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Analysis of Yield and Quality of Rice Varieties in Chau Phu, An Giang, Vietnam

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Abstract— *Yield and yield components of the varieties differed statistically. 17 high-yield rice varieties were recorded (4.03-8.90 tons ha) higher than the control variety. The total number of grains showed that HATRI 04 had the highest, with values of 122 and 127.3 grains/panicle, respectively. The weight of 1000 grains: of the lines/varieties had an average weight of 24.8-28.2 gr. For short-grain high-yield rice, the softness and fluffiness of the rice depends mainly on the amylose/amylopectin content in the starch component of the rice grain. The determination of amylose content in the endosperm of rice fluctuates from 18-24 %, in which varieties such as HATRI 722, HATRI 10, Nang Hoa, SR 24 has low amylose content. In addition, gel strength is related to the softness of sticky rice. The aroma of level 2 varieties such as HATRI 10, HATRI 722 and HATRI 25, level 1 varieties for AG1, HATRI 22, SR 24, . The high head rice ratio fluctuates from 41.5-53.40%. The HATRI 62 variety has the highest ratio and the lowest is OM8. The HATRI 10 and HATRI 190 varieties have good resistance to brown planthopper and blast disease. Analysis of 4 molecular markers recorded with RM223, RG 28 and Wx and RM42: the results recorded the assessment of the genetic purity of aroma achieved varieties such as: Nang Hoa 9, Dai Thom 8, HATRI 10, OM4900, HATRI 62, HATRI 22. Seven varieties have low amylose content is Nang Hoa 9, OM18, ST24, HATRI 10, OM4900, HATRI 25, HATRI 22.*

Keywords— ***Amylose, gel consistency, Gelatinization temperature-GT yield, Milling quality, Molecular makers.***

I. INTRODUCTION

Rice (Oryza sativa L.) is one of the most widely grown cereals worldwide and provides staple food for more than half of the world's population (Mbanjo et al., 2020). With the rapid development of the economy and improvement of living standards, the demand for high-quality rice is increasing in Vietnam. Yield and quality of grain are influenced by many factors such as differences in varieties, cultivation methods, and climatic conditions (Guerrini, et al., 2020). Most studies have determined that the quality of rice grown in the field depends greatly on many factors (Zhang et al., 2019). With the advancement of modern technology and the improvement of quality of life, people are looking for food with high nutritional quality and appearance in specialty varieties. Improving the quality of major crops through breeding superior rice varieties with higher yield, nutrition and resistance is essential for providing adequate, reliable and sustainable food supply in the world (Godfray et al., 2014). Identifying genes related to grain shape and chalkiness is important for breeding modern rice varieties with excellent rice quality. With the rapid development of the economy and improvement of living standards, rice quality has become a major concern for many rice producers (Godfray et al., 2014). Rice grain quality includes appearance, cooking, eating, nutritional quality and milling, among which appearance quality is the main factor affecting market acceptability (Zheng et al., 2007). Appearance quality is mainly reflected by grain shape and chalkiness. Rice grain shape is often described by grain length (GL), grain width (GW), and is closely related to grain weight (Qiu et al., 2015). Rice grain size and chalkiness are determined by the interaction of genetic and

environmental factors (Zhao et al., 2015). Simple Sequence Repeat (SSR) markers are available and easily analyzed for any rice variety in any region of the genome, and candidate gene markers are being rapidly developed for glutinous rice breeding (N.T.Lang et al. 2008, N.T Lang et al., 2021). Therefore, in this paper, it is necessary to study the comparative yield and yield components, milling response and quality of 17 high-yielding rice varieties grown on Chau Phu land, An Giang.

II. MATERIALS AND METHODS

The materials used included 17 accessions from the Mekong Delta High-Tech Agricultural Research Institute.

The experiment was carried out at the Mekong Delta High-Tech Agricultural Research Institute (HATRI) and at Chau Phu An Giang

+Yield and composition traits Yield: was evaluated (Table 1,2,) the following quantitative traits were considered: panicle length (cm), which is the length of the mature panicle measured from the base of the plant to the panicle tip (taken from 10 randomly selected main panicles for each treatment). Number of panicles per bush, total number of panicles per plant (from 10 randomly selected main panicles for each treatment). 1000-grain weight (g), the weight of 1000 well-developed grains with 14% moisture (from 5 main panicles for each treatment). Number of grains/panicles obtained from the total number of filled grains per panicle (5 main panicles for each treatment). % empty grains, obtained from the number of total empty grains (5 main panicles for each treatment). Yield was determined by threshing, cleaning, drying and weighing the harvested grain mass from each replicate of each treatment. Moisture content in each plot was determined immediately after weighing with a moisture meter. Yield = weight of harvested grain (g)/number of harvested dust x number of dusts that can be obtained x MF (of harvested grain).

Quality analysis: according to (Lang et al., 2016).

+ **Amylose content** (AC): 40 grams of grain were dehulled and milled. The grain was ground through a 100 mesh sieve. Weigh 25 mg of rice flour and 2 ml of 1.0 N NaOH in a conical flask, leave overnight or place in a water bath at 500C. If in aqueous solution, leave in a water bath for 10 minutes and cool. The cooled solution is added with 5ml of butanl: pertroleum (1:3) to remove lipid. Then add 1.5ml of 0.4N KI and mix well. The AC solution is tested according to the following standards (5%, 10%, 15%, 20%, 25% and 30%) with standard amylose.

+ Gel consistency (GC): Weigh 100mg of rice flour in a test tube measuring 10mm x 110mm and add 0.2ml of 95% alcohol and containing 0.025% thymol blue. Add 0.2N KOH to the test tube. The test tube is closed and boiled in a water bath for 8 minutes. Remove from room temperature and leave for 5 minutes, put the test tubes on ice for 20 minutes and let them lie along the surface of the gel. The length of the gel is measured with a ruler. Evaluate the length of the gel.

+GT was determined using the alkali digestion test (Little et al.1958). A duplicate set of six whole-milled kernels without cracks was selected and placed in a plastic box (5×5×2.5 cm). Ten mL of 1.7% (0.3035 M) KOH solution was added. The samples were arranged to provide enough space between kernels to allow for spreading. The boxes were covered and incubated for 23 h in a 30°C oven. The starchy endosperm was rated visually based on a seven-point numerical spreading scale as a standard evaluation system for rice (IRRI .1913). According to the ASV score, GT of rice grains can be classified into four groups: high (1–2), high-intermediate (3), intermediate (4–5) and low (6–7) (Juliano et al.,1985)

+ Assess protein content according to the Yoshida method 1976. **Measure total nitrogen according to the Kjeldahl method**: Procedure:Organic matter is mineralized with concentrated H2SO4 at high temperature. Organic molecules will be decomposed into CO2, H2O and NH3. NH3 reacts with H2SO4 to form salt (NH4)2SO4. The salt (NH4)2SO4 is decomposed with NaOH solution to release NH3 gas again. The released NH3 is allowed to react with H3BO3 to form salt (NH4)2B4O7. This salt is titrated with H2SO4 or 0.05N HCl. Determine the total amount of nitrogen based on the amount of acid used for titration.

+DNA extraction:

DNA extraction by Miniscale method (Nguyen Thi Lang, 2002). Fresh, young rice leaf samples (2 cm) were ground in a mortar and pestle after adding 400 µl of buffer solution (50 mM Tris-HCl pH 8.0, 25mM EDTA, 300mM NaCl and 1% SDS). Grind the sample until the buffer solution turns green. Add 400 µl of buffer solution and mix well. Transfer 400 µl of lysate to the test tube containing the original leaf sample. The lysate was activated by adding 400 µl of chloroform. The supernatant was transferred to a new test tube (1.5 ml) and the DNA was precipitated using ethanol. The DNA sample was dried and suspended in 50 µl of TE buffer (10mM Tris-HCl pH 8.0, 1mM EDTA pH 8.0). The DNA sample was stored at -20oC.

+PCR reaction:

PCR amplification was performed in 10mM Tris-HCl (pH 8), 50mM KCl, 1.5mM MgCl2, one unit of TAKARA Taq, 4 nmol dNTP, 10 pmol primer, using microsatellite (SSR) marker and 50ng genomic DNA. PCR cycle: strand separation at 950C for 5 min, followed by 35 cycles of 940C for 60 sec, 550C for 30 sec and 720C for 60 sec. The final

strand extension was at 720C for 5 min. 13 µl l of buffer solution (98% formamide, 10mM EDTA, 0.025% bromophenol blue, 0.025% xylene cyanol) was added after PCR. Polymorphisms in the PCR products were detected by ethidium bromide staining after electrophoresis on 3% agarose gel.

+**Data analysis**: Analysis of variance. The agronomic morphological data collected were initially analyzed through analysis of variance to verify genetic variation in the measured traits. Some traits with insignificant genetic variation, based on Ftest, were not considered for further analysis.

III. RESULTS AND DISCUSSION

Analysis of yield and yield components of the lines/varieties recorded statistically significant differences.Through analysis, the lines/varieties were recorded to have very good yields during cultivation. Plant height: average of lines/varieties 94-127 cm; The tallest variety is ST 24 (127 cm) so this variety is prone to lodging.

The growth period of the varieties is mostly lower than that of the control variety, most of the varieties have a growth period in the crop season from 95-120 days, there are two varieties with the longest growth period: Nang Hoa 9 and ST24. All varieties show some resistance to brown planthoppers. Except for AG 1, OM8, ST 24, Nang Hoa 9, OM 18, Jasmi85 and OM5451, which are susceptible to level 7. Some blast resistant varieties such as OM4900, HATRI 10 and HATRI 190 are very resistant, the remaining varieties are resistant to levels 3 and 5. Leaf blight is recorded as resistant to level 3 and slightly susceptible to level 5.

Table 1. Growth characteristics of the first-generation rice varieties in the Winter-Spring 2023-2024.

No.	Lines/ varieties	days	Hight plant	Brown plant hopper (score)	Bacteria leaf blight Score)	Blast (score)
1	AG1	95.27 f	94.00 d	7	5	7
2	Nàng Hoa 9	115.73 b	115.00 b	7	5	5
3	Jasmine 85Checked)	108.53 c	111.65 c	7	5	5
4	OM18	107.87 c	99.98d	7	5	3
5	DaiThơm 8	107.33 c	110.31 c	7	3	5
6	ST24	120.07 a	127.00 a	7	7	5
7	HATRI 10	98.00 e	110.85 c	1	3	1
8	OM4900	100.27 d	109.17 c	1	3	1
9	OM5451 (Checked)	95.73 f	110.5c	7	5	5
10	Lộc Trời 28	98.00 e	124.4a	5	5	5
11	OM8	100.07d	110.00 c	7	5	5
12	HATRI 190	101.80 d	118.45b	3	3	1
13	HATRI 475	95.00f	107.14c	3	3	5
14	HATRI 722	98.00e	118.24b	5	3	5
15	HATRI 62	96.00f	105.35c	1	5	3
16	HATRI 25	100.00d	118.55b	3	3	3
17	HATRI 22	99.00e	114.66c	3	3	3
	LSD (%)	2.5	1			
	CV (%)	4.25	1.02			

Notes: Characters followed by the same letter in the same column are not significantly different at the 5% level by Duncan test

Analysis of yield and yield components of lines/varieties recorded statistically significant differences. High yielding varieties such as HATRI 10, HATRI 190, HATRI 62 and HATRI 25. Filling of grains/ panicle : HATRI 25 variety has the highest number of filling of grains/ panicle followed by HATRI 62.

The weight of 1000 grains in the Winter-Spring crop is relatively high, from 24.1-28.2 grams, most of them have an average weight of (25-26 grams). Some varieties have large grains such as Nang Hoa 9, OM4900, HATR 62, HATRI 25 (27-28.2 grams). Long and slender like ST24, OM8.

The survey results show that the following traits are not statistically significant: Filling of grains/ panicle, weight of 1000 grains. This proves that the population has high genetic purity values on the variety. In particular, the yield and grain filling traits of the individuals are statistically significant. The results show that cultivation conditions, care conditions, and fertilizers for the full development of the variety are very important.

Table 2. Yield and yield components of the Winter-Spring 2023-2024

No	**Line**/ varieties	**Yield (T/ha)**	**Filling/ panicle**	**% unfilling**	weight of 1000 grains	**Spikelet /m²**
1	AG1	5.66d	113.8f	19.1g	24.0e	304.7g
2	Nàng Hoa 9	4.30e	107.9f	32.8a	28.2a	363.2e
3	Jasmine 85 (Đối chứng)	5.30d	122.5e	29.8b	26.2c	338.5f
4	OM18	4.10e	110.8f	21.8f	27.7b	357.9e
5	Đài Thơm 8	4.03e	113.3f	26.0e	26.5c	401.9d
6	ST24	3.93f	98.9h	28.0c	27.9b	298.8h
7	HATRI 10	8.90a	73.3i	19.4g	27.5b	460.8b
8	OM4900	7.76b	108.2g	27.0d	25.8d	417.9d
9	OM5451 (Đối Chứng)	6.66c	122.5e	18.8g	25.6d	374.6e
10	Lộc Trời 28	6.63b	104.5g	26.6e	26.2c	357.5e
11	OM8	5.60d	112.3f	23.0f	24.1e	360.4
12	HATRI 190	8.46a	122.3e	14.4	26.4c	490.7a
13	HATRI 475	7.50b	130.5c	18.0g	25.5d	438.9d
14	HATRI 722	8.16a	127.8d	19.1g	26.5d	485.7a
15	HATRI 62	8.40a	136.9c	10.6h	26.5d	417.4d
16	HATRI 25	8.06a	195.2a	12.1h	27.6b	460.3b
17	HATRI 22	7.26b	141.6b	18.1g	26.7d	454.4c
	LSD 5%	0.94	12.16	8.59	2.8	7.9
	CV%	6.8	15.6	26.5	1.2	13.7

Notes: Characters followed by the same letter in the same column are not significantly different at the 5% level by Duncan test

• Analysis of some quality indicators of high-yield rice

Rice quality assessment:

In addition to the appearance quality, the Ngu glutinous rice lines also have rice quality. In 17 high-yield rice varieties, through analysis of amylose content, it was noted that the amylose content of most lines was low. Amylose content (AC) is a major factor determining the quality of rice when cooked and eaten. Amylose molecules have a straight chain structure containing about 500 dextrose units. The amylose-amylopectin ratio is the main factor to classify rice into waxy (glutinous) and non-glutinous rice. The lowest

amylose content was recorded in HATRI 722, HATR 10, HATRI 190, OM4900, Nang Hoa 9, ST 24…

Gel consistency (GC) is a good measure of the stickiness of milled rice and determines the softness after cooking. a simple and sensitive test to quickly determine the quality of rice when eating as a supplement to AC. It is measured by the length of cold rice pasta in a test tube in a horizontal direction and classified into: varieties of the medium group GC 41-68mm and soft GC 68-100mm (such as ST24, Jasmine 85, HATRI 722) . Gel consistency directly affects the texture of rice, so cooked rice has a gel strength that hardens faster than soft Gel consistency . The longer the Gel consistency , the softer the rice, and the lower the amylose content, which is also consistent with the rule of gelatinization temperature. The lines recorded good Gel consistency soft rice (100mm). Gelatinization temperature (GT): determines the water absorption and cooking time. GT is the temperature at which starch granules absorb water and begin to swell irreversibly. Most lines have a gelatinization resistance of level 3-5.

Evaluation of milling quality:

Milling analysis: The process of removing the germ and outer bran layer from brown rice is called "whitening" or "milling". Polishing is the process of removing the "subaleurone" layer after whitening the rice grain. Friction and abrasion are the two main processes used to remove the bran layers from brown rice: friction breaks the kernel and hull from the bran, while abrasion separates the raw rice surface from the bran. The degree of milling can be varied to suit consumer taste or to comply with general regulations, it is also estimated on the basis of the color of the milled grain and the percentage of broken rice. Milled rice has whole and broken grains of different sizes. Rice bran and germ account for 8-10% of the total grain mass. Evaluation of head rice percentage shows that varieties with good head rice percentage above 50% such as HATRI 10, HATRI 62, HATRI 190, HATRI 722. These varieties will increase the high head rice recovery(table 3). Chalkiness in rice refers to the opaque areas in the grain.C halkiness, a major determinant of rice quality, reduces the appearance of rice and affects milling and cooking qualities, thereby reducing the commercial value of rice(Zhao et al 2022). Recent studies have also identified WBR7 and LCG1 as regulators of chalkiness in rice through their effects on the accumulation of grain reserve components(Tu et la .2025). Despite these advances, the underlying genetic and molecular mechanisms causing chalkiness in rice remain unclear. E3 ligase is a key component of the ubiquitin-proteasome system, which determines substrate specificity in the cascade of reactions by covalently linking ubiquitin to target proteins (Shi et al .2024).Most of the 17 varieties give grain not chalkiness table 3 . Evaluation of nutritional quality:Protein analysis: The amount and type of protein are important factors in rice nutrition. Different factors affect the protein content of rice: climate and environment, and the amount of fertilizer applied, maturity time, degree of milling, and the characteristics of the variety. The protein content of rice varieties ranges from 7.5 to 8.9%. The variety with the highest protein content (HATRI 10, HATRI 22).The aroma of the high-aromatic variety is the variety with 3 high-aromatic varieties HATRI 10, HATRI 722 and HATRI 25.(Table 3).

Table 3. Milling quality and rice quality of 17 lines / varieties rice.

No.	Line/ Varieties	Brown rice(%)	White rice (%)	head rice(%)	Length (cm)	Wide (cm)	Amylose(%)	gel consistency (GC) (mm)	Gelatinization temperature	chalkiness	Protein(%)	Aroma
1	AG1	81.7d	74.0b	45.0d	7.14b	3.2a	21.2e	78a	5	0	7.5e	1
2	NangHoa 9	80.8d	74.0b	48.0c	8.12a	3.0a	19.9e	79a	5	0	8.6a	1
3	Jasmine 85 (Checked)	84.3b	71.0c	47.3d	7.14b	2.9b	19.0cd	76a	5	0	8.0b	1
4	OM18	82.3b	72.0c	40.1d	7.23b	3.0a	19.5d	77a	5	0	8.4b	1
5	DaiThom 8	83.4b	75.0a	46.3e	7.10b	3.0a	20.1f	78a	5	0	8.3b	1
6	ST24	80.6d	73.0c	42.0f	8.25a	2.9b	17.0c	77a	5	0	8.4b	1
7	HATRI 10	80.6d	70.6e	51.2b	7.10b	3.1a	19.5.	77a	5	0	8.9a	2
8	OM4900	80.9d	71.2d	53.6a	7.08c	3.0a	18.7c	77a	5	0	7.6e	1
9	OM5451	80.6d	74.0b	49.4b	7.12b	3.0a	24.0ab	64b	0	0	8.7a	0

	(Checked)											
10	Lộc Trời 28	80.2d	72.2d	46.8b	7.10b	2.8c	22.0b	64b	3	0	8.6a	0
11	OM8	80.3d	72.0d	41.5f	7.05c	2.6d	22.5a	62b	3	0	8.5a	0
12	HATRI 190	82.0c	76.8a	50.7a	7.25b	3.1a	21.5	68b	3	0	8.7a	1
13	HATRI 475	82.7c	78.5a	51.2a	7.02c	2.9b	22.4	68b	3	1	8.4b	1
14	HATRI 722	82.4c	76.4a	51.4a	7.15b	3.2a	180.14	78a	5	1	8.5b	2
15	HATRI 62	82.6c	76.8a	53.4a	7.05c	3.1a	22.4	64c	3	1	8.7a	0
16	HATRI 25	86.7a	74.5b	50.5a	7.69b	3.2a	18.4	70a	5	0	8.6a	2
17	HATRI 22	84.7b	74.5b	52.7a	7.56b	3.2a	19.45	77a	5	0	8.9a	1
	CV (%)	***1.11***	***1.16***	***1.50***	***0.21***	***0.60***	***4.28***	***2.73***	-	-	***1.09***	-
	F	**	**	**	**	**	**	**	-	-	**	-

Notes: Characters followed by the same letter in the same column are not significantly different at the 5% level by Duncan test

PCR products with SSR molecular markers

In this study, 4 SSR molecular markers were used to amplify DNA for 17 experimental rice lines/varieties. The results showed that all SSR products showed polymorphism on 17 rice varieties (P=100%). The presentation of the results of the products of the experimental SSR primers only presented some products of typical primers while the products of the remaining primers are presented in the appendix.

The study applied microsatellite to design the aroma on the chromosome 8 and concluded that RM223 was quite tightly linked to fgr, with a genetic distance value of 1.6 cm (N.T.Lang et al.,2002) . From the results obtained, it was shown that the number of samples creating different bands with two alleles was often clear at the position of the molecular marker size. The difference in the number and position of the bands can indicate the difference in DNA sequence between varieties. Based on the band image, both alleles are recorded, allele A (220bp) and allele B (210bp).

Observe the image bands with a size of 210bp compared to the standard scale corresponding to allele B carrying the aromatic gene. For the image bands with a size of 220bp compared to the standard scale corresponding to allele A not carrying the aromatic gene. PCR product for primer pair RM223 on chromosome 8: electrophoresis results show that DNA amplification for the product reaches 100% and 2 alleles with amplification sizes from 220 bp to 210 bp. The aromatic varieties Nang Hoa 9, Dai Thom 8, HATRI 10, OM4900, HATRI 22

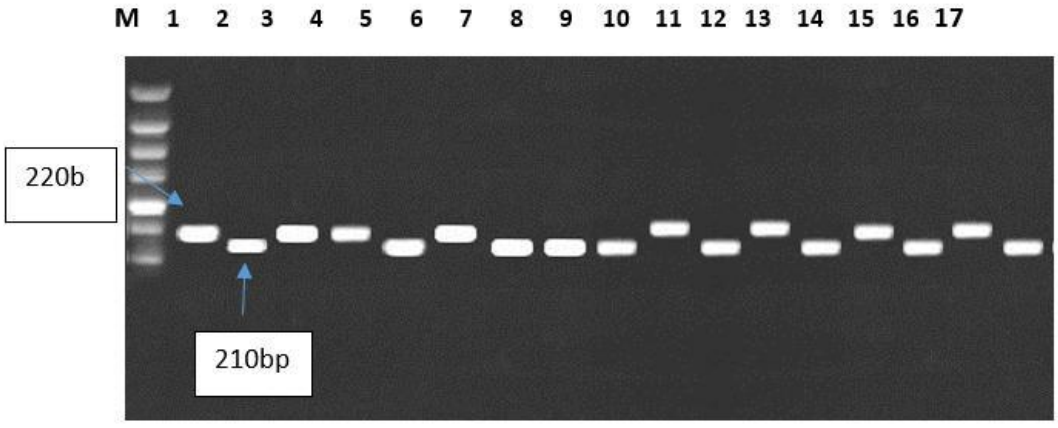

Fig.1. The segregation prediction of the aroma of determined by PCR analysis . PCR products of the detected by DNA amplification with primers for RM223 on 17 rice lines/varieties

Notes:

1: AG1; 2: Nang Hoa 9; 3: Jasmine 85; 4: OM18, 5: Dai Thom 8; 6: ST24; 7: HATRI 10; 8: OM4900; 9: OM5451; 10: Loc Troi 28; 11: OM8; 12: HATRI 190; 13: HATRI 475; 14: HATRI722; 15: HATRI 62; 16: HATRI 25; 17: HATRI 22.

For the RG28 marker, Aromatic genotype evaluation with the RG28FL-RB marker on 17 lines/varieties. The results recorded aromatic band with molecular size of 1800bp, non-aromatic band with molecular size of 1600bp. The aromatic homozygous or non-aromatic homozygous individuals correspond to the presence of 1 band on the electrophoretic spectrum, the heterozygous individuals show 2 bands on the electrophoretic spectrum as shown in Figure 2.

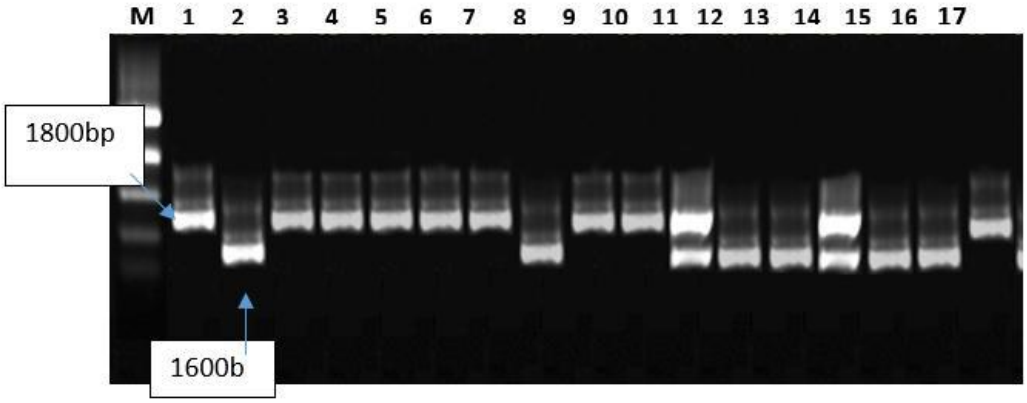

Fig.2. The segregation prediction of the aroma of determined by PCR analysis . PCR products of the detected by DNA amplification with primers for RG28F-R .

Notes : 1: AG1; 2: Nàng Hoa 9; 3: Jasmine 85; 4: OM18, 5: Đài Thơm 8; 6: ST24; 7: HATRI 10; 8: OM4900; 9: OM5451; 10: Lộc Trời 28; 11: OM8; 12: HATRI 190; 13: HATRI 475; 14: HATRI 722; 15: HATRI 62; 16: HATRI 25; 17: HATRI 22.

Analysis of amylose content : The banding patterns on the gel are the maker genotypes from wich we can predict the genotypes of markers linked locus and the phenotype of the individual plants. The Band pattern identifical to amylose contents were selected with maker Wx , RM42 . For marker Wx :The results recorded low amylose band with molecular size of 210bp, hight amylose band with molecular size of 220 bp. Nang Hoa, Jasmine 85, OM4900, HATRI 475, HATRI 62, HATRI 25 give for low amylose .

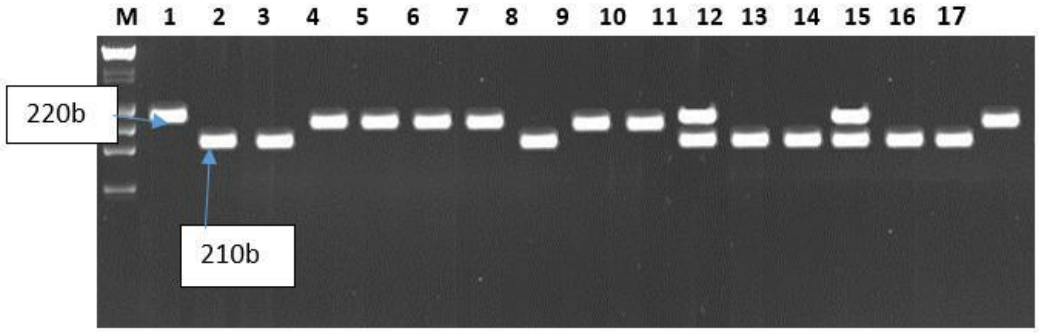

Fig.3. The segregation prediction of the amylose of determined by PCR analysis . PCR products of the detected by DNA amplification with primers for Wx.

Notes : 1: AG1; 2: Nang Hoa 9; 3: Jasmine 85; 4: OM18, 5: DaiThơm 8; 6: ST24; 7: HATRI 10; 8: OM4900; 9: OM5451; 10: Lộc Trời 28; 11: OM8; 12: HATRI 190; 13: HATRI 475; 14: HATRI 722; 15: HATRI 62; 16: HATRI 25; 17: HATRI 22.

For marker RM 42 .The results recorded low amylose band with molecular size of 220bp, hight amylose band with molecular size of 250 bp.

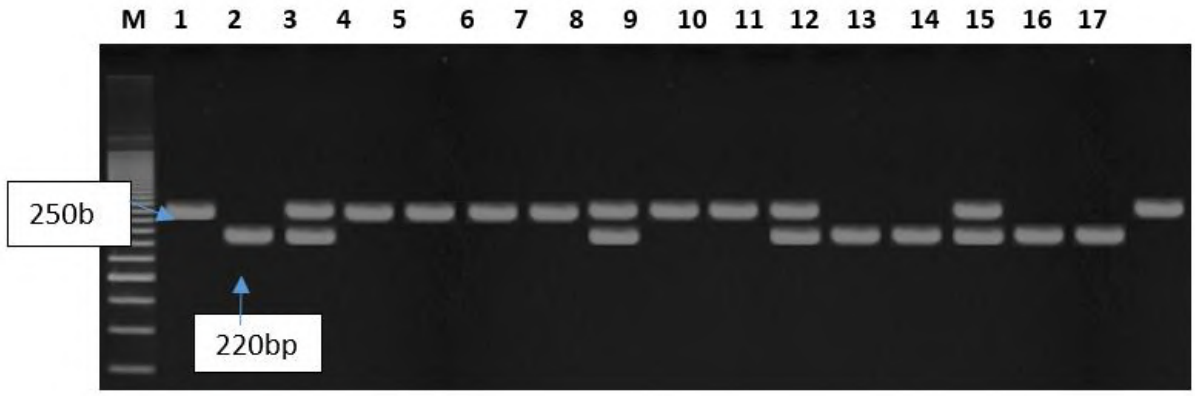

Fig.4. The segregation prediction of the amylose of determined by PCR analysis . PCR products of the detected by DNA amplification with primers forRM 42 .

Notes : 1: AG1; 2: Nàng Hoa 9; 3: Jasmine 85; 4: OM18, 5: Đài Thơm 8; 6: ST24; 7: HATRI 10; 8: OM4900; 9: OM5451; 10: Lộc Trời 28; 11: OM8; 12: HATRI 190; 13: HATRI 475; 14: HATRI 722; 15: HATRI 62; 16: HATRI 25; 17: HATRI 22.

In summary, the analysis of 4 indicators recorded the assessment of the genetic purity of aroma in varieties such as: Nang Hoa 9, Dai Thom 8, HATRI 10, OM4900, HATRI 62, HATRI 22. Seven varieties with low amylose content are Nang Hoa 9, Jasmine 85 , OM 4900, HATRI 190, HATRI 475, HATRI 25.

IV. DISCUSSION

Analysis of variance. For each of the 14 quantitative traits, the mean, range (maximum and minimum), standard deviation, coefficient of variation (CV), mean standard error, and F value were calculated (Table 1and 2). Results show that most of the quantitative traits are highly variable. With respect to maturity, the earliest maturing genotype matured in 95 days while the maximum number of days to maturity was 120 days. Maximum values were obtained in yield (8.9 tons/ha) on the variety HATRI 10, and number of filled grains (195.2 grain/ panicle) on HATRI 25 . Both showed high fertility which indicate that these are good materials that could potentially be used by plant breeders for varietal development in the future.

Highly significant differences among the various traits in the 17 improves varieties were obtained for grain length, grain width, number of unfilled grains, 1000-grain weight. Differences were not significant for panicles per plant.

Paddy rice is obtained through the process of growing rice, which undergoes sequential mechanical processes in rice hullers, hullers, millers, polishers, graders and packaging before being stored in warehouses for distribution and marketing. Typically, when processing 100 kg of paddy, about 20% is separated into husks, leaving the remaining 80% as brown rice. Further milling of brown rice produces about 10% bran and polish and 70% milled rice. This milled rice consists of a mixture of head rice and broken grains, where high quality milled rice allows a maximum of 4% broken grains in the head rice. Therefore, after milling, about 66% of the original rough rice remains, which is considered suitable for consumption. The size and chalkiness of the rice grain are determined by the interaction of genetic and environmental factors (Zhao et al., 2015). Most of the 17 varieties give grain not chalkiness table 3.

Eating and cooking quality and protein content in the grain (are the main factors that determine the quality of rice grains. Quality can be further analyzed into amylose content (AC), Gel consistency (GC) and gelatinization temperature (GT). AC can be divided into five groups, namely waxy (0–2%), very low (3–9%), low (10–19%), medium (20–25%) and high (>25%). Rice grains with AC of 16–20% are the most common in the market and meet the demand for non-glutinous rice (Lang et al., 2002). GT is usually measured on glutinous rice varieties, which record gel strength (100mm) and gelatinization resistance of level 9. However, amylose content clearly shows that the variety has a lower amylose content than other varieties (Table 3).

Milling quality and appearance are the most important indicators to evaluate rice quality as in this article, the glutinous rice variety has the highest head rice ratio is the HATRI 62 variety to 53.4% (Table 3). Milling form is an essential parameter of the final quality of rice, wheat and other cereal products, because the milling process can create the largest and most profound changes in the final products (Cappelli et al., 2020).Aroma is ranked among the main indicators. And this is the typical variety HATRI 10, HATRI 722 has long grains, grade 2 aroma.

V. CONCLUSION

Rice variety, growth period (95-120 days, strong plant, medium tillering, high yield (4.30-8.9 tons/ha). Maximum values were obtained in yield (8.9 tons/ha) on the variety HATRI 10, and number of filled grains (195.2 grain/ panicle) on HATRI 25 . Almost 17 lines with amylose contents (18-24%), delicious rice, fragrant (grade 2). High whole grain rate. The variety is resistant to brown planthopper and blast disease. In general, the rice variety's shape is completely different from the rice varieties in comparison with checked . When analyzing 4 molecular markers recorded with RM223, RG 28 , Wx , RM 42 makers , the analysis of 4 markers recorded the assessment of genetic purity of aroma in varieties such as: Nang Hoa 9, Dai Thom 8, HATRI 10, OM4900, HATRI 62, HATRI 22 when PCR products of the detected by DNA amplification with primers for RG 28 and RM 223 . Seven varieties with low amylose content are Nang Hoa 9, OM18, ST24, HATRI 10, OM4900, HATRI 25, HATRI 22 when PCR products of the detected by DNA amplification with primers for RM 42 and Wx . These varieties continue to be widely propagated in the province.

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