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An Increasing Growth Of Oil Palm Plants Based A Mixture Nitrogen And Potassium Chemicals

Asmara Sari Nasution[1], Efi Said Ali[2]
[1,2]Universitas Al-Azhar, Medan, North Sumatera, Indonesia

Article Info	ABSTRACT
Keywords: Palm Oil, POC Nitrogen, POC Potassium	This research aims to test the concentration of POC Nitrogen and POC Potassium on the growth of oil palm plant seeds (Elaeis guineensis Jacq). The method used in this research was a Randomized Group Design (RAK) which consisted of 2 treatment factors. The first treatment is the POC Nitrogen Concentration Test which consists of N0=Control, N1= 1%, N2= 2%, N3= 3%. The second treatment is the POC Potassium Concentration Test K0=Control, K1=1%, K2=2% and K3=3%. The parameters observed were plant height (cm), number of leaves (strands), leaf width (cm) and stem diameter (cm). The research results showed that the POC Nitrogen Concentration Test had a significant effect on the parameters of plant height (cm), number of leaves (cm) and leaf width (cm) but had no significant effect on the stem diameter parameter (cm). In the POC Potassium Concentration Test, it showed a real influence on the stem diameter parameter (cm) but an insignificant effect on the parameters of plant height (cm), number of leaves (strands) and leaf area (cm). The interaction between the POC Nitrogen and POC Potassium Concentration Tests showed unreal results for each observation parameter.
	Corresponding Author: Asmara Sari Nasution Universitas Al-Azhar, Medan, North Sumatera, Indonesia Asmarasari59205@gmail.com

INTRODUCTION

The oil palm plant (Elaeis Guineensis Jacq) comes from West Africa. However, there are some opinions that state that oil palm comes from the South American region, namely Brazil. This is because oil palm species are found in forest areas in Brazil compared to America. In reality, oil palm plants thrive outside their native areas, such as Malaysia, Indonesia, Thailand and Papua New Guinea. In fact, it is able to provide higher production per hectare (Fauzi, 2012).

Oil palm was first introduced to Indonesia by the Dutch colonial government in 1848. At that time four oil palm seeds were brought from Maritius and Amsterdam to be planted in the Bogor Botanical Gardens. Oil palm plants began to be cultivated and cultivated commercially in 1911. Pioneers The oil palm plantation business in Indonesia is Adrien Haller, a Belgian national who has learned a lot about oil palm in Africa. His cultivation was followed by K. Schadt which marked the birth of oil palm plantations in Indonesia. Since then, oil palm plantations in Indonesia have begun to develop The first oil palm plantations were located on the East Coast of Sumatra (Deli) and Aceh. The plantation area at that time was 5,123 ha. Indonesia began exporting palm oil in 1919 amounting to 576 tonnes to European countries, then in 1923 it began exporting palm kernel oil amounting to 850 tonnes (Directorate General of Plantations 2014). Palm oil (Elaeis guineensis Jacq) is a mainstay industrial crop for the Indonesian economy which remains survive in times of crisis prolonged economic growth and is one of the plantation commodities that contributes large foreign exchange to the country (Krismawati et al, 2013).

Indonesia is the second largest producer of palm oil in the world after Malaysia. Indonesia has soared to become the largest producer of palm oil exports in the world. In the 2009-2010 harvest season, this archipelagic country produced 21 million tons of palm oil, which is almost half of its oil production. The world's palm oil amounts to 45 million tons. Another 18 million tons come from Malaysia. Projections for the next few years predict that Indonesia will occupy first position. The market prospects for processed palm oil are quite promising, because demand from year to year has increased quite significantly, not only domestically but also abroad (Purwanto, 2011).

The role of the nutrient (N) in oil palm plants is that they are needed in large quantities and function to improve plant vegetative growth and protein synthesis. A lack of the nutrient N in plants can cause plants to become stunted and plant leaves to turn yellow (Hardjowigeno, 2010). The K nutrient plays a role in plant resistance to pests and diseases (Mangoensoekarjo, 2007). The element K is a nutrient that plants need in large quantities and is important for the preparation of oil and influences the number and size of bunches (Sutarta et al, 2007). Deficiency of the nutrient K will occur in old leaves because the nutrient K is transported to young leaves (Hardjowigeno, 2010).

Literature Review

Morphology of Oil Palm Plants

Oil palm plants are one of the plantation commodities that have a fairly high selling value and are the largest foreign exchange contributor to Indonesia compared to other plantation commodities. Each plant has different morphological characteristics and functions. Morphologically, oil palm plants consist of vegetative parts (roots, stems and leaves) and generative parts (flowers and fruit) (Sunarko, 2009).

Oil palm plants are one-seed plants (monocots) which have fibrous roots. At the beginning of germination, the first root appears from the germinated seed (radicle). After that the radicle will die and form main or primary root. Next, the primary roots will form secondary, tertiary and quaternary roots. Oil palm roots that have fully formed generally have primary roots with a diameter of 5-10 mm, secondary roots 2-4 mm, tertiary roots 12 mm, and quaternary roots 0.1-0.3. The roots that are most active in absorbing water and nutrients are the tertiary and quaternary roots located at a depth of 0-60 cm at a distance of 2-3 meters from the base of the tree (Lubis and Agus, 2011).

Stem

Oil palm stems are characterized by the fact that they do not have cambium and generally do not branch. In the initial growth after young maturity, the stem forms widened without internodia elongation. The stem of the oil palm plant functions as a support structure for the canopy (leaves, flowers and fruit). Then another function is as a vascular system that transports nutrients and food for plants. Plant height usually increases optimally around 35-

75 cm/year according to environmental conditions if it supports it. The economic age of plants is greatly influenced by the increase in stem height/year. The lower it is. The greater the height of the stem, the longer the economic life of the oil palm plant (Sunarko, 2009).

Leaf

The leaves consist of a leaf stalk (petiole) which has two rows on both sides, the leaf stalk is directly connected to the main leaf bone (rachis) which is longer than the leaf stalk. On the left and right of the leaf bone (spike) which connects the leaflets to the main leaf bone. In oil palm plants, the formation of oil palm leaves takes 4 years from the start of leaf formation until the leaves wilt naturally. When it buds The leaves have bloomed, the oil palm leaves are already 2 years old from the time they were first formed. Oil palms can produce 1-3 leaves every month (Lumbangaol, 2010).

Oil palm plants will start to flower at around 12-14 months of age. The flowers of oil palm plants are monocious, which means that male and female flowers are found on the same tree but not in the same bunch. Oil palm plants can cross-pollinate or self-pollinate because they have male and female flowers. Usually the flowers appear from the leaf axils. Each leaf axil only produces one inflorescence (compound flower). Usually, some of the inflorescences fall off in the early phases of their development so that individual plants can see that some of the leaf axils do not produce inflorescences (Sunarko, 2007).

The process of fruit formation from the time of pollination until the fruit matures is ± 6 months. Oil palm fruit is black when it is young, then after ± 5 months it gradually becomes yellowish red. When the color changes, oil forms in the flesh of the fruit. This color change is because the oil grains contain a dye (corotein). Oil palm fruit is a stone fruit which consists of three parts, namely the outer layer, middle layer and inner layer. Between the core and flesh of the fruit there is a hard shell layer (Risza, 2012).

Conditions for Growing Oil Palm

The suitable oil palm development area is at 15° N – 15° South Latitude. The ideal altitude of oil palm plantations ranges from 0 – 500 m above sea level (asl). Oil palm requires rainfall of 2,000 – 2,500 mm/year with dry month period < 75 mm/month no more than 2 months. The optimum temperature for oil palm growth is 29° C – 30° C. The intensity of sunlight is around 5 – 7 hours/day. The ideal optimum humidity is around 80 – 90% (Pahan, 2015).

The average annual temperature for palm growth and production ranges between 24-290C, with the best production between 25-27° C. In tropical areas, air temperature is closely related to height above sea level (asl). The optimal height is 200 m above sea level, and it is recommended that it be no more than 400 m above sea level, although in some areas, such as in North Sumatra, there are quite good oil palm plantations up to a height of 500 m above sea level. Minimum and maximum temperatures have not been widely studied, but it is reported that oil palms can grow well at temperatures ranging from 8 to 38° C (Allorerung et al., 2010). Soil that is good for the growth of oil palm plants and is often found in tropical areas is described as follows: Latosol, latosol soil in tropical areas can be red, brown and yellow. Latosol soil is formed in areas where the climate is also suitable for oil palm plants. Latosol soil is easily leached and covers most of the soil in wet tropical areas. Soil Alluvial is very important for oil palm plants, although its fertility varies from place to place. Alluvial along beaches and rivers is planted with oil palm (Sastrayasono 2010).

METHOD

The research was carried out in Namorambe Village, Deli Serdang Regency, from March to May 2024. The materials used in this research are: oil palm seeds, POC Nitrogen and POC Potassium, bamboo, standard stakes and others. The tools used are: hoe, machete, knife, measuring tape, scales, stationery and polybags. This research used a factorial randomized block design (RAK) method consisting of 2 treatment factors with 12 treatment combinations and 3 replications so that a total of 32 research treatment plots were obtained.

a. Treatment Factors POC Nitrogen (N) concentration consists of 4 levels
   N0 = 0 (without treatment)
   N1=1%
   N2=2%
   N3=3%
b. Treatment Factor POC Potassium (K) Concentration consists of 4 levels
   K0=0%
   K1=1%
   K2=2%
   K3=3%
c. Treatment Combination.

N0 K0	N1 K0	N2 K0	N3 K0
N0 K1	N1 K1	N2 K1	N3 K1
N0 K2	N1 K2	N2 K2	N3 K2
N0 K3	N1 K3	N2 K3	N3 K3

d. Number of Repetitions.

$$(t-1)\ (n-1) \geq 15$$
$$(16-1)\ (n-1) \geq 15$$
$$15\ (n-1) \geq 15$$
$$15\,n - 15 \geq 15$$
$$15n > 15+15$$
$$15n > 30$$
$$n > 30/15$$
$$n = 2\ldots\ldots$$
(2 repetitions).

RESULT

Data on average plant height due to POC Nitrogen and POC concentration tests

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The results of statistical analysis of variance show that the concentration test POC Nitrogen showed no significant effect on plant height at ages 4 and 8 WAP, but had a real effect at age 12 WAP. Whereas the POC Potassium concentration test showed no significant effect on plant height at 4, 8 and 12 WAP. Interaction between POC concentration test Nitrogen and Potassium POC showed no significant effect on height plants at the ages of 4, 8 and 12 WAP.

Results of the average plant height at the ages of 4, 8 and 12 WAP due to the test concentration of POC Nitrogen and POC Potassium after carrying out the average difference test using the Duncan distance test can be seen in Table 1.

Table 1. Average Plant Height due to POC Nitrogen and POC Potassium Concentration Tests. At ages 4, 8 and 12 WAP.

Treatment	Plant Height (cm)		
	4 WAP	8 WAP	12 WST
POC Nitrogen Concentration Test			
N0 = (Control)	6.78aA	13.16aA	19.59bB
N1 = 1%	7.15aA	13.22aA	19.65bB
N2 = 2%	7.20aA	13.68aA	20.38aA
N3 = 3%	7.58aA	13.97aA	21.51aA
POC Potassium Concentration Test			
K0 = (Control)	7.05aA	12.85aA	19.44aA
K1 = 1%	7.13aA	13.55aA	20.13aA
K2 = 2%	7.23aA	13.74aA	20.50aA
K3 = 3%	7.30aA	13.91aA	21.06aA

Note: numbers followed by the same letter in the same column are not significantly differ rent at the 5% and 1% levels.

In Table 1 it can be explained that the POC Nitrogen concentration test had no significant effect on plant height at 4 and 8 WAP, but had a significant effect at 12 WAP, where the highest treatment was at N3, namely 21.51 cm, but was not significantly different for N2, N1 and N0.

In Table 1 it can be explained that the POC potassium concentration test had no significant effect on plant height aged 4, 8 and 12 WAP, where the highest plants were in the K3 treatment, namely 21.06 cm, which had no significant effect on K2, K1 and K0, where the lowest plants were in the K0 treatment is 19.44 cm.

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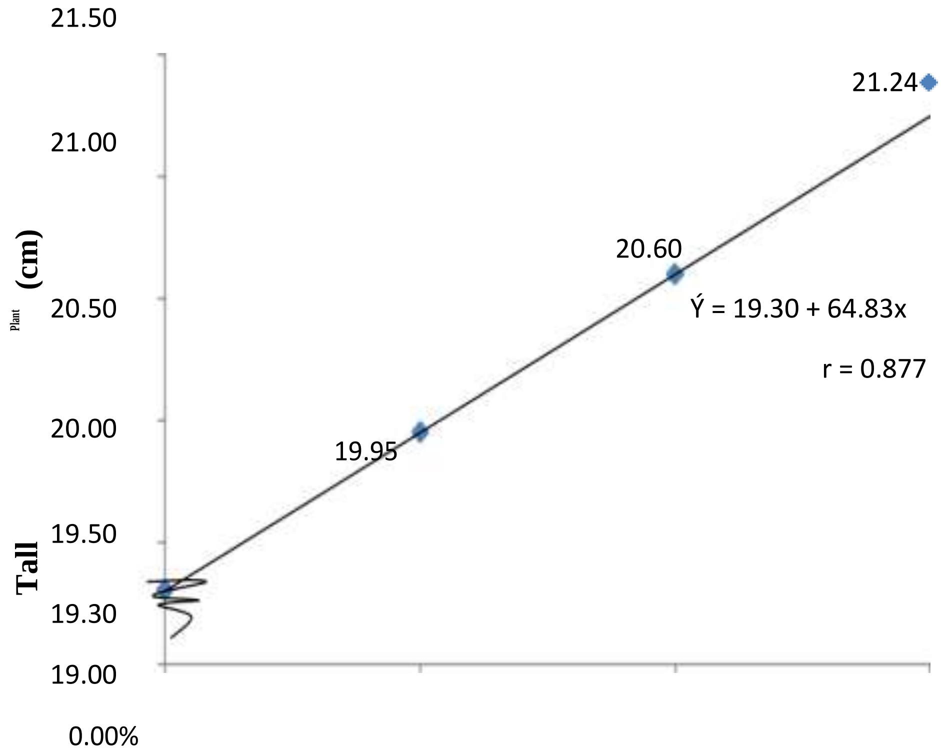


Figure 1. Graph of the Relationship between Plant Height and the POC Nitrogen Concentration Test.

From Figure 1, it can be explained that with every increase in POC Nitrogen concentration, the height of the oil palm plant increases. Where the highest plant height was in the K3 treatment (3%), namely 21.24 cm. Potassium at 4, 8 and 12 WAP can be seen in appendices 11, 13 and 15 while the analysis of variance can be seen in appendices 12, 14 and 16.

The results of statistical analysis of variance show that the concentration test POC Nitrogen showed no significant effect on the number of leaves at age 4 and 8 WAP, but had a real effect at age 12 WAP. Meanwhile in the test Potassium POC concentration showed no significant effect on the number of leaves at ages 4, 8 and 12 WAP. Interaction of POC Nitrogen and POC concentration test Potassium showed no significant effect on the number of leaves at ages 4, 8 and 12 WAP Results of the average number of leaves at the age of 4, 8 and 12 WAP for the test POC Nitrogen and POC Potassium concentrations after the average difference test with using the Duncan distance test can be seen in Table 2.

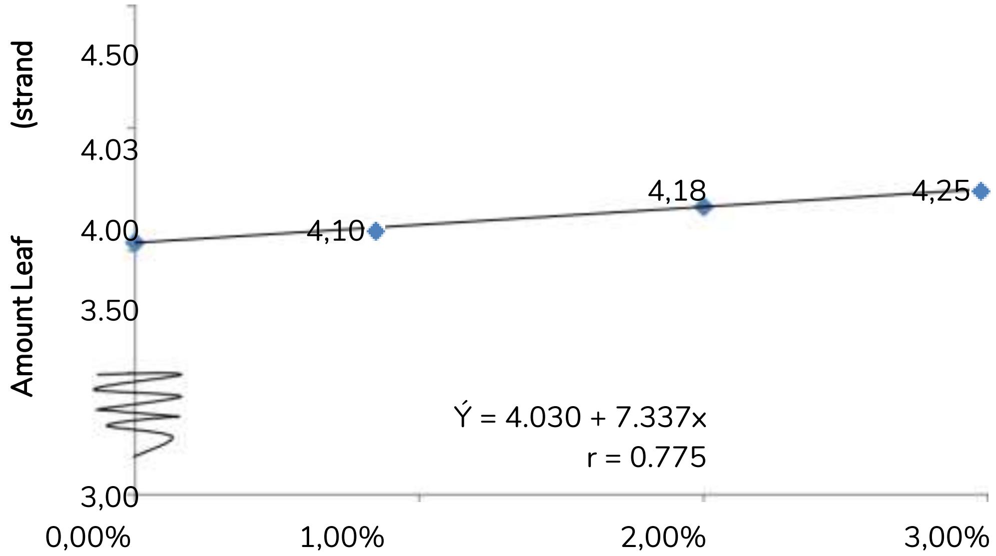
Table 2. Average Number of Leaves Due to POC Nitrogen and POC Potassium Concentration Tests. At ages 4, 8 and 12 WAP.

Treatment	Number of Leaves (pieces)		
	4 WAP	8 WAP	12 WST
POC Nitrogen Concentration Test			
N0 = (Control)	2.23aA	3.1aA	4.1bB
N1 = 1%	2.23aA	3.2aA	4.1bB
N2 = 2%	2.28aA	3.3aA	4.1bB
N3 = 3%	2.24aA	3.3aA	4.3 aA
POC Potassium Concentration Test			
K0 = (Control)	2.24aA	3.17aA	4.06aA
K1 = 1%	2.21aA	3.23aA	4.10aA
K2 = 2%	2.26aA	3.25aA	4.19aA
K3 = 3%	2.25aA	3.27aA	4.21aA

Note: numbers followed by the same letter in the same column are not significantly different at the 5% and 1% levels.

In Table 2 it can be explained that the POC Nitrogen concentration test had no significant effect on the number of leaves aged 4 and 8 WAP, but had a significant effect at the age of 12 WAP, where the highest treatment was in N3, namely 4.3 leaves, which was very significantly different in treatments N2, N1 and N0.

In Table 2 it can be explained that the POC potassium concentration test had no significant effect on the number of leaves aged 4, 8 and 12 WAP, where the highest plant was found in the K3 treatment, namely 4.21 pieces, which had no significant effect on K2, K1 and K0, where the lowest number of leaves was found. in the K0 treatment, namely 4.06 strands.



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POC Nitrogen Concentration Test

Figure 2. Graph of the relationship between the number of leaves and the POC nitrogen concentration test.

From Figure 2, it can be explained that every time the POC Nitrogen concentration is increased, the number of oil palm leaves increases. Where the highest number of leaves was found in the N3 treatment (3%), namely 4.3 pieces.

Effectiveness of POC Nitrogen Concentration on the Growth of Oil Palm (Elaeis guineensis Jacq.) Seedlings in Pre Nursery

Effect of POC Nitrogen (N) on Plant Growth Nitrogen also plays an important role as a constituent of enzymes in plant metabolic processes, because enzymes are composed of protein. As a complement to its role in protein synthesis. Nitrogen is an inseparable part of the chlorophyll molecule and therefore a sufficient amount of nitrogen will result in strong vegetative growth and a fresh green color. (Nugraha, 2010).

Effect of POC Potassium (K) on Plant Growth Potassium has an effect on plant physiology, such as resistance to pest attacks, strengthening roots and efficient use of water. Lack of potassium can cause plants to collapse easily and be easily attacked by pests and disease. Potassium is not found in abundance in soils that have large amounts of clay minerals (Hardjowigeno, 2010).

From the statistical tests carried out, it can be seen that POC nitrogen shows a real influence on the parameters of plant height, number of leaves and leaf area but has no real influence on stem diameter. This happens because nitrogen plays a role in plant vegetative growth. Syarief in Rachmiati (2014) added that nitrogen fertilizer is needed by plants for the formation or growth of vegetative parts of plants such as leaves, stems and roots.

The increase in plant height is greatly influenced by the availability of nitrogen in the soil (Rusmana and Salim, 2003), which states that the role of the nitrogen element for plants is to stimulate overall plant growth, especially stems, branches and leaves. The number of leaves on a plant plays an important role in plant development because leaves are a medium for the photosynthesis process which produces energy for plants to grow. Providing nitrogen fertilizer has a significant effect on the number of leaves at week 12. According to Hanafiah (2005), the use of nitrogen fertilizer plays a prominent role in the vegetative parts of plants (leaves and shoots).

According to Barchia (2009) in a plant, nitrogen functions as an important constituent of chlorophyll, protoplasm, protein, enhancing growth and development of all tissues. The chlorophyll content in leaves can be determined by measuring the level of greenness of the leaves of a plant. According to Candra et al (2015), nutrient availability for plants can increase the rate of photosynthesis. Increasing the rate of photosynthesis will increase the production of assimilate produced. Its influence on plant vegetative growth is characterized by an increase in the number of leaves and will trigger an increase in plant height, number of leaves and leaf area. According to Johan's statement (2010), fruit growth requires sufficient nutrients, especially nitrogen. Lack of these substances can disrupt plant growth. The element nitrogen is needed for protein formation.

Effectiveness of POC Potassium Concentration on the Growth of Oil Palm (Elaeis guineensis Jacq.) Seedlings in Pre Nursery

There was no real influence on the observation parameters of plant height, number of leaves and leaf area due to the administration of a potassium POC concentration test which had nutrient content that did not fully help and fulfill the plant's nutrient needs. However, the observation parameters of stem diameter show a real influence where the nutrient K functions to stimulate cell division, enlarge cell tissue and assist in the photosynthesis process. Kani (2017) stated that organic materials, apart from having an effect on nutrient availability, also have a direct effect on plant physiology. Such as increasing respiration and photosynthesis activities which stimulate increased nutrient uptake thereby increasing maximum plant growth and production.

According to Rubatzky and Yamaguchi (2010), plant growth apart from the availability of nutrients sourced from fertilization is also influenced by several other factors such as environmental factors including climate, sunlight and soil. Time also plays a role in the growth of plants and the conditions of their growing environment. According to Pardono (2011), differences in plant height are caused by the different ability to absorb nutrients in each plant. The higher the concentration of fertilizer given, the faster it will increase the development of organs such as roots, so that plants can absorb more nutrients and water in the soil which in turn will affect plant height. However, plants also have certain limits in absorbing nutrients.

According to Harjadi (2019), if a plant is in the reproductive phase of plant development, the carbohydrates resulting from photosynthesis that occur in the leaves are not entirely used for growth but are stored for the development of flowers, fruit and seeds. This is in accordance with the opinion of Rinsema (2017), that by providing the right fertilizer in terms of type, dose, time of fertilization and method of administration it will be able to encourage growth and increase plant yields both in quality and quantity. Yatim (2018), explains that the character of a plant is largely determined by its genetic characteristics, where these genetic characteristics are very difficult to change or vary. The same variety will have the same characteristics and traits.

The results of the research after statistical analysis showed that the interaction between the POC Nitrogen and POC Potassium concentration tests showed no significant different effect on each observation parameter of plant height (cm), number of leaves (strands), leaf area (cm) and stem diameter (cm). . The results of the absence of interaction between the POC Nitrogen and POC Potassium concentration tests are clarified in the research of Simanjuntak (2013) which states that if one factor has a stronger influence than another factor, the other factor will be covered and each factor has very different properties. influence and the nature of its work, it will produce a different relationship in influencing plant growth.

CONCLUSION

In the POC Nitrogen concentration test there was no significant effect on stem diameter, but it had a significant effect on plant height, number of leaves and leaf area. The best treatment at N3 (3%). The POC Potassium concentration test showed that the parameters of plant height, number of leaves and leaf area had no significant effect, but had a significant effect on stem diameter. The largest diameter was in the K3 treatment (3%). The interaction between the POC Nitrogen and POC Potassium concentration tests shows that the parameters of plant height, number of leaves, leaf area and stem diameter have no significant effect.

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