Early Growth Improvement Of Sugarcane Bud Ps-881 Through Cattle Breeding Liquid Waste

Bambang Gunawan, Sri Purwanti, Nurlina, Tatuk Tojibatus

Abstract: The advantage of cattle breeding in addition to giving a positive impact providing main products such as meat and milk, also have the another advance. As matter of fact, the livestock business must produce waste. Within use appropriate technology by utilizing cattle liquid waste into fertilizer material after going through the processing or fermentation process to become an organic fertilizer that is beneficial to the plant. This study proposed to carry out the effect of POC concentration of cattle urine on the germination rate of sugarcane bud that is more effective and efficient. The experiment was conducted at Experimental Garden of Agricultural Faculty at the University of Merdeka Surabaya, with an elevation of ± 5 meters above sea level. This research used Randomized Block Design (RAK), with 1 treatment factor. The POC concentration of cattle urine (P) consisted of 8 treatment levels ie 0 ml, 10 ml, 20 ml, 30 ml, 40 ml, 50 ml, 60 ml, and 70 ml POC per liter of water. This research revealed two results; first, the significant influence of POC concentration of cow urine on increasing growth of sugarcane bud plant on the variables studied, including bud length, root number, and dry weight per plant during germination period of sugarcane plant. Second, The highest value achieved by treatment P7 is the concentration of 70 ml of POC of cow urine per liter of water at all observation parameters.

Keywords: POC, Urine Liquid Waste, sugarcane bud, Germination, Cattle waste.

1. INTRODUCTION

Germination is an early stage of a complex process of morphological, biochemical and sugarcane plant physiology. Germination is a critical phase for the growth stage of sugarcane and good germination will be achieved if factors in (genetic) and outside as well as climate, soil, and cultivation techniques in the optimal state. Storage from the optimal state will cause the ability of germination of sugarcane crops to decline rapidly. Hence, good germination is themain capital for successful gardens (Harjadi, 1991). Available Natural resources such as water, oxygen, carbon dioxide, food and sunlight during the period of sugarcane growth are extremelyneeded, but the rate at which each growth phase of the plant is not always the same. Thus there are measures of needs that are largely determined by how the biological needs aregrowing. Sugarcane plants have five stages of growth, namely the germination phase, prunes, elongation of stems, maturity and death, the need for water resources at each stage stadium is different. Staging germination until the elongation of the stem can be said to require a lot of water needs. But in the phase of maturity and even death, the need for water is precisely in fewer conditions to optimize the filling of sugar in the stem. Hence, the Unfulfilled one or more of the needed natural resources could result in a quality decrease of growth and productivity of the resulting crop. In the cultivation of sugar cane, efforts to meet the needs of natural resources at the optimal time is required provide maximum yield (Anonymous, 2008). Indonesia is one of the countries with sugarpotential. With the position of being below the equator line, it is a good luck to make this agrarian country as the sugar self-sufficiency.

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But the facts say another since the early 1990s until now Indonesia is always importing sugar that every year more than 500 thousand tons of imported sugar into Indonesia which the majority of the population is farmers. In the last 10 years, the area of sugarcane plantations in Indonesia has continued to increase with an average growth of 3.75% per year from only 340,660 hectares in 2000 to 473,841 hectare in 2009. In the 2008 and 2009 period, there was a relatively small increase of only 2, 9% from 460 thousand to 473 thousand hectares; this is because the sugar price plummeted at the time, thereby lowering the interest of sugar cane farmers to plant sugarcane. With an area of 2009 reached 473 thousand hectares, sugarcane production 2.85 million tons, theproductivity of sugarcane 5.1 tons per hectare, yield 7.83%, crystal production 2.6 million tons and crystal productivity 5.96 tons per hectare (Anonymous, 2010). Sugar production is a synergy of sugarcane productivity as raw material and performance of sugar factory. In plants, productivity is determined by genetic factors ie varieties, environmental factors that are cultivation techniques and interaction of both. Plant productivity will be optimal if both factors are well managed (Ahmad, S. 2013). As matter of fact, Soil fertility determines the harvest of sugarcane, concerning aspects of physical and chemical boundary factors of the soil. Physical properties of soils that stand out are drainage/permeability, texture and pore space. While the soil chemical properties are organic matter content, pH, essential nutrient availability and soil Cation exchange capacity (CEC).The soil texture within meet a suitable for sugarcane based on soil characteristics is moderate to severe or according to soil texture classification are clay, sandy, dusty and dusty or soil with textured a little rough rather smooth (Buckman and Brady, 1960). The best soil acidity (pH) for sugarcane is in the range 6.0 - 7.0 but it can still grow in the range of pH 4.5 - 7.5. Soil fertility (nutrient status), based on P3GI study results to determine land suitability for sugar cane plant with total N criteria> 1.5, P2O5 available> 75 ppm, K2O available> 150 ppm. The optimal planting period (pattern I) at the end of the dry season until the beginning of the rainy season or planting season can also be at the end of the rainy season until the early dry season (pattern II) with light soil conditions, soil can be processed throughout the season. In the wet area (dry months ≤ 2 months) the best sugarcane

planting period at the beginning of the dry season (Anonymous, 2008). According to Simanungkalit et al. (2006), based on results of some research indicate that most agricultural land intensively has been declined in productivity and has been degraded by land, especially related to the very low of land's C-organic content, ie <2%, even in many intensive wetlands in Java the content < 1%. Whereas to obtain optimal productivity required C-organic> 2.5%. On the other hand, as a wet tropical country that has an abundant source of organic material, but has not been optimally utilized. The advantage of cattle breeding in addition to providing a positive impact that produces the main products such as meat and milk, also have a negative impact because the cattle breeding business must produce waste. cattle breeding waste is the waste product of a business activity including solid and liquid waste such as feces, urine and feed residue. The greater the scale of business, the more waste generated. Based on several studies that have been done noted that one average cow produces an average of 10-25 kg/day. If in a collective cage kept as many as 100 heads of cattle, then the dirt that can be collected is 2,500 kg. But until now the cow dung produced is generally dumped into the water channel to be used for the fields irrigated by the channel. At that time (cattle breeding liquid waste) can not be utilized directly by the plant because it has not been decomposed with a C/N ratio of more than 40. An alternative waste management action is needed to minimize the negative impact of livestock raising. One way to reduce the pollution load due to livestock waste is to apply clean technology is to use the waste of urine and cow feces into fertilizer or fertilizer material after processing or fermentation to become a useful organic fertilizer for plants (Oginawati et al., 2013). Several studies have shown that cattle urine contains growth regulators such as Indol Acetic Acid (IAA) that have a positive effect on plant vegetative growth; besides that the typical urine aroma can prevent the coming of various pests of plants, so it can function as the controlling plant pests. Cattle urine also produces primary nutrients such as Nitrogen (N) 1%, Phosphor (P) 0.5% and Potassium (K) 1.5% (Lingga, 1991). Preparation of liquid fertilizer from cattle urine must go through several processes, the most important process to be carried out is fermentation, which for the fermentation process, either aerobically (requires oxygen) or not aerobically (does not require oxygen) by utilizing the activity of microorganisms capable of altering or transpromising the organic chemistry of the organic substance. Hormones contained in the plant is only a small amount, therefore, the addition of substances or hormones that support the growth of roots and stems is needed. Thus, the growth of plants to be faster. For example in the making cuttings, without the provision of hormones or aphrodisiacs, roots grow on the cuttings will grow a little longer, and with the addition of hormones in the wound or media than the roots on the cuttings will grow faster. The Benefits and chemical content found in cattle's urine (liquid waste) was a big use for agriculture that develops systems or organic cropping patterns. So far, most farmers in Indonesia are still less attention to the efficacy of a very potent in the urine of this livestock, theliquid waste farm is often in the waste just like that. But behind the pungent odor contained various substances that are in need by plants, the chemical content of cow urine is very complex such as nitrogen, phosphorus, potassium (NPK) and some other chemical elements. Thus the cattle's urine is very feasible to replace chemical fertilizers because it has the main composition is Nitrogen (N): 1.4 to 2.2%, phosphorus (P): 0.6 to 0.7%, and potassium (K) 1.6 to 2.1%. Because of the full range of nutrients needed by plants to grow flowers so that cow urine is a cheap solution to meet the needs of fertilizers in agricultural cultivation (Anonymous, 2014). Liquid organic fertilizer is a solution of decomposition of organic materials derived from plant residues, animal or humans waste that contain more than one element of the ingredient. The advantages of this organic fertilizer are able to overcome the nutrient deficiency in quick, no problem in nutrient washing, and also able to provide nutrients quickly. Compared with inorganic fertilizers, liquid organic fertilizers generally do not damage the soil and plants even though they are used as often as possible, besides this fertilizer also has a binder so that the solution of fertilizer given to the soil surface can be directly utilized by the plant (Hadisuwito, 2012). The results of Alfarisi and Manurung's research (2015), shows that cattle urine organic fertilizer significantly influence growth and production of sweet corn (Zea mays saccharata L). at a concentration of 75 Cc per liter gives a better effect on the growth and production of sweet corn. The result of laboratory test from Indonesian Research Center and Industrial Consultation (2017) proves that the cattle urine liquid organic fertilizer contains macro elements such as Organic C 1.460%; Nitrogen 0.098%; P2O5 0.102%; K2O 0.216%; Ca 166,52 ppm; Mg 104,61 ppm and micro element, among others: Co 2.15 ppm; Al 2.88 ppm; Fe 0.13 ppm; Na 1.28 ppm; Ni 0,21 ppm; Zn 0.23 ppm; B 1.13 ppm; Mn 0.012 ppm there are also some hormones IAA 8.61 ppm; cytokinin 5.16 ppm; gibberellin 2.54 ppm and bacterial content, such as: pospat bacteria pospat, Lactobacillus, Actinomycetes and photosynthetic bacteria. In the planning of sugarcane cultivation, several things must be well considered, among others: the availability of planting materials, good processing, fertilization and other crop maintenance measures. One effort that can be taken to overcome it is by application of liquid organic fertilizer(POC) derived from cattle breeding liquid waste that is thenutrient-containing fertilizer that has the characteristics of slow release (slow release) and contains plant growth regulator for the plant. Therefore, the purpose of this research by using cattle breeding liquid waste as the application of liquid organic fertilizer for the early growth of sugarcane plant is to know the effect of giving the organic cattle urine liquid fertilizer concentration is the most effective and efficient to the initial growth rate or germination of sugarcane bud.

2. RESEARCH DESIGN

The experiment was conducted at Experimental Garden at theUniversity of Merdeka Surabaya, with a height point of about 5 meters above sea level. The experimental materials included sugarcane bud PS-881 sugarcane cutters, soil and manure as themedium with a ratio of 3: 1. The experimental material used is the liquid organic fertilizer (POC) of cattle urine, where this POC is made thefirst solution with various concentrations according to the treatments studied, then the solution is given at each treatment based on the volume of POC solution as much as 300 ml and the same time of giving when planting, 7 days , 14 days, 21 days, and 28 days after planting. This study used Randomized Block Design (RAK), where the treatment used one (1) factor that is Concentration of Organic Fertilizer Liquid Plus (P) consisted of 8 treatment levels and repeated 3 times with each treatment there were 2 plant samples, so obtained 24 treatment . The treatment,

among others: P0 = 0 ml; P1 = 10 ml; P2 = 20 ml; P3 = 30 ml; P4 = 40 ml; P5 = 50 ml; P6 = 60 ml; P7 = 70 ml POC per liter of water.

3. RESULT AND DISCUSSION

3.1 Speed of Germination, Bar Diameter, Number of Leaves and Root Lengths

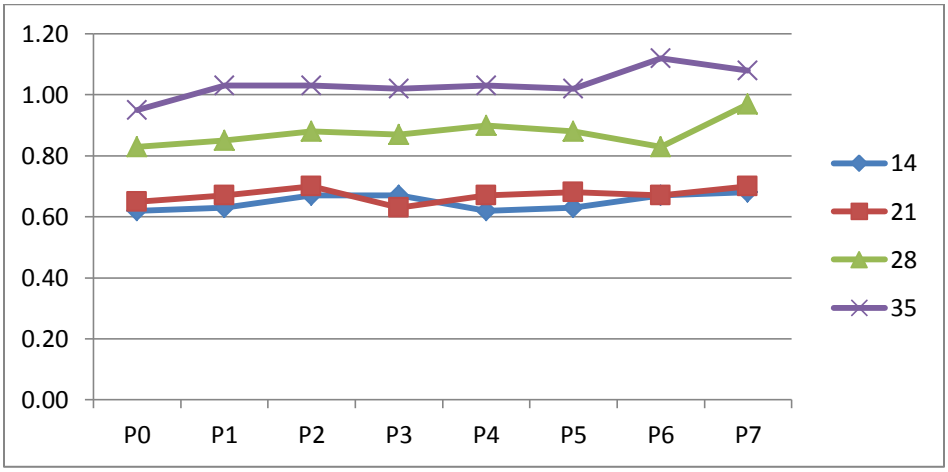
The result of statistic analysis shows the concentration of liquid organic fertilizer (POC) from cattle urine waste gave no significant effect (F-amount <F5%) to the variable of germination rate, bud diameter, leaf number and root length at phases of sugarcane chip, variation in the F-test. Whereas, The mean of observation of these variables due to the treatment of POC concentration of cattle urine on sugarcane bud at the beginning of sugar cane growth, presented in table 1. The table 1 below shows how the treatment of various POC concentration of cattle urine on cuttings of sugarcane bud seen P2 and P3 treatment tend to give the better values that are 3,00 days and 3,17 days compared to other treatment, although statistically, all the treatments do not markedly different. Meanwhile, if the percentage increase of germination rate to control treatment calculated, it is shown that treatment P2 gave acceleration rate of germination of 9.91% while P3 4.80% compared to control treatment. Then the result of giving various POC concentration of cattle urine toward sugarcaneon thevariable of bud diameter of observation (35 hst) showed that all treatments under study from P1 to P7 tended to give better response by giving better value than control treatment. Similarly, the variables in the number of leaves seen in P1 to P7 treatments tended to give better values than the control treatment, although statistically different were not significant with all the treatments studied at various ages of plant observation. The length of root variables also showed that P3 treatment tended to give thebetter value of 46.02 cm with a percentage increase of control treatment of 23.28% compared with other treatments, although statistically different was not significant with other treatments at 35 days of age planting.

Table 1. *the Results of Mean Observation toward Germination Speed, sugarcane bud Diameter, Number of Leaves and Length of Rootsugarcane chip*

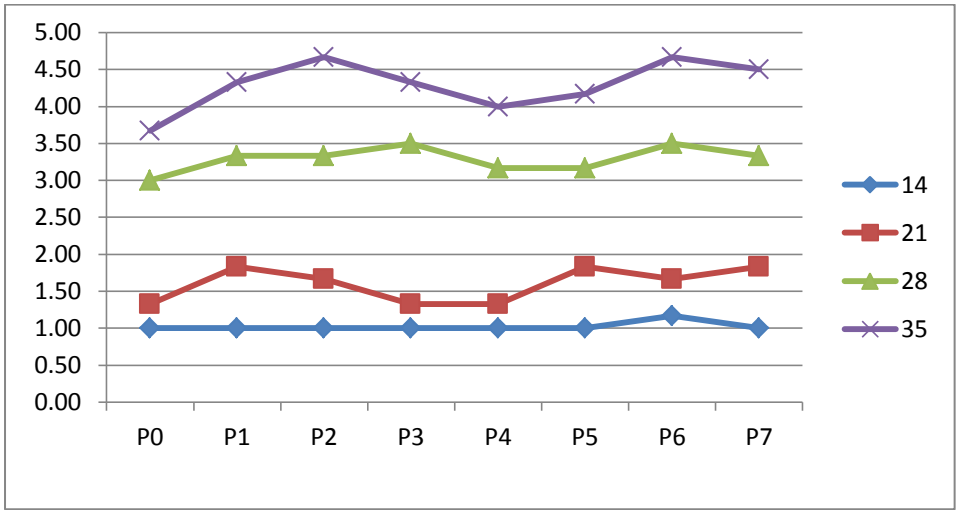
Treatment	Mean Observation Value			
	Germination Speed	Diameter of Bud(35 HST)	Number of Leaves (35 HST)	Length of Root (35 HST)
P0	3.33	0.95	3.67	37.33
P1	3.33	1.03	4.33	38.97
P2	3.00	1.03	4.67	44.12
P3	3.17	1.02	4.33	46.02
P4	3.33	1.03	4.00	41.28
P5	3.50	1.02	4.17	42.02
P6	3.33	1.12	4.67	40.47
P7	3.33	1.08	4.50	40.28
BNT 5 %	tn	tn	tn	tn

Description: The numbers that are next to the same letter, in the same column show no significant difference (5% BNT).

In addition, the graph showing the pattern of observation of stem diameter variable, the number of leaves at the stage of germination of bud cuttings, is presented below.



Graph 1. *Pattern Value of chip Diameter At Germination Stage of sugarcane bud at Various Age Observation.*



Graph 2. *Pattern Value of Leaves Amounts At Germination Stage of sugarcane bud at Various Age Observation.*

The results of this study revealed an illustration that the application of liquid cattle urine organic fertilizer has a use on the increase of physiological effects toward plants during the germination period of sugarcane bud, especially in the treatment of P2 and P3,which brought the acceleration of germination compared with the control treatment. Fertilizer is a food for all types of plants, plants take food by absorbing it through the tip of the roots of newly grown and or in the early sugarcane bud germination optimally utilize energy from food reserves on the sugarcanebud around the shoots, thus giving no effect significantly different in the germination speed variables in all treatments studied. The use of organic fertilizer is an implementation of the concept of ecological agriculture by considering the efficiency of production costs. The technology in this liquid fertilizer production process is to create a nutrient with unique characteristic within also contains growth hormone such as IAA, cytokinin, and gibberellin as well as microorganisms which play a role in increasing the availability of nutrient contents for the plants, so that overall liquid organic fertilizer is able to stimulate and promote the growth of roots, stems, leaves and saplings quickly. Fertilization is the act of providing additional nutrients to the soil complex whether carrying in directly or indirectly. Fertilization could contribute plant nutrient. The goal is to improve the soil fertility level so that plants get enough nutrients to improve the quality and quantity of plant growth. According to Harjadi, S. (1991), Leaf organs play a role as the main Photosynth producer during the process of photosynthesis, where the result of the photosynthesis is subsequently important in growth and the formation of plant biomass. Photosynthesis is the process by which carbon dioxide and water with the influence of sunlight and the presence of chlorophyll is converted into organic compounds that are energy-rich carbohydrates.

3.2 Length of Bud, Number of Roots and Dry-Weight per Plant

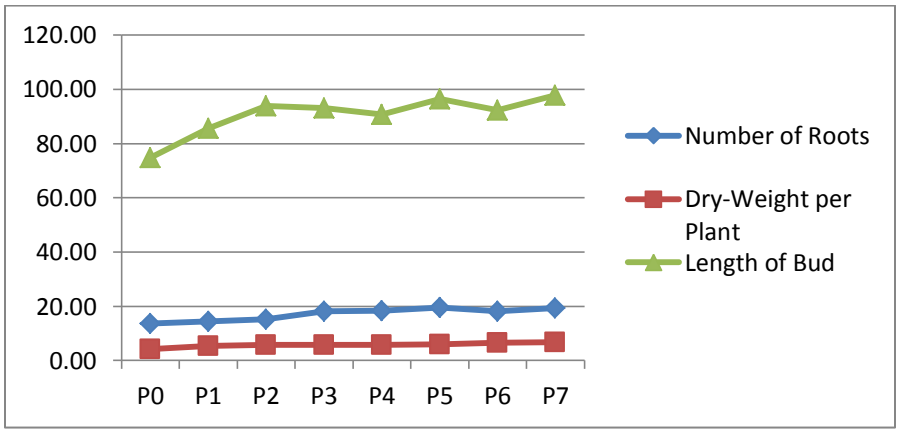
The statistical analysis results show that the concentration of liquid organic fertilizer (POC) from cattle liquid waste also gave a significant effect (F Amount> F5%) to the varieties of shoot length, root number and dry weight per plant at the stage of germination bud cuttings, in the F test. The average result of this observation is due to the treatment of POC concentration of cow urine on sugarcane bud plant at germination stage, presented in table 2.

Table 2. *Results Mean Observation of Length of Bud, Number of Roots and Dry-Weight per Plant of Sugarcane Bud (cm) at Age 35 Days After Planting.*

Treatment	Mean Observation Value		
	Length of Bud	Number of Roots	Dry-Weight per Plant
P0	74.72 a	13.67 a	4.30 a
P1	85.60 ab	14.50 ab	5.43 ab
P2	93.77 b	15.33 ab	5.88 bc
P3	93.17 b	18.17 bc	5.87 bc
P4	90.75 b	18.33 bc	5.72 bc
P5	96.38 b	19.50 c	6.08 bc
P6	92.28 b	18.17 bc	6.62 bc
P7	97.87 b	19.33 c	6.72 c
BNT 5 %	12.75	4.01	1.28

Description: The numbers that are next to the same letter, in the same column show no significant difference (5% BNT).

The table 2 above shows the provision of various concentration of POC of cattle urine toward sugarcane bud that on length of bud, the number of roots and dry weight per plant showed treatment of P1 to P7 gave better effect than control treatment, although treatment P7 gave the highest value - a total of 97.87 cm; 19,33 and 6,72 gram compared to other treatments. However, statistically variable length of bud shows that treatment of P1 to P7 was not significant, whereas root number variables showed that treatment of P3 to P7 was not significantly different, as were dry weight variables per plant that the treatment of P2 to P7 is not significant. Furthermore, a graph showing the observation pattern at the stage of the germination of the sugarcane bud is presented below.



Graph 3. *Value Pattern onLength of Bud, Number of Roots and Wet Weight and Dry Weight Per Plant at germination Stage of Sugarcane Bud At the End of Observation (35 HST).*

Organic matter added to the planting medium also serves as a source of energy and soil microbial food so that it could increase microbial activity in the provision of plant nutrients. In another word, the addition of organic material in addition as a source of nutrients for plants, as well as a source of energy and nutrients for microbes. The content of bacteria in this cow urine POC, such as photosynthetic bacteria is a microbe capable of contributing to increasing the capacity of photosynthesis of plants and Lactobacillus sp. is a microbe that plays a role in helping the process of fermentation of organic materials into lactic acid compounds that can be absorbed by plants. While microbial solvent pospat is microbial that serves to dissolve the elements of P in fertilizer pospat (TSP, SP-36, SP-18) and P elements tied silicate clay silicate soil into a compound pospat available and easily absorbed by plants (BPKI, 2017). Organic materials/fertilizers are very useful for increasing agricultural production both for quality and quantity, reduce environmental pollution, and improve the quality of land in a sustainable manner. The long-term use of organic fertilizer can increase the productivity of the land and can prevent land degradation. Sources of materials for organic fertilizers are very diverse, with varying physical and chemical/nutrient characteristics so that the effects of organic fertilizer use on land and plants can vary (Simanungkalit et al., 2006). The results of laboratory tests by the board of Center for Research and Industry Consultation (2017) prove that the organic fertilizer Liquid of cattle's urine contains elements of macro and micro elements are also equipped with several hormones namely IAA, cytokinin, GA3 is very role and needed for growth and development of plants, the content of microorganisms that help the availability of nutrients for plants. According to Subroto and Awang (2005), that elements of N, P and K are classified as macro elements for most plants, most plants absorb P elements in the form of orthophosphate H2PO4-, ten times less in the form of secondary orthophosphate HPO42-the absorption of the element is influenced by soil pH around rooting plants. If the pH of the soil is low (acid), then the absorption of element P in (primary orthophosphate form, whereas if the pH value is high, it will increase the absorption of element P in the form of secondary orthophosphate.Exportant element P which is very important for the plant is at the beginning of plant growth, stimulate the growth of plant roots, so as to increase the absorption of other nutrients in the soil. This liquid organic fertilizer has important chemical functions such as (1) the provision of macro nutrients (N, P, K, Ca, Mg, and S) and as Zn, Cu, Mo, Co, B, Mn, and Fe, though the number is relatively small. The use of liquid organic fertilizer can prevent micro element deficiency in marginal soil or soil that has been intensively cultivated with a less balanced fertilization; (2) increasing cation exchange capacity (CEC) of land; and (3) can form complex compounds with metal ions that poison plants such as Al, Fe, and Mn.

4. CONCLUSION

Based on the research results above, it can be concluded as follows:

1. There is significant influence by POC concentration of cattle breeding liquid waste (urine) on increasing growth of sugarcane bud on the variables studied, including thelength of

bud, number of roots and dry-weight per plant during germination period of sugarcane plant.
2. The highest value is achieved by P7 treatment which is the concentration of 70 ml cattle urine POC per liter of water on all observed parameters studied; but statistically the best value was achieved by treatment of P3 (30 ml of POC of cattle urine per liter of water) because it was not significantly different from P7 treatment on all variables studied, such as germination rate, length of bud, number of leaves, length of root, number of roots, and dry-weight per plant because it is considered more effective and efficient.

REFERENCES

[1] Ahmad, S.MelajuBersamaVarietasMenujuSwasembadaGula 2014. Retrieved from http://pusatpenelitiangula.blogspot.com/2013/02/melaju-bersama-varietas-menuju.html#more, 2013.

[2] Alfarisi, N. and Manurung T. Pengaruh pemberian pupuk urine sapi terhadap pertumbuhan dan produksi jagung manis dengan menggunakan EM-4. Biologi Unimed. Jurnal Bio Sains Vol.1 No.3 Desember 2015, 2015.

[3] Anonymous.Kandungan Kimiawi Urine Sapi Untuk Pertanian.Retrievedfrom http://www.organikilo.co/2014/12/kandungan-kimiawi-urine-sapi-untuk, 2014.

[4] Pengembangan Perkebunan GulaDalam Menuju Swasembada Gula. dalam :http://www.datacon.co.id/Agri-2010 Gula.html), 2010.

[5] ……KonsepBudidayaTanamanTebu.Retrieved from http://cerianet-agricultur.blogspot.com/2008/12/konsep-budidaya-tebu.html, 2008.

[6] BalaiPenelitiandanKonsultasiIndustri.Hasil Uji Laboratorium Pupuk Organik Urine Sapi.Surabaya, 2017.

[7] Harjadi, S. Pengantar Agronomi. PT Gramedia Jakarta.195 pp,1991.

[8] Oginawati, K Khoerunisa, R Nur Hijrah, S. PenangananLimbahPadatdan Limbah Cair Usaha Peternakan.InstitutTeknologi Bandung, 2013.

[9] Simanungkalit et al,.Organic Fertilizer and Biofertilizer.Balai Besar Litbang Sumberdaya Lahan Pertanian Badan Penelitian dan Pengembangan Pertanian.Bogor, 2006.

[10] Subroto andAwangYusrani.KesuburandanPemanfaatan Tanah.IBBayumedia. Malang. 100 hal,2005.

[11] Yitnosumarto. S. Percobaan: Perancangan, Analisisdan lnterprestasinya. Dep. P dan K Program MIPA Universitas Brawijaya.Malang,1991.