

PHILIPPINE NATIONAL STANDARD

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Water Buffalo Milk – Product Standard – Specifications



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Foreword

In 2018, the Philippine Carabao Center (PCC) of the Department of Agriculture (DA) proposed to develop a Philippine National Standard (PNS) for the specifications of water buffalo milk to improve its quality and safety. The Technical Working Group (TWG), tasked to develop the PNS was created through Special Order (SO) No. 1092, series of 2018 (Creation of TWGs for the Development of PNS for Agriculture and Fisheries Products and Machinery, Tools, and Equipment), SO No. 442, series of 2020 (Creation of Technical Committees [TCs] and its TWG for the Development of PNS for Agriculture and Fisheries Products, Machinery, and Structures), and SO No. 81, series of 2021 (Creation of TWG for the Development of PNS for Agriculture and Fishery Products, Machinery, Tools, and Equipment). The TWG was composed of representatives from the government agencies, academe, and private sector. The draft PNS underwent a series of TWG meetings and stakeholder consultations conducted via online platforms before its endorsement to the DA Secretary for approval in October 2021.

This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2.

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1 Scope

This standard applies to raw milk from water buffalo intended for further processing. It does not cover reconstituted, recombined, toned milk, and milk sources that do not come from water buffalo.

2 Normative References

The following documents are referred to in the text in such a way that some or all of their contents constitute the requirements 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.

Bureau of Agriculture and Fisheries Product Standards (BAFPS) – Department of Agriculture (DA). (2008). Fresh milk – Specifications (PNS/BAFPS 36:2008). http://www.bafs.da.gov.ph/bafs_admin/admin_page/pns_file/2021-02-24-PNS-BAFPS%2036-2008-Fresh%20Milk.pdf

Bureau of Agriculture and Fisheries Standards (BAFS) - DA. (2017). Code of Hygienic Practices (COHP) for milk (PNS/BAFS 210:2017). http://www.bafs.da.gov.ph/bafs_admin/admin_page/pns_file/PNS%20BAFS%20210-2017%20%20COHP%20Milk.pdf

National Dairy Authority (NDA) – DA. (2019). The dairy safety regulations (NDA Administrative Order 4, series of 2019). https://www.da.gov.ph/wp-content/uploads/2021/05/ac04_s2019.pdf

3 Terms and Definitions

For the purpose of this standard, the following terms and definitions shall apply.

3.1

alcohol precipitation test

APT

detects milk protein instability when the levels of acid and/or rennet are increased and acted upon by the alcohol. Increased levels of albumin in colostrum milk and salt concentrates in mastitic milk will also result in a positive test.

3.2

water buffalo

bubaline animal that has been genetically selected for milk production and secondarily for meat production; also known locally as carabao and buffalo

3.3

clot on boiling (COB) test

determines heat instability of milk due to developed acidity and mineral imbalance such as in colostrum, milk from animals in late lactation, and milk from mastitis-infected udders

3.4**lactometer test**

determines if milk is likely adulterated through its specific gravity

3.5**organoleptic**

characteristics of milk in terms of sensory qualities, such as color, odor, appearance, and consistency

3.6**pH**

determines the acidity or alkalinity of the milk

3.7**raw water buffalo milk**

milk obtained from water buffaloes not less than seven days post calving, which does not contain colostrum and did not undergo standardization, heat treatment, and/ or other forms of pre-treatment

3.8**sediment test**

detects the presence of visible soluble and insoluble contaminants in milk such as soil, dirt, manure, and blood

3.9**titratable acidity test**

determines the level of acidity in milk, expressed as a percentage of lactic acid

4 Minimum Requirements**4.1 Compositional Quality**

Raw water buffalo milk should meet quality requirements based on composition specified in Table 1.

Table 1. Compositional quality of raw water buffalo milk

Composition	Limit
Fat	Not less than 6.0%
Protein	Not less than 3.5%
Lactose	Not less than 4.5%
Total Solids (TS)	Not less than 15.0%
Solids-Not-Fat (SNF)	Not less than 9.0%
Somatic Cell Count (SCC)	Not to exceed 400,000 cells/mL

4.2 Milk Quality

Raw water buffalo milk should have the following qualities:

4.2.1 Organoleptic

Milk should be clean, have fresh smell/odor, and uniformly white in color. Milk which is collected under unhygienic conditions have the characteristic of foul smell (off odor) such as sour smell/odor, have pink color if stained with blood or presence of blue thin line if adulterated with water.

4.2.2 Sediment

Milk should have no sediments. Light to black brown or black sediments indicate the presence of soil while reddish sediments indicate the presence of blood.

4.2.3 APT

Milk should not exhibit clotting, coagulation or precipitation.

4.2.4 COB

Milk should not exhibit clotting, coagulation or precipitation.

4.2.5 Specific Gravity

Milk should have a specific gravity that ranges from 1.030 to 1.036 at 15.6°C (60°F).

4.2.6 Acidity

Titrateable acid in the form of lactic acid should be in the range of 0.13% to 0.16%. The pH should be in the range of 6.6 to 6.8.

4.3 Contaminants

Milk shall meet the following requirement on specified contaminants:

4.3.1 Microbiological Quality

Aerobic Plate Count (APC)/Standard Plate Count (SPC) of water buffalo milk should not exceed 300,000 cfu/mL.

4.3.2 Lead

Lead content shall not exceed the Maximum Level (ML) of 0.02 mg/kg.

4.3.3 Veterinary Drugs Residues

The Maximum Residue Limits (MRLs) for veterinary drugs in milk shall be in accordance with the limits specified in Annex A (MRLs for Veterinary Drug Residues in Milk from Ruminant Species Applicable in Water Buffalo Milk).

4.3.4 Pesticide Residues

The MRLs for pesticides in milk shall be in accordance with the limits specified in Annex B (MRLs for Pesticide Residues in Milk from Ruminant Species Applicable in Water Buffalo Milk).

4.3.5 Aflatoxin

Aflatoxin M1 content shall not exceed 0.5 µg/kg.

4.4 Preservatives

The raw water buffalo milk for further processing should not contain preservatives used for retaining the milk integrity prior to milk analysis.

5 Methods of Analysis

Raw water buffalo milk should be tested for its quality and safety based on the following methods of analysis listed in Table 2.

Table 2. Methods of analysis for raw water buffalo milk

Parameter	Methods of test	Principles
Milk protein instability	APT Alcohol-Alizarin test	Reaction of milk protein with alcohol to form precipitates
Presence of sediment	Sediment test Centrifuge Filtration	Centrifugation theory Filtration theory
Presence of clot, coagulate or precipitate	COB Test	Reaction of milk acidity and salts to heat to form clot, coagulate or precipitate to test heat stability of milk
Specific Gravity	Milk Analyzer Pycnometer method Lactometer test	Milk analyzer: ultrasonic testing Pycnometer method and Lactometer test: fluid displacement
Acidity	Titration method (acidity as % lactic acid), pH meter	Titration method: neutralization of acid in milk with the base pH meter: measurement of electro-chemical potential of hydrogen-ion activity
Microbiological Quality (APC/SPC)	Conventional method (Bacteriological Analytical Manual Chapter 3) Petrifilm Test	Conventional method: formation of a visible colony from each bacterial cell when sample is mixed with agar and incubated at aerobic conditions Petrifilm test: Ready-made culture medium system with indicator

Parameter	Methods of test	Principles
Lead	Inductively Coupled Plasma – Optical Emission Spectrophotometry (ICP-OES) ICP- Mass Spectrophotometry (ICP-MS)	Spectroscopic technique that makes use of naturally occurring electromagnetic spectrum defined by the wavelength in the mid-infrared region, wherein the measurement data is converted into a usable result
Pesticide residues	Liquid Chromatography Test Inhibitor Test	Adsorption of molecules to the stationary phase and the solubility of molecules within the mobile phase. These properties are a function of the electrochemical and physical characteristics of both the mobile and stationary phases
Veterinary drug residues	Inhibitor test Antibiotic residue test kits	Inhibitor test: liquid chromatography tests Antibiotic residue test kits: rapid qualitative lateral flow assay with indicator
Aflatoxin M1	Association of Official Analytical Chemists (AOAC) 2000.08 Aflatoxin M1 test kits	AOAC 2000.08: liquid chromatography tests Aflatoxin M1 test kits: rapid qualitative lateral flow assay
Fat	Fourier- Transform Infrared (FTIR) spectroscopy Spectrophotometry Milk analyzer Gerber method Babcock method	FTIR spectroscopy and Spectrophotometry: spectroscopic technique that makes use of naturally occurring electromagnetic spectrum defined by the wavelength in the mid-infrared region, wherein the measurement data is converted into a usable result Milk analyzer: ultrasonic testing Gerber and Babcock methods: fat separation and centrifugation
Protein	FTIR spectroscopy Spectrophotometry Milk analyzer Kjeldahl method	FTIR spectroscopy and Spectrophotometry: spectroscopic technique that makes use of naturally occurring electromagnetic spectrum defined by the wavelength in the mid-infrared region, wherein the measurement data is converted into a usable result Milk analyzer: ultrasonic testing Kjeldahl method: digestion of milk with strong acid which releases nitrogen
Lactose	FTIR spectroscopy Spectrophotometry	FTIR spectroscopy and Spectrophotometry: spectroscopic

Parameter	Methods of test	Principles
	Milk analyzer Gravimetric methods	technique that makes use of naturally occurring electromagnetic spectrum defined by the wavelength in the mid-infrared region, wherein the measurement data is converted into a usable result Milk analyzer: ultrasonic testing Gravimetric methods: measurement of mass
Total Solids (TS)	FTIR spectroscopy Spectrophotometry Milk analyzer (by computation) Oven-dry method	FTIR spectroscopy and Spectrophotometry: spectroscopic technique that makes use of naturally occurring electromagnetic spectrum defined by the wavelength in the mid-infrared region, wherein the measurement data is converted into a usable result Milk analyzer: ultrasonic testing Oven-dry method: drying of milk samples at high temperature
Solids-Not-Fat (SNF)	FTIR spectroscopy Spectrophotometry Milk analyzer	FTIR spectroscopy and Spectrophotometry: spectroscopic technique that makes use of naturally occurring electromagnetic spectrum defined by the wavelength in the mid-infrared region, wherein the measurement data is converted into a usable result Milk analyzer: ultrasonic testing
Somatic Cell Count (SCC)	Flow cytometry Direct Microscopic Somatic Cell Count (DMSCC) Milk analyzer	Flow cytometry: technique used for counting and characterization of particles and cells based on recognition of DNA from cells DMSCC: automated microscope based on image cytometry Milk analyzer: ultrasonic testing

6 Hygiene

Hygienic methods for raw water buffalo milk should be in accordance with the Code of Hygienic Practice for Milk (PNS/BAFS 210:2017).

7 Collection

Collection methods for raw water buffalo milk should be in accordance with Section 8 of the Code of Hygienic Practice for Milk (PNS/BAFS 210:2017) and Article 4, Section 3 of NDA's Dairy Safety Regulations (NDA Administrative Order 4 – 2019).

8 Labeling after collection

The labeling after collection of milk should be in accordance with Article 4, Sub-section 5.5 of NDA's Dairy Safety Regulations (NDA Administrative Order 4 – 2019).

9 Milk Storage

Storage methods for raw water buffalo milk should be in accordance with Section 7 of the Code of Hygienic Practice for Milk (PNS/BAFS 210:2017) and Article 4, Section 3 of NDA's Dairy Safety Regulations (NDA Administrative Order 4 – 2019).

10 Transport and delivery of milk

Transport and delivery methods for raw water buffalo milk should be in accordance with Section 8 of the Code of Hygienic Practice for Milk (PNS/BAFS 210:2017) and Article 4, Sub-section 2.9 of NDA's Dairy Safety Regulations (NDA Administrative Order 4 – 2019).

11 Documentation and record keeping

Documentation and record keeping for raw water buffalo milk should be in accordance with Section 9 of the Code of Hygienic Practice for Milk (PNS/BAFS 210:2017) and Article 4, Sub-section 2.9 of NDA's Dairy Safety Regulations (NDA Administrative Order 4 – 2019).

Annex A
(Normative)

Table A.1 Maximum Residue Limits (MRLs) for veterinary drug residues in milk from ruminant species applicable in water buffalo milk

Veterinary Drug	MRL
Albendazole	100 µg/L
Alpha-Cypermethrin	100 µg/kg
Amoxicillin	4 µg/kg
Benzympenicillin	4 µg/L
Ceftiofur	100 µg/L
Chlortetracycline	100 µg/L
Clenbuterol	0.05 µg/L
Colistin	50 µg/kg
Cyfluthrin	40 µg/L
Cyhalothrin	30 µg/kg
Cypermethrin	100 µg/kg
Deltamethrin	30 µg/kg
Dexamethasone	0.3 µg/L
Dihydrostreptomycin	200 µg/kg
Diminazene	150 µg/L
Doramectin	15 µg/kg
Eprinomectin	20 µg/L
Febantel	100 µg/L
Fenbendazole	100 µg/L
Gentamicin	200 µg/L
Imidocarb	50 µg/kg
Isometamidium	100 µg/L
Ivermectin	10 µg/kg
Lincomycin	150 µg/kg
Monensin	2 µg/kg
Neomycin	1500 µg/kg
Oxfendazole	100 µg/L
Oxytetracycline	100 µg/L
Pirlimycin	100 µg/kg
Procaine Benzylpenicillin	4 µg/L
Spectinomycin	200 µg/L
Spiramycin	200 µg/L
Streptomycin	200 µg/kg
Sulfadimidine	25 µg/L
Tetracycline	100 µg/L
Thiabendazole	100 µg/L
Trichlorfon (Metrifonate)	50 µg/kg
Tylosin	100 µg/kg
Reference: Bureau of Agriculture and Fisheries Standards (BAFS) – Department of Agriculture (DA). (2016). Veterinary drugs residues in food: Maximum Residue Limits (MRLs) (PNS/BAFS 48:2016). http://www.bafs.da.gov.ph/bafs_admin/admin_page/pns_file/PNS+BAFS+48.2016+Veterinary+Drug+Residues+in+Food.MRLs.pdf	

Annex B
(Normative)

Table B.1 Maximum Residue Limits (MRLs) for pesticide residues in milk from ruminant species applicable in water buffalo milk

Pesticide	MRL (mg/kg)
Chlorpyrifos	0.02
Dimethoate	0.05
Disulfoton	0.01
Teflubenzuron	0.01
Reference: Codex Alimentarius Commission (CAC). (2021). Pesticide database, commodities detail, ML0107-Milk of cattle, goat, and sheep. http://www.fao.org/fao-who-codexalimentarius/codex-texts/dbs/pestres/commodities-detail/en/?c_id=188	

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<http://www.fao.org/ag/againfo/themes/documents/lps/dairy/dap/qcm1.htm>

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