Kaunia, Vol.XVI, Num.2, October 2020, pp. 25~28
ISSN 1829-5266 (paper), ISSN 2301-8550 (online)
Available online at http://ejournal.uin-suka.ac.id/saintek/kaunia

A Review on the Physical, Milling Quality and Physicochemical Characteristic of Hipa 6 Jete and Hipa 7

Shinta Dewi Ardhiyanti[1], Siti Dewi Indrasari[2,*]

[1]Indonesian Center for Rice Research, Subang, Indonesia.
[2]Assessment Institutes for Agricultural Technology of Yogyakarta, Indonesia
Correspondency email: dewindrasari@yahoo.com*

Abstract

Up to now the Agriculture Ministry of Republic of Indonesia has released 19 varieties of hybrid rice. Hipa 6 Jete and Hipa 7 varieties are two of them. Hybrid rice is a group of rice plants formed from first generation individuals (F1) derivative of a combination of crossing between certain elders. Hybrid rice superior varieties has a higher yield potential than inbred superior varieties that dominate rice cultivation areas. Rice quality is one of the factors that determine the level of consumer acceptance of a variety. The rice quality is influenced by several factors such as physical quality, cooking quality and taste quality. This paper aims to review the physical quality, milling quality and physical properties of Hipa 6 Jete and Hipa 7. The length of Hipa 6 Jete and Hipa 7 are long and the shape are slender. Based on the head rice and broken rice percentage both Hipa 6 Jete and Hipa 7 are met the medium 2 and 3 quality class (SNI 6128:2015). Based on the physicochemical characteristics both Hipa 6 Jete and Hipa 7 are classified as intermediate amylose content with soft gel consistency and with high intermediate gelatinization temperature. In cooling condition the cooked rice of Hipa 6 Jete and Hipa 7 are soft texture.

***Keywords**: physical quality, milling quality, physicochemical characteristics, Hipa 6 Jete variety, Hipa 7 variety*

Introduction

As the staple food for Indonesian people, the need for rice is increasing from year to year. The yield potential or production is one of the main criteria of farmers in selecting varieties and planting rice. There are more than 300 rice varieties grown in Indonesia of national and local varieties, with inbred and hybrid types. Up to now the Ministry of Agriculture, Republic of Indonesia has released 19 varieties of hybrid rice (Wahab, et al., 2017). Hipa 6 Jete and Hipa 7 varieties are two of them. Hybrid rice is a group of rice plants formed from first generation individuals (F1) derivative of a combination of crossing between certain elders. Hybrid rice superior varieties has a higher yield potential than inbred superior varieties that dominate rice cultivation areas (Satoto et.al., 2008). When paddy and rice products have reached the market, the quality of rice becomes the main determinant of rice selling. The demand for rice quality is increasing with the increasing people's income. Consumers prefer rice with a good taste, while milling manufacturers prefer a high yield of milled rice. This make the quality of rice a very important thing to note (Mardiah, et.al., 2012) The rice quality is influenced by several factors such as physical quality, cooking quality and taste quality.

The physical quality of rice consists of the length and shape of rice, translucency, milling degree and whiteness degree of rice. In general consumers in Central Java, Yogyakarta and East Java prefer white rice (Mardiah et al., 2016). Factors affecting white color in rice are milling degree and storage conditions (Wang et al., 2002). Milling quality is one of the important factors that determine the quality of rice. Other factors that affect the quality of milled rice are genetic, environmental, harvesting and post-harvest handling (Haryadi, 2006)

Milling quality consists of the yield of milled rice, percentage of head rice, percentage of broken rice and groats. The yield of milled rice will determine the weight of the rice produced and ultimately determine the economic value of the rice. The percentage of head rice has a great variety depending on various factors including varieties, seed types, chalky grains, cultivation, environmental factors, postharvest handling from harvesting into milling. In SNI Rice 6128: 2015, some of the required quality components include milling degrees, moisture content, head grains, broken grains, groats, red grains, yellow/broken grains, chalky grains, foreign matters and paddy grains (BSN, 2015). This paper reviewed the post-harvest analysis of rice of Hipa 6 Jete and Hipa 7 varieties covering the physical and milling

quality, nutritional quality and physicochemical properties.

Physical and Milling Quality of Milled Rice

Generally, the physical quality parameters of rice consist of length, shape, whiteness degree, translucency and milling degree. The length of rice is the length of rice grain measured between the two ends of whole grains using a micrometer. The rice shape is the ratio of length to the width of rice that varies on each variety. Rice derived from Japonica paddy is generally short and round, while the original Indica paddy is long and slender

The International Rice Research Institute (IRRI) classifies the length of rice as follows: very long (> 7.5 mm), long (6.61-7.5 mm), medium (5.51-6.60 mm), and short (<5.50 mm) (Cruz, 2002). Table 1 shows that Hipa 6 Jete and Hipa 7 include medium rice (5.51-6.65 mm). The length of Hipa (5 Ceva and Hipa 8 hybrid rice were 7.4 mm and 7.6 mm (Indrasari et al., 2017a). Hipa 8 is an aromatic hybrid rice. Based on IRRI criteria were categorised as length rice. The length of Ciherang, Inpari 1, and Inpari 6 a new improved varieties of paddy irrigation were 6.9 mm, 7.2 mm and 7.5 mm respectively (Indrasari et al, 2017a). Those were categorised as length rice based on IRRI criteria.

Based on Table 1 it is known that the ratio of length and width of Hipa 6 Jete and Hipa 7 were 3.13 and 3.63 respectively. The ratio of length and width of the rice determines the classification of the grain shape. The International Rice Research Institute classifies rice into 4 types: slender (> 3.0), medium (2.1-3.0), bold (1.1-2.0), and round (≤ 1) (Cruz, 2002). Based on the classification, the shape of both Hipa 6 Jete and Hipa 7 were slender. The rice shape of both Hipa 5 Ceva and Hipa 8 are medium (2.2 and 2.1) (Indrasari et al., 2017a). The rice shape of Ciherang, Inpari 1 and Inpari 6 a new improved varieties of paddy irrigation were medium and slender (3.0; 3.4 and 3.2) respectively determined as IRRI criteria (Indrasari et al., 2017a)

Translucency is the level of rice transparant that is affected by the chalky level (appearance) and whole rice. Translucency is determined using the Satake Milling Meter. The higher the percentage rate of translucency the clearer the appearance of the rice. In general consumers prefer white and transparent milled rice. The translucency of Hipa 7 (1.89 %) is higher than that of Hipa 6 Jete (1.79) (Table 1). The translucency of Hipa 5 Ceva and Hipa 7 is the same that is 2,1 % (Indrasari et. al. 2017a). While the translucency of Ciherang, Inpari 1 and Inpari 6 were 2.3 %, 2.9%, and 3.1% respectively (Indrasari et al, 2017a). The rice translucency is determined by the genetic traits and the milling method. The friction method is friction between rice grains that will produce rice with a higher value of translucency than that of abrasive method that is friction with grinding stone.

Milled rice, head rice and broken rice are the parameters of milled rice quality. Milled rice is rice that has been partially removed its aleurone layer. Rice head is a grain of rice with a larger size or equal to 0.8 parts of whole grains of rice. Broken rice is a grain of rice with size greater than 0.2 and smaller than 0.8 parts of the whole grains of rice. Whole rice is a grain of rice that is not broken at all (BSN, 2015) Specification of SNI 6128: 2015 milled rice quality requirements is shown in Table 2.

The percentage of milled rice of Hipa 6 Jete (69.8%) and Hipa 7 (70.1%) (Table 1) was higher than that of Hipa 5 Ceva (66.2%) and Hipa 8 (68%) but lower than that of Ciherang (70.5%), Inpari 1 (72%) and Inpari 6 (71.6% (Indrasari et al., 2017a). The percentage of head rice of Hipa 6 Jete (74.2%) which met the Medium 2 quality class (minimum 73%) and Hipa 7 (69%) met the Medium 3 quality class (minimum 60%) (Table 1 and Table 2).

Table 1. Physical and milling quality of Hipa 6 Jete and Hipa 7 rice.

Variety	Length (mm)	L/W Ratio	Translucency (%)	Milled Rice (%)	Head Rice (%)	Broken Rice (%)
Hipa 7	7.33	3.63	1.89	70.1	69.0	24.7
Hipa 6 Jete	6.67	3.13	1.79	69.8	74.2	24.8

Source: Wibowo et al., 2010

The percentage of milled rice of Hipa 6 Jete (69.8%) and Hipa 7 (70.1%) (Table 1) was higher than that of Hipa 5 Ceva (66.2%) and Hipa 8 (68%) but lower than that of Ciherang (70.5%), Inpari 1 (72%) and Inpari 6 (71.6% (Indrasari et al., 2017a). The percentage of head rice of Hipa 6 Jete (74.2%) meet the Medium 2 quality class (minimum 73%) and Hipa 7 (69%) meet the Medium 3 quality class (minimum 60%) (Table 1 and Table 2).

The percentage of head rice of Hipa 6 Jete (74.2%) is greater than the percentage of head rice of Hipa 5 Ceva (64.5%) and and almost the same as Hipa 8 (74.3%). The percentage of Hipa 7 head rice (69%) is greater than the percentage of Hipa 5 Ceva head rice (64.5%) and less than Hipa 8 (74.3%). Meanwhile, the percentage of head rice Ciherang, Inpari 1 and Inpari 6 were 61.3%, 97.6% and 97.1% respectively (Indrasari et. al. 2017a).

Table 2. Specification of SNI 6128: 2015 milled rice quality requirements.

No	Quality Component	Satuan	Quality Class			
			Premium	Medium		
				1	2	3
1	Milling degree (minimum)	%	100	95	90	80
2	Moisture content (maximum)	%	14	14	14	15
3	Head rice (minimum)	%	95	78	73	60
4	Broken rice (maximum)	%	5	20	25	35
5	Groat (maximum)	%	0	2	2	5
6	Red grain (maximum)	%	0	2	3	3
7	Yellow + damaged grain (max-imum)	%	0	2	3	5
8	Chalky grain (maximum)	%	0	2	3	5
9	Foreign matter (maximum)	%	0	0.02	0.05	0.2
10	Paddy grain (maximum)	grain/100 g	0	1	2	3

Source: BSN, 2015

The percentage of broken rice of Hipa 6 Jete and Hipa 7 was 24.8% and 24.7% met the Medium 2 quality class (maximum 25%) (Table 1 and Table 2). The percentage of broken rice both varieties are almost equal to Hipa 8 (24.9%) and much lower than Hipa 5 Ceva (34.2%). Meanwhile, the percentage of broken rice Ciherang, Inpari 1 and Inpari 6 were 38.4%, 2.6% and 2.7% (Indrasari et al., 2017a) respectively. Conversely with the head rice, high percentage of broken rice cause declining of consumer acceptance. One of the factors that determine the high broken rice in milled rice is moisture content. When grain was milling with low moisture content will cause high broken grain. Conversely, if it is too wet it will produce high grain groats.

Nutritional Quality and Physicochemical Characteristic

The range of protein content of Hipa 7 and Hipa 6 Jete varieties are 7.9-8.2% (Table 3). While the protein content of Inpari 24 Gabusan and Aek Sibundong are 8.3% and 9.0 % consecutively (Indrasari et al., 2017b). The average content of protein milled rice in Indonesia is 7,82% (Persatuan Ahli Gizi Indonesia, 2009).

Table 3. Protein content and Physicochemical characteristic of Hipa 6 Jete and Hipa 7.

Variety	Protein (%)	Amylose (%)	Gel Consistency (mm)	Alkali Score
Hipa 7	7.9	22.7	79.0	3
Hipa 6 Jete	8.2	22.2	78.0	3

Source: Wibowo et al., 2010

The amylose content of starches in milled rice usually ranges from 15 to 35%. Based on amylose content, milled rice is classified as: waxy (0-2% amylose), very low (3-9% amylose), low (10-19%), intermediate (20-25% amylose), and high (>25% amylose) (Cruz, 2002). The amylose content of Hipa 6 Jete (22.2%) and Hipa 7 (22.7 %) (Table 3) and Hipa 5 Ceva (22.9%) were classified as intermediate or medium amylose (Indrasari et al., 2017a). While the amylose content of Hipa 8 (19.4%) was classified as very low amylose content (Indrasari et al., 2017a). The amylose content of Ciherang (22.65%) was the same with Inpari 1(22.65%) were classified as intermediate amylose content, while the amylose content of Inpari 6 (17.26%) was classified as very low amylose content (Indrasari et al., 2017a).

Gel consistency measures the tendency of the cooked rice to harden on cooling. Gel consistency is determined by heating a small quantity of rice in a dilute alkali. This test differentiates the consistency of cold 5.0% milled rice paste. Within the same amylose group, varieties with a softer gel consistency are preferred, and the cooked rice has a higher degree of tenderness. Rice is grouped into 3 groups based on the gel consistency, i.e consistency of hard gel (very flaky rices) with gel length ≤ 40 mm, flaky rices with gel length 41-60 mm, and low gel consistency (soft rices) with gel length ≥ 61 mm (Cruz and Khush, 2000). Harder gel consistency gel is associated with harder cooked rice and this feature is particularly evident in high-amylose rice. Hard cooked rice also tend to be less sticky. The gel consistency of Hipa 6 Jete and Hipa 7 were soft (78 mm and 79 mm) (Table 3). The gel consistency of Hipa 5 Ceva and Hipa 8 were soft also (65 mm and 81 mm). While the gel consistency of Ciherang, Inpari 1 and Inpari 6 were also soft (64 mm, 61 mm, 86 mm) respectively (Indrasari et al., 2017a).

Gelatinization temperature is the time required for cooking the milled rice. It is estimated by the extent of alkali spreading. The degree of spreading is measured using a seven-point scale. The corresponds of alkali spreading value to gelatinization temperature as follows: 1-2, high (74.5–80^{o}C), 3 high intermediate, 4-5, intermediate (70-74^{o}C), and 6-7, low (<70^{o}C) (Cruz, 2002). In Asia there is a normally a preference for rice with intermediate gelatinization temperature. The alkali score of Hipa 6 Jete and Hipa 7 were 3, meaning that the gelatinization temperature were high intermediate (Table 3). The gelatinization temperature of Hipa 5 Ceva and Hipa 8 were >74^{o}C (high) and 70-74^{o}C (medium). The gelatinization temperature of Ciherang, Inpari 1 and Inpari 6 were >74^{o}C (high), >74^{o}C (high) and 55-69^{o}C (low) respectively (Indrasari et al., 2017a).

Conclusion

The length of Hipa 6 jete and Hipa 7 are long and the shape are slender. Based on the head rice and broken rice percentage both Hipa 6 Jete and Hipa 7 are met the medium 2 and 3 quality class. Based on the physicochemical characteristics both Hipa 6 Jete and Hipa 7 are classified as intermediate amylose content with soft gel consistency and with high intermediate gelatinization temperature. In cooling condition, the cooked rice of Hipa 6 Jete and Hipa 7 are soft texture.

References

Badan Standardisasi Nasional (BSN) 2015 Standar Nasional Beras Giling No. 6128:2015. Jakarta.

Cruz, NMD. 2002. Rice grain quality evaluation procedures In Graham R (Ed) A Proposal for IRRI to Establish a Grain Quality and Nutrition Research Center. Discussion Paper No. 44 International Rice Research Institute. 15 p.

Cruz, NJ and Khush, GS.2000. Rice grain quality evaluation procedures In Singh RK et al (Eds) Aromatic Rice. Oxford and IBH Publishing Co. Pvt. Ltd. Calcutta. 289p.

Haryadi. 2006. Teknologi Pengolahan Beras. UGM Press. Yogyakarta.

Indrasari, SD,, S.D. Ardhiyanti, dan T.F. Djaafar. 2017a. Grain characteristics of common rice varieties in Indonesia. In Fathurrohman et al (Eds) Proceeding 1st International Conference on Food Security Innovation 2017 Emerging Global Food Innovation for Future Quality of Life Project Implementation Unit Islamic Development Bank University of Sultan Ageng Tirtayasa Serang P: 38-46.

Indrasari, SD, N. Siswanto, M. Kobarsih, TF Djaafar. 2017b. Milling quality assessment of red rice through several milling processes in Yogyakarta Special Provinces. In Proceedings of the International Conference on Food Science and Nutrition: Exploring Food for Future Scientific Discovery and New Trends. Faculty of Food Science and Nutrition, Universiti Malaysia Sabah. P: 67-72.

Mardiah Z et al 2012 Karakteristik Mutu Fisik dan Mutu Giling Beras Varietas Padi Lokal di Indonesia In Purnomo et al. (Eds) Prosiding Seminar Nasional Membangun Negara Agraris Yang Berkeadilan dan Berbasis Kearifan Lokal Buku 2 Fakultas Pertanian Universitas Sebelas Maret Surakarta P: 51-66.

Mardiah, Z, AT Rakhmi, SD Indrasari, dan B Kusbiantoro. 2016. Evaluasi mutu beras untuk menentukan pola preferensi konsumen di pulau Jawa. Jurnal Penelitian Pertanian Tanaman Pangan Vol. 35 No. 3 (2016):163-167.

Mahmud, MK, Hermana, Zulfianto, NA, Apriyantono, RR, Ngadiarti, I., Hartati, B, Bernadus, Tinexcelly. 2009. Tabel Komposisi Pangan Indonesia. Persatuan Ahli Gizi Indonesia. Jakarta. 64p.

Satoto, B Sutaryo, dan B Suprihatno. 2008 Prospek Pengembangan Varietas Padi Hibrida In Daradjat et al. (Eds) Padi Inovasi Teknologi Produksi. Buku 2. Balai Besar Penelitian Tanaman Padi P: 29-65.

Wahab, MI, Satoto, R Rahmat, A Guswara, dan Suharna. 2017. Deskripsi Varietas Unggul Baru Padi. Badan Litbang Pertanian. Jakarta 93 hal.

Wang, L, YJ Wang, and R Porter. 2002 Structures and physicochemical properties of six wild rice starches. Journal of Agricultural and Food Chemistry 50(9): 2695-2699.

Wibowo P., SD Indrasari, B Kusbiantoro, A Setyono, dan AA Daradjat. 2010 Karakterisasi Sifat Fisik, Fisikokimia, Gizi dan Indeks Glikemik Beras dari Beberapa Varietas/Galur Harapan Padi. Laporan Akhir Tahun. Balai Besar Penelitian Tanaman Padi Subang. 28 p.