KONTRIBUSIA, Vol 6, Issue 1, 2023
ISSN 2614-1582 E-ISSN 2614-1590
Published by Research and Community Development Center

Growth and Production Performance of Sugar Cane (*Saccharum officinarum* L.) Clon SB 01, SB 04, sb 19, SB 20 in the Village Curahmalang, Jombang Regency

Author
Setyo Budi (Orcid ID. 0000-0001-7598-1614)
Wiharyanti Nur Lailiyah (Orcid ID. 0000-0002-7911-4507)

Correspondence
Department of Agrotechnology, Faculty of Agriculture, University of MuhammadiyahGresik

Abstract

Sugar productivity decreased in 2015-2016 by 11.76% and reached the lowest productivity in 2017 of 4,985 kg/ha White Crystal Sugar (GKP). The reason could be due to the presence of several types of sugarcane that experienced a decrease in yield during cultivation, such as nutrient deficiencies which resulted in divergent sugarcane plant height. Then the low sugarcane juice contained in sugarcane plants also affected production results. This study aimed to determine the growth and yield performance of sugarcane (Saccharum officinarum L.) clones SB01, SB04, SB19, SB20. This research was conducted in the garden of the Center for Sugarcane Research and Development (P3T) Faculty of Agriculture, University of Muhammadiyah Gresik, PG GEMPOLKREP and PT Perkebunan Nusantara X (PTPN X). Sumobito District, Jombang Regency from March to June 2021. Materials for observations used clones SB 01, clones SB 04, clones SB 19, and clones SB 20. The variables observed were sugarcane shoots, sugar cane stalks, and sugarcane leaves. Data analysis used descriptive analytical, variability and heritability.

Keywords: Performance, SB Clone, *Saccharum Officinarum* L.

Received: 05 July 2022. Accepted: 29 December 2022

Introduction

Sugar cane is a plant that can only grow well in areas with a tropical climate and includes types of grass that are grown as producing sugar from the stem. As a tropical country, Indonesia has the potential for high sugarcane production. The area of sugarcane in 2018 reached 429,959 hectares which was dominated by people's plantations (PR) covering an area of 258,722 hectares or 60.17% of the total area of sugarcane in Indonesia, large private plantations (PBS) covering 62,882 hectares or 14.63% (Ditjenbun, 2019). Significant reduction in sugar productivity sharply 108,355 hectares or 25.20% and large state plantations (PBN) covering an are occurred between 2015-2016 with a decrease of 11.76% and achieved the lowest productivity in 2017 of 4,985 kg/ha GKP (Ditjenbun, 2019). Sugarcane (Saccharum officinarum L.) is a valuable plant, quite economical, because it is the main raw material in the manufacture of sugar. Sugarcane plants contain sap which can be processed into sugar crystals (Putra, E., Sudirman, A.,

Indrawati, W., 2016). Sugar is one of nine basic ingredients of Indonesian society. Need for white crystal sugar (GKP) is currently estimated at 2.9 million and refined crystal sugar (GKR) at 2.8 million tons so that the total national sugar demand reaches 5.7 million tons. Sugar production 2015 was estimated at 2.73 million tonnes indicating that National sugar needs are still not fulfilled (Ditjenbun, 2013).

There are several methods of plant crossing that can help to make the crossing process easier. After the crossover occurs, next further selection. With the passage of time, accumulation pool of elders will be obtained, some of which can be released as the best clones for the region certain, some are not good enough to be commercialized, some are removed because they are not in accordance with the breeding objectives that have been previously established (Lahay, R. R. 2009). In all plant breeding programs, pools will always change where newcomers will enter while those who others out (Blackburn, 1984).

A clone is a group of plants within a certain species which is propagated vegetatively by using certain plant organs and the group has certain characteristics that are different from those owned by other plant groups which are also propagated vegetatively in the same species (Mawardi, Surip and Suhendi Dedy 2004).

The stages of the plant breeding process lies on the plant identification stage which becomes a benchmark in determining a variety. Identifying characteristics of morphology of the SB clone (Setyo Budi) was carried out to determine the tendency of the clone to the parent. Plant identification can be done in 4 methods, including taxonomy keys, writing plant descriptions, comparing specimens, comparing pictures, and opinions of institutions or experts. The method Used in this study is to compare specimens directly. This method is considered effective in knowing the type of sugarcane because the object can be compared to real.

Method

This research was carried out in March – June 2021 in the garden of the Center for Sugarcane Research and Development (P3T) Faculty of Agriculture, Universityof Muhammadiyah Gresik, PG GEMPOLKREP and PT Perkebunan Nusantara X (PTPN X), Sumobito District, Jombang Regency with an altitude of ± 90 meters above sea level. The tools used in this research are sickle, magnifying glass (loop), ruler, meter, refractometer, raffia string, caliper, machete, camera and other stationery. Cameras were used as documentation that supported and complemented data in the field. The material used is clone SB 01, SB 04 clone, SB 19 clone, and SB clone 20. This study used data analysis using descriptive analysis, variability and heritability methods. Observation parameters included sugar cane shoots, sugar cane stalks, leaves. While the growth parameters included plant height, stem density, stem diameter and brix.

Results and Discussion

Observation of morphological characterswas carried out in several stages. The first stage was the identification of suitable clones to be observed. The second stage was a land survey to ensure the condition of sugarcane plants according to the desired clone to be observed with morphological characters. The next stage was mapping the sample to be observed. The method of determining the sample was by selecting plants that had the most complete morphology and were selected randomly in a land area. The selected sample was observed according to the observed variable that has been determined. The results of the observations of these variables were divided based on

the morphology of the stems, leaves, and shoots.

Clone SB01

Sugarcane stalks composed of clone SB01 had a zig-zag or (bend) arrangement of segments. With a book shape of cylindrical segments, the color of the stem was green with a thin wax layer so that it did not affect the color of the stem, it had growing cracks but no cork cracks, there was no growing ring, while the terraces and holes were massive as seen in Figure 4.1 clone SB01 at 38 WST, June 2021.

Figure 1. Clone SB01
Source: Documentation, Personal June, 2021.

Sugarcane leaves in clone SB01 had a green color, leaf <1/2 of leaf with a width of 6 cm, leaf triangle color was green, there were ears of leaves that were erect with strong growth, they had dorsal hairs with a narrow area not reaching the tip of the midrib, loose nature of the midrib included in the easy category. It was more clearly presented in Figure 4.2 of the SB01 clone at the age of 38 MST, June 2021.

Figure 2. Sugarcane leaves on clone SB01
Source: Documentation, Personal June, 2021.

The buds of sugarcane clones SB01 had an oval shape with a growing point in the middle of the top of the buds, the buds of SB01 also had wide eye wings, they had no basal edge hairs and crested hairs or eyegrooves, the buds were located at the former base of the leaf midrib. . It was more clearly presented in Figure 4.3 SB01 clone at the age of 38 MST, June 2021.

Figure 3. Sugarcane plant buds clone SB01
Source: Documentation, Personal June, 2021.

Sugarcane clones SB01 at the age of 257 DAP, 271 DAP, 285 DAP, and 299 DAP respectively had average stem length values of 247 cm, 257 cm, 297 cm, and 320 cm. The average stem diameter was 2.37 cm, 2.47 cm, 2.57 cm, and 2.83 cm. The average brix values were 22.1%,21.6%, 22.1%, and 21.6%.

The VMC 71/238 variety was issued July 6, 2015 through SK number 440/Kpts/KB/.120/7/2015. Derived from the induction from the Philippines, the result of a cross of POJ 3016 x PHIL 56-226. This variety also had moderate germination properties with medium stem density. Infrequent or sporadic flowering type and early to middle maturity. The production potential of VMC 71/238 variety can produce 1,019 ku/ha of sugarcane with a yield of 9.00% and 91.71 ku/ha of crystal. The VMC 71/238 variety was also resistant to shoot borer, stem borer, mosaic disease, smut, and pokkah boeng disease. The suitability of the location of the VMC 71/238 variety is suitable for development in the typology of paddy fields and uplands with Alluvial and Grumosol soil types.

Clone SB04

Sugarcane stalks composed of SB04 clones had a spool-shaped arrangement of segments. With straight-

line book shape,the color of the stem was yellow with a thin wax layer so that it did not affect the color of the stem, it had growing cracks but no cork cracks, there was no ringing growth, but it had a clearer core and holes as shown in Figure 4.4 clone SB04 at the age of 38. MST, June 2021.

Figure 4. Sugarcane stalks SB04
Source: Documentation, Personal June, 2021.

Sugarcane leaves on clone SB04 had a yellowish color, leaf arch <½ of leaf length with a width of 4.5-5 cm, leaf triangle color was green, there were ears of leaves that were erect with moderate growth, they had dorsal hairs with a wide area, loose nature midrib including easy category. It was more clearly presented in Figure 4.5 clone SB04. at 38 MST, June 2021.

Figure 5. Sugarcane plant leaves clone SB04
Source: Documentation, Personal June, 2021.

The buds of sugarcane clones SB04 had a round shape, the widest part was in the middle with a growing point in the middle of the top of the buds, the buds of SB04 also had wide eye wings. They did not have basal edge hairs and crest hairs or eye grooves, shoot eyes located at the base of the leaf midrib more clearly shown in Figure 4.6 clone SB04. at 38 MST, June 2021.

Figure 6. Sugarcane shoots on clone SB04
Source: Documentation, Personal June, 2021.

Sugarcane clones SB04 at the age of 257 DAP, 271 DAP, 285 DAP, and 299 DAP respectively had average stem length values of 256 cm, 267 cm, 303 cm, and 323 cm. The average stem diameter values were 2.13 cm, 2.20 cm, 2.30 cm, and 2.42 cm. The average brix values were 18.6%, 19.3%, 21.0%, and 21.3%. or medium and early to mid-cooking time. The potential production of PS 862 variety could produce sugarcane in paddy fields with sugarcane yields of 370 ku/ha with a yield of 1.51% and crystal 91 ku/ha.

The PS 862 variety was also resistant to shoot borer, stem borer, mosaic disease, and sensitive to pokkah boeng disease. The suitability of the location of the PS 862 variety was suitable for development in the typology of paddy fields and dry fields. The PS 862 variety was issued October 9, 1998 through SK number 685.b/Kpts-IX/1998. Derived from the F162 polycross cross in 1986 from selection number PS 86 – 8504. This variety also had moderate germination properties with medium stem density. Flowering type was rare.

Clone SB19

Sugarcane stalks composed of SB19 clones had a cylindrical arrangement of segments. With a zigzag or (bend) book shape, the stem color was green with a thick wax layer, had no growing cracks and no cork cracks.

Figure 7. Sugarcane stalks on clone SB19
Source: Documentation, Personal June, 2021.

Sugarcane leaves on clone SB19 had a light green color, leaf arch > 1/2 length with a width of 5.5-6 cm, leaf triangle color was green, there were ears of leaves that were erect with strong growth, they had dorsal hairs with a narrow area, characteristic off the midrib including the medium category. It was more clearly presented in Figure 4.8 at the age of 38 MST, June 2021.

Figure 8. Sugarcane leaves on clone SB19
Source: Documentation, Personal June, 2021.

The buds of sugarcane clones SB19 had a round shape, the widest part in the middle with a growing point in the middle of the top of the bud, the buds of SB04 also had wide eye wings. The wings were serrated and had no basal hairline and crested hairs or eye grooves, the buds were located at the base of the leaf midrib. It was more clearly presented in Figure 4.9 at the age of 38 MST, June 2021.

Figure 9. Sugarcane shoots on clone SB19
Source: Documentation, Personal June, 2021.

Sugarcane clones SB19 at the age of 257 DAP, 271 DAP, 285 DAP, and 299 DAP respectively had average stem length values of 249 cm, 277 cm, 293 cm, and 303 cm. The average stem diameter values were 2.30 cm, 2.40 cm, 2.50 cm, and 2.60 cm. The average brix values were 21.4%, 22.0%, 21.8%, and 22.0%.

The VMC 71/238 variety was issued July 6, 2015 through SK number 440/Kpts/KB/.120/7/2015. Derived from the induction from the Philippines, the result of a cross of POJ 3016 x PHIL 56-226. This variety also had moderate germination properties with medium stem density. Infrequent or sporadic flowering type and early to middle maturity. The production potential of VMC 71/238 variety could produce 1,019 ku/ha of sugarcane with a yield of 9.00% and 91.71 ku/ha of crystal. The VMC 71/238 variety was also resistant to shoot borer, stem borer, mosaic disease, smut, and pokkah boeng disease. The suitability of the location of the VMC 71/238 variety was suitable for development in the typology of paddy fields and uplands with Alluvial and Grumosol soil types.

Clone SB20

Sugarcane stalks composed of SB20 clones had a cylindrical arrangement of segments. With straight segment book shape, yellow stem color with thick wax layer, no growing cracks and no cork cracks, there was a growing ring, terraces and holes were massive. It was more clearly presented in Figure 4.10 at the age of 38 MST, June 2021.

Figure 10. Sugarcane stalks on clone SB20
Source: Documentation, Personal June, 2021.

Sugarcane leaves on clone SB20 had a green color, leaf > ½ of length with a width of 5.5-6 cm, leaf triangle color was green, there were ears of leaves that were erect with strong growth, they had dorsal hairs with a narrow area, loose nature midrib included in the medium category. more clearly presented in Figure 4.11 at the age of 38 MST, June 2021.

Figure 11. Leaves of sugar cane on clone SB20
Source: Documentation, Personal June, 2021.

The buds of sugarcane clones SB20 had a round shape, the widest part in the middle with a growing point in the middle of the top of the buds, the buds of SB20 also had wide eye wings. The wings were serrated and had no basal hairline and crested hairs or eye grooves, the buds were located at the base of the leaf midrib. It was more clearly presented in Figure 4.12 SB20 clone. at 38 MST, June 2021.

Figure 12. Sugarcane shoots on clone SB20
Source: Documentation, Personal June, 2021.

Sugarcane clones SB20 at the age of 257 DAP, 271 DAP, 285 DAP, and 299 DAP respectively had average stem length values of 243 cm, 267 cm, 293 cm, and 300 cm. The average stem diameter values were 2.30 cm, 2.41 cm, 2.51 cm, and 2.62 cm. The average brix values were 23.6%, 24.3%, 24.0%, and 23.3%.

The PSBM 901 variety was issued January 16, 2004 through SK number 54/Kpts/SR.120/1/2004. Derived from PS 78 – 127 polycross in 1990. This variety also had good and simultaneous germination properties with dense stem density. The type of flowering was not flowering and the time of maturity was early to middle. Production potential of PSBM 901 variety in paddy field production could produce sugarcane 704 ± 162 ku/ha with a yield of 9.93% ± 1.02% and crystallization 69.5 ± 16.3 ku/ha. The PSBM 901 variety was also resistant to shoot borer, stem borer, mosaic disease, smut, and pokkah boeng disease. The suitability of the location of the PSBM 901 variety was suitable for development in the typology of rice fields and dry fields in Lampung and South Sumatra.

Conclusion

The SB01 clone had the same morphological character as the VMC71/238 variety. It was estimated that the agronomic potential and production of clone SB01 were not much different from that of the VMC 71/23 variety. The SB04 clone had a tendency to have similar

morphological characters with the PS 862 variety. It was estimated that the agronomic and production potential of the SB04 clone was not much different from that of the PS 862 variety. The notation 19 clone had the same morphological character as the VMC71/23 variety. It was estimated that the agronomic potential and production of the notation 19 clone was not much different from the VMC 71/23 variety. The SB20 clone had a tendency to have similar morphological characters with the PSBM 901 variety. It was estimated that the agronomic potential and production of the SB20 clone were not much different from the PSBM/901 variety.

References

Achadian, EM., Kristiani, A, Magarey, RC., Sallam, N., Samson, P., Francois-
Reges Goebel, & Lonie, K. (2011). Hama dan Penyakit Tebu. Buku saku.
Kerjasama P3GI dengan BSES Limited. Australia dan ACIAR. 154 hal.

Anonim, 2019. Pelepasan klon PSMLG Agribun 1 dan PSMLG Agribun 2 sebagai Varietas Unggul Tanaman Tebu (SK Mentan nomor 23/KPTS/KB.020/2/2019 dan SK Mentan nomor 24/KPTS/KB.020/2/2019).

Anwar, Khoirul. 2019. Identifikasi Karakter Morfologi Beberapa Klon Tanaman Tebu (*Saccharum officinarum* L.) Di Desa Sambiroto Kecamatan Sooko-Mojokerto. Skripsi.

Asbani, N. (2012). Observasi hama dan penyakit pada tanaman tebu.
Laporan hasil
penelitian Balittas tahun anggaran 2012. Balittas Malang.

ASRAF, H. MUHAMMAD, M. T. NOORITAWATI, AND M. S. B. RIZAM. 2012."A Comparative Study in Kernel-Based Support vector machine of Oil Palm Leaves Nutrient Disease." Procedia Engineering 41 : 1353-1359.

Budi, Setyo, Sri Uchtiawati, Suhaili, dan Wiharyanti Nur Lailiyah. 2017. Manajemen Agribisnis Tanaman Tebu (Saccharum officinarum L.). UMG Press. Gresik. Hal. 29-33.

Bakti,.P.L.W. 2009. Analisis Kandungan Klorofil dan Laju Fotosintesis Tebu Transgenik PSIPB1 yang Ditanam di Kebun Percobaan PG. Djatiroto Jawa Timur S1 Skripsi. Fakultas Pertanian IPB. Bogor.

BPS . 2018. Statistik Tebu Indonesia. Badan Pusat Statistik. Jakarta.

Indrawanto, C. 2010. Budidaya dan Pasca Panen TEBU. Penerbit ESKA Media.
Jakarta. 45 hal.

Benitez, T., A.M Rincon, M.C Limon and A.C. Codon. 2004. Biocontrol Mechanisms of Trichoderma Strain. International Microbiologi. Vol 7:249-260.

Basuki dan Sari, V.K. 2019. Efektifitas Dolomit dalam Mempertahankan pH Tanah Inceptisol Perkebunan Tebu Blimbing Djatiroto. Buletin Tanaman Tembakau, Serat & Minyak Industri 11(2): 58-64

Bahar, H. dan S. Zen. 1993. Parameter genetik pertumbuhan tanaman, hasil dan komponen hasil jagung. Zuriat. 4: 4-7

CAMARGO, A., AND J. S. SMITH. 2009. "An image-processing based algorithm to automatically identify plant disease visual symptoms." Biosystems Engineering 102.1: 9-21.

CAMARGO, A., AND J. S. SMITH. 2009. "Image pattern classification for the identification of disease causing agents in plants." Computers and Electronics in Agriculture 66.2: 121-125.

COMSTOCK, J.C AND R. A. GILBERT. 2009.“Sugarcane Mosaik Virus

Disease".University of Florida: Florida Sugarcane Handbook.

Direktorat Jendral Perkebunan. 2018. Tebu. http://ditjenbun.pertanian.go.id/?publi kasi=buku-publikasi-statistik-2016-2018.

Ditjenbun. (2013). Direktorat Jendaral Perkebunan Tahun 2013. Jakarta: Direktorat Jendral Perkebunan.

Hamida, R., and P. Parnidi. 2019. Kekerabatan plasma nutfah tebu berdasarkan karakter morfologi. Buletin Tanaman Tembakau, Serat dan Minyak Industri. 11(1): 24-32.

Lestari, A. D., W. Dewi W., W. A. Qosim, M. Rahardja, N. Rostini, R.

Setiamihardja. 2006. Variabilitas Genetik dan Heritabilitas Karakter Komponen Hasil dan Hasil Lima Belas Genotip Cabai Merah. Zuriat. 17(1): 94-102.

Mastur, Syafaruddin, M. Syakir. 2015. Peranan dan pengelolaan hara nitrogen pada tanaman tebu untuk peningkatan produktivitas tebu. Perspektif 14:73-86.

Mastur. 2016. Respon fisiologi tanaman tebu terhadap kekeringan. Bulletin Tembakau, Serat dan Minyak Industri 8:98-111.

Muhibuddin, A., A.L. Abadi, A. Ahmad dan L. Addina. 2011. Biodiversity Of Soil Fungi On Integrated Pest Management Farming System. Journal of Agricultural Science. Vol 33, No 2

Prasetyo, B.H. dan D.A. Suriadikarta. 2006. Karakteristik, Potensi dan Teknologi Pengelolaan Tanah Ultisol untuk Pengembangan Pertanian Lahan Kering di Indonesia. Jurnal Litbang Pertanian. 25(2): 39-46.

Poehlman, J.M., D.A. Sleeper. 1995. Breeding Field Crops. Iowa State University Press. USA. Poespodarsono, S. 1988. Dasar-dasar Ilmu Pemuliaan Tanaman. PAU. Bogor

Rahmad, D. 2012. Karakteristik morfologi pertumbuhan beberapa varietas tebu. J. Agro Plantae. 1:126-131.

Raven, P. H., et. al. 2005. Biology of Plants, 7th ed. New York: W. H. Freeman.ISBN 0-7167-1007-2.

Ravindra, K., S.K. Singh, K. Srivastava, R.K. Singh. 2015. Genetic variability and character association for yield and quality traits in tomato (Lycopersicon esculentum Mill). Agriways. 3(1): 31-36

RAID, R. N AND J.C. COMSTOCK. 2006. "Sugarcane Rust Virus Disease". University of Florida: Florida Sugarcane Handbook.

Saibi, AMA., Elna Karnawati. 2015. Serangan penggerek pucuk Scirpophaga excerptalis Walker (Lepidoptera; Pyralidae) pada tiga system tanam tebu (Saccharum officinarum). Jurnal Penelitian Tanaman Industri, 21(4), 161-166.

Sallam, N., Achadian, E., Kristini, A., Sochib, M., & Adi, H. (2010). Monitoring sugarcane moth borers in Indonesia: towards better preparedness for exotic incursions. In Proceedings of the 2010 Conference of the Australian Society of Sugar Cane Technologists held at Bundaberg,

Queensland, Australia, 11-14 May 2010 (pp. 181-192). Australian Society of Sugar Cane Technologists. SHABANZADE, MALIHEH, MORTEZA ZAHEDI, AND SEYYED AMIN

AGHVAMI. 2011. "Combination of local descriptors and global features for leaf recognition." Signal and Image Processing: An International Journal (SIPIJ). v2 i3: 23- 31.