Advances in Tropical Biodiversity and Environmental Sciences
7(3): 113-120, October, 2023
e-ISSN:2622-0628
DOI: 10.24843/ATBES.2023.v07.i03.p05
Available online at: https://ojs.unud.ac.id/index.php/ATBES/article/view/244

Vegetative Growth Response of Entog Dwarf Coconut (*Cocos nucifera* L.) to Different Planting Hole Size and Compound Inorganic Fertilizer Application

Natalina Zalukhu [1], Anita Costanci Christine Tengker [1], Yulianus Rompah Matana [2]*, Helen Joan Lawalata [1], and Marthy Lingkan Stella Taulu [1]

[1] Program Study of Biology, Faculty of Mathematics, Natural and Earth Sciences, Universitas Negeri Manado
South Tondano, Minahasa, North Sulawesi, Indonesia
[2] Palm Plant Research Institute
Corresponding author: yulianusmatana@yahoo.com

Abstract. Entog Dwarf coconut is a national superior variety. The purpose of this study was to determine the vegetative growth of Entog Dwarf coconut at 7-10 months of age. The research was conducted at the Palm Plant Research Institute in Manado (Upper Kima Experimental Garden and Ecophysiology Laboratory) using a factorial group randomized design with 2 factors and 3 replications. The first factor was the planting hole with a depth of 100cm and 60cm. The second factor was compound inorganic fertilizer with doses of 1.5kg, 1.0kg, 0.5kg, and control. Nutrient analysis of soil and leaves without fertilization at 7 and 10 months and after fertilization at 10 months. The results of the analysis of variance at the 5% level showed that planting holes had a significant effect, while compound inorganic fertilizers had a significant effect on vegetative characters. The tallest plants were about 51.2-63.7cm with a dose of 0.5-1.5kg while the shortest was 27.2cm, the largest stem circumference was 10.8-11.3cm with a dose of 0,5kg and 1.5kg while the smallest was 6.42cm, and the largest number of leaves was 3.67 midribs with a dose of 1.5kg while the smallest number was 2.67 midribs, where all vegetative characters were categorized as low in control plants. The interaction between the two factors had no significant effect on vegetative growth. The vegetative characters observed were positively correlated. The results of nutrient analysis of pH, moisture content, organic carbon, nitrogen, phosphorus, potassium, stomatal index, and chlorophyll showed little difference both without fertilization and after fertilization.

Keywords: coconut; fertilizer; hole; nutrients; vegetative

I. INTRODUCTION

Entog Dwarf coconut is a national superior variety originating from Kebumen Regency, Central Java, which was released in 2018. Entog Dwarf coconut is one of the types of coconut that is cultivated commercially. According to 2018 data, this coconut can be found in 4 sub-districts in Kebumen, including the Alian sub-district with a total of 494 trees, seed production of 13,314 and fruit production of 16,643. Kebumen District with a total of 169 trees, seed production of 2,074 and fruit production of 2,593. Ambal District with a total of 79 trees, seed production of 4,721 and fruit production of 5,901. Mirit District with a total of 145 trees, seed production of 4,364 and fruit production of 5,455 [29]. Entog Dwarf coconut has the ability to bear fruit quickly and has a large fruit size when compared to other Dwarf coconut types. The fruit of this type of coconut has good quality, with softer flesh, green skin, and more coconut water than other types of coconut. To support this potential, the maintenance of vegetative growth is important.

Vegetative growth is a phase related to three processes, namely cell division, cell elongation, and the first stage of cell differentiation [1]. The size of vegetative organs includes the addition of plant height, stem circumference length, number of leaves, and so on. Plant growth is inseparable from the growing environment, especially the planting media factor [2]. Planting hole size and nutrient content are planting media factors. Making planting holes aims to provide an optimal environment for the initial growth and recovery period of plants, making it easier for roots to penetrate the soil so that they can grow well [2]. Increasing the productivity of coconut plants can be achieved through fertilization when coconut plants are still in the Immature Plant Phase [3]. One of the practical fertilizers to use is compound inorganic fertilizer.

This fertilizer is more efficient and effective than organic fertilizer, is able to provide nutrients quickly, produces available nutrients that are ready to be absorbed by plants and contains a greater amount of nutrients. Compound fertilizer is a mixed fertilizer that generally contains more than one nutrient, where one fertilizer application can cover several elements, making it more efficient than a single fertilizer [4]. The compound fertilizer is those that contain Nitrogen, Phosphorus, and Potassium abbreviated as NPK.

Compound NPK fertilizer significantly increases frond production, stem circumference, leaf area, and frond length [5]. The application of NPK fertilizer has a significant effect on the growth of plant height, leaf width, number of leaves, leaf length and leaf area, which is due to the content of nutrients such as Nitrogen, Phosphate, and Potassium which can be translocated to all parts of the plant for the formation of new organs [6]. The purpose of this study is to determine the right hole size and dose of fertilizer for good vegetative growth of Entog Dwarf coconut.

II. METHOD

This research was conducted at the Upper Kima Experimental Garden and Ecophysiology Laboratory (Palm Plant Research Institute), Manado City, from September 2022 to January 2023.

The materials or objects of the research consisted of 7-month-old Entog Dwarf coconut seeds in the field, Phonska 15-15-15 NPK fertilizer, soil samples of particle size < 2 and < 0.5 mm, fresh leaf pieces of 0.5 and 3-5 cm and dry leaf samples. The tools used consisted of measuring instruments (meters), data writing tools (pencils, markers, erasers), books/records, sample containers (clear and black plastic), pylox, mobile phone camera, scissors, labels, 0.5mm and 2mm soil sieves, grinder machine, analytical balance with 3 decimal accuracy, exicator, shaking machine, oven, light microscope, pH meter, distillation apparatus, UV-VIS spectrophotometer and Atomic Absorption Spectrophotometer (SSA).

This study used a factorial Randomized Group Design with two factors. The first factor is planting hole size (t1) which consists of L1 =100 cm and L2 =60 cm. The second factor is the dose of compound inorganic fertilizer (NPK) type Phonska 15-15-15 (t2) consisting of P0 = no treatment (control), P1 = 0.5 kg, P2 = 1.0 kg, and P3 = 1.5 kg. The two factors were combined into L1P0, L1P1, L1P2, L1P3, L2PO, L2P1, L2P2 and L2P3. The number of treatment combinations was 8 with repetition 3 times so the number of experimental units was 24. Each experimental unit uses two plants so the total number of plants needed was 48 Entog Dwarf coconut plants.

The research procedure started with the selection of samples with the criteria of healthy plants or no symptoms from pests and diseases attack, and plant height between 100-200 cm and weed the grass around the plants. Furthermore, making a disc by digging the soil at a depth of 1-5 cm and a distance of 40-60 cm from the plant stem, followed by soil and leaf sampling which was carried out in 2 stages, namely without fertilization at the age of 7 and 10 months, namely in plants L1, L2, L1P0 and L2PO and after fertilization at the age of 10 months, namely in plants L1P1, L1P2, L1P3, L2P1, L2P2 and L2P3. Soil samples were taken from the soil of the excavated disc. Leaf samples were taken from the same plants as the soil samples. These leaf samples were taken from the middle of the 4-5th midrib of 10 leaves. These samples were taken to the laboratory to be analyzed for Soil pH, Moisture Content (%), Organic Carbon (%), Nitrogen (%), Phosphorus (%/ppm), Potassium (%), Stomatal Index and Chlorophyll Content (mg/L). Next, the dosage of Phonska 15-15-15 compound inorganic fertilizer was measured as 1.5 kg, 1.0 kg and 0.5 kg. The fertilizer was sprinkled on the previously made plates. Observations of vegetative characters were measuring plant height (cm) from the lower end with a maximum of 5 cm from the ground to the tip of the highest leaf, stem circumference length (cm) measured on the lower stem with a maximum of 5 cm from the ground, the last leaf midrib or the one that opens completely is marked with pylox to determine the number of midribs that increase in the next observation. Observations of vegetative characters were made every two weeks starting from the observation before fertilization. Observations were made seven times (± 4 months).

All observational data of vegetative characters were analyzed by 5% variance using R software. If there is a significant difference value or difference in the middle value at the 95% confidence interval, it is continued with the Tukey test. Then proceed with the correlation test to see the relationship of each character observed. Soil and leaf analyses were conducted on physical properties, namely moisture content by gravimetric method and stomatal observation by optical microscopy. . The stomatal imdex of the leaf is the ratio pf the number of stomata to the total number of stomata and epidermal cell [30]. Chemical properties are pH H2O & KCl with pH meter, organic carbon Walkley & Black with spectrophotometry, nitrogen with Kjeldahl titrimetric method, phosphorus Olsen & Bray I using spectrophotometry, potassium with Atomic Absorption Spectrophotometry and chlorophyll content with spectrophotometry. Chlorophyl content was traditionally measured by extracting the chlorophyll itself from a leaf sample using acetone before calculating the chlorophyll concentration by spectrophotometrically measuring absorption at 663 nm dan 645 nm [31]. Evaluation of nutrient status using criteria from the Bogor Soil Research Centre (PPT, 1995) and Soil Chemical Properties Assessment Criteria (LPT, 1983). The results of the analyses are presented in tables and figures

III. RESULTS AND DISCUSSION

Entog Dwarf coconut is a coconut germplasm collection planted by the Palm Plant Research Institute since February 2022. Entog Dwarf coconut was planted in the Upper Kima Experimental Garden at an altitude below 100 masl. There were 7 groups of Entog Dwarf coconut planted, where 1 group consisted of 32 plants with 16 plants planted at a depth of 100 cm and other plants planted at a depth of 60 cm. The distance between groups was 16 m and the distance between plots was 6 m (16×6m).

Based on the results of the analysis of variance, it shows that the planting hole size factor did not significantly affect the plant height, stem circumference length and number of leaves of the Entog Dwarf coconut plant at the 5% level. These results can be seen in Table 1.

TABLE 1
TUKEY'S FURTHER TEST OF THE EFFECT OF PLANTING HOLE ON VEGETATIVE GROWTH OF ENTOG DWARF COCONUT

t1 (cm)	Plant Height (cm)	Stem Circumfe-rence (cm)	Number of Leaves (midrib)
100	50.3a	10.6a	3.25a
60	47.1a	8.69a	3.08a

Description: Each number followed by an unequal letter in the column means significantly different at the 5% Honest Significant Difference test level.

Making planting holes aims to provide growing space for the roots of newly transplanted plants, where in coconut plant cultivation the planting hole size of 60 cm × 60 cm × 60 cm is used in light soils, while for heavy soils a planting hole of 100 cm × 100 cm × 100 cm is used [7]. Planting holes with a size of 60 cm × 60 cm × 60 cm are made on flat land and the size of the hole for soils with heavy textures such as dominant clay, rocky or rocky is enlarged to 80 cm × 80 cm × 80 cm or more and the size on sloping land is made with a diameter of 2 m or more [8].

Planting holes function as a place for plant growth media at the beginning of growth and facilitate the absorption of fertilizers into the soil [9]. In oil palm plants, the recommended planting hole size is 60 cm × 60 cm × 60 cm which can facilitate the absorption of fertilizer into the soil and optimal root development, where the size of the planting hole that is not suitable affects the development of plant roots [10]. Reference [11] showed that roots have a very important role in plant growth where the roots function as a support for the establishment of plants, as an absorber of water and nutrients in the soil that will transform to all parts of the plant.

The Entog Dwarf coconut plants grown at Upper Kima Experimental Garden are located on flat land with light soil texture so the planting hole sizes of 60 cm × 60 cm and 100 cm × 100 cm are thought to be suitable for good vegetative growth of Entog Dwarf coconut.

Meanwhile, the dosage factor of Phonska 15-15-15 compound of inorganic fertilizer had a significant effect on vegetative growth of Entog Dwarf coconut plants at 5% level. Analysis of variance showed a very significant difference between the height of plants using fertilizers and plants without the use of fertilizers (control).

TABLE 2
TUKEY'S FURTHER TEST OF THE EFFECT OF FERTILIZER DOSAGE ON VEGETATIVE GROWTH OF ENTOG DWARF COCONUT

t2 (kg)	Plant Height (cm)	Stem Circumference (cm)	Number of Leaves (midrib)
1.5	63.7a	11.3a	3.67a
1.0	52.6a	10.1ab	3ab
0.5	51.2a	10.8a	3.33ab
0	27.2b	6.42b	2.67b

Description: Each number followed by an unequal letter in the column means significantly different at the 5% Honest Significant Difference test level.

Table 2 showed that fertilizer doses of 1.5 kg, 1 kg, and 0.5 kg were able to produce the highest plants around 51.2-63.7 cm while the lowest in plants without fertilizer treatment (control) was 27.2 cm. Fertilization of NPK increased plant height and plant weight [12]. The results of further tests on the effect of compound inorganic fertilizer doses on the vegetative characteristics of Entog Dwarf coconut plants are shown in Table 2. Figure 1 shows that the plant height of all treatments observed every two weeks increased in height, forming an upward curve. It can be noted that the fertilizer-applied plants increased in height faster than the plants without fertilizer application (control).

Analysis of variance showed very significant differences between the length of the stem circumference of plants with fertilizer doses of 1.5 kg and 0,5 kg, 1 kg, without fertilizer (control). Table 2 shows that fertilizer doses of 1.5 kg and 0.5 kg were able to produce the longest plant stem circumference of 10.8-11.3 cm, at a dose of 1 kg at 10.1 cm followed by plants without fertilizer (control) at

6.42 cm which is categorized as low. The experimental results showed that the increase in stem circumference was influenced by the nutrients Nitrogen, Phosphorus, and Potassium contained in compound fertilizers [5].

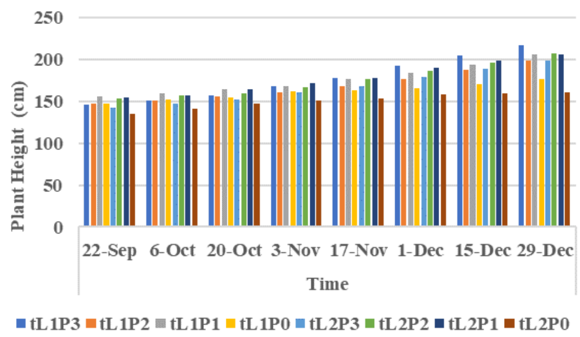

Fig. 1. Graph of Average Plant Height Every 2 Weeks
Description:
tL1P3 = height at 1 m hole and 1.5 kg fertilizer dose
tL1P2 = height at 1 m hole and fertilizer dose of 1.0 kg
tL1P1 = height at 1 m hole and 0.5 kg fertilizer dose
tL1P0 = height at 1 m hole and 0 fertilizer dose (control)
tL2P3 = height at 60 cm hole and fertilizer dose of 1.5 kg
tL2P2 = height at 60 cm hole and fertilizer dose of 1.0 kg
tL2P1 = height at 60 cm hole and 0.5 kg fertilizer dose
tL2P0 = height at 60 cm hole and 0 fertilizer dose (control)

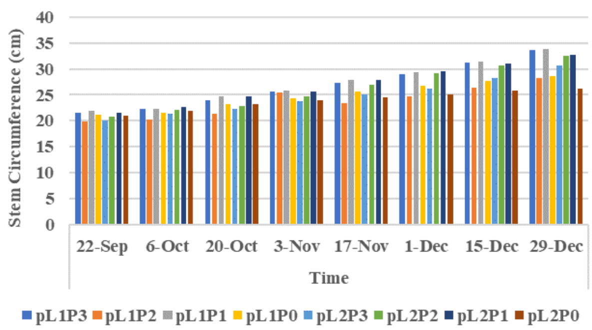

Fig. 2. Graph of Average Length of Stem Circumference Every 2 Weeks.

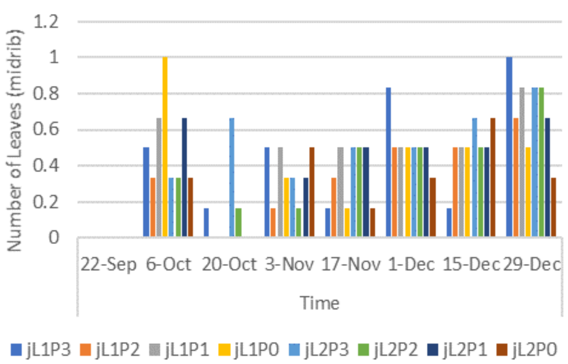

Fig. 3. Graph of Average Number of Leaves Every 2 Weeks.

Figure 2 shows the length of the stem circumference of plants from all treatments observed every two weeks increasing in length so that it forms an upward curve. It can be noted that the fertilizer-applied plants increased the stem circumference length faster than the plants without fertilizer application (control).

Analysis of variance showed significant differences between the number of plant leaves with fertilizer doses of 1.5 kg, 0,5 kg, and 1 kg, without fertilizer (control). Table 2 shows that the fertilizer dose of 1.5 kg can produce the highest number of plant leaves, namely 3.67 strands. At doses of 1 kg and 0.5 kg, the number was around 3-3.33 strands, followed by the number of leaves of plants without fertilizer (control) of 2.67 strands, which is categorized as low. Reference [13] showed that NPK fertilizer treatment had a real quadratic effect on the variable number of midribs at 12 BSP. N nutrients are directly involved in the formation of amino acids, proteins, nucleic acids, enzymes, nucleoproteins, and alkaloids that are needed for plant growth processes, especially leaf development, and tiller formation [12]. The small or large number of plant leaves is responsible for providing energy in the form of food and indirectly affects fruit production [14]. Figure 3 shows the number of leaves of plants from all treatments observed every two weeks increasing the number of strands so as to form an upward curve. Plants that applied fertilizer increased the number of leaves faster than plants without fertilizer (control). Because these plant changes were not visible just in a week.

Based on the results of the analysis of variance at the 5% level, it showed that the interaction of planting hole size and different doses of compound inorganic fertilizer had no significant effect on plant height, stem length, and number of leaves of Entog Dwarf coconut. It can be seen that the planting hole size factor has no effect on the observation of vegetative characters, while the compound inorganic fertilizer factor had a significant effect on the vegetative growth of the Entog Dwarf coconut. Reference [15] showed that there is no significant effect on all observation parameters because one of the factors given to plants is stronger than the other factors, so the two factors do not interact. Reference [4] show that if the interaction between one treatment and another is not significantly different, it can be concluded that the factors act freely.

The results of the analysis showed that the vegetative characters of the Entog Dwarf coconut plant were positively correlated with each other. Plant height is positively correlated with stem circumference and number of leaves and stem circumference is positively correlated with number of leaves (P value TT × LB = 0.66, P value TT × JD =0.45 and LB × JD = 0.58). The results of the correlation test between these characters can be observed in Figure 4. Reference [14] showed that the taller the plant, the greater the stem circumference and the more leaves, as well as the greater the stem circumference, the possibility of producing more leaves

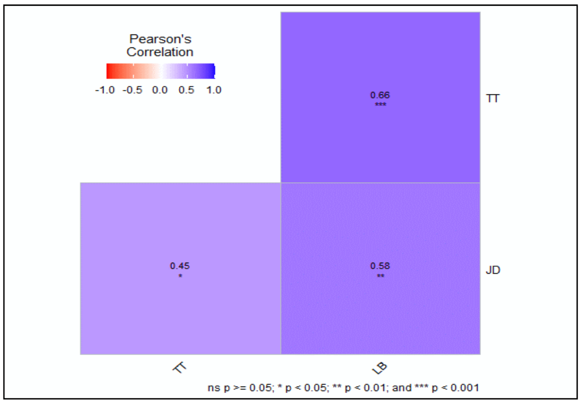

Fig. 4. Correlation Test Between Characters Description: TT = Plant Height, LB = Stem Circumference, JD = Number of Leaves

The results of soil analysis both without fertilization and after fertilization were presented in Tables 3 and 4 namely pH, moisture content, organic carbon, nitrogen, phosphorus and potassium. Meanwhile, the results of the analysis of the leaves of the Entog Dwarf coconut are shown in Tables 5 and 6 namely moisture content, organic carbon, nitrogen, phosphorus, potassium, stomatal index, and chlorophyll content.

The pH H_2O before fertilization at the age of 7 months and 10 months was classified as slightly acidic to neutral (6.40-6.77) with the highest pH H_2O obtained with a value of 6.77 (Neutral) in L2P0 and the lowest pH H_2O obtained with a value of 6.40 (Slightly Acidic) in L1. After fertilization at the age of 10 months the category of pH H_2O was slightly acidic to acidic (5.45-6.24) with the highest pH H_2O obtained with a value of 6.24 (Slightly Acidic) in L1P3 and the lowest pH H_2O obtained with a value of 5.45 (Acidic) in L2P3.

TABLE 3
RESULTS OF SOIL NUTRIENT ANALYSIS AT 7 MONTHS OF AGE

Sample Identity	Against 105°C Dry Sample						
t1 (cm)	Moisture content (%)	pH H2O	pH KCl	Organic Carbon (%)	N Total (%)	P Available (ppm)	Potassium (%)
L1	5,18	6,40 ss	5,14 n	1,62 l	0,10 l	201 vh	0,46 n
L2	4,95	6,64 n	5,16 n	0.96 vl	0,17 l	37 m	0,59 n

Letter descriptions as categories:
m = sour, n = neutral, l = low, h = high, ss = slightly sour, vl = very low, m = medium, vh = very high

TABLE 4
RESULTS OF SOIL NUTRIENT ANALYSIS AT 10 MONTHS OF AGE

Sample Identity		Against 105°C Dry Sample						
t1 (cm)	t2 (kg)	Moisture content (%)	pH H2O	pH KCl	Organic Carbon (%)	N-Total (%)	P Available (ppm)	Potassium (%)
L1	P3	5,11	6,24 ss	4,66 n	1,08 l	0,13 l	682 vh	0,09 vl
	P2	6,60	6,12 ss	4,81 n	0,54 vl	0,15 l	985 vh	0,10 L
	P1	4,33	5,52 s	4,15 n	1,01 l	0,12 l	253 vh	0,09 vl
	P0	6,94	6,48 ss	5,21 n	1,39 l	0,14 l	37 m	0,06 vl
L2	P3	6,12	5,45 s	4,25 n	1,09 l	0,07 vl	58 h	0,15 l
	P2	7,22	5,99 ss	4,81 n	0,44 vl	0,04 vl	583 vh	0,09 vl
	P1	5,54	5,50 s	4,20 n	2,25 m	0,14 l	423 vh	0,09 vl
	P0	6,69	6,77 n	5,41 n	1,12 l	0,15 l	127 vh	0,08 vl

The application of NPK fertilizer can reduce soil pH because the 10% S contained by this fertilizer will react with water molecules, oxygen and CO_2 in the soil which will produce sulfate ions and a number of H+ ions so as to reduce soil pH [16]. However, this result was in accordance with the land criteria for coconut plants, the appropriate pH ranges from 4.8 to 7.5 [17].

Soil organic carbon after fertilization at the age of 10 months with the highest level was 2.25% (Medium) in L2P1 and the lowest level was 0.44% (Very Low) in L2P2. These results show that compound inorganic fertilizers have no effect on soil organic carbon levels. However, weathering of organic matter can help provide nutrients Nitrogen, phosphorus and Potassium in the soil needed by plants and improve soil physical properties [12]. Leaf organic carbon before fertilization at the age 7 months and 10 months with the highest level was 5.02% (Very High) in L2P0 and the lowest level was 4.09% (High) in L1P0. Organic carbon of leaves after fertilization at the age 10 months with highest level was 5.28% (Very High) in L2P3 and the lowest organic carbon of 4.28% (High) in L1P1. Reference [20] show that carbon is exchanged between soil and atmosphere through the process of photosynthesis and decomposition, where plants absorb CO_2 and retain carbon while releasing oxygen through photosynthesis. The carbon retained by plants is then transferred to the soil via the roots during the decomposition of plant residues..

TABLE 5
RESULTS OF LEAVES NUTRIENT ANALYSIS AT 7 MONTHS OF AGE

Sample Identity	Against 105°C Dry Sample					Chlorophyll			Stomata
t1 (cm)	Moisture Content (%)	Organic Carbon (%)	N-Total (%)	P (%)	Potassium (%)	Chlorophyll A (mg/l)	Chlorophyll B (mg/l)	Chlorophyll Total (mg/l)	Average Index
L1	4,58	4,27 h	0,08 vl	0,011 vl	1,78 vh	31,858	21,101	14,815	0,10
L2	5,20	4,99 h	0,08 vl	0,009 vl	1,20 h	31,199	14,815	46,002	0,10

TABLE 6
RESULTS OF LEAVES NUTRIENT ANALYSIS AT 10 MONTHS OF AGE

Sample Identity		Against 105°C Dry Sample					Chlorophyll			Stomata
t1 (cm)	t2 (kg)	Moisture Content (%)	Organic Carbon (%)	N-Total (%)	P (%)	Potassium (%)	Chlorophyll A (mg/l)	Chlorophyll B (mg/l)	Chlorophyll Total (mg/l)	Ave-rage index
L1	P3	5,46	5,26 vh	0,11 l	0,003 vl	0,74 vl	32,815	36,019	68,812	0,11
	P2	5,10	5,23 vh	0,27 m	0,003 vl	1,00 r	30,778	41,261	72,015	0,10
	P1	5,39	4,28 h	0,22 m	0,004 vl	1,14 r	31,537	25,799	57,319	0,08
	P0	5,12	4,09 h	0,23 m	0,003 vl	1,04 l	31,969	24,917	56,868	0,09
L2	P3	4,79	5,28 vh	0,29 m	0,0,003 vl	0,76 vl	31,418	27,332	58,732	0,11
	P2	7,55	5,14 vh	0,26 m	0,003 vl	0,79 vl	31,624	24,233	55,840	0,10
	P1	4,94	4,79 h	0,22 m	0,004 vl	0,70 vl	31,461	25,827	57,270	0,09
	P0	3,90	5,02 vh	0,21 m	0,004 vl	1,00 l	31,003	18,656	49,645	0,10

Nitrogen is mainly required for vegetative growth of plants [21]. Nitrogen in the soil without fertilization at the age of 7 months and 10 months with the highest level was 0.17% (Low) in L2 and the lowest level was 0.10% (Low) in L1. Soil nitrogen after fertilization at the age 10 months with the highest level was 0.15% (Low) in L1P2 and the lowest level was 0.04% (Very Low) in L2P2. Leaf nitrogen without fertilization at the age 7 months and 10 months with the highest nitrogen was 0.23% (Medium) in L1P0 and the lowest nitrogen was 0.08% (Very Low) in L1 and L2. The leaf nitrogen after fertilization at the age 10 months with the highest level was 0.29% (Medium) in L2P3 and the lowest nitrogen was 0.11% (Low) in L1P3. The low N content is influenced by three factors, namely leaching with drainage water, evaporation and absorption by plants or some N is transported by the harvest, some returns as plant residues, is lost to the atmosphere and returns again, lost through leaching [22]. The loss of N from the soil is due to use by plants or microorganisms [23]. The important function of phosphorus in plants is in the process of photosynthesis, respiration, energy transfer and storage, cell division, and enlargement [24]. Phosphorus in the soil without fertilization at the age of 7 months and 10 months with the highest level was 201 ppm (Very High) in L1 and the lowest phosphorus was 37 ppm (Medium) in L2 and L1P0. Soil phosphorus after fertilization at the age of 10 months with the highest phosphorus was 985 ppm (Very High) in L1P2 and the lowest level was 58 ppm (High) in L2P3. Leaf phosphorus without fertilization at the age of 7 months and 10 months with the highest level was 0.011% (Very Low) in L1 and the lowest level was 0.003% (Very Low) in L1P0. Leaf phosphorus after fertilization at the age of 10 months with the highest level was 0.004% (Very Low) in L1P1 and L2P1 and the lowest level was 0.003% (Very Low) in L1P3, L1P2, L2P3 and L2P2. The availability of phosphorus is influenced by soil pH, where in acidic soils the availability of Al, Fe and Mn elements is generally greater so that they tend to bind H2PO4 and the reaction between Al, Fe and Mn with H2PO4 causes insoluble phosphorus so that it becomes unavailable to plants [25] or is not absorbed by plants [23]. Phosphorus is more slowly available to plants, whereas phosphorus fertilizer has less effect due to its low solubility [25].

Potassium in the soil before fertilization at the age of 7 months and 10 months with the highest level was 0.59% (Neutral) in L2 and the lowest level was 0.06% (Very Low) L1P0. The soil potassium after fertilization at the age of 10 months with the highest level was 0.15% (Low) in L2P3 and the lowest level of 0.09% (Very Low) in L1P3, L1P1, L2P2 and L2P1. Leaf potassium before fertilization at the age of 7 months and 10 months with the highest level was 1.78% (Very High) in L1 and the lowest level was 1.00% (Low) in L2P0. The potassium of leaves after fertilization at the age 10 months with the highest level was 1.14% (Low) in L1P1 and the lowest level was 0.70% (Very Low) in L2P1. The size of potassium has a relatively large hydrated form, so the element potassium is not strongly absorbed by the colloidal surface charge and easily leached from the soil, which causes the availability of potassium in the soil is generally low and the high mobility of potassium is mostly found in the vegetative parts of the plant [26].

The stomatal index on leaves without fertilization at the age of 7 months and 10 months with the highest level was 0.10 in L1, L2 and L2P0 and the lowest level was 0.09 in L1P0. The stomatal index after fertilization at the age of 10 months with the highest stomatal index was 0.11 in L1P3 and L2P3 and the lowest stomatal index was 0.08 in L1P1. The low stomatal index is a process of adaptation to drought stress conditions to prevent excessive transpiration [27].

Chlorophyll content in leaves without fertilization at the age of 7 months and 10 months with the highest total chlorophyll content was 56.868 mg/L in L1P0 and the lowest total chlorophyll content was 46.002 mg/L in L2. The chlorophyll content after fertilization at the age of 10 months with the highest total chlorophyll content was 72.015 mg/L in L1P2 and the lowest total chlorophyll content was 55.840 mg/L in L2P2. Reference [28] shows that chlorophyll is the main component of chloroplast for photosynthesis. The higher the chlorophyll content, the higher the level of photosynthesis. Chlorophyll has three main functions in the photosynthesis process, namely triggering CO2 fixation to produce carbohydrates, providing energy for the ecosystem, and utilizing solar energy.

IV. CONCLUSION

Based on the results of analysis of variance at level 5%, the provision compound of inorganic fertilizer doses significantly affects the vegetative growth of Entog Dwarf coconut. The tallest plants were about 51.2-63.7cm with a dose of 0.5-1.5kg while the shortest was 27.2cm, the largest stem circumference was 10.8-11.3cm with a dose of 0,5kg and 1.5kg while the smallest was 6.42cm, and the largest number of leaves was 3.67 midribs with a dose of 1.5kg while the smallest number was 2.67 midribs, where all vegetative characters were categorized as low in control plants. The interaction between the two factors had no significant effect on vegetative growth. The vegetative characters observed were positively correlated. The analysis showed that there was not much difference in the nutrient levels of soil pH, Moisture Content, Organic Carbon, Nitrogen, Phosphorus, Potassium, Leaf Stomatal Index, and Leaf Chlorophyll both without fertilization and after compound inorganic fertilization.

REFERENCES

[1] Hermanto, Effendy, I., & Anarsis, Y. 2021. Study on Growth of Oil Palm Plant Seeds (*Elaeis guineensis* Jacq) Main Nursery Treatment of Liquid Organic Fertilizer and NPK Compound Fertilizer. Jurnal Agrohita UM-Tapsel, 6(2): 155–159.

[2] Jaelani, R. N. 2017. Pengaruh Ukuran Lubang Tanam dan Pupuk Kandang terhadap Pertumbuhan Tanaman Salak (*Salacca zalacca*) pada Fase Vegetatif Awal. Thesis. Fakultas Pertanian Universitas Brawijaya. Malang.

[3] Rosniawaty, S., Ariyanti, M., & Suherman, C. 2019. The Growth Response of Immature Coconut (*Cocos nucifera* L.) Plants to The Application of Various

Doses of Vermicompost. Journal of Agrotechnology and Science, 6(2): 78-85.

[4] Daung, I., & Suroto, S. 2020. Effect of Giving Bokashi Organic Fertilizer and Phonska NPK Fertilizer on Growth and Production of Large White Ginger (*Zingiber officinale*) Plants. Agrifarm: Jurnal Ilmu Pertanian, 8(2): 73–78.

[5] Sukmawan, Y., Sudradjat, & Sugiyanta. 2015. The Role of Organic and NPK Compound Fertilizers on Growth of One-year-old Oil Palm on Marginal Land. J. Agron. Indonesia, 43(3): 242–249.

[6] Laia, S., Sitorus, B., & Manurung, A. I. 2021. Pengaruh Pemberian Pupuk Kascing Dan Pupuk NPK Terhadap Pertumbuhan Bibit Kelapa Sawit (*Elaeis guineensis* Jacq) Di Pre- Nursery. Jurnal Agrotekda, 5(1): 213-230

[7] Mardiatmoko, G. & Ariyanti, M. 2018. Produksi Tanaman Kelapa (*Cocos nucifera* L.), Ambon: Penerbit Fakultas Pertanian Universitas Pattimura

[8] Kementerian Pertanian Direktorat Jenderal Perkebunan. 2014. Pedoman Budidaya Kelapa (*Cocos nucifera*) yang Baik, Jakarta: Direktorat Jenderal Perkebunan.

[9] Chisyashita, F. 2021. Study on Cultivation of Oil Palm (*Elaeis guineensis* Jacq.) in Pulang Pisau Regency, Central Kalimantan Province. Proceedings Series on Physical & Formal Sciences, 2: 219–227.

[10] Sihombing, D., & Puspita, F. 2015. The Study of Cultivation Techniques Palm (*Elaeis guineensis*) Independent Farmers Lubuk Dalam District Siak Regency Riau Province. JOM Faperta, 2(1):1–27.

[11] Rahayu A. R. 2014. Pengaruh Dosis Pupuk NPK dan Kompos terhadap Pertumbuhan Ganyoung Merah (*Canna edulis* Ker) di bawah Tegakan Sengon (*Falcataria moluccana* Miq.) Skripsi. Fakultas Kehutanan IPB. Bogor.

[12] Fidiansyah, A., Sudirman Yahya, & Suwarto. 2021. The Effect of Inorganic and Organic Fertilizers on the Growth, Production and Quality of Tubers, and Pest Resistance of Shallots. Jurnal Agronomi Indonesia, 49(1): 53–59.

[13] Siallagan, I., Sudrajat, & Hariyadi. 2014. Optimizing Rate of Organic and NPK Compound Fertilizers for Immature Oil Palm. Jurnal Agron Indonesia, 42(2): 166–172.

[14] Pakpahan, H., Rompas, C. F. E., & Matana, Y. R. 2022. The Viability of Kopyor Dwarf Coconut Seed. Jurnal Nukleus Biosains, 3(1): 23–33.

[15] Halim, M., Wahyudi, E., & Putra, I. A. 2019. Pemberian Pupuk NPK dan Kompos Tandan Kosong Kelapa Sawit pada Pertumbuhan Bibit Kelapa Sawit (*Elaeis guineensis* Jacq) di Pembibitan Awal. Agrinula: Jurnal Agroteknologi Dan Perkebunan, 2(1): 9–12.

[16] Kaya, E. 2014. Pengaruh Pupuk Organik dan Pupuk NPK terhadap pH dan K-Tersedia Tanah serta Serapan-K, Pertumbuhan, dan Hasil Padi Sawah (*Oryza sativa* L). Buana Sains, 14(2): 113–122.

[17] Latupapua, A. I. 2020. Relationship between pH, Eh, and EC with Coconut Production at Different Growing Location. Agrologia, 9(1): 1–8.

[18] Salam, A. K. 2020. Ilmu Tanah, Lampung: Global Madani Press.

[19] Fitri, M. Z., & Salam, A. 2017. Detection of Relative Water Content Leaves as A Refuge of Induction Organizing Orange Jember. Agritop, 15(2): 252–265.

[20] Siringoringo, H. H. 2014. The Important Roles of Managing Carbon Sequestration in Soils. Jurnal Analisis Kebijakan Kehutanan, 11(2): 175–192.

[21] Amnah, R., & Friska, M. 2019. Effect of Activator on Levels of C, N, P and K Compost of Salak Sidimpuan Leaf Midrib. Jurnal Pertanian Tropik, 6(3): 342–347.

[22] Patti, P. S., Kaya, E., & Silahooy, C. 2013. Analysis of Soil Nitrogen Status in Relation to the N Uptake of Rice Plant in Waimital Village, Kairatu Sub District, West Seram District. Agrologia, 2(1): 51–58.

[23] Afni, N., Darman, S., & Amelia, R. 2020. Analysis of Some Natural Chemical Properties in Coconut Plantation Land (*Cocos nucifera*) in Vilage Sibayu Kecamatan Balaesang Donggala District. Agrotekbis: E-Jurnal Ilmu Pertanian, 8(6): 1243–1251.

[24] Lisdiyanti, M., Sarifuddin, & Guchi, H. 2018. The Influence of Humic Matter and Phosforus Fertilizer for Increasing Available P in Ultisol. Jurnal Pertanian Tropik, 5(2): 192- 198.

[25] Radja, R.D.D., & Susanto, S. The Effect of Phosphorus Fertilizer on Vegetative and Generative Growth of Roselle (*Hibiscus sabdariffa* L.). Makalah Seminar Departemen Agronomi dan Hortikultura. Fakultas Pertanian IPB. Bogor.

[26] Wirayuda, H., Sakiah, S., & Ningsih, T. 2022. Kadar Kalium pada Tanah dan Tanaman Kelapa Sawit (*Elaeis guineensis* Jacq) pada Lahan Aplikasi dan Tanpa Aplikasi Tandan Kosong Kelapa Sawit. Tabela Jurnal Pertanian Berkelanjutan, 1(1): 19–24.

[27] Sumadji, A. R., & Purbasari, K. 2018. Indeks Stomata, Panjang Akar Dan Tinggi Tanaman Sebagai Indikator Kekurangan Air Pada Tanaman Padi Varietas Ir64 Dan Ciherang. Jurnal Agri-Tek: Jurnal Penelitian Ilmu-Ilmu Eksakta, 19(2).

[28] Nurcahyani, E., Apriyanti, D., Wahyuningsih, S., & Mahfut, M. 2020. Analisis Klorofil Dan Pertumbuhan Eksplan Kacang Kedelai (*Glycine max* (L.) Merr.) Kultivar Anjasmoro Secara In Vitro Dengan Pemberian Air Kelapa (*Cocos nucifera* L.). Analit:Analytical and Environmental Chemistry, 5(2): 101–110.

[29] Putra, A.R.D.M. 2021. Analisis Usaha Tani Indukan Benih Kelapa Genjah Varietas Entog di Kecamatan Alian Kabupaten kebumen. Skripsi. Fakultas Pertanian UMY. Yogyakarta.

[30] Zhu, C, Hu, Y, Mao, H, Li, S, Li, F, Zhao, C. Luo, L, Liu, W and Yuan, X. 2021. A Deep Learning-Based Method for Automatic Assessment of Stomatal Index in Wheat Microscopic Images od Leaf Epidermis. Front Plant Sci:12: 716784.