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RESPONSE OF SWEET CORN VARIETIES TO PLANT DENSITY AND TILLER REMOVAL: PRELIMINARY STUDIES

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ABSTRACT. The sweet corn breeding strategy aims to enhance and sustain a consistent yield over time. The interaction between density and tiller removal is currently being discussed among sweet corn farmers, as well as scientists working in sweet corn. Considering the studies carried out to date and the research directions suggested by them, the present study aimed to determine the impact of plant density, variety, tiller removal and their interactions on the yield and ear prolificacy/weight of sweet corn under the climatic conditions of northeast Romania. The experiments were focused on 3 sweet corn varieties (Deliciosul de Bacău, Deliciul verii and Royalty F1), sown at 3 densities (50k, 60k and 70k plants/ha) and considering 2 variants for tiller removal (tiller removal / without tiller removal). The highest yield of sweet corn was recorded in the Royalty F1 hybrid in the plots in which the tillers were removed (24.27 t/ha). The Royalty F1 hybrid also had the heaviest ears (313.33 g) in plots with tiller removal and 60k plants/ha. Overall, the most favourable plant density in terms of yield was 60k plants/ha. The experimental results showed that in the climatic conditions of northeast Romania, tiller removal led to increased yield, especially in the Deliciosul de Bacău hybrid. Tiller removal in this hybrid resulted in a significant increase in yield (from 18.41 to 23.08 t/ha).

Keywords: plant density; sweet corn variety; tillers impact; yield.

INTRODUCTION

Scientists have contradictory opinions about tiller removal in sweet corn and commercial cornstarch. Many voices, among them farmers and researchers, believe that corn tillers lead to lower production (Dhaliwal and Williams, 2024; Islam *et al*., 2023), while others argue that tillers do not influence production. In contrast, they produce energy for the mother plant and grain filling (Veenstra *et al.,* 2021). Ortez *et al.* (2022) asserted that tillers may produce harvestable ears and grain only if they develop early. According to a study conducted by Ullah *et al.* (2023), tillers rarely produce productive ears. They are considered sinks that compete with the main stem for nutrients and moisture.

The plant genotype (Hansey and Leon, 2011) and various factors such as temperature, light intensity, soil fertility, soil moisture, plant density and management practices are strongly linked to tiller development in corn (Bayabil *et al*., 2023; Veenstra *et al*., 2021; Yurchak *et al.,* 2023).

Markham and Stoltenberg (2010) stated that a lower average daily temperature in combination with a higher light intensity results in increased tiller numbers in corn. Veenstra *et al.* (2023a) reported that tiller density in corn is strongly linked to plant density and the resources available per plant. According to Pangaribuan *et al.* (2023), tiller growth and survival are strongly related to resource availability rather than plant density alone since tiller death has been observed mainly in mature plants.

The process of selecting corn species to enhance and sustain a consistent yield over time has led to increased plant density, particularly in highly productive regions (Assefa *et al.*, 2018). The optimum density of corn plants is highly dependent on available resources, as a lack of nutrient availability is known to decrease the optimal plant density (Berzsenyi and Tokatlidis, 2012).

Furthermore, according to Berzsenyi and Tokatlidis (2012), a low density is characteristic of corn cultivated in marginal environments.

Massigoge *et al.* (2022) believed that it is essential to increase corn productivity in environments with high resource availability per plant, during seasons with high rainfall and when plant density is low. This can be achieved by adopting prolific genotypes and exploiting tiller development in corn, which might enhance both vegetative and reproductive plasticity. Veenstra *et al.* (2021) pointed out that tiller presence did not affect production regardless of plant density; in contrast, under favourable conditions, tillers have a plant density compensation potential. In addition, increasing plant density from 25,000 to 60,000 plants ha^{-1} had a significant positive influence on corn yield.

Considering the studies carried out to date and the research directions suggested by them, the present study aimed to determine the impact of plant density, variety, tiller removal and their interactions on the yield and ear prolificacy/weight of sweet corn under the climatic conditions of northeast (NE) Romania.

MATERIALS AND METHODS

Site description

This study was carried out on the Agricola Targu Frumos SA farm located in NE Romania (47˚13'00"N 26˚55'25"E), in Targu Frumos, Iasi county, at 198 m altitude. The area is characterised by a temperate continental climate. The main soil type in the field where experiments were performed was a cambic, luteous-clayey cernoziom formed on loessoside deposits and clays, under sylvatic climatic conditions on slopes medium inclined to the southeast. According to the physicochemical analyses performed, the soil has a pH of 7.6 and a content of 2.5% humus, 19.15% sand and 0.595% clay. The soil had a 0.127% total nitrogen content and 27 and 229 ppm concentrations of P_2O_5 and K_2O, respectively.

In recent years, climate change has resulted in extreme weather events characterised by extremely hot summers and frosty winters, along with substantial variations in temperatures between day and night, particularly during the late autumn and early spring seasons. Another aspect that characterises excessive climate is the uneven distribution of precipitation throughout the year. According to the measurements done in 2023 at the monitoring station of the Agricola Targu Frumos SA farm during the experiments, the highest amount of precipitation was recorded in August (60.8 mm) and the lowest in June (13.6 mm). In May, the total amount of precipitation recorded was 41.6 mm, and in July and September, it was 43.2 and 16.4 mm, respectively. The average monthly temperature during the experiment varied between 16 and 25.9°C, with the coldest month being May and the warmest month being August. The average monthly temperature in June was 20.6°C, and in July, it was 23.9°C. The greatest amount of precipitation occurred at the beginning and end of the vegetation period, meaning that the flowering and grain-filling phenophases were marked by very high temperatures and low rainfall. During the summer, according to MADR (2024), more than 40 days with temperatures above 30°C, low precipitation, and extended periods of drought were recorded.

Biological material

A panel of three commercial varieties of sweet corn was tested in this study. Deliciul verii and Deliciosul de Bacău are Romanian hybrids, and Royality F1 is an American hybrid. These are the most popular sweet corn varieties grown in Romania and the USA, suitable for all favourable areas in our country.

Experimental design

The experiment was organised in a split-plot design, with three replicates for each treatment. The main plot factors were assigned to hybrids and plant densities. Thus, the experimental design matrix was 3×3×2, considering 3 sweet corn varieties tested (**H**: Deliciosul de Bacău, Deliciul verii and Royalty F1), 3 sowing densities (**D**: 50k, 60k and 70k plants/ha) and 2 variants for tiller removal (**T**: one treatment with tiller removal, the second one as the control, without removal).

Sweet corn seeds were sown on May 18th, 2023, at a depth of 5 cm, after temperatures of 13–15°C had been recorded over the last three days. In the experimental field of the study, the previous year's crop was wheat. The field was kept weed-free by manual removal of weeds by daily workers twice before flowering and once at the end of the flowering period before the milk stage. A linear sprinkler irrigation system was used to ensure adequate water supply and to prevent water stress caused by abnormally low rainfall. During the experiments, the plots were watered 4 times with 30 L/m^2 (in total 120 L/m^2). The sweet corn harvest was carried out in the second decade of August. For pest control, Lamdex Extra (25 g/kg lambda-cyhalothrin) and Coragen (chlorantraniliprole 200 g/L) insecticides were applied in doses of 0.3 kg/ha and 125 mL/ha, respectively. In these experiments, Blackjak, which is a 100% natural humic acid-based biostimulator, was applied before sowing, and Aminosol® was applied as a foliar fertiliser.

Tillers removal

One-time tiller removal was performed by hand when the main stalk reached the V10 growth stage, being careful not to damage the main stem. The tillers were removed on the same day by the same worker. This protocol was also used by Wells *et al.* (2016) and Rotili *et al.* (2021) in their studies.

Data collection was limited to the two central rows of the plot to avoid boundary effects, while the ends of the plot rows were designated as buffer zones. Harvesting of ears from plants and tillers was carried out by hand when physiological maturity (R3) was reached. For each experimental variant, the harvested area was approximately 8 m long and 1.5 m wide, and the yield obtained from the harvested area was adjusted to 1 ha. Each plot contained four rows. In plots where tiller removal was applied, all plants were free of tillers.

Statistical analysis

The study aimed to determine the impact of plant density, hybrid, tiller density and their interactions on the yield and ear prolificacy/weight of sweet corn under the specific climatic conditions of the study area. All response variables were analysed using analysis of variance (ANOVA) in SPSS ver. 21. Plant density, variety, tiller density and their interactions were considered fixed effects, while year and replicates nested within a year of testing were treated as random effects. Mean comparisons for significant treatment effects were performed using Duncan's test at $p \leq 0.05$.

RESULTS AND DISCUSSION

Yield data variations

The effects of plant hybrid, plant density, tiller density and their interactions on yield and ear prolificacy/weight in sweet corn can be complex and linked with environmental conditions. Understanding and optimising these factors requires careful consideration of the specific conditions in which sweet corn is grown. The choice of plant hybrid plays a crucial role in determining the yield and quality of sweet corn. Hybrids differ in their tolerance to environmental conditions, pest resistance and growth characteristics. Therefore, it is important to select the hybrid that best suits specific environmental conditions. Additionally, different hybrids have specific temperature and climate requirements. Some hybrids may be better suited for warmer or cooler climates. Sweet corn hybrids also vary in their maturation periods, with some being early maturing, while others take longer to reach harvest (Lashkari *et al.*, 2011; Shelton and Tracy, 2013; Ye *et al.*, 2023).

Based on these assumptions, this study evaluated the adaptability of Deliciosul de Bacău, Deliciul verii, and Royalty F1 hybrids to the climatic conditions of NE Romania. These three sweet corn varieties are considered early hybrids with a vegetation period of 80–90 days.

As shown in *Figure 1*, Royalty F1 had a considerably higher average yield than Deliciosul de Bacău and Deliciul verii.

According to Dhaliwal *et al.* (2021), the higher productivity of Royalty F1 may be because it is a highly prolific modern sweet corn hybrid. Soare *et al.* (2019) observed that the yield of sweet corn hybrids varied considerably. In the same experimental conditions, Accentuate F1 sweet corn produced a significantly higher yield of 10.35 t/ha, while Sweet Thing F1 produced a yield of only 5.1 t/ha. These findings suggest that the yield response of these hybrids is primarily influenced by genetics, adaptation and maturity.

Therefore, the choice of hybrid can have a significant impact on sweet corn yield, and growers should carefully consider their options when selecting which varieties to plant.

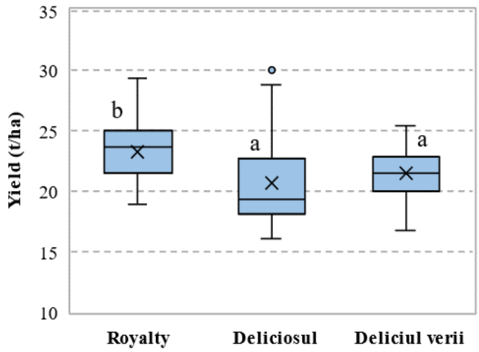

Figure 1 – Box plot of yield variation under the influence of sweet corn variety. Plots sharing the same letter are not significantly different according to Duncan's test at $p \leq 0.05$

Plant density is known to influence resource competition in corn cultivation. A higher plant density might lead to increased competition, potentially reducing individual plant yield unless proper spacing and resource management are implemented. Plant density can affect the number of ears per unit area. A lower plant density might allow for larger, well-developed ears, while a higher density can lead to more ears that may be smaller in size (Liu *et al.*, 2022; Ye *et al.*, 2023).

Increasing the plant density from 50k to 70k plants/ha had a positive effect on yield, with the highest average yield recorded at 60k plants/ha (22.76 t/ha fresh ears). At 50k plants/ha (control check), the average yield was 21.13 t/ha fresh ears, and at 70k plants/ha, it was 21.68 t/ha fresh ears. Statistical data analysis showed that changes in plant density within the selected range did not have a significant effect on crop yield. This implies that within the studied range, the variations in plant density did not lead to statistically significant differences in overall yield. However, the highest variation in yield was observed at a plant density of 70k plants/ha, as shown in *Figure 2*. Although the overall effect on average yield may not have been statistically significant, the variation suggests that a higher plant density might introduce some level of unpredictability or variability in crop performance.

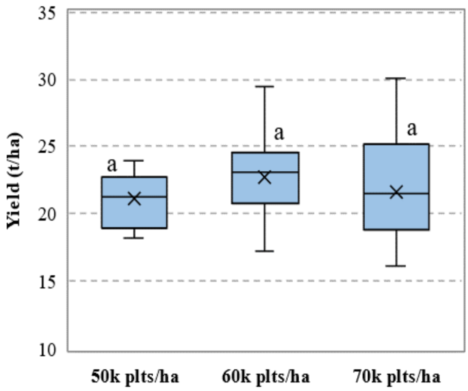

Figure 2 – Box plot of sweet corn yield variation under the influence of plant density. Plots sharing the same letter are not significantly different according to Duncan's test at p ≤ 0.05

According to Dhaliwal *et al.* (2021), modern sweet corn hybrids are designed to have a more compact plant structure with fewer tillers and lower fresh shoot biomass. This allows for a greater number of individual plants to be grown in a given area while minimising interference between neighbouring plants. Liu *et al.* (2022) showed that increasing the plant density from 45k to 75k plants/ha resulted in a significant increase in the fresh ear yield of MT6855 and WT2015 sweet maize.

However, this increase did not have any impact on the fresh ear yields of XMT10 and YZ7 sweet maize. This suggests that the response to plant density may vary among different sweet maize hybrids.

A greater tiller density can result in heightened competition for vital resources, such as water, nutrients and sunlight, both among the tillers themselves and the mother plants. If these resources are not used efficiently, this competition can ultimately lead to a yield decrease (Rotili *et al.*, 2021).

In this study, the measurements carried out revealed that the higher yield was in favour of tiller removal (*Figure 3*). The average yield in plots with tiller removal was significantly higher, reaching 23.43 t/ha fresh ears, compared to 20.29 t/ha fresh ears in plots without tiller removal. From a statistical perspective, the difference in average yield between plots with and without tiller removal was significant. This emphasises the importance of tiller removal as a management practice that positively impacts sweet corn yield.

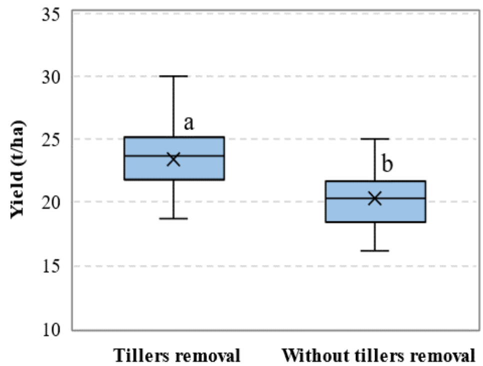

Figure 3 – Box plot of sweet corn yield variation under the influence of tiller removal treatment. Plots sharing the same letter are not significantly different according to Duncan's test at p ≤0.05

The results of our study revealed that removing tillers from sweet corn is crucial for obtaining high yields, regardless of the hybrid. The most significant differences were observed in the Deliciosul hybrid, with an increase in fresh ear yield of 4.67 t/ha when the tillers were not removed. Tiller removal increased the yield by 1.93 t/ha fresh ears for Royalty F1 and by 2.83 t/ha for Deliciul verii (*Table 1*).

Based on the data presented in *Table 2*, increasing the plant density without removing the tillers significantly negatively affected the sweet corn yield. The difference between the yield harvested from plots where the tillers were removed and those where the tillers were kept was 5.29 t/ha at 70k plants/ha fresh ears, 2.69 t/ha fresh ears at 60k plants/ha and 1.45 t/ha at 50k plants/ha.

Therefore, in the climatic conditions of NE Romania, the increase in plant density (from 50k to 70k plants/ha) without tiller removal reduced the sweet corn yield. The highest yield was harvested at 70k plants/ha on plots with tiller removal (24.33 t/ha fresh ears).

According to Rotili *et al.* (2021), the decreased sweet corn yield in plots without tiller removal may be due to increased soil water consumption during the early stages of the crop cycle due to increased crop transpiration.

This effect is even enhanced by increasing plant density. Various studies have established that corn is highly dependent on water availability in the soil during the growth stage; therefore, the precipitation deficit affects its production (Ren *et al.*, 2008; Zhang *et al.*, 2019).

Table 1 – Interaction effects of H*T on yield

Variant	Yield (t/ha fresh ears)
Deliciosul de Bacău * Tillers removal	23.08 ± 2.30[ab]
Deliciosul de Bacău * Without tillers removal	18.41 ± 0.42[c]
Deliciul verii * Tillers removal	22.96 ± 0.56[ab]
Deliciul verii * Without tillers removal	20.13 ± 0.40[bc]
Royalty F1* Tillers removal	24.27 ± 1.06[a]
Royalty F1 * Without tillers removal	22.34 ± 0.56[ab]

Notes: Mean ± standard deviation of each variable is reported in correspondence with each experimental treatment. Within the column, the values followed by different letters are significantly different according to Duncan's test at p ≤ 0.05. H – sweet corn variety; T – tiller removal treatment.

Table 2 – Interaction effects of D*T on sweet corn yield

Variant	Yield (t/ha fresh ears)
50k plts/ha * Tillers removal	21.86 ± 0.35[abc]
50k plts/ha * Without tillers removal	20.41 ± 0.91[bc]
60k plts/ha * Tillers removal	24.11 ± 0.57[a]
60k plts/ha * Without tillers removal	21.42 ± 0.74[abc]
70k plts/ha * Tillers removal	24.33 ± 1.50[a]
70k plts/ha * Without tillers removal	19.04 ± 0.67[c]

Notes: Mean ± standard deviation of each variable is reported in correspondence with each experimental treatment. Within the column, the values followed by dif-ferent letters are significantly different according to Duncan's test at p ≤ 0.05. D – plant density; T – tiller removal treatment.

For example, Ren *et al.* (2008) established that under the semiarid climate of Shaanxi Province, northwestern China, to achieve the highest sweet corn yield, rainfall should be between 230 and 440 mm. Unfortunately, 2023 was a year of drought in the area where the experiments were conducted, with May and June being rainfall-deficient and highly deficient, with quantities below 30 mm, according to MeteoRomania (2024). Even if the plots were irrigated, the amount of water used was probably insufficient; thus, tiller growth affected the yield.

Ear prolificity variations

The number of ears per plant, also known as ear prolificity, is important phenological information of interest in sweet corn. The more ears a plant produces, the more valuable it is and the cost is lower (Dhaliwal *et al.*, 2021). For breeders, prolificity is one of the most important criteria in the selection of hybrids for growth. Some breeders consider that it is better to have sweet corn with a single ear per plant that is well developed with many kernels and that is long and wide. Others are looking for 2 smaller ears that are more long than wide.

Regarding the influence of sweet corn variety, as we have previously stated, prolificacy is a function of genetics and is less related to the technology itself. Thus, the highest number of ears per plant was harvested from Deliciul verii (1.36 ears/plant) and the lowest from Royalty F1 (1.30 ears/plant).

Statistical analysis of the ear prolificity variation function of the sweet corn variety showed that the mean value obtained for Royalty F1 compared to Deliciul verii was significantly lower (*Figure 4*).

Analysis of the experimental data revealed that plant density had a significant impact on the prolificity of the ears. Under the studied climatic conditions, increasing plant density negatively affected ear prolificity. For instance, at 50k plants/ha, 1.47 ears were harvested per plant.

At 60k plants/ha, this number decreased to 1.34 ears per plant, and at 70k plants/ha, it dropped to 1.18 ears per plant (*Figure 5*). Lashkari *et al.* (2011) found that for maize hybrids KSC260, KSC302 and KSC500, an increase in plant density from 7 to 13 plants/ m^2 did not affect the number of ears/plant, but significantly reduced the yield.

Tiller density might influence the number of ears per plant. If tillers contribute significantly to ear production, a higher tiller density could potentially lead to increased ear prolificacy, although it may also affect individual ear weight, depending on resource allocation (Veenstra *et al.*, 2023b).

The highest number of ears per plant was harvested from plots with tiller removal (1.38 ears/plant compared to 1.29 ears/plant in the plots without tiller removal). However, from a statistical point of view, the differences observed between plots according to tiller density in terms of ear prolificity were not significant (*Figure 6*).

According to the results obtained in this study, tiller density is always variable, not fixed, and cannot be associated with the technological peculiarities implemented. It is driven purely by genetics itself.

Table 3 highlights the effects that the interaction T*D*H has on ear prolificacy. Increasing plant density without tiller removal significantly reduced the number of ears per plant, regardless of the sweet corn variety. From the experimental plots with 50k plants/ha and in which the tillers were removed, 1.47 ears/plant for Deliciosul, 1.57 ears/plant for Deliciul Verii and 1.47 ears/plant Royalty F1 were harvested, while from the experimental plots with 70 k plants/ha and without tiller removal, the ear prolificity decreased to 1.13 ears/plant for Deliciosul, 1.13 ears/plant for Deliciul Verii and 1.07 ears/plant for Royalty F1.

The most stable data in terms of the influence of both plant density and tiller density were found at 70k plants/ha density. At this density, 1.13 ears/plant were harvested for Deliciosul and Deliciul verii from the plots without tiller removal and 1.27 ears/plant for Deliciul verii and Royalty F1 from the plots with tiller removal.

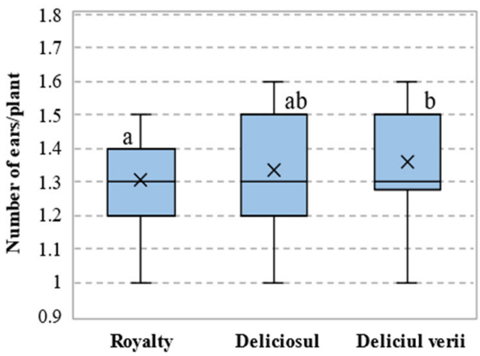

Figure 4 – Box plot of ear prolificity based on sweet corn variety. Plots sharing the same letter are not significantly different according to Duncan's test at p ≤ 0.05

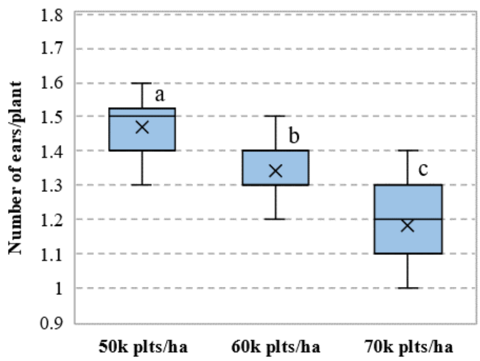

Figure 5 – Box plot of sweet corn ear prolificity based on plant density. Plots sharing the same letter are not significantly different according to Duncan's test at p ≤ 0.05

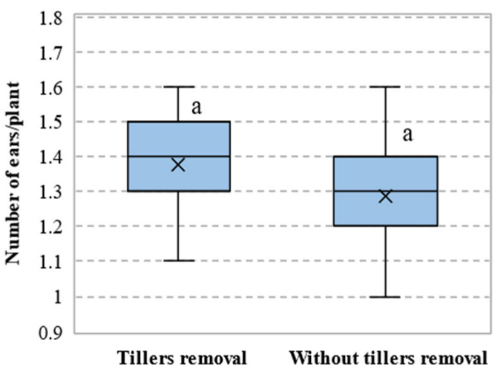

Figure 6 – Box plot of sweet corn ear prolificacy based on tiller removal treatment presence. Plots sharing the same letter are not significantly different according to Duncan's test at p ≤ 0.05

Table 3 – Interaction effects of T*D*H on ear prolificity

Variant	Mean values (number of ears / plant)		
	Deliciosul de Bacău	Deliciul verii	Royalty F1
Tillers removal * 50k plts/ha	1.47 ± 0.09 ab	1.57 ± 0.03 a	1.47 ± 0.03 ab
Tillers removal * 60k plts/ha	1.40 ± 0.10 abc	1.40 ± 0.06 abc	1.33 ± 0.07 bc
Tillers removal * 70k plts/ha	1.23 ± 0.07 cde	1.27 ± 0.03 cd	1.27 ± 0.07 cd
Without tillers removal * 50k plts/ha	1.47 ± 0.03 ab	1.47 ± 0.09 ab	1.40 ± 0.06 abc
Without tillers removal * 60k plts/ha	1.30 ± 0.06 bcd	1.33 ± 0.03 bc	1.30 ± 0.01 bcd
Without tillers removal * 70k plts/ha	1.13 ± 0.07 de	1.13 ± 0.07 de	1.07 ± 0.03 e

Notes: The mean ± standard deviation of each variable is reported in correspondence with each experimental treatment. Within each column, the values followed by different letters are significantly different according to Duncan's test at $p \leq 0.05$. H – sweet corn variety; T – tiller removal treatment; D – plant density.

Ear weight variations

The individual ear weight was the most variable indicator that we measured in this study, as shown in *Figure 7*, *Figure 8* and *Figure 9*. In a typical design, based on 3 replications, we kept the same number of replications, with 10 ears/replication.

Ear weight is a more complex variable that is dependent not only on the presence of tillers and plant density but also on sweet corn variety. Elite hybrids, such as Royalty F1, produce heavier ears, regardless of the density of plants and tillers, compared to Deliciosul de Bacău and Deliciul verii (*Figure 7*). The ear weight of Royalty F1 varied between 260 and 350 g, whereas for Deliciosul and Deliciul verii, the ears weighed between 210 and 330 g and between 230 and 290 g, respectively. Comparing the data obtained with those provided by the Agricultural Research and Development Station Turda, which created the Deliciul verii hybrid, the actual average ear weight in this study fell within the manufacturer's specifications (220–240 g). These results suggest that under the climatic conditions of NE Romania from 2023, the hybrid is performing in line with the intended characteristics. The average ear weights of Deliciosul de Bacău and Royalty F1 determined in this study were lower than the manufacturer's specifications (330–400 and 400 g, respectively). These findings suggest that the Deliciul verii hybrid was more versatile in the tested experimental conditions.

The increase in plant density from 50k to 60k plants/ha did not cause significant differences in mean ear weights, whereas the ears harvested from plots with a density of 70k plants/ha had significantly lower mean weights (*Figure 8*).

Regarding the influence exerted by the removal of tillers on ear weight, we did not find any statistical significance between the calculated mean values (*Figure 9*). The variation in ear weight was lower in the plots where the tillers were removed, so that more than half of the ears weighed between 265 and 300 g. In the plots without tiller removal, more than 50% of the ears sampled weighed between 240 and 290 g. In this study, for the Deliciul verii hybrid, the variation in the plant density from 50k to 70k plants/ha and tiller removal did not cause significant effects on the weight of the ears (*Table 4*). The corn ear weight ranged from 260 to 290 g in plots where tillers were removed and from 230 to 290 g in plots where tillers were not removed. This indicates that the maximum weight was achieved regardless of whether the tillers were removed. Ear weight data indicate that the mean values of Deliciosul de Bacău and Deliciul verii were significantly lower than the Royalty F1 hybrid (261.94 g and 267.22 g vs. 301.39 g, respectively). The harvested ear weight of the Royalty F1 hybrid was significantly different from that of the Romanian varieties.

The largest variation in ear weight may be explained by tiller size, which could affect the ear size. When the tillers are high, a high foliar surface occurs, and they may impact pollination by shading the ear silk.

Increasing the plant density without removing the tillers significantly negatively affected the sweet corn yield, as well as the ear prolificity. Regardless of the plant density and the presence of tillers, Royalty F1 sweet corn produced a lower number of ears per plant, but the ears were heavier compared to Deliciosul and Deliciul verii varieties, under the climatic conditions of NE Romania in 2023. In this study, artificial shading covering the ear silks during pollination was more visible at a density of 50k plants/ha due to the tiller size.

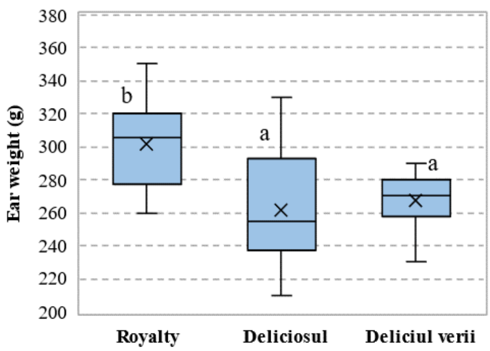

Figure 7 – Box plot of ear weight under the influence of sweet corn variety. Plots sharing the same letter are not significantly different according to Duncan's test at $p \leq 0.05$

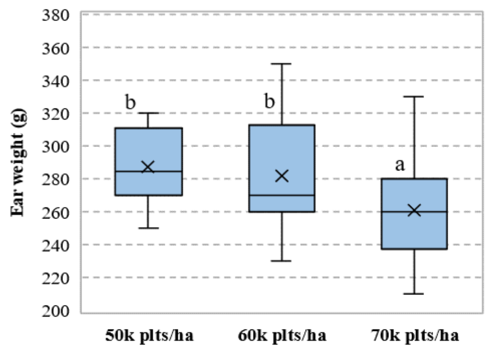

Figure 8 – Box plot of sweet corn ear weight under the influence of plant density. Plots sharing the same letter are not significantly different according to Duncan's test at $p \leq 0.05$

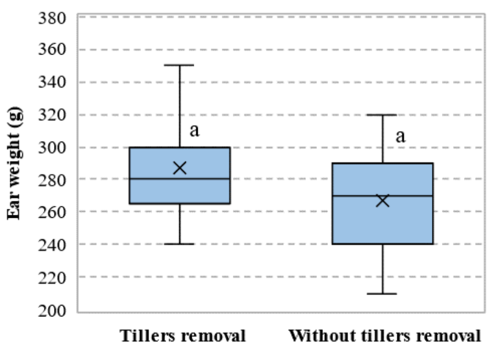

Figure 9 – Box plot of sweet corn ear weight under the influence of tiller removal treatment. Plots sharing the same letter are not significantly different according to Duncan's test at $p \leq 0.05$

Table 4 – Interaction effects of T*D*H on ear weight

Variant	Mean values (g)		
	Deliciosul de Buzău	Deliciul verii	Royalty F1
Tillers removal * 50k plts/ha	296.67 ± 5.77[abc]	276.67 ± 5.77[abcd]	301.67 ± 27.54[abc]
Tillers removal * 60k plts/ha	281.67 ± 33.29[abc]	280.00 ± 10[abcd]	313.33 ± 47.26[ab]
Tillers removal * 70k plts/ha	273.33 ± 49.33[bcd]	266.67 ± 11.55[cd]	290.00 ± 17.32[abc]
Without tillers removal * 50k plts/ha	260.00 ± 10.00[cd]	273.33 ± 20.82[bcd]	316.67 ± 5.77[a]
Without tillers removal * 60k plts/ha	240.00 ± 10.00[de]	266.67 ± 5.77[cd]	310.00 ± 10.00[ab]
Without tillers removal * 70k plts/ha	220.00 ± 10.00[e]	240.00 ± 10.00[de]	276.67 ± 5.77[abcd]

Notes: The mean ± standard deviation of each variable is reported in correspondence with each experimental treatment. Within each column, the values followed by different letters are significantly dif-ferent according to Duncan's test at p ≤ 0.05. H – sweet corn variety; T – tiller removal treatment; D – plant density.

In the microplot trials, we did not have this problem due to continuous walking in the field for data collection, but in the open field, we expected this factor to have a higher influence.

Similar results to those obtained in this study were reported by Shelton and Tracy (2013), whose aim was to examine the inheritance of traits associated with density tolerance in 15 sweet corn hybrids. They found that increasing plant density from 29,936 to 97,239 plants/ha had negative effects on ear dry weight and ear length but positive effects on the number of ear/ha and sweet corn yield.

Furthermore, they determined that increasing plant density led to a decrease in the number of tillers per plant, and sweet corn inbreds C68, C40 and Ia5125 had the highest planting density tolerance. Chozin and Sudjatmiko (2019) showed that sweet corn yield was significantly influenced by genotype. Datta *et al.* (2022) showed how important irrigation is for sweet corn crops.

Thus, the ears had the highest weight at a 1:4 ratio of irrigation water to cumulative pan evaporation (230 g), and the lowest weight (166 g) when the ratio between irrigation water and cumulative pan evaporation was 1.

The difference in ear weight among the three sweet corn varieties that were studied is not only caused by the hybrid genotype but may also depend on the maturity of the variety and phenotypic plasticity. Since soil water availability and nutrients are both known to have significant influences on ear weight, their shortage can lead to ears weighing less than the manufacturer's specifications. Therefore, it is extremely important to irrigate crops, especially during periods of scarce rainfall. Adequate water supply is essential for optimal growth and development of corn plants, ensuring that they meet or exceed the specified ear weight (Ren *et al.*, 2008; Zhang *et al.*, 2019).

CONCLUSIONS

Sweet corn is a crop of great economic importance worldwide, whose production is influenced by various factors related to the genotype, the management practices applied and the environment in which the crop is grown.

To introduce new technological sequences to sweet corn culture in NE Romania, in this work, the yield, ear prolificity and ear weights of three varieties of sweet corn grown at three densities with and without tiller removal were evaluated. According to the results of this study, the peak yield of Deliciul verii, Deliciosul de Bacău and Royality F1 occurred at 60k plants/ha, with a higher plant density decreasing production. The Royalty F1 hybrid produced a lower number of ears per plant compared to Deliciosul de Bacău and Deliciul verii. However, it compensated with heavier ears. This highlights the importance of selecting varieties based on specific traits and environmental conditions.

Furthermore, data analysis revealed a significant negative impact on sweet corn yield and ear prolificity when plant density was increased without removing tillers. This suggests that plant density alone may not be sufficient for optimal yield, and the presence of tillers needs to be considered. Therefore, managing tiller density through removal can be an effective strategy to enhance sweet corn yield. By reducing competition among tillers and optimising resource utilisation, farmers may achieve higher yields and improve crop performance.

In conclusion, this study provides valuable insights into the interactions between plant density, tiller removal, genotype and environmental conditions in sweet corn cultivation in NE Romania. These findings can contribute to optimising cultivation practices and improving sweet corn production in the specified region.

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