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Research paper



F1 hybrid rice growth differences in growing conditions

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Abstract

One effort to increase national rice production is to utilize dry land, this is because many wetlands changed into the non-agricultural sector. On the other hand, the productivity of rice in dry land is generally lower than paddy rice, because farmers typically use local varieties because it feels suit the tastes of the local community. For that, there need to be new varieties that have high production and flavor to taste the communities where these varieties will be developed. This is to increase the interest of farmers grows rice on dry land. Assembly of new varieties has been conducted in Phase-1 and the resulting F1 hybrid plants (JTLDR-G-416). This study aims to determine the yield potential of the F1 hybrid plants in different soil conditions, namely rice paddies, and fields. Placement varieties in the field using a randomized block design and repeated 4 times. The varieties used are F1 hybrids, varieties (Parental Jati Luhur and Dayang Rindu), as well as high-yielding varieties (Inpago-7 and Ciherang). The parameters studied were plant height, number of tillers per hill, number of panicles per hill, number of grains per panicle, filled grains per cent, grain weight of 1000 grains and grain weight per clump. The results showed that the production of the F1 hybrid is better than the varieties Lady Longing and Jati Luhur. If F1 hybrids planted in the fields, then a higher production ± 7.1% compared with the dry land.

Keywords: *The Results of the F1 Hybrid; Multi-State; Dry Rice.*

1. Introduction

Rice is the staple food sources for the majority of the Indonesian people. National rice demand is increasing in line with population growth. South Sumatra is one of the provinces in Indonesia which has a National Food Barn Program has been able to meet the rice needs of the population, even to a surplus of more than 450,000 tons in 2009. Later in 2015 rice production also increased by 15.73% compared to 2014 (BPS, 2016).

In recent years, a lot of agricultural lands converted into oil palm plantations, rubber, and settlements. This causes a threat to food security has been achieved. Therefore, efforts to take advantage of dry land as the rice planting area expansion is an alternative that is expected to support food security. In Sumatra, the chances of developing dry land rice in addition to the traditional lands can also be as crop intercropping during the opening of new land for plantations. At the young rubber plantations, intercropping can be done until the third year and on the palm plantations until the fourth year (Suryana, 200).

Key to increasing rice production in dry land is yielding varieties. Through plant breeding program, which is developing high-yielding varieties with high productivity and early maturity, The contribution of improved varieties to increase rice production more than the increase in harvested area, in the period 1971-2006 increased productivity contributed about 56.1%, whereas the increase in area harvested and interaction both contributed respectively 26.3% and 17.5 % (Sembiring, 2008). High yielding varieties of upland rice which was recently released government, among other varieties UNSOED-1 scented and high yield, varieties of IR 79 971-B and 191-B and IR 79 771-B and 227-B is capable of producing average grain as much as 8, 4 tons per hectare (Agricultural Research 2011).

Although new varieties are produced has proved its success on increasing production, but the reality on the ground shows that the majority of farmers, especially in South Sumatra fixed planted local varieties on the grounds that local rice is more adaptive and have a sense of environmental conditions in accordance with their preferences. Therefore, the development of new varieties must consider the tastes of consumers where these varieties are developed so that farmers would adopt new varieties are produced. In preliminary studies, it has been done and produced an F1 hybrid that is a hybrid of Jati Luhur varieties and varieties Dayang Rindu. Jati Luhur be an option because he's superficial and adaptive to the local environmental conditions, while Dayang Rindu varieties have the advantage of the preferred aroma is typical and local communities in South Sumatra (Gusmiatun, 2015).

Appearance and production of a plant in a growth environment is the result of work between genetic factors with the environment. Different environments can result in the appearance and production are different, so to what extent the interaction between genotype and environment (G x E) is a very important thing to note in breeding programs or in the framework of its development (Mangoendidjojo, 2000). For this study aims to determine the appearance of the first derivative of upland rice genotypes (F1 hybrid), at two different environmental conditions, namely rice paddies and fields.

2. Materials and methods

Research implemented within one growing season, at two different locations namely on dry land and in the fields. The composition of the varieties in the field using Random Group, repeated 4 times. Varieties tested at each site, namely: F1 hybrid (genotype JT-DR-G-416), varieties (both parents: Jati Luhur and Dayang Rindu), as well as high-yielding varieties (Inpago-7 and

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Ciherang). The parameters studied were plant height, number of tillers per hill, number of grains per panicle, filled grains per cent, grain weight of 1000 grains and grain weight per clump. To determine the effect of treatment of the parameters investigated, tested with Honestly Significant Difference,

3. Result dan discussion

Results showed that all the tested varieties produce better growth and yield if planted in the paddy field than planting in dry soil. The highest production in dryland produced by Variety Inpago-7, while in paddy fields generated by Ciherang. While the production of F_1 hybrids in dryland and paddy is better than both parents (Table 1).

Table 1: Growth And Production of Upland Rice Five Varieties on Land Different Conditions

Treatment	Plant height (cm)	Number of tillers	Total panicle		Empty Grain Percent (%)	Weight of 1000 grain (g)	Weight of grain/ clump (g)
	Field						
F1	101.5a	9.4b	9.4b	146ab	5.1B	24.5a	29.02a
Jati Luhur	100a	9.4b	9b	146ab	5.2B	26.5ab	29.3a
Dayang Rindu	166.9b	8.4a	8.4a	148abc	4.8b	25ab	28.9a
Inpago-7	106.6a	10c	9.4b	145A	5.1B	24.5b	29.6a
Ciherang	101.5a	9b	9b	147abc	5.2B	26ab	28.2a
	wetland						
F1	105.67 a	10c	10c	151bcd	4.44b	25.5ab	31.08a
Jati Luhur	103.27 a	10.3c	10c	152cd	4.17ab	27b	30.4a
Dayang Rindu	170.7a	9.4b	9.4b	150abc d	4.44b	25.5ab	30.5a
Inpago-7	108A	10c	10c	149abc	4.2ab	25ab	30.5a
Ciherang	107A	13d	12d	155d	3.1a	27.5b	34b
BNJ.0.05	20	0:51	0.45	5:02	1:11	2.5	3:22

3.1. Plant height (cm)

Plant height is an indicator of growth and as a parameter to measure environmental influences or treatment applied, but nevertheless remains influenced by genetic factors. Rice is grown in paddy fields the growth environment can provide sufficient water during the vegetative growth of the plants so that the average height is 3.63 cm compared grown on dry land. Water serves as a means of transport from cell to cell to transport the substances needed for plant growth (Andoko, 2005).

The results showed that the varieties Dayang Rindu height is more than other varieties, reaching 166-171 cm. Hai because of a genetic varieties Rindu Dayang higher than other varieties. While the F1 hybrid plants, when grown in dry land and in high yield paddy crop, is almost the same as its parent Jati Luhur, namely between 100 -104 cm (Figure 1).

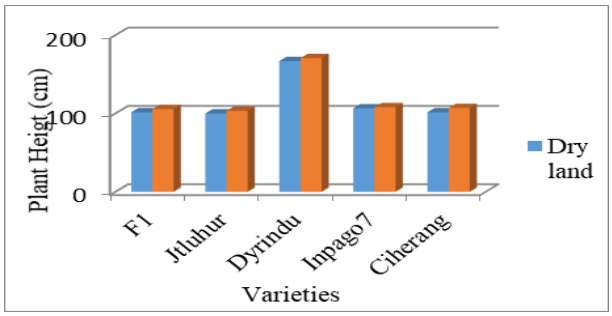


Fig. 1: Plant Height of Several Varieties on Dry Land and Rice Fields.

3.2. Total panicle

The number of productive tillers produced in each cluster is determined by the type of varieties grown, in addition, environmental factors also come into play. Varieties used in the study resulted in the number of tillers per hill on average between 8-10 puppies. On dry land, the number of seedlings produced less is 8-10 tillers; compared within the field that is 9-13 tillers (Figure 2 and 3). This is presumably due to water limitation factor for growing rice in the fields. The number of chicks produced by the rice plant cannot be maximized if crops suffer from lack of water (Edi, et al., 2015). The number of tillers can be greatest if the plant has a good genetic trait and grow in an environment favorable or suitable for plant growth and development (Husana, 2010). This condition can be seen in Ciherang, if planted in dry land then the total number of seedlings in each clump decreased from 13 to 9 puppies. While the F1 plants decreased from 10 to 9 puppies.

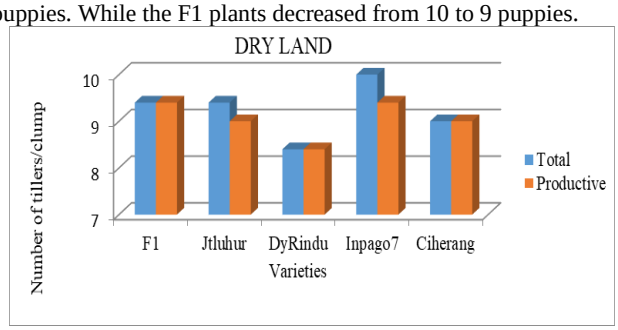


Fig. 2: Total & Productive Tillers per Clump Some Rice Varieties in Dry Land.

3.3. Total panicle

The number of panicles in each cluster is equal to the number of productive tillers because such tillers produce panicles called productive tillers. The results showed that almost all the seedlings were produced (tillers total), can form a panicle (productive tillers), both planted in dry land and rice fields. Likewise, the F1 hybrids, resulting in productive tiller as much as 9-10 tillers (Figure 2).

According to Wagiyana et al., (2009) found, the number of the productive tiller is determined by the number of seedlings that grow before reaching the primordial phase, but the chicks that formed the last panicle might not produce the grain-grain panicle filled everything, so likely to produce the grain hollow. The number of tillers is also influenced by the nature of the genetic and environmental conditions in accordance with the growth of plants, which are genetically more use assimilation high for stem and leaf formation compared to tillering (Asfaruddin, 1997). This can be shown on the variety Dayang Rindu, which has the highest plant height, producing the fewest number of tillers, ie 8-9 tillers. According to IRRI (1996), criteria number of tillers classified as low, medium,<5, 5-9, 10-19, and 20-25 stems.

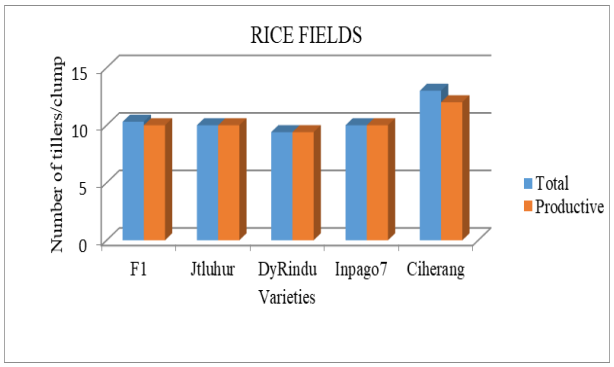


Fig. 3: Total & Productive Tillers Per Clump Some Rice Varieties in Rice Fields.

3.4. Total grain per panicle

The number of grains in each panicle of rice plant is determined by the growing environment, in paddy fields produce more grain than in the dry land. Likewise, the varieties planted, each variety has different capacities to produce the number of grains in each panicle. In the paddy field, Ciherang can produce 155 grains in each panicle, 151 grain produce F1 hybrids. Whereas if the F1 hybrid is planted in the dry land, the number of grain per panicle decreased to 148 grains (Figure 4).

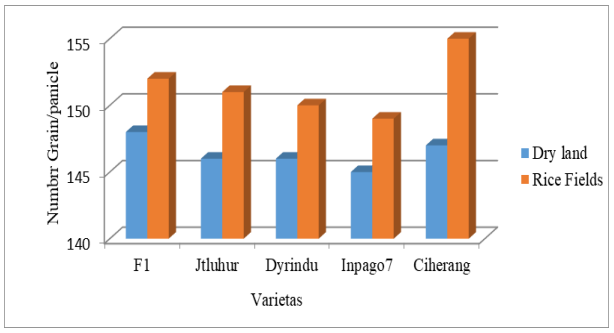


Fig. 4: Number of Grain Per Panicle Some Rice Varieties on Dry Land & Rice Fields.

Rice plants grown in the paddy fields and the water supply gets enough nutrients during the vegetative phase, So it does not have problems in the reproductive phase. According to Lakitan (2008), that the environment has little effect on grain size, but the biggest influence on the amount of grain. An environment which is meant, among other things light, temperature, water availability, and CO2.When these elements are in limited circumstances, the result of too little photosynthesis.

3.5. Empty grain percent (%)

Grain hollow percent for all varieties grown either on dry land or in the field is low. The average grain vacuum generated in the drylands of 5:08%, in the fields of 4:07% of the F1 hybrid plants, if planted in dry soil produces grain hollow 5.1%, if planted in the field has resulted in 4.4% (Figure 5). Low grain hollow percent shows the ability of the source (source) to supply assimilate into a limp (sing) (Murata and Matsushima, 1978). Values lower percentage of empty grain (5-15%), Is one of the criteria of the qualities that should be for potentially high-yield rice (Abdullah et al., 2008).

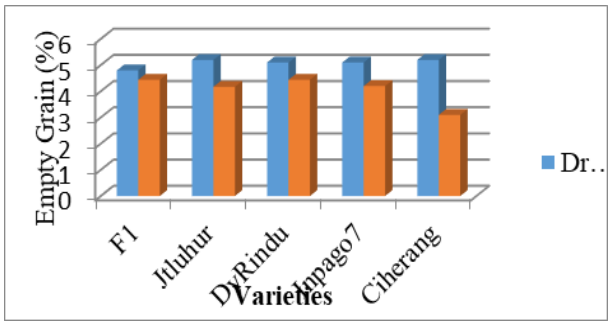


Fig. 5: Percent Empty Grain Per Panicle Some Rice Varieties on Dry Land & Rice Fields.

3.6. The weight of 1000 grains (g)

The results showed that all varieties tested produced an average weight of 1000 grains did not differ by genetic, either planting in the soil or in the fields, which is between 25-28 g (Figure 6). This suggests that the growing environment can support the soybean crop during the grain filling, so the plants are not deprived of nutrients and water. At the time of Markowitz seeds, plants need nutrients and water in sufficient quantities. 1000 grain weight will increase when the groundwater conditions and nutrients remain available for plant growth processes (Roesmarkam and Yuwono, 2002).

High or low seed weight is determined by lot or at least dry matter contained in the seed. Dried material in seeds is the result of photosynthesis is used to send filling (Masdar, 2007). In addition, bright 1000 grain is also influenced by genetic factors, weight generated by all the varieties tested almost the same.

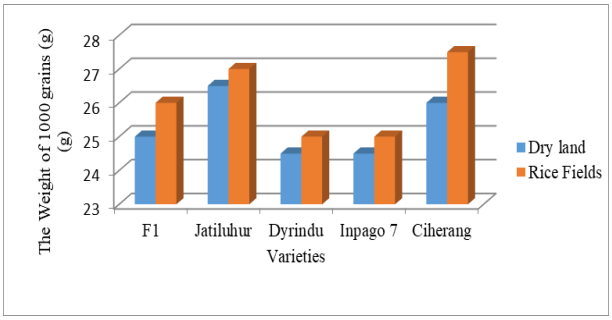


Fig. 6: The Weight of 1000 Grains (G) Some Rice Varieties on Dry Land & Rice Fields.

3.7. Grain weight per clumps (g)

The average yield of grain weight in each clump of rice varieties tested for planting in paddy fields is more severe than that of rice planting in the dry land, namely 31.08 g compared to 29.02 g. The highest grain yield of fields is 34 g, produced by Ciherang. While the dry land is 29.6 g by varieties Inpago-7. F1 hybrids in paddy fields produce 31.08 g, in dryland yield 29.02 g (Figure 6).

Grain weight in each clump of rice plants is influenced by environmental factors the time of pollination (water, nutrients, carbon dioxide, and solar energy), number of tillers, and pest and disease. Differences in the ability of plants to take advantage of environmental factors will affect the ability of plants to perform photosynthesis. Thus carbohydrates, proteins, fats and other organic acids produced from photosynthesis processes will also be different, then it will affect the growth and production, in this case, the grain yield (Sumardi, et al., 2005). In paddy fields, enough water is available to make the process of photosynthesis and translocation of photosynthesis to sink organ (grain).

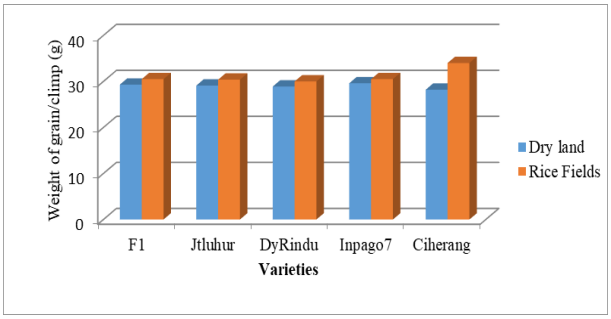


Fig. 7: Weight Grain Per Clump (G) of Some Rice Varieties on Dry Land & Rice Fields.

4. Conclusion

Plant growing environments affect production, varieties of rice grown in paddy fields of production are higher than on dry land. F1 hybrids in paddy fields produce 31.08 g of grain from each grove, on dryland yield 29.02 g. In the paddy field, an F1 hybrid can adapt better than both parents, the Jati Luhur and Dayang Rindu.

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