PHILIPPINE NATIONAL STANDARD

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Industrial Crops – Coconut (Copra)

BUREAU OF PRODUCT STANDARDS

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Foreword

The formulation of the standard for Copra was an offshoot of the request of the Philippine Coconut Authority (PCA) to the Bureau of Agriculture and Fisheries Product Standards (BAFPS). This standard provides guidance consistent to the stringent requirements of developed countries especially in the European Union which is the major importer of Philippine coconut products.

The Philippine National Standard (PNS) for Copra was prepared by the Technical Working Group (TWG) created per Special Order No. 257 series of 2008. Prior to development of this standard, series of technical reviews and public consultations were conducted to gather inputs from different copra stakeholders. The draft standard was presented in the identified major copra producing/trading/processing areas particularly in Regions 11, 10 and Region 4B in collaboration with the coconut industry and the regional field offices of the PCA and the Department of Agriculture.

The PNS for Copra aims to provide common understanding on the scope of the standard, classification, tolerances, methods of sampling and analyses, packaging and labeling requirements, contaminants and hygiene.

1 Scope / coverage

This standard establishes a system of grading and classifying copra traded for direct domestic use or further processing into other products or for export.

2 References

The titles of the standard publications and other references of this standard are listed on the inside back cover.

3 Definitions

For the purpose of this standard, the following definitions apply.

3.1
aflatoxin
a group of toxic compounds generally produced by strains of the fungi, Aspergillus flavus and Aspergillus parasiticus on suitable hosts/substrates such as copra, corn, peanut and other oilseeds which cause severe human and animal diseases

3.2
aflatoxin related mold (ARM)
copra grades based on the presence of yellowgreen mold together with penetrating mold

3.3
coconut
the fruit of the coconut palm, scientifically known as Cocos nucifera Linn

3.4
copra
dried meat (kernel) of a coconut which serves as basic raw material for the extraction of coconut oil

3.5
extraneous matter
any unwanted material including dirt, dust, soil, insects or any other material/ substance present, adhered or incorporated to the copra

3.6
inferior copra
smoky, burnt, moldy or rubbery (‘copra goma’) copra

3.7
lot
a stated quantity or volume of the product which at the time of inspection, has uniform characteristics related to the following aspects: packer and / or dispatcher, country of origin, nature of the produce, class, size, variety or commercial type, type of package and presentation

3.8
moisture content (MC)
the amount of moisture (water) in the copra expressed in percent (%)

3.9
penetrating mold
mold that causes indentations or holes on the surface of the copra and can be visibly seen on the cross section of a split copra

3.10 ppb
unit to express the level or amount of aflatoxin in parts per billion

4 Minimum requirements

- well dried and clean;
- reasonably free from any visible extraneous matters, molds and insects and other contaminants defined in section 10; and
- reasonably free from rancid or objectionable odor.

5 Classification/Grading

5.1 Classification based on characteristic quality of copra

The following rules shall govern the determination of characteristic quality of copra:

Table 1 – Classification based on characteristic quality of copra

Parameters	Grade 1	Grade 2	Grade 3
Moisture content (%)	**[67.9]**	**[810.9]**	**[1113.9]**
Oil (%, min.)	62	60	58
Free fatty acid (as oleic, % max.)	0.5	4.0	5.0
Color of meat	clean, white to pale yellow	brown to dark brown	brown to dark brown
Extraneous matter (% max.)	0.25	0.75	1.0
Aflatoxin level (ppb, max.)	5	20	20
ARM (% max.)	0	10	20
Inferior copra (%. max)	0	10	20
Other specifications	free from smoke and other contaminants		

6 Tolerances

With the exemption of copra classified as Grade 1, five percent (5 %) by number or weight of the copra may fail to meet the requirements of the specified class or grade but shall conform to the requirements of the next lower grade.

7 Sampling and analysis

Method and procedures in sampling and analysis in this standard are listed on annex 1.

8 Packaging

Copra shall be packed in bags or any suitable container that will adequately protect the products from normal hazards of transportation and handling including rodents, birds, insects and fungus. Container must be clean, free from objectionable odor, and in good condition.

9 Marking / labeling

Each container shall be properly labeled with the following information:

9.1 Name of product “Copra”;
9.2 Grade, Lot Number or Batch number;
9.3 Net weight (in kg);
9.4 Name and address of producer or exporter;
9.5 Date of packaging; and
9.6 Product of the Philippines.

10 Contaminants

10.1 Heavy metals

Copra shall comply with those acceptable/tolerable residue levels for heavy metals established by the Codex Alimentarius Commission for this commodity.

10.2 Pesticide residues

Copra shall comply with those acceptable/tolerable residue levels for pesticide residues established by the Codex Alimentarius Commission for this commodity.

11 Hygiene

11.1 It is recommended that the product covered by the provisions of this standard be prepared and handled in accordance with appropriate sections of the Recommended International Code of Practice – General Principles of Food Hygiene (CAC/RCP 1 – 1969, Rev. 2 – 1985), and other relevant Codex texts such as Code of Practice for the Prevention and Reduction of Aflatoxin Contamination in Tree Nuts (CAC/RCP 59 – 2005, Rev. 12006).

11.2 The produce shall comply with microbiological criteria established in accordance with the Principles for the Establishment and Application of Microbiological Criteria for Foods (CAC/GL 21 – 1997).

Annex A

A.1 Sampling

A.1.1 Sampling of copra for the determination of MC

Sampling shall be undertaken in the presence of the supplier or a representative, if he/she so desires. Sampling shall be carried out using a 3/8" diameter steel spear. When handling deliveries in sacks, samples shall be taken through the sack wall prior to emptying. Sampling shall be taken evenly throughout the unloading such that the total accumulated weight is at least 500 grams. When handling loose copra from trucks, boats or conveyors, samples shall be taken at random throughout the unloading operation to give a total sample of at least 250 grams. When sampling from a heap of copra, the required number of samples shall be taken from the different sides and as far as possible at different depths within the heap.

The sampling rate for large quantities of copra being unloaded on conveyors from ships shall be at least 250 grams per 20 tons (approximately one truckload) of copra. Such samples maybe combined and subsampled for moisture analysis. The number of analyses carriedout shall be agreed between the buyer and the seller. After collection, all samples shall be wellmixed and transferred to airtight containers.

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A.1.2 Sampling of copra for the determination of physical characteristics (Extraneous matter, inferior copra, yellow green mold and penetrating mold)

The quantity and weight of the copra delivered is first taken. Sampling shall be done while the copra is being unloaded from trucks, boats, or conveyors and it is undertaken in the presence of the seller or his/her representative. Samples taken shall weigh a minimum of 9 kg and shall be obtained through the use of shovel. The shovel shall have dimensions approximately 30 cm X 30 cm such that it will take a sample of about 1.5 kg copra. When handling sacks, sample a number of sacks in each lot equal to the integral part of the square root of the total number of bags delivered (Refer to Table 2).

When sampling from a heap (pile) of copra, the required number of samples shall be taken from the different sides and as far as possible at different depths within the heap.

A.2 Analysis

A.2.1 Moisture content

A.2.1.1 Method

a) **The Brown duvel method of determination of moisture content in copra**

1) **Apparatus**

- BrownDuvel Moisture Tester (preferably electrically operated)
- Distilling Flask, 1000 mL capacity, glass

- Thistle tube , 350 mm long, glass
- Graduated cylinder, 25 mL, with 1 mL units
- Thermometer, 0 °C to 250 °C range, with 1 °C graduation
- Funnel, 15 cm diameter, plastic or aluminum
- Beaker, 250 mL capacity
- Dust separator, locally fabricated 5 mesh
- Strainer, ordinary, 15 cm diameter, mesh
- Weighing balance, accurate to ±0.2 grams

2) **Heat transfer oil**

The oil used must be moisture free.

- Capella Oil (Caltex)
- Vetria Oil (Shell)
- Univolt 60 (Petron)
- Refined and deodorized coconut oil

3) **Procedure**

- The final representative copra sample is mixed and placed in a mesh, locally fabricated dust separator where small pieces of copra dust and extraneous matters are removed.
- Check the weighing balance and set it to zero every time it is used.
- Weigh accurately one hundred grams (100 g) of representative copra sample and with the aid of an aluminum or plastic funnel, transfer the weighed sample into a clean and dry 1000 mL distilling flask.
- Measure 150 mL of heat transfer oil in a 250 mL beaker and slowly pour into the distilling flask.
- Allow the oil to settle by gently shaking the flask to attain a uniform level, and then cover the flask with a tightfitting rubber stopper with an inserted thermometer tip that is just touching the oil inside the flask.
- Open the water inlet in the condenser. If the water in the condenser is not continuously flowing, take note that it is always cold and at a level just below the thistle tube brim.
- Place the flask on a closed heater then turn the switch on. Take note that the boiling flask stem is slightly inclined towards the condenser and properly fitted to the thistle tube.
- Put a 25 mL graduated cylinder below the thistle tube, as a receiver of the moisture condensate.
- Heat the contents of the flask until the temperature reaches 200 °C. The heating time shall be 15 ±2 minutes.
- Allow the contents to cool until the thermometer reaches 160 °C.
- Disconnect the flask from the condenser.
- Remove the graduated cylinder from the thistle tube stem taking care that the last drop of moisture condensate fall inside the cylinder.
- Read the moisture content directly from the cylinder, disregarding the dark liquid portion on top. The cylinder shall be at eye level when taking the reading and the lower meniscus of the liquid viewed.

b) **Oven dry method**

1) **Apparatus**

- _____
- _____

2) **Other Materials**

- _____
- _____

3) **Procedure**

- The _____
- _____

A.2.2 Oil content

A.2.2.1 Apparatus

a) Soxhlet apparatus with a suitable thimble for containing 10 g of sample or other suitable extractor

b) Water bath

c) Glass mortar

A.2.2.2 Reagent

a) Petroleum ether, B.P. 400 °C - 60 °C

A.2.2.3 Procedure

a) Weigh accurately about 10 g of the sample dried under an electrical oven at 100 °C - 102 °C for a period of 2 hours in a thimble. Place the thimble in the Soxhlet extractor, or its equivalent, under which a weighed flask has been place, extract with petroleum ether for 6 hours. Remove the thimble from the extractor and dry it. Transfer the contents to a glass mortar and grind as finely as possible. Return the ground material to the thimble; wash out the mortar with petroleum ether and add to the extractor. Repeat the extraction with petroleum ether for another 2 hours. Evaporate off the solvent on water bath to remove all solvent. Dry the oil in an oven at 100 °C - 102 °C for 30 minutes. Cool in a desiccator and weigh. Repeat the process of 30 minute heating and cooling until the difference inweight between two successive weighing is less than 1 mg. Record the lowest weight. Oil content in dry basis is calculated as follows:

$$\text{Oil content, Dry basis (\%)} = \frac{100\ (W1W2)}{W}$$

where

W is the weight of the dried sample (g);
W1 is the weight of the Soxhlet flask with the extracted oil (g); and
W2 is the weight of the empty Soxhlet flask (g).

A.2.3 Free fatty acid (as oleic)

A.2.3.1 Apparatus

a) 250 cm^3 Erlenmeyer flask

A.2.3.2 Reagent, solution and preparation

a) Standard sodium hydroxide solution or potassium hydroxide solution - 0.1 mole/dm^3.

b) Phenolphthalein indicator solution prepared by dissolving 1 g of phenolphthalein in ethyl alcohol (95 % by volume) and dilute to 100 cm^3 with ethyl alcohol.

c) Mixture of ethyl alcohol and diethyl ether (1:1 by volume), neutralized to phenolphthalein with standard solution as clause A.2.3.2a).

A.2.3.3 Procedure

a) Weight accurately about 5 g of the oil extracted from clause 2.2 in a 250 cm^3 Erlenmeyer flask. Add 50 cm^3 of mixture in clause A.2.3.2c) and shake well to dissolve the oil. Add 2 to 3 drops of phenolphthalein indicator and titrate with standard sodium hydroxide or potassium hydroxide solution until a definite pink color persists for at least 15 seconds. Calculate the free fatty acid content as follows:

$$\text{Fatty acid, As oleic (\%)} = \frac{V \times N \times MW \times 100}{1000 \times W}$$

where

V is the volume of standard sodium hydroxide or potassium hydroxide solution , cm^3;
N is the normality of standard sodium hydroxide;
W is the weight of the oil (g); and
MW is the molecular weight of oleic acid.

A.2.4 Extraneous matter

A.2.4.1 Apparatus

a) Dust separator

b) Weighing balance, accurate to ± 0.2 grams

A.2.4.2 Procedure

In the absence of any built in dust separator system in the copra handling system, extraneous matter may be determined as follows:

a) The taken sample (minimum of 9 kg) is collected and put in a clean and dry container and weighed. The total sample is then transferred to a suitable sieve. The sieve is then shaken until it is judged that the bulk of the dust has passed through. The bulk copra sample is then examined to separate and collect other foreign materials (stone, hair, string, etc.) adhered to the copra.

b) The foreign material is then weighed on a balance having at least 10 g weighing divisions. Extraneous matter is calculated as follows:

$$\textbf{Extraneous matter (\%)} = \frac{\text{Weight of foreign material (g) X 100}}{\text{Total sample weight (kg) X 1000}}$$

A.2.5 Inferior copra

A.2.5.1 Apparatus

a) Weighing balance, accurate to ± 0.2 grams

b) Shovel, have dimensions approximately 30 cm x 30 cm

A.2.5.2 Procedure

From the samples used in B, a subsample is used and this will be obtained by cone--and-quartering as follows:

a) The whole sample is piled on the clean elevated flat surface and is well mixed with a shovel. The pile is then divided into 4 equal parts and opposite quarters are taken as the sub-sample. Further cone-and-quartering will be carried-out if the subsample exceeds the desired weight of between 4.5 kg and 5.0 kg.

b) Separate and collect the inferior copra from noninferior copra then weigh. Calculate the percentage of inferior copra as follows:

$$\textbf{Inferior copra (\%)} = \frac{\text{Weight of inferior copra (kg) x 100}}{\text{Total sub-sample weight (kg)}}$$

c) After the examination, return the inferior copra to the residual copra to remake the original sample which will be used in the succeeding examinations.

A.2.6 Yellow-green mold copra

A.2.6.1 Apparatus

a) Weighing balance, accurate to ± 0.2 grams

b) Shovel, have dimensions approximately 30 cm x 30 cm

A.2.6.2 Procedure

a) From the remake samples used in A.2.6, examine, collect then weigh the copra containing the yellowgreen aflatoxin forming mold – Aspergillus flavus. Take note that even the small area with yellow green mold is sufficient to classify the whole piece as yellow-green mold copra. Calculate the percentage of copra with yellow-green mold as follows:

$$\textbf{Yellowgreen mold copra (\%)} = \frac{\text{Weight of yellow-green mold copra (kg) X 100}}{\text{Sub-sample weight (kg)}}$$

A.2.7 Copra with penetrating mold

A.2.7.1 Apparatus

a) Weighing balance, accurate to ± 0.2 grams

A.2.7.2 Procedure

a) Copra is included in this category if there are molds penetrating the copra causing indentations or holes on the surface that are visibly seen on the cross section of a split copra. Copra showing clear signs of mold penetration from the residual sample in A.2.7 shall be separated and weighed. Calculate the percentage of copra showing mold penetration as follows:

$$\textbf{Copra with penetrated mold (\%)} = \frac{\text{Weight of penetrated copra (kg) X 100}}{\text{Sub-sample weight (kg)}}$$

A.2.8 Aflatoxin related mold (ARM) for grading copra

A.2.8.1 Procedure

a) ARM can be determined using the data gathered from A.2.7 and A.2.8. Take note that mold other that in D and E do not contribute to the percentage mold used for grading copra. Calculate the percentage ARM as follows:

ARM (%) = Yellow-green mold (%) + Penetrating mold (%)

Table 2 – Sampling scheme for copra delivered in sacks

Total number of sacks	Minimum number of sacks sampled	Individual sample weight (kg/Sack)
13	1	9.0
48	2	4.5
915	3	3.0
1624	4	3.0
2535	5	3.0
3648	6	1.5
4963	7	1.5
6480	8	1.5
8199	9	1.5
100120	10	1.5
121143	11	1.5
144168	12	1.5
169195	13	1.5
196224	14	1.5
225255	15	1.5
256288	16	1.5
289328	17	1.5
329360	18	1.5
361399	19	1.5
400	20	1.5

(Source: PCA, 2003)

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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