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Morphological Characteristics and Pleasant Relationship Between Crossing of Black Rice Accesion with Inpara 5 that Containing SUB-1 Genes

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Abstract

In South Sumatera the cultivation of black rice are uncommon.This is because of the lack of available land for planting which can be used to grow local black rice.Since more farmers dominate the white rice or brown rice cultivation.One effort that can be made to increase the area of local blackrice rice planting areas is to use South Sumatra 's vast swampy land.Related to previous study, this research will be carried out by testing the growth of F1 seeds crossed by accession to high productivity local black rice and nutrition with marinated resistant Inpara 5 varieties.In quantitative parameters maximum average value of it was shown at the age of 12 MST plants that IM.6 plants at 145.08 as the highest average value of the crossing results. IM.6 was the highest median value with 144.5.Maximum standard deviation value was 5.06 for IT.11 plants, and the minimum value being 141.4 for IM.6 forms and 150.0.6 for IM.6 plants.The qualitative parameters consist of plant shape, stem color, leaf color and flag leaf are seen when the plant is 6 MST or in the vegetative phase.Done by describing plants from 5 sample plants per randomly selected population.From the result of this research, there is no significant differential among the accession and parental.

Keywords : Black rice, Inpara 5, accession, resistant

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1. Introduction

Rice is a food crop commodity that produces rice, which plays an essential part in Indonesia's economic life. Rice, being a staple food, is notoriously difficult to substitute with other staples [1]. Until 2013, the topic of food security, particularly rice, was a major concern for the Indonesian people. Rice imports were 1.6 million tons in 2011, and 1.9 million tons in 2012 [2].

In addition to white rice and brown rice, black rice is one of rice which has recently been consumed and preferred as a functional food by most individuals. Black rice is a local rice that has the same characteristics as other local rice such as, has a long harvesting time and a higher posture, according to [3]. But on the opposite, black rice has greater benefits compared with brown rice and white rice. This is because it contains high amounts of anthocyanin, fiber, and iron which are good for health.

In South Sumatera the cultivation of black rice is still generally rare. This is because of the lack of available land for planting which can be used to do the cultivation of local black rice and also local farmers dominate still do the white rice and brown rice cultivation. One effort to increase the area of local blackrice rice planting is use South Sumatera 's vast swampy land. While it can help to expand the area of black rice planting, there are many major barriers to rice plant cultivation in the lebak swamp, such as water management that has not been well maintained so that the entire planting area in the lebak swamp would be flooded very deep and long enough in the rainy season. This makes it hard for farmers to predict when to plant rice at the right time [4].

In 2010, the Inpara 5 variety was launched in the rice halls [5]. Inbred swamp rice (Inpara) 5 is a type of swamp rice with 115 days of planting characteristics, upright plant form, upright flag leaves, slender grain shape, medium thickness, medium rice texture, 25.2 percent amylose

content, 59 percent glycemic index 4.5 t/ha average yield, and 7.2 t/ ha potential yield. This form of inpara has immersion tolerance (in the vegetative process for 14 days), is immune to leaf blight pathotypes IV and VIII, but is somewhat susceptible to brown planthopper biotype [6].

Identical with previous study, this research will be carried out by testing the growth of F1 seeds crossed by accession to high productivity local black rice and nutrition with marinated resistant Inpara 5 varieties.

2. Materials and Methods

14 accession used for this observation. Seeds from the crossing of black rice of the variety Inpara 5 (Table 1) are submerged in water for 24 hours prior to planting. In a nursery that has been added by planting media in the form of a mixture of soil and manure, the seed nursery is carried out at a ratio of 1:3. Each accession of the crossing results was planted and labeled in a different row with a gap of 10 cm between the rows and 2 cm of grain. In planting plots, the seeds would then be planted. In the form of a mixture of ground and manure, the parcels were packed with planting media. Liquid silica fertilizer is sprayed with ml/ L at the age of 7-10 days after planting to improve grain growth vigour.

It is carried out 2 weeks after planting to transplant seedlings from the nursery into the plot. In the same plot, plants from the same accession are located. Weeding, pest and disease control, and fertilization are included of plant maintenance. Basic fertilizer and silica are used. The doses used were 100 kg / ha of urea, 150 kg / ha of SP 36 and 200 kg / ha of KCl and liquid silica ml / L. At 1 MST, basic fertilizer was applied, while silica fertilizer was applied two months after planting.

Harvesting is indicated by the drooping of the rice grains, yellowing of the leaves and grains, and the grain when pressed hard. With the signs above, the rice plant can be harvested.

3. Results and Discussion

3.1. Quantitative Parameters

On three quantitative parameters, correlation analysis between plants crossing with parents was performed. These include the parameters provided in Figure 1 for plant height, number of tillers and weight of 1000 seeds. Until 2013, the topic of food security, particularly rice, was a major concern for the Indonesian people. Rice imports were 1.6 million tons in 2011, and 1.9 million tons in 2012. [7]. Rice yields are affected by genotype, environmental factors, and the combination between genotype and environment [8].

According to [9], the variability in yield provided by each variety is caused by genetic characteristics as well as the growth environment of each variety.

Table 1. Quantitative Parameters consist of plant height, productive per grump and weight of 1000 seeds in 18 varieties observed

Accession	Parameters		
	Plant Height	**Productive Per-Grump**	**Weight 1000 Seeds**
MI.3	135.4	12.4	23.7
MI.6	145.1	12	24.9
PI.1	137.6	12.6	24.3
TI.4	139.2	11.8	23.5
TI.6	141.7	12.6	25.4
IM.7	134.4	12.8	25.2
IM.10	139.2	12.8	23.8
IP.2	142.1	13	24.1
IP.6	142.4	13.4	25.4
IP.8	140.3	13.2	23.2
IT.1	140.5	12	25.6
IT.6	141.2	12	24.9
IT.7	137.8	12	25.6
IT.11	141.9	13	24.4
Mariana	142.9	13.4	25
Purwokerto	146.7	13.4	24.4
Toraja	146.3	15	23.9
Inpara 5	100.7	15	25.6
Stadev	**9.75**	**0.89**	**0.76**
Max	**146.7**	**15.0**	**25.6**
Min	**100.7**	**11.8**	**23.2**

3.1.1. Plant Height

Plant height parameters were measured when the plant entered the generative age, at 8 MST. Measurements were made from the base of the stem to the tip of the highest leaf. According to [10] , the longer the vegetative phase. The more provide optimal time for development plant The average of plant height shown at Table 1 that MI.6 accession has the maximum average of plant height with 145.1 cm and Purwokerto as a parent has 146.3 plant height while IM.7 has minimum average plant height. Based on Table 1, standard deviation all the average of plant height is 9.75. Developed a model of the steady-state diffusion of O_2 through a primary rice root and its laterals and the simultaneous consumption of O_2 in root respiration and loss to the soil [11].

3.1.2. Productive Tillers Per-grump

Productive tiller per-grump is count when the plant enters the generative phase by seeing how many productive tillers per grump are. In parameter of

productive tiller per-grump shown in the Table 1, Standard deviation of this parameter is 0.89. Toraja and Inpara 5 has the highest average number of productive tiller per-grump parameter which is 15.0 close with the average number of productive tiller of cross breed plant. Moreover, according to [12] yield and quality of some local black rice cultivars are still relatively low since, often, panicles in the same family do not reach the same maturity stage. According to [13], the amount of nutrientrequired by the plant is directly proportional to the plant's ability to grow.

3.1.3. Weight of 1000 Seeds

The weight of 1000 seeds is calculated when the plant begins to be harvested. by calculating the total weight of seeds in 1000 grains. Based on Table 1, it shows that IT.1, IT.7 and Inpara 5 styles at 25.62 grams are the highest average weight of 1000 seeds and total of standard deviaation is 0,76.

3.1.4. Analysis of Correlation Between Crossbreed and Parents Based on Quantitative Parameters

On three quantitative parameters, correlation analysis between plants crossing with parents was performed. These include the parameters provided in Figure 1 for plant height, number of tillers and weight of 1000 seeds.

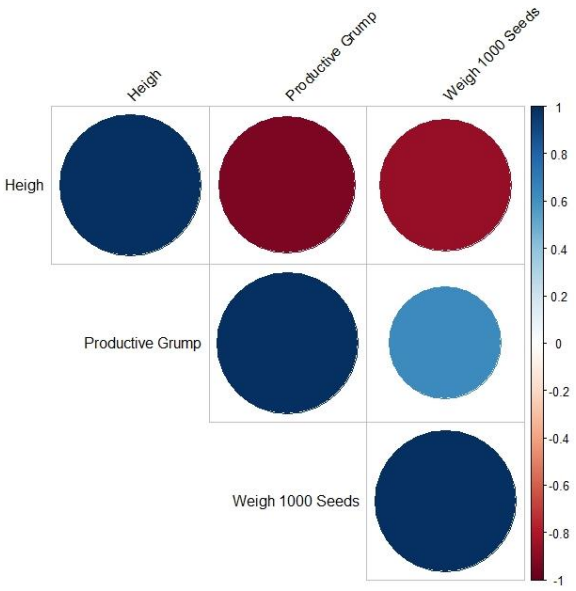


Figure 1. Correlation of quantitative parameter.

Figure 1 showed that value of correlation coefficient are negative correlation, except between weight of 1000 seeds and number of tillers. [14] of nitrate release from organic matter and its subsequent uptake by roots of rice.Plant height can not be affected to productive tiller per-grump and the opposite, but number of productive tiller per-grump has positive affect to the weight of 1000 seeds. [15] notes that higher plant heights are developed in more than one part of the plant population. Plant growth does not ensure high plant productivity. The dry weight of the plant per tiller describes the effect of the length of the vegetative phase on the plant's ability accumulate dry matter [16].

Plants that grow well are able to consume large quantities of nutrients, and the availability of nutrients in the soil influences plant activities, including photosynthetic activity, so that plants can increase growth and development [17]. Furthermore, [18] stated that the nature or qualities that determine the yield of varieties influence the height of the plant stem. Said that the preservation of a low resistance channel of aerenchyma and intercellular gaps, which permits gaseous exchange between the atmosphere and subsurface organs, has long been considered crucial for the survival of emergent macrophytes such as rice in anaerobic flooded soils [19].

3.2. Qualitative Parameters

Parameters of plant shape, stem color, leaf color and flag leaf are seen when the plant is 6 MST or in the vegetative phase. Done by describing plants from 5 sample plants per randomly selected population.

3.2.1. Leaf Color

The terms of leaf color progeny were affected by donor parent genom introgression. In the parameters of plant leaf color performed at the age of plant 12 MST. Out of 14 plant accession, 13 accession were identify has 5 GY (5/10) or dark green leaves color, except IP.8 has 5 GY (5/8) light green leaf color. There are 2 varieties of plants with a light green leaf color in the donor parent there are Mariana and Inpara 5. Undercase, Purwokerto and Toraja has dark green leaf color. [19] Identify morphological features of leaves that promote underwater photosynthesis. These include faster uptake of dissolved carbon dioxide linked to developmental plasticity that generates thinner cuticles and leaf laminae.

Figure 2. Left: 5 GY (5/10) dark green, Right: 5 GY (5/8) light green.

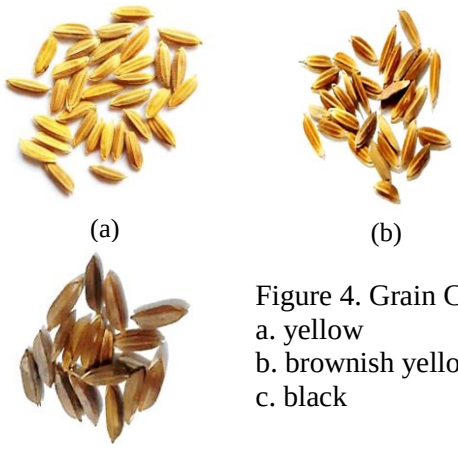
3.2.2. Grain Shape

There are two type of grain shape that identify on this research are short slender and long slender. All genotype and donor parent found that has type of grain long slender except Mariana and Inpara 5. Figure 3 shows the shape of grain.

Figure 3. Left: short slender grain shape, Right: long slender grain shape.

3.2.3. Grain Color

Based on research, it is shown that 2 accessions of plants with a brownish yellow color are IP.6 and IT.1. MI.3, MI.6, PI.1, TI.4, TI.6, IM.7, IM.10, IP.2, IP.8, IT.6, IT.7, IT.11 and Inpara 5 has yellow color grain and the donor parent progeny has black color grain.



(a) (b)

(c)

Figure 4. Grain Color
a. yellow
b. brownish yellow
c. black

3.2.4. Loss Panicle

In the loss parameters based on research, it is shown that 14 forms of black rice crossbreed accessions, nine accession have a moderate loss of panicle (30-50%) are MI.3, MI.6, PI.1, TI.4, TI.6, IP.6, IT.1, IT.6, IT.7 accessions, a minor loss (<30%) for 3 accessions are IM.7, IM.10, IT.11. High loss panicle (>50%) for 2 crossbreed accessions there are IP.2 and IP.8. In the donor parent plant, moderate loss panicle severity was obtained for 2 varieties out of 4 varieties there are Mariana and Purwokerto, and a moderate loss panicle are Toraja and Inpara 5.

3.3. Character among Accession

A dendogram was used to examine the resemblance of characters between accessions. The resemblance between the characters on the dendogram is shown by the connecting lines of the accessions.

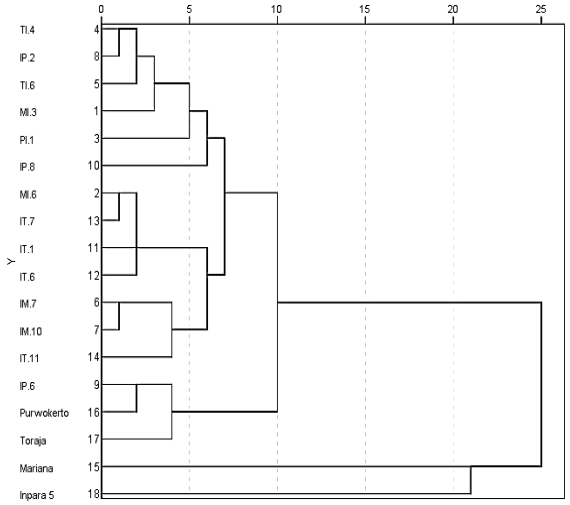


Figure 5. Dendogram of characters between accessions was used to examine the resemblance

The plant accessions can be grouped into three groups in the dendogram data (Figure 5), based on the similarity between accessions. The first class is MI.3, MI.6, PI.1, TI.4, IT.6, IM.7, IM.10, IP.2, IP.8, IT.1, IT.6, IT.7, IT.11 plant accession. The accessions of plants IP.6, Purwokerto and Toraja are in the second class. Mariana is the third class and Inpara 5 is the fourth class. It can be seen that, even if their parents are different, TI.4 and IP.2 plants have close kinship. This can be seen by displayed a short line of the dendogram. As they come from the same parent line, IM.7 and IM.10 have a close kinship. While IP.6 has nearly the same characteristics as its relatives, Purwokerto 's approach is dominant. Diversity can occur due to segregation or environmental influences

that, due to the adaptation of plants to the environment, affect the appearance of plant characteristics (Figure 5).

4. Conclusion

1. The quantitative and qualitative parameters showed that the cross-bred plants have the same derivative properties as their parents. However, IP.6 and IT.1 rice accessions had the dominant inheritance in their male parents Purwokerto and Toraja varieties.
2. Dendogram showed there are attachment or bonding on each accession crossbreeding with their donor parent and between accessions from same donor parent.

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