DOI :https://doi.org/10.36378/juatika.v4i2.1992
JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL.4 NO. 2 July 2022
eissn 2656-1727
pissn 2684-785X
Hal : 273 – 289

The Effectiveness of Slow Release Potassium Fertilizer Found on The Productivity of Oil Palm (*Elaeis guineensis Jacq.)* That Have Produced in Peatland

Ardian, M. Amrul Khoiri, Ugei Ramahendra Al-Faith, Nurbaiti, Angga Pramana*
Faculty of Agriculture, Riau University, Post Code 18193, Pekanbaru
Email correspondence : pramana.angga@lecturer.unri.ac.id

ABSTRACT

Oil palm (*Elaeis guineensis Jacq.*) comes from the Palmae *family* which is a source of vegetable oil. The production of oil palm plants that continues to increase certainly needs efforts, one of which is through fertilization. This study aimed to see the effectiveness of the frequency of treatment with slow release potassium fertilizer on the productivity of oil palm (*Elaeis guineensis Jacq*.) plants that have produced on peatlands. This has been implemented in an oil palm plantation in Pangkalan Baru Village, Siak Hulu District, Kampar Regency. The research has been carried out for six months starting from February 2021 to July 2021. This research was conducted using a non-factorial Randomized Block Design (RAK). The treatment consisted of 4 levels of treatment, namely a dose of 3 kg given 1 time / 6 months, a dose of 3 kg given 1.5 times / 6 months, a dose of 3 kg given 2 times / 6 months, and a dose of 3 kg given 3 times / 6 months. Each treatment was repeated 5 times. Therefore, 20 experimental units were obtained. Each experimental unit consisted of 3 sample plants so that the total number of sample plants used was 60 plants. The observed parameters were the number of female flower bunches, the number of male flower bunches, sex ratio, number of bunches, bunch weight, fresh fruit weight, and fresh fruit volume. The results of the research that have been carried out show that the application of treatment with a dose of 3 kg given 1.5 times / 6 months significantly increases the weight of bunches, weight of fresh fruit, and volume of fresh fruit on mature oil palm plantations on peatlands.

Keywords : *Palm Oil, Slow Release Potassium Fertilizer, Peat*

1. INTRODUCTION

Oil palm (*Elaeis guineensis Jacq.)* comes from the Palmae *family* which is a source of vegetable oil. In 2019, Indonesia has an oil palm plantation area of 14,677,560 Ha and in Riau Province it has an oil palm plantation area of 2,806,349 Ha (Directorate General of Plantations, 2018). Meanwhile, the production of Crude Palm Oil (CPO) in Riau Province in 2019 reached around 7.5 million tons (Riau Province Central Statistics Agency, 2020).

The production of oil palm plants that continues to increase certainly needs efforts, one of which is through fertilization. Fertilization is the addition of nutrients to plants so that they can be fulfilled properly in the soil. Fertilizers are divided into two, namely organic fertilizers and inorganic fertilizers. Organic fertilizers are fertilizers that come from plant remains through a decomposer process. Meanwhile, inorganic fertilizers are fertilizers that come from chemicals and can be used to add nutrients to plants.

Oil palm fruit weighing 1 ton is capable of producing as much as 23% or 230 kg of empty palm oil bunches (TKKS), 6.5% or 65 kg of shell, 4% or 40 kg of wet decanter solid, fiber (Fiber) 13% or 130 kg and 50% liquid (Simbolon et al., 2018).

Based on the analysis conducted (Safrida et al., 2019), palm ash contains 21.15% K2O, 2.42% P2O5, 2.22% CaO, and 2.46% MgO as well as other micro nutrients. According to Akmal (2018), that the ash of oil palm empty fruit bunches in addition to containing high K2O also contains micro-nutrients, namely Mn, Fe, Cl, Cu, B, and Zn. The high content of K2O in the ash of empty oil palm fruit bunches has the potential as a substitute for potassium fertilizer sold in the market, so that the ash from empty fruit bunches can be used as fertilizer. (2018) stated that the oil palm sludge content was dominated by N (27.03 kg ton^{-1} BK), P (2.54 kg ton^{-1} BK), K (15.5 kg ton^{-1} BK), Ca (14.20 kg ton^{-1} BK) and Mg (7.36 kg ton^{-1} BK).

One of the fertilizers on the market is slow release potassium fertilizer. Slow release potassium fertilizer is a fertilizer whose raw materials come from by-products of the Palm Oil Mill (PKS). The content of slow release potassium fertilizer is C-Organic 20.21%, C/N Ratio 24.57%, N 0.82%, P2O5 13.10%, K2O 20.93%. Research by Pramana et al. (2021) showed that fertilizer from empty fruit bunches had N content of 0.73%, C-Organic 9.28%, C/N ratio 12.29%, P 0.42%, K 3.99%, while the content of EFB only. N 6.28%, C-Organic 14.19%, C/N ratio 2.26%, P 1.88%, K 2.51% and Mg 1.61%

The nutrient content that is classified as high in slow release potassium fertilizer is potassium. The element potassium (K) plays a role in the formation of protein and carbohydrates and improves the quality of seeds or fruit (Sulardi & Sany, 2018).

Potassium is the most important nutrient, because this element is mostly transferred to oil palm fruit bunches (Bata et al., 2016). According to Saputra et al. (2018), the need for oil palm plants for potassium elements is higher than other elements, so that potassium deficiency has a major impact on decreasing fruit bunch production. According to Nurwidayati (2017), potassium nutrient greatly determines the quality of oil palm fresh fruit bunches.

Peat soil generally has a low pH level, has a high cation exchange capacity, low base saturation, has a low content of K, Ca, Mg, P elements and also has a low content of micro elements (such as Cu, Zn, Mn and B) anyway (Permatasari et al., 2021). According to Aziza et al. (2022), Potassium is the most

important nutrient after essential elements (N and P) as a supply of plant nutrients, so it is necessary to supply nutrients to peat soil with fertilization so that the growth and production of oil palm plants is more optimal. Research by Agung et al. (2019) applied EFB compost at a dose of 100 or 150 g/polybag with or without the addition of NPK fertilizer, indicating an increase in the number of seedling leaves. Seedling height, stem diameter, and leaf greenness.

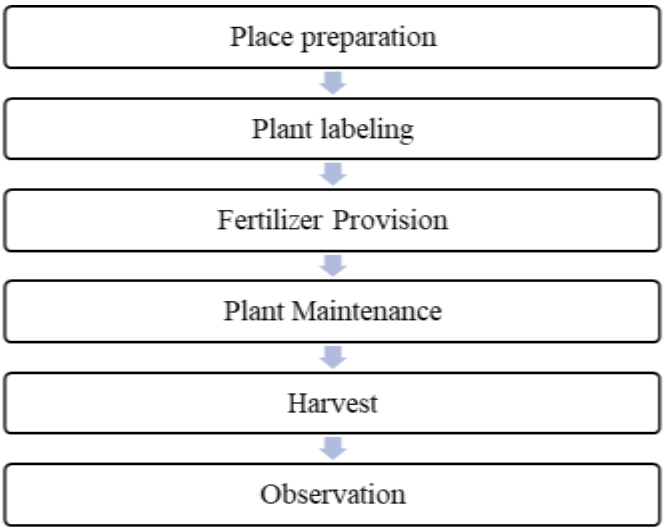
This study aims to see the effectiveness of the frequency of application of slow release potassium fertilizer on the productivity of oil palm (Elaeis guineensis Jacq.) plants that have produced on peatlands.

2. METHODOLOGY

This research has been carried out in the Plasma oil palm plantation in Pangkalan Baru Village, Siak Hulu District, Kampar Regency with a total plantation area of 1000 ha. The research has been carried out for 6 months starting from February 2021 to July 2021.

The materials used in this research are oil palm varieties Dura x Psifera (production of PPKS Marihat) which have produced 15 years old as many as 60 plants planted on 0.5 ha of peat soil and slow release potassium fertilizer. The tools used are machetes, hoe, digital scale, fruit scale, ruler, measuring cup, dodos/egrek, and stationery.

This research was conducted experimentally using a non-factorial Randomized Block Design (RAK). The treatment consisted of 4 levels of treatment, namely a dose of 3 kg given 1 time / 6 months, a dose of 3 kg given 1.5 times / 6 months, a dose of 3 kg given 2 times / 6 months, and a dose of 3 kg given 3 times / 6 months. Each treatment was repeated 5 times, therefore 20 experimental units were obtained. Each experimental unit consisted of 3 sample plants so that the total number of sample plants used was 60 plants. The flow of this research can be seen in the following figure:



Picture 1. Research chart

Parameters observed were the number of female flower bunches, the number of male flower bunches, sex ratio, number of bunches, bunch weight (kg), fresh fruit weight (gr), and fresh fruit

volume (ml). The data obtained from the research results were analyzed statistically by analysis of variance using SPSS. The results of the analysis of variance were further tested with Duncan's New Multiple Range Test (DNMRT) at a level of 5%.

3. RESULTS AND DISCUSSION

The number of female flower bunches, the number of male flower bunches, Sex ratio, and the Number of Bunches

The results of variance showed that the frequency of treatment with slow release potassium fertilizer had no significant effect on the number of female flower bunches, the number of male flower bunches, *sex ratio*, and the number of bunches. The results of the DNMRT further test at the 5% level on the number of female flower bunches, number of male flower bunches, *sex ratio,* and number of bunches can be seen in table 3.

Table 3. Number of Female Flower Bunches, Male Flower Bunches, Sex Ratio, and Number of Bunches on Frequency Treatment of Slow Release Potassium Fertilizer

.

Frequency of Slow Release Potassium Fertilizer	Total			
	TBB	TBJ	SR	T
Dosage 3 kg distribution 1 time / 6 months	6.80 a	6.06 a	1.13 a	9.06 a
Dosage 3 kg distribution 1.5 times / 6 months	7.13 a	6.26 a	1.14 a	8.93 a
Dosage 3 kg distribution 2 time / 6 months	6.33 a	6.33 a	1.09 a	8.80 a
Dosage 3 kg distribution 3 time / 6 months	6.59 a	6.13 a	1.08 a	9.20 a

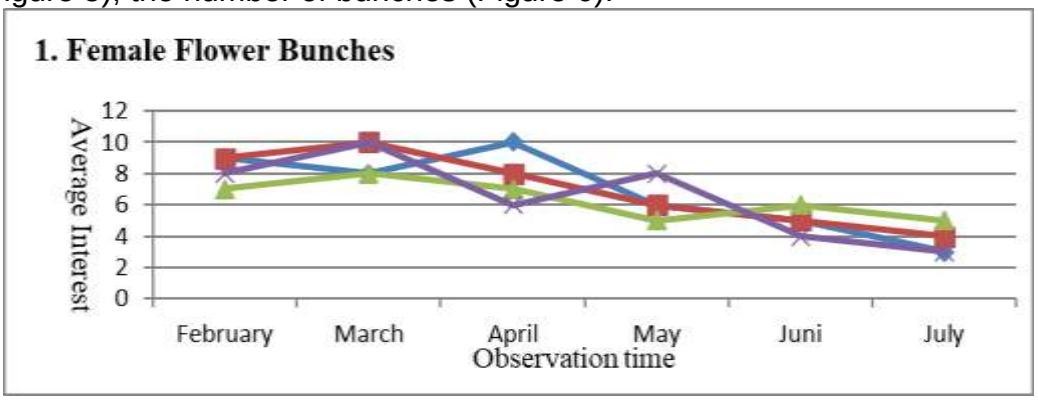
The numbers in the columns and rows followed by the same lowercase letters were not significantly different according to the DNMRT follow-up test with a level of 5%.

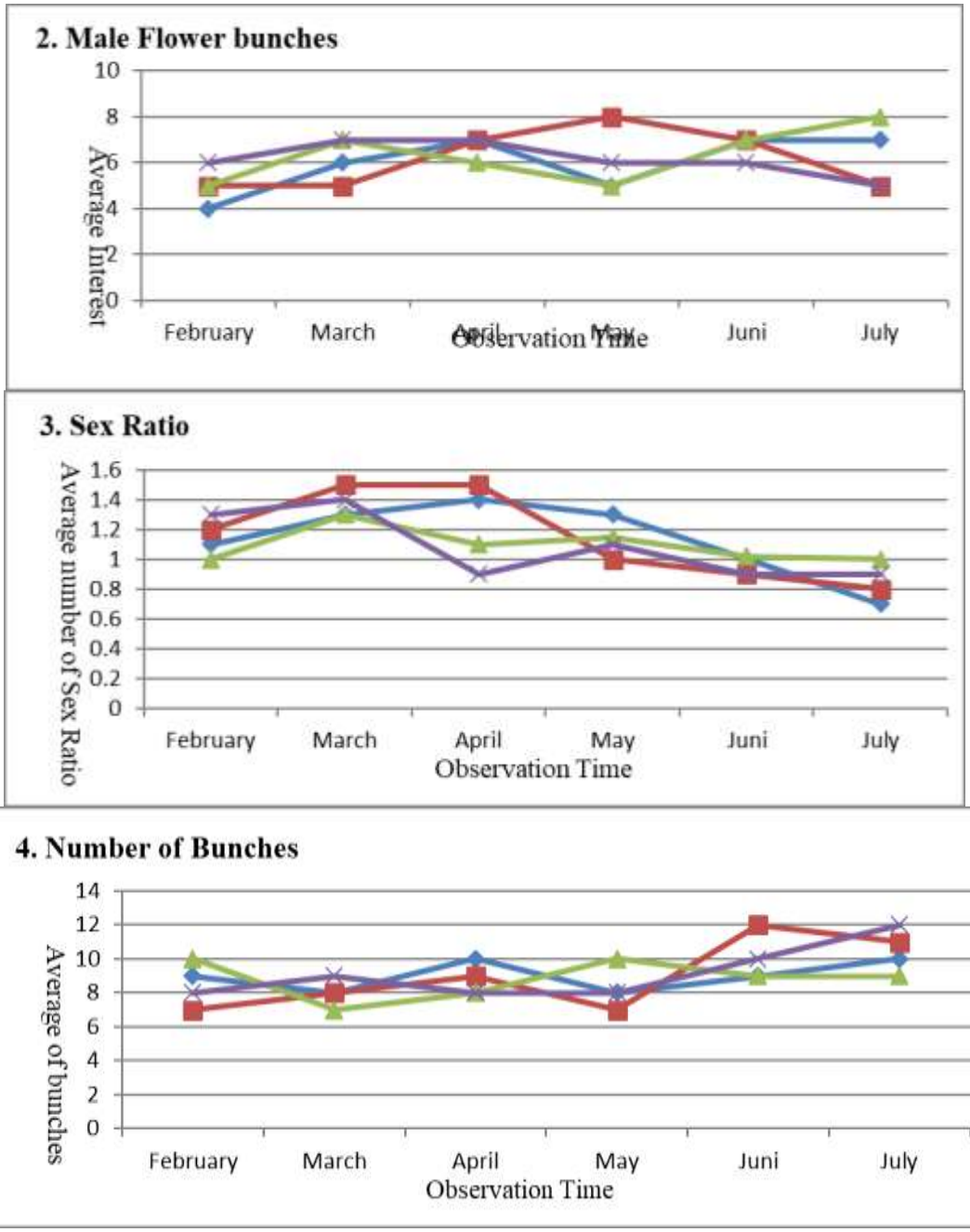
Table 3 shows the parameters of the number of female flower bunches for treatment at a dose of 3 kg given 1.5 times / 6 months giving higher results, namely 7.13 and not significantly different from treatment with a dose of 3 kg given 1 time / 6 months, a dose of 3 kg given 2 times/6 months and a dose of 3 kg given 3 times/6 months. In the parameter of the number of male flower bunches for treatment at a dose of 3 kg given 2 times / 6 months gave higher results, namely 6.33 and not significantly different from the treatment with a dose of 3 kg given 1 time / 6 months, a dose of 3 kg given 1.5 times / 6 months. month and a dose of 3 kg given 3 times / 6 months.

In the number of *sex ratio* parameters for treatment at a dose of 3 kg given 1.5 times / 6 months gave higher results, namely 1.14 and not significantly different from the treatment with a dose of 3 kg given 1 time / 6 months, a dose of 3 kg given 2 times / 6 months and a dose of 3 kg given 3 times / 6 months. In the parameter of the number of bunches for treatment at a dose of 3 kg given 3 times / 6 months gave higher results, namely 9.20 and not significantly different from the treatment with a dose of 3 kg given 1 time / 6 months, a dose of 3 kg given 1.5 times / 6 months and a dose of 3 kg given 2 times / 6 months.

Picture 2. Oil palm that was observed

The following is monthly data during the study on the parameters of the number of female flower bunches (Figure 3), the number of male flower bunches (Figure 4), sex ratio (Figure 5), the number of bunches (Figure 6).





Information : Dosage 3 kg distribution 1 time/6 months Dosage 3 kg distribution 1.5 times / 6 months Dosage 3 kg distribution 2 times / 6 months Dosage 3 kg distribution 3 times / 6 months

Table 3 shows that the parameters of the number of female flower bunches, the number of male flower bunches, the number of *sex ratios*, and the number of bunches gave no significantly different results between treatments at a dose of 3 kg given 1 time / 6 months, a dose of 3 kg given 1.5 times / 6 months, a dose of 3 kg is given 2 times / 6 months and a dose of 3 kg is given 3 times / 6 months.

It is suspected that the frequency of treatment with slow release fertilizer has not been able to increase the number of female flower bunches, the number of male flower bunches, the number of *sex ratios*, and the number of bunches because at the time of applying slow release potassium fertilizer, oil palm plants don't respond immediately.

The time interval of administration that is too frequent and too infrequent will result in low plant growth and actually decreases and is related to the time of administration. This is in accordance with the statement of Afianto et al. (2020) which states that the problem of time and method of giving a compound is important in order to increase the efficiency of plants in absorbing the given material. Jasmi et al. (2015) added that the availability of sufficient nutrients for plants is highly dependent on the time interval of administration, which at the appropriate time interval will provide sufficient nutrients for plants.

According to Lestari (2016), said that the uptake of nutrients by plants is not the same. There are times when plants grow very vigorously and quickly so that the exchange of nutrients is intensive, at that time the plants will take a lot of food nutrients. Mangering et al. (2021) stated that the proper placement of fertilizer and the timing of application are important factors in fertilization. To be effective, fertilizer must be applied correctly and when the plant needs it.

Tataridas et al. (2022) stated that one thing that needs to be considered in fertilization is the frequency and dose given must be in accordance with the rules or recommendations given on the label or calculations adapted to soil conditions and plant growth phases. According to Sulardi and Zulbaidah (2020) plants that obtain nutrients in optimum quantities and at the right time will grow and develop optimally.

Soetejo and Kartasapoetra (2013) stated that the application time also determines plant growth. Different fertilizer application times will have an effect on plant growth. Applying fertilizer through the leaves at too frequent intervals can lead to wastage of fertilizer. On the other hand, if the fertilizer interval is too infrequent, it can cause nutrient requirements for plants to be insufficient.

Good fertilization must pay attention to the right dose and time. Nuryani et al. (2019) stated that fertilizer application must be carried out correctly and according to the recommended concentration, because excessive application of fertilizer will cause poisoning to plants. Timsina (2018) which states that to achieve optimal fertilization efficiency, fertilizer must be given in an amount that meets the needs of the plant, not too much and not too little. If the application of fertilizer is too much, the soil solution will be too concentrated so that it can cause poisoning to plants, on the other hand, if there is too little fertilization, the effect of fertilization on plants may not be visible.

Flower development is also influenced by climatic and genetic factors. Climatic conditions are one of the main environmental factors that affect the success of oil palm development. The emergence of midrib and flowers is influenced by climatic and genetic variations (Hoffmann et al., 2014).

According to Trimanto et al. (2020), that flowering is part of the plant life cycle which is strongly influenced by genetic and environmental factors. According to Trimanto et al. (2020), said that the process of flowering and fruit formation is also influenced by external factors, including temperature, temperature, short day length and altitude.

In the process of plant production, the number of fruit is closely related to the number of flowers formed by the plant itself, this is also supported by the state of the surrounding environment. Not all flowers that are formed can undergo fertilization and not all fruits that are formed can continue to grow until they become ripe fruit (Elfarisna & Pratiwi, 2022). From a physiological point of view, it is impossible for a plant to grow all the fruit to be large and ripe, as long as the

plant cannot provide sufficient nutrients for fruit growth (Maulana, 2020).

Sari et al. (2018) stated that the phenology of the emergence of female flowers is supported by relatively hot environmental conditions, while male flowers are supported by more humid environmental conditions. The climatic conditions that support the formation of this flower will make the flower bunches develop well, so that pollination runs smoothly. Hasibuan et al. (2017) stated that high pollination success will increase fruit set, so that the size of fresh fruit bunches becomes larger and denser.

Bunch Weight (kg)

The results of the variance showed that the frequency of application of slow-release potassium fertilizer had a significant effect on the weight of the bunch. The results of the DNMRT further test at the 5% level of the bunch weight (can be seen in Table 4).

Table 4. Bunch weight (kg) in the treatment of the frequency of slow release potassium fertilizer

Frequency of Slow Release Potassium Fertilizer	Average Bunch Weight (kg)
Dosage 3 kg distribution 1 time / 6 months	10.03 ab
Dosage 3 kg distribution 1,5 time/ 6 months	10.31 a
Dosage 3 kg distribution 2 times/ 6 months	9.22 ab
Dosage 3 kg distribution 3 times / 6 months	8.97 b

The numbers in the column followed by the same lowercase letter are not significantly different according to *Duncan's new Multiple Range Test* (DNMRT) advanced test with a level of 5%.

Table 4 shows the parameters of the average number of bunches weight for treatment at a dose of 3 kg given 1.5 times / 6 months giving higher yields of 10.31 kg and significantly different from the treatment with a dose of 3 kg given 1 time / 6 months, a dose of 3 kg. administration of 2 times / 6 months and a dose of 3 kg of administration 3 times / 6 months.

The following is monthly data during the study on the parameters of the average number of bunches weight (kg) (can be seen in Figure 7).

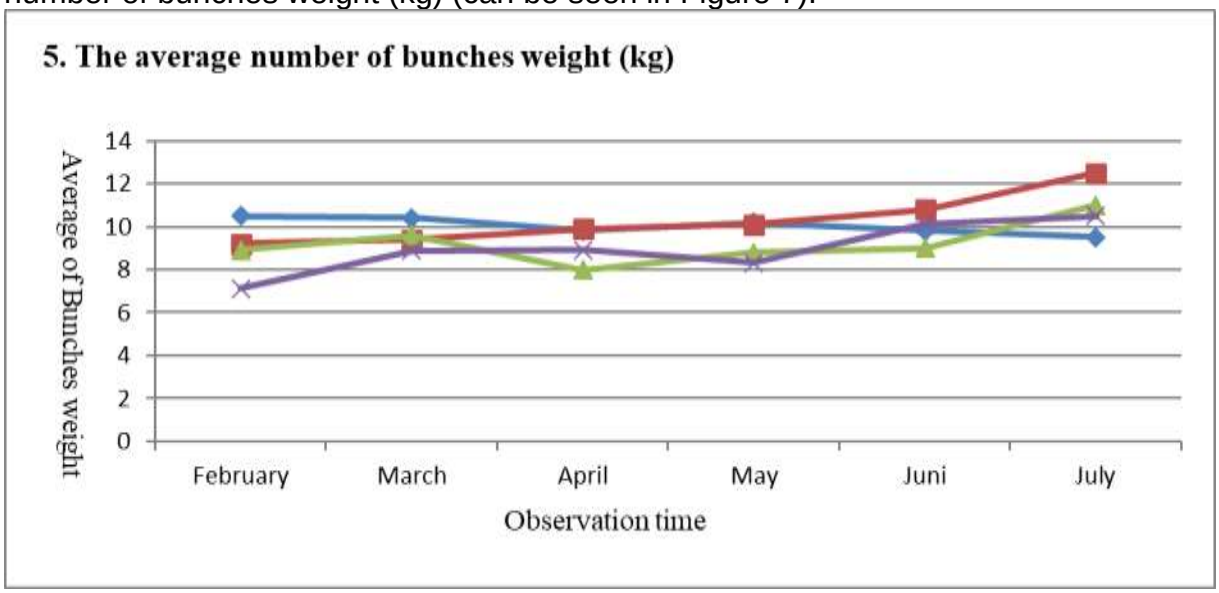


Table 4 shows that the frequency of treatment with slow release potassium fertilizer at a dose of 3 kg given 1.5 times/6 months resulted in significantly different bunch weights compared to other treatments. It is suspected that at a dose of 3 kg treatment given 1.5 times / 6 months has been able to increase the weight of the bunch due to the high content of K nutrients so that it helps the nutrient needs in the soil. Marginingsih et al., (2018) stated that in the process of plant growth and development it is necessary to absorb nutrients in the soil so that the nutrient needs of plants can be met.

Picture 8 . comparison of fruit bunches between treatments

1 time / 6 months	1,5 time / 6 months	2 time / 6 months	3 time / 6 months

Slow release potassium fertilizer has a higher potassium nutrient content which can help the process of forming roots of oil palm plants. According to Reski et al. (2021), an increase in root surface area can occur with the addition of potassium nutrients which can increase the dry weight of the roots so that nutrient absorption becomes greater. Potassium plays a role in photosynthetic enzymes, carbohydrate translocation and CO2 absorption in the leaf mouth.

According to Khaswarina (2001), mentioning that potassium can stimulate root elongation, then Jumin and Hasan Basri (2014), that potassium in addition to improving roots also plays a role in the formation of chlorophyll. According to Agus (2013), there is a contribution of root respiration in oil palm plants on peatlands. Yahya et al. (2013) stated that the root system of oil palm is limited by the presence of a layer of groundwater.

Azlansyah (2013) adds that if plant roots develop well, other plant parts will grow and develop well because plant roots are able to absorb nutrients and water well. According to Saputra et al. (2018), element K plays a role in regulating turgor pressure, activating enzymes in photosynthetic reactions and enzymes in protein and starch synthesis. According to Halpera and Subagiono (2019), potassium is important in the preparation of oil and affects the number and size of bunches.

Fruit filling greatly affects the availability of nutrients for the photosynthesis process which produces carbohydrates, fats, mineral proteins which will be translocated to the storage section for example in fruit (Firdaus & Juanda, 2022). Provision of fertilizers must use good management so that the results obtained in the production of oil palm plants are more optimal. In accordance with the statement of Jasmi

et al. (2015), that achieving the effectiveness and efficiency of fertilization is recommended to refer to the 5T rules (on time, right type, right dose, right method, and right on target) and trained workers. Karsino and Islan (2015) stated that the fertilization period for mature plants should be carried out 3 times a year or 1 time within a period of 4 months, because the frequency of fertilization will affect production results.

Fresh Fruit Weight (gr)

The results of the variance showed that the frequency of application of slow-release potassium fertilizer had a significant effect on fresh fruit weight. The results of the *Duncan New Multiple Range Test* (DNMRT) further test at a level of 5% on fresh fruit weight (can be seen in Table 5).

Table 5. Fresh Fruit Weight on the frequency treatment of slow release potassium fertilizer.

Frequency of Potassium Fertilizer Slow Release	Average Fresh Fruit Weight (gr)
Dosage 3 kg distribution 1 time / 6 months	15.37 ab
Dosage 3 kg distribution 1,5 time / 6 months	15.88 a
Dosage 3 kg distribution 2 time / 6 months	14.44 b
Dosage 3 kg distribution 3 time / 6 months	14.39 b

The numbers in the column followed by the same lowercase letter are not significantly different according to *Duncan's new Multiple Range Test* (DNMRT) advanced test with a level of 5%.

Table 5 shows that the parameters of the average amount of fresh fruit weight for treatment at a dose of 3 kg given 1.5 times/6 months gave higher yields of 15.88 g and significantly different from the treatment with a dose of 3 kg given 1 time/6 months, the dose 3 kg given 2 times / 6 months and a dose of 3 kg given 3 times / 6 months.

The following is monthly data during the study on the parameters of the average number of fresh fruit weights (gr) (can be seen in Figure 9).

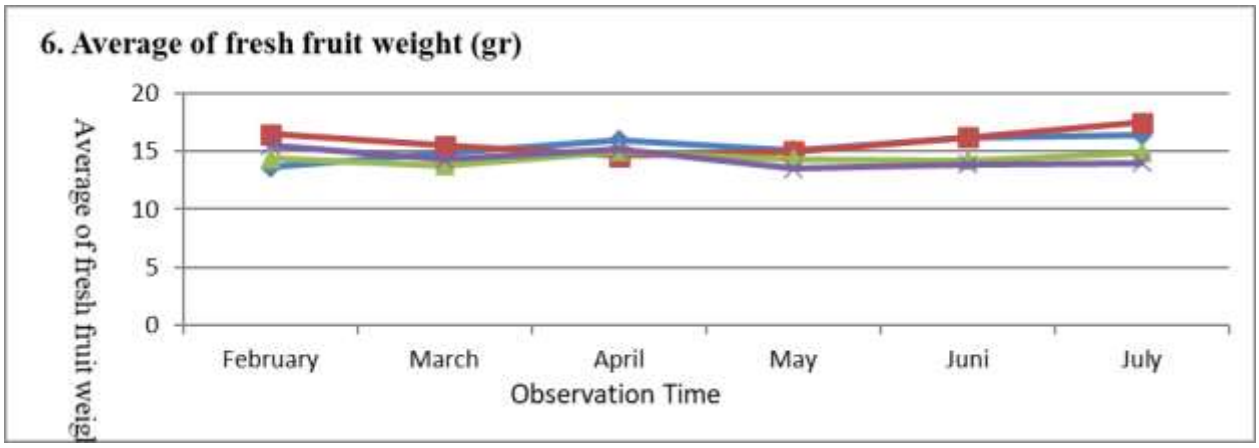


Table 5 shows that the frequency treatment of slow release potassium fertilizer at a dose of 3 kg given 1.5 times/6 months resulted in significantly different fresh fruit weights compared to other treatments. It is suspected that at a dose of 3 kg treatment given 1.5 times / 6 months has been able to increase the

weight of fresh fruit because the nutrients in the slow release super potassium fertilizer can help in increasing the weight of the fresh fruit of oil palm. Ginting and Panjaitan (2018) stated that oil palm requires adequate macro and micro nutrients to support growth and yield.

Slow release potassium fertilizer whose basic ingredients come from by-products of palm oil mills which contain potassium which is relatively high and needed by plants. According to Nazari (2020), the nutrient potassium functions to help the formation of protein and carbohydrates, plays a role in strengthening the plant body, hardens the woody parts of plants, leaves, flowers and fruit do not fall easily, increases plant resistance to drought and disease, and improves the quality of seeds. /fruit. According to Halpera and Subagiono (2019) element K is used to regulate carbohydrate translocation. Tumewu et al. (2015) stated that the element potassium is needed by plants in the synthesis of protein and carbohydrates as well as the translocation of carbohydrates more smoothly.

Yulianingsih (2019) stated that the benefits of potassium for plants are helping the formation of protein, carbohydrates and sugar. It Helps the transport of sugar from leaves to fruit, strengthening plant tissues, and increasing resistance to disease. Urrego et al. (2014), stated that potassium is very useful in cell division, regulation of cell permeability, regulation of water in cells along with potassium elements. According to Aziza et al. (2022), the element of potassium can increase the formation of carbohydrates and produce better fruit.

Riyanti (2021) emphasized that in order to achieve optimal fertilization, fertilizers must be given in sufficient quantities for the continued growth and development of these plants. According to Budiargo et al. (2015), fertilizers must be used efficiently and on target. Arsyad et al. (2012) stated that the availability of nutrients in sufficient and fulfilled quantities can affect the growth and development of plants so that they are able to produce according to their potential.

Good fertilization must follow the 5 T rules, namely the right dose, the right type, the right time, the right application, and the right target (Susilowati & Kusumo, 2019). Natalia et al. (2016) stated that the right dose means that the plant does not get fertilizer in an insufficient and not excessive amount.

According to Nurwidayati (2017), the weight of fruit in oil palm bunches will increase along with the age of the fruit because the translocation of assimilate to the fruit continues until it reaches physiological maturity. The ripening of the fruit is marked by the release of the fruit from the bunch, which is called membrondol and this loose fruit is used as a sign of fruit maturity. Fresh fruit bunches (FFB) harvested at fruit maturity are indicated by at least 1 loose fruit bunches per kg FFB for bunches weighing more than 10 kg and 2 bunches for bunches weighing less than 10 kg.

According to the research of Pambudi et al. (2016), that increasing water availability causes fruit filling time to run well so that fruit weight increases. According to Harahap et al. (2016), the weight and size of the fruit will increase with the increasing age of the oil palm plant. The age of the plant affects the fresh weight of the fruit, the dry weight of the fruit and the volume of the fruit.

According to Hidayat and Hariyadi (2019), fruit maturity is determined through physiological maturity where the fruit has perfect shape and the oil content is optimal. Physiological ripeness is fruit maturity that has been further marked by the outer fruit that has separated from the bunch and has fallen to the ground, which

is used for the criteria for ripening bunches in harvesting.

Fresh Fruit Volume (ml)

The results of variance showed that the frequency of treatment with slow release potassium fertilizer had a significant effect on the volume of fresh fruit. The results of the *Duncan New Multiple Range Test* (DNMRT) further test at a level of 5% on the volume of fresh fruit (can be seen in Table 6).

Tabel 6. Fresh Fruit Volume in the treatment of slow release potassium fertilizer frequency

Frequency of Slow Release Potassium Fertilizer	Average Fresh Fruit Volume (ml)
Dosage 3 kg distribution 1 time / 6 months	15.30 a
Dosage 3 kg distribution 1,5 time / 6 months	15.63 a
Dosage 3 kg distribution 2time / 6 months	14.30 b
Dosage 3 kg distribution 3 time / 6 months	14.24 b

The numbers in the column followed by the same lowercase letter are not significantly different according to *Duncan's new Multiple Range Test* (DNMRT) advanced test with a level of 5%.

Table 6 shows that the parameters of the average volume of fresh fruit for treatment at a dose of 3 kg given 1.5 times/6 months gave higher yields, namely 15.63 ml and significantly different from the treatment with a dose of 3 kg given 1 time/6 months. 3 kg given 2 times / 6 months and a dose of 3 kg given 3 times / 6 months.

The following is monthly data during the study on the parameters of the average volume of fresh fruit (ml) (can be seen in Figure 10).

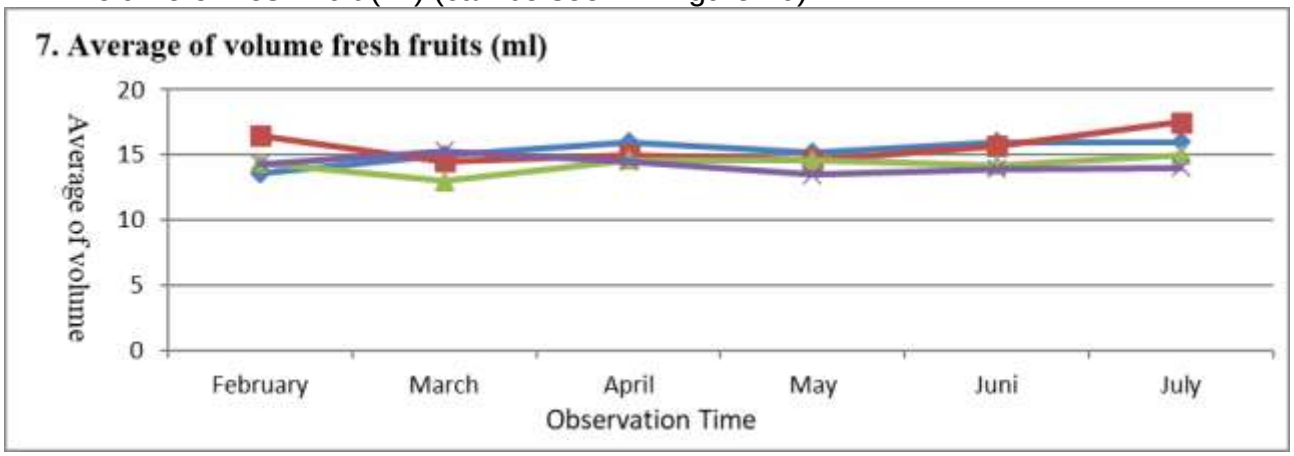


Table 6 shows that the frequency treatment of slow release potassium fertilizer at a dose of 3 kg given 1.5 times/6 months resulted in significantly different volumes of fresh fruit compared to other treatments. It is suspected that at a dose of 3 kg, administration of 1.5 times/6 months of slow release potassium fertilizer has been able to increase the volume of fresh fruit because the nutrients in this slow release potassium fertilizer

can help complement the nutrient requirements in the soil.

The element potassium plays a role in metabolic processes and has a special influence on nutrient absorption, regulation of respiration, transpiration, enzyme work and functions as carbohydrate translocation (Riski & Susila, 2019). According to Urrego et al. (2014), the potassium element in plants functions in the process of sugar and starch formation, sugar translocation, enzyme activity and stomata movement. Nurwidayati (2017) stated that the element potassium gives strength to stems and stimulates leaf growth in plants, helps translocation of photosynthetic products, and stimulates root growth.

According to Budiargo et al. (2015), that fertilization can increase soil fertility which causes the level of plant production to be relatively stable. In addition, fertilization is very useful in completing the supply of nutrients in the soil so that plant needs are met. Saputra et al. (2018) stated that the use of good fertilizers and the right way will affect oil palm production.

According to Mangering et al. (2021), the time and frequency of fertilization is determined by climate (especially rainfall), soil physical properties, logistics and the presence of synergistic and antagonistic properties between nutrients. Rainfall plays a role as a parameter in determining the time of application of fertilization. The dose of fertilizer is determined based on the age of the plant, soil type, ground cover condition, visual condition of the plant. Fertilization time is determined based on the plant age schedule. Increasing crop productivity can be done with effective and efficient fertilization in fertilization management.

Fruit ripening occurs when the maximum accumulation of chemicals in the fruit occurs, where fat as the main constituent of the fruit including the mesocarp and seeds or kernel can reach 45% based on the wet mesocarp weight (Mulyadi et al., 2017)\.

Generally, fruit that is ready to be harvested is ripe fruit which is marked by brondolons that have separated from the bunches around the disk. According to Huori (2018), fruit yields are stated with good criteria if the composition of normal or ripe FFB is 98% and raw and rotten fruit is 2%. Prayogi et al. (2016) stated that the heavier a fruit is in a fresh state, when the fruit is dried it will experience a small weight loss, causing the fruit to remain heavy, as well as its volume.

Small palm fruit between 12-18 g / grain sits on the grain. Each grain consists of 10-18 grains depending on the perfection of pollination. Palm fruit that is harvested in the form of bunches is called palm fruit bunches (Akmal, 2018). Huori (2018) stated that any increase in time and fruit size will affect the dry weight and volume of the fruit itself. This is because the increasing weight and size of the fruit will increase the chemical composition and structure of the oil palm fruit so that it affects the dry weight of fruit and fruit volume.

According to Bata et al. (2016), the fresh weight of the fruit will affect the dry weight of the fruit and the volume of the oil palm fruit, because the fruit that has a heavy weight will have a large size and cross-sectional area of the fruit so that it will affect the volume of the fruit and its dry weight.

4. CONCLUSION

Based on the research that has been done, it shows that the application of treatment with a dose of 3 kg given 1.5 times / 6 months significantly increases

the weight of bunches, fresh fruit weight, fresh fruit volume in oil palm plants that have matured on peatlands.

REFERENCE

Afianto, A. K., Djarwatiningsih, & Sulistyono, A. (2020). Effect of Concentration and Time Intervals of Liquid Organic Fertilizers on Tomato Growth and Yield (Lycopersicum esculentum L.). *Plumula*, *8*(2), 2089–8010.

Agung, A. K., Adiprasetyo, T. A., & Hermansyah, H. (2019). Penggunaan Kompos Tandan Kosong Kelapa Sawit Sebagai Subtitusi Pupuk Npk Dalam Pembibitan Awal Kelapa Sawit. *Jurnal Ilmu-Ilmu Pertanian Indonesia*, *21*(2), 75–81. https://doi.org/10.31186/jipi.21.2.75-81

Akmal. (2018). Respon Pemberian Abu Tandan Kosong Kelapa Sawit Terhadap Produksi Tanaman Mentimun (Cucumis sativus L.). *Journal TABARO Agriculture Science*, *2*(1), 152–163. http://www.ojs.unanda.ac.id/index.php/jtas/article/view/109

Arsyad, Junedi, H., & Farni, Y. (2012). Pemupukan Kelapa Sawit Berdasarkan Potensi Produksi untuk Meningkatkan Hasil Tandan Buah Segar (TBS) pada Lahan Marginal Kumpeh. *Jurnal Penelitian Universitas Jambi*, *14*(1), 29–36.

Aziza, I., Rahayu, Y. S., & Dewi, S. K. (2022). Pengaruh Pupuk Organik Cair dengan Penambahan Silika dan Cekaman Air terhadap Tanaman Kedelai. *Journal Unesa*, *11*, 183–191. https://journal.unesa.ac.id/index.php/lenterabio/index%0A183

Badan Pusat Statistik Provinsi Riau. (2020). *Provinsi Riau Dalam Angka 2020*.

Bata, Y., Rahayu, E., & Andayani, N. (2016). Produktivitas Kelapa Sawit Yang Dipupuk Dengan Tandan Kosong Kelapa Sawit. *Jurnal Agromast*, *1*(2). http://journal.instiperjogja.ac.id/index.php/JAI/article/view/316

Budiargo, A., Purwanto, R., & Sudradjat, . (2015). Manajemen Pemupukan Kelapa Sawit (Elaeis guineensis Jacq.) di Perkebunan Kelapa Sawit, Kalimantan Barat. *Buletin Agrohorti*, *3*(2), 221–231. https://doi.org/10.29244/agrob.v3i2.14986

Elfarisna, & Pratiwi, D. S. (2022). Respons pemberian vermikompos pada tanaman okra hijau (Abelmoschus esculentus). *Agrovigor: Jurnal Agroekoteknolog*, *15*(8.5.2017), 10–17.

Firdaus, R., & Juanda, B. R. (2022). Pengaruh Varietas Dan Dosis Pupuk Npk Mutiara Terhadap Pertumbuhan Dan Hasil Cabai Merah Hibrida. *Prosiding Seminar Nasional Pertanian*, 111–124. https://www.ejurnalunsam.id/index.php/psn/article/view/4810%0Ahttps://www.ejurnalunsam.id/index.php/psn/article/download/4810/3033

Ginting, C., & Panjaitan, M. (2018). Perkembangan fruit set tandan kelapa sawit (Elaeis guineensis Jacq.) dengan perlakuan berbagai formula hara. *Agroista*, *02*(01), 41–51.

Halpera, H., & Subagiono. (2019). Pengaruh Pemberian Dosis Kcl Terhadap Pertumbuhan dan Hasil Tanaman Kelapa Sawit (Elaeis Quinensis Jack) Tm 15 Di Ultisol Kabupaten Bungo. *Jurnal Sains Agro*, *4*(2), 1–7. https://ojs.umb-bungo.ac.id/

Harahap, L. S., Rasyad, A., & Khoiri, I. M. A. (2016). Pola Perubahahan Beberapa Sifat Morfologis dan

Fisiologis Buah Kelapa Sawit (Elaeis guineensis Jacq.) selama Perkembangan Sampai Saat Panen. *J. Agrotek. Trop*, *5*(2), 62–69.

Hasibuan, H. A., Purba, A. R., & Lubis, M. I. (2017). Ragam Genetik Kandungan Asam Lemak , Bilangan Iodine Dan Beta Karoten 24 Aksesi Plasma Nutfah Kamerun Koleksi Pusat Penelitian Kelapa Sawit Genetic Variability in Fatty Acid and Beta Carotene Content of 24 Accessions Cameroon Germplasm of Iopri Collection. *J. Pen. Kelapa Sawit*, *25*(1), 1–9.

Hidayat, D. D., & Hariyadi. (2019). Manajemen Panen Kelapa Sawit (Elaeis gueneensis Jacq.) di Seruyan Estate, Kebun Minamas, Kalimantan Tengah. *Buletin Agrohorti*, *7*(3), 311–318. https://doi.org/10.29244/agrob.v7i3.30203

Hoffmann, M. P., Vera, A. C., Wijk, M. T. van, Giller, K. E., Oberthür, T., Donough, C., Whitbread, A. M., & Fisher, M. J. (2014). Simulating Potential Growth and Yield of Oil Palm with PALMSIM. *Better Crops*, *98*(4), 25–26.

Jasmi, Mahdjali, S., & Gunawan, J. (2015). Pengaruh Konsentrasi dan Interval Waktu Pemberian Pupuk Organik Cair (POC) dan Kuda Laut Terhadap Pertumbuhan Dan Hasil Tanaman Terung (Vigna sinensis L.). *Jurnal Agrotek Lestari*, *1*(1), 35–46. http://jurnal.utu.ac.id/jagrotek/article/view/436/372

Karsino, E., & Islan, I. (2015). Implementasi Pemupukan Tanaman Kelapa Sawit (Elaeis Guineensis Jacq) Pola Perkebunan Kkpa pada Lahan Gambut di Kabupaten Rokan Hilir dan Kabupaten Siak. *Jurnal Online Mahasiswa Fakultas Pertanian Universitas Riau*, *2*(1), 1–14. http://dx.doi.org/10.1016/j.biochi.2015.03.025%0Ahttp://dx.doi.org/10.1038/nature10402%0Ahttp://dx.doi.org/10.1038/nature21059%0Ahttp://journal.stainkudus.ac.id/index.php/equilibrium/article/view/1268/1127%0Ahttp://dx.doi.org/10.1038/nrmicro2577%0Ahttp://

Lestari, S. A. D. (2016). Pemanfaatan paitan sebagai pupuk organik pada tanaman kedelai. *Iptek Tanaman Pangan*, *11*(1), 49–56.

M. Huori. (2018). Formulasi Model Nilai Sortasi Panen (NSP) dan Indeks Pengutipan Brondolan (IPB) sebagai Indikator Kinerja Pemanenan Kelapa Sawit. *Jurnal Citra Widya Edukasi*, *X*(1), 87–96.

Mangiring, W., Yatmin, & Krisnarini. (2021). Respon Pertumbuhan Stek Lada (Pipper nigrum L) Pada Berbagai Konsentrasi Pupuk Organik Cair dan Waktu Pemupukan. *EnviroScienteae*, *17*(3), 6.

Marginingsih, R. S., Nugroho, A. S., & Dzakiy, M. A. (2018). Pengaruh Substitusi Pupuk Organik Cair Pada Nutrisi AB mix terhadap Pertumbuhan Caisim (Brassica juncea L .) pada Hidroponik Drip Irrigation System. *Jurnal Biologi Dan Pembelajarannya*, *5*(1), 44–51.

Maulana, B. (2020). *Respon Tanaman Terung Ungu (Solanum melongena L.) Terhadap Pemberian POC Kulit Buah-Buahan Lewat Akar dan Daun*. universitas pembangunan pancabudi. Medan.

Mulyadi, Rasyad, A., & Isnaini. (2017). Perkembangan Morfologi dan Sifat Fisik Buah Pada Tanaman Kelapa Sawit (Elaeis guineensis Jacq.). *Jurnal Online Mahasiswa Fakultas Pertanian Universitas Riau*, *4*(1), 72–76.

Natalia, M. C., Aisyah, S. I., & Supijatno, . (2016). Pengelolaan Pemupukan Kelapa Sawit (Elaeis guineensis Jacq.) di Kebun Tanjung JatiPengelolaan Pemupukan Kelapa

Sawit (Elaeis guineensis Jacq.) di Kebun Tanjung Jati. *Buletin Agrohorti*, *4*(2), 132–137. https://doi.org/10.29244/agrob.v4i2.15009

Nazari, Y. A. (2020). The Conditions of Nutrient Status in Soil and Leaf Elements of Oil Palm (Elaeis guineensis Jacq) in BPSBP Kalimantan Selatan. *Journal of Chemical Information and Modeling*, *45*(3), 274–284.

Nurwidayati, T. (2017). Pemanfaatan endapan limbah cair pabrik kelapa sawit (LCPKS) dan abu tandan buah kosong kelapa sawit (TKKS) sebagai pupuk organik tablet. *Prosiding Seminar Nasional Ke-1*, 270–275.

Nuryani, E., Haryono, G., & Historiawati. (2019). Pengaruh Dosis dan Saat Pemberian Pupuk P terhadap Hasil Tanaman Buncis (Phaseolus vulgaris L .) Tipe Tegak. *Jurnal Imu Pertanian Tropika Dan Subtropika*, *4*(1), 14–17.

Pambudi, I. H. T., Suwarto, ., & Yahya, S. (2016). Pengaturan Jumlah Pelepah untuk Kapasitas Produksi Optimum Kelapa Sawit (Elaeis guineensis Jaqc.). *Buletin Agrohorti*, *4*(1), 46–55. https://doi.org/10.29244/agrob.v4i1.15000

Permatasari, N. A., Suswati, D., Arief, F. B., Aspan, A., & Akhmad, A. (2021). Identifikasi Beberapa Sifat Kimia Tanah Gambut pada Kebun Kelapa Sawit Rakyat di Desa Rasau Jaya II Kabupaten Kubu Raya. *Agritech: Jurnal Fakultas Pertanian Universitas Muhammadiyah Purwokerto*, *23*(2), 199–207.

Pramana, A., Hamzah, A., Haitami, A., & Okalia, D. (2021). Quality analysis of “kosmos” tkks compose using selulotic microorganism. *Agrointek : Jurnal Teknologi Industri Pertanian*, *15*(3), 839–844. https://doi.org/10.21107/agrointek.v15i3.10149

Prayogi, A., Adiwirman, & Khoiri, M. A. (2016). Studi Mutu Buah Kelapa Sawit (Elaeis guineensis Jacq.) Pada Berbagai Umur Tanaman Di Lahan Gambut. *Jurnal Online Mahasiswa Fakultas Pertanian Universitas Riau*, *3*(1), 140–154.

Reski, L., Afrida, & Syamsuwirman. (2021). Pengaruh Poc Urine Kelinci Terhadap Pertumbuhan Bibit Kelapa Sawit (Elaeis guineensis Jacq.) Pada Fase Main Nursery. *UNES JOURNAL MAHASISWA PERTANIAN*, *5*(2), 63–77.

Riski, F. W., & Susila, P. E. T. (2019). Dampak Pemberian Kalium dan Cekaman Kekeringan Terhadap Serapan Hara dan Produksi Biomassa Bibit Kelapa Sawit (Elaeis gueenensis Jacq.). *J. Pen. Kelapa Sawit*, *27*(1), 41–56.

Riyanti. (2021). *Pupuk P Terhadap Pertumbuhan Dan Produksi Tanaman Serai*. *4*(September), 116–128.

Safrida, Ariska, N., & Yusrizal. (2019). Respon Beberapa Varietas Padi Lokal (Oryza sativa L.) Terhadap Amelioran Abu Janjang Sawit Pada Lahan Gambut. *Jurnal Agrotek Lestari*, *5*(1), 28–38.

Saputra, B., Suswati, D., & Hazriani, R. (2018). Kadar Hara Npk Tanaman Kelapa Sawit Pada Berbagai Tingkat Peniti Sungai Purun Kabupaten Mempawah Nutrient Levels of Oil Palm Npk At Different Stages Peat Soil Decomposition in Oil Palm Plantations Pt . Peniti Su. *Perkebunan Dan Lahan Tropika*, *8*(1), 34–39.

Sari, V. I. S. I., Gultom, P. P., & Harahap, P. (2018). Pertumbuhan dan Perkembangan Tanaman Kelapa Sawit (Elaeis guineensis Jacq.) dengan Pemberian Bioherbisida Saliara (Lantana camara) sebagai Metode Alternatif Pengendalian Gulma. *Agrosintesa Jurnal Ilmu Budidaya Pertanian*, *1*(2), 52.

https://doi.org/10.33603/.v1i2.1927
Simbolon, J., Simanihuruk, B. W., Murcitro, B. G., Gusmara, H., & Suprijono, E. (2018). Pengaruh Subtitusi Pupuk N Sintetik Dengan Limbah Lumpur Sawit Terhadap Pertumbuhan Dan Hasil Jagung Manis. *Jurnal Ilmu-Ilmu Pertanian Indonesia*, *20*(2), 51–59. https://doi.org/10.31186/jipi.20.2.51-59
Sulardi, T., & Sany, A. M. (2018). Uji pemberian limbah padat pabrik kopi dan urin kambing terhadap pertumbuhan dan produksi tanaman tomat (Lycopersicum esculatum). *Journal of Animal Science and …*, *3*, 7–13. http://jurnal.pancabudi.ac.id/index.php/jasapadi/article/view/430
Sulardi, & Zulbaidah. (2020). Efektivitas Pemberian Pupuk Kandang Sapi dan Poc Enceng Gondok Terhadap Pertumbuhan dan Produksi Bawang Merah (Allium ascalonicum L.). *Jurnal of Animal Science and Agronomy Panca Budi*, *5*(1), 1–6.
Susilowati, L. E., & Kusumo, B. H. (2019). Sosialisasi Pemupukan Berimbang Spesifik Lokasi Untuk Tanaman Jagung Di Kabupaten Dompu. *Jurnal Gema Ngabdi*, *1*(3), 103–108. https://doi.org/10.29303/jgn.v1i3.21
Tataridas, A., Kanatas, P., Chatzigeorgiou, A., Zannopoulos, S., & Travlos, I. (2022). Sustainable Crop and Weed Management in the Era of the EU Green Deal: A Survival Guide. *Agronomy*, *12*(3), 589. https://doi.org/10.3390/agronomy12030589
Timsina, J. (2018). Can organic sources of nutrients increase crop yields to meet global food demand? *Agronomy*, *8*(10), 1–20. https://doi.org/10.3390/agronomy8100214
Trimanto, T., Pitaloka, D. A., & Metusala, D. (2020). Karakterisasi Morfologi dan Fenologi Pembungaan Dua Aksesi Kopsia pauciflora Hook.f. Bunga Putih dan Merah Muda di Kebun Raya Purwodadi, Jawa Timur. *Buletin Plasma Nutfah*, *26*(2), 77. https://doi.org/10.21082/blpn.v26n2.2020.p77-88
Tumewu, P., Paruntu, C. P., & Sondakh, T. D. (2015). Hasil Ubi Kayu (Mannihot esculenta Crantz .) Terhadap Perbedaan Jenis Pupuk. *Jurnal LPPM Bidang Sains Dan Teknologi*, *2*(2), 16–27. https://ejournal.unsrat.ac.id/index.php/lppmsains/article/view/10687
Urrego, D., Tomczak, A. P., Zahed, F., Stühmer, W., & Pardo, L. A. (2014). Potassium channels in cell cycle and cell proliferation. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *369*(1638), 20130094. https://doi.org/10.1098/rstb.2013.0094
Yulianingsih, R. (2019). Peningkatan Pertumbuhan Dan Hasil Tanaman Bayam Merah (Amaranthus Tricolor, L.) Dengan Pemberian Pupuk Organik Cair Urine Sapi Ratri. *Piper*, *15*(28), 60–70.