

Theses for doctoral dissertation (PhD)

**Content evaluation of sweet corn (*Zea mays* convar. *saccharata* Koern)
hybrids**

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1. INTRODUCTION

Sweet corn cultivation area in Hungary has more than tripled since 1993. It is currently cultivated on 37,288 hectares, and since 2013, sweet corn has remained unchanged at over 30,000 hectares. This represents the largest harvested area among the vegetables grown in our country, and more than half of the total vegetable growing area (72,967 ha) is cultivated with sweet corn. Hungary is the largest producer of sweet corn in Europe (it has maintained its position since the 2000s) the second largest exporter in the world. Its harvested average yield has increased steadily from the initial 12 t/ha to 15 - 16 t/ha today, thanks to the high-quality sweet corn hybrids and the appropriate cultivation technology. Most of the sweet corn produced annually, 95%, is exported.

During my research, I measured and compared the yield, yield elements, and content values of sweet corn hybrids of different genotypes over the course of three years (2020 – 2022). In the course of our investigations, we aimed to: (1) investigate the correlations between vintage and genotype x vintage effects on the results of the harvested sweet corn wet crop (wet tuber + husk), (2) examine the wet grain weight, wet cob weight and tuber length, (3) the examination of plant height and stem diameter of sweet corn, (4) the analysis of the mineral content in the different genotypes, (5) the correlation between the sugar content of sweet corn and the harvested yield, (6) the distribution of carotenoids as a function of wet grain yield, with special regard to the lutein content.

2. MATERIAL AND METHODS

2.1. The location of the experiment

Our experiment was set up in the Demonstration Garden at the Agricultural Campus of the University of Debrecen on chalky chernozem soil.

	2020	2021	2022
	Hibrids		
1	Messenger (MES)	Messenger (MES)	Messenger (MES)
2	GSS8529 (GSS)	GSS8529 (GSS)	GSS8529 (GSS)
3	Prelude (PRE)	GSS5649(GSB)	GSS5649(GSB)
4	Desert R78 (DES)	Sf1359(SF1)	Sf1359 (SF1)
5	Noa (NOA)	Desert R78 (DES)	Tyson (TYS)
6	Kouatour (KUA)	Noa (NOA)	
7	Kwando (KWA)	Desert R72(DEB)	
8		Honey (HON)	

2.2. Laboratory methods

The quality parameters were determined from the sample taken at the time of harvest under laboratory conditions at the Agricultural Equipment Center of DE MÉK. For the statistical analysis of the content values of the sweet corn hybrids, the plants were randomly selected for sampling. For the laboratory tests, the samples were transported in liquid nitrogen and then stored frozen at -84 °C until processing.

To element determination, a gentle low temperature was used during the drying of sweet corn kernels. The samples were dried at 50 °C and then stored at 24 °C until processing. After collecting the samples from the stock, the drying process in the drying cabinet (Binder FD 720 thermal chamber) started immediately with maximum air speed. To determine the elemental content of sweet corn grain samples, 0.5 g of the prepared sample was measured, and 5 ml of distilled cc. HNO₃ and 3 ml of 30% H₂O₂ were added. It was sealed and destroyed in four steps using the ETHOS Plus Milestone microwave shredder and Application Note 076 method. After finishing the destruction, the vessels were cooled, and after opening, their contents were poured into a 50 ml volumetric flask. The measurements were carried out with an inductive plasma excitation - atomic emission ICAP 7000 spectrophotometer (Thermo Scientific).

We measured the sweet corn moisture content of the samples. The sweet corn samples were ground together with dry ice, then the ground sample was approx. 1/3 of it was put into a 40 ml EPA vial. It was stored in an open container at room temperature until the dry ice sublimated. After reaching room temperature, the weight of the vial was measured immediately. The vials were then placed in a vacuum oven at 70 °C, applying a vacuum of 500 mbar, after 3 hours the vacuum was reduced to 100 mbar and dried overnight at this pressure. We took it out of the drying cabinet and sealed it airtight, when it cooled down to room temperature, we weighed its exact weight.

When determining the number of carotenoids, **Moros et al. (2002)** method was used. For the tests, 0.6 g of ground sample was weighed into a 50 ml centrifuge tube. 6 ml of 100% ethanol was added, vortexed for 30 seconds, and then sonicated in a cooled ultrasonic bath for 5 minutes. 3 mL of 10% NaCl solution and 10 mL of hexane were added and vortexed for 30 seconds. We centrifuged for 3 minutes until the phases separated at 5000 rpm. The upper, hexane phase was pipetted into an evaporation tube. The hexane extraction was repeated two more times, until the lower, aqueous-alcohol phase became colourless. The collected hexane fractions were evaporated to dryness under a stream of nitrogen at room temperature in the dark. 2 mL of MeOH containing 0.1% BHT was added to the evaporated residue. It was dissolved using a vortex and ultrasound, and then the solution was filtered through a syringe filter with a pore diameter of 0.22 µm into an HPLC vial. It was stored in a freezer at -18 °C until HPLC analysis.

2.3. Statistical methods

Fisher's least significant difference (LSD) test was used to determine significant differences between individual values. The correlation between the variables was characterized by the Pearson correlation coefficient. The applicability of PCA was determined with the Kaiser–Mayer–Olkin test. The critical value of the test is 0.5. If the MSA (Measure of Sampling Adequacy) value of any variable exceeds this value, it is suitable for analysis. The statistical evaluation of the experimental results is R 3.2.4. in a statistical environment (Teams 2016a), with RStudio (Team2016b) graphical interface using "gplots" (Warner et. al., 2015) "car" (Fox and Wesiberh, 2011) and "agricolae" (De Mendiburu, 2016) packages and Minitab LLC., Pennsylvania, USA) with statistical software.

3. RESULTS

During our research, we evaluated the correlation of the yield of sweet corn hybrids with each year and the relationship between hybrid and year. According to our results, the year had a significant effect on the yield of the hybrids ($P < 0.001$), and the hybrid x year effect was also statistically verifiable ($P < 0.05$). Examining the grain weight relationships, according to our results, the amount of grain weight was significantly influenced by the hybrid, vintage, and the hybrid x vintage effect ($P < 0.001$). The year had the greatest effect on the amount of cob weight ($P < 0.001$), and there was also a statistically proven difference between the hybrids ($P < 0.01$).

1. table: Correlation of the yield of sweet corn hybrids with vintages and evaluation of hybrid x vintage relationships, Debrecen, 2020-2022

		DF	AdjSS	AdjMS	F-value	P-value
Yield	Year	2	73,444	36,7222	133,25	0,000
	Hibrid	1	13,097	13,0966	47,52	0,000
	Hibrid*year	2	2,311	1,1553	4,19	0,032
Eye weight	Year	2	12,894	6,4468	82,28	0,000
	Hibrid	1	16,877	16,8773	215,39	0,000
	Hibrid*year	2	4,543	2,2716	28,99	0,000
Cob mass	Year	2	32,1414	16,0707	145,46	0,000
	Hibrid	1	0,8292	0,8292	7,51	0,013
	Hibrid*year	2	0,6343	0,3172	2,87	0,083

2. table: Correlation of potassium, phosphorus, magnesium, calcium, iron, zinc content of sweet corn hybrids with vintages and evaluation of hybrid x vintage relationships, Debrecen, 2020-2022

		DF	Adj SS	Adj MS	F-value	P-value
Kalium (mg/kg)	Year	2	90020429	45010215	1811,49	0,000
	Hibrid	1	14725100	14725100	3461,48	0,000
	Hibrid*year	2	21192332	10596166	426,46	0,000
Potassium(mg/kg)	Year	2	9479215	4739608	1114,16	0,000
	Hibrid	1	809603	809603	1732,59	0,000
	Hibrid*year	2	4878945	2439473	573,46	0,000
Magnesium (mg/kg)	Year	2	2368846	1184423	2534,73	0,000
	Hibrid	1	240,67	240,667	163,47	0,000
	Hibrid*year	2	53678	26839	57,44	0,000
Calcium (mg/kg)	Year	2	18051,6	9025,79	365,5	0,000
	Hibrid	1	15,042	15,0417	45,11	0,000
	Hibrid*year	2	2227,8	113,88	45,11	0,000
Iron(mg/kg)	Year	2	42,333	21,1667	37,17	0,000
	Hibrid	1	31124315	31124315	1252,64	0,000
	Hibrid*year	2	1,333	0,6667	1,17	0,000
Zink(mg/kg)	Year	2	12,33	6,167	4,19	0,000
	Hibrid	1	240,67	240,667	163,47	0,000
	Hibrid*year	2	52,33	26,167	17,77	0,000

Overall, based on our experimental results, we determined that the two sweet corn hybrids included in the study differed significantly in terms of yield, grain weight, and micro-meso-macro element content. In the comparison of the vintage (2020; 2021; 2022), the yield, grain weight, calcium, iron, potassium, and phosphorus content differed reliably. In terms of mass, the 2020 and 2021 vintages were similar. The magnesium concentration differed in the three vintages and slightly differed in the 2020-2021 vintage. The zinc content differed, in 2022 the zinc content was like the 2021 vintage and different in the 2020 vintage.

The statistical evaluation of results of the two hybrids enabled valuable correlations in the

3 different vintages.

In our experiment, the proportions of fruit elements measured at harvest differed slightly from year to year, a similar conclusion was reached by Xiong et al. (2017) analyzing sweet corn yield results. In a comparison of mineral content, MES sweet corn contained more minerals, excluding iron and calcium. Gu et al. (2015), we found that the content of macro and microelements in corn kernels shows a significant correlation with the environment, soil type, amount of precipitation, and temperature.

Overall, we found that for both hybrids out of the three years, the amount of harvested fruit was the least in the unfavorable vintage in 2022, but at the same time it was significantly higher in 2020. In the case of GSS sweet corn, compared to 2020, the amount of the crop was significantly less in 2021 by only 4%, but by 21% in 2022. In the case of MES sweet corn, compared to 2020, the amount of raw produce was also 13% less in 2021 and 17% less in 2022.

Li et al. (2021), we proved the importance of the amount of irrigation water as a supplement to natural precipitation during the growing season. In their studies, a higher amount of irrigation water resulted in delayed phenological development and a prolonged vegetative growth phase, while with a lower amount of applied irrigation water, the vegetative development phase was significantly shortened and led to early maturity. Based on our own research results, we proved that, on the other hand, the vintage effect is primary and significant. The basis of efficient precision maize cultivation is the coordination of nutrient and water management and the practical application of new scientific results achieved in field duration experiments (Nyéki et al. 2021, Széles et al 2018, 2019). The value of a top variety is determined not only by its productivity, but also by whether it can "carry" the top yield even under extreme conditions. From the point of view of the significance of the duration experiments, the exact determination and monitoring of the complex effects of various agrotechnical factors and weather conditions on the soil are extremely important. Soil changes are extremely important not only from an agronomical point of view, but also from an ecological and environmental protection point of view. Pepo et al. (2020), we established the ecological sensitivity of corn, which was proven by the increased value of the vintage effect (11 %).

4. CONCLUSIONS AND RECOMMENDATIONS

In addition to precision farming, an essential element of modern sweet corn cultivation technology is the provision of optimal nutrients to achieve the right quantity and quality of sweet corn. During our research, for the past 3 years, we have examined the factors affecting sweet corn yield and quality, the influence of vintage, hybrid, vintage and hybrid on yield and mineral content. We analysed our results in three different years.

In 2020, a very large amount of precipitation fell during the growing season (447 mm), which significantly exceeded the average for many years, and the precipitation was especially favourable for all of this. The water supply was optimal in the phenological phases (blooming, fruit setting, grain saturation) that determine the yield.

At the beginning of the 2021 growing season, the weather was cool compared to the season. In June there was a definite change in the nature of the weather. The first month of summer was characterized by significantly warmer weather with little precipitation. Unlike most of the region, the July rainfall (70 mm) in the experimental area slightly exceeded the long-term average. The rest of the growing season was also dry. High summer temperatures played an important role in the development of severe drought. After June, July was 3.3 °C warmer than the long-term average and the heat wave continued in the first half of August.

In 2022, an even more severe drought developed than the previous year. April is rainy on average, but after that every month until August was very dry. The water shortage and its harmful effects were exacerbated by the fact that the weather was significantly warmer than usual. The summer months are respectively 3.4; 2.4; They showed a positive temperature anomaly of 2.9 °C.

Considering the vintage effect of the three years, the year 2020 was the most outstanding in terms of sweet corn cultivation. Drought damage and lack of rainfall resulted in a significant yield reduction in the 2021 and 2022 growing years, for both hybrids.

The statistical evaluation of the results of the two sweet corn hybrids separately in three different vintages enabled the discovery of valuable correlations and their application in the hybrid specific technology.

In 2020, the yield of GSS Hibrid showed a positive correlation with the amount of grain weight and cob, stem diameter, tube length, tube diameter, as well as Ca, Fe content. There was a negative correlation between the amount of fruit, plant height and K, Mg, Zn, P concentration. The grain weight showed a positive correlation with the amount of cob, stem diameter, tube length, tube diameter, Ca, Fe content, while the correlation between plant height, K, Mg, Zn, P concentration was negative. The amount of cob was positively correlated with tube length, Ca, Fe, K content and the correlation between cob mass and plant height, stem diameter, tube

diameter, K, Mg, Zn, P content was negative. Plant height was positively correlated with stem diameter, tube diameter, K; It correlates very closely with Mg content and there was a negative correlation between tube length, Ca, Fe, Zn, P content and plant height. Stem diameter was positively correlated with tube length, tube diameter, Ca, Fe, levels. I established a negative correlation between stem diameter and K, Mg, Zn, P concentration. The tube length showed a positive correlation, with the tube diameter, very closely correlated with the Ca, Fe content. I established a negative correlation between the concentration of K, Mg, Zn, P, and the pipe length. The pipe diameter was positively correlated with the Ca, Fe content and I observed a negative correlation between the pipe diameter and the K, Mg, Zn, P content. The Ca content was positively correlated with the Fe content and the correlation was negative with K, Mg, Zn. Between P content. The Fe content did not depend on anything, it was negatively correlated with the K, Mg, Zn, P content. K content was closely correlated with Mg, Zn, P content. The Mg content was positively correlated with the Zn, P content. Mg was positively correlated with Zn, P content. The Zn content was positively correlated with the P content.

In 2021, its yield was positively correlated with grain weight, plant height, stem diameter, Fe, K, Zn, P content. There was a negative correlation between the amount of fruit and the amount of cob, tube length, tube diameter, Ca, and Mg content. Grain weight showed a positive correlation between Fe, Zn, P content and tube length. I observed a negative correlation between grain yield and cob weight, plant height, stem diameter, tube diameter Ca, K, Mg content. Cob mass showed a positive correlation with tube length, tube diameter, Ca, Fe, Mg, Zn. I observed a negative correlation between cob weight and plant height, K, P content. Plant height was positively correlated with stem diameter, K, P content. I observed a negative correlation between pipe length and pipe diameter, Ca, Fe, Mg, Zn content. Regarding the tube length, I observed a positive correlation between the Ca, Mg content. At the same time, the correlation between pipe length and pipe diameter, Fe, K, Zn, P content was negative. Regarding Ca content, there was a positive correlation with Mg and Fe content. I observed a negative correlation between Ca content and K, Zn, P content. Examining the Fe content, it correlated positively with the amount of Mg, Zn and negatively with the K, P content. Examining the K content, I observed a positive correlation with the P content and a negative correlation with the amount of Mg, Zn. The Mg content was negatively correlated with the Zn, P content. The Zn content was negatively correlated with the P content.

In 2022, its yield was positively correlated with grain weight, plant height, tube diameter, Ca, K, P content. The correlation between the amount of fruit and the amount of cob, stem diameter, tube length, Fe, Mg, Zn content was negative. The amount of grain yield showed a positive correlation with tube diameter, Ca, Fe, Zn, P content and a negative correlation between grain

yield and the amount of cob, plant height, stem diameter, tube length, K, Mg content. Regarding the amount of cob, I found a positive correlation between the stem diameter, Ca, Mg, P content and a negative correlation between the amount of cob and plant height, tube length, Fe, K, Zn content. Regarding plant height, there was a positive correlation between stem diameter, tube length, tube diameter, K, Mg content. I established a negative correlation between plant height and Ca, Fe, Zn content. In terms of pipe length, the correlation was positive with the amount of Fe, K, Mg, Zn, and the correlation was negative with the amount of pipe diameter, Ca, P. The pipe diameter showed a positive correlation with the Ca, K, Mg, P content and a negative correlation with the Fe, Zn content. Ca content is positively correlated with P content and Mg content, and negatively correlated with Fe, K, Mg, Zn content. The Fe content was positively correlated with the Zn content and the correlation was negative with the K, Mg, P content. The Mg content showed no correlation with the Zn and P content. Zn content was negatively correlated with P content.

In MES Hibrid 2020, based on the results of the correlation analysis, there was a positive correlation between the amount of the crop and the cob mass, stem diameter, plant height, tube length, Ca, K content. At the same time, there was a negative correlation between the amount of fruit and grain yield, tube length, tube diameter, Fe, Mg, Zn, P content. The amount of grain yield was positively correlated with the amount of cob, stem diameter, tube length, and the correlation between grain yield and tube diameter, Ca, Fe, K, Mg, Zn, P content was negative. The amount of cob showed a positive correlation with stem diameter and tube length. I established a negative correlation between cob weight and plant height, tube diameter, Ca, Fe, K, Mg, Zn, P content. Plant height is closely related to tube diameter, Fe, Mg content and there was a negative correlation between plant height and stem diameter, tube length, Ca, K, Zn, P content. Stem diameter showed a positive correlation with tube length and Ca, K, P content, and there was a negative correlation between stem diameter and tube diameter, Fe, Mg, Zn content. The pipe diameter showed a positive correlation with the Fe, Mg content and a negative correlation with the Ca, K, Zn content. In the examination of the Ca content, the correlation between the Ca content and the K, P content was positive, while the correlation with the Fe, Mg content was negative. Analyzing the Fe content, I established a positive correlation between the K, Mg, Zn content and a negative correlation with the P content. The Mg content was negatively correlated with the Zn, P content. The Zn content was positively correlated with the P content. In 2021, its yield was positively correlated with grain yield, cob weight, stem diameter, tube length, tube diameter, Fe, Mg, Zn content. I established a negative correlation between the quantity of the crop and the plant height, Ca, K, P content. Regarding the amount of grain yield, I established a positive correlation with cob weight, stem diameter, tube length, tube diameter,

Fe, Mg, Zn, P content. The correlation between grain yield and plant height and Ca content is negative. Regarding the amount of the cob, I found a positive correlation between the length of the tube and the Mg content, but the correlation was negative between the amount of the cob, plant height, stem diameter, tube diameter, Ca, Fe, K, Zn, P content. Regarding plant height, there was a positive correlation between stem diameter, tube diameter, Fe, P content and a negative correlation between tube length, Ca, K, Mg, Zn content. Based on the statistical analysis of stem diameter, there was a positive correlation between tube length, tube diameter, Fe, K, Mg, Zn, P content. There was a negative correlation between stem diameter and the amount of Ca. Regarding the pipe length, I found a positive correlation between the Ca, Fe, K, Mg, Zn, P content and a negative correlation with the pipe diameter. Based on the results of the pipe diameter, the correlation between Fe and P content was positive, and the correlation between Ca, K, Mg, Zn content was negative. The Ca content is positively correlated with the K, Mg, Zn, P content and there is no correlation between the Fe and Ca content. The Fe content showed a correlation with the K, Mg, Zn, P content. Mg was positively correlated with Zn and P content. Zn was positively correlated with P content.

Its yield in 2022 was positively correlated with Fe, K, P content. The amount of fruit was negatively correlated with the amount of grain yield, cob weight, plant height, stem diameter, tube length, tube diameter, Ca, Mg, Zn content. The amount of grain yield showed a positive correlation with the amount of cob, plant height, stem diameter, tube diameter, Mg, Zn, P content. Grain yield showed a negative correlation with tube length, Ca, Fe, K content. Cob mass was positively correlated with stem diameter, tube diameter, Mg, Zn content. The correlation was negative with plant height, tube length, Ca, Fe, K P content. Plant height showed a positive correlation with stem diameter, tube length, Ca, Fe, K, Mg, Zn, P content. There was a negative correlation between plant height and tube diameter and plant height. The stem diameter showed a positive correlation with the tube length, tube diameter, Ca, Mg, Zn content. The correlation between Fe, K, P content and stem diameter was negative. Regarding the pipe length, there was a positive correlation between the content of Ca, Fe, K, and there is no correlation between the size of the pipe length and the pipe diameter, Mg, Zn, P content. Based on the results of the pipe diameter, I determined that there was a positive correlation between Mg, Zn and a negative correlation between Ca, Fe, K, P content. Regarding Ca content, Fe, K showed a positive correlation and Mg, Zn, P content showed a negative correlation. Regarding Fe, the correlation between K and P content was positive and there was no correlation between Mg and Zn content. Regarding the K content, there was a positive correlation with the P content, and I found no correlation between Mg and Zn. Mg was positively correlated with Zn content and negatively with P content. Zn shows a positive correlation with P content.

Despite the reductions in concentration per hectare.

Overall, based on our experimental results, we determined that the two sweet corn hybrids included in the study differed significantly in terms of yield, grain weight, plant height, stem diameter, tube length, tube diameter, micro-meso-macro element content. In the comparison of the year (2020; 2021; 2022), the yield, seed weight, plant height, tube length, calcium, iron, potassium, and phosphorus content differed reliably. In terms of cob weight and pipe diameter, the 2020 and 2021 vintages were similar. The magnesium concentration differed in the three vintages and slightly differed in the 2020-2021 vintage. The zinc content differed, in 2022 the zinc content was like the 2021 vintage and different in the 2020 vintage.

Regarding the phenometric parameters, sweet corn GSS grew taller, and this was accompanied by a larger stem diameter, tube length and tube diameter. In terms of yield results, the sweet corn yield of GSS was also higher compared to MES. In our experiment, the proportions of fruit elements measured at harvest differed slightly from year to year, a similar conclusion was reached by Xiong et al. (2017) analyzing sweet corn yield results. In a comparison of mineral content, MES sweet corn contained more minerals, excluding iron and calcium. Gu et al. (2015), we found that the content of macro and microelements in corn kernels shows a significant correlation with the environment, soil type, amount of precipitation, and temperature.

5. NEW SCIENTIFIC RESULTS

1. Based on our research results, we determined that the year had a significant effect on the yield of the sweet corn hybrids (wet tuber + cob) and confirmed the hybrid x year interaction. Compared to MES, the harvested crop of GSS was 9% more in 2020, 10% in 2021 and 4% more in 2022 according to the vintage effect.
2. We proved that the hybrid, the year, and the hybrid x year effect were significant on the amount of wet grain weight in 2020-2022 (9,516-13,210 t/ha). We found that, unlike this, the amount of wet cob weight was between 5.485 and 9.387 (t/ha), compared to MES, GSS was 2% more in 2020, 15% in 2021, and 4% more in 2022.
3. Compared to MES, the wet kernel weight of GSS sweet corn was 19% more in 2020, 24% in 2021 and 5% more in 2022. Based on our statistical tests, we determined that the year had a significant effect on the size of the pipe length. The tube diameters of the two hybrids tested were 50 mm and 54 mm (MES-GSS) between 2020 and 2022. Compared to MES, the sweet corn tube diameter of GSS was 7% thicker in 2020 and 6% thicker in 2021 and 2022.
4. We found that the year had the greatest effect on the plant height (minimum - maximum value) of the sweet corn hybrids. At the same time, we verified in our tests that the stem diameter depended on the genotype of the hybrid.
5. We proved that the Ca, Fe, K, P, Mg content of the sweet corn was affected by the hybrid, the year, and the hybrid x year interaction. The data of the two different genotypes differed significantly and reliably. The biggest difference between the two hybrids was measured in the potassium content of sweet corn hybrids in 2020 (9858-13875 mg/kg). Compared to MES, the potassium content of GSS sweet corn was 29% less in 2020.
6. Our tests proved that the sugar concentrations of the sweet corn hybrids at harvest were slightly influenced by the year and that the sugar yield per hectare was primarily a function of the yield. In 2020, the fructose content of sweet corn hybrids was 1.13 - 2.78 g/100g, in 2021 it was 2.6 and 9.5 g/100g.
7. We proved that the lutein content of sweet corn (in 2020 it was 3.84-9.57 mg/kg and in 2021 it was 2-13.9 mg/kg) was primarily genetically determined and did not decrease with the increase in yield. A new result is that, in addition to lutein, the concentration of zeaxanthin, β -cryptoxanthin, and β -carotene did not decrease with the growth of the crop, which confirms the importance of selecting sweet corn hybrids from the point of view of healthy nutrition.

6. PRACTICAL USE OF RESULTS

1. Based on the obtained experimental results, it was found that the GSS and MES hybrids have superior wet grain yield values (13210, 10 668 t/ha) compared to other sweet maize hybrids, which is important for the processing industry.
2. In the studies conducted, the yield and mineral content of sweet maize hybrids differed significantly, (16,765-22,060 t/ha) and genotype-matched (GSS,MES).
3. The sugar content of sweet maize hybrids is determined by their harvest time. In the performed analyses, the sugar content of sweet maize hybrids varied. The sugar content measured at the earlier harvest date 10.08.2020. 1,13 – 2,78 g/100g, was lower for all seven sweet maize hybrids.
4. The carotenoid content of cultivated sweet corn hybrids is significant. Target cultivation of sweet corn is also justified due to the demand for valuable xanthophylls. In our studies, the sweet corn hybrids contained a large amount of lutein (2-6.9 mg/kg). A significant result that can be used in practice for the processing industry is that increasing sweet corn yields does not reduce the possibilities of using lutein.

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Subject: PhD Publication List

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Doctoral School: Kálmán Kerpely Doctoral School
MTMT ID: 10081302

List of publications related to the dissertation

Hungarian scientific articles in Hungarian journals (4)

1. **Demeter, C.:** A Messenger csemegekukorica (*Zea mays* L. convar. *saccharata* Koern) hibrid termésminőség elemzése 2020-2021-ben.
Növénytermelés. 71 (1), 1-20, 2022. ISSN: 0546-8191.
2. Nagy, Z., Széles, A., **Demeter, C.**, Illés, Á., Bojtor, C., Zelenák, A., Nagy, J.: Az agrometeorológiai hatások elemzése csemegekukorica (*Zea mays* L. convar. *saccharata* Koern.) üzemi termesztési kísérletekben.
Növénytermelés. 70 (1), 7-21, 2021. ISSN: 0546-8191.
3. **Demeter, C.**, Széles, A., Illés, Á., Bojtor, C., Szabó, A., Bakos, Z., Zelenák, A., Nagy, J.: Normálédes és szuperédes csemegekukorica (*Zea mays* L. convar. *saccharata* Koern) hibridek beltartalmi értékeinek összehasonlító elemzése.
Növénytermelés. 70 (2), 5-20, 2021. ISSN: 0546-8191.
4. **Demeter, C.**, Széles, A., Illés, Á., Bojtor, C., Nagy, J.: Eltérő genotípusú csemegekukorica (*Zea mays* L. convar. *saccharata* Koern.) hibridek fenometriai és terméselem vizsgálatainak eredményei.
Növénytermelés. 69 (4), 26-36, 2020. ISSN: 0546-8191.

Foreign language scientific articles in Hungarian journals (2)

5. Huzsvai, L., Fejér, P., Illés, Á., Bojtor, C., Bojtó, C., Horváth, É., **Demeter, C.:** Analysis of sweet corn nutritional values using multivariate statistical methods.
Agrártud. Közl. 1, 103-108, 2021. ISSN: 1587-1282.
DOI: <http://dx.doi.org/10.34101/ACTAAGRAR/1/8587>
6. Bakos, Z., Bojtor, C., Illés, Á., **Demeter, C.**, Zelenák, A.: Nutritional values and yield parameters of a sweet maize variety (*Zea mays* L. convar. *saccharata* Koern).
Növénytermelés. 70 (3), 109-111, 2021. ISSN: 0546-8191.





Foreign language scientific articles in international journals (2)

7. Mousavi, S. M. N., Illés, Á., Bojtor, C., **Demeter, C.**, Bakos, Z., Vad, A., Abakeer, R. A., Sidahmed, H. M. I., Nagy, J.: Quantitative and qualitative yield in sweet maize hybrids.
Braz. J. Biol. 84, 1-9, 2022. ISSN: 1519-6984.
DOI: <http://dx.doi.org/10.1590/1519-6984.265735>
8. **Demeter, C.**, Nagy, J., Huzsvai, L., Zelenák, A., Szabó, A., Széles, A.: Analysis of the Content Values of Sweet Maize (*Zea mays* L. Convar *Saccharata* Koern) in Precision Farming.
Agronomy-Basel. 11 (12), 2596-2608, 2021. EISSN: 2073-4395.
DOI: <http://dx.doi.org/10.3390/agronomy11122596>
IF: 3.949

Foreign language abstracts (3)

9. Bakos, Z., **Demeter, C.**: Comparative analysis of molecular biological markers of different sweet corn (*Zea mays* L. convar. *saccharata* Koern) genotypes.
In: 19th Wellmann International Scientific Conference : Book of abstract. Ed.: Kiss Orsolya, University of Szeged Faculty of Agriculture, Hódmezővásárhely, 21, 2022. ISBN: 9789633068601
10. Bakos, Z., Nagy, J., Parádi, I., **Demeter, C.**, Szűcs, K., Szántó-Egész, R., Micsinai, A.: Evaluation of molecular biological markers of different sweet corn (*Zea mays* L. convar. *saccharata* Koern) genotypes.
In: Scientific Conference of PhD Students of FAFR, FBFS and FHLE SUA in Nitra with international participation : Proceedings of abstracts. Eds.: Monika Tóthová, Judita Lidiková, Kristína Candráková, Dominik Hollý, Slovak University of Agriculture in Nitra, Nitra, 65-65, 2021. ISBN: 9788055224008
11. **Demeter, C.**, Bakos, Z., Zelenák, A., Nagy, J.: Evaluation of NDVI, SPAD and nutritional values of sweet maize (*Zea mays* L. convar. *saccharata* Koern).
In: Scientific Conference of PhD. Students of FAFR, FBFS and FHLE SUA in Nitra : Proceedings of Abstracts. Eds.: Monika Tóthová, Judita Lidiková, Kristína Candráková, Dominik Hollý, Slovak University of Agriculture in Nitra, Nitra, 67-67, 2021. ISBN: 9788055224008

List of other publications

Hungarian scientific articles in Hungarian journals (2)

12. Nagy, J., **Demeter, C.**, Bakos, Z., Szabó, A., Sinka, L., Sidahmed, H. M. I., Simon, K., Illés, A.: A csemegekukorica (*Zea mays* conv. *saccharata* Koern) termésselemeinek elemzése öntözéses termesztésben.
Növénytermelés. 72 (2), 97-111, 2023. ISSN: 0546-8191.





13. Nagy, J., **Demeter, C.**, Bakos, Z., Simon, K., Sidahmed, H. M. I.: A csemegekukorica (*Zea mays* L. convar. saccharata Koern) hibridek betakarítási idejének értékelése a szárazanyag- és a szacharózgyarapodásának dinamikája alapján = Harvest time evaluation of sweet maize (*Zea mays* L. convar. saccharata Koern) hybrids based on dry matter and sucrose yield dynamics.

Növénytermelés. 72 (1), 53-68, 2023. ISSN: 0546-8191.

Foreign language scientific articles in international journals (1)

14. Mousavi, S. M. N., Illés, Á., Szabó, A., Shojaei, S. H., **Demeter, C.**, Bakos, Z., Vad, A., Széles, A., Nagy, J., Bojtor, C.: Stability yield indices on different sweet corn hybrids based on AMMI analysis = Índices de estabilidade de rendimento em diferentes híbridos de milho-doce com base na análise AMMI.

Braz. J.Biol. 84, 1-8, 2024. ISSN: 1519-6984.

DOI: <https://doi.org/10.1590/1519-6984.270680>

Total IF of journals (all publications): 3,949

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26 October, 2023

