

THE EFFECT OF PLANT METHOD AND PURE LINES RICE APPLICATION FROM RICE BREEDING RESULT OF LOCAL ACEH

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ABSTRACT

Rice as the first crops resources for all citizen in Indonesia still found some problems especially in total of production. The demand of rice was increase every year and the effort to increase the rice production still do by many researchers. The research was conducted in Sukamakmur sub-district, Aceh Besar district, Aceh province from June to September 2017. The randomized complete block design with 2 factors and 3 replications were used in the experiment. The first factor was plant method (tranplanting method and direct seeding method) and the second factor was pure lines rice from rice breeding result of local Aceh and national rice variety, that was Inpari Sidenuk (G1), M5 USK-Snb.RGO-238-045-039e-103 (G2), M5 USK-Snb.RGO-238-094-088j-140 (G3), M5 USK- Snb-Rga-238-UTFP-5 (G4), and F5 SGP X IRBB27 (G5). The result showed that plant method factor was significantly effected to plant growth at 60 and 90 days after planted and the pure lines rice factor was significantly effected to the total of grain per panicle and the total of panicle brench length.

Keywords: Local rice, Inpari Sidenuk, Pure lines rice, Rice breeding.

1. INTRODUCTION

Rice (*Oryza sativa* L.) is one of the important crops and known for many centuries since human being lived in the world. The rice production in the world stay in the third rank from all cereals kind after corn and wheat [1]. [2] said the national rice production of Indonesia still in low category, it is around 4,7 t ha⁻¹ and it is different with another country like China and India which is the rice production almost 7 t ha⁻¹.

The demand of rice in Indonesia was increasing every year followed by the increasing of Indonesian population. Rice production in 2015 was increased until 6,37% dry milled grain compare in 2014. The increasing of rice production was happened in Java around 2,31 million ton and outside of Java it was around 2,21 million ton. The increasing of rice production was caused by the increasing of land around 0,32 million ha (2,31%) and the productivity was 2,04 kw ha⁻¹ (3,97%). The potential of rice production in Aceh was very large, which is the harvest area and rice production always increasing until 2,3 million ton in 2015 or increase from 510.984 in 2014 [3]. But, there are some problems that found in rice cultivations especially about climate, land fertility, and other factors.

Varieties of rice are one of the problems to increase the rice production. There are many kinds of rice seeds which is cultivated by farmer, like local rice variety and others good rice variety. Now, the local rice variety does not like to cultivate by the farmer because the rice performances are variety, like shape, color grain, plant height, and harvesting time. But, the rice local variety has a good adaptation.

Based on the problems above, the increasing of rice production can solve through rice breeding activity, which the aim is to improve the weakness from the rice itself, like long time harvesting, plant height, but it is not change the best character. So, through line rice test used gamma and cultivated use some methods need to do.

2. MATERIALS AND METHODS

2.1 Materials

Experimental site

The research was conducted in Sukamakmur sub-district, Aceh Besar district, Aceh Province from June to September 2017. The research used randomized complete block design with 2 factors and 3 replications. The first factor was plant method (transplanting method and direct seeding method) and the second factor was pure lines rice from rice breeding result of local Aceh and national rice variety.

Rice seed

The rice seeds used in this research are Inpari Sidenuk (control), M5 USK-Snb.RGO-238-045-039e-103, M5 USK-Snb.RGO-238-094-088j-140, M5 USK-Snb-Rga-238-UTFP-5, and F5 SigupaiXIRBB27.

Fertilizer

Fertilizers that use in this research are manure 10 kg plot⁻¹ and NPK Phonska 0,66 kg plot⁻¹. Fertilizing activity do for 3 times. First time, it was manure 10 kg plot⁻¹ which is give before the rice planted. Second fertilizer was NPK phonska which is give when 21 days after planted. The third fertilizer was NPK phonska which is give 0,66 kg plot⁻¹ give when 55 days after planted.

2.2 Methods

Soil tillage

Soil tillage was used tractor with the depth is 30 cm. A weeks after that, the second soil tillage do again to flatteten the land used hoe and made the special plot for nursery activity with the size was 2 x 5 m.

Seed Treatment

To protect the seed from bacteria contaminated, we need to soak the seed in bactericide soluble with the concentration 2,5 g l⁻¹ in 5 minutes. After the treatment, the seed must clean with the water and soak again with water in 24 hours. After that, make the seed dry and wrap use warm fabric in 24 hours until the coleoptile was out.

Seedling

The coleoptile was out from the seed as length was 1 mm and ready to sowing.

Transplanted Seeding

The rice cultivated use direct seeding from nursery land in row with size 20 x 20 cm when the seed age was 12 days after sowing.

Direct Seeding

Direct seeding method applied with soawing the rice seed and planted in plot with distance 20 x 20 cm each line.

Harvesting

Harvesting time when the grains look mature and the color was yellow, and the straw started dry, and enough hard when the grain pressed by hand.

3. RESULTS AND DISCUSSION

3.1 Plant Height (cm)

Plant height at 30, 60, and 90 days after planted show in Table 1., Table 2., and Table 3.

Table 1: Plant height (cm) at 30 days after planted

Rice Lines	Plant Method		Mean
	Seeding Transplantation	Direct Seeding	
Inpari Sidenuk	31,93	33,60	32,77
Galur M5 USK-Snb.RGO-238-045-039e-103	34,20	27,40	30,80
Galur M5 USK-Snb.RGO-238-094-088j-140	31,93	33,07	32,50
Galur M5 USK-Snb-Rga-238-UTFP-5	32,80	30,40	31,60
Galur F5 Sigupai X IRBB27	33,00	33,53	33,27
Mean	32,77	31,60	

Table 2: Plant height (cm) at 60 days after planted

Rice Lines	Plant Method		Mean
	Seeding Transplantation	Direct Seeding	
Inpari Sidenuk	60,33	60,93	60,63
Galur M5 USK-Snb.RGO-238-045-039e-103	60,73	52,60	56,67
Galur M5 USK-Snb.RGO-238-094-088j-140	54,60	63,60	59,10
Galur M5 USK-Snb-Rga-238-UTFP-5	57,53	53,47	55,50
Galur F5 Sigupai X IRBB27	58,47	66,53	62,50
Mean	58,33a	59,43a	

Note: The number followed by the same letters was not significantly different from BNJ test of 5%.

Table 3: Plant height (cm) at 90 days after planted

Rice Lines	Plant Method		Mean
	Seeding Transplantation	Direct Seeding	
Inpari Sidenuk	88,47	85,67	87,07
Galur M5 USK-Snb.RGO-238-045-039e-103	89,13	76,00	82,57
Galur M5 USK-Snb.RGO-238-094-088j-140	77,47	95,40	86,43
Galur M5 USK-Snb-Rga-238-UFTP-5	86,87	74,60	80,73
Galur F5 Sigupai X IRBB27	87,27	90,87	89,07
Mean	85,84a	84,51a	

Note: The number followed by the same letters was not significantly different from BNJ test of 5%

The kinds of rice lines and plant method and the interaction didn't show the significant effect to the plant height at 30 days after planted. Meanwhile, the plant method factor show significant effect to plant height at 60 and 90 days after planted, but it didn't show the significant effect from the rice lines and the interaction factor to plant height at 60 and 90 days after planted.

The heighest plant height at 30, 60, and 90 days after planted showed in F5 Sigupai x IRBB27, it is 33,27 cm, 62,50 cm, and 89,07 cm. And then Inpari Sidenuk, M5 USK-Snb.RGO-238-094-088j-140, M5 USK-Snb.RGO-238-045-039e-103, and M5 USK-Snb-Rga-238-UFTP-5.

F5 Sigupai X IRBB27 was the results from crossing actvity from the fifth filia Sigupai with IRBB27. Sigupai was the local rice from Aceh Barat district and having special character like the grain shape is crescent and the taste is good and aromatic, but it has the long life period around more than 5 months. According to [4] Sigupai Nagan Raya and Cantek Manis having the plant height morphology higher than another varieties like Dupa. So, the special characteristic in Sigupai after crossing with IRBB27 still bring the best character.

3.2 Panicle Length per Clump

The using kinds of rice lines with plant methods and the interaction didn't the significant effect to panicle lenght per clump. Five rice lines that used in this research known if F5 Sigupai x IRBB27 has the heigher panicle lenght per clump if compare with other rice lines, it is 25,16 cm.

And then, the next heighest panicle lenght per clump is M5 USK-Snb.RGO-238-045-039e-103 with the lenght is 24,04 cm, Inpari Sidenuk, M5 USK-Snb.238-094-088j-140, and M5 USK-Snb-Rga-238-UFTP-5. Beside that, the plant method factor with transplanting seeding method has the longer mean value compare with direct seeding, 24,40 and 23,82 cm.

[5] from his research found that the agronomy character and morphology was different because gamma radiation. The length panicle as one of the morphology character didn't show the significant effect because gamma radiation, rice with gamma radiation effect has the panicle length is 22,39 cm and without gamma radiation is only 22,32 cm.

3.3 1000 Seeds Weight (g)

Kinds of rice lines and plant method with the interaction didn't show the significant effect to 1000 seeds weight. The weighest 100 seeds weight is M5 USK-Snb-Rga-238-UFTP-5 it is 2,94 g. And the lowest weighest 1000 seeds weight is M5 USK-Snb.RGO-238-094-088j-140 and F5 Sigupai X IRBB27 it is 2,81 g. Meanwhile, 1000 seeds weight with direct seeding method has the weighest wieght compare with transplantation seeding, it is 2,89 g even it didn't significant effect statistically.

The improvment for rice production especially in yield problems has many ways. One of that through gamma radiation. Gamma radiation application aims to improve some of character from rice lines but it didn't change whole of character [6]. M5 USK-Snb.RGO-238-045-039e-103, M5 USK-Snb.RGO-238-094-088j-140, and M5 USK-Snb-Rga-238-UFTP-5 are the rice lines from gamma radiation effect. From table 5 known the weighest 1000 seeds comes from gamma radiation effect. It showed that there is an improvement from character of Sanbei which got gamma treatment.

Table 4: Panicle length per clump

Rice Lines	Plant Method		Mean
	Seeding Transplantation	Direct Seeding	
Inpari Sidenuk	23,10	24,91	24,01
Galur M5 USK-Snb.RGO-238-045-039e-103	24,59	23,50	24,04
Galur M5 USK-Snb.RGO-238-094-088j-140	25,38	22,64	24,01
Galur M5 USK-Snb-Rga-238-UFTP-5	23,73	22,94	23,34
Galur F5 Sigupai X IRBB27	25,21	25,12	25,16
Mean	24,40	23,82	

Table 5: 1000 seeds weight (g)

Rice Lines	Plant Method		Mean
	Seeding Transplantation	Direct Seeding	
Inpari Sidenuk	2,88	2,78	2,83
Galur M5 USK-Snb.RGO-238-045-039e-103	2,78	3,01	2,90
Galur M5 USK-Snb.RGO-238-094-088j-140	2,83	2,79	2,81
Galur M5 USK-Snb-Rga-238-UTFP-5	2,76	3,12	2,94
Galur F5 Sigupai X IRBB27	2,87	2,76	2,81
Mean	2,82	2,89	

Table 6: Grain total per panicle

Rice Lines	Plant Method		Mean
	Seeding Transplantation	Direct Seeding	
Inpari Sidenuk	127,37	85,83	106,60a
Galur M5 USK-Snb.RGO-238-045-039e-103	173,20	173,07	173,13b
Galur M5 USK-Snb.RGO-238-094-088j-140	165,27	151,60	158,43b
Galur M5 USK-Snb-Rga-238-UTFP-5	152,13	130,73	141,43ab
Galur F5 Sigupai X IRBB27	158,97	184,40	171,68b
Mean	155,39	145,13	

Note: The number followed by the same letters was not significantly different from BNJ test of 5%

Table 7: Total length of panicle brench

Rice Lines	Plant Method		Mean
	Seeding Transplantation	Direct Seeding	
Inpari Sidenuk	105,27	105,40	105,33a
Galur M5 USK-Snb.RGO-238-045-039e-103	121,20	125,47	123,33ab
Galur M5 USK-Snb.RGO-238-094-088j-140	131,13	113,27	122,20ab
Galur M5 USK-Snb-Rga-238-UTFP-5	113,93	121,47	117,70ab
Galur F5 Sigupai X IRBB27	130,80	135,47	133,13b
Mean	120,47	120,21	

Note: The number followed by the same letters was not significantly different from BNJ test of 5%

The weight of 1000 seeds will decrease when the gamma radiation increase until 400 Gy, [7] showed the weight of 1000 seeds from Ciherang which is get gamma radiation treatment 400 Gy and 500 Gy decrease the weight of 1000 seeds, but the increasing of gamma radiation rate until 200 Gy can increase the weight of 1000 seeds in Cempo Ireng rice.

3.4 Grain Total per Panicle

The kinds of rice lines factor show the significant effect to grain total per panicle, but it didn't show the significant effect from plant method and the interaction factors. Inpari Sidenuk show the significant effect to M5 USK-Snb.RGO-238-045-039e-103, M5 USK-Snb.RGO-238-094-088j-140, and F5 Sigupai X IRBB27. The heighest grain total per panicle is M5 USK-Snb.RGO-238-045-039e-103, it is 173,13. The lowest grain total per panicle is Inpari Sidenuk it is 106,60. Plant method with transplantation seeding has the highest value compare with direct seeding, it is 155,39 and 145,13.

M5 USK-Snb.RGO-238-045-039e-103 rice line is gamma radiation effect. According to [8] showed the mean of grain per clump increase because gamma radiation treatment. [7] said that gamma radiation treatment can improve the productivity from Ciherang and Cempo Ireng which showed there is a different significant in grain total per clump and 1000 seeds weight which it means that length of panicle will corelate positively to the total of grain per panicle.

3.5 Total Length of Panicle Brench (cm)

The kinds of rice lines and plant method show the significant effect to total length of panicle brench to rice line factor, but there is no significant effect to plant method and the interaction factor. The highest toal length of panicle brench is F5 Sigupai X IRBB27 it is 133,13 cm, and transplantation seeding method has the highest value if compare with direct seeding, it is 120,47 dan 120,21.

F5 Sigupai X IRBB27 rice line is the longest total panicle brench, and followed by seed caused gamma treatment like M5 USK-Snb.RGO-238-045-039e-103, M5 USK-Snb.RGO-238-094-088j-140, and M5 USK-Snb-Rga-238-UTFP-5

4. CONCLUSIONS

Plant method factor show significant effect to plant height 60 and 90 days after planted. Rice lines factor significant effect to grain total per panicle and total length of panicle brench. Plant method and rice lines did not show significant effect to the interactions.

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