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Tropical fruit wines – Specification



BUREAU OF PRODUCT STANDARDS

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Foreword

The need for more standards for our Philippine ethnic foods transpired during the round table discussion on the processed food exports. The development of the standard aims to set the high standard of the product, provide guide for the assurance of its quality and safety, harmonize export requirements, and prepare the products to be more competitive in the world market.

The project entitled "Development of Standards for Ethnic Food Products" developed several food standards. One of these standards was the Standard for Tropical Fruit Wines and the Recommended Code of Practice for the Processing and Handling of Tropical Fruit Wines.

The development includes different phases among others the analysis of fruit wines conducted by the DOST-CAR Regional Standards and Testing Laboratory and the analysis of the container used done by the FDA.

The Standard was reviewed, finalized and endorsed for adoption by the Food and Drug Administration as the Philippine National Standard and Recommended Code of Practice.

Public consultation workshop was held in the Cordillera Autonomous Region where the production of the products is common. Concerned stakeholders from different agencies and offices attended the workshop and contributed their expertise for the finalization of the draft.

Tropical fruit wines – Specification

1 Scope

This standard shall apply to wines prepared by alcoholic fermentation of juice obtained from one or more tropical fruits.

2 References

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

3 Definition of terms

For the purposes of this standard, the following terms shall mean:

3.1**adjunct**

it is a plant-derived product added to alcoholic beverages to contribute to their flavor and color

3.2**aging**

it is the process of storing of wine in a sealed container after fermentation to improve its quality

3.3**brix**

it is the concentration of sugar in syrup corresponding approximately to concentration of solutes expressed in percentage as measured with a refractometer or hydrometer and expressed in °Brix units

3.4**container**

it is any form of packaging material, which completely or partially encloses the food (including wrappers). A container may enclose the food as a single item or several units of types of prepackaged food when such is present for sale to the consumer

3.5**contaminant**

it is any biological or chemical agent, foreign matter, or other substances that are not intentionally added to food, which may compromise food safety and suitability

3.6**current Good Manufacturing Practices (cGMP)**

it is a quality assurance system aimed at ensuring that products are consistently manufactured, packed or repacked or held to a quality appropriate for the intended use. It is thus concerned with both manufacturing and quality control procedures

3.7

ethanol

it is light, volatile alcohol produced during fermentation of sugars

3.8

fermentation

it is a metabolic process of converting reducing sugars into ethanol by yeast (*Saccharomyces* spp.)

3.9

food

it is any substance, whether semi-processed or raw, which is intended for human consumption, and includes drink, chewing gum and any substance which has been used in the manufacture, preparation or treatment of "food" but does not include cosmetics or tobacco or substances only used as drugs

3.10

food additive

it is any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food (including substance intended for use in the producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding of food; and including any source of radiation intended for any such use), if such substance is generally recognized, among experts qualified by scientific training and experience to evaluate its safety, as having been adequately shown scientific procedures to be safe under the conditions of intended use (R.A. 3720. Food, Drug and Cosmetic Act)

3.11

food standard

it is a regulatory guideline that defines the identity of a given food product (i.e. its name and the ingredients used for its preparation) and specifies the minimum quality factors and when necessary, the required fill of the container. It may also include specific labeling requirements other than or in addition to the labeling requirements generally applicable to all prepackaged foods

3.12

ingredient

it is any substance including food additive, used as a component in the manufacture or preparation of a food and present in the final product in its original or modified form

3.13

label

it includes any tag, brand, mark, pictorial or other descriptive script, written, printed, marked, embossed or impressed on, or attached to the container

3.14

lot

it is food produced during a period of time and under more or less the same manufacturing condition indicated by a specific code

3.15

pasteurization

it is a heat treatment process applied to a product with the aim of avoiding public health hazards arising from pathogenic microorganisms. Pasteurization, as a heat treatment process, is intended to result in only minimal chemical, physical and sensory changes

3.16

packaging

it is the process of packing that is part of the production cycle applied to a bulk product to obtain a finished product. Any material, including printed material, employed in the packaging of a product including any outer packaging used for transportation of shipment. Packaging materials are referred to as primary or secondary according to whether or not they are intended to be in direct contact with the product

3.17

pH

it is the intensity or degree of acidity of a food material

3.18

processing aids

these are additives that are used in the processing of food to achieve a specific technological purpose and which may or may not result in the presence of residues or derivatives in the final product (BFAD A.O. No. 88-A s. 1984)

3.19

potable water

it is water fit for human consumption and potability determined by health authorities cited in Philippine National Standards for drinking water (Department of Health A. O. No. 2007-0012. Philippine National Standards for Drinking Water 2007)

3.20

refractometer

it is the instrument used to measure the percent soluble solids of sugars referred to as degree Brix ($^{\circ}\text{Bx}$); concentration of sugars expressed in terms of number of grains of sucrose per 100g of liquid

3.21

total acidity (of wine)

it is the sum of all titratable acidities of the wine when it is titrated to pH 7 against a standard alkaline solution using phenolphthalein indicator, it is amount of organic acids derived from the raw materials or produced during alcoholic fermentation, and expressed as grams of acid per 100 mL of sample

3.22**volatile acidity (of wine)**

it is the amount of steam-distillable acids present in the wine which is attributed to the growth of acetic acid bacteria and sometimes of yeasts; used as an indicator of spoilage and expressed as grams acetic acid per 100 mL of sample

3.23**wine**

it is an alcoholic beverage produced by the natural fermentation of the juice of grapes or other fruits or of the fermentable parts of plant or plant-related products; it contains 7 to 24% alcohol by volume and may contain certain optional ingredients

4 Description of products**4.1 Product definition**

Tropical fruit wines are prepared through the alcoholic fermentation of juices extracted from sound and mature varieties of tropical fruits listed in, but not limited to annex 1, including those fortified with alcohol from other food sources, made effervescent with carbon dioxide, and with or without the addition of food additives.

4.1.1 Sparkling fruit wine – Fruit wine made effervescent with carbon dioxide produced from secondary fermentation within a closed container, tank, or bottle, or from a carbonating agent; and has an actual alcoholic strength of not less than 8.5 % by volume.

4.1.2 Fortified fruit wine – Fruit wine added with alcohol from other food sources. It has an actual alcohol content of not less than 14.0 % alcohol by volume.

4.2 Process definition

The product shall undergo a fermentation process followed by aging, may be pasteurized, and shall be filled in any suitable container sufficient to ensure quality and shelf life stability at ambient conditions.

5 Essential composition and quality factors**5.1 Raw materials****5.1.1 Basic ingredients**

5.1.1.1 Fruit juice – The fruit juice to be used shall be obtained from sound and mature fresh or processed fruits listed in, but not limited to annex 1, that are fit for human consumption.

5.1.1.2 Inoculum – A starter culture essentially made up of yeast cells belonging to genus *Saccharomyces* and may include other fermenting microorganisms.

5.1.1.3 Potable water – Water fit for human consumption.

5.1.2 Optional ingredients

Other food grade ingredients may be added, such as refined sugar, processed fruit juices, and adjuncts.

5.2 Quality criteria

5.2.1 General requirements

The tropical fruit wine shall have the characteristic color, aroma and flavor of fermented fruit juice and should be free from objectionable sensory characteristics.

5.2.1.1 Alcohol content

The alcohol content shall be composed mostly of ethyl alcohol and shall not be less than 7 % (v/v) and not more than 24 % (v/v),

5.2.1.2 Methanol

The methanol content shall be in accordance to the provisions of BFAD M.C. No. 13 s 1989: Methanol may be present in alcoholic beverages provided that it shall be derived from the natural alcohol fermentation process and not added.

5.2.1.3 pH

The pH of the finished product shall not be less than 3.0 and not more than 4.0.

5.2.1.4 Total acidity

The total acidity shall not be less than 0.6 % and not more than 0.9 %.

5.2.1.5 Soluble solids

The soluble solids of the finished product shall not be less than 8.0 % m/m, as determined by a refractometer at 20 °C, uncorrected for acidity and read as °Brix on the International Sucrose Scales.

5.2.1.6 Volatile acidity

The volatile acidity (expressed as acetic acid) shall not exceed 0.14 g/100 mL.

5.2.2 Types of defects

5.2.2.1 Foreign matter

The presence in the sample unit of any matter, which has not been derived from any of the ingredients or from the processing aids used, does not pose a threat to human health and is readily recognized without magnification, or is present at a level determined by magnification method or any equivalent methods that indicates non-compliance with good manufacturing practices and sanitation practices.

5.2.2.2 Odor/flavor/color

A sample unit affected by objectionable odors or flavors indicative of decomposition and unacceptable discoloration due to product deterioration.

5.2.3 Classification of “defectives”

A container that has any of the type of defects set in 4.2.2 shall be considered “defective”.

5.2.4 Lot acceptance

A lot will be considered as meeting the applicable quality requirements when the number of “defectives”, as defined in sub-section 4.2.3, does not exceed the acceptance number of the appropriate sampling plan.

6 Food additives

Food additives when used shall be in accordance with the regulations established by the Bureau of Food and Drugs (BFAD) (Bureau Circular No. 016 s.2006. Updated List of Food Additives), the Codex Alimentarius Commission and/or authority for these products.

The following food additives listed in, but not limited to, table 1, may be used for the manufacture of tropical fruit wines:

Table 1 – Food Additives for Tropical Fruit Wines (BC No. 016 s. 2006).*

Function	Name	Maximum level
A. Acidity regulator	Calcium malate	GMP
	Calcium sulfate	2000 mg/kg
	Citric acid	700 mg/kg
	Fumaric acid	3000 mg/kg
	Lactic acid	GMP
	Malic acid (DL-)	GMP
	Potassium carbonate	5000 mg/kg
	Potassium dihydrogen citrate	3000 mg/kg (for use in cooler-type products only)
	Potassium hydrogen carbonate	5000 mg/kg
B. Antifoaming agent	Polydimethylsiloxane	10 mg/kg
C. Anticaking agent	Aluminum silicate	GMP
	Calcium aluminium silicate (synthetic)	GMP
	Silicon dioxide (amorphous)	17 mg/kg
	Sodium aluminosilicate	GMP
D. Antioxidant	Ascorbic acid	200 mg/kg
	Calcium ascorbate	GMP
	Erythorbic acid	GMP
	Ferrocyanides	GMP (as anhydrous sodium ferrocyanide)
	Glucose oxidase	GMP
	Mineral oil	GMP (for use as a float on fermentation fluid to prevent contamination)

Function	Name	Maximum level
	Potassium ascorbate	GMP
	Sodium ascorbate	200 mg/kg
	Sodium erythorbate	GMP
	Sorbates	2000 mg/kg (as sorbic acid)
	Tocopherols	150 mg/kg (for use in cooler-type products only)
	Tripotassium citrate	3000 mg/kg (use level reported as 25 lbs/1000 gal x (0.45 kg/lb) x (1 gal/3.75 L) x (1 L/kg) x (106mg/kg) = 3000 mg/kg)
E. Carbonating agent	Carbon dioxide	GMP
F. Color	Allura Red AC	200 mg/kg
	Amaranth	30 mg/kg
	Annato Extracts	GMP
	Azorubine	200 mg/kg
	Beet Red	GMP
	Brilliant Black PN	200 mg/kg
	Brilliant Blue FCF	200 mg/kg
	Brown HT	200 mg/kg
	Canthaxanthin	5 mg/kg
	Caramel Color, Class I	GMP
	Caramel Color, Class III	GMP
	Caramel Color, Class IV	GMP
	Carmines	200 mg/kg
	Carotenes, Vegetable	GMP
	Carotenoids	200 mg/kg
	Chlorophylls	GMP
	Chlorophylls, Copper Complexes	GMP
	Curcumin	200 mg/kg
	Grape Skin Extract	GMP
	Indigotine	200 mg/kg
Iron Oxides	GMP	
Ponceau, 4R	200 mg/kg	
Tannic acid (tannins, food grade)	200 mg/kg	
G. Emulsifier/Stabilizer/ Thickener	Agar	GMP
	Bromelain	GMP
	Calcium alginate	4000 mg/kg
	Calcium carbonate	3500 mg/kg
	Carob Bean Gum	500 mg/kg
	Carrageenan	
	Diacetyltartaric and Fatty Acid Esters of Glycerol	GMP
	Ethyl maltol	100 mg/kg
	Gellan Gum	GMP
	Guar Gum	500 mg/kg
	Gum arabic	500 mg/kg
	Insoluble Polyvinylpyrrolidone	7910 mg/kg (added level; residue not detected in ready-to-eat food)
	Karaya Gum	500 mg/kg
	Konjac Flour	GMP
	Maltol	250 mg/kg
	Microcrystalline Cellulose	GMP
	Mono- and Diglycerides	18 mg/kg
	Papain	GMP
	Pectins (amidated and nonamidated)	GMP
	Polyglycerol Esters of Fatty Acids	500 mg/kg

Function	Name	Maximum level	
	Polyglycerol Esters of Interesterified Ricinoleic Acid	1000 mg/kg	
	Polyoxyethylene stearates	GMP	
	Polyvinylpyrrolidone	60 mg/kg (residual level)	
	Potassium alginate	GMP	
	Powdered Cellulose	GMP	
	Processed Eucheuma Seaweed	GMP	
	Sodium carboxymethyl cellulose	5000 mg/kg	
	Sorbitan Esters of Fatty Acids	GMP	
	Tara Gum	GMP	
	Tragacanth Gum	500 mg/kg	
	Xanthan Gum	GMP	
	H. Enzyme	Protease (<i>A. oryzae</i> var.)	GMP
	I. Preservative	Benzoates	1000 mg/kg (as benzoic acid)
Dimethyl dicarbonate		250 mg/kg (added level; residue not detected in ready-to-eat food)	
p-Hydroxybenzoates		200 mg/kg (as p-hydroxybenzoic acid)	
Lysozyme hydrochloride		500 mg/kg	
Phosphates		220 mg/kg (as phosphorus)	
J. Propellant	Nitrogen	GMP (use as packing gas)	
K. Sweetener	Acesulfame Potassium	GMP	
	Aspartame	700 mg/kg	
	Saccharin	80 mg/kg	

*Based on the food category system: 14.2.3 Wines, 14.2.4 Fruit Wines

7 Contaminants

7.1 Pesticide residues.

Amount of residue shall comply with those maximum residue limits for pesticides established by the Fertilizer and Pesticide Authority of the Department of Agriculture, Codex Alimentarius Commission and/or authority for these products.

7.2 Heavy metal contaminants.

The products covered by the provisions of this standard shall comply with those maximum residue levels for heavy metal contaminants established by the Codex Alimentarius Commission and/or authority for these products.

8 Hygiene

8.1 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. 4-2003) and/or the BFAD A.O. No. 153 s. 2004 – Guidelines, Current Good Manufacturing Practices in Manufacturing, Packing, Repacking or Holding Food and processed according to the Recommended Code of Practice for the Processing and Handling of Tropical Fruit Wines (PNS/FDA No. 31:2010).

8.2 When tested by appropriate methods of sampling and examination, the product:

- shall be free from filth that may pose a hazard to health;
- shall be free from parasites which may represent a hazard to health;
- shall not contain any substance originating from microorganisms in amounts which may represent a hazard to health; and
- shall be free from container integrity defects which may compromise the hermetic seal.

9 Weights and measures

9.1 Fill of container

9.1.1 Minimum fill

The minimum fill of container shall not be less than 1 inch away from the cork or cap. A container that fails to meet the requirement for minimum fill shall be considered slack-filled.

9.1.2 Lot acceptance

A lot will be considered as meeting the requirement of 8.1.1 when the number of slack-filled containers does not exceed the acceptance number of the appropriate sampling plan.

10 Labeling

10.1 Each container shall be labeled and marked with the following information in accordance with BFAD's labeling regulation (A.O. 88-B s. 1984):

10.1.1 Name of the product

The product shall be designated by the word 'wine', qualified by the name of fruit or fruits from which it was derived, such as "pineapple wine", or "pineapple-strawberry wine". For sparkling fruit wines and fortified fruit wines, the product name shall be preceded by the word "sparkling" or "fortified" respectively, such as "sparkling pineapple wine" or "fortified strawberry wine".

10.1.2 The complete list of ingredients and food additives used in the preparation of the product in descending order of proportion.

10.1.3 The net quantity of content by volume in the metric system. Other systems of measurement required by importing countries shall appear in parenthesis after the metric system unit.

10.1.4 The name and address of the manufacturer, packer and/or distributor of the food.

10.1.5 Lot or code number identifying product lot.

10.1.6 Open date marking

The words "Best/Consume Before"/"Use by date", may be included, indicating end of period at which the product shall retain its optimum quality attributes at defined storage conditions.

10.1.7 The words "Product of the Philippines" or the country of origin if imported.

10.1.8 Alcoholic strength expressed as a percentage by volume

10.1.9 Directions for use

10.1.10 Storage instructions

10.1.11 Additional requirements

A pictorial representation of the product and/or the raw material/s used should be placed on the label so as not to mislead the consumer with respect to the product and/or raw material/s so illustrated.

11 Methods of analysis and sampling

11.1 Measurement of pH of Wines

According to the AOAC Official Methods of Analysis, Method No. 960.19, 16th ed., 1995. (Annex 2)

11.2 Determination of volatile acidity

According to the AOAC Official Methods of Analysis, Method No. 964.08, 16th ed., 1995. (Annex 3)

11.3 Determination of total (Titratable) acidity

According to the AOAC Official Methods of Analysis, Method No. 962.12, 16th ed., 1995. (Annex 4)

11.4 Determination of soluble solids

According to the AOAC Official Methods of Analysis, Method No. 932.14C, 16th ed., 1995. (Annex 5)

11.5 Determination of alcohol by volume from specific gravity

According to the AOAC Official Methods of Analysis, Method No. 920.57, 16th ed., 1995. (Annex 6)

11.6 Method of sampling

Sampling shall be in accordance with the FAO/WHO Codex Alimentarius Sampling Plans for Prepackaged Foods - CAC/RM 42-1969, Codex Alimentarius Volume 13, 1994.

11.7 Determination of lead using atomic absorption spectrophotometer

According to the AOAC Official Methods of Analysis, Method No. 972.15C, 16th ed., 1995.

11.8 Determination of tin using atomic absorption spectrophotometer

According to the AOAC Official Methods of Analysis, Method No. 985.16. 16th ed., 1995.

Annex 1

Tropical fruit varieties grown in the Philippines*

Common name(s)	Scientific name
Avocado	<i>Persea americana</i> Mill.
Bago	<i>Gnetum gnemon</i> Linn.
Banana / Saging	<i>Musa acuminata</i>
Bilimbi / Kamias	<i>Averrhoa bilimbi</i> Linn.
Biriba	<i>Rollinia deliciosa</i> Saff.
Blueberry	<i>Vaccinium corymbosum</i>
Breadfruit / Rimas	<i>Artocarpus altilis</i> (Park.) Fosb.
Breadnut / Kamansi	<i>Artocarpus camansi</i> Blanco
Canistel / Tiessa	<i>Lucuma nervosa</i> A.DC.
Cashew / Kasuy	<i>Anacardium occidentale</i> Linn.
Chinese Laurel / Bignay	<i>Antidesma bunius</i> Linn.
Datiles	<i>Muntingia calabura</i> Linn.
Durian	<i>Durio zibethinus</i> Murr.
Galo	<i>Anacolosia luzoniensis</i> Merr.
Governor's Plum / Bitungol	<i>Flacourtia indica</i> (Burm. f.) Merr.
Granadilla	<i>Passiflora quadrangularis</i> Linn.
Guava / Bayabas	<i>Psidium guajava</i> Linn.
Jackfruit / Langka	<i>Artocarpus heterophyllus</i> Lam.
Java Apple / Makopa	<i>Syzygium samarangense</i> (Blume) Merr. Perry
Java Plum / Duhat	<i>Syzygium cumini</i> (Linn.) Skeels
Jujube / Manzanitas	<i>Ziziphus jujube</i> (Linn.) Lam.
Kalumpit	<i>Terminalia microcarpa</i> Dence
Lanzones	<i>Lansium domesticum</i> Cor.
Lemon / Limon	<i>Citrus limoneia</i> Osbeck
Lipoti	<i>Eugenia polycephaloides</i> C. B. Rob.
Mango / Mangga	<i>Mangifera indica</i> Linn.
Mangosteen	<i>Garcinia mangostana</i> Linn.
Manila Tamarind / Kamachile	<i>Pithecellobium dulce</i> (Roxb.) Benth.
Marang	<i>Artocarpus odoratissima</i> Blanco
Marmalade Plum / Chico-mamey	<i>Poteria sapota</i> (Jacq.) Moore and Stearn
Melon	<i>Cucumis melo</i>
Mountain Apple / Yambo	<i>Syzygium malaccensis</i> (Linn.) Merr. And Perry
Orange / Dalandan	<i>Citrus aurantium</i> Linn.
Paho	<i>Mangifera philippinensis</i> Mukh.
Papaya	<i>Carica papaya</i> Linn.
Passion Fruit / Pasionaria	<i>Passiflora edulis</i> Sims.
Pineapple / Pinya	<i>Ananas comosus</i> (Linn.) Merr.
Rambutan	<i>Nephelium lappaceum</i> Linn.
Santol	<i>Sandoricum koetjape</i> (Burm. f.) Merr.

(table continued)

Common name(s)	Scientific name
Sapodilla / Chico	<i>Achras zapota</i> Linn.
Sour sop / Guyabano	<i>Annona muricata</i> Linn.
Spanish Plum / Siniguelas	<i>Spondia purpurea</i> Linn.
Star Apple / Kaimito	<i>Chrysophyllum cainito</i> Linn.
Star fruit / Balimbing	<i>Averrhoa carambola</i> Linn.
Strawberry	<i>Fragaria ananassa</i>
Sugar apple / Sweet Sop / Atis	<i>Annona squamosa</i> Linn.
Tamarind / Sampaloc	<i>Tamarindus indica</i> Linn.
Velvet Apple / Mabolo	<i>Diospyros discolor</i> Willd.
Watermelon / Pakwan	<i>Citrillus vulgaris</i> Schrad.

* Other tropical fruit varieties may be used provided that they conform to the standards stated herein.

References:

Coron, R. E. 1983. **Promising Fruits of the Philippines**. Laguna, Philippines: University of the Philippines Los Banos, College of Agriculture.

Food and Nutrition Research Center. 1966. **Manual on Food Preservation and Processing Recommended for Use in the Philippines**. Manila: National Science Development Board Printing Press.

Annex 2**Measurement of pH of wines****A. Preparation of potassium hydrogen tartrate buffer solution (Saturated solution at 25 °C, 0.034 M)**

Add excess (ca 100 %) of $\text{KHC}_4\text{H}_4\text{O}_6$ (NIST SRM 188) to H_2O in glass-stoppered bottle or flask, and shake vigorously; few minutes of shaking is for saturation (100 mL H_2O at 25 °C dissolves ca. 0.7 g $\text{KHC}_4\text{H}_4\text{O}_6$). Adjust to 25 °C, let solid settle, and decant clear solution, or filter if necessary. Discard when mold appears. Few crystals of thymol added during preparation will retard mold growth, and will alter pH by unit. For accuracy of ± 0.01 pH unit, temperature of solution must be between 20 °C and 30 °C.

B. Calibration of pH meter

Let pH meter with glass and calomel electrodes warm up before use according to manufacturer's instructions. Check meter with freshly prepared, saturated, aqueous solution of $\text{KHC}_4\text{H}_4\text{O}_6$. Adjust meter to read 3.55 at 20 °C, 3.56 at 25 °C.

C. Determination of pH of sample

Rinse electrodes free of bitartrate by dipping in H_2O and then in sample. Place electrodes in fresh sample, determine temperature, and read pH to nearest 0.01 unit.

Annex 3

Determination of volatile acidity

A. Apparatus

- (a) **Steam distillation apparatus** – See Figure 960.16 (see 26.1.32) of the AOAC Manual
- (b) **Cash electric still** – See Figure 964.08 of the AOAC Manual. Consists of outer chamber, inner chamber, trap, 2-way stopcock, electric coil heater, and glass “T” outlet for H₂O. All parts are of Pyrex. Residue in inner chamber after distillation is flushed out automatically by vacuum action when current is shut off. Addition of H₂O through funnel above stopcock gives automatic spray bath to inner chamber, and waste drains through outlet in glass “T”. Two-way stopcock permits introduction of sample, serves as escape vent for CO₂, and allows introduction of wash H₂O.

B. Preparation of sample

Remove dissolved CO₂ from ca. 50 L sample by either: placing under low vacuum (H₂O aspirator) 2 min with continuous stirring; or bringing to incipient boiling under air condenser and cooling immediately.

C. Determination

- (a) **Steam distillation apparatus** – Add ca 600 L boiled H₂O to outer chamber of still. Pipet 25 mL freshly prepared sample into inner chamber and stopper. Boil H₂O 3 in with sidearm open. Close and distill ca 300 mL into Erlenmeyer. Add 0.5 mL phenolphthalein to distillate and titrate rapidly with 0.1N NaOH until pink persists 15s. express results as g CH₃COOH/100 mL = mL 0.1N NaOH x 0.006 x 4.
- (b) **Cash electric still** – Add H₂O and pipet sample as in (a). Rinse funnel with ca 5 mL H₂O. Distill ca 300 mL into Erlenmeyer. Titrate and express results as in (a). (Disconnect heating coil immediately and empty still by opening drain tube to outer chamber and stopcock to inner tube. Rinse still with two 10 mL-15 mL portions H₂O by adding through funnel; evacuate each portion through drain tube.)

Annex 4**Determination of titratable acidity in wines**

Remove CO₂ if present, by either of the following methods:

- (1) Place ca 25 mL sample in a small Erlenmeyer flask and connect to H₂O aspirator. Agitate 1 in under vacuum; or
- (2) Place ca 25 mL sample in a small Erlenmeyer flask, heat to incipient boiling and hold 30 s, swirl, and cool.

Add 1 mL phenolphthalein indicator solution to 200 mL hot, boiled H₂O in 500 mL wide-mouth Erlenmeyer flask. Neutralize to distinct pink. Add 5.00 mL degassed sample and titrate with 0.1 N standardized NaOH to same end point, using well-illuminated white background.

To express titratable acidity as grams of predominant acid per 100 mL of wine,

$$\text{g / 100 mL} = \text{mL NaOH} \times \text{normality of NaOH} \times F \times 100/5$$

where

F is the factor appropriate to the predominant acid in the wine; 0.067 for malic acid, 0.045 for oxalic acid, 0.075 for tartaric acid, 0.090 for lactic acid

Annex 5

Determination of total soluble solids

A. Apparatus

(a) *Hand refractometer.* – With scale reading of 0-35° Brix

B. Standardization of refractometer

Adjust instrument to read n of 1.3330 of 0% sucrose with H₂O at 20°.

C. Preparation of sample

Bring the sample to a temperature close to 20 °C, then filter to remove it of any undissolved solids

D. Determination

Place sufficient amount of sample on the prism of the instrument, taking care that the sample covers the glass surface uniformly. Determine the total soluble solids by direct reading in terms of °Brix.

Annex 6

Determination of alcohol by volume from specific gravity

A. Distillation of sample

Measure 100 mL original material into 300 mL-500 mL distillation flask, noting temperature, and add 50 mL water. Attach flask to vertical condenser by means of bent tube, distill almost 100 mL, and dilute to 100 mL at same temperature. (Foaming, which sometimes occurs, especially with young wines, may be prevented with by adding a small amount of antifoam material) For wines that contain an abnormal amount of CH_3COOH , neutralize exactly with 1N NaOH solution before proceeding with distillation (unnecessary for wines of normal taste and odor).

B. Calibration

Fill thoroughly cleaned pycnometer with recently distilled water, stopper, and immerse in constant temperature water bath with bath level above graduation mark on pycnometer. After 30 min, remove stopper and with capillary tube adjust until bottom of meniscus is tangent to graduation mark. With small roll of filter paper, dry inside neck of pycnometer, stopper, and immerse in water at room temperature for 15 min. Remove pycnometer, dry, let stand 15 min, and weigh. Empty pycnometer, rinse with acetone, and dry thoroughly in air with suction. Let empty flask come to room temperature, stopper, and weigh.

Weight of water = weight of pycnometer + water – weight of empty pycnometer

C. Determination of specific gravity at room temperature

1. Determine weight of sample as in B.

Weight of sample = weight of pycnometer + distillate – weight of empty pycnometer

2. Calculate specific gravity as follows:

Specific gravity = $\frac{S}{W}$,

where

S is the weight of sample; and
W is the weight of water.

D. Determination of alcohol

Obtain corresponding % alcohol by volume from Appendix C: Reference Volumes 913.02. AOAC Manual. 16th ed.

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FORMULATING BODY
Development of Standards for Tropical Fruit Wines

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