Raw whole camel milk — Specification
The following organizations were represented on the Technical Committee

Kenya Dairy Board  
Ministry of Health — Public Health Department  
Directorate of Livestock Production  
Directorate of Veterinary Services  
Egerton University — Department of Dairy and Food Science Technology  
Government Chemist’s Department  
National Public Health Labs  
Kenya Industrial Research and Development Institute (KIRDI)  
Consumer Information Network  
New Kenya Creameries Cooperative (NKCC)  
Brookside Dairy Ltd.  
Eldoville Dairies Limited  
Githunguri Dairy  
Happy Cow Ltd  
Sameer Agriculture and Livestock (K) Limited  
KIBIDAV Ltd (TOGGS)  
Kenya Camel Association (KCA)  
Regional Pastoral livelihood resilience Project  
Agricultural sector Development Support programme (ASDSP)  
University of Nairobi  
Kenya Bureau of Standards — Secretariat

REVISION OF KENYA STANDARDS

In order to keep abreast of progress in industry, Kenya Standards shall be regularly reviewed. Suggestions for improvements to published standards, addressed to the Managing Director, Kenya Bureau of Standards, are welcome.
Raw whole camel milk — Specification
Foreword
This Kenya Standard was prepared by the Milk and Milk Products Technical Committee under the guidance of the Standards Project Committee and it is in accordance with the procedures of the Kenya Bureau of Standards.

The dairy cattle sub-sector contributes to 4% of National Gross Domestic Product (GDP). However the contribution of dairy camel sub-sector is not reflected in the National economic report. This is due to lack of market competitiveness in the dairy camel sector. In Kenya, the estimated camel population is about 3 million, with annual camel milk production of 940 thousand tonnes (940 million litres) in 2013; indicating that dairy camel sub-sector offers a huge potential for improving the livelihoods of communities living in Arid and Semi-Arid Lands (ASAL). Various agencies have made efforts to improve the market competitiveness of dairy camel sub-sector through development of camel milk standards.

The standard for raw whole camel milk were first developed in 2006 and adapted in 2007. Currently there is new scientific data and evidence on quality and safety of camel milk; hence the need to review the existing raw whole camel milk standard (KS 2016:2007) to reflect the true situation in the camel milk sub-sector.

The standard addresses quality and safety requirements of raw whole camel milk; including Annexes on carrying out the rapid tests.

During the preparation of this standard reference was made to various documents and extensive consultation with stakeholders.

Acknowledgement is hereby made for the assistance derived from these sources.
Kenya Standard

Raw whole camel milk — Specification

1 Scope

This Kenya standard specifies the requirements and methods of sampling and test for raw whole camel milk.

2 Normative references

The following contain provisions, which, through reference in this text constitute provisions of this standard. All standards are subject to revision and any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this standard are encouraged to take steps to ensure the use of the most recent editions of the documents indicated:

AOAC 922.08, Determination of Hypochlorite and chloramins in milk- Colorimetric method
AOAC 942.17, Determination of Arsenic in foods- Molybdenum blue method
AOAC 947.05; Determination of Acidity of milk- trimetric method
AOAC 960.27, Determination of preservatives in milk
AOAC 962.16, Determination of Beta-lactam Antibiotics in milk
AOAC 980.21, Determination of Aflatoxin M1 in milk and cheese-thin layer chromatographic method
AOAC 999.10, Lead, Cadmium, Copper, Iron, and Zinc in foods, Atomic Absorption Spectrophotometry after dry ashing
CAC/MRL 1; Maximum Residue Limits (MRLs) for pesticides
CAC/MRL 3 Maximum Residue Limits (MRLs) and Risk Management Recommendations (RMRs) for Residues of Veterinary Drugs in Foods
KS CODEX STAN 193, Codex general standard for contaminants and toxins in foods
KS ISO 2446, Milk — Determination of fat content (Routine method)
KS ISO 4831:2006; Microbiology of food and animal feeding stuffs - Horizontal method for the detection and enumeration of coliforms - Most probable number technique
KS ISO 4832; 2006; Microbiology of food and animal feeding stuffs - Horizontal method for the enumeration of coliforms - Colony-count technique
KS ISO 4833-1; Microbiology of the food chain -- Horizontal method for the enumeration of microorganisms -- Part 1: Colony count at 30 degrees C by the pour plate technique
KS ISO 5738:2004 (IDF 76:2004); Milk and milk products -- Determination of copper content -- Photometric method (Reference method)
KS ISO 5764, Milk - Determination of freezing point - Thermistor cryoscope method (Reference method)
KS ISO 6785, Milk and milk products -- Detection of Salmonella spp
KS ISO 6611, Milk and milk products — Enumeration of colony-forming units of yeasts and/or moulds — Colony-count technique at 25 degrees C
KS ISO 6731, Milk, cream and evaporated milk - Determination of total solids content (reference method)
KS ISO 6732, Milk and milk products -- Determination of iron content -- Spectrometric method (Reference method)
KS ISO/TS 6733:2006 (IDF/RM 133:2006); Milk and milk products -- Determination of lead content -- Graphite furnace atomic absorption spectrometric method
KS 1552, Code of hygienic practice for milk and milk products

3 Terms and Definitions

For the purpose of this Standard, the following definition shall apply.

3.1
raw whole camel milk
it shall mean the normal, clean and fresh secretion obtained by practically emptying the udder of a healthy camel, but excluding that obtained during the first seven days after calving and free from colostrum

4 Essential Quality and compositional requirements

4.1 General Requirements

Raw whole camel milk;

4.1.1 Shall not have any foreign matter.

4.1.2 Shall not have any foul odour and taints.

4.1.3 Shall have characteristic white colour.

4.1.4 Shall not be mixed with milk from any other livestock

4.2 Principal Compositional requirements

Raw whole camel milk shall comply with the compositional requirements given in Table 1 below.

Table 1 — Compositional requirements

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Characteristic</th>
<th>Limits</th>
<th>Test methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Milk fat, % min.</td>
<td>2%</td>
<td>KS ISO 2446</td>
</tr>
<tr>
<td>ii)</td>
<td>Solids not fat, % min.</td>
<td>6%</td>
<td>KS ISO 6731</td>
</tr>
<tr>
<td>iii)</td>
<td>Density at 20 ºC</td>
<td>1.026 g/mL – 1.035 g/mL</td>
<td>AOAC 961.07</td>
</tr>
<tr>
<td>iv)</td>
<td>Freezing point depression</td>
<td>0.518°C to 0.530°C</td>
<td>KS ISO 5764</td>
</tr>
<tr>
<td>v)</td>
<td>pH</td>
<td>6.4 – 6.7</td>
<td>PH Meter ; Annex C</td>
</tr>
<tr>
<td>iv)</td>
<td>Total acidity (expressed as % of lactic acid), max</td>
<td>0.17% to 0.21%</td>
<td>KS ISO/TS 11869</td>
</tr>
</tbody>
</table>

4.3 Rapid tests

The camel milk shall comply with the rapid tests described in Annex A – H.

5 Microbiological limits

5.1 Total viable count, the plate shall be incubated for 48 h at 32 ºC.
Table 2 — Total Viable count

<table>
<thead>
<tr>
<th>Grade</th>
<th>Counts (per ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>&lt; 200 000</td>
</tr>
<tr>
<td>II.</td>
<td>&gt;200 000 – 1 000 000</td>
</tr>
<tr>
<td>III.</td>
<td>&gt;1 000 000 – 2 000 000</td>
</tr>
</tbody>
</table>

5.2 Coliform count, the plate shall be incubated for 24 h at 37 °C.

Table 3 — Coliform limits

<table>
<thead>
<tr>
<th>Grade</th>
<th>Counts (per ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>0-1000</td>
</tr>
<tr>
<td>II</td>
<td>1000-50000</td>
</tr>
<tr>
<td>III</td>
<td>50000-100000</td>
</tr>
</tbody>
</table>

6 Contaminants

The products covered by this standard shall comply with the maximum levels of CODEX STAN 193 and the maximum residue limits for pesticides and veterinary drugs established by the Codex Alimentarius Commission (CAC).

5.1 Heavy metals

Heavy metal limits for raw whole camel milk shall be as given in Table 4.

Table 4 — Limits for heavy metal contaminants raw whole camel milk

<table>
<thead>
<tr>
<th>SL No</th>
<th>Heavy metal</th>
<th>MRL (max.)</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>Arsenic (AS)</td>
<td>0.1 mg/kg</td>
<td>AOAC 942.17</td>
</tr>
<tr>
<td>ii)</td>
<td>Lead (Pb)</td>
<td>0.02 mg/kg</td>
<td>KS ISO 6733</td>
</tr>
<tr>
<td>iii)</td>
<td>Mercury (Hg)</td>
<td>1.0 mg/kg</td>
<td>AOAC 999.10</td>
</tr>
<tr>
<td>iv)</td>
<td>Copper (Cu)</td>
<td>5.0 mg/kg</td>
<td>AOAC 960.40/KS ISO 5738</td>
</tr>
<tr>
<td>v)</td>
<td>Zinc (Zn)</td>
<td>50 mg/kg</td>
<td>AOAC 999.10</td>
</tr>
<tr>
<td>vi)</td>
<td>Tin (Sn)</td>
<td>250 mg/kg</td>
<td>AOAC 999.10</td>
</tr>
<tr>
<td>vii)</td>
<td>Cadmium as Cd,</td>
<td>1.5 mg/kg</td>
<td>AOAC 999.10</td>
</tr>
</tbody>
</table>
5.2 **Mycotoxin residues**

Raw whole camel milk shall not have more than 0.015 ppb aflatoxin M1 content when tested according to KS ISO 14501 or AOAC 980.21.

5.3 **Veterinary drug residues**

The products covered by this standard shall comply with those maximum limits for veterinary drug residue limits established by the Codex Alimentarius Commission in; Codex general standard for contaminants and toxins in foods and feed (Codex Stan 193)

5.3.1 **Antibiotic residues**

Raw whole camel milk shall not have more than 10.0 ppb beta lactam content of antibiotic residues as beta lactam content when tested according to AOAC 962.16 and when analyzed by the appropriate approved methods as given in the Food, Drugs and Chemical Substances Act, Cap. 254 of the Laws of Kenya and the CODEX guidance

5.4 **Pesticide residues**

Raw whole camel milk shall conform to the maximum limits for pesticide residues, established by the Codex Alimentarius Commission for these products in Codex general standard for contaminants and toxins in foods and feed (Codex Stan 193)

6 **HYGIENE**

6.1 The raw whole camel milk shall be handled in accordance with KS 1552:2016 and other relevant Kenya standards and regulations. The raw whole camel milk shall comply with microbiological criteria established in accordance with KS CAC/GL 21.

6.2 It shall be transported in clean and sanitized containers made of approved food grade materials and shall comply with the relevant Kenya standards.
Annex A
(normative)

Organoleptic test and temperature

A.1 General

Judging the quality of milk by its taste and smell requires considerable skill, which could only be acquired by training and practice. Organoleptic tests are used in all dairies and an experienced person can pick out bad samples with a high degree of accuracy.

A.2 Procedure to be adopted on the receiving platform

A.2.1 Foreign matter

Presence of the foreign matter such as pieces of dung, hair or any other foreign material should be checked.

A.2.2 Colour

Observe the color of the milk. If abnormal in color, it shall be isolated and subjected to confirmatory tests.

A.2.3.1 Odour

A.2.3.1.1 Smell the milk in the container immediately after removing the lid. In case of foul odour and taints, it shall be isolated and subjected to confirmatory tests.

A.2.3.2.1 Those due to developed acidity. This is the most important factor to be examined when grading milk by organoleptic test.

A.2.4.2.1 Those due to feed, or exposure of milk to air or contamination from containers.
Annex B
(normative)

Determination of insoluble matter

B.1 Sediment test

B.1.1 Sediment test on raw milk reveals the extent to which visible insoluble matter has gained entrance to the milk and the extent to which such material has not been removed from milk by single service strainers.

The Sediment test represents a simple, rapid and quantitative measure of indicating the cleanliness of milk with respect to visible dirt.

Allow a measured quantity of milk to pass through a fixed area of a filter disc and compare the sediment left with the prepared standards.

B.1.2 Apparatus

a) Sediment tester with filtering surface 24 mm in diameter.

b) White lintine cotton discs, 32 mm in diameter, expected filtration area 28 mm in diameter.

c) Sampling dipper, of 500 ml capacity for sampling from milk cans or weighing vats. Standard sediment discs

Use commercially available standard sediment discs

B.1.3 Procedure

Take a milk sample from well-stirred cans or vats of milk with the sampling dipper. Measure the quantity used with reasonable accuracy. Filter the milk through a properly adjusted, firm lintine cotton disc (rough side facing milk) held in the sediment tester so that a filtration area of 28 mm is exposed. Compare the sediment disc with the prepared sediment standard discs and record the sediment score.

B.1.4 Interpretation

For the purpose of comparison, it is convenient to use about five prepared standard discs so as to classify the milk with respect to its sediment content in accordance with the specific requirement of the dairy or the milk collection depot. For the former, five discs showing 0.1, 0.2, 0.5, 1.0 and 2.0 mg may suffice. Under rural conditions, discs showing 0.0, 0.5, 2.0, 5.0 and 7.0 mg sediment may be more convenient to start with. In either case, no attempt shall be made to estimate the degree of sediment in milk in more than five classes, for example, Excellent, Good, Fair, Bad and Very Bad. No attempt shall be made to grade as sediment any hair, flies, piece of hay or straw or any large particles of dirt. These shall be reported separately.

The presence of appreciable sediment in unprocessed milk supplies indicates careless or insanitary dairy farm practice. However, the lack of sediment is not always indicative of ideal conditions, since visible Sediment may be readily removed by straining at the dairy farm.
Annex C
(normative)

Determination of pH

C.1 General

The pH value or hydrogen ion concentration gives a measure of the true acidity of milk. The relationship between pH and acidity of milk is only approximate. In normal camel milk the pH ranges from 6.4 to 6.7. The value is reduced by the development of acidity. On the other hand, the pH value of milk from a camel infected with mastitis is alkaline in reaction, the value being over 7.0. The pH of milk may be determined rapidly by using any appropriate method.

C.2 Indicator strips

Indicator paper strips or discs are made by soaking strips of absorbent paper in a suitable indicator and drying them.

A rough estimate of pH is obtained by dipping a strip of the prepared paper in milk and observing the colour. Bromocresol purple (pH range 6.4 to 6.7 – colour changes from straw yellow to bluish-green) are commonly used as indicators. Both narrow and wide range ready-made indicator papers are available over the pH range 6.4 to 6.7.

NOTE Indicator paper strips shall always be kept in closed glass bottles and dry conditions.

C.3 Interpretation

In normal milk the pH is well below 6.7 on an average, camel milk gives a pH of 6.4 to 6.7. Milk of pH over 6.9 should be regarded with suspicion as indication of some diseases of the udder or of late lactation milk.
Annex D
(normative)

Alcohol test

D.1 General

The alcohol test is used for rapid assessment of stability of milk to processing, particularly for condensing and sterilization.

The alcohol test is useful as an indication of the mineral balance of milk and not so much as an index of developed acidity. The test aids in detecting abnormal milk, such as a colostrums, milk from animals in late lactation, milk from animals infected with mastitis and milk in which the mineral balance has been disturbed.

D.2 Apparatus

D.2.1 Test-tubes, 150 mm x 19 mm, preferably with graduation marks at 5 ml and 10 ml or alcohol gun.

D.2.2 Measure for alcohol, for 5 ml.

D.3 Reagents

D.3.1 Ethyl alcohol, 70-75 % by volume (density 0.867 5 g/ml at 27 °C).

D.4 Procedure

Place 5 ml of milk in a test tube and add an equal quantity of alcohol. Mix the contents of the test tube by inverting several times. Note any flakes or clots. The presence of a flake or a clot denotes a positive test.

D.5 Interpretation

A negative test indicates low acidity and good heat stability of milk sample.

NOTE Milk showing positive is not considered suitable for the manufacture of evaporated milk which has to be sterilized to ensure its keeping quality.
Annex
(informative)

Ten-minute resazurin test

G.1 General

This test provides a rapid measure of the sanitary condition and keeping quality of milk. Resazurin reduction occurs in two stages, the first an irreversible change from the blue resazurin to the pink resorufin and the second a reversible change from the pink resorufin to the colourless dihydroresorufin. The first stage of reduction or colour change from blue to pink is fairly easily brought about so that the quality of milk is assessed in much shorter time. Taking advantage of the two-stage reduction, several procedures have been proposed for reading the end point of resazurin test.

With fresh milk the observed change is resazurin reduction is due to the bacteria present and the leucocytes content. The reduction brought about by leucocytes, however, diminishes with the age of milk. Reduction can be assumed to be brought by the leucocytes if the colour in the down graded milk sample (for example, milk from animals suffering from mastitis) remains unchanged for a longer time than observed normally.

The test is intended as a platform test for detecting milk of poor keeping quality and shall be carried out on samples collected for bacteriological analysis.

G.2 Apparatus

a) Sterile test-tube without rims, 150 mm x 16 mm, internal diameter 13.5 mm ± 0.5 mm accurately marked at 10 ml. If not used directly after sterilization, they shall be kept in closed boxes protected from dust.

b) Sterilized rubber stoppers, for closing the test tubes. The stoppers are sterilized by immersing in a boiling water bath for not less than 10 min.

c) Sterile 1 ml pipettes, straight-sided, blow-out delivery pipettes for measuring the dye solution (see G.3) shall preferably comply with the following specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall length</td>
<td>300 mm</td>
</tr>
<tr>
<td>External diameter</td>
<td>7.5 mm to 8.5 mm</td>
</tr>
<tr>
<td>Graduation</td>
<td>one mark only at 1 ml level</td>
</tr>
<tr>
<td>Distance of graduation from tips</td>
<td>140 mm to 180 mm</td>
</tr>
<tr>
<td>Internal diameter</td>
<td>2.3 mm to 3.0 mm</td>
</tr>
</tbody>
</table>

The pipettes shall also be calibrated to deliver 1 ml of water at 27 °C when the contents are blown out with the tip touching the side of the vessel, three seconds allowed for drainage and the accumulated drop then blown out. No pipette should have an error of more than ± 2 %, that is, the amount delivered should be between 0.98 ml and 1.02 ml.

d) Sterile 10 ml pipettes, Straight-sided, blowout type.

e) Sampling dippers, These shall be sterilized by keeping in boiling water for 30 min. Water shall be changed at frequent intervals when a series of samples are to be examined.
f) Pipette case of metal.

g) **Water-bath**, Maintained at 37.5 °C ± 0.5 °C, fitted with a cover to exclude light and containing a metal rack designed to hold test tubes when immersed in water. The water-bath shall preferably be thermostatically controlled. The level of water in the bath shall be maintained above the level of the milk in the tubes. The interior of the bath shall be completely dark.

h) Stop watch.

i) Hot air oven autoclave or steam-sterilizer.

j) Wire baskets, for holding test tubes.

k) Glass marking pencil.

l) Bunsen burner or spirit lamp.

m) Comparator with standard resazurin disc. The comparator may be provided with artificial daylight source of illumination.

n) Sterile 50 ml measuring flask or cylinder.

o) Glass distiller, for preparing distilled water.

### G.3 Reagents

**Sterile standard resazurin solution**

Prepare 0.05 % (W/V) stock solution by resazurin in glass distilled, sterilized water. Preserve in tightly stoppered amber-coloured bottle in a refrigerator. Prepare a 0.005 % bench solution by diluting with sterile water. It shall be prepared fresh after every 8 h. When actually not in use, keep it in a cool dark place.

**NOTE** - Resazurin powder shall conform to the following requirements:

i) It shall contain sodium resazurate equivalent to 60 ± 3 % resazurin.

ii) Apart from traces of sodium resocefate, no other dyestuff shall be present.

iii) The remaining part shall consist of sodium carbonate and/or sodium acetate and moisture only.

iv) It shall give a colourless water-clear solution on reduction in alkaline solution.

v) At a concentration of 1 to 220 000 in fresh normal mixed cow milk of 3.4 % fat, it shall give a tinto-meter disc reading of not less than 6.

### G.4 Procedure

Start the test as soon as possible after a group of samples has been taken and at least within 30 min.

Shake the sample container at least 25 times, each shake being an up and down movement with an excursion of about 30 cm, the whole process of shaking not exceeding 12 s. After shaking, take 10 ml for the test in the test tube. Place the tubes in numerical order, with the thumb and fingers of the left hand, taking care not to touch the mouth of the tube. Measure 1 ml of the resazurin solution with a sterile pipette, insert the pipette about half an inch into the mouth of the tube and expel the solution by blowing.
Replace the stopper, by inverting the tube twice in 4 s and return to the rack. When resazurin has been added to a batch of not more than five tubes, place immediately in the water-bath and note the time. The delivery jet of the pipette shall not touch the milk in the tube. Any pipette becoming contaminated shall be immediately discarded. Use a fresh sterile pipette for every group of five samples.

At the end of 10 min and 30 s, remove the tubes from the water-bath and immediately match the colour with the resazurin disc in the comparator, recording the results for the tubes in the right section.

The comparator and stand are placed on a bench at such a height that the operator is able to look down on the two apertures. The disc is then revolved until the sample is matched and the disc reading noted. When the colour falls between two disc numbers, it shall be recorded as the half value; for example, a reading between 3 and 4 shall be recorded as 3.5.

Tubes giving a reading between 0 and 1, streaky pink or very pale pink are recorded as 0.5.

NOTE     It is an advantage for two persons to work in a team when a number of samples are to be taken rapidly, one to take the samples and the other to handle the containers and check the identity of the samples. Similarly, at the time of reading one person to watch the tubes and another to record.

G.5 Precautions

The following precautions are necessary to get consistent results:

a) All testers should be trained to correctly match the colours in the comparator.

b) The control and experimental test tubes shall be of the same type and thickness of glass.

c) Control samples used shall be from the same consignment as milk tested to compensate for the natural colour of milk.

d) Resazurin solution, milk, and milk to which resazurin has been added shall not be exposed to direct sunlight in the laboratory.

e) The water-bath shall be kept covered during the test.

f) The temperature of the water-bath shall be checked before commencing each batch of tests.

G.6 Interpretation

The results shall be interpreted as follows:

<table>
<thead>
<tr>
<th>Disc reading</th>
<th>Keeping quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 or higher</td>
<td>Satisfactory</td>
</tr>
<tr>
<td>3.5 to 1</td>
<td>Doubtful</td>
</tr>
<tr>
<td>4 or higher</td>
<td>Unsatisfactory</td>
</tr>
</tbody>
</table>
Annex G
(normative)

Clot-on-boiling (C.O.B.) test

G.1 General
This is a quick test to determine developed acidity and the suitability of milk for processing.

G.2 Apparatus
a) Test-tube: 15.6 cm x 1.9 cm, preferably with a mark at 5 ml;
b) Water-bath.

G.3 Procedure
Transfer 5 ml of the sample to the test-tube and smell. Place the tube in a boiling water-bath and hold for about 5 min, and smell again for any acidic flavour. Remove the tube and rotate it in an almost horizontal position and examine the film of milk or side of the test-tube for any precipitated particles. The formation of clots indicative of a positive test.

G.4 Interpretation
The principal features of the boiling test are speed and definiteness of results. Milk either remains unchanged or coagulates. Milk, which gives a positive C.O.B. test, has acidity generally above 0.17 % (as lactic acid) and is not suitable for distribution as liquid milk or for processing.