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Test of Varieties and Breeding Seed Toward the Productivity of Sugar Cane (*Saccharum Officinarum. L*) on Dry Land

Setyo Budi

Center of Research andDevelopmentof Sugarcane (P3T),Agrotechnology Department
Faculty of Agriculture University of Muhammadiyah Gresik Indonesia
Jln. Sumatera 101 GKB Gresik.

Abstract

This research is implemented in Wotansari, Gresik from October 2014 up to November 2015. The objective of this study aims at obtaining sugarcane crystalline above 10 ton every hectare by examining several varietieshigh sugar contenting sugarcanevia technological and mechanization breedingon the dry land. Factorial Group Random Design Method is instigated. It comprises two factors, namely VMC 76-16, Columbia 2 clone and *Cokro*. Next, the second factor covers breeding Bud chips and Mule. Data collection is obtained by observing growth indicators andproduction. It consists ofheightof the stems and the amount ofgreeneriesaged within 3, 6, 9 and 12 months, brix stem within the age of 9 and 12 months, diameter, sugar contentandweight of the stem within 12 months. Research finding showed that significant interaction occurred between combined treatments toward the height growth of the stems in the ages of 3 months and number of stems within 3, 6, 9, and 12 months. Brix indicator sugar content, stem diameter, and the weight of sugarcane did not reveal significant interaction toward the treatment. The clone of Columbia 2 developed through bud chips model resulted the highest stem height within the age of 3 months. On the other hand, the clone of *Cokro* developed through Mule system produced the biggest amount of stems in the ages of 3, 6 and 9 months. Finally, the biggest number of stems occurred in the age of 12 months were resulted by *Cokro* and Columbia 2 developed through bud chips.

Keyword: varieties, breeding, sugarcane productivity

Introduction

The productivity of sugarcane crop in Indonesia from 1941 until 2014, empirically with the passage of time, the average crystalline every hectare is getting down. As an

illustration, the average weight of cane /ha, sugar content /ha, crystal /ha in 1941 respectively 134.34 ton / ha, 12.6 /ha, 13.6 ton / ha. The average weight of cane /ha, sugar content /ha, crystal /ha in 2014 respectively 76.30 tons /ha, 7.64 /ha, 5.41 t /ha. These facts reveal the behavior of non professional culture of the majority of stakeholders in the sugar industry. This condition, if more entrenched, it will endanger the national identity and national food sovereignty especially commodities sugar [11].
Sugarcane crops in dry land, in fact, when it is cultivated using culture techniques with proper technique and mechanization oriented and supported factory management transparent and accountable with minimal sugar factory efficiency FR> 0.70, then the crystal above 10 tons per hectare will be more easily to achieve [9]. Dry land is shown to contribute significantly to the total production of sugar availability nationwide. Over 70 per cent of cultivation of sugar cane cultivated on dry land is a successful phenomenon. Empirical facts prove that the average productivity of crystal in national level in 2014 is very low at 5.41 tons per hectare. On the other hand, the cost of production (HPP) in a certain area to produce one kilo of sugar is very high. In 2015, the base price set by the government is around IDR 8900/ kg. Productivity per hectare are getting lower and followed the high cost of production today. It should be a fundamental strategy to revitalize the management of the sugar industry which is already highly inefficient.
One of the factors that affect the productivity of sugarcane crop is the effectiveness of metabolic enzymes. NaCl-rich soils and soil less acid are not good for the cultivation of sugar cane because if the plant contains a lot of sodium chloride, then the sap produced so hard to produce sugar. Poor soil structure affects productivity. Similarly, the pH of the soil also affects the productivity. The desired pH ranges between the intervals of 5.5 to 8.0. On this basis, all the factors that affect productivity of sugar content has to be optimized [16].
Nitrogen plays an important role in the growth of sugar cane plant because it has a constituent of the basic ingredients of proteins and the formation of chlorophyll. Therefore, nitrogen had ties with the function of photosynthesis, accelerating the height of plants, thus spurring higher plants and stimulating the number of tillers. The amount of nitrogen taken directly associated with the production. Nitrogen should be given a gradual and balanced with phosphorus and potassium so nitrification can take place properly. Nitrogen is absorbed by plant roots in the form of NO3-and NH4 +, but this was soon reduced to nitrate via an enzyme-containing ammonium molybdenum. The nitrogen content of protoplasm ranges between 2-2.5 percent [11].
The potential of existing varieties in Indonesia until today actually has the ability to produce sugar per hectare above 10 tons.Various sources of information about the potential productivity of some varieties of sugarcane crop ahead of various research results indicate that the crystal production above 10 tons per hectare is good indicator. This empirical fact can be scientificindicator, that the actual chances of improving plant productivity of sugarcane per unity area is very large although it becomes very heavy and complex challenges. The main orientation of sugarcane farmers in the cultivation of sugar cane is the weight of the sugarcane itself. This condition has now become a large part of the cultural stakeholders in the national sugar industry. This condition is very alarming, if we still sensible and still felt as a dignified nation [10].

The study conducted by [9] results in the Sugar Factory *Jatitujuh RajawaliNusantara Indonesia* (RNI) reported in 1995 showed that PS 148 varieties are planted on dry land and the Mediterranean types derived from tissue culture seedlings are able to produce an average of 10.44 tones of crystal. It was then inoculated with Azospirillum brasillence plus Pseudomonas *Cepacea* SB3 and SB 24 and provided additional chemical fertilizers 400 kg ZA, TSP 200 kg, and 150 kg KCl. The provision of inoculum in each plant produces approximately 1.25 grams. Crystal as much as 9.08 tons produced from the seeds from the Seed Garden Flat inoculated with Pseudomonas *Cepacea* SB 23 and provided additional chemical fertilizers 400 kg ZA, TSP 200 kg, 150 kg KCl. Crystal as much as 9.96 tons produced from the seeds derived from the inoculated seedlings cut 1 SB 3 and SB 24 plus Pseudomonas *Cepacea* and it is added with chemical fertilizers 400 kg ZA, TSP 200 kg, and 150 kg KCl.

The results of research conducted by [6] in Watoetoelis PTPN X sugar factory in the scale space of 2 hectare showed that the Bululawang varieties that are planted from Nursery Flat area and seedlings produce an average crystalline every hectare of 10 tones and at cutting 1 produces an average of 11 tons per hectare. Furthermore, the results of research [7] in the area of sugar factory PTPN XI Semboro 5 hectares wide scale shows that Bululawang varieties grown from seed sources from Nursery Flat Seeds and seedlings propagated through mule system produce an average of 9.42 tons per hectare crystal in every harvest time. The results of the experiment for the broad scale of 4 hectares in the Sugar Factory Lestari PTPN X of East Java Province showed that the varieties Bululawang grown from seed sources Nursery Flat and seed cane propagated mule produce an average crystal 13 tons per hectare in wet rice fields in each harvest time. The report occurs on the site visit of regional Representative. In the dry land, the average crystal produced 12.5 tons per hectare. Furthermore, the average crystal produced via cutting 1show approximately 12.0 tons per hectare [1].

The results of research from Research Center of PTPN X related test several varieties carried out in 2011 proved that the PL55 varieties produce an average of 11.04 tons of rock crystal. For the varieties of 97-153 PSJT produce 10.03 tons of rock crystal. For PSJK 922 varieties produce 10.43 tons crystal. Next, for PS 891 varieties produce crystal 10.97 tons. For PSBM 901 variety produces 12.29 tons of rock crystal, and crystal Kentung produces 10.11 tons [9]. The results of the study from Indonesian Sugar Plantation Research Center (P3GI) Pasuruan in 2011 showed that PS 862 varieties cutting 1 planted in fields are able to produce an average of 10.30 tons per hectare crystal, PS 863 that are cultivated in the fields produce 11.62 tons of rock crystal and cutting 1 produces crystal 10.48 tons. PS 864 planted in the field produces crystal 10, 14 ton. PS 921 planted in the field produce 11.90 tons of rock crystal, which is grown in 902 PCSO field produce 11.62 tons of rock crystal, PSJT 941 planted in the field produce crystal 12.80 ton, and Kidang Kencana grown in wet rice field hassugar content of 11.06 tons of rock crystal [15].

The varieties of VMC 71-238 cultivated in wet rice fields as plant cane (PC) are producing at least 11 tons of crystal and when grown in dry land can achieve 9.17 tons per hectare crystal [1]. Further varieties PS 881 is also able to produce crystals at least 13.9 tons per hectare and PS 882 varieties able to produce crystals at least 13.7

tons per hectare. Some varieties have the potential to produce crystals above 10 tons per hectare provided the matriarchal culture cultivation techniques correctly. One example of PA 028 varieties are able to produce crystals of at least 9.25 tons per hectare [2]. Indeed, in Indonesia, it is still available of local varieties and clones that could potentially produce crystals above 10 tons per hectare. Evidently, a lot of sugarcane farmers in the Sugar Factory in East Java province in 2015 milled to produce crystal sugar content above 10 and above 10 tons per hectare in a particular area. Some of them are: Tukijan with total area of 10.94 hectares of sugar factory PTPN X Ngadirejo are able of producing an average sugar content of 10.31 and an average crystal 14.27 tons per hectare. Furthermore, Maritjan with a land area of 1.00 hectares in area sugar factory PTPN X is capable of producing an average sugar content of 11.43 and an average of 10.74 tons per hectare crystal [1]. The basic principle of the cultivation of sugarcane should be based on the culture of proper technique. Consequently, direct example of cultivation of sugarcane should be shared and spread out to all sugarcane farmers in Indonesia [12].

Materials and Methods

The coverage of the study consists of Nursery Parent (KBI) Bululawang Varieties, VMC 76-16, Cokro, Colombia 2, bud-chips kitsthat includes: drilling kitsand HWT supporting tools, pot tray, disinfectant, water, electricity, workshop, soil, organic substance, and sand. Meanwhile, supporting tools / materials consists of a refract-meter digital pH meter, Polari-meter and its peripheral devices, guide books (SOP) seedling production bud-chips, land nurseries and land for planting sugarcane milled (dry land), seeds bud-chips, NPK fertilizer, ZA, filter mud, tools (tractor) processing soil, planting and maintenance of plants, stakes, seeds bud-chips transportation. This research is conducted in Desa Wotansari Kecamatan Balongpanggang Kabupaten Gresik in the area of Watoetoelis Sugarcane Factory PTPN X East Java, Indonesia.

This study employs a randomized block design factorial consisting of two factors with 8 treatment combinations. Each treatment was repeated three times. Number of treatment consists of 24. First Factor Varieties comprises 4 types. The first factors comprise of 4 varieties, namely 1) Bululawang (V1), 2) Cokro (V3), 3) VMC 76-16 (V2) and 4) Colombia 2 (V4). Moreover, the second factors consist of Mule System (B) and Budchips System (BC). Placement of treatment combination each test is done randomly. Each treatment combination shaped stretch with an area of approximately 0.30 hectares with the distance between segment is around 150 Cm. Budchips sugarcane crop seeds are planted in a single row of double planting. Plan Production at the field trial research is presented in Figure 1.

I	II	III
V4B	V2BC	V2B
V2BC	V1B	V3B
V1BC	V4B	V1BC
V3B	V3BC	V4BC
V3BC	V4BC	V1B
V4BC	V2B	V3BC
V1B	V3B	V2BC
V2B	V1BC	V4B

Figure 1: Experimental Research Production Plan in the Field

Preparation stagewas began in January 2014. Considering the seed cane should be provided seven (7) months prior to planting, the seed cane was prepared on March 2014. Seedlings are planted in Parent Nursery (KBI) Varieties of Bululawang, VMC 76-16, Columbia 2 and *Cokro*, Planting using a model way of planting a double row planting single spaced segment 150 Cm. Spacing of the size of30 x 50 cm. Organic matter in soil research is filter mud for about 500 quintalor 50 tonnes per hectare granted and mixed at the same time by means of mechanized land preparation. Chemical fertilizer application given 9 quintals per hectare, with details NPK 4 quintals+ ZA 5 quintals +filter mud 500 quintals. Provision of fertilizer given two times, the first at the same plant and are given time to plant 2 to 3 months. Duration of effective implementation of the study 13 (thirteen months) commencing from October 2014 to November 2015.The data collection is done by observing indicators of growth and production include: high growth stems of plants, the number of rod / 10 meters, trunk diameter, sugar content, brix, the weight of the sugar cane plant stems.

Results and Discussion

The Height of Sugar Cane Plant Stem (rod/cm) Age 3, 6, 9 and 12 Months (crops).

The average height stems sugarcane crops each combination treatment observation period of 3 months of age plants are presented in Table 1.

Table 1: Interaction Combination Treatmenttoward the Height ofSugarcane Stems (rod/cm) Within the Age of 3 months

INTERACTION	3 Months	
Bululawang /Mule	89.3	a
VMC 76-16 /Mule	90	ab
Cokro /Mule	95	bcdef
Columbia 2/Mule	91	abcd
Bululawang /Budchips	91.6	abcde

VMC 76-16 / Budchips	91	abc
Cokro/ Budchips	104	g
Columbia 2/ Budchips	113.3	h
LSD $_{0.05}$	5.34	

Note: The above score number followed by the same letter in the same column indicates no significant difference at LSD $_{0.05}$

Based on Table 1, the result ofanalysis of variance observation time of 3 months of sugarcane plants, each combination treatment showed a real interaction for stem height sugarcane crop. The highest sugar cane crop observation period of 3 months of age as high as 113.30 resulting clones are grown Columbia 2 double single row planting. The results of this research proved that the clones Columbia 2 capable of optimal growth and development appropriate genetic potential held in the metabolic processes, especially in the process of cell elongation shoots. The height average of sugar cane plant stems at the age of 3 months to produce tall stems of crops and analysis of variance was significantly different from other varieties tested. Sightings plant stem growth in a relatively uniform plant populations and planted simultaneously with a single model double row planting. Observations on certain repetition tall stems clone Columbia 2 with 3 months old plants can reach over 120 cm tall stems. The growth stems optimal sugar cane crop is strongly supported by the growing medium and the optimal environment, so that the entire population of plants grown single double row planting have the same opportunity to take advantage of the growing medium and environment optimally. So, the stem height can grow in unison for the entire stem in plant populations in particular Columbia 2 clones and Cokro variety. To determine the growth of the stem of each combination of treatments for stem height rod at the age of 3 months with the interaction is presented in Figure 2.

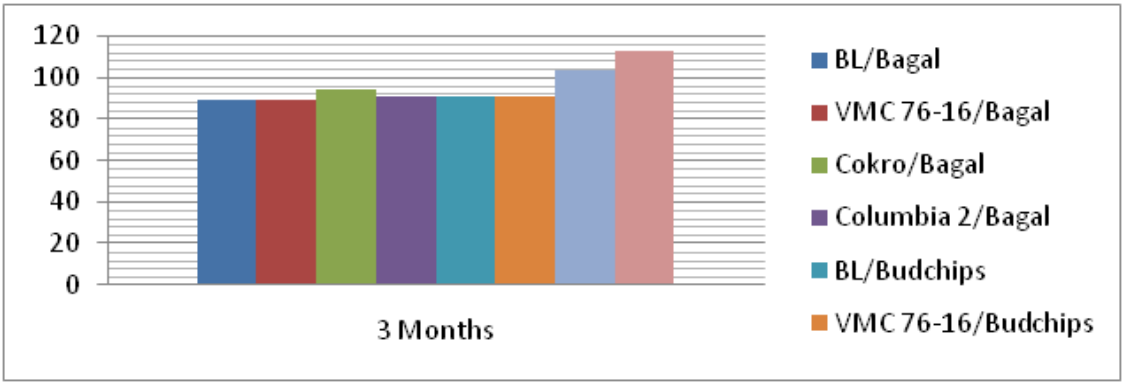

Figure 2: The Diagram of Interaction Combination Treatment of Height Sugarcane Plant Stem Age 3 Months.

Based onFigure 2, it is apparent that each combination treatment time 3 months old sugarcane crop interactions occur very real for stem height. The interaction occurs

because each variety tested and propagation of seedlings in mules and budchips interplay suitable potential, so there are the same opportunities in stimulating the development of the meristem tissue. Besides, the availability of nitrogen increase the same potential as the building blocks of protein, chlorophyll, acids and formation of coenzyme nuklead. As a result, the growth of the stem of each combination treatment is almost the same except clone Columbia 2 propagated varieties Bululawang budchips and the growth of the stem is very prominent.

The results are consistent with the opinion of [17] which explains that the process of plant metabolism will run optimally when the availability of plant nutrients available in the form of ions and cations in the root zone of plants sugar cane. The movement of ions of nitrogen and phosphate ions are generally caused by the diffusion process, but if the content of N and P soil solution is high enough, the flow of time is very instrumental. Ions which are on the surface of the roots will go beyond the root cavity through simple diffusion process sorption exchange. Thus the availability of ions and cations can be directly absorbed by the plant roots and can be used to optimize the metabolic processes of cell elongation process sugar cane plant shoots. To determine whether each treatment observation time of sugarcane plants aged 6, 9 and 12 months (harvest) are presented in Table 2.

Tabel 2: The Average Height of Stem Sugar Cane Plant (rod/cm) in the Age of 6, 9, 12 Months

TREATMENT	AGE (MONTHS)					
	6		9		12	
KINDS OF VARIETIES						
Bululawang	129.65	a	274.8	b	400.2	ab
VMC 76-16	133.3	ab	261	a	384.3	a
Cokro	140.6	c	328.1	c	426.5	b
Columbia 2	136.3	bc	300.5	c	421.2	b
$LSD_{0.05}$	4.4		4.4		19.19	
BREEDING PROPAGATION						
Mule	91.3		286.65	a	405.8	
Budchips	99.4		295.55	a	410.1	
$LSD_{0.05}$	tn		17.42		tn	

Note: The above score number followed by the same letter in the same column indicates no significant difference at $LSD_{0.05}$

Based on Table 2, the result of analysis of variance observation time of sugarcane plants aged 6, 9 and 12 months respectively combination of a wide variety of treatment showed no significant differences for stem height sugarcane crop, especially when crop age 9 months. The highest sugar cane plant stems (140.60) Cm observation time of 6 months old plant produced varieties are grown Cokro double single row planting and analysis of variance was not significantly different from the other varieties tested for stem height sugarcane crop. Time observation sugar cane crop at

the age of 9 months, the plant stem heights falls into around 328.10 Cm Cokro produced varieties of seedlings planted budchips single-double row planting but analysis of variance was not significantly different from the clones Columbia 2. Potential high average Cokro stem varieties and clones Columbia 2 in particular replay can be reached above 350.10 cm. Observation time of 12 months of age cane crop, the highest plant stems 426.5 Cm Cokro produced varieties of seedlings planted budchips single-double row planting, but analysis of variance was not significantly different from the clones Columbia 2. The high stalks of sugar cane plants to four varieties tested either from seeds or budchips mule grown single double row planting is relatively the same and simultaneously in the appropriate plant population due to the potential of growing excellent environment including competition against solar radiation is relatively small because the distance isrelatively very wide of 150 cm. Furthermore, humidity and air temperature in the plant population for all treatments are relatively equal, so it is possible the competition on the environment is relatively small or if there was a competition, then the competition is as strong as the distance between arc very wide (150 cm) and in the segment relative width is 30 X 50 Cm, Similarly, the growing environment in the soil is also getting better with the provision of balanced fertilizer 5 quintals ZA + 4 quintals of NPK + 500 quintals filter mud with evidence of soil pH with increasing age of the plant is getting down (early planting pH of 7.83 and 7.54 at the end of harvest). This allows the pH decrease in the availability of essential nutrients is increasing. One evidence of the availability of nitrogen and phosphorus from the analysis that is initially increasing the availability of N and P205 respectively 0.09% and 16 ppm and nitrogen availability increased to 0.13% and P2O5 at 84 ppm. The increase the availability of nitrogen and phosphorus, it is increasingly enable the preparation of several enzymes and proteins, including ATP in metabolism leaf photosynthesis and respiration of leaves more active.

This result showed consistent opinion with [11] which suggests that the availability of nutrients is balanced area rhizosphere, especially nitrogen, resulting in the nitrification process is going well, then nitrite soon reduced to ammonium by the enzyme-containing nitrogenase that could ultimately accelerate the elongation of plant cells. Furthermore, the availability of phosphorous greatly spur the formation of productive tillers and tissue metabolism shoots particular cell elongation and enlargement of the stem and promotes the formation of sugars or juice. The availability of other essential elements and micro nutrients in the soil greatly affects the growth of sugar cane. Based on the results from the soil analysis, it turns out that there is a tendency of increasing nutrient availability to the balanced fertilization between the provision of inorganic fertilizers and organic matter on dry land. Similarly, according to [16], that there is a positive correlation between the average length of sugar cane crops and crop productivity potential of sugarcane per unit area. Indicators of productivity can be either the average sugar content, the weight of cane per stem, stem diameter or length of waiting sugarcane milled.

Number of Stem Sugar Cane Plant (rod/10 m) Age 3, 6, 9, 12 Months (Crops)
The average number of stems sugarcane crops each treatment combination with 10-meter arc length of observation time the plant ages 3, 6, 9 and 12 months are presented inTable 3.

Table 3: Interaction Combination Treatment of Total Plant Stems Sugarcane (rod / 10 m) Age 3, 6, 9 and 12 Months (crops)

INTERAKSI	3 Months		6 Months		9 Months		12 bulan	
Bululawang /Mule	83	ab	83	ab	86	ab	118	abc
VMC 76-16 /Mule	80	a	80	a	82	a	116	ab
Cokro /Mule	118	g	119	h	123	g	124	bcdef
Columbia 2/Mule	99	d	99	e	108	e	109	a
Bulu Lawang /Bud-chips	89	abc	89	abcd	90	abcd	122	bcde
VMC 76-16 /Bud-chips	84	abc	84	abc	86	abc	119	abcd
Cokro/Bud-chips	104	def	104	efg	108	ef	135	g
Columbia 2/Bud-chips	103	de	103	ef	116	efg	135	g
LSD $_{0.05}$	9.90		9.92		8.50		10.83	

Note: The above score number followed by the same letter in the same column indicates no significant difference at LSD $_{0.05}$

Based on Table 3, the result of analysis of variance, plant observation time the age of 3, 6, 9 and 12 months respectively combination treatments showed highly significant interaction stem the number of sugar cane. The number of tillers were generated Cokro varieties derived from the seeds planted mule single-double row crop planting time observation of the age of 3, 6, 9 months, respectively 118, 119 and 123 trunks. Plant observation time within 12 months of age the highest number of stems produced rod 135 varieties of Cokro derived from the seeds of various analysis budchips although not significantly different clones planted Columbia 2 double single row planting. Cokro varieties and clones Columbia 2 proves clearly that planting seedlings grown budchips double single row planting able to interact positively and between individual plants within a population able to compete equally strong against the availability of nutrients and the environment grow as strong and balanced. As a result, the number of stems produced in the area of arc length of 10 meters, the average number of rods capable of producing the most suitable potentials.
The interaction of all the treatment of the sugar cane plant stem number indicates that each combination of treatments can utilize all the resources available in accordance potentials. Provision of a balanced fertilizer as much as 5 quintals of ZA + 4 quintals of NPK + 500 quintal per hectare filter mud enables the availability of nitrogen in the soil increased. As a result, the process of plant growth and development increasingly active and eventually more and more number of leaves, so the results fotosintat also more and translocated to other plant parts. Graph the growth of each combination treatment of the number of stems in lengths of 10 meters (arc) when the plant ages 3, 6, 9 and 12 months are presented in Figure 3.

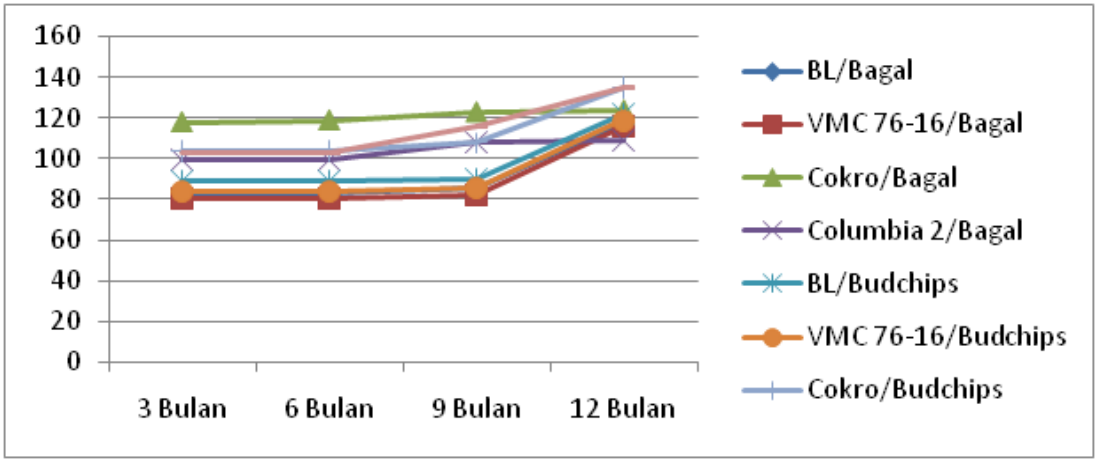

Figure 3: Graph Growth of Plant Stem Sugarcane at age 3, 6, 9, and 12 months

Based on Figure 3, it is is proved that each combination treatments showed highly significant interaction of stems at the age of 3, 6, 9 dam 12 months. This growth phase is a phase of rapid vegetative, allowing Cokro varieties and clones Columbia 2 spur growth especially cell division process and the enlargement of the plant by utilizing the availability of nutrients in the soil optimally. Furthermore, in the phase of ripening varieties and clones Columbia Cokro 2 is still active spur growth, accompanied by the formation process sugar crop growth indicators still looked fresh and healthy. Based on soil analysis before harvesting, the nutrient content in soil studies showed an increased availability of soil nutrients. The results of the soil analysis including the availability of initial nitrogen of 0.09% and after harvest reached 0.13%. Nitrogen in plants as raw material proteins and the formation of chlorophyll. These elements function in the process of photosynthesis, accelerating the growth of the plants so as to accelerate the number of tillers [17] and [11]. Similarly, according to [14] and [16] that the sugarcane crop productivity can be improved if the nutrients for plant growth and development process is still available.

Sugar Cane Plant Brix (%) Age 9 and 12 Months (crops)

The average of sugar cane plants brix of each treatment plant with the observed time aged 9 and 12 months (crops) is presented in Table 4.

Table 4: Sugarcane Crop Brix (%) Age 9 and 12 Months (Crops)

TREATMENT	AGE (MONTH)	
	9	12
TYPES OFVARIETIES		
Bululawang	24.00	24.90
VMC 76-16	24.15	24.70
Cokro	24.90	25.30

Columbia 2	24.70	25.30	
LSD $_{0.05}$	tn	tn	
BREEDING PROPAGATION			
Mule	24.30	24.85	a
Budchips	24.60	25.28	a
LSD $_{0.05}$	tn	0.57	

Note: The above score number followed by the same letter in the same column indicates no significant difference at LSD $_{0.05}$

Based on Table 4, the result of analysis of variance of each treatment plant observation time aged 9 and 12 months showed no real effect except for the observation time of 12 months of age, treatment of seed multiplication significant effect on the average brix sugar cane plant stems. The average of brix sugar cane crop plants aged 12-month high is 25.28% produced by Columbia 2 clone propagated by budchips which planted in single row double planting.Potential clones Colombia 2 in particular replay can actually achieve an average brix be 25.28% if the media and also optimal growing environment around the area of sugar cane plant populations. The high brix on the trunk clone Columbia 2 and varieties Cokro of seedlings propagated budchips illustrates that most likely the entire shaft of the sugar cane crop in plant population growth relatively uniformly and simultaneously, due to the emergence of productive tillers relatively the same, so it is possible the level of maturity of the plant population optimal relative same. The impact is an average brix generated higher than in other varieties tested. This fact shows that the clones and varieties Cokro Columbia 2 is suitable if the seedlings coming from seeds budchips.

The results are consistent with the opinion of [15] and [13]. They suggest that the average brix sugar cane plant stems can be used to determine the level of maturity stems sugarcane crop. On the basis of the average brix of this, sugar content forecasts can be known. To convince the sugar content can also be analyzed by a tool POL Polarimeter with supporting tools that supported mobile and efficient. Base on the Regional Regulation No. 17 of 2012 on increasing sugar content and crystals in East Java province, the average of the lowest brix between the stem top, middle and bottom of at least 20 and an average of at least 14% POL. POL generated in this study are also achieved an average above 14%. This means that the potential sugar content of the resulting each treatment combination were planted in dry land is relatively high.

Sugar Content from Sugarcane Plant (%) Age 12 Months (Crops).

The average quantity of sugar content crop each treatment observation time of 12 months of age crop (harvest) are presented in Table 5.

Table 5: Sugar Content (%) Sugar Cane Plant Stem Age 12 Months (crops)

TREATMENT	AGE (MONTH)	
	12	
TYPES OFVARIETIES		
Bululawang	10.5	
VMC76-16	10.2	
Cokro	10.7	
Columbia	10.3	
LSD $_{0.05}$	tn	
BREEDING PROPAGATION		
Mule	10.2	
Budchips	10.6	
LSD $_{0.05}$	tn	

Note: The above score number followed by the same letter in the same column indicates no significant difference at LSD $_{0.05}$

Based on Table 5, the result of analysis of variance of each treatment plant observation time of 12 months of age, both varieties and seed multiplication showed no significant effect on the average sugar content of sugarcane crop stems. The sugar content of sugarcane crop stalks height of 10.7%, resulting Cokro varieties sourced from seeds grown budchips single-and double row planting and analysis of variance was not significantly different from the other varieties tested. The results of this study indicate that the use of seeds and mules budchips essentially showed no difference in the sugar content produced for all varieties and propagation of seedlings were tested. From the analysis of variance showed no significant difference to the average sugar content of each stem of the plant cane.

The average sugar content generated in each variety and the way of planting are relatively homogeneous in each treatment in the distance of 150 Cm. The entire population harvested plants do not appear new tillers. Further, plant stems grow upright and condition of the plant stems relatively the same height and appear healthy and fresh. The high sugar content is also due to the availability of existing $P_2$05 in the soil, increasing fertilizer balance, 4 quintals of NPK + 5 quintals of ZA + 500 quintals of filter mud per hectare. The results of the soil analysis showed that the soil fertility of the study sites is increasing among the evidence: 1). Initial analyzes the availability of N = 0.09% = 16 ppm P_2O5, K_2O = 146 ppm, 12691 ppm = CaO, MgO = 1576 ppm, pH = 7.83, C-Org = 1.34%, Na_2O = 31 ppm, = 3 ppm Fe, Mn = 21 ppm, Cu = O ppm, Xn = O ppm and after harvest the results can be shown as follows: N = 0.13%, P2O5 = 84 ppm, 411 ppm = K_2O, CaO = 1.31 ppm, MgO = 0.13 ppm, pH = 7.54, C-Org = 1.18%, Na_2O = 133 ppm, Fe = 1 ppm, Mn = 21 ppm, Cu and Zn ppm = O = O ppm. The results of the soil analysis in this study proved that if the nutrients are available to be absorbed by plant roots and grow very supportive environment, the cultivation of sugar cane, the production of all components of the combination treatment can achieve optimal tested. The results of this study are reported in

accordance [14] and [10] that the productivity of each variety of sugar cane plant can reach a maximum according to the potential of cultivation based on proper culture technique. All varieties tested proved the ability to achieve sugar content above 10.

Sugar Cane Plant Stem diameter (rod / cm) Age 12 Months.
The average diameter of the sugar cane crop each treatment observation time of 12 months of age crop (harvest) are presented in Table 6.

Table 6: Average Diameter of Sugarcane Crop in the Age of 12 Months (rod / cm)

TREATMENT	AGE (MONTH)	
	12	
TYPES OFVARIETIES		
Bululawang	3.3	
VMC 76-12	3.1	
Cokro	3.3	
Columbia 2	3.1	
LSD $_{0.05}$	tn	
BREEDING PROPAGATION		
Mule	3.2	
Budchips	3.2	
LSD $_{0.05}$	tn	

Note: The above score number followed by the same letter in the same column indicates no significant difference at LSD $_{0.05}$

Based on Table 6,the result of analysis of variance of each treatment plant observation time of 12 months of age both varieties and seed multiplication showed no significant effect on the sugar cane plant stem diameter. The average diameter rod highest sugarcane plants produced 3.3 cm Bululawang varieties grown single double row planting and analysis of variance was not significantly different from the varieties Cokro. The average size of stem diameter occurring varieties is possible Bululawang and Cokro possessed the genetic potential of growth and development simultaneously, because of the ongoing enlargement process of stem cells in the optimal plant stems on the entire plant population.
The results of this study demonstrate that each combination of treatments grown model of planting single row of double planting resulting plant population increased, but because the distance of 150 cm, allowing all populations stems of plants have the same opportunity to take advantage of all the resources both media growing and the environment. Agronomically, optimal root growth, so that translocation element to the top of the plant as well balanced as a result of the availability of nutrients increases with the balanced fertilization between chemical fertilizers and organic materials such as filter mud. Naturally competition between the stems of plants in the plant population is reduced, so that the growth stems can be optimally and simultaneously and can reduce the growth of new tillers particular time generative phase.

Physiologically, it enables an optimal activity of stem cell enlargement in all populations of stem sugar cane. This is in accordance opinions [11] which suggests that the sugar cane plant stem diameter can be maximized as the potential of culture when planted unfounded correct technique. Similarly, according to [16] and [15] that it can reach a maximum trunk diameter when it is cultivated by the rules of sustainable cultivation of sugar cane.

Sugarcane Weight/Stem (rod.kg)Age 12 Months

The average weight of cane / sugar cane plant stems each treatment observation time of 12 months of age crop (harvest) are presented inTable 7.

Table7: The Weight of Sugarcane Stem in the Age of 12 Months (rod/kg)

TREATMENT	AGE (MONTH)	
	12	
TYPES OF VARIETIES		
Bululawang	1.5	
VMC 76-16	1.5	
Cokro	1.6	
Columbia 2	1.6	
LSD $_{0.05}$	tn	
BREEDING PROPAGATION		
Mule	1.5	
Budchips	1.6	
LSD $_{0.05}$	tn	

Note: The above score number followed by the same letter in the same column indicates no significant difference at LSD $_{0.05}$

Based on Table 7,the result of analysis of variance, each treatment both varieties and seed multiplication crop observation time of 12 months of age showed no significant effect on the weight of the sugar cane plant stems. The weight of the largest sugar cane crop stalks 1.6 kg produced varieties Cokro and Columbia 2 is derived from the seeds budchips and analysis of variance was not significantly different varieties and VMC 76-16 Bululawang grown single double row planting. Potential average weight of each stem of the plant sugarcane varieties Bululawang, VMC 76-16, Cokro and clone Columbia 2 actually still possible to be increased by more than 1.6 kg of seed origin sugar cane plants derived from the seeds budchips and media and optimal growing environment around the area of plant populations, the varieties of Cokro, Bululawang and clone Columbia 2 have an actual average weight of each stem of the plant cane is greater than 1.6 kg.

The absence of differences in the weight of each stem of the plant cane in each treatment showed that each of variety able to optimize genetic potential possessed to improve the ability to compete on the environment grow more optimally. Optimumweight cane is gained through fertilization, which is 5 quintals of ZA + 4

quintals of NPK +500 quintals of filter mud per hectare. Evidence from the soil analysis is very clear there is an increase in the availability of nutrients, especially essential nutrients. Roots acquire energy supply of carbohydrates from the top of the plant. The roots of supplying nutrients and water from the underground environment for plant growth and development. Root development is strongly influenced by the soil conditions. It is clear that since the soil conditions is more fertile, the availability of nutrients is increasing, so the metabolic processes take place more optimally with cane weight of evidence each bar of each combination of relatively equal treatment.
The availability of essential nutrients as well as the results of the soil analysis are increasing also plays a role in increasing metabolism process for the growth and development of the plant. The most striking evidences are the entire shaft in plant populations grow in unison, upright, healthy, fresh and without the new saplings when it is harvested. Similarly, the number of plants that collapsed lessed and it shows more visible growth leaf color. Having regard to the spacing of an arc of 150 cm and 30 x 50 cm and an indicator of the average length stems sugarcane crop, the number of plant stems of sugar cane, the weight per stem plant sugarcane and sugar content is generated, it is based on mathematical calculations taking into account the average number of sugarcane stems and each stem weight, the weight of sugarcane crop productivity, especially in dry land per hectare can reach up to 120 tons and taking into account the average sugar content generated, then the crystal at least 10 tonnes per hectare. The results are consistent with the results of research [8] and [1] reported that the productivity of sugarcane crop in a certain area can achieve productivity weight of sugarcane up to 120 tons and crystal above 10 tons per hectare, when the varieties grown cultivated optimally using the proper culture technique and planted with adequate soil fertility. The importance of technology transfer strategy to sugarcane farmers groups, that is essentially crystal 10 tons per hectare is not too difficult to achieve, when the cultivation of sugar cane-based culture is planted in dried land area with correct techniques[12].

Conclusion

The results showed that the real interaction occurs between a combination treatment of the growth and development of the high average age of plant stems period of 3 months and the number of stems at the age of 3, 6, 9, and 12 months. Brix indicators, sugar content, stem diameter, and weighs cane showed no real interaction on a combination of treatments. Columbia 2 propagated budchips generate high average of stem at the age of 3 months with approximately 113.30 cm. Meanwhile, at the age of 6, 9, and 12 months, the highest stem produced by Cokro propagated Budchips respectively are 140.60, 328.10, 426.50 cm. Further,indicators of stems, Cokro propagated using mule system produce an average number of stems mostly in the age of 3, 6 and 9 months with around 118, 119, 123, while the number of stem largest at the age of 12 months generated by Cokro and Columbia 2 propagated via budchips as many as 135. Then, the average brix at 12-months produced by Columbia 2 and Cokro propagated budchips that is equal to 25.30%. The average recovery rate at 12-month highs produced by Cokro propagated budchips that is equal to 10.70%. The

average diameter of the trunk at 12-month highs generated by Bululawang and Cokro propagated budchips that is equal to 3.3 cm. Furthermore, the average weight of the heaviest cane at the age of 12 months generated by Cokro and Columbia 2 propagated budchips at 1.6 kg / rod.

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