Available online at: http://proceeding.rsfpress.com/index.php/ess/index
LPPM UPN "Veteran" Yogyakarta Conference Series
Proceeding on Engineering and Science Series (ESS)
Volume 1 Number 1 (2020): 755-760

Yields Components Of Some Sweet Corn Line (*Zea Mays* Var. *Saccharata Sturt*) Generation S-4

Bambang Supriyanta, Dwi Lestari, Danar Wicaksono, Andiko Suryo Putrotomo

Universitas Pembangunan Nasional VeteranYogyakarta,
Email address bambangsg2@gmail.com

Abstract

One of the efforts to get varieties of good quality sweet corn plants yield is through a plant breeding program. Plant breeding is an effort to find downy mildew resistant sweet corn variety with high yield component. This research was aimed to evaluate resistances and yield components of 9 inbred lines of S-4 generation of sweet corn. It was conducted in 2020 in the experimental garden, Faculty of Agriculture, UPN Veteran Yogyakarta. The research used a randomized complete block design (RCBD) with three replications. The treatments were 9 inbred lines sweet corn S-4 generation that consisted of SB 1-1, SB 1-3, SB 1-4, SB 1-6, SB 2-1, SB 2-2, KD 1-1, KD 1-3 and 50 / 4-2B. The results showed SB 1-3 has the greatest growth performance, high productivity, and 15% disease incidence. However, SB 1-3 did not have early flower development. The fastest tassel and ear development perform by SB 2-1 with 15% disease incidence. The sweetest line showed by SB 2-2, SB 1-4, and SB 1-6 with 6%, 9%, and 21% disease incidence sequentially. The lowest disease incidence was 50/4-2B (1%).

Keywords: Inbred Line, Sweet Corn, Corn Downy Mildew

I. INTRODUCTION

Corn is the primary food plant in Indonesia. Corn is an alternative plant for the dry season. Sweet corn has a high economic value but has low productivity and susceptible to downy mildew disease. Plant breeding is a technology to develop new sweet corn variety with high productivity and more resistance against downy mildew disease. This research was conducted to evaluate some sweet corn lines from generation S-4 to be used as a potential line in further sweet corn breeding research.

II. LITERATURE REVIEW

One of the most popular vegetable commodities in the world is sweet corn. The demand for sweet corn continues to increase in Indonesia along with population growth. Sweet corn production in Indonesia is still unable to meet market demand. Efforts that can be made to obtain sweet corn plant varieties that have the potential for good yield quality and high productivity can be pursued with plant breeding programs (Sujiprihati et al., 2005). The assembly of superior varieties begins with forming pure (lines inbred line) as prospective parents. The formation of pure lines is basically through the plant and ear selection during self-pollinating and free-pollinated materials (Takdir et al., 2007).

Heritability estimation can be used to determine how much a character can be inherited. Heritability is the ratio between the variety of genotypes and the total magnitude of the phenotypic variation of a character. The higher the heritability value of a selected trait, the higher the increase in the traits obtained after selection (Sudarmadji et al., 2007). If the genetic diversity in a population is large, this shows that the individuals in the population are diverse so that the chances of obtaining the expected genotype will be large. The positive correlation that is owned by plants will facilitate selection because it will be followed by an increase in one trait to another so that one trait or selection index can be determined. Conversely, if the correlation is negative, it is difficult to obtain the expected properties. If there is no correlation between the expected traits, the selection will be ineffective (Suprapto, 2007). By calculating the cross-analysis we can decipher the magnitude of the direct and indirect effects of several components of the outcome on the outcome. The magnitude of the direct influence is stated by the magnitude of the cross coefficient. The total effect is the sum of the direct and indirect effects. This line is to prepare for the manufacture of pure lines for the formation of hybrid varieties.

III. RESEARCH METHODOLOGY

This research was conducted from December 2019 to March 2020 at the Experimental Garden of the Faculty of Agriculture, UPN "Veteran" Yogyakarta. This study used a one-factor completely randomized block design (RAKL) with three replications. The treatments were 9 S-4 generation sweet corn lines consisting of SB 1-1, SB 1-3, SB 1-4, SB 1-6, SB 2-1, SB 2-2, KD 1-1, KD 1 -3, and 50 / 4-2B. There are 27 experimental units in total and each experimental unit consists of 20 plants.

Soil cultivated perfectly. The application of manure under the trademark Tani Subur (TS) as the basic fertilizer was as much as 97.5 kg per plot. Planting in the form of rows of spacing between plants of 30 cm. The distance between the lines is 75 cm. The seeds were planted as much as 2 seeds per planting hole followed by giving Furadan 3G. Fertilization is carried out 3 times, first at 10 DAS with urea 5.4 g / plant and NPK pearl fertilizer 10.8 g / plant. The second and third fertilization at 20 and 30 DAS using urea fertilizer at a dose of 5.4 g / plant. Follow-up fertilization using Liquid Organic Fertilizer (POC) PAL and ZPTA TOP DEWE.

Weeding manually by hand. The filling is done twice, namely before the third fertilization and after the third fertilization. Irrigation using a fertigation system. To control armyworms, spray with bulldog pesticides is carried out. To control weeds, spraying with a selective herbicide rich in bases was carried out. Harvesting is done 75 days after planting.

The growing factor and yield component were evaluated from each line. Growing factors like the plant height, stem diameter, and a number of leaves were observed through its increment from week 4 until 8 after planting. Age of plant when developing male and female flower are also observed. The yield component like the number of ears per crop, weight, length, and diameter of the ear was observed after harvest. The corn sweetness was observed using a refractometer. Disease incidence was evaluated at five weeks after planting. Disease incidence by calculates the number of symptomatic plants divided by the number of alive plants.

IV. FINDING AND DISCUSSION

Plant height, stem diameter, and the number of leaves are an important indicator of plant growth. It indicated the plant has the capability to absorb nutrients and other growth resources to grow. The higher increment of plant height from week 4 until 8 was SB 1-3 line (127.5 cm), which was higher than the other. The lowest increment of plant height from week 4 until 8 was SB 2-1 (98.41 cm). According to Wasonowati (2011), plant height growth shows the activity of xylem formation and enlargement of growing cells. This activity causes the cambium to be pushed out and the formation of new cells outside these layers, resulting in an increase in plant height. SB 1-4, SB 2-2, SB 1-3, and SB 2-1 lines have a high increment of stem diameter. Stems have an important function to support the plant's upright and keep the plant-strong. SB 1-3 line grow 5.6 leaves from week 4 until 8. It was higher than the other lines. The more the number of leaves means the greater of photosynthesis results so. From the growth indicator, SB 1-3 line showed better performance than other lines. However, the greatest sweet corn line is not only evaluated by the growth indicator, but also some others.

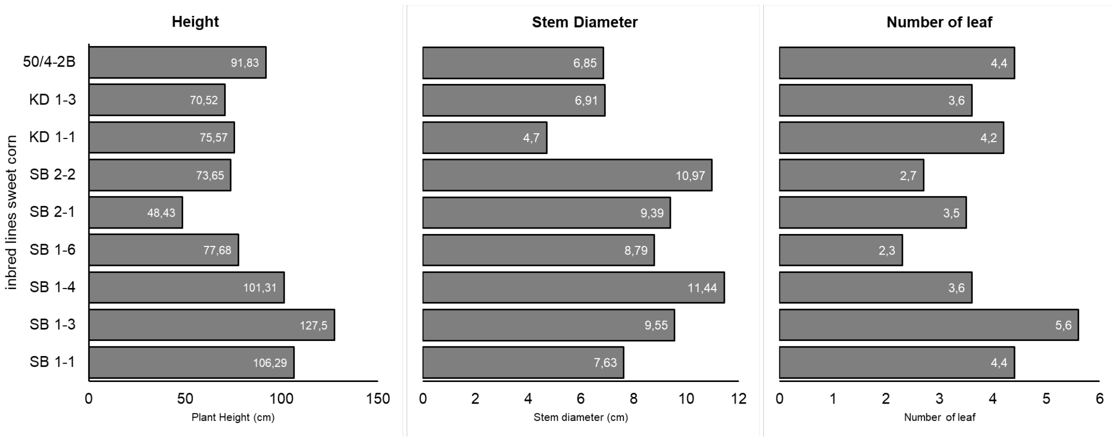

Figure 1. The increment of Plant Height, Stem Diameter, dan Number of leaves from week 4 until 8.

Corn has some growth phase: seedling, vegetative, generative, and harvesting phase. All phase usually takes about 90 days. Find early age of harvesting sweet corn will make more production per year. Corn becomes resistant to downy mildew in the generative growth phase. The shorter vegetative phase will reduce the possibility of downy mildew pathogen infection. Figure 2 showed the time of seedling until they begin the generative phase. It showed by the development of the Tassel (male flower) and ear (female flower). The fastest tassel development age was SB 2-1 at 51.33 days after planting (dap) and significantly different from other lines. The fastest ear development age was SB 2-2 lines (56.33 daps) but was not significantly different from the SB 2-1 (57 daps). SB 2-1 or SB 2-2 lines can be used as genetic material to assemble hybrid varieties with a short life (early maturity).

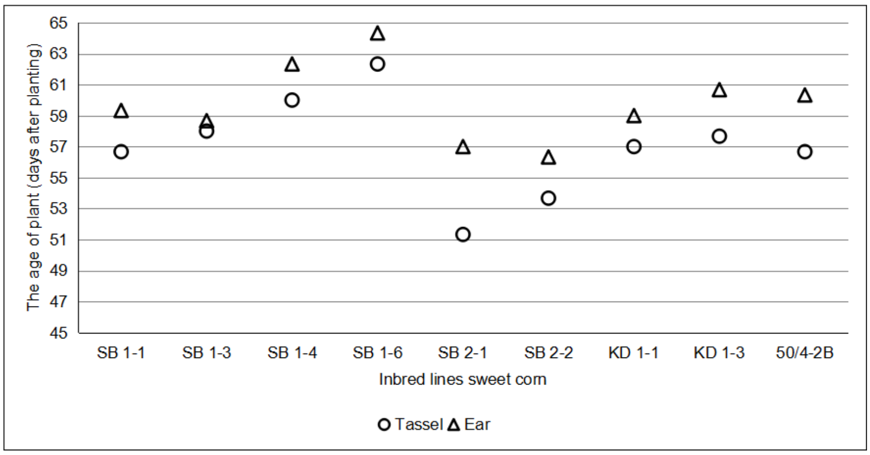

Figure 2. The age of produce flower on the inbred line of sweet corn.

The ear is a final product of sweet corn because it has high economic value. Figure 3 showed the evaluation result of nine lines. The variable number of ears per crop did not show significant differences between treatments. SB 1-3 lines had the highest weight (291.78 g) and were significantly different from other lines. This variable reflects the yield obtained from the corn crop. The ear weight of SB 1-3 lines had the highest result (198.5 g) and was significantly different from other lines. This variable reflects the yield obtained from the maize crop. In the variable ear diameter, SB 1-3 lines had the largest diameter (43.14 mm) but not significantly different from SB 1-4 (40.15 mm). SB 1-3 lines had the longest ear (19.80 cm) and were significantly different from other lines. The bigger diameter and longer ear can reflect the weight of the ear. Figure 1 shows that SB 1-3 has high growth performance and it also has high productivity.

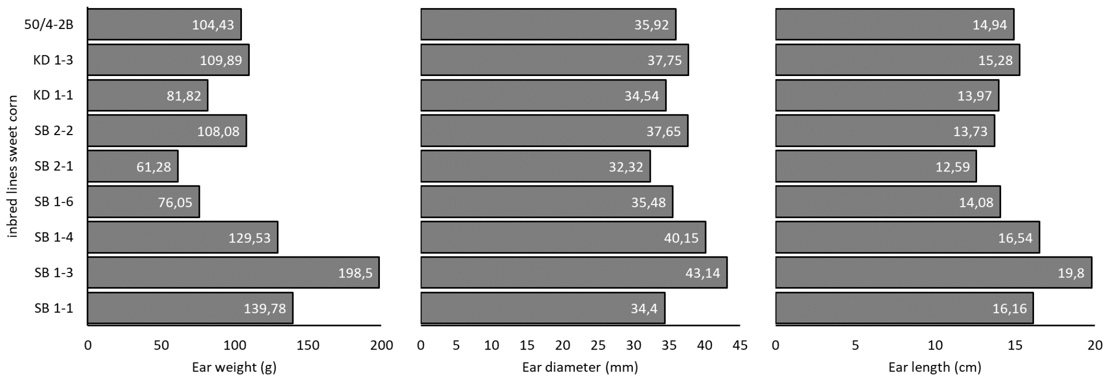

Figure 3. Weight, Diameter, and length of corn ear on the inbred line of sweet corn.

The lines that had the highest level of sweetness were the SB 2-2 (14.25 Brix) and were not significantly different from the SB 1-4 (13,25 Brix) and SB 1-6 (13,25 Brix). The sweet taste of sweet corn comes from the recessive gene sugary (su), brittle (bt), or shrunkensh2-2 (sh2). Such recessive genes can prevent or inhibit the normal conversion of sugar to starch during endosperm development. So that the level of sweetness in sweet corn is more influenced by genetic factors than environmental factors.

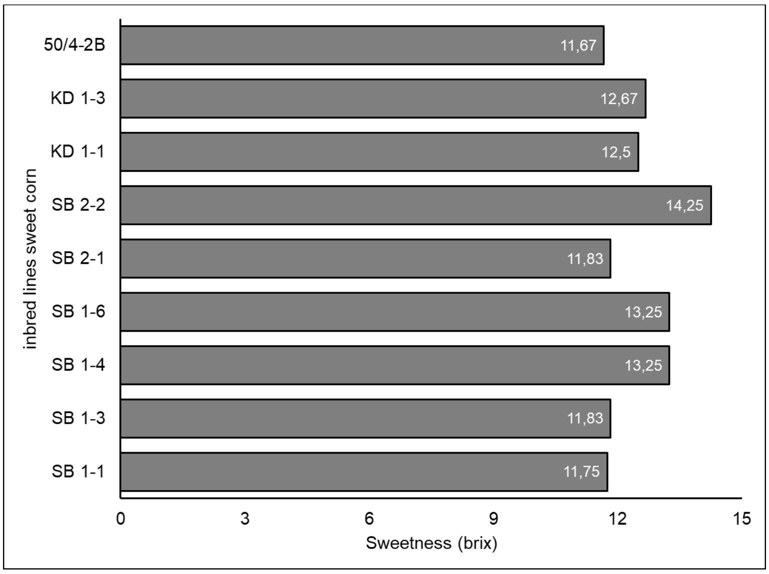

Figure 4. The sweetness of some inbred line of sweet corn.

Resistance corn variety from Downy mildew disease needs to develop to keep high plant productivity. Figure 5 showed all lines used have disease incidence lower than 30%. 50/4-2B has the lowest disease incidence (1%) and SB 1-1 has the highest (27%). SB 1-3 line with great growth performance and high productivity has 15% disease incidence. The fastest tassel and ear development line (SB 2-1) has 15% disease incidence.

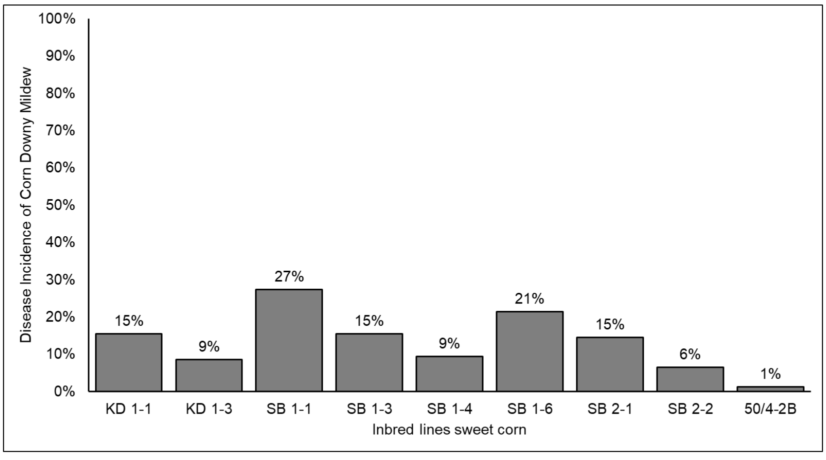

Figure 5. Disease Incidence of Corn Downy Mildew on some inbred line of sweet corn.

The evaluation result of growth factor, yield component, and disease resistance against downy mildew disease become a continuous consideration in choosing the best line. Growing factors become causal factors of good yield component so growing factors become confirmation data to evaluate yield component. When it showed a high yield component, but the growth factor does not support, it might because of high environmental influence. High yield component but high disease incidence occurs to bring a high risk of crop failure.

Yield component evaluation showed that SB 1-3, SB 1-4, and SB 1-1 line have high yield components successively and were supported by a high growth factor, but they did not show early flower development. Between of three-line, SB 1-4 has the smallest disease incidence (9%), followed by SB 1-3 (15%) and SB 1-1 (27%).

V. CONCLUSION AND FURTHER RESEARCH

SB 1-3 has the greatest growth performance, high productivity, and 15% disease incidence. However, SB 1-3 did not have early flower development. The fastest tassel and ear development perform by SB 2-1 with 15% disease incidence. The sweetest line showed by SB 2-2, SB 1-4, and SB 1-6 with 6%, 9%, and 21% disease incidence sequentially. The lowest disease incidence was 50/4-2B (1%).

VI. REFERENCES

Stansfield, WD, 1991. Genetics. Interpretation of Language M. Affandi and LT Hardy. Erlangga, Jakarta.

Sudarmadji, R. Mardjono, and H. Sudarmo. 2007. Genetic variation, heritability, and genotypic correlation of important traits of the sesame plant. Littri's Journal. Vol. 13 (3). Research Institute for Tobacco and Fiber Crops. Poor. 88 - 92.

Sujiprihati, S. Sutjahjo, SH, and LI Rochmah, 2005. Plant Morphology and Corn Growth Phases towards the Formation of Semi-Bulk Corn. Journal of Akta Agrosia Vol 8 no 2 pp 46-51 July-December 2005.

Suprapto. 2007. Genetic Variation, Heritability, Genetic Actions, and Genetic Progress (Glycine max Merrill) in Ultisol Soil. Indonesian Journal of Agricultural Sciences. Volume 9 No 2, Hlm 183-190

Takdir, AM, S. Sunarti., And MJ Mejaya. 2007. The Formation of Hybrid Corn Varieties. Directorate General of Food Plants. Bogor.

Wasonawati, C. 2011. Increasing the growth of tomato plants (Lycopersicon esculentum Mill) with hydroponic cultivation systems. Journal of Agrovigor 4 (1): 21-28