THAI AGRICULTURAL STANDARD

TAS 4000-2003

THAI HOM MALI RICE

National Bureau of Agricultural Commodity and Food Standards
Ministry of Agriculture and Cooperatives

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The Hom Mali rice is an agricultural commodity that Thailand has been the important world producer and exporter. In order to have the Thai Hom Mali rice better accepted nationally and internationally in term of food safety and export promotion. The Ministry of Agriculture and Cooperatives of Thailand encourages the establishment of a standard for Thai Hom Mali rice.

The provisions of this standard are based upon the information of the following documents:

Ministry of Agriculture and Cooperatives B.E. 2543. Notification of the Ministry of Agriculture and Coopertives Re: Standard for Thai Hom Mali Rice, B.E. 2543, on 26th April B.E. 2543.

Ministry of Commerce B.E. 2544. Notification of the Ministry of Commerce Re: Prescribing Thai Hom Mali Rice as a Standardized Commodity and the Standards of Thai Hom Mali Rice, B.E. 2544, on 31st October B.E. 2544.

FAO/WHO. 1995. Code Alimentarius Volume 7. Cereals, Pulses, Legumes and Derived Products and Vegetable Proteins. Codex Standard for Rice (CODEX STAN 198-1995). Joint FAO/WHO Food Standard

***Remark*:**

The standard title has been revised from "Thai Agricultural Commodity and Food Standard (TACFS)" to "Thai Agricultural Standard (TAS)" in accordance with the enforcement of the Agricultural Standards Act B.E. 2551 (2008).

NOTIFICATION OF THE NATIONAL COMMITTEE ON AGRICULTURAL COMMODITY AND FOOD STANDARDS SUBJECT: THAI AGRICULTURAL COMMODITY AND FOOD STANDARD: THAI HOM MALI RICE

It is appropriate to establish the national standard for Hom Mali rice for the benefit of quality improvement, trade facilitation and consumer protection. Therefore, the National Committee on Agricultural Commodity and Food Standards notifies the establishment of Thai Agricultural Commodity and Food Standard entitled Thai Hom Mali Rice to be used as a voluntary standard as attached herewith.

Notified on 6 November 2003 (B.E. 2546)

Sora-at Glinpratum

Minister of the Ministry of Agriculture and Cooperatives

Chairman of the National Committee on Agricultural Commodity and Food Standards

THAI AGRICULTURAL STANDARD

THAI HOM MALI RICE

1. SCOPE

This Thai Agricultural Standard applies to Thai Hom Mali rice produced from the grain of *Oryza sativa L.* which including paddy, brown rice and white rice derived from the paddy of the fragrant non-glutinous rice varieties which are sensitive to photo period and cultivated as a main crop in Thailand. The Department of Agriculture, Ministry of Agriculture and Cooperatives, has certified the varieties as Khao Dawk Mali 105 variety and RD15 variety. Its grains contain a natural fragrant aroma depending on its age, and when cooked, retains a soft texture.

2. DEFINITION

For the purposes of this standard:

2.1 Paddy or rough rice or unhusked rice means rice retaining its husk after threshing.

2.2 Husked rice or brown rice or cargo or loonzain rice means rice from which the husk only has been removed. Some part of bran layer may be removed during dehusking process.

2.3 White rice or milled rice or polished rice means rice obtained by removing bran and the embryo from brown non glutinous rice.

2.4 Non glutinous rice or non waxy rice means rice having translucent appearance. Some of the grain may or may not contain an opaque spot.

2.5 White glutinous rice means rice obtained by removing bran and embryo from brown glutinous rice.

2.6 Parts of rice kernels mean each part of the whole kernel that is divided lengthwise into 10 equal parts.

2.7 Whole kernels mean rice kernel that are in whole condition without any broken part, including kernels which have at least nine parts.

2.8 Head rice means broken kernel whose length is more than those of brokens but not reach the length of the whole kernel. This includes split kernels that retain at least 80% of the whole kernel area.

2.9 Brokens mean broken kernels whose length are at least 2.5 parts of a whole kernel, but less than the

length of head rice. This includes split kernels that retain less than 80% of the whole kernel area.

2.10 Red kernels means kernels that have red bran covering the kernels wholly or partly.

2.11 Chalky kernels means non-glutinous rice kernels that have opaque area like chalk covering at least 50% of the kernels.

2.12 Undeveloped kernels means rice kernels that have not developed normally and are flat.

2.13 Yellow kernels means rice kernels that have some parts of the kernels turn into an apparent yellow. This includes parboiled rice kernel that is light brown partly or wholly.

2.14 Immature kernels means rice kernels which are light green and smaller than normal grains.

2.15 Forelgn matter means the other matter than rice kernel and includes rice husk and bran detached from rice kernels.

2.16 Amylose means a kind of starch in rice kernels. When cooked, the texture of the rice kernels varies according to the content of amylose.

2.17 Alkali spreading value means rate of disintegration of the starch from white rice kernels after being soaked in 1.7% potassium hydroxide solution for 23 hours at 30°C ambient room temperature.

2.18 Per cent means percentage by weight.

3. PROVISIONS CONCERNING QUALITY

3.1 MINIMUM QUALITY REQUIREMENTS

3.1.1 General provisions

The paddy, brown and white kernels of qualified Thai Hom Mali Rice shall be in compliance with the following requirements:

3.1.1.1 Safe and suitable for human consumption.

3.1.1.2 Uniform in appearance.

3.1.1.3 Retain the characteristics of its varieties.

3.1.1.4 Starch of white rice contains 13-18 % of amylose at 14 % moisture content, determined according to the method of analysis as describe in clause 9.2.

3.1.1.5 Alkali spreading value of white rice is in the range of 6-7, determined according to the method of analysis as described in clause 9.2.

3.1.2 Specific requirements for paddy

The paddy of qualified Thai Hom Mali Rice shall be in compliance with the following requirements:

3.1.2.1 Husk of the kernels has straw color.

3.1.2.2 Grains, when milled into white rice, contains a natural fragrant aroma, depending on its age, and shall be free from abnormal odor.

3.1.2.3 Size of brown rice kernel must not be less than 7.2 mm. in length and its length/width ratio not less than 3.2 : 1.

3.1.2.4 Having a moisture content not exceding 14%, except freshly harvested paddy of Hom Mali rice, which shall be dried in the later stage to reduce the moisture level to 14% or below.

3.1.2.5 Containing not less than 95% of Thai Hom Mali rice.

3.1.2.6 Rice and matter that may be present shall not exceed the limits given in table 1.

3.1.2.7 Yielding not less than 36% of whole kernel and head rice when milled.

Table 1 Rice and matter that may be present not exceeding:

Kind of defect	Percentage by weight
Red kernels	2.0
Yellow kernels	1.0
Chalky kernels	7.0
White glutinous rice	2.0
Foreign matter and undeveloped kernels	2.0

3.1.3 Specific requirements for brown rice and white rice

The brown rice and white rice of qualified Thai Hom Mali Rice shall be in compliance with the following requirements:

3.1.3.1 Containing a natural fragrant aroma, depending on its age and shall be free from abnormal odor.

3.1.3.2 Free from living insects and mite.

3.1.3.3 Having a moisture content not exceding 14%.

3.1.3.4 Containing not less than 92% of Thai Hom Mali rice.

3.2 QUALITY CLASSIFICATIONS

3.2.1 Classification of Paddy

Paddy of qualified Thai Hom Mali Rice is divided into 5 classes (grades), depending on its milling quality (percentage of whole kernels and head rice) as given in table 2. In trading, if the milling quality of class 1 paddy is higher than 44%, sub-classes under this class may be quoted under the agreement between the seller and buyer.

Table 2 Classification of paddy

Classes	Whole kernels and Head rice (%) yielding by milling
1	Not less than 44%
2	Not less than 42%
3	Not less than 40%
4	Not less than 38%
5	Not less than 36%

3.2.2 Classification of white rice and brown rice

Classification of white rice and brown rice; provision for grain compositions, head rice, brokens, rice and matter that may be present and milling degree are specified in accordance with the Standards of White Rice and Brown Rice prescribed in the Standards for Thai Hom Mali Rice, notified by the Ministry of Commerce, in Appendix A.

4. PACKAGING

4.1 PADDY

In case of paddy packed in sacks, the sacks shall be clean, sturdy, and well stitched or sealed.

4.2 WHITE RICE AND BROWN RICE

White rice and brown rice shall be packed in such a way to protect the produce property. The packaging material shall be clean and of a quality such as to avoid causing any external contamination and deterioration to rice. It shall meet the resistance characteristics to ensure suitable handling and transporting. The use of materials for printing or labeling must have been done with a non-toxic ink or glue.

5. MARKING OR LABELLING

5.1 CONTAINERS DESTINED FOR THE FINAL CONSUMER

Each package shall bear legibly without misleading or deceptive statement as follows:

5.1.1 Nature of the produce

Name of "Thai Hom Mali brown rice" or "Thai Hom Mali white rice"

5.1.2 Net weight

5.1.3 Identification

Name and address of producer, packer or retailer

5.1.4 Classes (grades) (if graded)

5.1.5 Date of production or packing

5.1.6 Cooking direction

For price marketed in Thailand, the label shall be in compliance with the requirement notified under the Food Act and Consumer Protection Act.

5.2 NON-RETAIL CONTAINER

Non-retail container shall bear the following, in a legibly mark or in an accompanying document:

5.2.1 Nature of the produce

Name of "Thai Hom Mali paddy", "Thai Hom Mali brown rice" or "Thai Hom Mali white rice"

5.2.2 Net weight

5.2.3 Identification

Name and address of producer or packer.

5.2.4 Classes (grades) for brown rice and white rice (if graded)

5.2.5 Date of production or packing.

5.3 LANGUAGE

The label of Hom Mali rice shall be in Thai. In case of white rice or brown rice of export, label may be described in other language.

5.4 OFFICIAL INSPECTION OR CERTIFICATION MARK

The official Inspection or Certification Mark shall be in compliance with the provisions and conditions of inspection or certification agencies recognized by the Ministry of Agriculture and Cooperatives or other regulatory agencies.

6. CONTAMINANTS

Comply with the provision of relevant regulations and the Thai Agricultural Standards on contaminants.

7. PESTICIDE RESIDUES

Comply with the provision of relevant regulations and the Thai Agricultural Standards on pesticide residues.

8. HYGIENE

8.1 STORAGE

Storage area shall be clean, in good hygiene, capable to protect the rice from external wet and contamination from pests such as rodents, insects, birds including pets. Storage area, including practice, shall provide good aeration to prevent moisture and heat accumulation. In case of rice stored in sacks, the stack of rice sacks shall be arranged in such a way that the distance between the wall and rice stack is enough to introduce good aeration, convenient for cleaning activity and inspecting. It is recommended to regularly inspect the stored rice to estimate the damage and the infestation of pests in order to set an appropriate management.

8.2 TRANSPORTATION

Carriage for transporting rice shall be clean with an appropriate covering to prevent external contamination and wetting. The carriage shall not cause any contamination of hazard substance.

9. METHODS OF ANALYSIS AND SAMPLING

9.1 SAMPLING

Sampling of Hom Mali rice shall comply with those described in Appendix B.

9.2 METHODS OF ANALYSIS

9.2.1 Analysis for foreign matter.

9.2.2 Analysis for milling quality of paddy.

9.2.3 Analysis for moisture content.

9.2.4 Analysis for amylose content.

9.2.5 Analyses for admixture of other rice in Hom Mali Rice.

9.2.5.1 Alkali spreding valus test (for brown rice and white rice)

9.2.5.2 Staining test (for paddy; and brown or white rice containing brokens)

The methods of analysis are described in Appendix C.

9.3 Where necessary, methods of sampling and analysis other than those mentioned in clauses 9.1 and 9.2 shall comply with the provision prescribed in relevant regulations and provision set in the Thai Agricultural Standard concerning methods of analysis and sampling.

APPENDIX A
CLASSIFICATION OF WHITE RICE AND BROWN RICE, PROVISION FOR GRAIN COMPOSITION, HEAD RICE, BROKENS, RICE AND MATTER THAT MAY BE PRESENT AND MILLING DEGREE OF EACH CLASSES (GRADES) OF WHITE RICE AND BROWN RICE

1. DEFINITION

(In addition to the provision in clause 2 of the Thai Agricultural Commodity and Food Standards: Thai Hom Mali Rice)

1.1 Small brokens c1 means small broken rice kernels that pass through round hole metal sieve No.7.

1.2 Undermilled kernels means white rice kernels that have the milling degree below that specified for each grade of rice.

1.3 Damged kernels means rice kernels that are obviously damaged as can be seen due to moisture, heat, mold, insects, or others.

1.4 Siev no. 7 means a round hole metal sieve that is 0.79 mm. (0.031 inch) thick and 1.75 mm. (0.069 inch) diameter.

1.5 Other seeds means seeds of other plant than rice.

1.6 Millng degree means the degree to which rice is milled.

1.7 Extra well milled means the removal of bran entirely to the extent that the rice kernels have an especially beautiful appearance.

1.8 Well milled means the removal of bran entirely to the extent that the rice kernels have a beautiful appearance.

1.9 Reasonably well milled means the removal of a large amount of bran to the extent that the rice kernels have a reasonably beautiful appearance.

1.10 Ordinary milled means the removal of some portions of bran.

2. THAI HOM MALI WHITE RICE SHALL BE DIVIDED INTO 8 CLASSES (GRADES) AS FOLLOWS:

2.1 White rice 100 % grade A

2.2 White rice 100 % grade B

2.3 White rice 100 % grade C

2.4 White rice 5%

2.5 White rice 10%

2.6 White rice 15%

2.7 White broken rice A1 Extra super

2.8 White broken rice A1 Super

3. THAI HOM MALI BROWN RICE SHALL BE DIVIDED INTO 6 CLASSES (GRADES) AS FOLLOWS:

3.1 Brown rice 100 % grade A

3.2 Brown rice 100 % grade B

3.3 Brown rice 100 % grade C

3.4 Brown rice 5%

3.5 Brown rice 10%

3.6 Brown rice 15%

4. PROVISION FOR GRAIN COMPOSITION, HEAD RICE, BROKENS, RICE AND MATTER THAT MAY BE PRESENT AND MILLING DEGREE OF EACH CLASSES (GRADES) FOR WHITE RICE, WHITE BROKENS AND BROWN RICE SHALL COMPLY WITH THOSE DESCRIBED IN TABLES 1, 2 AND 3.

Table 1 Standards for white rice

Grades	Grain composition (%)					Size of head rice (parts)	Size of brokens (parts)	Rice and matter that may be present, not exceeding (%)							Milling degree
	Whole kernels	Head rice	Broken & Small brokenC1					Red and/or Undermilled kernels	Yellow kernels	Chalky kernels	Damaged kernels	White glutinous rice	Undeveloped, Immature kernels, Other seeds and foreign matter	Paddy (grains /kg.)	
			Total	Brokens less than min. specified & not passing through sieve No.7	Small broken C1										
100% grade A	≥60.0	–	≤4.0	0	0	≥8.0	≥5.0 – <8.0	0	0	3.0	0	1.5	0	5	Extra well milled
100% grade B	≥60.0	–	≤4.5	≤0.5	≤0.1	≥8.0	≥5.0 – <8.0	0	0.2	6.0	0.25	1.5	0.2	7	Extra well milled
100% grade C	≥60.0	–	≤5.0	≤0.5	≤0.1	≥8.0	≥5.0 – <8.0	0	0.2	6.0	0.25	1.5	0.2	7	Extra well milled
5%	≥60.0	–	≤7.0	≤0.5	≤0.1	≥7.5	≥3.5 – <7.5	2.0	0.5	6.0	0.25	1.5	0.3	10	Well milled
10%	≥55.0	–	≤12.0	≤0.7	≤0.3	≥7.0	≥3.5 – <7.0	2.0	1.0	7.0	0.5	1.5	0.4	15	Well milled
15%	≥55.0	–	≤17.0	≤2.0	≤0.5	≥6.5	≥3.0 – <6.5	5.0	1.0	7.0	1.0	2.0	0.4	15	Reason-ably well milled

Table 2 Standards for white broken rice

Grades	Grain composition (%)						Defect, not exceed (%)		
	Whole kernels	Whole kernels & > 6.5 parts of brokens	> 5.0 parts of brokens	< 6.5 parts of brokens & not pass through sieve No. 7	< 5.0 parts of brokens & not pass through sieve No. 7	Small Brokens C1	White glutinous rice		Foreign matter
							Total (including C1)	Small brokens C1	
A1 Extra Super	≤15	–	≥74.0	–	≤10	≤1.0	1.5	0.5	0.5
A1 Super	–	≤15.0	–	≥80.0	–	≤5.0	1.5	0.5	0.5

Table 3 Standards for brown rice

Grades	Grain composition (%)			Size of head rice (parts)	Size of Brokens (parts)	Rice and matter that may be present, not exceeding (%)						
	Whole kernels	Head rice	Brokens			Red kernels	Yellow kernels	Chalky kernels	White glutinous rice	Damaged kernels	Undeveloped, Immature kernel Other seed and foreign matter	Paddy
100% grade A	≥80.0	–	≤4.0	≥8.0	≥5.0 – <8.0	1.0	0.5	3.0	0.5	1.5	3.0	0.5
100% grade B	≥80.0	–	≤4.5	≥8.0	≥5.0 – <8.0	1.5	0.75	6.0	0.75	1.5	5.0	1.0
100% grade C	≥80.0	–	≤5.0	≥8.0	≥5.0 – <8.0	2.0	0.75	6.0	0.75	1.5	5.0	1.0
5%	≥75.0	–	≤7.0	≥7.5	≥3.5– <7.5	2.0	1.0	6.0	1.0	1.5	6.0	1.0
10%	≥70.0	–	≤12.0	≥7.0	≥3.5 – <7.0	2.0	1.0	7.0	1.0	1.5	7.0	2.0
15%	≥65.0	–	≤17.0	≥6.5	≥3.0 – <6.5	5.0	1.0	7.0	1.5	2.5	8.0	2.0

ANNEX B
SAMPLING

1. APPARATUS

1.1 Stick or sleeve type trier

1.2 Nobbe type trier

2. METHOD

2.1 Sampling from bags or sacks shall be done by using a trier in such a way that the composite sample collected from primary samples represent the commodity with lease insertions, according to the provision prescribed by AOSA, as follows;

2.1.1 In case of commodity is packed in bags or sacks not more than 6 units, composite sample shall be collected from the primary samples drawn from all bags or sacks.

2.1.2 In case of commodity is packed in bags or sacks more than 6 units, composite sample shall be combined from the primary samples drawn at random from 5 bags or sacks, plus 10% of the number of the total containers. If the last decimal of the calculated number is greater than one half, an increment upward to make a round figure is allowed.

2.2 Sampling in bulk shall be taken by using a sleeve-type trier. Insert the trier from the top middle and bottom positions, as follows:

Capacity(Kg.)	**No. of primary samples for a composite sample**
Less than 500	at least 5 primary samples
500 – 3,000	1 primary sample/300 Kg., but not less than 5 primary samples
3,000 – 20,000	1 primary sample/500 Kg., but not less than 5 primary samples
More than 20,000	1 primary sample/700 Kg.

However, it is not neccessary to take more than 30 primary samples per a pile of commodity.

ANNEX C
METHOD OF ANALYSIS

1. MOISTURE CONTENT

1.1 APPARATUS

1.1.1 Hot air oven

1.1.2 Balance, capable to weigh to the nearest 0.0001 g.

1.1.3 Desiccator

1.1.4 Grinder, capable to grind white rice to flour up to 80-100 mesh fineness.

1.1.5 Aluminum can with lid.

1.2 METHOD

1.2.1 Grind white rice kernels to flour with the grinder (1.1.4)

1.2.2 Dry an aluminum can with the lid underneath it (1.1.5) in an oven (1.1.1) at 130°C for 1 hour. Cool to room temperature in a desiccator. Weigh the can with lid and record the actual weight.

1.2.3 Puts an approximately 1 g. flour in the aluminum can (1.2.2). Weigh and record the actual weight.

1.2.4 Dry the can with flour (1.2.3) in the oven with the lid underneath at 130°C for 1 hour. Cool the can and lid to room temperature in the desiccator. Weigh and record the actual weight.

1.2.5 Calculate the percentage of the moisture content (M.C) from the following formula:

$$\text{M.C. } (\%) = \frac{(B - C)}{(B - A)} \times 100$$

If A = weight of aluminum can with lid.

B = weight of aluminum can with lid and flour before drying.

C = weight of aluminum can with lid and flour after drying.

2. FOREIGN MATTER IN PADDY

2.1 APPARATUS

2.1.1 Seed blower

2.1.2 Sieve

2.2 METHOD

2.2.1 Random paddy from a composite sample to get an approximately 100 g. of working sample and record the weight.

2.2.2 Sieve the working sample to separate heavy matter, such as, soil particle, sand, pebble and broken seed.

2.2.3 Clean the sieved sample in a seed blower (2.1.1) to separate light matter, such as, straw, pedicel and undeveloped kernel.

2.2.4 Any remaining foreign matter shall be sorted by visual examination. Then record the weigh of cleaned paddy. The percentage of foreign matter shall be calculated by the following formula:

$$\text{Foreign matter (\%)} = \frac{\text{Weight of paddy before cleaning} - \text{Weight of cleaned paddy}}{\text{Weight of paddy before cleaning}} \times 100$$

3. MILLING QUALITY

3.1 APPARATUS

3.1.1 Aspirator

3.1.2 Shelling machine, Satake

3.1.3 Whitener, Mc. Gill Miller No.2

3.1.4 Sizing Divider

3.2 METHOD

3.2.1 Clean paddy in an aspirator (3.1.1), to sort out undeveloped kernel, pedicel and foreign matter (heavy material should be separated by hand picking)

3.2.2 Determine moisture content, if it exceeds to 14%, the paddy must be dried to reduce the moisture.

3.2.3 Weigh a portion of 125 g. cleaned paddy.

3.2.4 Dehull the paddy with a shelling machine (3.1.2), record brown rice weight.

3.2.5 Mill the brown rice in a whitener (3.1.3) for 30 seconds with loading weight and another 30 seconds without loading weight. Cool at room temperature and record the white rice weight.

3.2.6 Separate white rice or milled rice into whole kernels, head rice and broken kernels in sizing divider (3.1.4), which comprises of sieve No.10 in upper part and sieve No. 135 in lower part.

3.2.7 Repeat separation the whole kernels, head rice and brokens by hand to get an accurate result.

3.2.8 Record the weight of whole kernels and head rice.

3.2.9 Calculate the percentage of hull, bran, whole kernels and head rice by the following formula:

$$\text{Hull (\%)} = \frac{\text{Wt. of paddy} - \text{Wt. of brown rice}}{\text{Wt. of paddy}} \times 100$$

$$\text{Bran (\%)} = \frac{\text{Wt. of brown} - \text{Wt. of milled rice}}{\text{Wt. of paddy}} \times 100$$

$$\text{Whole kernels and head rice (\%)} = \frac{\text{Wt. of head rice}}{\text{Wt. of paddy}} \times 100$$

Remarks: Continue operating a shelling machine and a whitener for a long time may introduce heating. It is recommended to stop operating at 10 samples interval.

4. AMYLOSE CONTENT

4.1 APPARATUS

4.1.1 Spectrophotometer

4.1.2 Balance, capable of weighing to the nearest 0.0001 g.

4.1.3 Magnetic stirrer.

4.1.4 Grinder, capable to grind white rice to flour up to 80-100 mesh fineness.

4.1.5 Volumetric flask, 100 ml.

4.1.6 Volumetric pipette; 1, 2, 3, 4 and 5 ml.

4.1.7 Measuring pipette; 1 – 10 ml.

4.2 REAGENTS

4.2.1 Ethyl alcohol, 95%

4.2.2 Sodium Hydroxide (NaOH), 2 N solution.

4.2.3 Glacial acetic acid, 1 N solution.

4.2.4 Iodine solution, containing 0.2 g. iodine (I_2) and 2.0 g. potassium iodide (KI) in 100 ml.

4.2.5 Pure amylose.

4.3 METHODS

4.3.1 Grind white rice in a grinder (4.1.4). Weigh 0.1000g. flour and put into a 100 ml. dry volumetric flask (4.1.5)

4.3.2 Add 1.0 ml. 95% ethyl alcohol (4.2.1); shake gently to spread the flour.

4.3.3 Add 9.0 ml. of 2 mol/l of Sodium hydroxide solution (4.2.2)

4.3.4 Stir the test solution on a magnetic stirrer (4.1.3) for 10 min.; add distilled water to the volume of 100 ml.

4.3.5 Add 70 ml. distilled water into another 100 ml. volumetric flask, and add 2.0 ml. of 1mol/l of glacial acetic acid solution (4.2.3) and 2.0 ml. iodine solution (4.2.4).

4.3.6 Pipette 5 ml. aliquot of the test solution (4.3.4) and put into the prepared volumetric flask (4.3.5), add distilled water to the volume of 100 ml., let stand for 10 min.

4.3.7 Measure the absorbance of the solution (4.3.6) at the wavelength of 620 nm. with spectrophotometer, setting the absorbance of the blank solution at zero (0).

4.3.8 Prepare the blank by adding 2.0 ml. glacial acetic acid and 2.0 ml. iodine solution, add distilled water to adjust the volume to 100 ml.

4.3.9 Evaluate the percentage of amylose by absorbance in accordance with the standard curve (4.4).

4.4 DETERMINE THE STANDARD CURVE

4.4.1 Weigh 0.0400 g. of amylose and put into a dry volumetric flask (4.1.5) and proceed the same procedure as in (4.3.2 – 4.3.4) to obtain a standard solution.

4.4.2 Prepare a set of 5 volumetric flasks with 100 ml. capacity. Add 70 ml. distilled water. Transfer 0.4, 0.8, 1.2, 1.6 and 2.0-ml. aliquot of glacial acetic acid solution (4.2.3) into the series of the flasks respectively. Add 2.0 ml. aliquot of iodine solution into each flask.

4.4.3 Transfer 1.0, 2.0, 3.0, 4.0 and 5.0 ml. aliquot of the standard solution (4.4.1) into the series of the flasks respectively (4.4.2), which are corresponding to 8%, 16%, 24%, 32% and 40% of amylose content respectively. Add distilled water to the volume to 100 ml. Measure the absorbance of the solution at the wavelength of 620 NM. with spectrophotometer, setting the blank at zero (0) absorbance, as mention in (4.3.7)

4.4.4 Plot the standard curve with absorbency of the standard solutions against amylose content (4.4.3)

4.4.5 Convert the absorbance of the sample solution to amylose content percentage according to the standard curve (4.4.4)

5. ADMIXTURE OF OTHER VARIETIES

5.1 ALKALI SPREADING VALUE

5.1.1 Apparatus

5.1.1.1 Balance, capable of weighing to the nearest 0.0001 g.

5.1.1.2 Oven

5.1.1.3 Volumetric flasks, 1,000 ml.

5.1.1.4 Petri dish with cover, 14.5 cm. diameter

5.1.4.5 Desiccator

5.1.2 Reagents

5.1.2.1 Potassium hydroxide pellet (KOH) 87%

5.1.2.2 Potassium hydrogen phthalate

5.1.2.3 Phenolphthalein

5.1.3 Preparation for 1.7% ± 0.05% Potassium hydroxide solution

5.1.3.1 There are 2 methods to prepare Potassium hydroxide solution

5.1.3.1.1 Directly prepare working solution

Dissolve 19.54 g. of potassium hydroxide pellet in cooled-boiled distilled water, and let cool down to room temperature; add distilled water to 1,000 ml. in a 1,000 ml.volumetric flask (5.1.1.3).

5.1.3.1.2 Prepare working solution from Stock solution.

5.1.3.1.2.1 Dissolve 588.2 g. potassium hydroxide pellet in cooled-boiled distilled water, and let cool down to room temperature; add distilled water to 1,000 ml. in a 1,000 ml. volume flask (5.1.1.3). This solution is used as Stock solution.

5.1.3.1.2.2 Dilute 33.0 ml. of the Stock solution (5.1.3.1.2.1) to 1,000 ml. with distilled water. This solution is used as working solution

5.1.3.2 Determine the concentration of working solution

5.1.3.2.1 Dry Potassium hydrogen phthalate at 130°C for 1 hour and let cool down in desiccator.

5.1.3.2.2 Weigh approximately 0.5000 g. of Potassium hydrogen phthalate (5.1.3.2.1) and record the exact weight.

5.1.3.2.3 Dissolve Potassium hydrogen phthalate (5.1.3.2.2) in 50 ml. of distilled water. Add 3 drops of 1% Phenolphthalein solution and tritrate the solution with the working solution to reach the end point, which the solution turns to pink color. Record the volume of working solution.

5.1.3.2.4 Prepare blank solution by the same way as 5.1.3.2.3, but without Potassium hydrogen phthalate.

5.1.3.2.5 Calculate the concentration of working solution, as following formula:

$$\% \text{ Potassium hydroxide} = \frac{P}{204.23} \times \frac{56.109}{V - B} \times 100$$

When V = Volume in ml. of working solution used for Potassium hydrogen phthalate titration

B = Volume in ml. of working solution used for blank titration

P = Weight of Potassium hydrogen phthalate in gram

5.1.4. Method

5.1.4.1 Sampling exactly 100 white rice kernels and put into a set of 4 petri dishes (25 kernels each). Place the dishes above a black board.

5.1.4.2 Add 100 ml. Potassium hydroxide solution into each petri dishes (5.1.4.1). Ensure that the kernels completely submerge in the solution and spread independently. Cover and let stand undisturbed at room temperature for 23 hours.

5.1.4.3 Rate the disintegration of the rice kernels in 5.1.4.2, according to the scale of alkali spreading value in table1.

Table 1 Alkali spreading value of white rice kernel

Scale of alkali spreading value	Spreading of the rice kernel
1	Rice kernel not affected
2	Rice kernel swollen
3	Rice kernel swollen, collar incomplete and narrow
4	Rice kernel swollen, collar complete and wide
5	Rice kernel split or segmented, collar complete and wide
6	Rice kernel dispersed, merging with collar
7	Rice kernel completely dispersed and intermingled

5.1.4.4 Evaluation

Rice kernels, those have the alkali-spreading value score of 1 – 5, are not considered as Thai Hom Mali Rice.

5.2 STAINING TEST (FOR PADDY AND BROWN RICE OR WHITE RICE CONTAINING SOME BROKENS)

5.2.1 Apparatus

5.2.1.1 Beaker or Plastic cups 100 ml.

5.2.1.2 Plastic dropper, 1 ml.

5.2.1.3 Volumetric flask, 100, 2,000 ml.

5.2.1.4 Pipette, 1-10 ml.

5.2.1.5 Brown bottle, 100 ml.

5.2.1.6 Cylinder, 50 ml.

5.2.1.7 Forceps

5.2.1.8 Tissue paper

5.2.1.9 Balance, capable of weighing to the nearest 0.01 g.

5.2.2. Reagents

5.2.2.1 Sodium hydroxide pellet (NaOH)

5.2.2.2 Glacial acetic acid

5.2.2.3 Potassium Iodide (KI)

5.2.2.4 Iodine (I_2)

5.2.2.5 Thymol blue

5.2.2.6 Ethyl alcohol 95%

5.2.2.7 Isopropyl alcohol 70%

5.2.2.8 Distilled water or deionized water

5.2.3 Preparation of working solution

5.2.3.1 Sodium hydroxide solution 1 N (NaOH): Dissolve 4.00 g. of NaOH (5.2.2.1) in approximate 80 ml. distilled or deionized water, transfer to 100 ml. volumetric flask, left cool and adjust to 100 ml.

5.2.3.2 Acetic acid solution 1 N: Dilute 6 ml. Glacial acetic acid (5.2.2.2) in distilled or deionized water, let it cool down to room temperature and fill up to 100 ml. in a volumetric flask.

5.2.3.3 Sodium hydroxide solution 0.05 N: Dilute 5 ml. 1 N of NaOH (5.2.3.1) in distilled water and fill up to 100 ml. in a volumetric flask.

5.2.3.4 Acetic acid solution 0.05 N: Dilute 5 ml. of 1 N Acetic acid solution (5.2.3.2) in distilled water and fill up to 100 ml. in a volumetric flask.

5.2.3.5 Working Solution: Mix 10 ml. of 1 N NaOH (5.2.3.1) and 10 ml. 1 N of Acetic acid (5.2.3.2), and fill up to 100 ml. in a volumetric flask.

5.2.3.6 Indicator solution: Weigh 0.10 g. Thymol blue (5.2.2.5) and dissolve in 53 ml. of 95% Ethyl alcohol. Add distilled or deionized water to 100 ml in a volumetric flask.

5.2.3.7 Iodine solution: Weigh 0.20 g. Iodine (5.2.2.4) and 2.00 g. Potassium Iodide (5.2.2.3) dissolve in 80 ml. distilled water. Let stand in dark room over night. Add distilled or deionized water to 100 ml in a volumetric flask. Keep this solution in brown bottle

Remark: This solution should be use before 2 months.

5.2.4 Method

5.2.4.1 Preparation for staining solution

5.2.4.1.1 Transfer an aliquot of 30-ml. working Solution (5.2.3.5) into a beaker.

5.2.4.1.2 Add 3 drops of indicator solution (5.2.3.6)

5.2.4.1.3 Put in drop by drop of 0.05 N NaOH (5.2.3.3) to get the end point (titration). The color of the solution changes from yellow to blue.

5.2.4.1.4 Put in drop by drop of 0.05 N Acetic acid (5.2.3.4) until the color change from blue to yellow again (back titration).

5.2.4.1.5 Add 1.5 ml. of Iodine solution (5.2.3.7) into the staining solution (5.2.4.1.4). This solution shall be used for staining white rice kernels.

5.2.4.2 Staining method

5.2.4.2.1 Sampling 3.0 g. newly milled rice and put in a 100 ml. beaker or plastic cup (5.2.1.1).

5.2.4.2.2 Add 15 ml. 70% Isopropyl alcohol (5.2.2.7) into the beaker or plastic cup. Swirl the liquid to wash the kernels surface for 45 seconds and decant the alcohol.

5.2.4.2.3 Add 15 ml. distilled water, swirl for 30 seconds and decant all the excess water.

5.2.4.2.4 Add 15 ml. staining solution (5.2.4.1), swirl for 45 seconds and decant the solution.

5.2.4.2.5 Wash the excess staining solution with water.

5.2.4.2.6 Place rice kernels on tissue paper (5.2.1.8) and remove the excess waters with tissue paper. Let dry for 5 minutes.

5.2.4.2.7 Sort the stained rice kernels with forceps (1.7) into 2 parts as:

Part 1 Light to pink color indicates low amylose or Hom Mali rice.

Part 2 Blue to dark purple color indicates high amylose or rice produces a hard texture cooked product.

5.2.4.2.8 Weigh both 2 parts of rice kernels.

5.2.4.2.9 Calculate percentage of admixture of other varieties in Hom Mali rice as follow:

$$\text{Admixture of other rice (\%)} = \frac{\text{Wt. of part 2 rice kernels}}{\text{Wt. of part 1 and part 2 rice kernels}} \times 100$$

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