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Growth Responses And Yield Of Local And New Superior Paddy Varieties In Different Irradiation Intensity

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Abstract

This study was determined on growth response and yield of local and new superior paddy varieties in different irradiation intensity. Research was done on November 2014 - March 2015 in Research Institute for Agricultural Technology (BPTP), Pasar Miring village, Deli Serdang district, North Sumatra State. A field experiment was carried out using split plot design with main plot paddy varieties (Ramos, Kuku Balam, Mekongga and Inpari-4) and different irradiation intensity (100%, 75% and 50%) as the subplot. The result showed that with increase in plant height, tillers/hill, tillers productive, weight of 1000 grains and yield following the high irradiation intensity. However, as compare between local variety (Ramos and Kuku Balam) and new superior variety (Mekongga and Inpari-4) showed that plant height increase in local variety but decrease in new superior variety was significantly affected by different irradiation intensity. Unlike variety new superior variety (Mekongga and Inpari-4) which higher in yield as well as local variety (Ramos and Kuku Balam) was significant, respectively. Tillers/hill, tillers productive and weight of 1000 grains were insignificantly different both for two varieties (local and new superior). The result suggests that new superior variety was better than local variety in yield under different irradiation intensity.

Key words: paddy, growth, yield, local and new superior variety, irradiation intensity

Introduction

Rice (*Oryza sativa* L.) is a very important food crop and a main food in developing countries, including Indonesia. Increasing of population will cause food insecurity, which affect many aspects of life (Ramli, 2012). Rice is a plant belonging aquatic plants (water plant) that grows on the land continuously flooded either naturally on marshland or intentional inundation in paddy soil. Rice can also be grown on dry land rainfall will be sufficient for water plant (H Siregar, 1987).

Sunlight gives various influences on plant growth, in addition to providing a source of energy for photosynthesis. The absence of light will affect the physiological status of the plant tissue. Carbohydrate content will be reduced at low light intensity or darkness. Changes in hormone levels endogenis or other

physiological components can be affected by changes in light intensity, duration or quality of light. This influence may occur in plants elders or culture at a certain stage (Yuliarti, 2010).

Local yielding rice have the advantage of very good taste, fluffier and scented, have a high selling price (Saheda, 2008). The new superior rice / hybrid has genetic traits like sturdy stem, panicle length and dense, short life of 110-145 days, has a number of chicks that much, broad leaves dark green, high yield of 6-12 tonnes / ha. To get maximum yield, rice hybrid varieties to be planted in fertile soil, nutrients must be available, sufficient irrigation, integrated pest management and crop management must be done well.

Knowing the growth response and the yield of some local varieties and new superior to variations in the intensity of radiation is the purpose of this study, which will be used as information material applied study (Applied research) for all those who need to do the cultivation of rice in low light intensity.

Materials and Methods

This rescarded activities has been carried out at the Agricultural Research and Development, Institute for Agricultural Technology (BPTP), Pasar Miring, Deli Serdang, North Sumatra. The research was conducted from November 2014 to March 2015, at the rice area of 20 x 20 m are given shade paranet 25% and 50%. Varieties tested Kuku Balam, Ramos, Mekongga, Inpari-4.

The method used separated plot, design (RPT) factorial by two factors, namely: a. Shade (N), as the main plot N0 = without shade (intensity of direct sunlight 100%) N1 = paranet 25% (The intensity of the sunlight receiver 75%) N2 = paranet 50% (The intensity of the sunlight receiver 50%) b. Varietas rice (V), as subplots V1: Kuku Balam (Local Superior) V2: Ramos (Local Superior) V3: Mekongga (New Superior) V4: Inpari 4 (New Superior).

Observations were made on plant height (cm) starts after a 10-day-old plants to flowering plants, 2 twice a week (Dahlan, 2011). Number of tillers per hill, ranging from the age of 30 days after planting, performed 15 days till the age of 60 days after planting (Kaderi H, 2004). Rice productive tiller number is calculated based on the number of tillers produce panicles of rice plants and grains, conducted one week before harvest (Kaderi H, 2004). Grain weight of 1000 seeds (g) were obtained from the plots that have been dried to a moisture content of 14% by weigh as much as 1000 pithy grain seeds (Sham, A, 2001). The yield of grain per plot (kg / plot) and yield per hectare (t / ha) by weighing all the weight of grain yield per plot and converted into ha (Senewe, 2011).

Result and Discussion

Plant height

Based on the analysis of variance (ANOVA) with Separated plot design (RPT), showed that some of the growth response of local and high-yielding rice vareities new superior effectd on rice plant height parameter age 2 MST. Further test results Duncan with significance level of 5% shows that in some varieties gave significantly ducan different results, while giving shade and their interaction had no significant results. In Table 1 are presented the average height of rice plants age 2 MST with some varieties and notation Duncan test results.

Table 1. Mean High Rice Age 2 MST with some local rice varieties and New Superior and Variations of Intensity Radiation (Shade) (cm).

AP/PU	N ₀	N ₁	N ₂	TOTAL
V ₁	50.28	51.14	56.7	52.70a
V ₂	48.88	51.66	50.16	50.23a
V ₃	29.23	29.38	30.48	29.7 b
V ₄	31.78	33.03	32.08	32.3 b
TOTAL	40.04	41.30	42.35	164.94

Note: Mark followed by the same letter are not in the same column differ significantly according to the level of 5% DMRT

Table 1 indicate that the variety has the highest plant height shown in V₁ (52.70 cm) were significantly different when compared to V₃ (29.7 cm) and V₄ (32.3cm), but not significant with V₂ (50.23 cm). In observation of high rice plants age 4 MST after averaging different according to Duncan test at 5% significance level indicates that the growth response of some rice vareities of new local superior and superior to variations in the intensity of the radiation gives a significantly different effect. While the interaction between the two treatments showed no significant results.

The highest Plants were found in several local varieties and new superior contained in V₁ (varieties Kuku Balam), namely (112 489 cm). This result is suspected of plant varieties that can adaptacced to the environment that was not the place of the original. As explained by Somaatmadja (1995) that said that a variety can grow well in the area of deploymnt, with a high and stable yield, has a high economic value, socially acceptable and sustainable.

The number of tillers/hill

Table 2. Mean Number of tillers rice age 4 MST with some local rice varieties and new improved variation of intensity of radiation (shade)

AP/PU	N ₀	N ₁	N ₂	TOTAL
V ₁	15.86	10.63	8.5	35
V ₂	15.56	9.9	8.46	33.93
V ₃	15.13	8.46	7.03	30.63
V ₄	14.2	8.93	7.63	30.76
TOTAL	15.19 a	9.48 b	7.90 c	130.33

Note: Mark followed by the same letter are not in the same row significantly different according to the level of 5% DMRT

Based on the analysis of variance (ANOVA) Separated plot design, showed that some local rice varieties and new superior of the intensity of the radiation (shade) affects parameter tiller number of rice plants aged 4 and 6 MST. Further test results with significance level of 5% shows that variations in the intensity of the radiation (shade) gave significantly different results. But in some local rice varieties and new

improved and the interaction between the two treatments provide no significant effect. Table 2 showed the data on the average number of tillers of rice plants age 4 MST, each of variations in the intensity of the radiation (shade), the following notation according to the average of the results of different test Duncan methods. The variation of the intensity of irradiation (shade) where the highest tiller shown in N0 (15:19 tillers) were significantly different when compared with N1 (9:48 tillers) and N2 (7.90 tillers). By using the technique of regression and correlation analysis, regression equation of $Y = 14.50 - 0.145x$ with $r = 0.903$.

Number of Tillers Productive

Based on the analysis of variance (ANOVA) Separated plot design, showed that some local rice varieties and new superior to variations in the intensity of irradiation parameters affected the number of productive tillers of rice plants. Further duncan test results with significance level of 5% showed that variations in the intensity of the radiation (shade) give significantly different results, while in some local rice varieties and new improved and their interactions gave different results is not significant. Data presented in Table 3, the average number of productive tillers of rice plants with variations in the intensity of irradiation (shade), the following notation according to the average of the results of different Duncan test methods.

Table 3. Mean number of productive tillers of rice plants with some local rice varieties and new improved variation of intensity of radiation (shade)

AP/PU	N ₀	N ₁	N ₂	TOTAL
V ₁	15.4	10.8	10.56	12.25
V ₂	15.03	11.73	8.96	11.91
V ₃	13.9	12.56	12.43	12.96
V ₄	14.16	13.5	12.4	13.35
TOTAL	14.62 a	12.14 b	11.0913 c	50.48

Note: mark followed by the same letter are not in the same row differ significantly according to the level of 5% DMRT

Based on data in Table 3 showed that the variation of the intensity of irradiation (shade), where the crop with the highest number of productive tillers shown in N0 (14.62 tillers) were significantly different when compared with N1 (12:14 tillers) and N2 (11:09 a.m. tillers). By using the technique of regression and correlation analysis, regression equation of $Y = 14.38 - 0.070x$ with $r = 0.949$.

The parameter number of tillers 4 MST obtained results from the variance can be determinited variations of the intensity of irradiation (shade) and replicates the real effect primarily on observations of 6 MST. At the highest number of tillers present in N0 (variation of radiation intensity 100%), namely (21 816 tillers). It is presumed that the different number of tillers on each variety as found in the description of the plant, and the variations in the intensity of the radiation (shade) 100% which can lead to plant growth more quickly multiply quickly in comparison with shaded plants. Soemartono (1990) said that the high temperature on vegetative phase to raise the number of tillers, due to increased activity of the plant to take up nutrients. It is presumed that the number of tillers during vegetative change in number when the

plant will turn into the generative phase. Canisius (1990) said that the maximum number of tillers achieved at the age of 50-60 days after planting. Then tillers formed after reaching the maximum limit will be reduced because growth is weak, and even die.

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Weight of 1000 grains (g)

Results of analysis of variance showed that some local rice varieties and new superior of the irradiation intensity variations along with interaction effect was not significant to the weight of 1000 grains in rice plants.

Table 4. Mean Weight of 1000 grains (g) Rice with Superior Local Rice Varieties and New Superior and variation of intensity irradiation (Shade)

AP/PU	N ₀	N ₁	N ₂	TOTAL
V ₁	100.2	104.11	94.3	298.61
V ₂	99.95	94.95	95.44	290.34
V ₃	102.6	108.3	103.55	314.45
V ₄	101.5	95.15	95.9	292.55
TOTAL	404.25	402.51	389.19	1195.95

The 1000 grain weight of seed parameter response of local rice varieties and new high yield no significant effect. It is foreseeable environmental conditions at flowering so that no water can lead empty grain. Ismail et al. (2003), Said that the weight of 1000 grains correlated rainfall and soil moisture.

The amount of production per plot

Based on the analysis of variance (ANOVA) with Separated plot design, showed that some local rice varieties and new superior to variations in the intensity of irradiation parameters affected the amount of yield per plot of rice plants. Further Duncan test results with significance level of 5% showed that some local rice varieties and new improved and variations in the intensity of the radiation gives significantly different results while the interaction between the two different effects are not significant.

Table 5. Average of Production Per Plot Rice With Superior Local Rice Varieties and New Superior and variation of intensity irradiation (Shade)

AP/PU	N ₀	N ₁	N ₂	TOTAL
V ₁	0.87	0.26	0.17	0.43 b
V ₂	0.97	0.19	0.20	0.45 b
V ₃	1.62	0.37	0.87	0.95 a
V ₄	1.72	0.79	0.52	1.01 a
TOTAL	1.30 a	0.40 b	0.44 b	2.86

Note: Mark followed by the same letter are not the same columns and rows are significantly different according DMRT level of 5%

The yield parameters per plot and yield per ha obtained results from the variance can be seen the response of local rice varieties and new high yielding significant. The amount of yield per plot is V4 (Variety Inpari-4) (1,051 kg / plot), and the amount of yield per ha ie V4 (Variety Inpari-4) (6,185 tons / Ha). This result is unexpected by the influence of the dose of fertilizer and planted varieties that can increase the production of rice plants increased. Lopez et al. (1999) and Baehaki (2001), that said that the new varieties is one effort to improve results and anticipate the failure of paddy rice at the farm level, where varieties are circulating now at one time the result will be decreased and resistance to pests and diseases certain to be reduced.

Conclusions

Local and new improved varieties significantly different effect on plant height parameter (4, MST), production per plot, the yield per ha. The grain of 1000 grains, not significant. And good yielding varieties V1 (Variety Nails Balam), new varieties are either V4 (Variety Inpari-4). The influence of variations in the intensity of radiation 100% (N0) increased plant height, accelerating the number of tillers and productive tillers, and increase the yield of rice plants per plot. There is no significantly different relationship between local varieties and new superior to intensitass irradiation on all parameters of growth and yield of rice.

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