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Research Paper

AGRONOMICAL CHARACTERISTICS PERFORMANCE OF F1 GENERATION RAINFED RICE FROM CROSS BREEDING BETWEEN INTRODUCED RICE VARIETY AND LOCAL RICE VARIETY OF SOUTH SUMATRA

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The effort to improve perfomance and quality of rainfed rice currently can be done by using cross breeding between local rice variety and introduced rice variety. This local rice variety had aromatic gene with specific aroma as well as taste and texture which was in accordance to community cultural pattern of South Sumatra. This aromatic gen was found in Dayang Rindu rice variety, whereas the introduced rice variety had advantages in term of age, production and adaptation capability in South Sumatra area. The research objective was to determine the perfomance of F_1 generation crop resulting from cross breeding between introduced rice variety and local rice variety indigenous of South Sumatra in order to produce new superior rice variety having characteristics of high production, short ageas well as specific taste and aroma of South Sumatra specialty. This research was conducted at farm plot in Pulau Semambu Village, Indralaya Utara Subdistrict from January to April 2016. The method used in this research was Randomized Block Design with one treatment factor and six replications for each treatment. Rice seeds used as treatments were consisted of Inpago-7, JatiLuhur, Dayang Rindu and F_1 generation varieties. The results showed that F_1 generation rice variety had no significant different in term of crop height and tiller numbers than Jati Luhur brood which had high yield potential (3.5 to 4 ton/ha) and crop's age of 110 to 118 days so that it had potential to be developed as candidate of new superior rice variety.

Keywords: Agronomical characteristics, Rainfed rice, F_1 generation

INTRODUCTION

The food autonomyat province level should be achieved in order to create national food tenacity. One of strategies that can be implemented is by utilizing unproductive land which consisted of dry land and swamp land for rice cultivation. South

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Sumatra Province had extensive dry land area in which only 52,679 ha that had been managed or about 13.7% from total dry land area of 385,407 ha (BPTP Sumatera Selatan, 2009).

The opportunity of rainfed rice development at dry land in addition to traditional land as second crop was in accordance to new land clearing for plantation area. The second crop can be cultivated up to third year at young rubber plantation area as well as up to fourth year at oil palm plantation area (Suryana, 2008; and Yusuf, 2009). Rainfed rice can also be cultivated at swamp land area during dry season (Gusmiatun, 2015). Although rainfed rice has high development potential, but farmers eagerness to cultivate rainfed rice was relatively low. This was caused by low productivity and low quality of local variety rainfed rice which was generaly used by farmers. The average production of this local variety rainfed rice was in the range of 1.5 to 2.5 ton/ha or about 43% from productivity of paddy field rice (BPS, 2007).

Despite its mentioned diadvantages, there was local variety rainfed rice which had specific taste and wangi aroma that only available in certain area. Local variety rainfed rice which had specific taste, fragrant aroma, good tastingas well high economic value kown as Dayang Putri was found in Musi Rawas District of South Sumatra Province. It is prefered by local community members. The disadvantages of Dayang Putri rice variety were long ageof six months and low productivity with magnitude of 1.9 to 2.0 ton/ha (Portal Nasional RI, 2012). If rice having superior characteristics (aroma and taste) is cross breeded with rice variety having short age and high production, then it is expected to yield the new rice variety having short age and high production and fragrant aroma which in turn can increase the interest of farmers to cultivate rainfed rice.

The government up to nowadays had been introduced several superior rice varieties, but the assembly of new superior rice varieties by considering the interest of region in which the varieties will be developed is still needed because the community preferences toward taste are different amongst areas/regions. The objective of this effort is that farmers are eager to adopt new rice varieties. Results of field survey showed that most famers at South Sumatra are still cultivating local rice varieties because this local rice varieties have taste in accordance to farmers community preferences.

The assembly of new variety is started from cross breeding between the selected brood, crop variation from the cross breeding results of F_1 generation is depends on brood selection which will produce heterotic hybrid. Hybrid vigoror heterosis is a trend in which F_1 individual from cross breeding results will have better perfomance than one of broodor average of both broods.

For self pollination crop, the probability of heterosis utilization is started with brood selection which produce the best characteristics combination. This is important to proceed breeding for the best gene combination that can be obtained from variety that is relatively homozyigote (Hayes, 1964).

The advantages of unhulled rice potential should be determined for F_1 hybrids from cross breeding between local rice variety and superior rice variety in order to produce new hybrid rice having high production and fragrantaroma. This research objective was to determine the growth and production of F_1 crop resulting from cross breeding between Jati Luhur rice variety and local rice variety of Dayang Rindu.

MATERIALS AND METHOD

This research was conducted at experimental plots of Agricultural Faculty, Muhammadiyah University Palembang located in Pulau Semambu Village, Indralaya Utara Subdistrict from January to April 2016. Rice seeds used in this study were originated from four rice varieties consisting of broods of Jati Luhur, Dayang Rindu, F_1 (JTL-DR), and control variety of Inpago-7. Field research was conducted by using Randomized Block Design with one treatment factor and six replications for each treatment. Treatment unit was plot having size of 2 m x 5 m, two seeds was planted in a hole with planting distance of 25 cm x 25 cm.

Observation was consisted of crop height (cm), productive tiller numbers, harvest date (Day After Planting), percent of empty unhulled rice (%) and unhulled rice weight per clump (g).

RESULTS AND DISCUSSION

Results

1. Vegetative parameters (crop height, productive tiller numbers).
2. Production parameters (percent of empty unhulled rice, unhulled rice weight/clump).

Table 1: Average Value of Growth and Production Parameters of Several Rainfed Rice Varieties

No	Variety / Crop Morphology	Jati Luhur (JTL)	Dayang Rindu (DR)	F_1 (JTLXDR)	Inpago-7
1	Crop height (cm)	105 a	137 c	103 a	114 b
2	Productive tiller numbers	13 a	9 b	12:00 AM	13 a
3	Percent of empty unhulled rice (%)	8.1 a	7.1 a	7.9 a	7.5 a
4	Unhulled rice weight/clump (g)	31.60b	28.15 a	31.50b	30.20b
5	Harvest age (Day After Planting = DAP)	95.50 a	142.75 c	95.75 a	114.00 b

Figure 1: (a) Height Differences and (b) Productive Tiller Numbers Differences Ofrainfed Rice Crop Among Stbroods and F_1

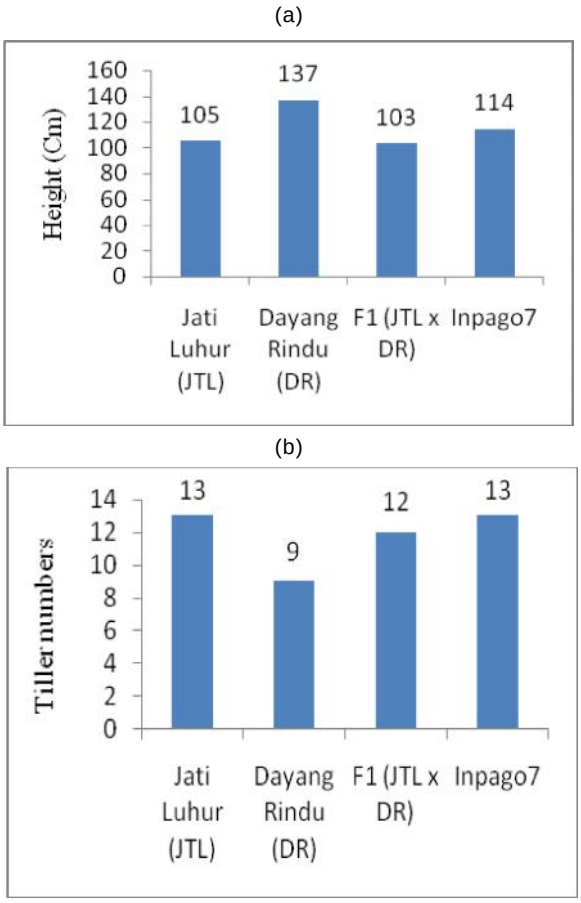


Figure 2: (a) Differences of Empty Unhulled Rice Percentage and (b) Differences of Unhulled Rice Weight/Clump of Rainfed Rice Crop Amongst Broods and F_1

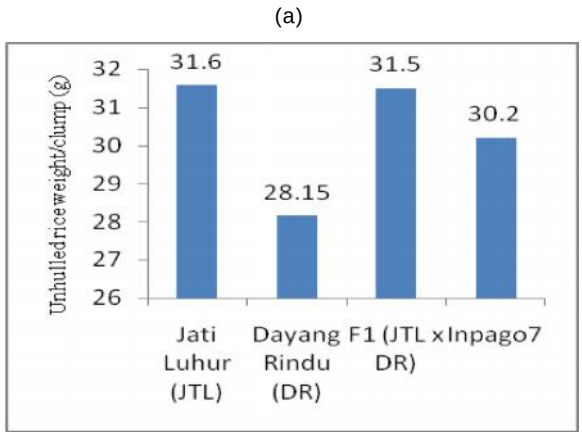
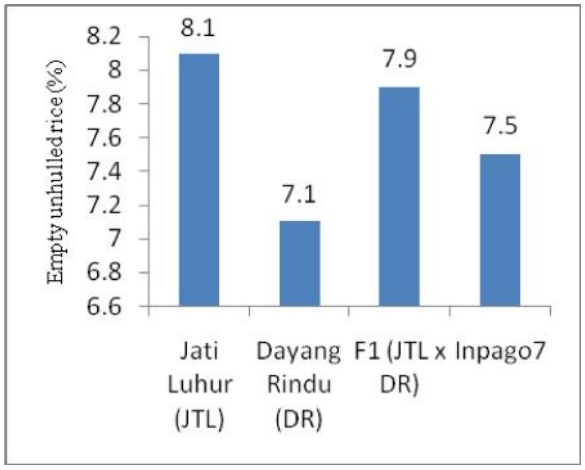


Figure 2 (Cont.)

(b)



3. Harvest age (DAP).

Figure 3: Differences of Rainfed Rice Age (DAP) Among Stbroods and F_1 Generation

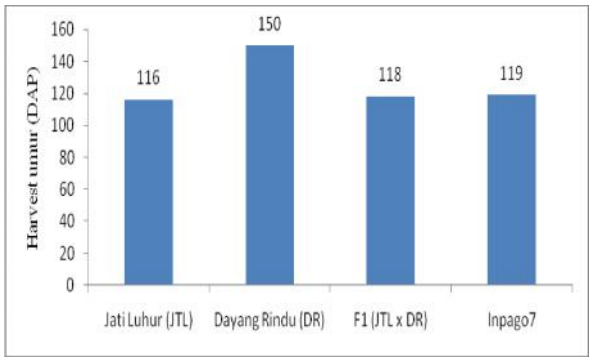


Figure 4: F_1 (Jati Luhur X Dayang Rindu)

Figure 5: Inpago-7

Figure 6: Dayang Rindu

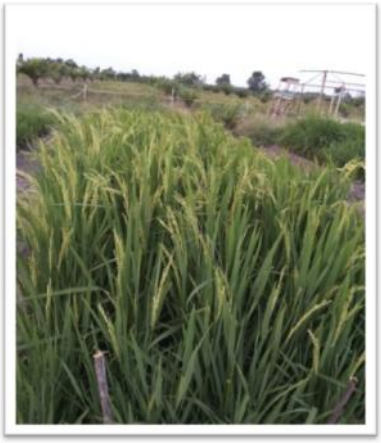


Figure 7: Jati Luhur

Discussion

The average crop height of F_1 generation produced from cross breeding of Jati Luhur rice variety and local rice variety of Dayang Rindu was 103 cm which was not significantly different than Jati Luhur variety height of 105 cm, but it was lower than Dayang Rindu variety height of 137 cm (Figure 1a). This results was the expected perfomance because higher crop is not always better than shorter crop, evenhigher crop is easily fall down especially during period of panicle filling. On the other hand, short and stiff stem is the expected characteristics for development of superior rice varieties because it is not only fall resistant, but also has more balance ratio of unhulled rice and rice straw (Jennings *et at*., 1979; and Yoshida, 1981). The characteristic of hybrid crop (in this case is F_1 generation is determined by characteristic of its broods. If characteristics of both broodsare combined sinergically, then the produced generation will pose combine characteristics which is better than both of its brood (You *et al*., 2006).

Tiller numbers produced by each variety are determine by crop's genetical factors. Results of the study showed that F_1 generation inherited brood gen of Jati Luhur which control numbers of productive tiller so that productive tiller numbers produced by F_1 generation was not different than productive tiller numbers produced by its brood of Jati Luhur with magnitude of 12 tillers. This magnitude was not different than tiller numbers produced by control variety of Inpago-7, whereas Dayang Rindu broodhad only produced 9 tillers (Figure 1b). Capacity of tillers is one important characteristics for superior variety. Crops having high tiller numbers are suitable for several planting distance variations, capable to compensate the death clumpsand capable to achieve leave area quickly (Yoshida, 1981).

The crop growth in term of crop height and productive tiller numbers affects the yield of unhulled rice. The higher the numbers of productive tiller, the higher the crop production. The F_1 generation had produced higher unhulled rice weight per clump (30.2 to 31.6 g/clump) than Dayang Rindu variety as shown in Figure 2a.

The effect of crop height on unhulled rice yield was found on Dayang Rindu rice variety which had the highest crop height so that it produced the lowest unhulled rice yield. According to Navasero and Tanaka (1966), stem elongation could results in assimilates competition with panicle development because stem elongation can consume about 60% of produced net assimilates and the rest of assimilates are distributed for leaves growth and panicle (Wada, 1969). Futhermore, Murata and Matsushima (1978) had stated that excessive vegetative growth can results in decrease of assimilates supply.

Research results for all tested crops (Jati Luhur, Dayang Rindu, F_1 and Inpago-7 varieties) showed low percentage of empty unhulled rice in the range of 7.1 to 8.1%. This finding showed that capability of *Source*to supply assimilates into Sink was relatively sufficient. The opposite condition was found on crops that had higher percentage of empty unhulled rice (more than 20%) because source was less capable to supply assimilates although it had high sink especially on unfavourable environment so that many sink was empty or not be utilized by source (Makarim *et al.,* 2004).

Harvest age of F_1 crop was not different than Jati Luhur brood (116 to 118 DAP), but its harvest umur was shorter than that of local tetua of Dayang Rindu with magnitude of 150 DAP (Figure 3). This finding was the expected generation from

both broods used in this study because one of characteristics for superior rice variety is short umur. The age of rice crop is determined by the period length of vegetative phase consisting growth phase of crop vegetative organs such as stem elongation or crop height De Datta (1981) and Yoshida (1981). The higher the rice crop height, the longer the vegetative phase period so that its harvest umur is longer. Local rice variety of Dayang Rindu had the highest crop height so that its harvest ageis the longest.

CONCLUSION

1. The F_1 crop produced from cross breeding between Jati Luhur and Dayang Rindu varieties had similiar growth and production levels with parent Jati Luhur. This cropheight was 101 cm and unhulled rice production per clump was 31.5 g.
2. The F_1 crop had short agewith magnitude of 118 Day After Planting.

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