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Response of Growth and Production of Upland Rice Plants (Oryza sativa L.) to Application of Vedagro Fertilizer and Green Manure

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ABSTRACT

The aim of the study was to determine the response of growth and production of upland rice (Oryza sativa L.) to the application of vedagro fertilizer and green manure. Under the guidance of Mrs. Ir. Ernita, MP. This research was carried out in the experimental garden of the Faculty of Agriculture, Riau Islamic University, for four months from February to May 2021. The aim of the study was to determine the response of various doses of vedagro fertilizer and green manure to the growth of upland rice plants. The experimental design used in this study was a completely randomized factorial design consisting of two factors. The first factor was the dose of Vedagro (V) fertilizer which consisted of 4 levels: 0, 30, 60, 90 grams per plot and the second factor was the dose of green fertilizer (H) which consisted of 4 levels: 0, 1, 2, 3 kg per plot. . Parameters observed were plant height, number of productive tillers, flowering age, harvesting age, weight of full grain, weight of empty grain, weight of wet grain in a clump, weight of dry grain in a clump and weight of 100 dry grains. The data were analyzed statistically and continued with the honest significant difference test (BNJ) at the 5% level. The results showed that the application of vedagro and green manure gave a real response to all observed parameters. The best treatment was at the dose of vedagro fertilizer 90 g/plot and green manure 3 kg/plot (V3H3). The main factor of vedagro fertilizer gave a real response to all observation parameters. The best treatment was found at the vedagro fertilizer dose of 90 g/plot (V3). The main factor of green manure gives a real response to all parameter observations. The best treatment was at a green manure dose of 3 kg/plot (H3).

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1. INTRODUCTION

Rice (Oryza sativa L.) is a staple crop used by Indonesian people as food. Rice plants are very important for maintaining food security, because until now there has been no food plant that can replace rice as the staple food of most Indonesian people.

Rice plants that have been processed will produce rice and bran, which is mostly processed for consumption is rice. Rice is an energy source food that has a high carbohydrate content but low protein. The nutritional content of rice per 100 grams of material is 360 kcal of energy, 6.6 grams of protein, 0.58 grams of fat and 79.34 grams of carbohydrates.

Rice production in Riau in 2014 reached 385.47 tons of dry milled grain (GKG), in 2015 production increased to 393.91 tons of GKG, in 2016 rice production in Riau decreased to 373.53 tons of GKG, in 2017 decreased again to 365.74 tons of GKG, but in 2018 managed to increase again to 391.13 tons of GKG (Central Bureau of Statistics, 2018).

Unstable rice production in Riau province is due to the narrower rice planting area, relatively low cultivation techniques, ineffective pest and disease control, and lack of attention to the use of high-yielding varieties. This is further exacerbated by the excessive use of chemical fertilizers which results in soil damage and dependence on chemical fertilizers because the soil is poor in macro and micro nutrients. To support rice production, it requires optimal and intensive fertilization and the use of superior varieties. One way is to use organic matter to reduce the use of inorganic fertilizers.

Vedagro Fertilizer is an organic fertilizer containing macro nutrients such as N : 11-12%, K2O : 4.5–6%, P2O5 : 0.4–0.6%, Ca : 1.1%, Mg : 1.9 –2.2%, and micro nutrients consist of Fe, Mn, Cu, Zn, B, Co, Mo and Pb (PT.RAFI, 2013). Vedagro fertilizer contains high levels of nitrogen, which is a constituent of proteins and enzymes. Growth will be faster if more and more proteins are formed, because these compounds are needed for the formation of new cells. Nitrogen in fertilizers absorbed by plants will immediately stimulate overall growth, especially plant height, stems and leaves.

Green manure has the ability to improve soil physical, chemical and biological properties. The use of green manure in agriculture, helps the environment maintain its ecological cycle. Because at harvest time, some of the biomass remains in the land and is used again for the next planting season so that external inputs in agricultural production can be kept as low as possible.

In the field of agriculture, green manure has the advantage that it is easy to obtain and can be planted in the field. One of the examples is Crotalaria juncea L. or commonly known as baby monkeys. Crotalaria juncea has a nutrient content of 4.57% N, 0.94% P and 0.94% K. Crotalaria juncea has a low C/N ratio of 12.22% (Yulianan, 2013). The element N in plants plays an important role in the formation of plant cells, tissues and organs of plants. According to Wang, et al, (2012) the use of Crotalaria juncea L. as green manure has been developed since 1982.

2. METHOD

2.1 Place and time

This research was carried out at the Experimental Field of the Faculty of Agriculture, Riau Islamic University, Pekanbaru, Jalan Kaharuddin Nasution KM 11 No. 113 Perhentian Marpoyan, Air Cold Village, Bukit Raya District, Pekanbaru City. This research was carried out for 4 months starting from February to May 2021.

2.2 Materials and tools

The materials used in this study were the seeds of the Inpago 10 variety, Fertilizer Vedagro, and Topsin 500 SC. zinc plate, wood, EM-4, palm sugar, granulated sugar, bran, dolomite lime, manure, color paint, rapia rope, nails, Crotalaria juncea (wet), and sugar plastic.

While the tools used in this study were saws, scissors, measuring cups, hoes, rakes, machetes, hammers, handspayers, tape measure, analytical scales, buckets, gembor, mulch, plastic sheeting, plastic mulch, paranet, fence nets, cameras, and stationery.

2.3 Research methods

The design used in this study was a factorial Completely Randomized Design (CRD) consisting of two factors. The first factor was the dose of Vedagro fertilizer (V) which consisted of 4 levels and the second factor was the dose of green fertilizer (H) which consisted of 4 levels, so there were 16 treatment combinations. Each treatment consisted of 3 replications, so 48 experimental units were obtained. Each experimental unit consisted of 16 plants, and 4 plants were sampled, resulting in a total of 768 plants.

The treatment factors are: Factor (V) = Dosage of Vedagro fertilizer (V) which consists of 4 levels: V0 = Without applying Vedagro fertilizer, V1 = Dosage of Vedagro fertilizer 30 g/plot (300 kg/ha), V2 = Dosage of vedagro fertilizer 60 g/plot (600 kg/ha), V3 = Dosage of vedagro fertilizer 90 g/plot (900 kg/ha). Factor (H) = Dosage of green manure which consists of 4 levels: H0 = No green manure application, H1 = Dosage of green manure 1 kg/plot (10 tonnes/ha), H2 = Dosage of green manure 2 kg/plot (20 tonnes/ha) ha), H3 = Green manure dose of 3 kg/plot (30 tonnes/ha).

Observational data from each treatment were analyzed statistically, if the calculated F is greater than the F table then proceed with the BNJ (Honest Significant Difference) follow-up test at the 5%.

2.4 Research Implementation

2.4.1 Land Preparation

The research area used is 21 mx 10 m in size. Before carrying out the research, the land was cleared first, especially from grass, wood, and litter and plant residues from previous studies using hoes, rakes and rickshaws. Install a paranet measuring 21 x 10 m so that the plants are not exposed to direct sunlight.

2.4.2 Soil Processing

Prior to making plots, the soil is processed first by plowing the soil to loosen the soil and improve soil aeration so that the activity of microorganisms in the soil is more optimal. After that, 48 plots were made with a size of 1 mx 1 m, with a distance between plots of 50 cm.

2.4.3 Preparation of Treatment Materials

The upland rice seeds used were the upland inpago 10 variety. The upland rice seeds were obtained from Malang with a requirement of 5 kg of upland rice seeds. The Vedagro fertilizer used in the study came from the Binter agricultural shop on Jalan Kaharuddin Nst, Pekanbaru, Riau. Vedagro Fertilizer that has been used in the study as much as 2.19 kg as a treatment. Green manure Crotalaria juncea (runny grub) is made in the compost house of the Faculty of Agriculture, Islamic University of Riau in the amount of 8.9 kg. Crotalaria juncea green manure which was used in the study was 72 kg as a treatment.

2.4.4 Labeling

The installation of the research label was carried out the day before the treatment was given according to the research layout. The labeling aims to facilitate the treatment and observation of upland rice plants.

2.4.5 Giving Treatment

Vedagro fertilizer is given 1 time at the age of 14 days after planting. Fertilizer application is done in an array with a distance of 7 cm from the plant. The dose given was in accordance with the treatment, namely V0 = without Vedagro fertilizer application, V1 = 30 g/plot vedagro fertilizer dose, V2 = 60 g/plot vedagro fertilizer dose and V3 = 90 g/plot vedagro fertilizer dose. Green manure is given once, namely one week before planting. The application of green manure is done by mixing the fertilizer into the plot until it is evenly distributed. The dose given was in accordance with the treatment, namely H0 = without green manure, H1 = green manure dose 1 kg/plot, H2 = green manure dose 2 kg/plot and H3 = green manure dose 3 kg/plot. After that, let it stand for one week before planting.

2.4.6 Planting

Planting of upland rice was carried out using a tugal system with a depth of 4 cm. Each planting hole is filled with 1 rice seed, planting is done with a spacing of 25 cm x 25 cm and covered again with soil.

2.4.7 Basic Fertilization

The TSP fertilizer used in the study came from the Binter agricultural store on Jalan Kaharuddin Nst, Pekanbaru, Riau. TSP fertilizer application is done once at the age of 3 weeks after planting by running at a distance of 7 cm from the plant. The fertilizer dose used was 125 kg/ha (12.5 g/plot).

The KCL fertilizer used in the study came from the Binter agricultural store on Jalan Kaharuddin Nst, Pekanbaru, Riau. KCL fertilizer application is done once at the age of 3 weeks after planting by running it at a distance of 7 cm from the plant. The dose of fertilizer used is 100 kg/ha (10 g/plot).

2.4.8 Maintenance

Watering is done once a day in the morning, if it rains at night then watering is not done. Watering is done until the plants and soil are wet as a whole. This watering is intended so that the plants are not stressed by changes in soil temperature and the humidity is maintained so that the plants look fresh.

Weeding is carried out at intervals of 2 weeks at the ages of 14, 28, 42, 56, and 70 HST, with the aim of clearing the grass found on the land which can cause competition/competition with cultivated plants. Weeding is done by hoeing the grass around the planting area and removing the weeds that grow in the plot.

Hilling of rice plants is done 3 times after the plants are 21, 42, 63 HST, while the method of hilling the plants is by burying the stems of rice plants with soil using a hoe, the height of the paddy plants is 5 cm.

Pest and disease control is carried out preventively by keeping the research location clean of grass and other waste. Curative control is carried out at the age of 14 DAP when the rice plants are attacked by locusts and armyworms. Control efforts are carried out mechanically by taking the pests one by one by hand and trimming the affected leaves. At the age of 21 HST the rice plants were attacked by leaf blight, because the disease population had exceeded the control threshold, the Topsin 500 SC pesticide was sprayed with 3 ml/liter of water using a handsprayer and the results of this control were able to control the disease in rice plants.

2.4.9 Harvest

Rice plants can be harvested when they meet the criteria, including 90% of the flag leaf and grain grains have turned yellow or when the panicles have bent down because they have supported rice grain. Apart from that, it can also be pressed by hand, if it feels hard, it means it is ready to be harvested. Harvesting is done by cutting the clumps of rice plants with a sickle. Next, the grain is threshed from the panicle and then put into sacks and then trampled. After that the grain is collected for drying and observation.

2.5 Observation Parameters

Observational parameters taken from this study included: plant height (cm), number of productive tillers (stem), age of flowering (dap), harvesting age (dap), weight of full grain (g), weight of empty grain (g), weight of unhulled grain wet per clump (g), weight of dry grain per clump (g), weight of 100 dry grain (g).

3. RESULTS AND DISCUSSION

3.1 Research results

3.1.1 Plant height

The results of observations on rice plant height after analysis of variance showed that both the interaction effect and the main effect of vedagro and green manure application had a significant effect on plant height. The average results of observations of plant height after further tests were carried out on the Honest Significant Difference (BNJ) at the 5% level can be seen in Table 1.

Table 1. Average height of rice plants in the application of Vedagro fertilizer and Green fertilizer (cm)

Vedagro fertilizer (g/plot)	Green Manure (kg/plot)				Average
	0 (H0)	1 (H1)	2 (H2)	3 (H3)	
0 (V0)	127.30 g	135.45f	140.57 ef	146.00 de	137.33d
30 (V1)	139.85f	146.40 d	148.38 d	149.35 cds	146.00c
60 (V2)	145.75 de	148.58d	154.67 bc	156.92 ab	151.48b
90 (V3)	149.88 cds	155.68b	158.27 ab	161.47 a	156.33 a
Average	140.70 d	146.53c	150.47b	153.43 a	
KK = 1.27%BNJ		V and H= 2.09BNJVH			= 5.73

Note: The numbers in the columns and rows followed by the same lowercase letters are not significantly different according to the Honest Significant Difference (BNJ) test at the 5% level.

In Table 1. shows that the interaction of Vedagro fertilizer and Green manure is significantly different on rice plant height. Plant height in the V3H3 treatment combination (Dosage of Vedagro fertilizer 90 g/plot and green manure dose of 3 kg/plot) with an average rice plant height of 161.47 cm, not significantly different from the combination of V3H2 and V2H3 treatments, but significantly different from other treatment combinations. While the plant height in the V0H0 treatment combination with an average rice plant height of 127.30 cm. Rice plant height in the V3H3, V3H2 and V2H3 treatment combinations was better than the other treatment combinations because the application of Vedagro fertilizer 90 g/plot and Green manure 3 kg/plot could support each other to increase plant height in supplying the N nutrients needed by plants paddy.

3.1.2 Number of Productive Tillers

The results of observations on the number of productive tillers of rice plants after analysis of variance showed that both the interaction and main effects of vedagro and green manure application had a significant effect on the number of productive tillers. The average results of

observing the number of productive tillers after further testing the Honest Significant Difference (BNJ) at the 5% level can be seen in Table 2.

Table 2. The average number of productive tillers of rice plants on the application of Vedagro fertilizer and green manure (stems)

Vedagro fertilizer (g/plot)	Green Manure (kg/plot)				Average
	0 (H0)	1 (H1)	2 (H2)	3 (H3)	
0 (V0)	15.00 h	15.50gh	16.83 fg	20.50e	16.96d
30 (V1)	16.00gh	17.50f	21.83 de	22.67 cds	19.50c
60 (V2)	21.33 de	23.33 BC	24.33 ab	24.67 ab	23.42 b
90 (V3)	23.33 BC	24.67 ab	24.83 a	25.00 a.m	24,46 a
Average	18.92d	20,25c	21.96b	23,21 a	
KK = 2.24%BNJ		V and H= 0.52BNJVH		= 1.44	

Note: The numbers in the columns and rows followed by the same lowercase letters are not significantly different according to the Honest Significant Difference (BNJ) test at the 5% level.

In Table 2. shows that the interaction of Vedagro fertilizer and Green fertilizer is significantly different on the number of productive tillers of rice plants. The number of productive tillers in the V3H3 treatment combination (Vedagro fertilizer dose of 90 g/plot and Green manure dose of 3 kg/plot) with the average number of productive tillers of the rice plants being the thickest, namely 25 stems, was not significantly different from the treatment combinations V3H2, V3H1, V2H3, and V2H2, but significantly different from other treatment combinations. While the number of productive tillers in the V0H0 treatment combination with an average number of productive tillers in rice plants, namely 15 stems, was not significantly different from the V0H1 and V1H0 treatment combinations, but significantly different from the other treatment combinations.

3.1.3 Flowering Age

The results of observations on the age of flowering of rice plants after analysis of variance showed that both the interaction effect and the main effect of vedagro and green manure application had a significant effect on flowering age. The average results of observations of flowering age after further testing the Honest Significant Difference (BNJ) at the 5% level can be seen in Table 3.

Table 3. The average age of flowering of rice plants on the application of Vedagro fertilizer and green manure (HST)

Vedagro fertilizer (g/plot)	Green Manure (kg/plot)				Average
	0 (H0)	1 (H1)	2 (H2)	3 (H3)	
0 (V0)	80.00c	79.33 bc	76.67 ab	75.00a	77.75c
30 (V1)	79.33 bc	78.67 bc	75.00a	75.00a	77.00b
60 (V2)	78.67 bc	75.00a	75.00a	75.00a	75.92 a
90 (V3)	75.00a	75.00a	75.00a	75.00a	75.00a
Average	78.25b	77.00b	75.42 a	75.00a	
KK = 1.21%BNJ		V and H= 1.02BNJVH		= 2.81	

Note: The numbers in the columns and rows followed by the same lowercase letters are not significantly different according to the Honest Significant Difference (BNJ) test at the 5% level.

In Table 3. shows that the interaction of Vedagro fertilizer and Green manure is significantly different on the flowering age of rice plants. Flowering age in the V3H3 treatment combination (Dosage of Vedagro fertilizer 90 g/plot and Green manure dose of 3 kg/plot) with an average flowering age of rice plants of 75 HST, not significantly different from the combination of treatments V3H2, V3H1, V3H0, V2H3, V2H2 , V2H1, V1H3, V1H2, V0H3, and V0H2, but significantly different from other treatment combinations. Meanwhile, the flowering age of the V0H0 treatment combination with an average flowering age of rice plants was 80 HST, not significantly different from the V0H1, V1H0, V1H1, and V2H0 treatment combinations, but significantly different from the other treatment combinations.

The fastest flowering age was found in the combination of treatments V3H3, V3H2, V3H1, V3H0, V2H3, V2H2, V2H1, V1H3, V1H2, V0H3, and V0H2, with an average flowering age of 75 days. This is because the addition of vedagro organic fertilizer and green manure to rice plants is able to provide a good level of soil fertility and increase the availability of nutrients for plants.

3.1.4 Harvest Age

The results of observations on the age of harvesting rice plants after analysis of variance showed that both the interaction effect and the main effect of vedagro and green manure application had a significant effect on harvest age. The average results of observations of harvest age after further testing the Honest Significant Difference (BNJ) at the 5% level can be seen in Table 4.

Table 4. The average age of harvesting rice plants on the application of Vedagro fertilizer and green fertilizer (HST)

Vedagro fertilizer (g/plot)	Green Manure (kg/plot)				Average
	0 (H0)	1 (H1)	2 (H2)	3 (H3)	
0 (V0)	105.00b	105.00b	103.33 ab	100.00a	103.33b
30 (V1)	105.00b	105.00b	100.00a	100.00a	102.50 ab
60 (V2)	103.33 ab	101.67 ab	100.00a	100.00a	101.25 ab
90 (V3)	101.67 ab	100.00a	100.00a	100.00a	100.42a
Average	103.75b	102.92b	100.83 a	100.00a	
KK = 1.42%BNJ		V and H= 1.60BNJVH		= 4.39	

Note: The numbers in the columns and rows followed by the same lowercase letters are not significantly different according to the Honest Significant Difference (BNJ) test at the 5% level.

In Table 4. shows that the interaction of Vedagro fertilizer and Green fertilizer is significantly different from the age of harvesting rice plants. Age of harvest in the V3H3 treatment combination (Vedagro fertilizer dose of 90 g/plot and Green manure dose of 3 kg/plot) with an average harvest age of rice plants of 100 HST, not significantly different from the combination of treatments V3H2, V3H1, V3H0, V2H3, V2H2 , V2H1, V2H0, V1H3, V1H2, V0H3, and V0H2, but significantly different from other treatment combinations. While the harvesting age of the V0H0 treatment combination with an average rice harvest age of 105 HST, was not significantly different from the V0H1, V1H0, and V1H1 treatment combinations, but significantly different from the other treatment combinations.

3.1.5 Healthy Grain Weight

The results of observations on the weight of rice rice plants after analysis of variance showed that both the interaction effect and the main effect of vedagro fertilizer and green manure had a significant effect on the weight of rice rice plants. The average observed results of rice grain weight after further testing the Honest Significant Difference (BNJ) at the 5% level can be seen in Table 5.

Table 5. Average grain weight of rice plants in the application of Vedagro fertilizer and green fertilizer (g)

Vedagro fertilizer (g/plot)	Green Manure (kg/plot)				Average
	0 (H0)	1 (H1)	2 (H2)	3 (H3)	
0 (V0)	49.77e	49.77e	66.50 d	59.03 de	56,26 d
30 (V1)	57.40 de	60.13 de	103.13 bc	104.83 bc	81.38c
60 (V2)	99.37c	108.70 bc	111.82 bc	118.12 b	109.50b
90 (V3)	109.20 bc	106.57 bc	154.13a	160.35a	132.56 a
Average	78.93b	81.29b	108.90a	110.58a	
KK = 5.36%BNJ		V and H= 5.64BNJVH		= 15.48	

Note: The numbers in the columns and rows followed by the same lowercase letters are not significantly different according to the Honest Significant Difference (BNJ) test at the 5% level.

In Table 5. shows that the interaction of Vedagro fertilizer and Green manure is significantly different on the weight of rice rice plants. The weight of rich grain in the V3H3 treatment combination (Dosage of Vedagro fertilizer 90 g/plot and green manure dose of 3 kg/plot) with an average weight of rice plant that is 160.35 gram, not significantly different from the combination of V3H2 treatment, but significantly different with other treatment combinations. Meanwhile, the weight of rich grain in the V0H0 treatment combination with an average weight of rich grain in rice plants was 49.77 grams, not significantly different from the combination of treatments V0H1, V0H3, V1H0, and V1H1, but significantly different from the other treatment combinations.

3.1.6 Empty Grain Weight

The results of observations on the empty grain weight of rice plants after analysis of variance showed that both the interaction effect and the main effect of vedagro and green manure application had a significant effect on the empty grain weight. The average results of observations

of empty grain weight after further testing the Honest Significant Difference (BNJ) at the 5% level can be seen in Table 6.

Table 6. The average weight of empty grain of rice plants in the application of Vedagro fertilizer and green manure (g)

Vedagro fertilizer (g/plot)	Green Manure (kg/plot)				Average
	0 (H0)	1 (H1)	2 (H2)	3 (H3)	
0 (V0)	6.97 h	5.37h	5.37h	3.13 fg	5,21 d
30 (V1)	5.50 hi	2.40bcd	2.17bcd	2.67 def	3.18 c
60 (V2)	3.17 fg	2.03bcd	2.17bcd	1.90 bc	2.32 b
90 (V3)	2.87 ef	2.37 def	1.63 bc	1.30a	1.79a
Average	4.63 c	2.78 b	2.83 b	2,27 a	
KK =13.79%BNJ		V and H= 0.48BNJVH		= 1.31	

Note: The numbers in the columns and rows followed by the same lowercase letters are not significantly different according to the Honest Significant Difference (BNJ) test at the 5% level.

In Table 6. shows that the interaction of Vedagro fertilizer and Green manure is significantly different on the weight of empty grain of rice plants. The empty grain weight in the V3H3 treatment combination (Vedagro fertilizer dose of 90 g/plot and Green manure dose of 3 kg/plot) with an average empty grain weight of rice plants was 1.30 grams, but significantly different from the other treatment combinations. While the empty grain weight in the V0H0 treatment combination with an average empty grain weight of rice plants was 6.97 grams, not significantly different from the V1H0 treatment combination, but significantly different from the other treatment combinations.

3.1.7 Wet Grain Weight Per Clump

The results of observations on the weight of wet grain per hill of rice plants after analysis of variance showed that both the interaction effect and the main effect of vedagro and green manure application had a significant effect on the weight of wet grain per hill. The average observed weight of wet grain per clump after further testing the Honest Significant Difference (BNJ) at the 5% level can be seen in Table 7.

Table 7. Average wet grain weight per rice plant when Vedagro and green manure (g)

Fertilizer Vedagro (g/plot)	Green Manure (kg/plot)				Average
	0 (H0)	1 (H1)	2 (H2)	3 (H3)	
0 (V0)	56.73e	55.18e	71.85d	62.17 de	61.48d
30 (V1)	62.82 de	61.87 de	105.23 bc	107.50 bc	84.35c
60 (V2)	102.53c	110.73 bc	114.08 bc	120.03b	111.85b
90 (V3)	112.15 bc	107.82 bc	155.77a	161.73 a	134.37a
Average	83.56b	83.90b	111.73 a	112.86 a	
KK = 5.08%BNJ		V and H= 5.52BNJVH		= 15.09	

Note: The numbers in the columns and rows followed by the same lowercase letters are not significantly different according to the Honest Significant Difference (BNJ) test at the 5% level.

Table 7 shows that the interaction of Vedagro fertilizer and green manure is significantly different on the weight of wet grain per rice plant. Wet grain weight per clump in the V3H3 treatment combination (Vedagro fertilizer dose of 90 g/plot and Green manure dose of 3 kg/plot) with an average wet grain weight per rice plant clump of 151.73 grams, not significantly different from the V3H2 treatment, but significantly different from other treatment combinations. While the weight of wet grain per hill in the V0H1 treatment combination with an average weight of wet grain per rice plant was 55.18 grams, not significantly different from the combination of treatments V0H0, V1H1, V0H3, and V1H0, but significantly different from the other treatment combinations.

3.1.8 Dry Grain Weight Per Clump

The results of observations on the weight of dry grain per clump of rice plants after analysis of variance showed that both the interaction effect and the main effect of vedagro and green manure application had a significant effect on the weight of dry grain per clump. The average observed weight of dry grain per clump after further testing the Honest Significant Difference (BNJ) at the 5% level can be seen in Table 8.

Table 8. Average dry grain weight per rice plant when Vedagro and green manure (g)

Vedagro fertilizer (g/plot)	Green Manure (kg/plot)				Average
	0 (H0)	1 (H1)	2 (H2)	3 (H3)	
0 (V0)	12.64i	15.17 ghi	22.74bcd	17.07 fgh	16.90c

30 (V1)	16.79 fgh	23.93 bc	17.08 fgh	18.30 efg	19.03b
60 (V2)	14.68 hi	20.11 def	18.97 ef	19.48 def	18.31 b
90 (V3)	21.23 cds	17.77 uh	25,12 b	33.82 a	24.48 a
Average	16.34c	19.25b	20.98a	22,17 a	
KK = 5.92%BNJ		V and H= 1.29BNJVH		= 3.53	

Note: The numbers in the columns and rows followed by the same lowercase letters are not significantly different according to the Honest Significant Difference (BNJ) test at the 5% level.

Table 8 shows that the interaction of Vedagro fertilizer and green manure has no significant effect on dry grain weight per rice plant. Dry grain weight per clump in the V3H3 treatment combination (Dosage of Vedagro fertilizer 90 g/plot and Green manure dose of 3 kg/plot) with an average dry grain weight per rice clump of 33.82 grams, but significantly different from other treatment combinations. Meanwhile, the weight of dry grain per clump in the V0H0 treatment combination with an average dry grain weight per rice plant was 12.64 grams, not significantly different from the V0H1 and V2H0 treatment combinations, but significantly different from the other treatment combinations.

3.1.9 Weight of 100 Dry Grain

The results of observations on the weight of 100 dry unhulled rice after analysis of variance showed that both the interaction effect and the main effect of giving vedagro and green manure were significant on the weight of 100 dry unhulled grains. The average observed weight of 100 dry unhusked rice after further testing the Honest Significant Difference (BNJ) at the 5% level can be seen in Table 9.

Table 9. Average weight of 100 dry unhulled rice plants on the application of Vedagro fertilizer and green manure (g)

Vedagro fertilizer (g/plot)	Green Manure (kg/plot)				Average
	H0 (0)	H1 (1)	H2 (2)	H3 (3)	
0 (V0)	2.29 g	2.36 fg	2.58 de	2.68 cds	2.48c
30 (V1)	2.52 ef	2.71 cds	2.73bcd	2.80 abc	2.69 b
60 (V2)	2.61 de	2.73bcd	2.82 abc	2.84 abc	2.75 b
90 (V3)	2.80 abc	2.89 ab	2.90 ab	2.93 a	2.88 a
Average	2.56c	2.67 b	2.76 a	2.81 a	
KK = 2.15%BNJ		V and H= 0.06BNJVH		= 0.18	

Note: The numbers in the columns and rows followed by the same lowercase letters are not significantly different according to the Honest Significant Difference (BNJ) test at the 5% level.

Table 9 shows that the interaction of Vedagro fertilizer and green manure has no significant effect on the weight of 100 dry paddy grains. The weight of 100 dry grain in the V3H3 treatment combination (Vedagro fertilizer dose of 90 g/plot and green manure dose of 3 kg/plot) with an average weight of 100 dry grain rice plants, namely 2.93 grams, was not significantly different from the combination of treatments V3H2, V3H1, V3H0, V2H3, V2H2, and V1H3, but significantly different from other treatment combinations. While the weight of 100 dry grains in the V0H0 treatment combination with an average weight of 100 dry grains of rice plants, namely 2.29 grams, was not significantly different from the V0H1 treatment combination, but significantly different from the other treatment combinations.

3.2 Discussion

The occurrence of high growth of a plant is due to the occurrence of cell division and elongation events which are dominated at the shoot tips of the plant. The addition of organic matter containing N will affect the total N content and help activate plant cells and maintain the course of the photosynthesis process which ultimately affects plant height growth. Lack of nitrogen can result in stunted rice plants and stunted root development.

The element nitrogen is needed in large quantities for all growth in plants, nitrogen is the main metabolic source of vegetative growth, such as stems, roots and main leaves (Wijaya, 2013). Vedagro Fertilizer is an organic fertilizer of 45%, which contains macro nutrients such as N : 11-12%, K2O : 4.5–6%, P2O5 : 0.4–0.6%, Ca : 1.1%, Mg : 1.9–2.2%, and micro nutrients consist of Fe, Mn, Cu, Zn, B, Co, Mo and Pb (PT.PAFI, 2013). Vedagro fertilizer contains high levels of nitrogen, which is a constituent of proteins and enzymes. Meanwhile, green manure Crotalaria juncea L. also has a high N content of 4.57%. By combining Vedagro fertilizer and green manure Crotalaria juncea L. can increase the height growth of rice plants.

Provision of organic fertilizer is very good for the soil, both chemical, physical and biological soil. In accordance with the opinion of Suparta (2012), which states that the use of organic matter is very good because it can provide benefits for both soil and plants. Organic materials besides adding nutrients can also loosen the soil, improve soil structure and soil porosity, increase the binding capacity of the soil to water and store water longer so that plants can grow normally.

According to Zen, et al (2002) in Suryanugraha, et al, (2017), productive tillers can be grouped into three types, namely low tillers (less than 15 stems per clump), medium tillers (13-20 stems per clump) and many tillers (more than 20 stems per clump). From the observation table above it shows that the combination of treatments V3H3, V3H2, V3H1, V2H3, and V2H2, has a large number of productive tillers. Whereas the combination of treatments V0H0, V0H1 and V1H0 included having less number of productive tillers.

Vedagro fertilizer contains N, P, and K which plays a role in increasing the number of productive tillers in rice plants. The nutrients N, P and K make the soil more fertile, because nitrogen has benefits for plants, namely stimulating the growth of leaves and tillers, as well as the formation of roots. The more nutrient concentrations needed, the better effect on plant growth (Utomo, et al, 2016). According to Sutedjo (2010), Phosphorus is needed to stimulate root growth, accelerate and increase the growth of young plants in mature plants. Potassium is needed to help build protein and carbohydrates, and plays a role in strengthening the plant body by creating the growth of more tillers.

Crotalaria juncea L. green manure has 69.55% organic matter with 4.575% nitrogen source. The role of green manure Crotalaria juncea L. As an organic material that will support the life of microorganisms in the soil and can be used to improve soil physical, chemical and biological properties. In addition, these plants produce biomass quickly, with high water content and nitrogen nutrients (Pratama, 2017).

The addition of Crotalaria juncea L. green manure which has undergone decomposition is able to directly improve the physical properties of the soil such as making the soil more friable which results in an increase in plant growth, especially the formation of the number of tillers (Lestari, et al, 2011). Roidah (2013), stated that green manure helps nutrient-poor soil in providing the nutrients needed for plants better, improves soil structure so that roots can grow properly and performs its function in absorbing the nutrients needed by plants more optimally to increase the number of tillers. productive.

Kusnawati, et al, (2014), stated that vedagro fertilizer was able to accelerate and support the process of flower and fruit formation. Where vedagro fertilizer contains macro nutrients such as 11-12% N, 0.4-0.6% P2O5, and 4.5-6% K2O. Meanwhile, Crotalaria juncea green manure contains 4.57% N, 0.94% P, and 0.94% K. Crotalaria juncea has a low C/N ratio of 12.22% (Yulianan, 2013). Based on the organic fertilizer content above, the P nutrient is very low. To increase the flowering period in rice plants, follow-up fertilizers are added, namely TSP and KCL to complement the needs of P and K nutrients. Where the elements needed by plants in the generative phase are P elements which play a very important role in the formation of flowers and fruit. If the need for nutrient P is met optimally,

The length of flowering that occurs in the V0H0 treatment, this is because the plants do not get nutrient intake for their growth and development. Limited nutrients can limit plant growth while plant parts require adequate nutrient intake to develop normally. Marsono (2011), if all the nutrients needed by plants are balanced, there will be an increase in the root system, photosynthesis and vegetative growth, so as to stimulate stem cell elongation optimally increasing plant growth and accelerating the flowering period.

Through the application of vedaro fertilizer, it can provide sufficient N nutrients for the soil, as well as the content of P and K nutrients. Then, balanced with the application of Crotalaria juncea green manure, the N, P, and K nutrients that are needed by plants can be fulfilled properly and can be easily absorbed by roots. Kusnawati, et al, (2014), stated that nutrient P can accelerate the flowering and ripening period of fruit and grain seeds thereby accelerating the harvesting age of rice plants. The availability of nutrients is important to meet the needs of each plant to achieve good growth. Fertilizer plays an important role in various plant metabolic processes, the benefits of fertilizer have a balance of nutrients in plants with a ratio of nitrogen, phosphorus and potassium (Marsono, 2011).

According to Kusnawati, et al, (2014), nitrogen nutrients contained in vedagro fertilizer play an important role in increasing plant vegetative growth, especially to spur plant growth and

development. While the P nutrient is needed for the generative growth of plants, namely encouraging the formation and growth of flowers and fruit, while the K element is needed in forming and sending (carbohydrates), regulating the water requirements needed by plant tissues and encouraging water absorption. Element K greatly determines the productivity of plants in producing fruit, both in quantity and quality.

The combination of Vedagro fertilizer and Green manure treatment affected the weight of empty grain of V3H3 rice plants (Vedagro fertilizer dose of 90 g/plot and Green manure dose of 3 kg/plot) with an average of 1.30 grams. In the V3H3 treatment, it showed that the weight of empty grain was less than without the application of Vedagro fertilizer and V0H0 green fertilizer with an average weight of empty grain in rice plants, which was 6.97 grams, which was more. This is because applying a dose of 3 kg/plot of Vedagro fertilizer and a dose of 90 g/plot of green manure can increase good quality rice grain seeds, and a small amount of empty grain, because the nutrients N, P and K are available to plants during the plant growth period. paddy.

The application of vedagro organic fertilizer combined with green manure can have a significant effect on the weight of wet grain per clump, which is 25 grams. This is because vedagro and green manure contain high levels of N, P and K nutrients so that they can provide sufficient nutrients for plants to increase the grain weight of rice plants.

The element that greatly influences the growth period of plant production is the element P (phosphorus). Where is the nutrient phosphorus, namely accelerating the ripening of fruit and seeds and increasing grain production (Mawardiana, et al, 2013). Meanwhile, the increased availability of N elements can also be utilized by plants in the formation of chlorophyll which functions as an absorbent of sunlight in the process of photosynthesis. Likewise with the increased availability of K in the soil which can be used by plants for physiological processes and metabolism, one of which is in the process of photosynthesis.

Vedagro fertilizer and green manure are also rich in organic matter. An increase in soil organic matter will increase the cation exchange capacity (CEC) and improve the physical, chemical and biological properties of the soil. According to Hastanti, et al, (2018), proving that treatment by providing green manure into the soil is able to improve the biotic conditions of the soil and is able to increase the population of beneficial microorganisms to make it easier for plants to absorb nutrients in the soil. In addition, vedagro fertilizer and green manure are able to meet the needs of N, P and K nutrients to increase grain weight per clump.

According to Abro and Abbasi (2002) in Hastanti, et al (2018), stated that the provision of organic matter derived from legume plants was proven to be able to increase soil productivity and increase yields of dry grain rice harvest by 19%. Green manure Crotalaia juncea L. Is a Leguminoceae plant that has a high N content, lots of organic matter and has a water content. Nitrogen is a basic component that plays a role in the synthesis process which is used for all growth processes. Good photosynthesis will increase fruit formation.

According to Pratama (2017), during the generative period the fruit dry weight is a sink, which gets photosynthate from the results of photosynthesis that occurs in the generative phase and the remobilization of food reserves formed in the vegetative phase. Nutrients absorbed by plants are used by plants during their growth so that plants can increase the photosynthetic process, where the resulting photosynthesis is used for fruit development, namely fruit enlargement. Fruit size and weight are more influenced by environmental conditions such as nutrients during its development.

Vedagro fertilizer contains macro nutrients such as 11-12% N, 0.4-0.6% P2O5, and 4.5-6% K2O. Meanwhile, Crotalaria juncea green manure contains 4.57% N, 0.94% P, and 0.94% K. Crotalaria juncea has a low C/N ratio of 12.22% (Yulianan, 2013). Based on the organic fertilizer content above, the P nutrient is very low. To increase grain weight in rice plants, supplementary fertilizer, namely TSP, was added to meet the needs of the P nutrient.

One of the nutrients that play a role in increasing grain production is phosphorus deficiency, besides that phosphorus is found in large quantities in seeds. The provision of P nutrients can also affect seed dry weight, seed weight and yield quality. Element P can also cause the smooth process of metabolism, photosynthesis, assimilation, and respiration, all of these physiological processes are useful in determining the quality and quantity of seeds. Giving vedagro fertilizer and green manure is the right fertilization for rice plants. The provision of organic matter has an influence on the availability of P either directly through the mineralization process or indirectly by assisting the release of fixed P so that the availability of P increases (Hastanti, et al, 2018).

4. CONCLUSION

Based on the results of the research that has been carried out, the following conclusions can be drawn: The interaction of vedagro fertilizer and green manure gives a real response to all observation parameters, namely plant height, number of productive tillers, flowering age, harvesting age, rice grain weight, empty grain weight, wet grain weight per clump, weight of dry unhulled grain and weight of 100 dry unhulled grains. The best treatment was at a dosage of 90 g/plot of vedagro fertilizer and a dose of 3 kg of green manure/plot (V3H3). Vedagro fertilizer gives a real response to all observed parameters. The best treatment was at the vedagro fertilizer dose of 90 g/plot (V3). Green manure gives a real response to all observed parameters. The best treatment was at a green manure dose of 3 kg/plot (H3).

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Based on the results of the research that has been carried out, it is suggested for further research with increasing doses of vedagro fertilizer and Crotalaria juncea green manure on rice plants.

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