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Productivity Characterization of F4 Rice Generation as the Results of Sikuneng and Irbb27 Crossing

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Abstract: *The production of varieties is able to be conducted through hybridization or mutation with the base of local varieties with the purposeof getting superior varieties that have potential such as high productivity, short life cycle and preferred by farmer and consumer. Genetic diversity can be expanded by hybridization which combine the desired characteristics by the parentthus new populations are able to be obtained as thematerial for selection in the production of new high yielding varieties.This study aims to determine the character of productivity of F4rice yields from thehybridization ofSikuneng x IRBB27 and compared with the variety of Inpari 42 as a control. This research was conducted at the Aceh Rice Research Institute, Universitas Syiah Kuala, and this study designed as a non-factorial randomized block design. The treatments used in this study were 20 lines and varieties. Details oflines and varieties were; 17lines of hybridizationF3populations Sikuneng x IRBB27, isogenicline IRBB27, Sikuneng Variety and National Variety Inpari 42. Each treatment was replicated 3 times, therefore there were 60-unit experiments. The results indicated that Skn-6 performed the fastest flowering stageand harvest time, the highest grain weight per panicle and the highest grain weight of rice and Skn-18 had the highest grain weight per hill, the lowest empty grain weight and the highest yield potential.*

Keyword: *Paddy, Hybridization, Sikuneng, IRBB27, Rice Productivity*

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I. Introduction

Rice (Oryza Sativa. L) is the most important staple food crop in the world besides wheat (Ndjiondjop et al., 2010), more than 60% of the world's population consumes rice as a main food.Rice plays an important role in food security in Asian countries. Even though it is important, the stability of rice supply in developing countries is still difficult to be fulfilled. One of the reason is the lack of genetic resources that produce high productivity, increasing market demand, diminishing agricultural land (Rohmadiani, 2011) and decreasing number of farmers (Susilowati, 2016). This has happened in several developing countries (Kim, 2014) particularly countries located in the tropics(Kapoor et al., 2011) one of which is Indonesia.

In 2018, the estimated rice production in Indonesia was 56,54 million tons of dry unhusked rice or equivalent to 32,43 million tons of rice (BPS, 2018). Whereas rice consumption in Indonesia continues to increase every year in lines with the increasing rate of population growth in Indonesia (Wailes and Chavez, 2012). Therefore, every year Indonesia is having sufficient rice supplies and forced to import from several other countries (Rahayu and Febianti, 2019). Currently, the issue of food security is a global and has become the main agenda in all countries as a result of the shrinking of agricultural land, global climate change, and population growth (Ma et al., 2018).

Producing varieties through crossing plants or mutations based on local varieties, is expected to obtain superior varieties that have higher potential yield, short-lived and adaptive on tidal swamps area, and also preferred by farmers and consumers (Widodo et al., 2019). The selection of the grain origin, both for hybridization and mutation, is the first step in the assembly of new high yieldvarieties. The selection of grain origin must be based on the superiority of one or more characters to be developed (Sobrizal, 2016).

The diversity of agrotypical character of a plant is a morphological characteristic that is commonly used as a distinct characteristic between rice genotypes, such as plant height, number of productive and non-productive tillers, number of grains per panicle, grain shape, and panicle length. The selection of these characteristics can be conducted by utilizing a variety of phenotypes in these plants. The diversity of phenotypic characters of a plant is the appearance of plant traits in a growing environment is the result of interaction between genetic and environmental factors (Hao et al., 2010; Kumar et al., 2010). If the diversity of phenotypes is high, the opportunity to produce superior varieties is greater. There are various desired phenotypes, particularly at the harvest time, the plant height, the panicle length, the weight of a thousand grains, the grain content and the potential yield (Ishak, 2012; Sutaryo, 2014; Mara et al., 2015).

Recently, Aceh's local superior variety, Sikuneng has been successfully hybridization with IRBB27 from IRRI (Efendi, 2015). Sikuneng has the advantage of producing high yield and well adaptability, but its time is approximately 4.5 months and the plant is tall, making it easy to fall. Whereas IRBB27 has high productivity and has resistance to disease and hasheading date of 3.5 months, and has an sd-1 gene that are able to emerge the short plant architecture (Efendi, 2016).

In 2017,a hundred plants with different characters were selected as the initial F3 generation lines of a thousand individuals (hills) of F2 plants in the Grain Science and Technology Laboratory and a hundredof F3 generation plants were reselected and only 20 plants were selected for F4 generation. Potential individual yields in populations of a hundred F3 rice lines resultedby thehybridization of local varieties of Sikuneng with IRBB27 shows that the potential yield or individual yields in populations of F3 rice lineshybridizationby local varieties of Sikuneng with IRBB27 exceeded both the parent and female (Efendi, 2015). It is expected that this research wouldbe able to select several lines for the planting of F5 generation from the hybridization of local varieties Sikuneng x IRBB27 which have high yield and short life cycle that can be selected or few lines to be selected as green super rice varieties.

II. Materials and Method

The experiment was conducted at the Grain Science and Technology Laboratory, Faculty of Agriculture and Aceh Rice Research Institute, Syiah Kuala University, Darussalam, Banda Aceh, Indonesia. The geographical location was on 5º57 '1.63 "LU - 95º37", 09 "East with an altitude of 13 meters above sea level (Mobile Topographer, 2019) starting from March 2018 until August 2018.

Rice genotypes used in the experiment were rice genotypes from seventeen lines F3 populations and their parental; Sikuneng x IRBB27 Inpari 42 national variety. The planting media used was aerobic rice media that were served in the Rice Research Experimental Farm, Aceh, Universitas Syiah Kuala. The plants were fertilized with 1 ton of manure and NPK Phonska fertilizer (500 kg ha-1).

Experimental design

This research designed as anon-factorialRandomized Block Designof 20linesand varieties with three replications.The treatments applied in this experiment were genotypes with 20 levels of treatment, that were 17 lines from the hybridization of F3 Sikuneng x IRBB27, Sikuneng Parent, IRBB27 and Inpari 42 as comparison variety.

Research procedure

The grains were selected in advance. Selected grains were filled and had nodefect. The grains were germinated on cotton media and placed inside the incubator for 3 days, then the germinated grains were sown for 12 days in a tray that had been filled with sifting soil that had been mixed with compost with a volume ratio of 2:1. Planting was conducted when the grainlings were at 12 days after seedling (DAS) using the System of Rice Intensification (SRI) method. Planting was conducted by transferring the germinated grains to the soil with planting space of 25x25 cm and spacing between linesof 40 cm and one grainling was planted for each planting hole with a total of 40 plants in each repeat on one line.The weeding wasconducted every 2 weeks or depending on the growth of weeds. Weeding was conducted by pulling weeds manually. The watering of the fields was conducted as high as 2 cm, then the soil was left to dry itself (within 8 days), after the ground was dried, the watering wasreconducted as high as 2 cm. The watering was reconducted until the plants had entered the flowering stage. Since the flower phase came until 10 days before harvesting, the growing media continued to be flooded with water, then dried at 10 days before harvesting time. Harvesting was conducted once the rice grains appear to be physiologically marked with yellowing rice and the stem is bent. Harvesting was conducted by cutting the panicles in each hill and then dried and shed. Drying was conducted by drying panicles with its straw, which had been cut within 3-4 days. Then threshing the rice was conducted manually by hand and cleaned using a Grain Blower to separate the empty grains and filled grains. The observations in this study were plant height, heading date, growth rate during ripening, number of panicles per plant, panicle length, panicle weight, number of filledgrains, number of empty grains, weight of filledgrain, weight of emptygrain, grains weight per plant, percentage of filledgrains, a thousandgrain weight, harvest index and potential yield. Data analysis the obtained data then analyzed using Analysis of variance (Anova), the significant effectsof the treatments were further testedusing Tukey's Honest Significant Difference (HSD) at $\alpha = 5\%$.

III. Result and Discussion

Plant Height of Rice

The result of the variance analysis showsaverage height of F4linesaresignificantly different from the comparative varieties (*Inpari 42*). Plant height varies between the tested genotypes, higher plant height is found in *Sikuneng* (194 cm) which is a parent variety and is not significantly different from line 12 (183 cm) and the lowest plant height is Skn-1 (103 cm) which is not significantly different from the comparative varieties (Inpari 42).

Table 1. Rice plant height, average early maturity and growth time in somelines

Genotype	Plant Height(cm)	Rice Tillers	Heading date(days)	Growth Time(days)
Sikuneng	194,0 h	6,60 a	76,0 bc	120,0 f-g
IRBB27	125,3 a-d	13,07 b-d	76,0 bc	116,0 c-g
Inpari 42	112,6 ab	9,67 a-d	79,0 b-e	108,0 a-d
Skn-1	103,2 a	10,67 a-d	76,0 bc	105,7 ab
Skn-4	123,9 a-c	7,73 ab	77,0 b-d	114,7 b-g
Skn-6	150,6 c-h	10,80 a-d	63,0 a	98,7 a
Skn-7	145,9 b-f	13,13 b-d	77,0 b-d	116,3 c-g
Skn-8	168,8 e-h	12,47 a-d	83,0 c-f	119,7 f-g
Skn-9	150,3 c-g	12,60 a-d	76,0 bc	118,3 e-g
Skn-10	153,2 c-g	10,80 a-d	76,0 bc	122,0 g
Skn-11	157,4 c-g	15,20 cd	74,0 bc	107,7 a-c
Skn-12	183,4 g-h	12,20 a-d	77,7 b-d	109,3 b-e
Skn-13	156,7 c-g	12,80 a-d	72,0 ab	111,7 b-f
Skn-14	142,3 b-e	15,60 d	86,0 d-f	107,0 a-c
Skn-15	162,1 e-h	8,33 ab	78,3 b-e	117,7 d-g
Skn-16	167,2 e-h	7,60 ab	87,3 e-f	121,0 f-g
Skn-17	150,3 c-g	12,40 a-d	88,7 f	111,7 b-f
Skn-18	158,5 d-g	12,47 a-d	75,7 bc	115,0 b-g
Skn-19	161,5 e-h	11,47 a-d	72,0 ab	115,7 c-g
Skn-20	179,9 f-h	8,93 a-c	75,7 bc	120,0 f-g
BNJ 0.05	35,54	6,36	9,24	10,00

Note: The numbers followed by the same letter in the same column are not significantly different at the 0.05 level based on the HSD test

Irsal (2003) hasstated that new types of superior varieties are designed to have a plant height of 90-110 cm. Plant height which is classified as low is suspected to have *sd-1* gene. The *sd-1* gene (semi dwarf gene) is a gene that reduces levels of gibberellins (a hormone that regulates plant growth) in plants so plants that have the *sd-1* gene have a relatively low height. Plants that are not too high are generally preferred by farmers because they tend to be more resistant to lodging. Kustera (2008), assumed that the higher the plant is, the heavier weight is the plant will bear at the base of the stem therefore the lodging resistance of the plant will decrease. Abdullah *et al.*, (2008) has also confirmed that plants which have a height of 90-110 cm are relatively resistant to lodging. Plants that have a high level of lodging has an influence on yield reduction. Peng *et al.*, (2004) mentioned that the plants that are too high have the potential to experience vulnerability resulting in decreased yields, increased respiration, reduced translocation of nutrients and retention against pests and diseases. Makarim and Suhartatik (2009) assumes,short plant with stiff stems is more resistant to lodging and can contribute to higher yields (De Datta, 1981; Khush 1996; Makarim and Suhartatik, 2009).

Maximum Number of Rice Tillers

The average maximum number of tillers of *F4*linesare significantly different with the comparative variety of *Inpari 42*, but the maximum number of tillers tend to be higher in line 14. Ithasapproximately 16 tillers andit is not significantly different from the Sikuneng and Skn-10 genotype. The smallest grainlings are found in the *IRBB27*, with 6 tillers and 14 other lines had the same number of tillers and exceeded the comparative variety, *Inpari 42*.Safitri (2016)has stated, the number of tillers of each rice plant is divided into five groups, very high(>25 tillers), good (20-25 tillers), medium (10-19 tillers), low(5-9 tillers) and very low(<5 tillers). Based on this study, there are 13 genotypes classified as "medium" and 7 others classified as "several"tillers. The number of tillers will be maximal if the plant has good genetic traits coupled with favorable environmental conditions or in accordance with plant growth and development, the number of productive tillers is an important character in determining potential yield (Husna, 2010). This is due to the number of productive tillers that has a direct effect on the number of produced panicles, the more productive tillers the higher the amount of graincan be obtained (Fadjry *et al.*, 2012).

Heading Date and Growth Time

The line that has the earliest duration of heading date is Skn-6 (63 days) and the longest floweringline is Skn-17 (88.7 days). The average time of harvesting in *F4*linesis also very significant different from the comparative variety (*Inpari 42)* and otherlines. The linewhich has the fastest average growth timeis Skn-6 (99 days) and thelinewhich has the longest harvesting timeis Skn-10 which is 122 days. The results showthat the lines tested have the same flowering stage or even longer compared to the comparative variety as well as at the time of harvesting. Heading date is related to time of harvesting. According to Pramudyawardani *et al.*, (2015), flowering stage is controlled by the action of dominant additive genes, therefore the more dominant genes are present in one individual, the longer the heading date and it correlates with the length of harvesting time. According to Makarim and Suhartik (2009), early maturity of rice variety (110 days) has a vegetative phase (early growth to primordia) during 45 days and then after that it will in the reproductive phase (primordia to flowering) for the next 35 days followed by 30 days of ripening, while rice variety with a late maturity (130 days) the vegetative phase lasts for 65 days, 35 days reproductive days and 30 days maturation. Short time of rice harvesting time is ranged between 105-120 days and long time of harvesting is 150 days. Based on the following standards, oneline and comparative varietyboth have short or early growth time. The time of harvesting is an important character because the varieties distributed in the community that are required to have an early growth rate during ripening.

Number of Panicles, Length of Panicles, Grain Weight per Hill, Panicle Weight

Table 2 shows that *F4* rice genotype has a very significant effect on the variables of panicle number, panicle length, grain weight per hill and panicle weight. The approximately higher average panicels number is found in Skn-18 which is 15,2 panicles.In the panicle length, it shows that the average length of panicle F4linesare significantly different from the comparative variety (Inpari 42), which is 27,7 cm length whereas the lineSkn-15which is 40,9 cm length. The linesSkn-15 is very significantly differentto the other lines. In the grain weight per hill, it shows that the average grain weight per hill of F4 populationis not significantly different from the comparative variety*(Inpari 42)*. Skn-18 is the line with the approximate largest grain weight per hill(46,7 g). In panicle weight, the average weight of panicle F4 linesare significantly different from the comparative varietiy*(Inpari 42)* but lineSkn-6 tend to have more grain weight per panicle which was 5,7 g weight and it is not significantly different from *Inpari* 42 which is 4,43 g.

Table 2. Average number of panicles, panicle length, grain weight per hill and panicle weight in tested lines

Genotype	Panicles	Panicle Length (cm)	Grain Weight per Hill(g)	Panicle Weight (g)
Sikuneng	8,2ab	30,4 b-c	34,2 a	3,17 a-c
IRBB27	11,7a-c	30,2 a-c	29,0 a	5,77 j
Inpari 42	12,1a-c	27,7 ab	36,8 a	4,43 a-j
Skn-1	11,5 a-c	27,5 ab	29,2 ab	4,10 a-i
Skn-4	8,3 ab	28,6 a-c	18,9 a	3,23 a-d
Skn-6	9,0 ab	25,1 a	34,0 a	5,57 j
Skn-7	10,9 a-c	28,5 a-c	35,5 a	4,60 d-j
Skn-8	11,5 a-c	28,3 a-c	30,8 a	4,20 a-j
Skn-9	11,5 a-c	25,1 a	34,4 a	4,17 a-i
Skn-10	8,9 ab	29,9 a-c	28,0 a	4,73 f-j
Skn-11	12,6 a-c	30,2 b-c	42,3 a	4,40 a-j
Skn-12	13,1 a-c	29,9 a-c	41,2 a	3,60 a-e
Skn-13	11,2 a-c	30,5 b-c	29,0 a	3,10 ab
Skn-14	13,7 bc	31,0 b-c	35,1 a	3,67 a-f
Skn-15	7,7 a	40,9 d	25,6 a	4,20 a-j
Skn-16	8,0 a	29,5 a-c	34,0 a	5,70 j
Skn-17	11,3 a-c	33,3 c	44,5 a	4,27 a-j
Skn-18	15,2 c	30,5 b-c	46,7 a	4,70 f-j
Skn-19	9,8a-c	29,1 a-c	32,2 a	3,07 a
Skn-20	8,9ab	31,2 b-c	28,9 a	3,80 a-g
BNJ 0,05	5,61	1,93	21,17	1,93

Note: The numbers followed by the same letter in the same column are not significantly different at the 0.05 level based on the HSD test

The yield component is a quantitative trait that influences the results therefore the results are highly dependent on the results components that make it up.Abdullah *et al.*, (2008) also stated that if the rice which has high potential yield should have the moderate number of tillers (12-18 stems) however theyare all productive.

The panicle length determines the total number of grain per panicle. The longer the panicle, it is expected that the total number of grain per panicle is high therefore the number of filledgrain per panicle is also high. A large number of tillers is better balanced with a large number of productive tillers or a small number of unproductive tillers (Dewi *et al.,* 2009). Rusdiansyah (2006) grouped panicle lengths into three groups, short (≤20 cm), medium (20-30 cm), and long (> 30 cm). All of thetestedlines, 11 of them include to the medium category and the remaining genotype9 linesare included to the long category. The results of the study by Lestari *et al.*, (2011) has showed that panicle length was positively and significantly correlated to the number of filledgrains, the total number of grains per panicle, and the weight of thousandgrains.

The Character of Rice Grain

The highest average number of filledgrain is in Skn-16, which is 192,7 unhusked rice while the average number of filledgrain in the comparative variety is 174,3 unhusked rice. On the of the number of empty grains, it shows the average number of empty grainsF4linesissignificantly different from the comparative variety (*Inpari 42*), Skn-13 has theleastaverage number of empty grains that is 16,7 while the comparative variety of *Inpari 42*has 63,0 items. On the percentage of filledgrain shows the average percentage of filled rice of F4grainis very significantly different but line 9 hasthe average percentage of filled rice of 94,70% and is not significantly different from the comparative variety of *Inpari 42* which is 92,7%. On the percentage of empty grains, it is shownthat the average percentage of empty grains of F4 linesissignificantly different from comparative varieties *(Inpari 42)* and Skn-9 hasthesmaller average percentage of empty grains at 5,7% and it is not significantly different from the comparative variety of *Inpari 42*which is 7,3%. In the weight of unhulled rice grain, it is shownthat the average weight of unhulled rice grainF4linesis significantly different with the comparative variety*(Inpari 42)* and Skn-16 hasthe higher average weight of unhulled rice which was 4,75 gram and it is not significantly different from *Inpari 42* variety which is 3,53 grams. The weight of the empty grain shows the average weight of the empty rice grainF4is significantly different from the comparative variety (*Inpari 42*) and Skn-16 hasa lower empty grain weight of 0,2 grams. The weight of thousand grains shows that the average weight of a thousandgrains of *F4*linesis significantly different from the comparative variety (*Inpari 42*), the line which has the highest a thousandgrains weight, is found in Skn-17 which had 31,87 gramsgrains.

Yield characters that are affected by the additive genes are indicated by the possibility of character enhancement through crossing (Lingaiah *et al.,* 2014). These characters are closely related to the potential production of a plant, According to Safitri *et al.*, (2016), one of the characters possessed by superior varieties (> 9 tons ha^{-1}) which the number of grains per panicle ranges from 150-250 grains with filled percentage of 85-95%. Based on this study there are lines that meet the requirements of superior varieties according to Safitri *et al.,* (2016). However, there are 5 lines that have more than 150 grain numbers and the percentage of grain content exceeding 85%.

Table 3. Average grain characters in tested lines

Genotype	Amount of FilledGrain (grain)	Amount of Empty Grain (grain)	Persentase of FilledGrain	Persentase of GrainEmpty	Weight of Grain Yield (g)	Weight of Empty Grain (g)	1000 Grains Weight (g)
Sikuneng	176,7 c-e	78,7 g-i	93,0 b	7,0 a	2,26 a	0,42 a-d	22,73 ab
IRBB27	101,7 a-c	78,3 g-i	90,0 b	10,0 ab	4,70 ef	0,49 a-d	27,73 b-d
Inpari 42	174,3 c-e	63,0 e-h	92,7 b	7,3 a	3,52 a-f	0,41 a-d	22,90 ab
Skn-1	145,0 a-e	34,5 a-d	91,3 b	8,7 ab	3,34 a-d	0,28 a-d	24,00 a-c
Skn-4	88,8 a	60,5 d-h	74,0 a	25,7 c	2,42 ab	0,32 a-d	27,60 b-d
Skn-6	168,6 b-e	69,9 f-i	92,0 b	8,0 ab	4,69 f	0,39 a-d	27,43 b-d
Skn-7	172,3 b-e	28,4 a-c	93,0 b	7,0 a	3,91 c-f	0,21 a-d	23,90 a-c
Skn-8	142,1 a-e	56,3 d-h	92,3 b	7,7 a	3,38 a-e	0,33 a-d	23,17 ab
Skn-9	186,5 d-e	53,1 b-g	94,3 b	5,7 a	3,30 a-c	0,38 a-d	18,87 a
Skn-10	118,1 a-e	81,5 h-i	89,7 b	10,3ab	3,72 b-f	0,53 d	28,10 b-d
Skn-11	147,7 a-e	25,7 ab	93,3 b	6,7 a	3,65 b-f	0,24 a-d	27,23 b-d
Skn-12	121,1 a-e	27,3 a-c	93,3 b	6,7 a	2,82 a-c	0,28 a-d	26,17 a-d
Skn-13	106,0 a-c	16,7 a	91,7 b	8,3 ab	2,39 ab	0,22 a-d	24,20 a-c
Skn-14	94,1 ab	53,7 c-g	91,0 b	9,0 ab	2,66 a-c	0,51 b-d	31,10 c-d
Skn-15	128,3 a-e	39,7 a-e	87,0 a	13,3 b	3,20 a-c	0,45 a-d	27,97 b-d
Skn-16	192,7 e	76,7 f-i	92,0 b	8,0 ab	4,75 f	0,45 a-d	25,83 a-d
Skn-17	106,9 a-c	49,8 e-f	93,0 b	7,3 a	3,30 a-c	0,47 a-d	31,87 d
Skn-18	153,8 a-e	34,4 a-d	93,7 b	6,3 a	3,97 c-f	0,20 a	26,37 b-d
Skn-19	100,9 a-c	39,6 a-e	92,7 b	7,7 a	2,21 a	0,36 a-d	24,13 a-c
Skn-20	109,0 a-d	91,8 i	91,7 b	8,3 ab	2,77 a-c	0,50 a-d	25,03 a-d
BNJ 0,05	78,58	27,47	13,9	5,5	1,35	0,30	7,33

Note: The numbers followed by the same letter in the same column are not significantly different at the 0,05 level based on the HSD test

Environmental factors play an important role in the high and low number of grain per panicle, because the weather condition was sunny that could increase the rate of photosynthesis, therefore the light energy was used to convert water and CO^2 into food, produced photosynthates would be stored in stem and leaf tissue, then it would be transfer into grain level of maturation. The level of empty and filled grain in rice is influenced by genetic, environmental factors, including abiotic stress, and the time of stress occurring (Nokkoul and Wichitparp 2014; Sridevi and Chellamuthu 2015; Dulbari *et al.,* 2018b). Kausar *et al.,* (1993) stated that the weight of grain is controlled by the genetic nature of the plant itself.

Character of Yield Component

The harvesting index is the proportion of biological yields shown in the form of biological yields (Gadner *et al.,* 1985). The higher the harvesting index, the better the rice is, because it indicates the high grain weight of the crop which is an indicator of the high productivity of a variety.

Table 4. Average harvesting index and potential results for tested lines

Genotipe	HarvestIndex (%)	Potential Results (ton ha^{-1})
Sikuneng	0,42 a	5,47 ab
IRBB 27	0,49 a	4,67 ab
Inpari 42	0,81 a	5,90 ab
Skn-1	0,77 a	5,77 ab
Skn-4	0,48 a	4,63 ab
Skn-6	0,72 a	5,43 ab
Skn-7	0,69 a	5,70 ab
Skn-8	0,41 a	4,90 ab
Skn-9	0,67 a	5,53 ab
Skn-10	0,53 a	4,47 ab
Skn-11	0,53 a	6,77 ab
Skn-12	0,39 a	6,60 ab
Skn-13	0,43 a	4,67 ab
Skn-14	0,49 a	5,60 ab
Skn-15	0,53 a	4,07 a
Skn-16	0,64 a	5,47 ab
Skn-17	0,60 a	7,13 ab
Skn-18	0,54 a	7,47 b
Skn-19	0,57 a	5,13 ab
Skn-20	0,59 a	4,60 ab
BNJ 0,05	0,57	3,06

Note: The numbers followed by the same letter in the same column are not significantly different at the 0.05 level based on the HSD test

The harvesting index show that F4 lines are not significantly different from the comparative variety (Inpari 42) which has the highest harvesting index of 0,81% and it is not significantly different from Skn-1 of 0,77%. In the yield potential, the F4 linesare significantly different from the comparative variety (Inpari 42) (5,90 ton ha^{-1}).

The last character observed is the average productivity of lines of 5,30 tons ha^{-1} with a range of 3,03 to the 7.10 tons ha^{-1}. The productivity of the comparative variety of Inpari 42 is 5,27 tons ha^{-1} which is below the average of the national description due to environmental influences such as planting media and the water used have a salinity level of 8 milimos. Productivity is the main character that is used as a selection criteria in the direct selection. Lines with high productivity and exceeding comparative varieties are can to be used as candidates for new high yielding varieties. According to the results of this study, there are 5 lines that have higher productivity than the best superior varieties of Inpari 42, although the productivity values of theselines do not reach>9 tons ha-1.

IV. Conclusion

According to the results of the study, it can be concluded that the lines from the hybridizationof Sikuneng x IRBB27 in F3 generation have a very significant effect on the productivity of F4 generation of the 20lines that were tested, there were 2 lines, lines6with heading date and the fastest harvesting time, the highest grain weight per panicle and the highest grain weight andline 18 which has the highest grain weight per hill, the lowest empty grain weight and the highest potential yield.

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