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Classification of Hom Mali Rice with Different Degrees of Milling Based on Physicochemical Measurements by Principal Component Analysis

Areerat Imsil[1], Ronnarit Rittiron[2], Panmanas Sirisomboon[3] and Varipat Areekul[1]*

ABSTRACT

The effect of the degree of milling on the physicochemical properties of Hom Mali rice compared with low, intermediate and high amylose rice groups was investigated in order to differentiate Hom Mali rice from the other groups at different degrees of milling by principal component analysis (PCA). For all the rice groups, the apparent amylose content, alkali spreading value and pasting properties such as maximum viscosity, breakdown, final viscosity and setback viscosity increased with increases in the degree of milling except for the gel consistency which was reduced. Milled rice with a degree of milling of 15% showed the highest apparent amylose content, alkali spreading value and pasting properties compared with milled rice with degrees of milling of 10% and 5% and with brown rice. PCA could be applied to classify Thai rice varieties into four groups—Hom Mali, low, intermediate and high amylose rice groups—by two principal components (PCs). Rotated PC_1 and PC_2 using the Varimax method were better at explaining the variance of the parameters than the unrotated PCs. PCA clearly differentiated the classification of Rice Department 15 variety from the Pathum Thani 1 variety at the same degree of milling. Therefore, the stability of the degree of milling using PCA based on physicochemical measurements made it a preferable classification procedure for rice.

Keywords: rice, physicochemical properties, degree of milling, principal component analysis

INTRODUCTION

Hom Mali rice, Khao Dawk Mali 105 (KDML105) and Rice Department 15 (RD15) varieties, are substantial components of one of the most economic crops in Thailand. They are famous for their aroma, flavor, slender kernel and soft-cooking (Department of Foreign Trade, 1997). These rice varieties have gained wide acceptance and increased demand around the world due to the appreciation of their characteristics. Because of this, the price of Hom Mali rice is 1.3–2.5 times higher than the other aromatic and non-aromatic rice varieties (Rice Department, 2010). However, Hom Mali rice has similar physicochemical characteristics to some other aromatic rice varieties (for example, Pathum Thani 1, Hom Klong Luang and Pitsanulok 1) that are long grain, slender rice

1 Faculty of Agro-Industry, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand.
2 Department of Food Engineering, Faculty of Engineering at Kamphaeng Saen, Kasetsart University, Kamphaeng Saen Campus, Nakhon Pathom 73140, Thailand.
3 Agricultural engineering curriculum, Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Bangkok 10520, Thailand.
* Corresponding author, e-mail: kavaripa@kmitl.ac.th

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varieties with a low gelatinization temperature, low apparent amylose content and soft gel consistency (Kongseree, 2002). These other lower priced aromatic rice varieties with a similar grain quality to Hom Mali rice are often marketed under the name of Hom Mali rice to obtain a higher sale price. Consequently, it is very difficult to differentiate Hom Mali rice from the other aromatic rice varieties. This causes customer complaints regarding the impurity of Hom Mali rice and results in its price being devalued (Cheaupun *et al*., 2005).

Various approaches have been examined to classify Hom Mali rice. Methods have included physical morphological observation and physicochemical analysis such as the apparent amylose content (AACC, 1999), gel consistency (Cagampang *et al*., 1973), DNA methods (Mackill, 1995) and the pasting properties of rice performed using a Rapid Visco Analyzer (AACC, 2000c). Although these methods are reasonably accurate in the classification of Hom Mali rice, the practical classification methods are reduced to physical observation, the apparent amylose content or gel consistency. There is no formal classification using these characteristics to distinguish Hom Mali rice from other rice varieties with similar grain characteristics. Moreover, these properties are influenced by the degree of milling which removes the rice bran (Wadsworth, 1993). Increasing the degree of milling reduces the moisture, protein and lipid content and the gel consistency, whereas the apparent amylose content and some pasting properties increase with increased milling time (Wadsworth, 1993; Yadav and Jindal, 2008). Thus, the degree of milling affects not only the physicochemical properties but also the classification of rice. Hom Mali rice is generally classified as having low apparent amylose content and soft gel consistency (Kongseree, 2002). By increasing the degree of milling, the apparent amylose content increases whereas the gel consistency decreases. These changes make its physicochemical properties similar to those of rice varieties with intermediate or high amylose content. It might be possible that the changes in the degree of milling among various rice varieties could be related to the changes in their physicochemical properties. Thus, the classification of rice should consider the effect of the degree of milling on the physicochemical properties.

Interesting techniques to classify rice varieties include the determination of physicochemical properties accompanied by multivariate methods such as principal component analysis (PCA). PCA, a data reduction technique, aims to explain most of the variance in the data group whilst reducing the number of variables to a few uncorrelated components. This method is applied to classify groups of variables, based on loadings and the principal component (PC) scores. The loadings show how well a variable is taken into account by the model components and the loading interpret the variable relationships. The PC scores indicate the locations of the samples along each model component and can be used to detect sample patterns, groupings, similarities or differences (Anderson, 2003). Pitiphunpong and Suwannaporn (2009) applied PCA to identify differences between cultivated locations of KDML105 using pasting and calorimetric properties, but they did not consider the degree of milling.

Thus, the difference between Hom Mali rice and the other aromatic and non-aromatic rice varieties can be based not only on the presence or absence of aroma but also on the difference in the quantities of the physicochemical properties in the rice grain which are influenced by the degree of milling. Therefore, the objectives of this study were: 1) to investigate the effect of the degree of milling on the physicochemical properties of Hom Mali rice compared with other varieties and 2) to apply a PCA technique to differentiate Hom Mali rice from the other rice varieties at different degrees of milling.

MATERIALS AND METHODS

Materials

Two varieties (KDML105 and RD15) of Hom Mali rough rice from 50 different planting locations and 10 varieties of rough rice including low, intermediate and high amylose rice, were obtained from rice research centers and rice seed centers in Thailand. The rice samples were divided into four groups—Hom Mali rice and low, intermediate and high amylose rice groups. The 60 samples were harvested during November 2007 and April 2008. Each sample had the impurities separated out and was then dried in the sun to obtain a final moisture content of 12–13%. Then, each sample was packed under vacuum and stored at 10 ± 1 °C before milling.

Milling process

The 100 g rough rice samples were dehusked using a Satake dehusker (Model SB, Satake Engineering, Toyota, Japan). Each brown rice sample was subsequently milled using four different degrees of milling: 0, 5, 10, and 15% using a Satake miller (Model SKB, Satake Engineering, Toyota, Japan). Each degree of milling was obtained from the calibration curve between the degree of milling and the milling time of each rice group. The samples with different degrees of milling were then ground using a Cyclone Sample Mill (Udy Crop., Fort Collins, CO, USA). The rice flour was separated with a 1.0 mm screen for measuring of the apparent amylose content, gel consistency, moisture content and pasting properties by a Rapid Visco Analyzer (RVA; model 3-D, Newport Scientific, Warriewood, NSW, Australia) while a 0.5 mm screen was used for collection of the rice protein. Each rice flour sample was packed in an aluminum foil bag and stored at room temperature.

Physicochemical analyses

The moisture content and apparent amylose content were determined according to AACC (2000a) and AACC (1999), respectively. The total nitrogen content was determined according to AACC (2000b) using a Leco model FP-2000 nitrogen analyzer and then the protein content was calculated using a conversion factor of 5.95. Alkali spreading of the whole grain was evaluated according to Little *et al.* (1958). Gel consistency was measured according to Cagampang *et al.* (1973). The pasting properties were determined using the RVA according to AACC (2000c). The RVA amylograph provided the maximum viscosity (Max), trough, breakdown (BB), setback (SB) and final viscosity (FV) and was reported in units termed 'rapid visco units' (RVU). All measurements at different degrees of milling of each sample were conducted in duplicate.

Statistical analyses

Each physicochemical parameter was calculated as a mean ± standard deviation. In order to classify the rice varieties, the physicochemical data of the milled rice samples with different degrees of milling were analyzed by PCA using the Unscrambler software package version 9.7 (CAMO software AS, Norway). The data were presented in terms of the loadings of the physicochemical properties and the scores of each model principal component.

RESULTS AND DISCUSSION

Effect of degree of milling on physicochemical properties of brown and milled rice

The physicochemical properties of brown and milled rice at four different degrees of milling are shown in Table 1. At the same degree of milling, Hom Mali rice and low amylose rice had the same apparent amylose content which was lower than for the intermediate and high amylose

Table 1 Effect of degrees of milling on physicochemical properties of brown rice and milled rice.

Rice groups	D_{OM} (%)	AAC (%)	ASV	GC (mm)	Maximum viscosity (RVU)	Trough (RVU)	Breakdown (RVU)	Final viscosity (RVU)	Setback viscosity (RVU)
Hom Mali rice	0	16.0 ± 0.2	6.0 ± 0.1	77.0 ± 5.4	1,809 ± 10	1,643 ± 8	1,084 ± 7	3,032 ± 5	(-687) ± 9
	5	16.9 ± 0.4	7.0 ± 0.3	70.7 ± 3.9	2,704 ± 6	1,788 ± 5	1,413 ± 3	3,205 ± 5	(-599) ± 9
	10	18.6 ± 0.2	7.0 ± 0.2	64.2 ± 4.5	3,177 ± 9	1,882 ± 3	1,651 ± 2	3,271 ± 5	(-316) ± 4
	15	20.2 ± 0.2	7.0 ± 0.1	59.3 ± 5.2	3,489 ± 6	1,955 ± 1	1,798 ± 3	3,372 ± 6	140 ± 2
Low amylose rice	0	16.4 ± 0.8	6.0 ± 1.0	77.3 ± 3.3	2,096 ± 7	1,926 ± 4	1,055 ± 3	3,279 ± 6	169 ± 4
	5	17.8 ± 0.2	6.0 ± 0.9	67.0 ± 1.8	3,017 ± 6	2,125 ± 6	1,196 ± 6	3,577 ± 4	373 ± 3
	10	18.8 ± 0.8	6.0 ± 0.5	62.3 ± 2.5	3,156 ± 5	2,127 ± 4	1,299 ± 9	3,618 ± 6	444 ± 5
	15	20.4 ± 0.6	7.0 ± 0.5	57.3 ± 1.5	3,561 ± 3	2,321 ± 6	1,495 ± 6	3,806 ± 5	895 ± 4
Intermediate amylose rice	0	21.1 ± 0.7	4.0 ± 0.6	57.3 ± 2.8	1,395 ± 7	2,145 ± 3	971 ± 6	3,553 ± 9	964 ± 4
	5	22.8 ± 0.8	4.0 ± 0.6	51.3 ± 5.2	2,050 ± 3	2,309 ± 4	1,029 ± 7	3,633 ± 3	1,158 ± 5
	10	24.0 ± 0.4	5.0 ± 0.4	49.0 ± 4.1	2,483 ± 4	2,411 ± 4	1,216 ± 4	3,892 ± 9	1,445 ± 3
	15	24.8 ± 0.7	5.0 ± 0.6	41.5 ± 5.3	2,704 ± 5	2,557 ± 3	1,294 ± 6	4,066 ± 2	1,633 ± 4
High amylose rice	0	27.3 ± 0.9	2.0 ± 0.5	47.9 ± 1.6	999 ± 6	2,393 ± 7	444 ± 5	3,710 ± 8	1,180 ± 2
	5	28.3 ± 0.4	1.0 ± 0.4	43.2 ± 1.3	1,306 ± 7	2,583 ± 4	640 ± 3	4,069 ± 7	1,474 ± 4
	10	29.5 ± 0.2	1.0 ± 0.1	36.4 ± 4.4	1,707 ± 7	2,864 ± 4	767 ± 2	4,112 ± 9	2,320 ± 3
	15	31.0 ± 0.2	1.0 ± 0.4	32.6 ± 1.9	2,110 ± 6	3,047 ± 4	880 ± 3	4,811 ± 3	2,593 ± 5

D_{OM} = Degree of milling; AAC = Apparent amylose content; ASV = Alkali spreading value; and GC = Gel consistency rice. By increasing the degree of milling, the apparent amylose content of all rice groups increased, resulting in a lower apparent amylose content of brown rice (0% degree of milling) than in milled rice. Tran *et al*. (2004) found that any lipid in the rice grain affected the apparent amylose content because it could form a colorless complex with iodine (amylose-lipid complex); therefore, the iodine blue value and apparent amylose content of brown rice were lower than for milled rice. Moreover, the apparent amylose content of Hom Mali rice at 15% degree of milling (20.2%) was similar to that of intermediate amylose rice at 0 and 5% degree of milling (21.1% and 22.8%, respectively). This indicated that increasing the degree of milling in the range of 5 to 15%, increases the amount of the bran layer that is removed from the endospermic core, resulting in a proportional increase in the starch content and the apparent amylose content. Thus, the changes in the degree of milling of Hom Mali rice were related to the changes in the apparent amylose content which was similar to the other samples of low and intermediate amylose rice. Therefore, it was not possible to differentiate Hom Mali rice from other rice varieties by only measuring the apparent amylose content.

At the same degree of milling, the highest alkali spreading value was obtained for Hom Mali rice and low amylose rice, followed by intermediate and high amylose rice (Table 1). Although the degree of milling did not influence the alkali spreading value, all samples could be classified into three groups (based on the alkali spreading level of the whole rice grain) as having a low, intermediate or high alkali spreading value according to Prathepha *et al*. (2005). In the current study, a high alkali spreading value was observed only in Hom Mali rice and low amylose rice with the value in the range 6.0–7.0, whereas intermediate and high amylose rice produced intermediate and low levels of alkali spreading with value ranges of 4.0–5.0 and 1.0–2.0, respectively. Prathepha *et al*. (2005) also reported the effect of the amylopectin chain-length of the rice grain on the alkali spreading level among rice varieties.

Hom Mali rice and low amylose rice had higher gel consistency compared to the intermediate and high amylose rice. No difference in the gel consistency of Hom Mali rice and low amylose rice could be observed at all degrees of milling because both groups were classified as low amylose rice (Table 1). The gel consistency of the four rice groups decreased progressively with an increase in the degree of milling within the same group. These changes might have been affected by the retrogradation of the apparent amylose content. Mariotti *et al*. (2009) concluded that the retrogradation of high apparent amylose content, which was influenced by the changes in the degree of milling, increased rapidly after the temperature decreased, and resulted in shortening the distance of flow in the horizontal direction for the rice paste. The gel consistency was also found to be a major property in classifying rice into hard (length of gel = 40 mm or less), medium (length of gel = 41 to 60 mm) and soft gel consistency (length of gel = more than 60 mm) (Kongseree, 2002). Table 1 shows that Hom Mali and low amylose rice had a soft gel consistency for the same degree of milling at 0% to 10% whereas both rice varieties were classed as having medium gel consistency at 15% degree of milling. Intermediate amylose rice was also classified as having medium gel consistency at all degrees of milling. High amylose rice could be classified into both medium and hard gel consistency when the degree of milling varied from 0% to 5% and 10% to 15%, respectively. This also suggested that the degree of milling was an important factor in classifying rice on the basis of gel consistency.

Pasting properties are dependent on the rigidity of the starch granules, which in turn affects the granule swelling potential and the amount of amylose leaching out in the solution (Morris, 1990). The effect of the degree of milling on the pasting properties of brown rice and milled rice are shown in Table 1. At the same degree of milling, Hom Mali rice and low amylose rice had higher maximum and breakdown viscosity compared to intermediate and high amylose rice. These results may be attributed to the level of the apparent amylose content in the rice grain which affected the swelling power of the starch. This was confirmed by Mariotti *et al*. (2005) who found that low amylose rice flour had higher water binding capacity, swelling power, solubility and maximum viscosity than were found in high amylose rice flour.

From Table 1, the maximum, trough, breakdown, final and setback viscosity tended to increase with an increase in the degree of milling. The increasing values were the highest at 15% degree of milling for all rice groups. These changes were influenced by the decrease in the amylase activity and an increase in the apparent amylose content (Perdon *et al.,* 2001; Noosuk *et al*., 2005). The amylase activity in the bran layer played a significant role in reducing maximum viscosity. By increasing the degree of milling, the amylase was removed during milling and thus, the maximum viscosity increased with the increased degree of milling (Perdon *et al*., 2001; Mariotti *et al*., 2005). The increase in the apparent amylose content with an increase in the degree of milling also affected the swelling power and retrogradation of molecules of amylose, resulting in increases in the final and setback viscosity (Park *et al*., 2001; Mariotti *et al.,* 2005; Patindol *et al*., 2009).

As mentioned above, it was clear that the degree of milling affected the physicochemical properties of the rice, leading to difficulties in rice classification. Moreover, rice varieties with different degrees of milling could not be classified using only a single physicochemical property but could be classified by using a combination of properties. Therefore, a PCA technique may be able to properly classify rice varieties using several variables.

Principal component analysis (PCA)

From the physicochemical data, the moisture contents were not different among the rice groups for all degrees of milling (data not shown); therefore, they were discarded for the rice classification process. Thai rice could be classified into four groups using PCA, with two principal components (PCs). Table 2 shows the factor loading matrix and the variance obtained for milled rice with different degree of milling. The two PCs (PC_1 and PC_2) for the five conditions of all degrees of milling, 0, 5, 10 and 15% of milling could account for 76.83, 77.29, 80.77, 76.14 and 83.57% of the total variance, respectively.

However, the factor loading value of some variables in the physicochemical data was unclear, which affected the variable arrangement in the factor. From Table 2, the gel consistency at all degrees of milling had factor loading values for PC_1 and PC_2 of –0.77 and –0.67, respectively. These values showed a slightly difference between the two PCs resulting in difficulty in arranging the new variables in the factor. Therefore, a Varimax rotation was employed to minimize the number of variables that influenced the original PCs. Only two PCs were considered in the rotation because these PCs had an eigenvalue that was greater than zero. The results are shown in Table 3.

The PCA involved all degrees of milling (0%, 5%, 10% and 15%) and the value of correlation of the rotated PC_1 was related to the apparent amylose content, alkali spreading value, gel consistency, trough and setback viscosity. These parameters explained 43.62% of the variance. The rotated PC_2 was related to the maximum and breakdown viscosity, which explained 33.21% of the variance. Combined, the rotated PC_1 and PC_2 could account for 76.83% of the total variance. The rotated first (PC_1) and rotated second (PC_2) components of brown rice 5, 10 and 15% degree of milling accounted for

Table 2 Loadings of physicochemical properties of milled rice from all and each level at different degrees of milling.

Variables	Principal component (PCs)									
	All degree of milling[1]		0% degree of milling		5% degree of milling		10% degree of milling		15% degree of milling	
	PC_1	PC_2	PC_1	PC_2	PC_1	PC_2	PC_1	PC_2	PC_1	PC_2
AAC	0.88	-0.37	0.93		0.93		0.93		0.93	
ASV	-0.97	-0.31	-0.97		-0.97		-0.96		-0.97	
PTN		0.76		0.96		0.73		0.95	-0.88	0.86
GC	-0.77	-0.67	-0.87		-0.90		-0.90			
MV	-0.51	-0.77	-0.86		-0.88		-0.92		-0.92	
BD	-0.68		-0.93		-0.92		-0.94		-0.95	
Trough	0.87	0.51	0.94		0.93		0.93		0.95	
FV	0.38		0.80		0.88		0.38	0.24	0.94	
SB	0.92	-0.36	0.96		0.98		0.98		0.97	
Eigenvalue	5.12	3.32	7.42	1.08	7.73	1.15	7.34	1.03	8.06	1.12
Variance (%)	46.62	30.21	67.46	9.83	70.29	10.48	66.72	9.41	73.31	10.23
Cumulative (%)	46.62	76.83	67.46	77.29	70.29	80.77	66.72	76.14	73.31	83.57

[1] Physicochemical data were analyzed using PCA including 0, 5, 10 and 15% degrees of milling. AAC = Apparent amylose content; ASV = Alkali spreading value; PTN = Protein content; GC = Gel consistency; MV = Maximum viscosity; BD = Breakdown viscosity; FV = Final viscosity; and SB = Setback viscosity.

Table 3 Loadings of physicochemical properties from all and each level at different degrees of milling rotated by Varimax method.

Variables	Principal component (PCs)									
	All degree of milling[1]		0% degree of milling		5% degree of milling		10% degree of milling		15% degree of milling	
	PC_1	PC_2	PC_1	PC_2	PC_1	PC_2	PC_1	PC_2	PC_1	PC_2
AAC	0.95		0.94		0.94		0.93		0.93	
ASV	-0.87	-0.42	-0.98		-0.97		-0.96		-0.97	
PTN	0.38	0.65		0.96		0.72		0.96		0.83
GC	-0.91		-0.88		-0.89		-0.89		-0.89	
MV		-0.92	-0.86		-0.89		-0.93		-0.91	
BD	-0.33	-0.90	-0.93		-0.90	-0.23	-0.94		-0.94	
Trough	0.95		0.93		0.93		0.93		0.95	
FV	0.40		0.80		0.90		0.39	0.22	0.95	
SB	0.96		0.96		0.96		0.98		0.98	
Eigenvalue	4.79	3.65	7.40	1.09	7.55	1.33	7.32	1.05	8.01	1.19
Variance (%)	43.62	33.21	67.32	9.97	68.64	12.13	66.56	9.58	72.83	10.73
Cumulative (%)	43.62	76.83	67.32	77.29	68.64	80.77	66.56	76.14	72.83	83.57

[1] Physicochemical data were analyzed using PCA including 0, 5, 10 and 15% degrees of milling. AAC = Apparent amylose content; ASV = Alkali spreading value; PTN = Protein content; GC = Gel consistency; MV = Maximum viscosity; BD = Breakdown viscosity; FV = Final viscosity; and SB = Setback viscosity.

77.29, 80.77, 76.14 and 83.57%, respectively (Table 3). The correlation values for the rotated PC_1 of brown rice comprised eight variables—namely, the apparent amylose content, alkali spreading value, gel consistency, maximum, breakdown, trough, final and setback viscosity.

Rotated PC_2 had only one variable that was related with the protein content. Similar results were obtained with the 5, 10 and 15% degrees of milling.

The factor score of rotated PC_1 and PC_2 for all degrees of milling is presented in Figure 1. It was feasible to classify Thai milled rice into four groups according to their physicochemical properties—Hom Mali rice, low, intermediate and high amylose rice groups (Figure 1). Hom Mali rice and the low amylose rice group could be separated from the intermediate and high amylose rice groups but Hom Mali rice could not be differentiated from the low amylose rice group due to their similar physicochemical properties (Table 1). Moreover, Hom Mali rice with different degrees of milling had a different position at PC_2 resulting from the maximum and breakdown viscosity (Table 1 and Figure 1).

However, the PCA could not clearly classify the Thai rice varieties at all degrees of milling. Therefore, the feasibility of classifying Thai milled rice was studied at individual degrees of milling using PCA. Each degree of milling affected the classification performance in a similar way. Therefore, the factor score of the rotated PC_1 and PC_2 of only the 10% degree of milling is presented in Figure 2.

From the PCA score plot, at the same degree of milling, the score of the PC_1 axis could classify Thai milled rice into four groups—Hom Mali rice, low, intermediate and high amylose rice groups. On the other hand, the score of the PC_2 axis could not classify Thai milled rice into four groups because the protein variable was not sufficiently different (Figure 2, Table 3). However,

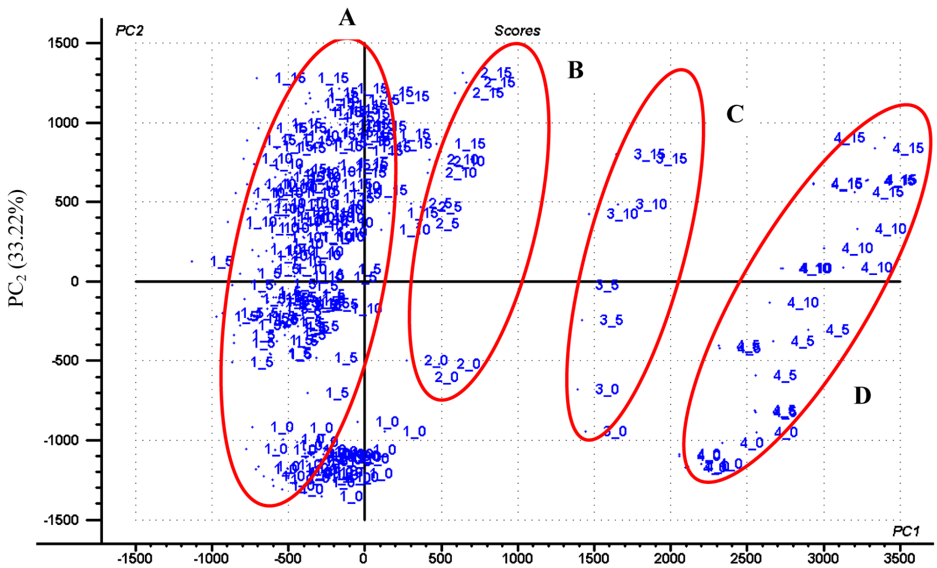

Figure 1 Score plot of the rotated PC_1 and rotated PC_2 from the physicochemical data of all degrees of milling, where A = 1_0, 1_5, 1_10, 1_15 = Hom Mali rice at 0, 5, 10, 15% degrees of milling; B = 2_0, 2_5, 2_10, 2_15 = low amylose rice at 0, 5, 10, 15% degrees of milling; C = 3_0, 3_5, 3_10, 3_15 = intermediate amylose rice at 0, 5, 10, 15% degrees of milling; and D = 4_0, 4_5, 4_10, 4_15 = high amylose rice at 0, 5, 10, 15% degrees of milling.

it was possible to classify the RD15 variety (Hom Mali rice group) from Pathum Thani 1 (low amylose rice group) at the same degree of milling by PCA due to their different pasting properties (Table 1). Therefore, the classification of Hom Mali rice from the other rice groups, especially the low amylose rice group should be fixed to the degree of milling.

CONCLUSION

The degree of milling affected the physicochemical properties of brown and milled rice. The apparent amylose content, alkali spreading value, maximum, trough, breakdown, final and setback viscosity were increased by an increase in the degree of milling for all rice groups while a decrease in the gel consistency was observed. PCA could be used for classifying Thai milled rice using two principal components. Rotated PC_1 and PC_2 using the Varimax method provided a better arrangement with new variables than the un-rotated principal components. Hom Mali rice was clearly differentiated from the low, intermediate and high amylose rice groups. For the same degree of milling, the RD15 variety could be differentiated from the Pathum Thani 1 variety due to their different pasting properties. Thus, using a stable degree of milling was preferable for differentiation among Hom Mali rice, low, intermediate and high amylose rice groups using PCA based on physicochemical measurements.

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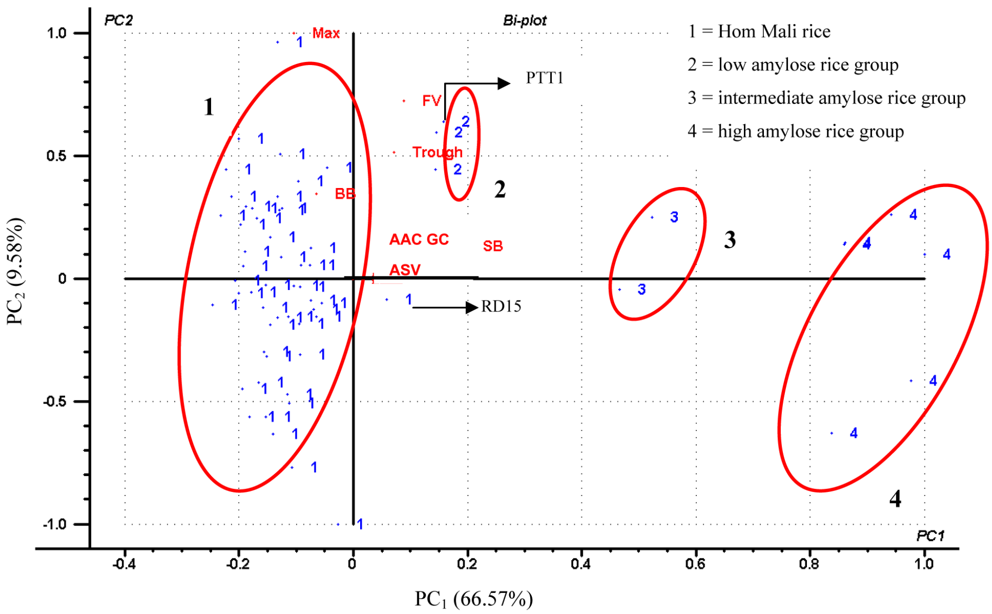

Figure 2 Score plot of the rotated PC1 and rotated PC2 of the physicochemical properties at 10% degree of milling. RD15 = Rice Department15 variety; PTT1 = Pathum Thani 1 variety; Max = Maximum viscosity; FV = Final viscosity; BB = Breakdown viscosity; SB = Setback viscosity; AAC = Apparent amylase content; GC = Gel consistency; and ASV = Alkali spreading value.

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