievements in the field of improvement and new culinary preparations are presented (HAȘ, 2004, SINGH et al., 2014).

Sweet corn or sugar corn is a species cultivated on relatively large areas in the world, due to its remarkable ecological plasticity. In Romania, the areas cultivated with this plant are very small or even missing. (ȘIȘEȘTI, 1955), (HAȘ V., 2004) state that in Romania the areas cultivated with sweet corn are low, this crop being cultivated especially in the household system, where the areas do not exceed 1-2 ha.

Sweet corn is a popular crop, due to the content of nutrients essential to the human body found in its grains. In the milk phase, its berries contain the best taste qualities, and the nutrients are best assimilated by the body (APAHIDEAN and MARIA APAHIDEAN, 2001).

Given the special qualities of sweet corn, recently, worldwide, there has been great progress in creating new varieties and hybrids with high production potential, specializing in directions of use, consumed either fresh or in the preserved form (STAN et al., 2003).

Sweet corn appears as a plant with high requirements for moisture and nutrition. High humidity is important in obtaining high yields of sweet corn (STAN, 2004). For most legumes, the high water content determines the juiciness, tenderness and freshness

of the product. Lack of water in the soil causes a decrease in production and quality depreciation (APAHIDEAN, 2004).

Given the need for plant water, irrigation is therefore a highly efficient measure, which can influence the level, consistency and quality of products. Known and practiced since ancient times, irrigation has been a key element in cultivation technology in recent decades, not only in arid areas, where plants could not be grown without irrigation, but also in semi-arid and sub-humid areas (LUCA and NAGY, 1999).

OBJECTIVES

The aim of this research was to analyze the influence of several factors, such as irrigation, fertilization and biological material, on the level of production of some sweet corn hybrids in the Transylvanian area, Henig - Alba Iulia. Sweet corn is a large water-consuming plant that effectively capitalizes fertilization. The way in which the biological material has adapted to the existing conditions, to the irrigated agriculture system, as well as the application of different degrees of fertilization was studied.

MATERIALS AND METHODS

The experiences were located in Henig, a village in Berghin commune, Alba county, located in the Secaşelor Plateau, on the Secaş river. Henig village in Berghin commune is located, from a geographical point of view, in the north-east area of Alba county at a distance of 18 km from Alba Iulia municipality.

During the experiments organized in 2020, three hybrids were studied, namely: Dulcin, Deliciul Verii and Estival. The hybrids used in the study are hybrids created at the Agricultural Development Research Station Turda. The Dulcin hybrid was registered in 1988, Estival was registered in 2002, and Deliciul Verii in 2004.

The experiments presented in this paper were located on a soil specific to the lower part of the Secaşelor basin, the type of soil being a leached chernozem, arranged on clayey marls, with a loamy-clay texture, with a weak acid pH, of 6.05 units.

The experiences that formed the basis of the research are multifactorial experiences, studying three factors.

The experimental project was a divided chart, with three repetitions ($n = 3$), the number of variants being 18 ($v = 2 \times 3 \times 3$). The variants resulted from the combination of the three factors, namely: Factor A - irrigation regime, with two graduations: a1 - non-irrigated crop, a2 - irrigated crop (at the minimum humidity of 50% of the active humidity range- A.H.R.); Factor B - fertilization regime, with three graduations: b1 - basic fertilization, b2 - basic fertilization + additional fertilization (NPK 16:16:16), b3 - basic fertilization + additional fertilization (foliar fertilization - Foliplant Universal) and Factor C - biological material (hybrids) - with three graduations: c1 - Dulcin; c2 - Deliciul Verii; c3 - Estival. The cultivation of sweet corn was established by direct sowing in the field. Sprinkler irrigation was used. Irrigation is applied according to the biological requirements of the plants. Manure was used for basic fertilization, and for additional use NPK 16:16:16 complex and foliar fertilization with Foliplant Universal were used. Manure fertilization was applied in autumn, being incorporated into the soil together with autumn plowing, the one with NPK was applied in spring, once the sweet

corn crop was sown, and the one with foliar fertilizer was applied when the plants had 6 - 8 true leaves, before sprouting, fruiting.

RESULTS AND DISCUSSIONS

In 2020, the production obtained from the experimental field was 14.05 t/ha of cobs, Estival hybrid having the lowest input, with the lowest average production, compared to the hybrids Dulcin and Deliciul Verii. As can be seen, the factors studied (irrigation regime, fertilization regime, biological material) influenced in different ways the production of sweet corn crop per unit area. In order to establish the degree of influence of each of the experienced factors and their graduations on the level of production in the sweet corn culture, the analysis of variation was used. The analysis of the effect of the first of the three factors studied, the irrigation regime, on the production of sweet corn, in the conditions of Henig - Alba Iulia area, in 2020, showed clearly higher productions for the irrigated variants, compared to non-irrigated variants (table 1).

Table 1

The influence of A factor (irrigation regime) on the yield of sweet corn culture in the conditions of Henig - Alba Iulia area, 2020

Variant	Average production (t/ha)	Relative production (%)	Difference $\pm d$ (t/ha)	Significance
a ₁ – non-irrigated crop	13.37	100.0	0.00	Mt.
a ₂ – irrigated crop (50 % of the AHR)	14.73	110.2	1.36	***

DL (p 5%) 0.02;

DL (p 1%) 0.04;

DL (p 0.1%) 0.12

The average production registered in 2020 for the irrigated variants was at the level of 14.73 t/ha cobs, and for the non-irrigated variants at 13.37 t/ha cobs. The production increase registered as a result of irrigation was 1.36 t/ha of cobs (10.17%), a very statistically significant difference. The fertilization factor also influenced the level of production of sweet corn cobs, the best results being recorded by the variants where an additional fertilization was performed, the production increase being presented in table 2.

Table 2

Influence of B factor (fertilization regime) on the yield of sweet corn culture in the conditions of Henig - Alba Iulia area, 2020

Variant	Average production (t/ha)	Relative production (%)	Difference $\pm d$ (t/ha)	Significance
b ₁ – basic fertilization	12.90	100.0	0.00	Mt.
b ₂ – basic fertilization + additional fertilization with NPK	15.05	116.7	2.15	***
b ₃ – basic fertilization + additional fertilization (foliar - Foliplant Universal)	14.21	110.1	1.31	***

DL (p 5%) 0.31;

DL (p 1%) 0.45;

DL (p 0.1%) 0.68

The differences in production compared to the control, recorded by variants b2 and b3, in which an additional fertilization with NPK was made, respectively foliar fertilization, were also, as in the case of the irrigation factor, very statistically significant, with 2.15 t/ha cobs (16.67%), respectively 1.31 t/ha cobs (10.16%).

The average productions made in 2020, by the three hybrids studied, respectively Dulcin, Deliciul Verii and Estival, achieved different values, these being presented in table 3.

Table 3

Influence of C factor (biological material) on the yield of sweet corn culture in the conditions of the Henig - Alba Iulia area, 2020

Variant	Average production (t/ha)	Relative production (%)	Difference $\pm d$ (t/ha)	Significance
c ₁ – Dulcin	14.94	100.0	0.00	Mt.
c ₂ – Deliciul Verii	15.38	103.0	0.44	**
c ₃ – Estival	11.84	79.3	-3.10	000

DL (p 5%) 0.32;

DL (p 1%) 0.43;

DL (p 0.1%) 0.58

Compared to the variant considered control (c1 - Dulcin), Deliciul Verii hybrid registered a distinctly significant production, while the Estival hybrid registered a very significant negative difference compared to the control variant.

Analyzing the simultaneous action of the experimental irrigation and fertilization factors, and the degree of influence of the production level on the sweet corn crop, it was found that higher yields were obtained for irrigated and fertilized variants, compared to non-irrigated and basic fertilized variants (Table 4).

Table 4

The influence of the interaction of A x B factors (irrigation regime x fertilization regime) on the production of sweet corn in the conditions of Henig area - Alba Iulia, 2020

Variant	Average production (t/ha)	Relative production (%)	Difference $\pm d$ (t/ha)	Significance
a ₁ x b ₁	12.27	100.0	0.00	Mt.
a ₂ x b ₁	13.53	110.2	1.26	***
a ₁ x b ₂	14.29	100.0	0.00	Mt.
a ₂ x b ₂	15.81	110.6	1.52	***
a ₁ x b ₃	13.56	100.0	0.00	Mt.
a ₂ x b ₃	14.86	109.6	1.31	***

DL (p 5%) 0.36;

DL (p 1%) 0.52;

DL (p 0.1%) 0.78

It was found that the values for the differences in productivity, compared to the control variants, are very significant, in all three cases, however, the differences were very close in value.

The highest values of the average production were obtained in the case of irrigated variants, to which a basic fertilization + additional fertilization with NPK was applied.

The data presented in table 5 show the average results obtained from research on the influence of the interaction of irrigation factors and biological material on the production of sweet corn in 2020, in the conditions of Henig - Alba Iulia area.

Table 5
The influence of the interaction of A x C factors (irrigation regime x biological material) on the production of sweet corn in the conditions of Henig area - Alba Iulia, 2020

Variant	Average production (t/ha)	Relative production (%)	Difference $\pm d$ (t/ha)	Significance
a ₁ x c ₁	14.32	100.0	0.00	Mt.
a ₂ x c ₁	15.56	108.6	1.24	***
a ₁ x c ₂	14.52	100.0	0.00	Mt.
a ₂ x c ₂	16.24	111.8	1.72	***
a ₁ x c ₃	11.28	100.0	0.00	Mt.
a ₂ x c ₃	12.40	110.0	1.12	***

DL (p 5%) 0.37;

DL (p 1%) 0.50;

DL (p 0.1%) 0.67

It was found that all three hybrids reacted favorably to the application of additional watering, by irrigation, in terms of the value of production obtained. In all of the cases studied, the productions obtained by the irrigated variants compared to the control variants are very significant, the highest values being recorded for the Deliciul Verii hybrid.

In 2020, each of the three hybrids studied, reacted favorably to the graduation of the fertilization factor, the results obtained on the influence of the interaction of fertilization factors and biological material on the production of sweet corn being presented in Table 6.

Table 6
The influence of the interaction of B x C factors (fertilization regime x biological material) on the production of sweet corn in the conditions of Henig area - Alba Iulia, 2020

Variant	Average production (t/ha)	Relative production (%)	Difference $\pm d$ (t/ha)	Significance
b ₁ x c ₁	13.62	100.0	0.00	Mt.
b ₂ x c ₁	15.92	116.9	2.30	***
b ₃ x c ₁	15.27	112.1	1.65	***
b ₁ x c ₂	14.22	100.0	0.00	Mt.
b ₂ x c ₂	16.51	116.2	2.30	***
b ₃ x c ₂	15.41	108.4	1.20	***
b ₁ x c ₃	10.86	100.0	0.00	Mt.
b ₂ x c ₃	12.72	117.1	1.85	***
b ₃ x c ₃	11.94	109.9	1.08	***

DL (p 5%) 0.5;

DL (p 1%) 0.76;

DL (p 0.1%) 1.05

The productions obtained for the basic fertilized + additional fertilized variants of the studied hybrids, all registered, compared to the control variant, very significant differences. The highest values of the differences in productivity, for the three studied hybrids, were recorded for the basic fertilized + additional fertilized (NPK) variants.

CONCLUSIONS

Sweet corn production is favorably influenced by the factors studied (irrigation regime, fertilization regime and biological material).

It was found that in all the cases studied, the increases obtained by the combinations that included the a2 graduation - irrigated culture, are very significant, compared to the productions of the variants that included the a1 graduation - non-irrigated culture.

Both the basic fertilization + the additional fertilization with NPK, and the basic fertilization + the additional fertilization with foliar fertilization, lead to a very significant increase of the production, in all the studied variants, compared to the basic fertilization (control). The biggest differences of the obtained production were registered in the case of the basic fertilized + additional fertilized variants with NPK.

Regarding the production of sweet corn in the two hybrids, Deliciul Verii and Estival, compared to the production obtained by the hybrid Dulcin (control), it can be stated that the hybrid Deliciul Verii is most suitable for cultivation in the area, with distinct significant differences. The Estival hybrid cultivated in the area has a very significant negative production compared to the production obtained by the Dulcin hybrid (control).

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