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Research Paper

Use of Local Resources from Oil Palm Bunch Ash combined with Cow Manure to Grow and Produce Sweet Corn (*Zea mays saccharata Sturt*) Planted in Peat Soil to Support Smart Agriculture

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Abstract
Sweet corn (*Zea mays saccharata* Sturt) is a food crop that has a sweeter taste than ordinary corn. It has high economic value and has a shorter harvest time. The demand for corn is increasing in Indonesia, but corn production is not sufficient to meet it. For this reason, efforts to increase sweet corn production are needed. The purpose of this study was to determine the effect of oil palm bunch ash and cow manure ameliorants on the growth and production of sweet corn on peat soil. The pot experiment was conducted in Bandar Agung Village, Lalan District, Musi Banyuasin, South Sumatra of Indonesia from December 2022 to March 2023. This study used a Randomized Factorial Block Design consisting of two factors: the first was the dose of oil palm bunch ash (control, 20 tons ha^{-1}, and 60 tons ha^{-1}) and the second was the dose of cow manure (control, 42 tons ha^{-1}, and 84 tons ha^{-1}). There were nine treatment combinations, each repeated three times. For each treatment, two plant samples were left. The results showed no significant effect on plant height, number of leaves, plant fresh weight, and plant dry weight. The application of 60 tons ha^{-1} of oil palm bunch ash combined with 42 tons ha^{-1} of cow manure showed the best results in terms of sweet corn growth, as it had the highest values in each variable observed.
Keywords
Ameliorant, cow manure, oil palm bunch ash, peat, sweet corn

1. INTRODUCTION

Sweet corn (*Zea mays saccharata* Sturt) is a staple food in some countries like Indonesia that many people like to grow this crop because the harvest period is short and has a high selling value (Seipin et al., 2016). Usually sweet corn was planted in dry season specially in wetland area like peat soil (Priyadi et al., 2005). The bonanza variety of sweet corn has good shelf life and has a very sweet taste. In Indonesia, many varieties of Bonanza strain F1 sweet corn are cultivated. Sweet corn also contains low fat, carbohydrates, protein, vitamins and relatively high sugar content (Silaban et al., 2013). Corn ranks second meal after rice as a staple food in Indonesia while in the third world the corn places after rice and wheat.

The development of sweet corn has a pretty good opportunity, in line with the high market demand of around 5% per year, but it is not enough to meet the demand (South Sumatra Plantation Service, 2011). Based on the Central Statistics Agency for West Kalimantan, sweet corn is generally cultivated on peat soils with production yields in 2017 reaching 103,742 tons with harvested area of 31,851 ha and a product capacity of around 3.26 tons ha^{-1} (Piolmi et al., 2021). Increased yields of sweet corn can be fulfilled if production yields are increased every year and the harvested area is increased (Simorangkir et al., 2015).

Peat soil has a potential to expand agricultural areas for food growth (Kaparang and Sediyono, 2013). In Indonesia peat has an area of 20.9 million ha while in Sumatra around 4.6 million ha of peat and 7.4% found in Jambi. The chemical characterization of peat soil are influenced by the type of mineral substratum, thickness and content of fiber. The content of organic matter is generally more than mineral, which is only less than 5%. The use of peat as productive agricultural land has several constraints, including thickness and degree of decomposition, low macro-micro nutrient, low pH (3.1-3.4), pyrite layers and poor water management. Degraded peatlands will decrease their land suitability for agriculture and the chance of fires will increase due to lower water levels. The causes of peatland degradation include improper land management such as land clearing and peatland fires. Due to low fertility of peat soil, usually perennial crops like palm oil can grow in this infertile soil, however in the sapric decomposition produced hiher yield compare to others (Veloo et al., 2015).

Ameliorant is a soil enhancer that is added to improve the soil acidity and root conditions for plant growth as well as a source of nutrients (Maftu'ah et al., 2013; Febriza, 2023). The increasing number of oil palm plantations every year results in more and more palm oil factory waste. According to the South Sumatra Plantation Service (South Sumatra Plantation Service, 2011), South Sumatra is Indonesia's largest oil palm producing region, with a planted area of around 866,763 ha. For oil palm bunches waste, 1 ton produces 600 kg - 650 kg of fertilizer (Naibaho, 1996). 6 kg of oil palm bunches can become 1.9 kg of ash (Kresnawaty et al., 2017). The K ash content of oil palm bunches acts as a binder and increases enzyme activity for metabolism which is quite large for plants (Haryoko, 2012). According to Haryoko's analysis (Haryoko et al., 2008) states that 100 g of bunch ash contains an alkaline pH of 11.07, 5.47% P, 36.75% K, 6.56% Ca, 0.92% C-organic, 164 mg kg^{-1} Cu, 214 mg kg^{-1} Zn and 114 mg kg^{-1} Mn. Oil palm bunch ash has a high potassium element reaching 30-40% K which is alkaline and hygroscopic so that it improves the pH (Akmal, 2018).

The application of a combination of oil palm bunch ash and manure is recommended instead of using only palm oil bunch ash because manure can power the ash compost if there are parts of the ash that have not decomposed completely. The application of cow manure has a good effect on helping the soil absorb water (Purnamayani et al., 2014). The nature of organic cow manure contains macro elements (N, P, S, Ca and K) and micro (molybdenium, cobalt, zinc, iron, boron). Cattle manure plays a role in increasing microbiological activity in soil, increasing cation exchange capacity and soil structure. Cow dung has a good effect on peat fertility because it can help the peat decompose the soil (Yuliana et al., 2015). The aims of this study were to determine the effect of oil palm bunch ash and cow manure ameliorants on the growth and production of sweet corn on peat soils and to determine the optimum dose of oil palm bunch ash and cow manure ameliorants that affect growth. and sweet corn production on peat soils.

2. EXPERIMENTAL SECTION

2.1 Locations and Research Materials

The research activity was carried out in Bandar Agung Village, Lalan District, Musi Banyuasin Regency of South Sumatra. The research was conducted from June 2022 to May 2023. The tools used in this experiment were stationery, hoes, buckets, sprayer, scissors, calipers, label paper trial plot, meter, oven, pH meter, polybag plastic, and analytical balance. The materials used include water, sweet corn seeds, solid waste of empty palm oil bunches ash, cow manure, urea, SP 36, KCl fertilizer, and peat soil. This pot experiment was using Randomized Factorial Block Design using two factors which were oil palm bunches ash at dosages of 0, 20, 60 tons ha^{-1} and cow manure with the rate of 0, 42, 84 tons ha^{-1} respectively.

2.2 Planting

The corn seeds used in this pot experiment were the Bonanza F1 sweet corn variety. Planting corn seeds was done by first soaking the seeds in water for 15 minutes, and if there were seeds floating in the water then the seeds could not be used for planting. Next, 10 kg of peat soils were used for planting media with a distance between pots of 70x80 cm. In each hole, 2 corn seeds were planted and then covered with the soil. One week after planting, one of the plants was cut and left 1 plant with the growing well.

2.3 Fertilization

Oil palm bunch ash fertilizer at doses of 0, 20, 60 tons ha^{-1} was applied 1 week before the seeds were sown and then mixed them evenly with the soil according to the treatment. After 2 days cow manure was added at doses of 0, 42, 84 tons ha^{-1} then incubated for 2 weeks. The basic fertilizer used was Urea fertilizer at 300 kg ha^{-1} applied 2 times, namely ½ dose given at planting and ½ dose applied additionally when the corn was 30 days after planting, SP36 200 kg ha^{-1} and KCl 100 kg ha^{-1} added all at once application. The morphology of Bonanza F1 variety of sweet corn produced from this experiment were displayed in Fig. 1.

2.4 Data Collection

Measurement data included growth, harvest observation, and analysis of levels in oil palm bunch ash and peat soil. Data collection of growth consisted of plant height and number of leaves. Measurements after harvesting were cob length with and without husk, cob weight with and without husk, cob diameter, and soil pH. Harvesting was done after the sweet corn was 73 days old.

2.5 Data Analysis

The data obtained were processed using Analysis of Variance (ANOVA). If the calculated F is greater than the F table at the 5% test level, it means that the treatment has a significant effect on the observed variables, then proceed with the 5% LSD test to determine the level of treatment that causes a real difference in response.

3. RESULT

3.1 Peat Soil

Analysis of peat soil characteristics carried out on the original soil before planting found that the soil pH was 3.82, indicating very acidic conditions. The low pH may be due to organic content affected by environmental factors, weather, and type of vegetation (Tong et al., 2016). Higher pH values of 4.52-5.16 were found in Peat soil of Aceh (Arabia et al., 2020). The N content was found to be about 1.28% (moderate), the phosphorus content was 19.06 mg kg^{-1}, and the potassium content was 75.38 cmol(+) kg^{-1}, which

Table 1. Original peat soil characterization

Variable	Result	Criteria*
pH	3.82	Very acidic
N-Total (%)	1.28	Medium
P2O5 Bray I (mg kg-1)	19.06	Very high
Potassium (Cmol(+) kg-1	75.38	Very high

Figure 1. The morphology of sweet corn of Bonanza F1 includes roots, stems, flowers, leaves (A), corn with husks (B), corn without husks (C)

Table 2. Oil palm bunch ash characterization

Variable	Result	Criteria*
pH	11.35	Very alkaline
N-Total (%)	0.056	Very low
P2O5 Bray I (mg kg-1)	47.74	Very high
Potassium (Cmol(+) kg-1	113.08	Very high

was classified as very high. The analysis of peat soil can be seen in Table 1.

Soil acidity is associated with low base saturation. The lower the base saturation, the more acidic the soil, and if the base saturation value reaches 100%, the pH will be neutral. The high phosphorus content is caused by several factors, namely pH, organic matter, temperature, and reaction time (Permatasari et al., 2021). N nutrients in soil are sourced from soil organic matter, namely coarse or fine organic matter, binders from microorganisms from rainwater, fertilizers, and air N (Haryoko et al., 2008). Meanwhile, the causes of potassium being high or low are caused by soil pH and parent material Gunawan et al. (2019).

3.2 Oil Palm Bunch Ash

The results of the analysis of oil palm bunch ash showed a soil pH of 11.35 (very alkaline), N content of 0.056% (very low), phosphorus content of 47.74 mg kg^{-1}, and potassium content of 113.08 cmol(+) kg^{-1}, classified as very high. The nutrient content of oil palm bunch ash shows that potassium and phosphorus were quite high but the N nutrient was low. The low N was due to during combustion, N changed to NO together with exhaust gases, then mixes with air and at high temperature combustion, nitrogen will change to nitric oxide (NO) (Hasna et al., 2019). According to Muhti (2018), the K nutrient content in palm oil bunch ash is around 35-40% and phosphorus is 7% P_2O_5.

Very high potassium elements can play a role in compiling plant parts, especially the development of meristem tissue for stem formation (Simbolon et al., 2018). Nitrogen plays a role as protoplasm, protein, the main component of chlorophyll, and provides nutrition for plants (Irmayani, 2013). Element K functions as a catalyst for various enzymatic reactions and other physiological processes (Al Amin et al., 2017). Available P is classified as very high so that it has high potential in providing phosphate elements for plant needs (Manurung et al., 2017).

3.3 Analysis of the Variables Observed

Based on the result of the analysis of variance, it was shown that each factor of the dose of oil palm bunch ash and dose of cow manure for sweet corn growth had a significant effect on the variables of length and weight of corn with husks, length and weight of corn without husks, and diameter of corn. However, it had no significant effect on the variable dry weight and fresh weight of plants, number of leaves, and plant height (Table 3).

The results of the analysis of variance presented in Table 3 shows that the application of ameliorants of oil palm bunch ash and cow manure to plant height and number of leaves had no significant effect at the age of 1 to 6 week after planting and for the dry weight and fresh weight of plants also shows that the effect is not significant. Meanwhile, the application of oil palm bunch ash and cow manure ameliorants on the length and weight of corn with husks, length and weight of corn without husks, and cob diameter has a significant to very significant effect.

3.4 Plant Height

Based on the analysis of variance, it was shown that the doses of oil palm bunch ash and cow manure had no significant effect on plant height. In the 6 Weeks After Planting (WAP), the highest average was obtained in the treatment of oil palm bunch ash at 60 tons ha^{-1} + cow manure at 42 tons ha^{-1} (T2P1) with a value of 138.17 cm, and the lowest was obtained in the treatment of oil palm bunch ash 60 tonnes ha^{-1} + cow manure 84 tonnes ha^{-1} (T2P2) with a value of 96.25 cm. The figure of the height growth of sweet corn plants is presented in Fig. 2.

Table 3. The results of the analysis of variance in all observed variables

No.	Variable	F Count	Coefficient of diversity
1	Plant height week 1	0.61ns	26.44
2	Plant height week 2	0.79ns	28.01
3	Plant height week 3	0.53ns	40.9
4	Plant height week 4	0.66ns	39.93
5	Plant height week 5	0.60ns	35.94
6	Plant height week 6	0.48ns	28.72
7	Number of leaves week 1	0.51ns	19.02
8	Number of leaves week 2	1.18ns	14.36
9	Number of leaves week 3	0.61ns	3.89
10	Number of leaves week 4	0.68ns	26.88
11	Number of leaves week 5	0.74ns	24.81
12	Number of leaves week 6	0.98ns	22.68
13	Skinned cob length	4.22**	9.92
14	Skinned cob weight	3.77*	26.63
15	Cob length without skin	6.23**	13.18
16	Cob Weight without skin	7.05**	25.69
17	Plant wet weight	0.42ns	37.65
18	Plant dry weight	0.61ns	46.29
19	Cob diameter	3.05*	12.18

Note: ns: (not significantly different),
* : (significantly different), ** : (very significantly different)

In Fig. 2 shows the plant height always increases during the observation period 1 up to 6 weeks after planting. On 1 to 2 weeks after planting showed the highest increase in plant height in the treatment (T1P1) of oil palm bunch ash 20 tons ha^{-1} + cow manure 42 tons ha^{-1} with value of 27.30 cm. After 2 to 6 weeks after planting showed the highest increase in plant height at the treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure 42 tons ha^{-1} with the highest plant height after 6 weeks of planting with value of 138.17 cm. Based on the results of the analysis of variance on the plant height, the effect was not significantly different, therefore the 5% LSD test was not continued.

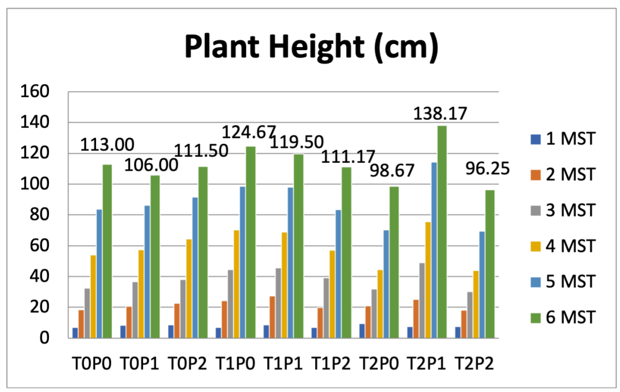

Figure 2. Average height of sweet corn plants

The treatment of oil palm bunch ash and cow manure had no significant effect on plant height. It was estimated that the nutrient requirements for sweet corn were already sufficient in the initial soil, thus the dose of treatment had no effect on the growth of sweet corn (Asroh, 2010). High rainfall results in nutrients such as N which are provided through fertilizers that have not been absorbed by plant roots because they are leached. Plants can have good growth during the vegetative phase if their nutrient needs are met properly. The sufficient nutrient will affect the process of plant tissue metabolism (Syafruddin et al., 2012). At the beginning growth rate will be slow, but eventually the growth will be faster (Mahdiannoor et al., 2016).

3.5 Number of Leaves

Based on the analysis of variance, the treatment had no significant effect on the number of leaves. After 6 weeks of planting, the highest number of leaves was obtained at the treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure 42 tons ha^{-1} with a value of 9.83 strands, and the lowest was found at the treatment (T2P2) of oil palm bunch ash 60 tonnes ha^{-1} + cow manure 84 tonnes ha^{-1} with a value of 6.23 strands. A figure of the number of leaves of the sweet corn is presented in Fig. 3.

Based on the results of the analysis of variance of number of leaves, the effect was not significantly different, therefore the 5% LSD test was not continued. Treatment of oil palm bunch ash and cow manure on the number of leaves had no effect on the treatment, perhaps due to the dominant plant genetic factor determining the number of leaves. Therefore the number of leaves that come out tends to be

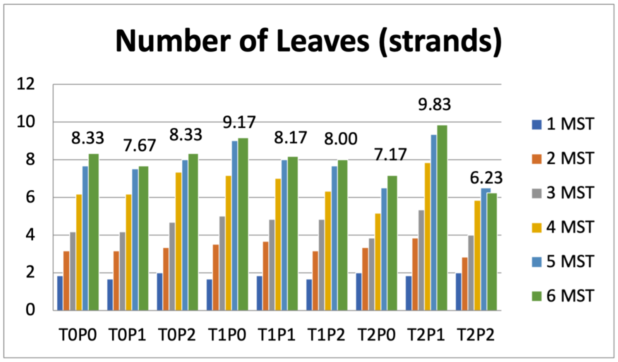

Figure 3. Average number of leaves of sweet corn plants

slow so it is difficult to be influenced by external factors (treatment) (Agustiar et al., 2016). The low N nutrient content with acidic soil conditions also affect the number of plant leaves, it is suspected that the treatment dose applied does not meet the nitrogen nutrient requirements of sweet corn (Mahdiannoor et al., 2016). According to Gusniawati et al. (2008), a source of nutrition for plants that is important when forming leaves, proteins and other organic compounds is element N.

3.6 Skinned Cob Length

Analysis of variance showed that the application of various doses of different treatments had a significant effect on the length of the skinned cob. The highest value was obtained at the treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure 42 tons ha^{-1} with a value of 30.58 cm, while the lowest was found at the control plot with a value of 20.67 cm. The results of Least Significant Difference (LSD) at the 5% test level are presented in Table 4.

Based on the age of harvest at 73 days after planting, the highest value was obtained for length of cobs with skinned at treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure of 42 tons ha^{-1} with value of 30.58 cm and significantly different from the control plot, (T0P1) at cow manure of 42 tons ha^{-1}, (T0P2) at cow manure 84 tons ha^{-1}, and (T1P1) at oil palm bunch ash of 20 tons ha^{-1} + cow manure of 42 tons ha^{-1}, but not significantly different from the treatment of T1P0 at dose of oil palm bunch ash 20 tons ha^{-1}, (T1P2) at palm oil bunch ash 20 tons ha^{-1} + cow manure 84 tons ha^{-1}, (T2P0) at palm oil bunch ash of 60 tons ha^{-1}, and (T2P2) at palm oil bunch ash of 60 tons ha^{-1} + cow manure 84 tons ha^{-1}.

The test results showed that the treatment had a very significant effect on the production period because the nutrients provided through the fertilizer were the same as the soil. The use of the element phosphorus (P) for plants helps the formation of seeds and roots during early growth, and accelerates fruit ripening (Hayati, 2006). Phosphorus element is needed in the ripening of seeds, cob formation and cob filling. The additional length of the skinned cob allows for more seeds to form. Therefore the availability of energy for the formation of more seeds. The element nitrogen for plants is very influential because it is important for cell division which encourages volume and size growth (Puspadewi et al., 2016).

3.7 Skinned Cob Weight

The analysis of variance revealed that the administration of various doses of different treatments had a significant effect on the skinned cob weight. The highest value was obtained at the treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure 42 tons ha^{-1} with a value of 355.12 g, while the lowest value was found at the control plot with a value of 153.22 g. Least Significant Difference (LSD) at the 5% test for skinned cob weight are presented in Table 5.

Based on harvest age at 73 days after planting, the highest value was obtained at the treatment (T2P1) of oil palm bunch ash of 60 tons ha^{-1} + cow manure of 42 tons ha^{-1} with a value of 355.12 g and significantly different from the treatment of control, (T0P1) at cow manure of 42 tons ha^{-1}, (T0P2) at cow manure of 84 tons ha^{-1}, (T1P1) at oil palm bunch ash of 20 tons ha^{-1} + cow manure of 42 tons ha^{-1}, (T2P0) at oil palm bunch ash of 60 tons ha^{-1}, and (T2P2) at oil palm bunch ash of 60 tons ha^{-1} + cow manure of 84 tons ha^{-1}, but not significantly different from the treatment (T1P0) of oil palm bunch ash 20 tons ha^{-1} and (T1P2) at oil palm bunch ash of 20 tons ha^{-1} + cow manure of 84 tons ha^{-1}.

The test results indicated that the treatment showed a very significant effect on the sweet corn production period because it was able to meet the nutritional needs of the plant. Oil palm bunch ash and cow manure are hygroscopic and alkaline as a source for liming so that they can increase soil pH and fertilize the soil and can increase the elements of Mg, Ca, K, P, and N (Nursida et al., 2019). According to Puspadewi et al. (2016), the element N for plants is very influential in being an important element for cell division which encourages growth, both increasing volume and weight of cobs.

3.8 Cob Length Without Skin

Analysis of variance revealed that the administration of various doses of different treatments had a significant effect on the cob length without skin. The highest values were obtained at the treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure 42 tons ha^{-1} with a value of 22.08 cm, while the lowest value was found at the control plot with a value of 12.73 cm. Test Least Significant Difference (LSD) at the 5% for cob length without skin are presented in Table 6.

Based on the harvest age of 73 days after planting, the highest value was found at the treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure 42 tons ha^{-1} with a

Table 4. The effect of oil palm bunch ash and cow manure on the length of sweet corn skinned cobs

Treatment			Cob length skinned (cm)
Symbol	Oil palm bunch ash (T)	Cow manure (S)	
T0P0	0	0	20.67 a
T0P1	0	42 tons/ha	24.75 a
T0P2	0	84 tons/ha	26.33 b
T1P0	20 tons/ha	0	29.67 c
T1P1	20 tons/ha	42 tons/ha	25.58 b
T1P2	20 tons/ha	84 tons/ha	29.42 c
T2P0	60 tons/ha	0	29.08 c
T2P1	60 tons/ha	42 tons/ha	30.58 c
T2P2	60 tons/ha	84 tons/ha	29.25 c
BNT 5%			2.7

Note: Numbers followed by the same small letter had not significantly different at 5% LSD test

Table 5. The effect of oil palm bunch ash and cow manure on the skinned cob weight

Treatment			Skinned cob weight (g)
Symbol	Oil palm bunch ash (T)	Cow manure (S)	
T0P0	0	0	153.22 a
T0P1	0	42 tons/ha	203.48 a
T0P2	0	84 tons/ha	177.22 a
T1P0	20 tons/ha	0	331.72 bc
T1P1	20 tons/ha	42 tons/ha	277.73 b
T1P2	20 tons/ha	84 tons/ha	313.40 bc
T2P0	60 tons/ha	0	286.15 b
T2P1	60 tons/ha	42 tons/ha	355.12 c
T2P2	60 tons/ha	84 tons/ha	178.90 a
LSD 5%			67.34

Note: Numbers followed by the same letter show results that are not significantly different in the 5% LSD test

Table 6. The effect of oil palm bunch ash and cow manure to the length of sweet corn without skin

Treatment			Cob Length Without Skin (cm)
Symbol	Oil palm bunch ash (T)	Cow manure (S)	
T0P0	0	0	12,73 a
T0P1	0	42 tons/ha	16,20 cd
T0P2	0	84 tons/ha	15,42 bc
T1P0	20 tons/ha	0	21,42 fg
T1P1	20 tons/ha	42 tons/ha	13,57 ab
T1P2	20 tons/ha	84 tons/ha	18,42 de
T2P0	60 tons/ha	0	19,75 ef
T2P1	60 tons/ha	42 tons/ha	22,08 g
T2P2	60 tons/ha	84 tons/ha	19,50 ef
LSD 5%			2,70

Note: Numbers followed by the same letter show results that are not significantly different in the 5% LSD test value of 22.08 cm and significantly different from the treatment control plot, (T0P1) at cow manure of 42 tons ha^{-1}, (T0P2) at cow manure of 84 tons ha^{-1}, and (T1P1) at oil palm bunch ash of 20 tons ha^{-1} + cow manure of 42 tons ha^{-1}, (T1P2) at oil palm bunch ash of 20 tons ha^{-1} + cow manure of 84 tons ha^{-1}, (T2P0) at oil palm bunch ash of 60 tons ha^{-1}, and (T2P2) at oil palm bunch ash of 60 tons ha^{-1} + cow manure of 84 tons ha^{-1}, but not significantly different from the treatment (T1P0) of oil palm bunch ash 20 tons ha^{-1}.

Application of all treatments is able to meet the nutritional sources of sweet corn. Fulfillment of the needs of macro and micro nutrients for plants, then for crop production results will be maximized. If the deficiency or excess of the nutrient can be a potential obstacle to the efficiency of other nutrients. The addition of P nutrients during the production period plays a role in the process of seed development or fruit formation (Novriani, 2010).

3.9 Cob Weight Without Skin

Analysis of variance revealed that the various doses of different treatments had a significant effect on the weight of the cob without the skin. The highest value was obtained at the treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure 42 tons ha^{-1} with a value of 287.35 g, while the lowest value was found at the control plot with a value of 108.70 g.

Based on the highest value of weight of cobs without skin, it was obtained in the treatment (T2P1) of oil palm bunch ash at 60 tons ha^{-1} + cow manure at 42 tons ha^{-1} with a value of 287.35 g and significantly different from the control plot, (T0P1) at cow manure of 42 tons ha^{-1}, (T0P2) at cow manure of 84 tons ha^{-1}, (T1P1) at oil palm bunch ash of 20 tons ha^{-1} + cow manure of 42 tons ha^{-1}, (T1P2) at oil palm bunch ash of 20 tons ha^{-1} + cow manure of 84 tons ha^{-1}, (T2P0) at oil palm bunch ash of 60 tons ha^{-1}, and (T2P2) at oil palm bunch ash of 60 tons ha^{-1} + cow manure of 84 tons ha^{-1}, but not significantly different from the treatment (T1P0) of oil palm bunch ash at 20 tons ha^{-1}. Least Significant Difference (LSD) at the 5% level are presented in Table 7.

Measurements were made after the corn was harvested at the age of 73 days after planting. The treatment dose given to the plants was thought to have fulfilled the nutritional needs of the nutrients for the plants. Nutrients for plants contained in treated fertilizer doses can increase seed weight production and accelerate fruit formation (Isnaini, 2006). The quality and size of the fruit during the production (generative) phase will be affected by the presence of potassium, while phosphorus serves to form flowers and fruit (Novizan, 2002).

3.10 Cob Diameter

Analysis of variance showed that the administration of various doses of different treatments had a significant effect on the cob diameter. The highest value was found at the treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure 42 tons ha^{-1} with a value of 51.02 mm, while the lowest one was obtained at the control plot with a value of 35.45 mm. Difference (LSD) at the 5% test level are presented in Table 8.

Based on the measurement after 73 days old, the average cob diameter was found the highest, at the treatment (T2P1) of oil palm bunch ash 60 tons ha^{-1} + cow manure 42 tons ha^{-1} with a value of 51.02 mm and significantly different from the control, (T0P1) at cow manure of 42 tons ha^{-1}, (T0P2) at cow manure of 84 tons ha^{-1}, and (T1P1) at oil palm bunch ash of 20 tons ha^{-1} + cow manure at 42 tons ha^{-1}, (T1P2) at oil palm bunch ash of 20 tons ha^{-1} + cow manure of 84 tons ha^{-1}, (T2P0) at oil palm bunch ash of 60 tons ha^{-1}, and (T2P2) at palm ash of 60 tons ha^{-1} + cow manure of 84 tons ha^{-1}, but not significantly different from the treatment (T1P0) of oil palm bunch ash 20 tons ha^{-1}.

The results of the analysis of the variability of the cob diameter indicated that the various treatment doses were sufficient for plant nutrients. The cob diameter is related to the cob length and cob weight. Increasing the size of the cob weight and cob length tends to increase the diameter of the sweet corn. The relatively high nitrogen content can increase the weight and length of the sweet corn cobs so that the cob diameter increases (Polii and Tumbelaka, 2012).

3.11 Soil pH After Harvesting

The initial soil pH before sweet corn planting was 3.82, indicating very acidic conditions. Then, after harvesting, the soil pH increased, ranging from 5.76 up to 7.01. The highest soil pH was obtained in the T2P2 treatment of oil palm bunch ash 60 tons ha^{-1} + cow manure 84 tons ha^{-1} with a value of 7.01. The soil pH of the control also increased compared to the original peat, with an increase in soil pH of around 1.94 units. The increase in pH was much greater if the ash of palm oil bunches and cow manure were added, as shown in Table 9.

Based on Table 9, it is suspected that the addition of oil palm bunch ash and cow manure can increase soil pH. In fact, this pH has a very important role for plants in terms of determining nutrients (Primadani, 2008). The alkaline cations produced from animal manure can fill the soil absorption complex causing the infertile peat soil shown by pH will increase from the original soil pH (Palupi, 2015). Oil palm bunch ash is characterized as a good ameliorant for remediation acidic soils because it has high base saturation and alkaline condition thus increases the pH level significantly and can support smart agriculture derived from local sources (Rahmadini et al., 2020).

Table 7. The effect of oil palm bunch ash and cow manure on the weight of cobs without skin

Treatment			Weight of cob without skin (g)
Symbol	Oil palm bunch ash (T)	Cow manure (S)	
T0P0	0	0	108.70 a
T0P1	0	42 tons/ha	123.75 a
T0P2	0	84 tons/ha	114.58 a
T1P0	20 tons/ha	0	264.42 c
T1P1	20 tons/ha	42 tons/ha	118.73 a
T1P2	20 tons/ha	84 tons/ha	174.52 b
T2P0	60 tons/ha	0	183.53 b
T2P1	60 tons/ha	42 tons/ha	287.35 c
T2P2	60 tons/ha	84 tons/ha	141.62 ab
LSD 5%			43,28

Note: Numbers followed by the same small letter show not significantly different at 5% LSD test

Table 8. Effect of oil palm bunch ash and cow manure on the cob diameter

Treatment			
Symbol	Oil palm bunch ash (T)	Cow manure (S)	Cob diameter (mm)
T0P0	0	0	35.45 a
T0P1	0	42 tons/ha	36.95 ab
T0P2	0	84 tons/ha	45.65 cd
T1P0	20 tons/ha	0	50.00 de
T1P1	20 tons/ha	42 tons/ha	45.53 cd
T1P2	20 tons/ha	84 tons/ha	41.62 bc
T2P0	60 tons/ha	0	44.05 c
T2P1	60 tons/ha	42 tons/ha	51.02 e
T2P2	60 tons/ha	84 tons/ha	40.57 abc
LSD 5%			5,28

Note: Numbers followed by the same small letter show not significantly different at 5

4. CONCLUSION

The application of oil palm bunch ash and cow manure had a significant effect on the length and weight of the cobs with the skin, the length and weight of the cobs without the skin, and the diameter of the cobs, but had no significant effect on plant height and number of sweet corn leaves (*Zea mays saccharata* Sturt) on peat soil. Treatment of 60 ton ha^{-1} of oil palm bunch ash and 42 ton ha^{-1} of cow manure was the best treatment compared to other treatments in increasing the growth and yield of sweet corn (*Zea mays saccharata* Sturt) on peat producing the highest dry corn with a value of 360.40 g $plant^{-1}$.

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