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Test of Type Varieties and Hierarchical Arrangement Level of Nurseries Toward The Growth of Sugarcane (*Saccharum Officinarum L.*) Seed From Single bud

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Abstract

This research focused on test type varieties and hierarchical arrangement level of nurseries toward the growth of sugarcane seed from single bud (budchips). This research was conducted in Perning, Mojokerto from April to June 2015. The objectives were to know significant difference and interaction of treatment combination of both type varieties and nursery level from single bud (budchips) toward growth percentage and height of seed. A complete random design was applied for two factors, namely varieties and hierarchical arrangement level of nurseries. Varieties that used were Bululawang, PS 862, PS 881, Cokro, and Columbia 2 clone. Meanwhile, hierarchical arrangement level of nurseries consists of KBN, KBI, KBD. Data was collected three times at 30, 60, 90 days after planting (DAP). The result showed that for first indicator is growth percentage of seed, type varieties have significant difference only at 30 DAP while hierarchical arrangement level of nurseries has significant difference at 30, 60, 90 DAP. Second indicator is height of seed, type varieties are significantly different at 30, 60, 90 DAP while hierarchical arrangement level of nurseriesis significantly different at 30 and 90 DAP.

Keywords: varieties, nurseries, single bud, growth percentage, seed height

1. Introduction

The problem of availability superior sugarcane seed in sugarcane cultivation at this time is still very crucial and complex. The indicator can be seen and felt from the

availability of superior sugarcane seed which mature in early, middle, and later is not solved yet systematically, planned, measurable, and sustainable in sugarcane seed cultivation based on correct technical culture, especially for the implementation on the field from planned sugarcane seed cultivation and management of harvest transport system. One of proven at this time is management of sugar factory felt difficult to mature optimally in fill the couple capacity per time.

The availability of sugarcane seed until now still become the main problem in sugar industry management because between the availability of sugarcane seed which mature in early, middle, and later about varieties, total, and time usually is not integrated with the need of sugarcane farmer. Ironically, suppliers of superior sugarcane seed (institutions or seed breeder) often get difficulties and even suffer losses because the seeds did not bought by the farmer. This condition makesthe availability of sugarcane seed becomes more limit. Otherwise, this condition makes more farmers in cultivating sugarcane do not use superior sugarcane seeds.

The behavior of sugarcane farmers have more years formed their characteristics in sugarcane cultivation which they plant sugarcane crop do not use superior sugarcane seed. Farmers' behavior is caused indirectly by management of sugar factories in Indonesia. As a result until now most of farmers consider that cultivate sugarcane which uses superior sugarcane seed is not significantly different with cultivate sugarcane use unqualified sugarcane seeds. Factually in the field, most of farmers only use ratoon. So, it can be ascertained that the heterogeneity of the growth and the production of sugarcane per unity area is very high. This condition exacerbated by most of sugar factories which is not transparent and fair, so it makes the behavior of farmers becomes entrenched in many years, that is only use ratoon for many times.

Complex problem related to the availability of sugarcane seeds must be solved by Indonesian government, remembered that optimal productivity per hectare can be determined by the quality of sugarcane seed which have been planted. According to [8] that transfer of technology must be done in stages and based on the target, especially for farmers' sugarcane group who are willing and able to use available technology. Base principal is the technology that uses to accelerate the availability of sugarcane seed for each nurseries level is available. Actually the solution is on the Indonesian government to make sugar factories management, particularly sugarcane farmers must be use superior sugarcane seed on cultivation.

The availability of sugarcane seed until now still use conventional method of nurseries, that is from principal seed garden (KBP) → grandma's seed garden (KBN) → parents' seed garden (KBI) → flat seed garden (KBD) → sugarcane milled garden (KTG). Time that spent for each nurseries level is about 6-7 months. It is because use mule propagation. Each hectare of nurseries level able produce seeds only for 7-10 hectare area. The purity of sugarcane seeds that produced by each nurseries level will be different. By considering the process of producing sugarcane seeds, so the total production of seeds is limit. Otherwise, the price of per unity superior sugarcane seed for each nurseries level becomes expensive. This condition often makes available sugarcane seeds do not bought by the farmers. This condition also always become complex problem in supplying sugarcane seeds until current time [7, 15].

Strategy for solving problem related to the availability of sugarcane seeds is preparing sugarcane seed qualified, seedling shorter age, and efficient land consistently that is by using single bud (budchips) method [11]. Single bud (budchips) is technology for accelerating nursery process by use one bud that got from drilling process using drilling tools [17]. The results of planting in single bud (budchips) method at PTPN X can save the use of sugarcane seeds for about 9000-12000 seed/ha. The main advantage of using single bud (budchips) is the number tillers which emerge is much more because single bud (budchips) which have been moved to the field able to produce tillers for about 10-20. Those tillers will grow perfectly until the harvest 8-10 stems/clump. Meanwhile, the seeds from mule only able produce for about 1-4 stems [1].

One of the factors that influence to the success of breeding technique in single bud (budchips) is growing media composition. The composition of planting media that used in single bud (budchips) consists of soil, compost, and sand. Soil is used because it is able for saving the water, compost is used because it can improve the physical, chemical, and biological characteristics of soil, then sand is used for increasing the aeration and drainage systems. It is expected that from combination of the third growing media composition can optimize the growth of sugarcane seed from single bud (budchips) propagation. The use of appropriate growing media is the first step to determine of the success sugarcane cultivation which finally can support improvement of sugar productivity. Container that used to plant the sugarcane seed in single bud (budchips) method is *pot tray*. There are many kinds of *pot tray* size. This is expected that by using three kinds of *pot tray* with different size can be known which one the appropriate *pot tray* for planting media, so it can optimize the growth of sugarcane seeds from single bud (budchips)[11]. Then [7] explained that by using irrigation tools (nozel) in springkler irrigation management semi automatically is expected able to control the need of water optimally for the growth of sugarcane seeds. So finally, it can help the growth of sugarcane seed maximally.

The availability of sugarcane seed for sugarcane milled garden (KTG) until now have already done by providing seeds from flat seed garden (KBD) and propagated by mule. In one hectare KBD only able fulfill sugarcane milled 7-10 hectare. Meanwhile, propagation seeds from single bud (budchips) in one hectare of KBD can fulfill sugarcane seed 35-40 hectare with addition time 2.5 – 3 months. This propagation method can be used as combination solution to accelerate the availability of sugarcane seed for all nurseries level. Based on analysis of variance, the hierarchical arrangement level of nurseries (KBN, KBI, KBD) are not significantly different with the percentage of sugarcane seed growth [7,14]

Actually, there are varieties and clones of sugarcane in Indonesia which have potency of crystal above 10 ton per hectare. Thus, collection of nurseries garden which produce superior sugarcane seed becomes a need and saver for the availability of superior nurseries. To increase the production of superior and certified nurseries is needed collection of germ plasm. Germ plasm is needed to conserve genetic diversity of certain species of plant and others [6]. To support conservation of germ plasm is needed doing sustainable plant breeding. Sustainable plant breeding is a method for exploring genetic potency to maximize expression of genetic potency of plant in

certain condition [15]. The purpose of plant breeding in Indonesia until this current time is to increase the potency genetically, improve the disease resistance of plant and also improve the sugarcane plant tolerance toward stresses of physical environment of drought and acidity. Thus, strategy to support the success of plant breeding program is builds and explores sources of germ plasm.

One of the ways to produce new superior and certified varieties of sugarcane is crossing. Crossing result will be done screening and adaptation test from many types of environment to determine the stability of its superiority. Based on those tests, it can be determined whether those new varieties are passing the selection or not. If it is passing the selection, so those varieties will be release as new variety and will be sources of seeds [15]. The propagation of sugarcane seeds generally begin from tissue culture process and will be continued by mule propagation. Based on the fact in the field shows that sugarcane propagation process in this current time does not show correct nurseries level. The correct hierarchical arrangement level of nurseries begins from the new variety will be propagated at KBP → KBN → KBI → KBD → and after that it can be spread to the farmers for KTG. It spent 28 months without counting the time of tissue culture process [5,15].Time for producing seed from nurseries garden belongs to long time process. Thus, it is needed to do a comprehensive test related to the acceleration of nurseries level from many kinds of superior varieties. This strategy can be started from KBN → KBD → KTG or KBN → KBI → KTG. Not only that, it also needed to consider the standard operational procedure [7].

The propagation process of seed can done by some ways, those are; 1) sugarcane seed from mule (sugarcane stem derived from 2-3 buds which do not grow yet, 2) shoots cuttings, 3) seeds, 4) buds (single bud /budchips), 5) tissue culture. The research result from [7] proved that the use of single bud (budchips) as the planting material can increase the productivity of sugarcane because it can produce more numbers of tillers than from mule seed. Single bud (budchips) can produce for about 10 tillers for each plant, compared to mule seeds that only can produce 5 tillers for each plant. The tillers from single bud (budchips) seed will grow much more because the seed is deliberately gripped in simple place with limit planting media. So when the seed planted in garden, it can grow with the number of tillers are relative similar.[7] also proved that breeding process of Columbia 2 clone from mule and single bud (budchips) which has been observed in green house of University of Muhammadiyah Gresik got better result than Columbia 1 clone in producing the number of tillers on both of first planting period and ratoon 1 period.

Nurseries are aimed to control the quality of seed in order to get maximal productivity. Based on [16] the need of sugarcane seed per hectare is about 60-80 quintal. Based on the research result of BPTPS the need of single bud (budchips) seeds in one hectare of first planting is needed for about 12000 – 18000 stems or for about 2-2.5 ton of mule. So, in one hectare of KBD able to fulfill the need of first planting is about 29-35 ha. Building nurseries need high cost if it produces in single bud (budchips). But, the result of seed propagation in single bud (budchips) is more effective and efficient and able to fulfill area KBD up to 75 – 80 %. Sugarcane nurseries which used as the seed and it propagated in single bud (budchips) needs many kinds of growing media. To fulfill growing media, it used *pot tray* with some

different size. *Pot tray* (seedling tray) is a coaster made of plastic that is commonly used as a container planting seedling before planting in the final location. The use of *pot tray* has many advantages compared to conventional method [3,9].

The advantages of *pot tray* are save human resources because time for sowing or moving the plants becomes less, seedling roots grow neatly and lead down orderly, sugarcane seed easy to be removed from the *pot tray* without damage the seed, maximizing the utilization of land and easily removed without risk of damaging the plants, minimize risks and prevent the plants trampled or fell, can be used repeatedly in order to reduce the production cost, easy to count the seedling that will be planted, increase the availability of sugarcane seeds [2]. Then, for irrigation system it is better for using springkler irrigation. [5] explained that springkler irrigation system is flexible and easy to use for watering the plants and also can be used to fertilization, treatment, maintaining soil moisture and control climatic condition.

The research result of [4] proved that Bululawang variety, VMC 76-16, PS 862, PS 881, Kidang Kencana, Cokro, Columbia 1 and Columbia 2 from nurseries of KBN, KBI, KBD which propagated in single bud (budchips) produced the percentage of seed growth up to 98 % during 3 months. According to [14] the test of type varieties and propagation method showed that seed propagation in single bud (budchips) produces the percentage of seed growth up to 96 % by referring to the standard operational procedure (SOP).

Photosynthesis and the use of carbohydrate in the top of soil will influence to the growth of roots. Otherwise, the damage of roots system will inhibit the growth of top soil.Organ on top soil can supply Auxin hormone for stimulating the growth of roots and reverse, roots can supply Kaukalin hormone for for the growth of organ on the top soil [6]. Furthermore, according to [10] that soaking time and the concentration of hormone during production process of single bud (budchips) seedling greatly influence to the success percentage of survival seedling. Thus, the quality of single bud (budchips) will determine the metabolic process in single bud (budchips) during the formation process of buds and roots.

One of the factors that affect to the growth of sugarcane seed is the effectiveness of metabolic enzymes. Until this current time is not widely known that the effectiveness of the compound has the role as a positive signal in the regulation of the enzyme nitrogenase, the enzyme phosphate, acetil coenzyme, particularly for IAA and calcium to the availability of nitrogen and energy. Related to the implementation production process of single bud (budchips) seed, there is treatment of soaking duration and giving hormone. Then, the appropriate treatment greatly affect to the quality of single bud (budchips). So, the quality of single bud (budchips) will stimulate the availability of food reserves to be formed into energy to boost the activity of the enzymes become more active. The activity of this enzyme will determine the growth of roots, buds, height, number of stem, and broad of leaves of sugarcane seed [10,12].Moreover, [13]explained that Rootone F as growth regulator and single bud (budchips) sources also give significant influence to the growth percentage of seed. Single bud (budchips) derived from top part of KBI produced the highest average of seed growth percentage compared to other sources of single bud (budchips) from middle and bottom.

2. Materials and Methods

The research material includes nurseries parents (KBN, KBI, KBD), superior sugarcane crops (Bululawang, PS 862, PS 881, Cokro, Columbia 2 clone), a set of tools of single bud (budchips) maker (BOR, HWT, polybag size 10x20 cm, springkler irrigation, disinfectants, water, electricity, home activities, nursery land, soil, organic matter, fertilizer, and sand. The research was conducted in Perning, Jetis district, Mojokerto Regency, region of Gempolkrep PTPN X sugar factory. The research activities consist of preparation started from August 2014, after that doing planting process of nurseries parents started from October 2014 and occurred during seven months. Next, the effectiveness test of nurseries level and type varieties toward the growth of sugarcane seed occurred from April to June 2015. Design of this study is complete factorial randomized design. There were two factors that used in this study, namely type of varieties and hierarchical arrangement level of nurseries. Type of superior varieties consists of Bululawang, PS 862, PS 881, Cokro, and Columbia 2 clone. Meanwhile, for hierarchical arrangement level of nurseries consist of Grandma's Seed Garden (KBN), Parents' Seed Garden (KBI), and Flat Seed Garden (KBD). Hence, this study comprised 15 treatment combinations. Each treatment is repeated three times. So, the total treatment combination is 45. Each treatment combination planted in polybag size 10x20 cm. Planting time is on the morning and finished more than three hours. So, this research needs 45 polybag. Placement of each treatment combination is random. Maintenance especially for irrigation is using springkler irrigation semi automatically. The observed is the growth of sugarcane seed by the indicators includes the percentage of the growth rate sugarcane seed and height of sugarcane seed.

3. Result and Discussion

3.1 The Percentage of The Growth Rate of Sugarcane Seed

The percentage of growth rate of sugarcane seed started at observation period 30, 60, and 90 days after plant (DAP) can be explained at Table 1.

Based on Table 1 which strengthened by analysis of variance that from observation period at 30, 60, 90 days after planting (DAP) showed that factor of type varieties give significant influence to the percentage of sugarcane seed growth rate only at 30 DAP. Otherwise, factor of hierarchical arrangement of nurseries gives significant influence for the percentage of sugarcane seed growth rate at 30, 60, and 90 DAP. The highest average of percentage sugarcane seed growth rate is 94.81 % at 30 DAP produced by Bululawang from Grandma's Garden Seed (KBN) although by analysis of variance proved between each variety does not show significant difference in procentage of sugarcane seed growth rate. The highest average of sugarcane seed is 93.09 and 92.12 % at 60 and 90 DAP produced by Bululawang variety although by analysis of variance particularly for observation period at 60 DAP, it does not show significant difference to other varieties which have been tested.

Table 1: The average percentage of sugarcane seed growth rate.

Treatment	Age (Days after planting)					
	30		60		90	
Type of varieties						
Bululawang	94.81	c	93.09		92.12	
PS 862	92.77	ab	92.46		91.74	
PS 881	92.60	ab	91.94		91.36	
Columbia 2	93.50	bc	91.46		90.32	
Cokro	91.33	a	89.98		88.96	
LSD $_{0.05}$	1.12		tn		tn	
The hierarchical arrangement of nurseries						
KBN	95.23	c	93.90	b	92.89	b
KBI	92.49	b	91.82	ab	90.81	a
KBD	91.29	a	89.63	a	88.99	a
LSD $_{0.05}$	0.87		2.63		2.07	

Note: The numbers that followed by the same alphabet in the same column indicated no significant difference at LSD $_{0.05}$

The result of this research proved that the percentage of sugarcane growth rate not only decide by the variety tested, but also decided from the hierarchical arrangement level of nurseries. By paying attention to this research result, so can be understood that the percentage of sugarcane seed growth rate can be determined by the quality of candidates buds, size, and subtlety single bud (budchips), the composition of planting media, process and implementation of sugarcane seed production propagated in single bud (budchips). It has been proved that by referring to standard operational procedure (SOP), so the percentage of sugarcane seed for 5 varieties tested showed similar percentage result of sugarcane seed growth rate especially at 60 and 90 DAP. Otherwise, at 30 DAP, it has been proved that there is significant different of 5 type varieties tested toward the percentage of sugarcane seed growth rate. To reinforce this statement can be seen on Figure 1.

Based on Figure 1 can be seen that there is significant difference between type varieties and percentage of sugarcane seed growth rate at 30 DAP. It is similar with analysis of variance results. Meanwhile, from histogram on Figure 1 can be understood that it seems there is significant difference among 5 type of varieties toward the percentage of sugarcane seed growth rate at 60 and 90 DAP although based on analysis of variance showed that there is no significant difference between 5 varieties which has been tested toward the percentage of sugarcane seed growth rate. The similar of percentage result of sugarcane seed growth rate may happen cause for 5 varieties is tested in good growing media which it is planted in polybag size 10 x 20 cm and filled by 3 kg of growing media with ratio of soil, sand, and fertilizer (1 : 1 : 1). After single bud finish planted in polybag, it must be controlled the dampness by covering the black plastic maximally 5 days. So, every single bud in polybag has same chance to encourage the process of emerging leaves which started by certain

cells inside dome ends of candidate buds splitting into meristematic and produced swelling buds on the end candidates. The swelling spread and wrapped around the tip area candidate buds. Once the neck leaves are formed, then cells in sub hypodermis become meristematic and produce buds. The emerging of buds for each variety tested is relative same that is between 3 until 5 days.

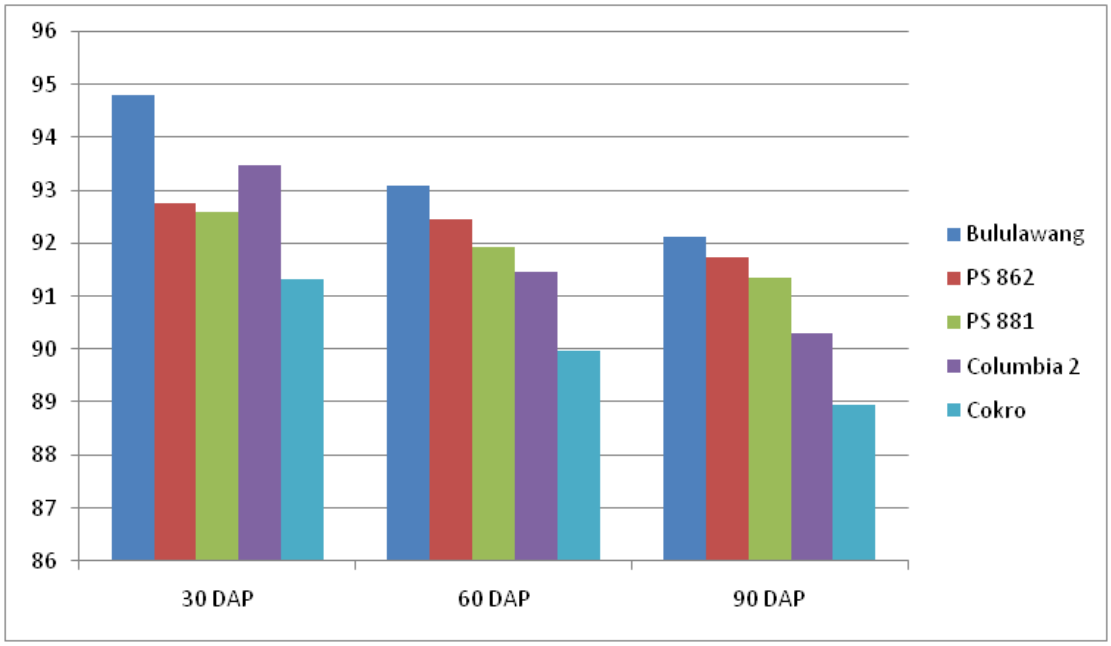

Figure 1: Histogram the percentage of sugarcane seed growth rate includes Bululawang, PS 862, PS 881, Cokro, and Columbia 2 clone at 30, 60, and 90 DAP.

This result is in line with [5] that for producing the highest average of percentage of sugarcane seed growth rate by propagating in budchips, so the process and the implementation must be based on standard operational procedure (SOP). The standard of nurseries includes the seed must be have proper age and the quality of buds candidates must be good and healthy, and also waiting time for to be planted is not more than 48 hours. The process and the implementation started from drilling the stalk to produce single bud, the treatment of hot water treatment (HWT) until planting process must be based on SOP. Then, for maintaining the seed, especially in dry land, it is better for using springkler irrigation semi automatically. This method may make all of the seeds get the same quantity and quality of water at the same time, so the environment, especially for the dampness and the temperature is relative same. If the standard operational procedure (SOP) is filled and implemented, so the percentage of sugarcane seed growth rate for every variety which propagated in single bud can reach up 95 %.

Next, hierarchical arrangement level of nurseries based on analysis of variance showed that there is significant influence for varieties toward the percentage of sugarcane seed growth rate. Thus, to reinforce this statement can be seen on Figure 2.

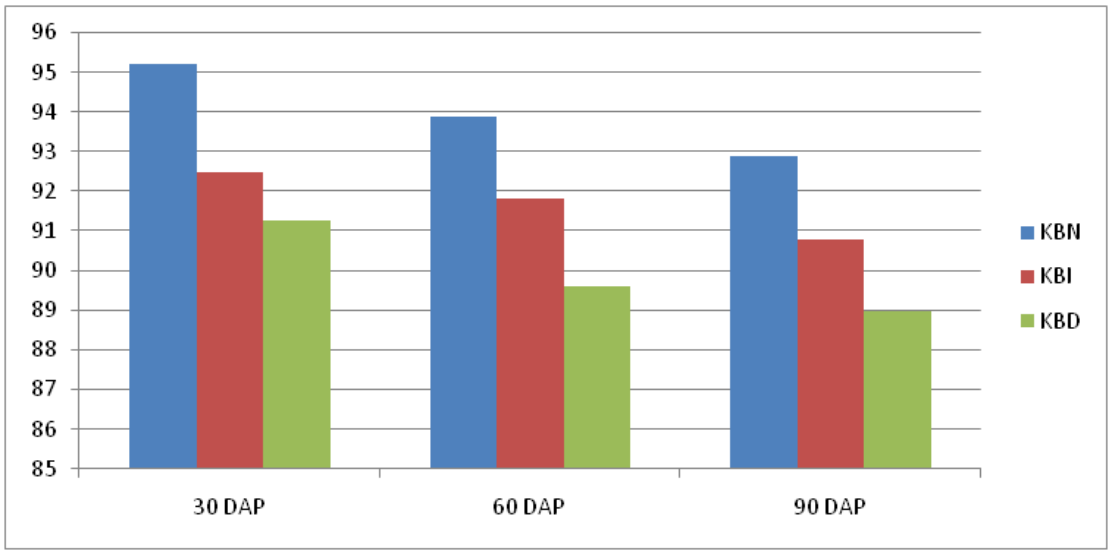

Figure 2: Histogram the percentage of sugarcane seed growth rate based on the hierarchical arrangement level of nurseries (KBN, KBI, KBD) at 30, 60, and 90 DAP.

Based on Figure 2 can be seen that hierarchical arrangement level of nurseries seems significantly different toward the percentage of sugarcane seed growth rate. It is similar with analysis of variance results. It has been proved that KBN produced the highest average of percentage of sugarcane seed growth rate is 95.23 %, 93.90 %, 92.89 % at 30, 60, and 90 DAP, but nurseries level for KBI and KBD actually based on analysis of variance do not show significant difference toward the percentage of sugarcane seed growth. This result showed that the use of sugarcane milled garden (KTG) is not always sourced from flat garden seed (KBD). It means that the seed for KTG can be directly sourced from KBI by noted that the seed which propagated in budchips is not in 90 DAP yet, so the level of its purity will be higher and does not get the disease, and also at 30 DAP will emerge productive tillers together. The acceleration of nurseries level may occurs if the propagation process can be done integrated between mule and single bud, so the availability of superior seed in mature early, middle, and later can be filled on proper time, and by good quantity and quality from nurseries source.

Remember on the limitation of nurseries number, so the availability of sugarcane seed can be propagated in single bud and also mule. Then, seed for KTG can be provided from mule or single bud. Thus, the quality of seed can be justified by followed of the availability of seeds in shorter times. Actually, the problem of the availability of sugarcane seed which is mature in early, middle, and later for sugarcane cultivation in 550.000 hectare at Indonesia is no matter if the strategy of propagation seed can be implemented integrated sustainable between mule and single bud. The solution depends on Indonesian government. This strategy if can be implemented integrated sustainable in one management of sugar industry, so the problem related to the availability of superior sugarcane seed will be solved at least 3 years later. This

research in line with [14] that hierarchical arrangement level of nurseries and type varieties did not show significant difference to the percentage of sugarcane seed growth rate which propagated in single bud. The main point to produce the highest average percentage of sugarcane seed growth rate is the process and also the implementation of sugarcane seed production propagated in single bud derived from many kind varieties and the hierarchical arrangement level of nurseries must be based on standard operational procedure (SOP).

3.2 Height of Sugarcane Seed

The average height of sugarcane seed on observation period at 30, 60, 90 days after planting (DAP) can be shown in Table 2.

Table 2: The average height of sugarcane seed (stem/cm)

Treatment	Age (Days After Planting)					
	30		60		90	
Type of varieties						
Bululawang	12.40	b	38.77	a	68.87	ab
PS 862	13.63	c	43.87	b	66.23	a
PS 881	13.80	c	43.67	b	69.77	b
Columbia 2	10.63	a	39.50	a	69.97	b
Cokro	10.53	a	37.40	a	68.67	ab
$LSD_{0.05}$	1.12		3.40		2.67	
Hierarchical arrangement of nurseries						
KBN	12.84	b	41.76		69.82	b
KBI	12.02	ab	39.94		69.60	b
KBD	11.74	a	40.22		66.68	a
$LSD_{0.05}$	0.87		tn		2.07	

Note: The numbers that followed by the same alphabet in the same column indicated no significant difference at $LSD_{0.05}$

Based on Table 2 which strengthened by analysis of variance on observation period at 30, 60, 90 DAP proved that type varieties and hierarchical arrangement level of nurseries show significant difference to the average height of sugarcane seed, except at the age 60 DAP. Hierarchical arrangement level of nurseries does not show significant influence to the height of sugarcane seed. The highest average of sugarcane seed height is 13.80 cm, 43.87 cm, and 69.97 cm at 30, 60, 90 DAP and each of them produced by first, PS 881 and it is not significant different with PS 862; second PS 862 and it is not significant different with PS 881; third, Columbia 2 clone and it is not significant different with PS 881. This research proved that actually for 5 varieties tested can be growth optimally based on its potency, particularly it can be shown from indicator of sugarcane seed height at 90 DAP. The optimization each of these varieties caused there is consistency process and the implementation of

production seed has already based on standard operational procedure (SOP), so environment resources become optimal for nurseries environment.
Based on research result, finally for 5 varieties tested has same chance to compete in growing environment, particularly the absorption of nutrient in polybag media. As the growing media is good, so the growth of roots can be developed optimally. Thus, transportation of nutrient from roots part to the plant part can be occurred optimally. As a result, the metabolism results can be used optimally in encouraging the formation process of leaves, stalk, and stem segment which derived from meristem that exist in differentiated tissue. Then, the addition of protoplasm increases, so it encourages the acceleration of sugarcane seed height. It has been proved that single bud (budchips) which planted in polybag media sixe 10 x 20 cm with the composition ratio of soil: sand: organic fertilizer is 1: 1: 1 of 3 kg of each polybag. The result is it can able to stimulate the elongation process of shoots cell which occurred optimally with a proven that the indicator of sugarcane seed height of those 5 varieties are relative same although based on analysis of variance is significantly different toward sugarcane seed height. To reinforce that these 5 varieties which tested have relative same of sugarcane seed height can be shown at Figure 2.

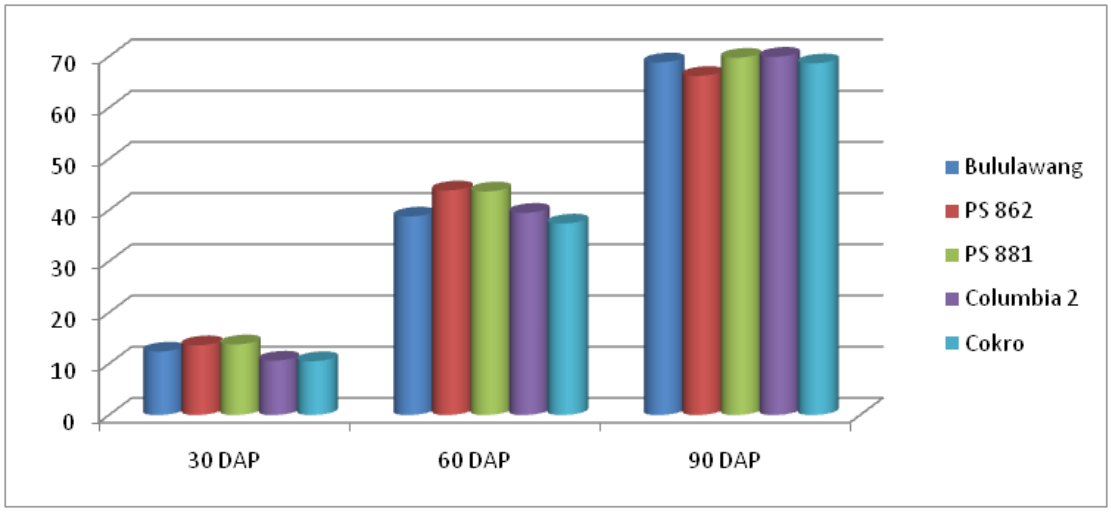

Figure 3: Histogram height of sugarcane seedincludes Bululawang, PS 862, PS 881, Columbia 2, and Cokro at 30, 60, 90 days after planting

Based on Figure 3, it can be seen clearly that Columbia 2 clone produced the highest average of sugarcane seed height that is 69.97 cm and based on analysis of variance is not significantly different with PS 881 variety. This statement showed that Columbia 2 clone and PS 881 variety have relative same potency in elongation process of shoots cell if there is optimal growing media and same growing environment, so there is a balance between process of photosynthesis and respiration. It has been proved that at 90 DAP, the height of those 5 varieties which have been tested are relative same although based on analysis of variance there is difference.

This research result is in line with [7] that the height of sugarcane seed is relative same for some varieties which propagated in single bud (budchips) by noted that the process and the maintenance must be based on standard operational procedure (SOP). Not only that, the quality of nurseries, especially for buds candidate must be healthy and waiting time for planting is not more than 48 hours. It used *pot tray* media which has diameter 3 cm and length 10 cm.

Next, hierarchical arrangement level of nurseries actually has significant influence to the height of sugarcane seed, but when the seed at 60 DAP, it does not show significant influence to the height of sugarcane seed. For more details can be seen on Figure 4.

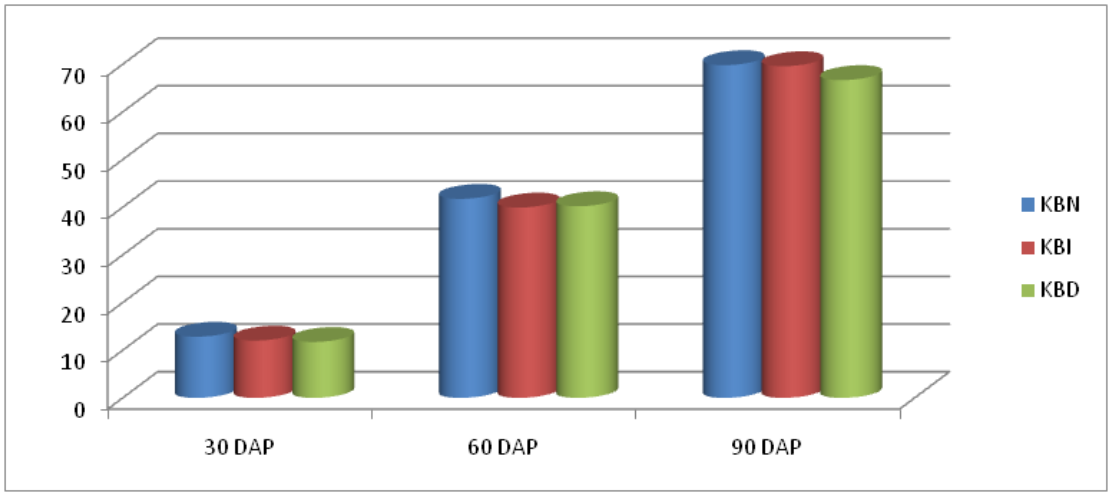

Figure 4: Histogram height of sugarcane seed based on the hierarchical arrangement level of nurseries at 30, 60, 90 days after planting.

Based on Figure 4, the histogram described that at 30 and 60 days after planting (DAP) seems there is no significant difference among nurseries (KBN, KBI, KBD) toward the height of sugarcane seed. This statement is similar with analysis of variance results. Meanwhile, when seed at 90 DAP, grandma's seed garden (KBN)shows significant influence with the height of sugarcane seed although based on analysis of variance does not show significant difference with parents' seed garden (KBI). The average height of sugarcane seed at 90 DAP can reach up to 69.82 cm produced by KBN but it is not significantly different with KBI.

This research shows that the availability of sugarcane milled garden (KTG) can directly sourced from parents' seed garden (KBI), so the level of purity is higher and the availability of superior sugarcane seed can be fulfilled by propagating it in mule and single bud (budchips) simultaneously and sustainable based on sugarcane farmers' need. This statement is appropriate with [14] that for producing more superior sugarcane seeds and similar quality can be done by propagated seeds in single bud (budchips). This method in shorter time can produce more sugarcane seeds with relatively homogeneous quality. It also in line with [7] that for increasing the

growth of sugarcane seed which derived from single bud (budchips) propagation must be done based on standard operational procedure. The result of this research gives big opportunity for stakeholders particularly seed breeder that the availability of sugarcane seed can be processed from Grandma's seed garden (KBN) directly moved to flat seed garden (KBD), it is without processed in parents' seed garden (KBI). Thus, the level of sugarcane seed purity which produced is still very high.

4. Conclusion

From observation period at 30, 60, 90 DAP, the result showed that for first indicator is growth percentage of seed, type varieties have significant difference only at 30 DAP. The highest average of sugarcane seed growth percentage is 94.81 % produced by Bululawang variety at 30 DAP. Meanwhile, hierarchical arrangement level of nurseries shows significant difference at 30, 60, 90 DAP. The highest average of sugarcane seed growth percentage is 92.89 % produced in single bud (budchips) from KBN at 90 DAP. Second indicator is height of seed, type varieties have significant difference at 30, 60, 90 DAP. The highest average of sugarcane seed height is 69.97 cm produced by Columbia 2 clone at 90 DAP. Meanwhile, hierarchical arrangement level of nurseries has significant difference at 30 and 90 DAP. The highest average of sugarcane seed height is 69.82 cm produced in single bud (budchips) from KBN at 90 DAP.

By considering the research results above, so this research proved that type varieties and nurseries level which have been tested able to give alternative way for stakeholder in providing superior and certified sugarcane seed that is not must based on nurseries level which has been exist along these days (KBP → KBN → KBI → KBD → KTG). Acceleration of nurseries level for supporting the availability of superior and certified sugarcane seed can be done in the form of KBN → KBD → KTG or can be used other options from KBN → KBI → KTG, or instead of from KBN directly to KTG which propagated in mule and single bud (budchips) integrated and sustainable.

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References

[1] Anonymous. 2013. *Sugarcane Breeding*. Plantation Research And Development Center. Sweetener And Fiber Plants Research Center (BPTPS). Karangploso Malang.

[2] Bayu, A. A. 2013. *Response Of Sugarcane Seeds Seedling (Saccharum Officinarum. L) Towards Studies Of Media And Nitrogen Fertilization On*

Budchips System. Thesis Of Agricultural Faculty Of Jember Universit. Page 15-18

[3] Budi, S. 2011. *The Report Of Study Result Of Sugar Industry Development Technology In Brazil And Columbia*. Team Of DPRD East Java, PTPN X. PTPN XI, P3GI Pasuruan Surabaya, August 25th 2011. Page 1-20.

[4] Budi, S., K. Anwar, N. Laily, S.S. Dadah, K. Widyaningsih, T. Sutaryianto. 2013. *The Improvement Of Sugarcane Plant Productivity Through Integration Model Of Optimal Technique Culture And Standardization Of Efficiency Factory-Based Single Bud Seed Budchips And Policies In East Java*. Research Final Report. Cooperation Of Higher Education Directorate Of National Education Departments Of The Republic Of Indonesia And Muhammadiyah University Of Gresik. Gresik, December 10th 2013. Page 1-65.

[5] Budi, S., K. Anwar, N. Laily, S.S. Dadah, K. Widyaningsih, T. Sutaryianto 2014. *The Improvement Of Sugarcane Plant Productivity Through Integration Model Of Optimal Technique Culture And Standardization Of Efficiency Factory-Based Single Bud Seed Budchips And Policies In East Java*. Research Final Report. Cooperation Of Higher Education Directorate Of National Education Departments Of The Republic Of Indonesia And Muhammadiyah University Of Gresik. Gresik, December 15th 2014. Page 1-72.

[6] Budi, S., K. Anwar, N. Laily, S.S. Dadah, K. Widyaningsih, T. Sutaryianto. 2015. *The Improvement Of Sugarcane Plant Productivity Through Integration Model Of Optimal Technique Culture And Standardization Of Efficiency Factory-Based Single Bud Seed Budchip) And Policies In East Java.* Research Final Report. Cooperation Of Higher Education Directorate Of National Education Departments Of The Republic Of Indonesia And Muhammadiyah University Of Gresik. Gresik, 2015. Page 65.

[7] Budi, S., and Jumadi, R. 2014. *Adaptation Test of Superior Sugarcane Variety of Columbia ratoon I Introduction at Green House of Muhammadiyah University of Gresik.* Journal of Agricultural and Fisheries. AGROFISH. ISSN : 1412-5757. Vol. 12 No. 2 February 2014. Page 64-76.

[8] Dianpratiwi, T. 2007. *Technology Transfer Strategies And Users Response*. Communication Media, Indonesian Sugar Community. Vol XXXI No 2 / July-August 2007.Page 2.

[9] Hanafi. 2013. *The Influence Of Pottray Media Towards Sugarcane Seeds (Saccharum Officinarum. L) Growth, The Origin Of Planting Material Budchips*. Agricultural Faculty Of Trunojoyo University. Page 2-9.

[10] Nila, I., Selvia, Meirani, Hasanah, Y. 2015. *The Performance of Sugarcane (Sachharum Officinarum L.) Budchips Seed By Treatment Soaking Time and IAA Concentration*. Online journal of Agrotechnology USU. 3 (2). 489-498.

[11] Putri, A.D., Sudiarso And T. Islami. 2013. *The Influence Of Planting Media Composition. On Single bud (budchips) Technique Using Three Varieties Of Sugarcane (Saccharum Officinarum. L)*. Agricultural Faculty Of Brawijaya University Of Malang. Plants Production Journal. Page 15-25.

[12] Budi, S and Sari, S. 2015. *Knowledge and Implementation of Soil Fertility*. Muhammadiyah University of Gresik. UMM Press. ISBN: 978-979-796-235-7. Page 1-285.
[13] Sitomeang, H.P., Barus, A., and Irsal. 2015. The Influence Concentration of Growth Regulator And Budchips Sources Toward The Growth of Sugarcane (*Saccharum Officinarum. L.*) Seed in Pot Tray. Online Journal of Agrotechnology. 3(3). Page 993-1004.
[14] Sudiarso, S. Budi, H. Tarno, S.S. Dahdah. 2014. *Acceleration Hierarchical Arrangements Of Availability Of Superior Certified Sugarcane Seeds Through Budchips And Mule*. Cooperation Of Research And Development Corporation And Agricultural Faculty Of Brawijaya University. Surabaya, December 2014. Page 1-67.
[15] Sugiarta, E. 2007. *Leveling On Recovery Of Sugarcane Plants. Communication Media, Indonesian Sugar Community*. Vol XXXI No 2 / July-August 2007.Page 36-38.
[16] Syakir, M. C., Indrawanto, Purwono, Siswanto, and Rumini, W. 2010. *Cultivation and Post Sugarcane Harvest*. ESKA Media. Jakarta.
[17] Yuliardi, R. 2012. *Bud chip*. [Accessed from official account of PTPN X on June 21, 2015]