

Growth and Yield of Red Rice (*Oryza nivara* L.) Applied with Organic and Inorganic Fertilizers

*Pertumbuhan dan Hasil Padi Merah (*Oryza nivara* L.) yang Diaplikasikan Pupuk Organik dan Anorganik*

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ABSTRAK

Padi beras merah merupakan salah satu jenis padi di Indonesia yang unggul dalam kandungan gizi dan harga jual dibandingkan padi beras putih tetapi produktivitas padi beras merah masih rendah. Salah satu cara memperbaiki pertumbuhan padi dan produktivitasnya yaitu pemupukan. Penelitian ini bertujuan untuk mengetahui pengaruh kombinasi pupuk organik dan anorganik terhadap pertumbuhan dan hasil padi beras merah (*Oryza nivara* L.) menggunakan rancangan acak kelompok (RAK) dengan 7 perlakuan. Setiap perlakuan diulang sebanyak 3 kali dan masing-masing unit perlakuan terdiri dari 3 tanaman sehingga total keseluruhan tanaman berjumlah 63 tanaman dalam percobaan. Hasil Penelitian menunjukkan bahwa perlakuan terbaik adalah kompos tandan kosong kelapa sawit 125 g + pupuk N, P, dan K 50%. Produksi tertinggi diperoleh pada perlakuan kompos tandan kosong kelapa sawit 125 g + pupuk N, P, dan K 50% dengan hasil 5,49 ton/ha yang memberikan pengaruh terbaik pada peubah tinggi tanaman, bobot gabah bernas per rumpun, persentase gabah bernas per rumpun, dan persentase gabah hampa terendah. Pemberian kombinasi pupuk organik dan 50% anorganik lebih baik dibandingkan dengan pemupukan anorganik saja. Pada sistem pertanian tanaman padi beras merah dapat disarankan memberikan kombinasi pupuk kompos tandan kosong kelapa sawit 125 g dan 50% pupuk N, P, dan K untuk meningkatkan hasil dalam budidaya tanaman padi beras merah.

Kata kunci: kompos, Leguminosae, tandan kosong kelapa sawit

ABSTRACT

Red rice was one species of rice in Indonesia that was superior in nutritional content and selling price compared to white rice but the productivity of red rice is still low. One of way to improved rice growth and productivity is fertilization red rice was one type of rice in Indonesia that contains high nutrition. This research aimed to observe the effects of the combination of organic and inorganic fertilizers on the growth and yield of red rice (*Oryza nivara* L.). The research used a Randomized Completely Block Design (RCBD) with 7 treatments. Each treatment had 3 replications and each experiment unit consisted of 3

plants so that there were 63 plants. The best treatment was compost of oil palm empty fruit bunch (125 g) + N, P, and K fertilizer 50%. The highest production was on oil palm empty fruit bunch compost (125 g) + Fertilizer N, P and K 50%, it was equivalent to 5.49 ton/ha. In the red rice crop farming system, it can be recommended to provide a combination of oil palm empty fruit bunch (125 g) compost and 50% N, P and K fertilizer to increase yields in the cultivation of red rice.

Keywords: compost, Leguminosae, oil palm empty fruit bunch

INTRODUCTION

Red rice is one species of rice in Indonesia that contains high nutrition. (Winarti et al., 2018). *Oryza nivara* L. Nutritional content per 100 g, consisting of 7.5 g protein, 0.9 g fat, 77.6 g carbohydrates, 16 mg calcium, phosphorus 163 mg, iron 0.3 g, vitamin B1 0.21 mg and anthocyanin (Indriyani et al., 2013). The selling price is higher than the price of white rice. Therefore, red rice is a luxury food. (Asmarani, 2017).

According to Susanto (2016), the price of red rice reached 38,550.00 IDR/kg while white rice was only 15,000.00 IDR/kg. Red rice productivity is still low at 3.94 ton/ha compared to white rice with the highest rice productivity reaching 5.44 ton/ha (Indonesian Central Statistics Agency, 2015). Dry rice production of 65,980,670 tons is not enough fulfil Indonesia's population, which reaches 252.17 million people with a level rice consumption reaching 132.98 kg/capita/year (Ministry of Agriculture 2015). Increasing rice production is priority to overcome supply shortages. One way to improve rice growth and productivity is fertilization. Fertilizers consists of 2 types a organic fertilizer and inorganic fertilizer.

Inorganic fertilizers N, P and K are beneficial for plant growth. Fertilizer N can increase plant growth in the vegetative and generative phases, increase productive tillers and reduce the number of empty grains (Hepriyani et al., 2016). Leguminosae plants are best used as organic material because have a low C/N ratio causes faster decomposition process and nutrient mineralization process (Istrun, 2015).

The interaction between OPEFB 7.5 tons/ha with P₂O₅ 46.575 kg/ha was able to give the highest yield red rice (Iqbal et al., 2016). Giving OPEFB compost increased the weight of 1000 seeds because the provision of OPEFB compost can sufficient nutrients to assimilates into seeds. The ability of plants to translate assimilates into seeds will affect their size, which will affect the weight of 1000 seeds of the plant. (Saputra et al., 2016). According the results of Sari's research (2014), it was stated that the application of manure 20 tons/ha followed by the application of inorganic fertilizers produced the highest production in Sri rice production. Based on the results of Alavan's research (2015) that the effect of fertilizing on the best rice growth is found in a 50% organic and 50% inorganic fertilization. The treatment showed that the *Mucuna bracteata* compost with a dose of 20 tons/ha combined with 50% N, P, and K fertilizers gave the best results on upland rice yields (Permatasari, 2015). In the early stages of the application of organic farming, it still needs to be supplemented with inorganic fertilizers because organic fertilizers contain very low levels of nutrients (Padmanabha et al., 2014). Based on the description above, It is suspected that giving 20 tons/ha long bean compost 125 g and 50% N, P and K fertilizers per plant give the best results to the growth and yield of red rice (*O. nivara*) accordingly conducted research on the effect of a combination of organic and inorganic fertilizers on the growth and yield of red rice. This research aimed to observe the effects of the combination of organic and inorganic fertilizers on the growth and yield of red rice (*O. nivara*).

MATERIALS AND METHODS

This research was conducted on Ilir Barat District I, Palembang. The research will be conducted from May to November 2018. Soil analysis was carried out at the Laboratory of Chemistry, Biology and Soil Fertility, Department of Soil Science, Faculty of Agriculture, Sriwijaya University, Indralaya Campus, Ogan Ilir, South Sumatra. This research used a randomized block design (RCBD) with 7 treatments. Each treatment has 3 replicates and consisted of 3 plants for replication respectively so that the total number of plants was 63 plants in the experiment. As for each treatment of plants, namely:

P1 : Fertilizer N, P and K 100% (200 kg Urea/ha + 100 kg SP-36/ha + 100 kg KCl/ha)

P2 : Long bean compost (125 g) + Fertilizer N, P and K 25%

P3 : Long bean compost (125 g) + Fertilizer N, P and K 50%

P4 : Oil palm empty fruit bunch compost (125 g) + Fertilizer N, P and K 25%

P5 : Oil palm empty fruit bunch compost (125 g) + Fertilizer N, P and K 50%

P6 : Chicken manure fertilizer (125 g) + Fertilizer N, P and K 25%

P7 : Chicken manure fertilizer (125 g) + Fertilizer N, P and K 50%

Data Analysis

The data obtained were analyzed using the analysis of variance (Anova) method to see the effect of the treatment. If the $F_{count} > F_{table}$ at the 5% test level means that the fertilizer treatment has a significant effect. Furthermore, to see the difference between treatments, further tests were carried out using the least significant difference test (LSD) at a test level of 5%.

Compost Making

Making Leguminosae compost need one month. Preparing EM4 solution, sugar solution, water and stir until evenly distributed then the material to be composted is prepared first in the form of

fresh leaves of 20 kg (80%) long bean plants. 4 kg (20%) bran, 0.5 kg sugar, 600 ml EM4 and enough water.

Planting Media Analysis

Soil analysis was carried out before and after the application of fertilizer. Soil was analyzed for N, P, K, pH and organic C/N content in the Laboratory of Chemistry, Biology and Soil Fertility, Department of Soil Science, Faculty of Agriculture, Sriwijaya University, Indralaya Campus, Ogan Ilir, South Sumatra, Indonesia.

RESULTS

Based on the results of the diversity analysis showed that the combination of organic and inorganic fertilizers had a very significant effect on plant height, number of tillers, and number of productive tillers per clump and significantly affected the grain weight of 1000 grains, the weight of rice grains per clump, root dry weight and dry grain production harvest but did not significantly affect the percentage of rice grain per clump, the percentage of empty grain per clump, the dry weight of crop stover, and the number of grains per panicle (Table 1).

Plant Height

The results of the diversity analysis showed that the combination treatment of organic and inorganic fertilizers had very significant effects on plant height variables. In the plant height variable, the highest plant was obtained in treatment oil palm empty fruit bunch compost 125 g + Fertilizer N, P and K 50% with an average height of 70.56 cm while the lowest plant height was obtained in treatment fertilizer N, P and K 100% with an average height of 59.33 cm. The height of rice plants (Table 2).

Number of Tillers per Clump

The results of the diversity analysis showed that the combination of organic and inorganic fertilizers significantly affected

the number of tillers per clump. The highest number of tillers was in treatment chicken manure fertilizer 125 g + fertilizer N, P and K 50% with an average of tillers 47.67 and the least number of tillers was in treatment fertilizer N, P and K 100% with an average of tillers 21.11. The number of tillers in all treatments (Table 3).

Number of Productive Tillers per Clump

The results of the diversity analysis

showed that the combination of organic and inorganic fertilizers significantly affected the number of productive tillers per family. The highest number of productive tillers per family was in treatment chicken manure fertilizer 125 g + fertilizer N, P and K 50% with an average of 23.67 and the lowest number of productive tillers was in treatment fertilizer N, P and K 100% with an average of 11.89. The number of productive tillers in all treatments (Table 4).

Table 1. The calculated F value and the coefficient of variation (cv) on various combinations of organic and inorganic fertilizers on all variables observed

Variable	F Count	CV (%)
Plant height	10.69**	3.03
Number of tillers per clump	18.20**	8.96
Number of productive tillers per clump	10.69**	10.57
Percentage of pithed rice grain per clump (%)	0.61 ^{ns}	18.10
Percentage of empty grains per clump (%)	0.61 ^{ns}	23.23
1000 grains weight	3.38*	11.52
Weight of pithed rice per clump	4.26*	21.80
Dry weight of plant stover	1.35 ^{ns}	36.71
Root dry weight	3.24*	27.64
Number of grains per panicle	0.53 ^{ns}	18.96
Dry grain production harvest	4.26*	21.80
F value 5%	3.00	

Note: CD = Coefficient of Variation, ^{ns} = Non significant effect, * = Significant effect

Table 2. Plant height in various combinations of organic and inorganic fertilizers

Fertilizer Doses	Average Amount Plant Height	LSD 5% = 3,63
P ₂ (Long bean compost + Fertilizer N, P, and K 25%)	66.44	b
P ₃ (Long bean compost + Fertilizer N, P, and K 50%)	69.00	bc
P ₄ (Oil palm empty fruit bunch compost Fertilizer N, P and K 25%)	67.00	bc
P ₅ (Oil palm empty fruit bunch compost Fertilizer N, P and K 50%)	70.56	c
P ₆ Chicken manure + pupuk N, P, and Fertilizer N, P and K 25%	69.33	bc
P ₇ (Chicken manure + Fertilizer N, P and K 50%)	70.00	c

Note: The numbers followed by the same letter mean that they are not significantly different in the LSD test of 5%

Table 3. Number of tillers per family of combinations of organic and inorganic fertilizers on various combinations of organic and inorganic fertilizers

Fertilizer Doses	Average Amount	LSD 5% = 6,02
	Number of Tillers	
P ₁ (Fertilizer N, P and K 100%)	21.11	a
P ₂ (Long bean compost + Fertilizer N, P, and K 25%)	36.77	b
P ₃ (Long bean compost + Fertilizer N, P, and K 50%)	40.33	bc
P ₄ (Oil palm empty fruit bunch compost Fertilizer N, P and K 25%)	37.22	b
P ₅ (Oil palm empty fruit bunch compost Fertilizer N, P and K 50%)	43.55	cd
P ₆ Chicken manure + pupuk N, P, and Fertilizer N, P and K 25%	37.67	bc
P ₇ (Chicken manure + Fertilizer N, P and K 50%)	47.67	d

Note: The numbers followed by the same letter mean that they are not significantly different in the LSD test of 5%

Table 4. Number of productive tillers per clump in various combinations of organic and inorganic fertilizers

Fertilizer Doses	Average Amount	LSD 5% = 3.72
	Number of Productive Tillers Per Clump	
P ₁ (Fertilizer N, P and K 100%)	11.89	a
P ₂ (Long bean compost + Fertilizer N, P, and K 25%)	18.44	b
P ₃ (Long bean compost + Fertilizer N, P, and K 50%)	21.22	bc
P ₄ (Oil palm empty fruit bunch compost Fertilizer N, P and K 25%)	19.56	bc
P ₅ (Oil palm empty fruit bunch compost Fertilizer N, P and K 50%)	23.11	cd
P ₆ Chicken manure + pupuk N, P, and Fertilizer N, P and K 25%	20.56	bc
P ₇ (Chicken manure + Fertilizer N, P and K 50%)	23.67	d

Note: The numbers followed by the same letter mean that they are not significantly different in the LSD test of 5%

Table 5. Weight of 1000 grains (g) on various combinations of organic and inorganic fertilizers

Fertilizer Doses	Average Amount	LSD 5% = 4.88
	Weight of 1000 Grains	
P ₁ (Fertilizer N, P and K 100%)	22.60	a
P ₂ (Long bean compost + Fertilizer N, P, and K 25%)	25.00	ab
P ₃ (Long bean compost + Fertilizer N, P, and K 50%)	29.83	b
P ₄ (Oil palm empty fruit bunch compost Fertilizer N, P and K 25%)	21.67	a
P ₅ (Oil palm empty fruit bunch compost Fertilizer N, P and K 50%)	22.77	a
P ₆ Chicken manure + pupuk N, P, and Fertilizer N, P and K 25%	21.40	a
P ₇ (Chicken manure + Fertilizer N, P and K 50%)	23.33	a

Note: The numbers followed by the same letter mean that they are not significantly different in the LSD test of 5%

Table 6. Weight of pithed rice per clump on various combinations of organic and inorganic fertilizers

Fertilizer Doses	Average Amount Weight of Pithed Rice per Clump	LSD 5% = 4.97
P ₁ (Fertilizer N, P and K 100%)	14.77	a
P ₂ (Long bean compost + Fertilizer N, P, and K 25%)	18.84	a
P ₃ (Long bean compost + Fertilizer N, P, and K 50%)	26.23	b
P ₄ (Oil palm empty fruit bunch compost Fertilizer N, P and K 25%)	29.88	a
P ₅ (Oil palm empty fruit bunch compost Fertilizer N, P and K 50%)	34.28	c
P ₆ Chicken manure + pupuk N, P, dan Fertilizer N, P and K 25%	28.08	b
P ₇ (Chicken manure + Fertilizer N, P and K 50%)	27.28	b

Note: The numbers followed by the same letter mean that they are not significantly different in the LSD test of 5%

Percentage of Pithed Rice Grain per Clump

The results of the diversity analysis showed that the combination of organic and inorganic fertilizers had no significant effect on the percentage of rice grain per clump. The highest percentage of rice grain per clump was found in treatment oil palm empty fruit bunch compost 125 g + fertilizer N, P and K 50% with an average of 61.34 and the lowest percentage of rice grain per clump was found in long bean compost 125 g + fertilizer N, P and K 25% with an average of 48.75. The percentage of rice grain per clump (Figure 1).

Percentage of Empty Grains/Clump (%)

The results of the diversity analysis showed that the combination of organic and inorganic fertilizers did not significantly affect the percentage of empty grains per clump. The highest percentage of empty grains per clump was found in long bean compost 125 g + fertilizer N, P and K 25% treatment with an average of 51.26 and the percentage of empty grains per clump. The lowest percentage of unhusked rice per clump was found in treatment oil palm empty fruit bunch compost 125 g + fertilizer N, P and K 50% with an average of 38.66. The percentage of empty grains per clump (Figure 2).

Grain Weight

The results of the diversity analysis showed that the combination of organic and inorganic fertilizers significantly affected the grain weight of 1000 grains. The highest 1000 grain grain weight is in long bean compost 125 g + fertilizer N, P and K 50% treatment with an average of 29.83 and the lowest 1000 grain grain weight is in chicken manure fertilizer 125 g + fertilizer N, P and K 25% treatment with an average of 21.40. 1000 grain grain weight in all treatments (Table 5).

Dry Weight of Plant Shoot

The results of the diversity analysis showed that the combination of organic and inorganic fertilizers did not significantly affect the dry weight of plant stover. The highest dry weight of crop stover was found in treatment chicken manure fertilizer 125 g + fertilizer N, P and K 50% with an average of 55.82 and the lowest dry weight of plant stover was found in treatment fertilizer N, P and K 100% with an average of 25.74. The dry weight of stover plants (Figure 3).

Weight of Pithed Rice per Clump

The results of the diversity analysis showed that the combination of organic and inorganic fertilizers significantly affected the weight of pithed rice per clump. The highest weight of unhulled rice per clump was found in treatment oil palm empty fruit

bunch compost 125 g + fertilizer N, P and K 50% with an average of 34.28 and the lowest puffed rice per clump was found in treatment fertilizer N, P and K 100% with an average of 14.77. oil palm empty fruit bunch compost 125 g + fertilizer N, P and K 50% treatment was significantly different for all treatments. Weight of pithed rice per clumps of all treatments (Table 6).

Root Dry Weight

The results of diversity analysis showed that the combination of organic and inorganic fertilizers significantly affected root dry weight. The highest root dry weight was found in treatment chicken manure fertilizer 125 g + fertilizer N, P and K 50% with an average of 45.56 and the lowest root dry weight was found in treatment fertilizer N, P and K 100% with an average of 20.64. Root dry weight of all treatments (Table 7).

Number of Grains per Panicle

The results of the diversity analysis

showed that the combination of organic and inorganic fertilizers had no significant effect on the number of grains per panicle. The highest number of grains per panicle was found in oil palm empty fruit bunch compost 125 g + fertilizer N, P and K 25% treatment with an average of 113.15 and the lowest grains per panicle was in long bean compost 125 g + fertilizer N, P and K 25% treatment with an average of 90.87. Grains per panicle (Figure 4).

Dry Grain Production Harvest

The results of diversity analysis showed that the combination of organic and inorganic fertilizers significantly affected dry grain production harvest. The highest production of dry grain production harvest was in the oil palm empty fruit bunch compost 125 g + fertilizer N, P and K 50% treatment with an average of 5.49 tons/ha and the lowest dry grain production was found in the fertilizer N, P and K 100% treatment with an average of 2.36 tons/ha. Dry grain production harvest (Table 8).

Table 7. Root dry weights on various combinations of organic and inorganic fertilizers

Fertilizer Doses	Average Amount Root Dry Weights	LSD 5% = 15.93
P ₁ (Fertilizer N, P and K 100%)	20.64	a
P ₂ (Long bean compost + Fertilizer N, P, and K 25%)	35.21	abc
P ₃ (Long bean compost + Fertilizer N, P, and K 50%)	28.61	ab
P ₄ (Oil palm empty fruit bunch compost Fertilizer N, P and K 25%)	23.69	ab
P ₅ (Oil palm empty fruit bunch compost Fertilizer N, P and K 50%)	42.66	bc
P ₆ Chicken manure + pupuk N, P, dan Fertilizer N, P and K 25%	30.31	ab
P ₇ (Chicken manure + Fertilizer N, P and K 50%)	45.56	c

Note: The numbers followed by the same letter mean that they are not significantly different in the LSD test of 5%

Table 8. Dry grain production harvest on various combinations of organic and inorganic fertilizers (ton/ha)

Fertilizer Doses	Average Amount Dry Grain Production Harvest	LSD 5% = 0.80
P ₁ (Fertilizer N, P and K 100%)	2.36	a
P ₂ (Long bean compost + Fertilizer N, P, and K 25%)	3.02	a
P ₃ (Long bean compost + Fertilizer N, P, and K 50%)	4.20	b
P ₄ (Oil palm empty fruit bunch compost Fertilizer N, P and K 25%)	4.78	b
P ₅ (Oil palm empty fruit bunch compost Fertilizer N, P and K 50%)	5.49	b
P ₆ Chicken manure + pupuk N, P, dan Fertilizer N, P and K 25%	4.49	bc
P ₇ (Chicken manure + Fertilizer N, P and K 50%)	4.36	c

Note: The numbers followed by the same letter mean that they are not significantly different in the LSD test of 5%

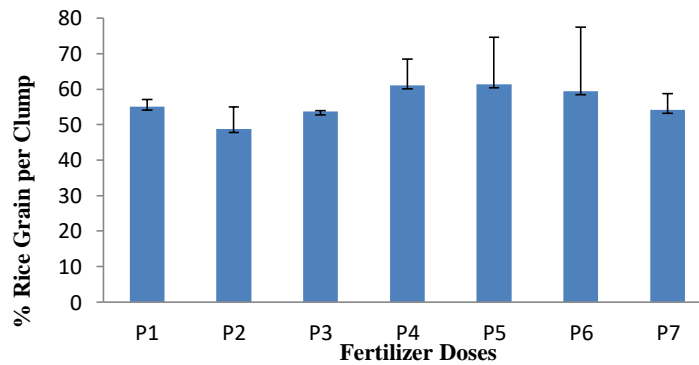


Figure 1. Average percentage of rice grain per clump on various combinations of organic and anorganic fertilizers

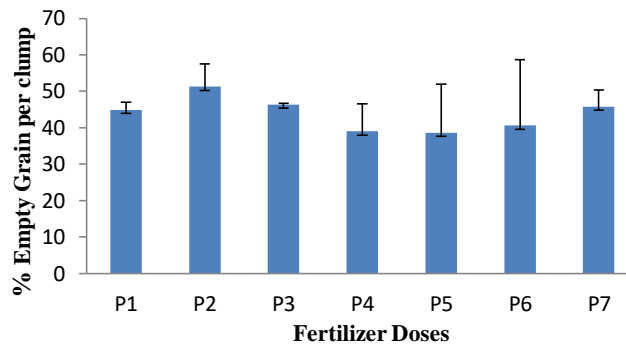


Figure 2. Average percentage of empty grain per clump in various combinations of organic and inorganic fertilizers

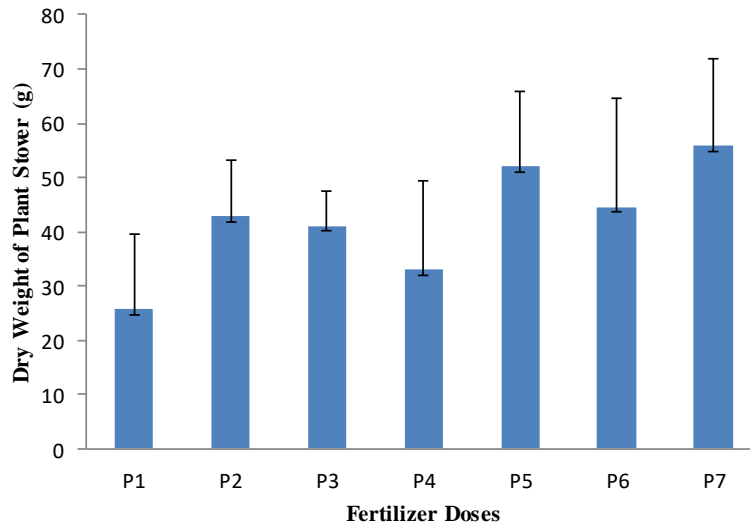


Figure 3. Average dry weight of plant stover on various combinations of organic and inorganic fertilizers

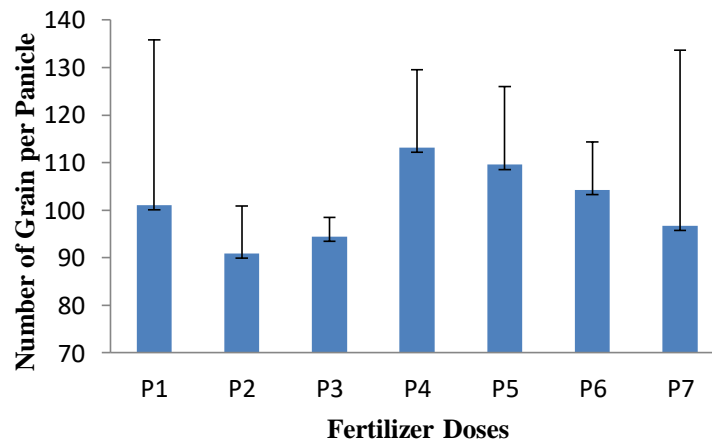


Figure 4. Average number of grains per panicle in various combinations of organic and inorganic fertilizers

DISCUSSION

The results of the average analysis showed that the treatment of oil palm empty fruit bunches compost 125 g + fertilizer N, P, and K 50% gave the best results on the plant height variable, the percentage of rice grains per clump, the highest grain weight of grains per clump, the lowest percentage of empty grains per clump and the highest production of harvested dry grain. Chicken manure fertilizer 125 g + fertilizer N, P and K 50% treatment gave the best results on the variable number of tillers and the number of productive tillers, dry stover weight, root dry weight. The Long bean compost 125 g + fertilizer N, P and K 50% treatment gives the best results on the grain

weight variable 1000 grains and oil palm empty fruit bunch compost 125 g + fertilizer N, P and K 25% treatment gives the best results on the variable number of grains per panicle. The number of tillers increased according to the increase in the N fertilizer dose and the N fertilizer dose had an effect on the flowering phase (Hikmah et al., 2017)

In the highest plant height variable was obtained in treatment oil palm empty fruit bunch compost 125 g + fertilizer N, P and K 50% with an average height of 70.56 cm while the lowest plant height was obtained in treatment fertilizer N, P and K 100% with an average height of 59.33 cm. This is because oil palm empty fruit bunch (OPEFB) compost can improve growth and

contain a large amount of K nutrients. This is in accordance with the opinion of Haryoko (2012) that in 100 g of oil palm empty fruit bunches obtained K = 36,75%, Ca = 6.56%, P = 5.47 %, P = 5.47%, C-organic = 0.92%, Mn = 114 ppm, Cu = 164 ppm, Zn = 214 ppm with pH = 11.07.

The combination of organic and inorganic fertilizers in oil palm empty fruit bunch compost 125 g + fertilizer N, P and K 50% treatment is better than fertilizer N, P and K 100% treatment which is only inorganic fertilization. This is in line with Alavan et al. (2015) which states that because OPEFB contains high enough nutrients where the macronutrients contained in OPEFB compost include C 35%, K 5.53%, N 2.32%, Ca 1.146%, Mg 0.95% and P 1.146% (Palm Oil Research Center, 2015). OPEFB fertilizer formulated in granular or large granules including slow-release fertilizers so that they remain in the soil for a long time and are available to plants until the generative phase and grain filling

In the 1000 grain weight variable, the highest 1000 grain weight was found in the treatment of long bean compost 125 g + fertilizer N, P, and K 50% with an average of 29.83. Long bean compost 125 g + fertilizer N, P, and K 50% treatment has the highest grain weight compared to other treatments. Based on the analysis of plant tissue, long bean compost treatment has the highest N and P nutrients. Long bean plant is a legume plant containing high nutrients namely N (65 kg/ha), P (6 kg/ha), K (33 kg/ha), Ca (23 kg/ha), Mg (16 kg/ha), and S (6 kg/ha) Optimization of in-situ organic matter supply technology by using plant residues and N₂ fixing plants composted with a biodecomposer to improve the quality of compost because compost has a low nutrient content with the ability to supply nutrients slowly to plants compared to synthetic fertilizers. (Saraswati R. and R. Heru Praptana 2017). The long bean compost treatment gives a small yield on pithy grain but gives results on the grain size of each grain. 1000 grain weight is

grain weight 1000 grains produced by a plant which is one of the determinants of rice plant quality and is influenced by grain size, but grain size has been determined during panicle out, so the development of caryopsis in filling grains in accordance with the specified grain size that grain size is determined by the results of the stored assimilation. 1000 grain weight is determined in the generative phase and is influenced by the size of the seed coat where the size of the seed coat is determined before the maturing phase.

The highest weight of rice grain perclump in treatment oil palm empty fruit bunch compost 125 g + fertilizer N, P and K 50% averaged 34.28 g. Based on the results of soil analysis, the highest nutrient K was in the oil palm empty fruit bunch compost treatment. This is in line with Purnamayani (2014) High K content in OPEFB compost can help increase drought and disease resistance. Element K in the OPEFB compost is not easy to release because it is absorbed in the OPEFB humus colloid. Therefore, it will remain available until harvest because it is exchanged little by little (slow-release). The availability of compost is sufficient to meet nutrient requirements from the vegetative phase to the generative phase, especially when filling grains so that the filling of grains can occur properly and produce little empty grain. Brown rice that has a longer life span than other types of rice require nutrients that are long available in the soil.

The highest dry weight of stover and plant roots was also found in treatment manure 125 g + fertilizer N, P and K 50% with an average of 55.82 g and 45.56 g. Increasing the number of tillers and the number of productive tillers will increase root biomass and rice stover. Based on the results of soil analysis in the laboratory of chicken manure containing the highest levels of N and P nutrients where the nutrients play a role in plant growth and root elongation. According to Hasibuan et al., (2017) Nitrogen is beneficial for increasing plant growth, increasing protein

levels in the soil, and increasing the proliferation of microorganisms in the soil. Nitrogen is the most important nutrient. Plant needs for N are higher than other nutrients and phosphorus nutrients which function to stimulate root growth, accelerate flowering, ripening seeds and fruit. Provision of N fertilizer at a dose of 100 kg/ha still provides remaining on soil n availability (Subatra, 2013).

These two nutrients influence growth and add weight to the roots and crowns. On the variable Number of grains per panicle. The highest number of grains per panicle was found in treatment oil palm empty fruit bunch compost 125 g + N, P and K fertilizer 25% with an average of 113.15 and the lowest grain per panicle was found in long bean compost 125 g + fertilizer N, P, and K 25% with an average of 90.87 grains. Grains in each panicle both pithy and empty are counted entirely. The highest number of grains was obtained in Oil palm empty fruit bunch compost 125 g + Fertilizer N, P and K 25% treatment but, there were many empty grains compared to pithy grains. The highest amount of pithed grain was found in treatment oil palm empty fruit bunch compost 125 g + Fertilizer N, P and K 50% and the highest production was obtained dry grain production harvest.

The highest production of dry grain production harvest was found in treatment oil palm empty fruit bunches compost 125 g + fertilizer N, P and K 50% with an average of 5.49 tons/ha and the lowest production of dry grain production harvest was found in treatment Fertilizer N, P, and K 100% with an average of 2.36 tons/ha. In rice production is the most important thing. Grain production per ha is determined by genetic and environmental factors. The environment that is around the plants called the macro environment. One that affects the macro environment is the fertilizer application. The effect of fertilizer is very important in plant growth and production. The more appropriate nutrient content for plants, better growth, and production.

The best growth was obtained in the treatment of Manure 125 g + fertilizer N, P and K 50% with an average number of tillers 47.67 while the best results were obtained treatment palm oil empty fruit bunch compost 125 g + fertilizer N, P, and K 50% with the weight of rice grain per clump average 34.28 g. This is because the photosynthetic results in manure 125 g + fertilizer N, P, and K 50% treatment are divided between vegetative and generative growth so that when filling the panicle grains is not optimal and there are many empty grains. The best growth was obtained in the treatment of manure 125 g + fertilizer N, P, and K 50% with an average number of tillers 47.67 The application of manure as much as 4 t / ha can increase the number of tillers, production components and upland rice production (Barus. 2012), while the best results were obtained treatment oil palm empty fruit bunch compost 125 g + fertilizer N, P, and K 50% with the weight of rice grain per clump average 34.28 g. This is because the photosynthetic results in manure 125 g + fertilizer N, P, and K 50% treatment are divided between vegetative and generative growth so that when filling the panicle grains is not optimal and there are many empty grains.

CONCLUSION

From the results of this research concluded that the best treatment of oil palm empty fruit bunch compost 125 g + fertilizer N, P, and K 50% that gives the best effect on plant height variables, the weight of pithed rice per clump, the percentage of pithed rice per clump, and the lowest percentage of empty grain. Giving a combination of organic fertilizer and 50% inorganic is better than inorganic fertilization. In the red rice crop farming system it can be recommended to provide a combination of oil palm empty fruit bunches 125 g compost and 50% N, P, and K fertilizer per plant (20 ton/ha) to increase yields in the cultivation of red rice.

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