

EFFECT OF COVERING ON SWEET CORN GROWING PERIOD AND SOME MORPHOLOGICAL PROPERTIES

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Abstract

Experiment aims to investigate, in 2013, shortening of sweet corn growing period with application of some technological elements: propagation time, propagation method, floating row cover. The chosen variety was a conventional sweet corn hybrid, very early ripening 'Spirit'. The following growing technologies were compared: 1. direct sowing of plants with floating row cover, early period 2. direct sowing of plants without row cover, early period 3. plants transplantation with floating row cover, normal period and 4. direct sowing of plants without row cover, normal period (regarded as control).

The transplanted plants had shorter growing period by 6 days, compared to direct sowed covered treatment and were 15 days earlier harvested than control. Interaction of growing technology and plants covering had also favourable effect on some important morphological properties of ears such as weight of husked and unhusked ears, ear length, ear diameter, length of seeds and number of seeds.

Key words: *earliness, sweet corn, transplantation, fleece covering.*

Introduction

Based on its present growing area, the sweet corn is the vegetable which is grown on the greatest area in Hungary. After dates of Hungarian Fruit & Vegetable Interprofessional Organization in 2003 the growing area was about 38,000 hectares. After 2003 followed a sudden and sharp decline. After diminishing, the plant returned in rise, in 2006 against over 30,000 hectares. The recession mentioned above affected not only Hungary but also the holdings of the USA and Western Europe. In the case of the former, however, the increase in fresh consumption partly counterbalanced the rate of decrease. Near 50% of world sweet corn production came from US (Slezák *et al.*, 2012). In 2013 the growing area was 34, 000 hectares, less with 1000 ha, compared to 2012 (Avar, 2013).

In order to promote fresh consumption, as well as to maintain and increase the sweet corn exports, it is necessary to promote investigations so as to be able to ensure a further increase in the growing area and yields of sweet corn with the help of the experiences. The literature mainly is concerned with maize growing technology, but a lot of dates could be used by sweet corn. Of the production technology elements, a number of researchers studied or are currently studying the sowing time of sweet corn.

As early as at the ending of 19th- and the beginning of the 20th century some researchers (Cserháti, 1901) highlighted the importance of the sowing date. Ripening can occur earlier when sowing earlier and using high quality seeds as compared to normal or late sowing. I'só (1969) and Pásztor (1966), after their multi-year sowing date trial, concluded the following: in the case of an earlier sowing seed germination will be more protracted, but from the point of view of fruit maturing it was more favourable than late sowing.

Several techniques are known in the art for the purpose of early fresh market shipments: seedling growing or direct seeding with temporary plant cover (Hodossi, 2004).

About the covered early sowing as a technological variation Aylswirth (1986) mentioned, that from an early sowed crop, made in first week of April, arranged in twin rows (42 cm) and covered by plastic, we could harvested marketable cobs by the fourth of July.

The most widespread method of seedling production is the use of soil blocks (Pereczes, 1999) which can also significantly increase earliness. The combined application of seedling growing and floating row cover can advance harvest by three weeks as compared to the traditional technology and can give farmers a three to four times greater income (Kurucz, 1998). Rattin et al. (2006) compared direct sowed and transplanted sweet corn varieties, without covering and concluded no difference, in ear weight and ear length, between transplanted treatments plant's, in comparison to direct sowing treatments plant's.

Materials and methods

The experiment were set up in 2013 on an area equipped for irrigation at Carei, Satu Mare County, situated in NW part of Romania. Conventional, reliable and sufficiently known among growers sweet corn variety, Spirit, was used as a reference variety in the variety comparison trials of the Central Agricultural Office. Hybrid has short growing period of 85 days and yellow kernels. Average height of plants is 159 cm, average ear height is 37 cm, ear length 19.6 cm and average ear weight is 245 g. The variety was granted official recognitions in 1988 and has been the dominant variety of the early ripening category till now. In the year prior to the experiment the area was under wheat.

The following treatments, each with four replications, were applied during the experiment:

P1 = direct sowing of plants with floating row cover, early period (11th April)

P2 = direct sowing of plants without row cover, early period (11th April)

P3 = plants transplantation with floating row cover, normal period (21th April)

P4 = direct sowing of plants without row cover, normal period, regarded as control (21th April)

For the frame structure of the treatments with cover we used \varnothing 4.2 mm zinc coated wire coils. The fleece, 60 cm in width, was stretched over a small tunnel of 40 cm in height and then its edges (25-25 cm, respectively) were covered with soil using a hoe and the its ends were tied to the stakes hammered down. The construction of the frame structure and the setting out of the fleece cover were carried out at the same day as direct seeding and out planting.

For the purpose of seedling growing, the seeds were sown on 5th April 2013, in trays with rigid walls having 3,7x4x5,4 cm size. For growing the seedlings, commercial mix made of white peat 10-20 mm, PG Mix 1 kg/m³ + micro nutrients, bentonite 40 kg/m³, pH 5,5-6,5 was used. The seedlings were planted out at the 3 to 4 leaf phenological stage. At the two propagation times the treatments P1 and P3 were covered with Novagryl floating row cover, having a weight of 19 g/m², (using the small tunnel technique) in order to enhance earliness. The stand was created to contain 60,607 plants per hectare, according to the recommendations of the owner of the variety, at a spacing of 110+40x22 cm in twin rows. Each plot had an area of 6x3,5m (8 parallel rows and 16 seeds sown in each row). Sowing depth was 3 cm. The edge was the respective outer rows of the 4 twin rows of the plot.

In October 2012, 35 t/ha of farmyard manure was worked into the soil with ploughing on area. Nitrogen fertilizer (120 kg/ha) was applied at the 6-7 leaf stage, the form of top dressing. The fertilizer application was worked into the soil with a rotary hoe.

Ears were harvested together with the husks, from the two central twin rows. Twenty ears were selected from each row and the following measurements were carried out:

weight of unhusked and husked ears (g),

total ear length (cm),

ear diameter (mm),

length of seeds (mm),

number of seeds.

The statistical analysis of the results was carried out by using the programme *RobStat 1.1*. When the standard deviations were identical the mean values were compared by pairs using the *Tukey-Kramer* test, while in the case of the non identical standard deviations the means were compared using the *Games-Howell* test (Vargha, 2007).

Results and discussion

According to obtained results, harvesting time (measured in days) was the shortest in the treatment P3 and P2, merely 60, respectively 79 days, i.e. the corns became ready for harvest 15, respectively 8 days earlier than those of P4 (control). In case of P1 treatment, harvesting began 6 days earlier compared to P4 (control).

Results of the one of the major characteristics in connection with yield rating, unhusked and husked ear weight, are summarised in Figure 1.

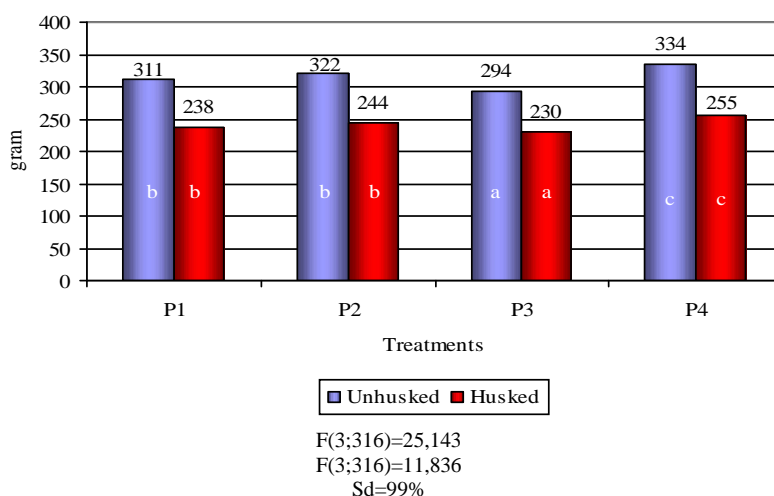


Fig. 1. Unhusked and husked ear weight (g).

Analysing the data measured for unhusked ear yield, it is noticeable that the average weight of the ears of the transplanted, covered treatment P3 was significantly (at $p<0.01$ level) lower as compared to the sowed, covered and uncovered treatments P1, P2 and P4 (control). Though there was some difference between the plants of the treatments P1 and uncovered, sowed, treatment P2 in unhusked ear weight, statistically this was not significant. Significantly highest value, supported statistically (at $p<0.01$ level), of unhusked ear weight was produced by ears of control treatment (P4). In case of husked ear weight the same tendencies were observed as in case of unhusked ear weight. The data concerning, an important characteristics for market appeal (total ear length) are contained in Figure 2.

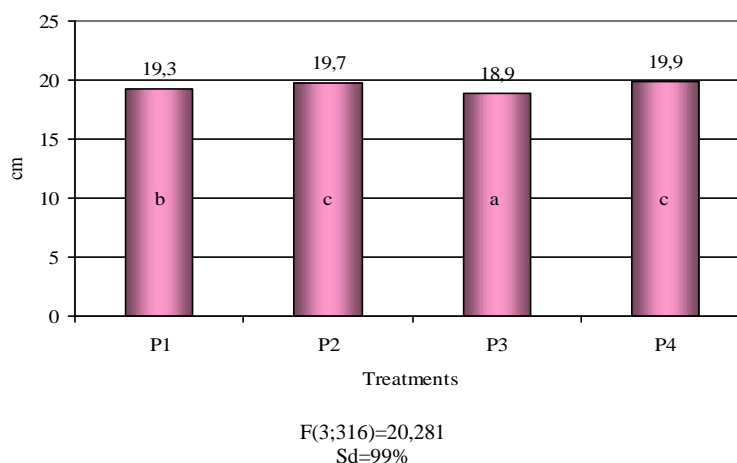
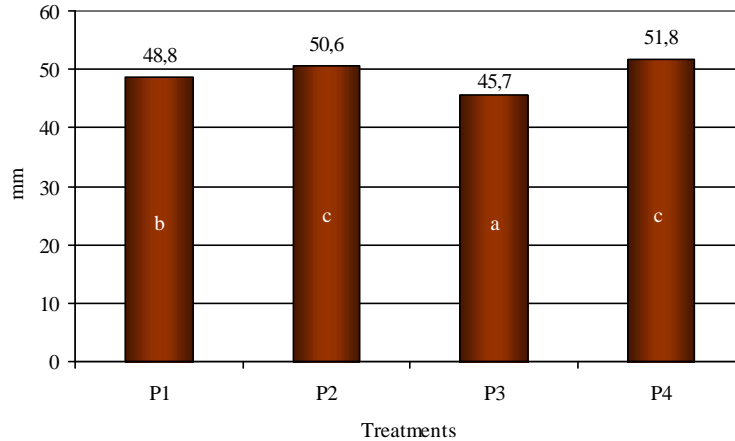


Fig. 2. Total ear length (cm).

The length of the covered transplanted treatment P3 was significantly (at $p < 0.01$ level) shorter compared to the ear length of all treatments. No statistically demonstrable difference was found between ear lengths of uncovered, direct sowed P3 and P4 (control) treatments.

Total ear length, average ear length 19.6 cm as measured in the variety comparison trials, achieved by the above mentioned P3 and P4 treatments.

Other important characteristics for market appeal (total ear diameter), is presented in Figure 3.

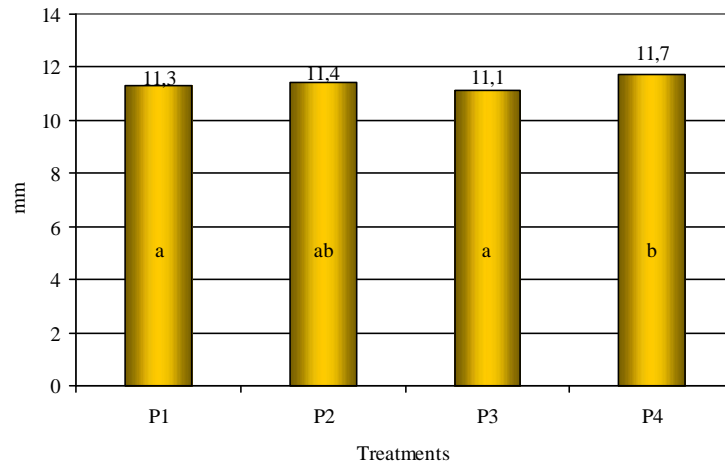


F(3;316)=66,795
Sd=99%

Fig. 3. Total ear diameter (mm).

The measured values were higher in case of uncovered treatments P2 and P3 compared to covered sowed treatment P1. The total ear diameter of transplanted, covered treatment P3 was significantly (at $p < 0.01$ level) lower as compared to the sowed, covered and uncovered treatments P1, P2 and P3.

Length of seeds is an important characteristic for yield quantity is presented on Figure 4.

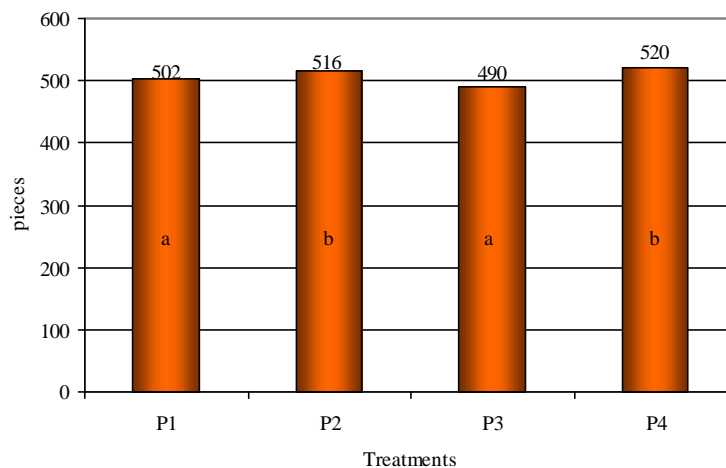


F(3;316)=14,877
Sd=99%

Fig. 4. Length of seeds (mm).

The measured values were higher in case of uncovered treatments P4 (control) and P2 compared to covered, control treatment P1 and P3. Length of seeds of transplanted, covered treatment P3 was significantly (at $p < 0.01$ level) lower as compared to the sowed, uncovered treatments P2 and P4 (control).

Number of seeds is also an important characteristic for yield quantity is presented on Figure 5.



F(3;316)=11,876
Sd=99%

Fig. 5. Number of seeds (pieces).

Analysing the data number of seeds, I observed that average number of seeds the transplanted, covered and sowed covered P3 and P1 treatments was significantly (at $p < 0.01$ level) lower as compared to the sowed, uncovered treatments P2 and P4 (control). In case of this morphological parameter the statistical programme could not demonstrate significantly difference compared covered treatments (P1-P3) and uncovered treatments (P2-P4).

Conclusions

Based on the results of the 2013 year experiment, the following conclusions can be made:

The growing period was significantly shortened with transplantation of sweet corn plants compared to direct seeded. Harvest time occurred 15 days earlier in the case of transplantation and floating row cover (P3) application compared to direct sowed, uncovered, control (P4) treatment, and 8 days earlier compared to direct sowed, covered P1 treatment. At the same time the floating row cover produce 6 days shortening in the growing season between P1 (direct sowing of plants with floating row cover) and P4 (direct sowing of plants with no row cover) control treatments.

The fleece covering had favourable effect on studied morphological characteristics of plants that are transplanted and floated with row cover.

In case of direct sowed treatment (P2) the effect of covering had positive effect on unhusked and husked ear weight, length of ears, total diameter of ears, number of seeds and length of seeds.

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