1. Scope

This standard prescribes quality specifications and safetyrequirements of raw dried seaweeds obtained from the class Rhodophyceae (red seaweeds) such as Euchema, Chondrus and Gigartina.

2. References

The titles of the standards and publications referred to in this standard are listed on the inside back cover.

3. Definitions

For the purpose of this standard, the following definitions shall apply:

3.1. General definitions

3.1.
Clean
Seaweed is free from dirt or other foreign matter

3.2.
Clean, reasonably
Seaweed exhibits unavoidable dirt and other foreign matter

3.3.
Cleaning
Means the removal of soil, food residues, dirt, grease or other objectionable matter from surfaces

3.4.
Contaminants
Any biological or chemical agent, foreign matter, or other substances that are not intentionally added to food, which may compromise food safety or suitability

3.5.
Damage/defect
Any defect, which materially affects the appearance, or the edible or shipping quality of seaweeds.

3.6.
Dehydration
Loss of moisture from the frozen product through evaporation

3.7.

Extraneous matter
Soil, residues and other dirt adhering on the seaweeds that impairs its quality.

3.8.
Mature
Presence of the fourth to fifth thallus.

4. Definition of Defectives

4.1. Ice-ice disease – characterized by general paling or loss of color in the early stages of infection.

4.2. Ephipytism / "Fouling" – presence of epiphytic or parasitic organisms which are attracted to the seaweeds for food requirements. This include algae, larval stages of mollusks, and other epiphytes.

4.3. Pitting – formation of cavity penetrating the cortex in one place and expanding in the medullar region.

4.4. Tip darkening – manifested by dark blackish tips.

4.5. Tip discoloration – change in tip color to pinkish which eventually soften, further discolor, become white and dissolve away.

4.6. Enlargement of the Thallus tips – tips have larger diameter than themed portion of the thallus, making the tips heavier than the usual weight.

4.7. Mud envelope – hardened mud wrapping of the thallus usually containing polychate worms inside the hardened mud.

4.8. Pest – presence of micro grazers which include Tripheustes and Ophiodesma spectabilis; macro grazers like mollusks, sea urchin, starfish, milkfish, rabbittfish, sea turtle.

5. Minimum Requirements

5.1. Raw dried seaweeds must be free of debris and epiphytes.

5.2. Raw dried seaweeds must be of one species only.

5.3. Raw dried seaweeds must be mature, having the presence of the 4^{th} to 5^{th} tahllus.

5.4. Raw dried seaweed must meet the following criteria as shown in Table 1.

Table 1. Specifications for Raw Dried Seaweeds

Criteria	Requirement (%)
Moisture	40% max
Clean Anhydrous weed (CAW)	35% min.
Tie-ties	0 (not present)
Extraneous weed	0 (not present)
Loose foreign materials	1% max
Sand and salt	24% max.
Maturity	Presence of the 4^{th} to 5^{th} thallus

6. Grading

Seaweed shall be graded according to its variety, general appearance, quality and condition.

6.1. Grade 1 – Similar varietal characteristics, free from decay, damages/ caused by pests, staining, dirt or foreign materials,

6.2. Grade 2 – Similar varietal characteristics, reasonably free from decay, damages, caused by pests, staining, dirt or foreign material

6.3. Grade 3 – Similar varietal characteristics, slightly free from decay, damages/ caused by pests, staining, dirt or foreign material.

7. Tolerances

Tolerances shall be allowed in each package for product not satisfying the requirements of the grade indicated.

7.1. Grade I - Five percent of the total weight of package of seaweeds is allowed for color and not more than 1% by count or weight of seaweeds for other defects shall fail to meet the requirements but shall conform to the requirements of the next lower grade.

7.2. Grade II – Ten percent of the total weight of package of seaweeds is allowed for color and not more than 2% by count or weight of seaweeds for other defects shall fail to meet the requirements but shall conform to the requirement of the next lower grade.

7.3. Grade III – Ten percent of the total weight of package of seaweeds is allowed for color and not more then 5% by count or weight of seaweeds for other defects shall fail to meet the requirements but shall conform to the requirements of the next lower grade.

8. Sampling

Sampling method to be used for ascertaining conformance to the requirements of this specification shall be in accordance with PNS ISO 874.

9. Packing

Seaweeds shall be packed in appropriate containers that will adequately protect the product from normal hazards of transportation and handling.

10. Marking or Labeling

Each container shall be legibly labeled with the following information:

10.1 Name of the product;

10.2 Grade, variety name;

10.3 Net weight in kilograms;

10.4 Brand name (if any);

10.5. Name of producer; and

10.6. The words “Product of the Philippines”.

11. Contaminants

The product shall comply with those maximum residue levels established by the Codex Alimentarius Commission and / or authority for this commodity.

12. Hygiene

It is recommended that the product covered by the provisions of this standard be prepared and handled in accordance with the appropriate sections of the recommended international code of practice – General Principles of Food Hygiene (CAC/RCP 1 – 1969, Rev. 3 – 1997, Amd. (1999) and other relevant Codex texts such as Codes of Hygiene Practice and Codes of Practice.

REFERENCES

Palma, Hector A. Seaweed Farming Systems, 2nd Mindanao Seaweed Congress. Zamboanga City. April 25-26, 2001.

Philippine Fisheries Profiles

Aqua Farm News. SEAFDEC Publication Volume IX No. 6. November – December 1991.

1. Scope

This standard specifies the quality requirement and methods of physico-chemical and microbial tests for Carrageenan and Processed Eucheuma Seaweed (PES) obtained from seaweeds of the class lihodophyceae (red seaweeds) commonly used as emulsifier, binder, thickener, gelling agent or stabilizer.

2. References

The references referred to in this standard are listed in the back cover.

3. Definitions

3.1 Carrageenan or Traditionally Refined Carrageenan (TRC) INS No. 407 or E 407

A refined hydrocolloid prepared by water or dilute alkali extraction from the following members of the families Gigartinaceae and Solieriaceae of the class Rhodophyceae (red seaweed); Eucheuma cottonii, E. spinosum,, Chvndrus crispus, C ocellaius, Gigartina acicularis, G. stellata, G pistillata and G. radula, Kappaphycus spp,, Iridaea, Hypnea, Furcellaria fastigiata.

NOTE' - Eucheuma cottonii (known in commerce as "cottonii" type) now refers to Kappaplrycus spp„ Eucheuna spinosum (the "spinosum" type) is correctly termed as Eucheuma denticulatcan

3.2 Processed Eucheuma Seaweed (PES) INS No. 407a or E407a

A semi-refined hydrocolloid from red seaweeds treated with alkali at a certain concentration and temperature; for food and non-food applications known also as Philippine Natural Grade (PNG), Semi-Refined Carrageenan (SRC), Alternatively Refined Carrageenan (ARC), Alkali-Modified Flour (AMF), Processed Seaweed Flour (PSF) and Alkali-Treated Carrageenophyte (ATC)

4. Technical Description

Carrageenan is a hydrocolloid 'consisting mainly of the ammonium, calcium, magnesium, potassium and sodium sulfate esters of galactose and 3,6-anhydrogalactose copolymers. These hexoses are alternately linked a-1,3 and B-1,4 in the polymer. The relative proportions of cations existing in carrageenan may be changed during the processing to the extent that one may become predominant.

The prevalent copolymers in the hydrocolloid are designated as kappa-, iota-, and lambda-carrageenan. Kappa-carrageeenan is mostly the alternating polymer of D-galactose 4-sulfate and 3,6-anhydro-D-galactose; iota-carrageenan is similar, except that the 3,6-anhydrogalactose is sulfated at carbon 2. Between kappa-carrageenan and iota-carrageenan there is a continuum of intermediate compositions differing in degree of sulfation at carbon 2. In lambda-carrageenan, the alternating monomeric units are mostly D-galactose-2-sulfate (1,3-linked) and D-galactose2,6 disulfate (1,4-linked).

Carrageenan may be produced by commercially available process detailed in Annex C.

Articles of commerce may be diluted with sugars for standardization purposes. Mixed with salts to obtain specific gelling or thickening characteristics or may contain emulsifiers carried over from drum drying processes. Carrageenan is a yellowish or tan to white, coarse-to fine powder that is practically odorless. Kappa and Iota are soluble in water at a temperature of 80°C while Lambda is soluble in water at room temperature.

PES is a hydrocolloid that may contain up to 15% algal cellulose and minor amounts of other insoluble matter in addition to the above description.

5. Requirements

5.1. Identification

Carrageenan and PES shall be identified for the characteristics specified in Table 1 when determined with the test methods specified therein.

Table1. Characteristics/Identification for Carrageenan and PES

Characteristics	Test Method
Solubility in Water	FCC 112"d supplement
Insolubility in alcohol	FCC II 2nd supplement
Identification of hydrocolloid and predominant type of copolymer	FCC 112 nd supplement
Infrared absorption spectra	FCC TI 2nd supplement

5.2. Quality Requirements

Carrageenan and PES shall conform to the requirements specified in Table 2 and Table 3 when tested with the methods specified therein.

6. Conditions of Manufacture

Carrageenan and PES shall be manufactured under the hygienic conditions in accordance with PNS 96.

7. Packaging

Carrageenan and PES shall be packed in inert material to prevent contamination and provide protection.

8. Sampling
Carrageenan and PES shall be sampled in accordance with Annex B

Table 2 - Physico-Chemical Requirements for Carrageenan and PES

Properties/Contaminants	Limits		Test method
	PES	TRC	
Loss on drying (105°C to constant weight) For powder, max. For chips, max.	12% 15%	12%	See list in Annex D
Residual alcohol, max	0.1%	0.1%	See list in Annex D
pH (for 1% concentration)	8-11	8 - 11	See list in Annex D
Viscosity of 1.5% (solution at 75°C), min.	5 mPa/s	5 mPa/s	See list in Annex D
Sulfate (as SO4)	15%- 40%	15%- 40%	See list in Annex D
Total ash (on dry weight basis)	15/o ° - 30%	° 15/o - 40%	See list in Annex D
Acid-insoluble ash, %, max	1.0%	1.0%	See list in Annex D
Acid Insoluble Matter	8%- 15%	2 %, max	See list in Annex D
Arsenic, max	3 mg/kg	3 mg/kg	See list in Annex D
Lead, max	5 mg/kg	2 mg/kg	See list in Annex D
Mercury, max	1 mg/kg	I mg/k	See list in Annex D
Cadmium, max	2 mg/kg	2 mg/kg	See list in Annex D

Table 3 - Microbiological Requirements

Microorganisms	Limits		Test method
	PES	TRC	
Total Plate count Aerobic plate count), max	5000 cfu/g	5000 cfu/g	AOAC 966.23C & AOAC 977.27
Yeast and mold, max	100 cfu/g	100 cfu/g	PNS 579/ISO 7954
E. Coli	Negative in lg	Negative in lg	PNS 581/ISO 7251
Salmonella Spp.	Negative in 25g	Negative in 25g	

Note - Colony forming unit (CFU) is equivalent to colonies per gram.

9. Labelling

9.1 Each package of carrageenan shall be labeled with the following information:
9.1.1 Name of product
9.1.2 Name and address of manufacturer/processor 9.1.3 Lot/batch number
9.1.4 Net mass in kilogram

9.2 The following information are recommended to be included on the label: 9.2.1 Precautionary measure such as:
   a. "Store in a cool and dry place"
   b. "Use no hook"
9.2.2 Type or code

Annex A

Determination on Loss on Drying

A1. Apparatus

Thermally controlled drying oven.

A2. Procedure

A2.1 A given amount of seaweed (25g - 100 g) is dried to constant mass at a temperature of 105°C.

A2.2 Percentage moisture is calculated with the formula:

$$PercentageMoisture = \frac{Wo - Wf}{Wo} x100$$

Where:

Wo - is the original mass
Wf - is the final mass

Annex B
Sampling

B1. Definitions

For the purpose of this sampling method, the following definitions shall apply:

B1.1 Consignment - the quantity of goods duplicated or received at one time and covered by a particular contract or shipping document. The consignment may be made up of one or more lots or parts of lots.

B1.2 Lot - a lot shall consist of products of the same material and manufactured under similar conditions or a state quantity of the consignment, presumed to be of uniform characteristics, taken from the consignment.

B1.3 Primary sample - a small quantity of carrageenan, taken at one time from point in a single container.

B1.4 Bulk sample - the quantity of carrageenan sample obtained by bringing together the primary sample from different positions in the lot.

B1.5 Laboratory sample - a prescribed quantity of carrageenan taken from the bulk ..after thoroughly mixing and quartering the primary samples. It is representative of the quality of the lot.

B2. General

B2.1 Sampling shall be carried out by a person appointed by agreement between buyer and seller and., if desired by either of them, in the presence of the buyer (or his representative) and of the seller (or his representative).

B2.2 In taking, preparing, storing and handling the samples, care shall be taken that the properties of the product are not affected. The following precautions and directions shall be observed.

B2.2.1 Samples shall be taken in a protected place not exposed to damp air, dust or soot. B2.2.2 The sampling apparatus shall be clean and dry.

B2.2.3 Precautions shall be taken to protect the samples, the product being sampled and the sample containers from adventitious contamination.

B3. Apparatus

B3.1 Taking samples - spoons, scoop, borers or other instruments suitable for taking samples from the interior of containers.

B3.2 Mixing and dividing - apparatus suitable for the purpose of mixing and quartering the bulk samples to obtain the laboratory samples.

B4. Constitution of lots

All the containers in a single production or consignment of carrageenan.

B5 Method of Taking Primary Sample

B5.1 Sampling from bags during packaging or (before sealing).

Take with the appropriate apparatus mentioned in B3, 50 g sample from every fifth bag filled from the bim and before sealing.

B5.2 Sampling from lot/stationary stock.

Sampling from stationary stock depends on the size of the lot and shall be in accordance with Table A.

Table A - Sampling from stationary stock

Lot Size (N)	Number of containers to be taken for sampling
1 to 5 containers	All containers
6 to 49 containers	5 containers
50 to 100 containers	10% of the containers
Over 100 containers	The square root of the number of containers, rounded to the nearest whole number

These containers should, as far as possible, be taken at random from the lot and, in order to achieve this, a random number table, agreed upon between the buyer and seller, should be used. If such a table is not available, the following procedure shall be adopted:

Starting from any container, count the containers as 1, 2, 3, ...etc up to r and so on. Withdraw from the lot every rth container thus counted for sampling; the value of r is equal to

$$r = \frac{N}{n}$$

where:

N is the total number of containers in the lot;

n is the number of containers to be taken (see table).

If r is a fractional number, its value shall be taken as equal to the integral part of it.

B5.3 When the product is in movement, samples may be taken at the time of loading or unloading of the containers. For this purpose, the number of containers to be taken shall also be in accordance with the table. The value of r shall be calculated as. indicated above, and every rth container counted during loading or unloading shall be removed for sampling.

B5.4 Take primary samples by means of an appropriate sampling instrument, from different parts of each container selected.

B5.5 A series of primary sample is taken from different positions in the lot. B6 Bulk sample

B6.1 Thoroughly mix all the primary sample taken as described above to form the bulk sample.

B6.2 The size of the bulk sample shall be four times or more of the quantity of sample required to carry out all the tests required in the specification.

B7. Laboratory samples

Divide the sample into four equal parts, according to the number of laboratory samples required. Laboratory sample shall be 200g - 500 g. Each part thus obtained constitute a laboratory sample: one of these samples is intended for the buyer and another for the seller. The third sample, bearing the seals of the buyer and of the seller (or of their representatives) if they were present at the time of sampling or of the person who sampled the lot, shall constitute the reference sample to be used in case of dispute between the buyer and seller; it shall be kept at a place acceptable to both parties.

B8. Packaging and labeling of samples B8.1 Packaging of samples

The laboratory samples shall be placed in clean, dry, airtight glass containers or other suitable containers which do not react with the product. The sample container shall be of such a size that they are almost completely filled by the sample. Each sample container, after filling, shall be made airtight by means of a stopper or other suitable closure, and sealed in such a way that it cannot be opened and re-scaled without detection.

B8.2 Labeling of samples

B8.2.1 The laboratory samples shall be labeled to give information concerning the sample and full details of the sampling i.e.

B8.2.1.1 The date of sampling

B8.2.1.2 The name and address of the person taking the sample; B8.2.1.3 The name of the product;

B8.2.2 If any defect is found at the time of sampling, a record of this shall be included in the details of sampling given on the sample container.

B8.3 Storage and dispatch of samples

B8.3.1 The laboratory samples shall be stored in such manner that the temperature of the product does not vary unduly from the normal atmospheric temperature. Samples which are required to be kept for a long time shall be stored in a cool and dark place.

B8.3.2 Laboratory samples on which an analysis is to be carried out shall be dispatched to the laboratory as soon as possible.

B9. Sampling report

If a sampling report is prepared, besides giving the usual information, it shall make reference to the condition of the carrageenan sampled to the technique applied if this is other than that described in this standard and to any circumstances that may have influenced the sampling.

Annex C
(Informative)
Processes for Carrageenan and PES

C1. Carrageenan is obtained by extraction from seaweed into water or aqueous dilute alkali. Carrageenan may be recovered by alcohol precipitation, by drum drying, or by precipitation in aqueous potassium chloride and subsequent freezing. The alcohols used during recovery and purification are restricted to methanol, ethanol and isopropanol. Articles of commerce may include sugars for standardization purposes, salts to obtain specific gelling or thickening characteristics, or emulsifiers carried over from drum drying processes.

C2. PES is obtained by soaking the clean seaweed in alkali for a period of time at controlled temperatures. The material is then thoroughly washed with water to remove residual salts and excess alkali followed by drying and milling.

Annex D
Test Methods

Properties/Contaminants	Test Method
Residual Alcohol	Joint FAO/WHO Expert Committee on Food Additives. 57`h Session. 2001. Compendium of Food Additive Specifications Addendum 9. Food and Agriculture Organization of the United Nations, Ital 16-17, 84
pH	Joint FAO/WHO Expert Committee on Food Additives. Combined Compendium of Food Additive Specifications. Volume 4. Analytical methods, test procedures and laboratory solutions used by and referenced in the food additive specifications. 2006. Food and Agriculture Organization of the United Nations, Rome. pp. 36-38
Viscosity of 1.5% (solution at 75°C	Joint FAO/WHO Expert Committee on Food Additives. 57' Session. 2001. Compendium of Food Additive Specifications Addendum 9. Food and Agriculture Organization of the United Nations, Italy. pp. 16, 83-84
Loss on drying (105°C to constant weight)	Joint FAO/WHO Expert Committee on Food Additives. Combined Compendium of Food Additive Specifications. Volume 4. Analytical methods, test procedures and laboratory solutions used by and referenced in the food additive specifications. 2006. Food and Agriculture Organization of the United Nations, Rome. p. 61
Sulfate (as S04)	Joint FAO/WHO Expert Committee on Food Additives. 57th Session. 2001. Compendium of Food Additive Specifications Addendum 9: Food and Agriculture Organization of the United Nations, Italy. p. 15-16, 83
Total Ash	Joint FAO/WHO Expert Committee on Food Additives. 57th Session. 2001. Compendium of Food Additive Specifications Addendum 9. Food and Agriculture Organization of the United Nations, Italy, p.16, 83
Acid -insoluble ash, 1%	Joint FAO/WHO Expert Committee on Food Additives. Combined Compendium of Food Additive Specifications. Volume 4. Analytical methods, test procedures and laboratory solutions used by and referenced in the food additive specifications. 2006. Food and Agriculture Organization of the United Nations, Rome. . 54
Acid Insoluble Matter	Joint FAO/WHO Expert Committee on Food Additives. Combined Compendium of Food Additive Specifications. Volume 4. Analytical methods, test procedures and laboratory solutions used by and referenced in the food additive specifications. 2006. Food and Agriculture Organization of the United Nations, Rome. p. 51

Arsenic	Joint FAO/WHO Expert Committee on Food Additives. Combined Compendium of Food Additive Specifications. Volume 4. Analytical methods, test procedures and laboratory solutions used by and referenced in the food additive specifications. 2006. Food and Agriculture Organization of the United Nations, Rome. p. 68
Lead	Joint FAO/WHO Expert Committee on Food Additives. 570' Session. 2001. Compendium of Food Additive Specifications Addendum 9. Food and Agriculture Organization of the United Nations, Italy. p.17-18, 84-85
Mercury	Joint FAO/WHO Expert Committee on Food Additives. 570' Session. 2001. Compendium of Food Additive Specifications Addendum 9. Food and Agriculture Organization of the United Nations, Italy. pp. 18-20, 86-87
Cadmium	Joint FAO/WHO Expert Committee on Food Additives. 57th Session. 2001. Compendium of Food Additive Specifications Addendum 9. Food and Agriculture Organization of the United Nations, Italy. p.19, 85-86

References

FNS 96:1985 - Code of Practice in the Manufacturing, Processing and Holding Human Food (BFAD GMP)

PNS 579:1991/ ISO 7954:1987 Microbiology - General guidance for enumeration of yeast and moulds - Colony count technique at 25° C

PNS ISO 7251:2005 (ISO published 2005) Microbiology of food and animal feeding stuffs -- Horizontal method for the detection and enumeration of presumptive Escherichia coli -- Most probable number technique

PNS 590:2007 / Official Methods of Analysis of AOAC International (2005) 18th Ed., AOAC INTERNATIONAL, Gaithersburg, MD, USA: Official Method 966.23C and 977.27.

Joint FAO/WHO Expert Committee on Food Additives. Combined Compendium of Food Additive Specifications, Volume 4. Analytical methods, test procedures and laboratory solutions used by and referenced in the food additive specifications. 2006. Food and Agriculture Organization of the United Nations, Rome

Joint FAO/WHO Expert Committee on Food Additives. 57th Session. 2001. Compendium of Food Additive Specifications Addendum 9. Food and Agriculture Organization of the United Nations, Italy

FCC III 1st supplement - Carrageenan