DJS 375: 2025
ICS 65.120

Jamaican Standard

Specification

For

Condensed Molasses Solubles of Sugar Cane Origin

BUREAU OF STANDARDS JAMAICA

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This standard was circulated in the draft form for comment under the reference DJS 375: 2025.

Jamaican Standards establish requirements in relation to commodities, processes and practices, but do not purport to include all the necessary provisions of a contract.

The attention of those using this standard specification is called to the necessity of complying with any relevant legislation.

Amendments

No.	Date of Issue	Remarks	Entered by and date

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Foreword

Condensed Molasses Solubles (CMS), also known as vinasse, stillage, or slop, is a co-product of the sugar and ethanol industries widely used in animal feed formulations for its nutritional value. This dark brown, syrup-like liquid retains the characteristic aroma and mineral content of the original molasses and contains amino acids produced by microorganisms during processing. CMS acts as an effective binding agent, reducing feed dustiness and improving pellet quality, while enhancing flavour, taste, and overall palatability for animals.

This standard specifies the quality, safety, and compositional requirements for CMS to ensure its consistency, quality, and safe use in animal nutrition. It outlines the physical, chemical, and microbiological criteria, as well as labelling and packaging requirements.

This standard is compulsory.

Committee representation

Related Documents

This standard makes reference to the following:

a) *JS 350: 2020 Labelling of goods —: Specific requirements for prepackaged goods*
b) *CRS 55-1 Labelling of goods — Part 1: General requirements*
c) *CRS 55-2 Labelling of goods — Part 2: Specific requirements for prepackaged goods*
d) *Association of Official Analytical Chemists*

Draft Jamaican Standard Specification for Condensed Molasses Solubles of Sugar Cane Origin

1. Scope

This standard specifies the requirements for Condensed Molasses Solids (CMS) derived from sugarcane that has been previously fermented for rum production, for use in animal feed, whether produced industrially or on farm. It provides guidance on manufacturing CMS and sets the maximum limits for heavy metals and other anti-nutritional factors in the final product. Additionally, it provides guidance for the maximum inclusion rates of CMS in animal feeds based on the animal species, ensuring it does not hinder growth performance.

2. Definitions

For the purpose of this standard the following definitions apply:

2.1 Anti-nutritional
Anti-nutritional factors are compounds which reduce the nutrient utilization and/or food intake of plants or plant products used as human foods.

2.2 Ash Content
The ash of a foodstuff is the inorganic residue remaining after the organic matter has been burnt away. The ash obtained is not necessarily of exactly the same composition as the mineral matter in the original food, as there may be losses due to volatilization or some interaction between constituents. Percent ash means the ash content of sugarcane molasses determined as sulfated ash.

2.3 BaPEQ (Benzo [a]pyrene equivalents)
A unit of measurement to express the potency of certain harmful compounds, specifically polycyclic aromatic hydrocarbons.

2.4 Cane Molasses
Cane Molasses is a by-product of the manufacture or refining of sucrose from sugar cane. It must not contain less than 46% total sugars expressed as invert. If its moisture content exceeds 27%, its density determined by double dilution must not be less than 79.50 Brix. IFN 4-13-251 Sugar cane molasses.

2.5 CMS (Condensed Molasses Solubles)
Condensed molasses solubles (CMS) is the name collectively given to the by-product from fermentation industries using molasses. During processing the fermentable sugars of molasses are consumed by various microorganisms to produce an end product, leaving the organic non-sugars as molasses solubles.

2.6 Crude Protein (CP)
Crude protein is the total amount of protein that is present in the product. Crude protein will be analysed by the amount of nitrogen (N) within the forage times 6.25, while the N content within protein is around 16%. Protein is built from amino acids. Amino acids are very important components for vital organs, muscles, hair, skin and enzymes. Therefore, protein is needed for daily maintenance as well as lactation, growth and

reproduction.

2.7 Dry Matter (DM)
Dry matter represents everything contained in a feed sample except water; this includes protein, fiber, fat, minerals, etc. In practice, it is the total weight of feed minus the weight of water in the feed, expressed as a percentage.

2.8 Heavy Metals
Heavy metals are elements with high atomic weights and densities greater than 5 grams per cubic centimeter (g/cm^3). They are characterized by their ability to form cations (positively charged ions) and bond with organic or inorganic molecules. While some heavy metals are toxic, others are essential for our biological functions.

2.9 Mycotoxins
Mycotoxins are naturally occurring toxins produced by certain moulds (fungi) and can be found in food.

2.10 Organic non-sugars
Natural carbohydrates which are not sweet in taste. For example: starch.

2.11 PEM (Polio Encephalomalacia)
Polio encephalomalacia (PEM) is a common neurological disease of ruminants that results from thiamine deficiency or sulfur toxicosis.

2.12 S.G. (Specific Gravity)
Specific Gravity or relative gravity is a dimensionless quantity that is defined as the ratio of the density of a substance to the density of the water at a specified temperature and is expressed as $SG = \rho\_substance / \rho\_water$.

2.13 Total Solids
The material left in a sample vessel after evaporation and subsequent oven drying at a defined temperature. Total solids include both total suspended and total dissolved solids, which are physically separated via filtration.

3. General Requirements

3.1 Product Description

3.1.1 Condensed Molasses Solubles shall comply with the requirements outlined in Table 1 when tested with the appropriate methods as indicated in Appendix A.

Table 1: Chemical Contaminants, Microbiological and Physical Requirements for Condensed Molasses Solubles

Parameter	Substances and related maximum level
Chemical	
Heavy metals	**Arsenic** max 2 mg/kg,
	Lead max 10mg/kg
	Cadmium max 1mg/kg
	Mercury max 0.1mg/kg
	Fluorine max 150 mg/kg
Polycyclic Aromatic Hydrocarbons	Max. 50 µg/kg BaPEQ

Polychlorinated Biphenyls (PCBs)	Max. 20 µg/kg
Pesticides	**Aldrin** max 0.01 mg/kg
	Dieldrin max 0.01 mg/kg
	Camphechlor max 0.1 mg/kg
	Chloordane max 0.02 mg/kg
	DDT max 0.05 mg/kg
	Endosulfan max 0.1 mg/kg
	Endrin max 0.01 mg/kg
	Heptachlor max 0.01 mg/kg
	Hexachloorbenzene 0.01 mg/kg
	HCH α max 0.02 mg/kg
	HCH β max 0.01 mg/kg
	HCH γ max 0.2 mg/kg
	Cl-Pesticides max 0.01 mg/kg
	P-Pesticides max 0.01 mg/kg
	N-Pesticides max 0.01 mg/kg
	Pyrethroïds max 0.01 mg/kg
Mycotoxins	**Aflatoxin**: max. 0.02 mg/kg
	Zearalenon: max. 0.05 mg/kg
	Ochratoxine max. 0.05 mg/kg
	Deoxynivelenol max 0.05 mg/kg
	Fumonisine max 0.05 mg/kg
	Alkaloïds max 0.05 mg/kg
Other	**Mineral oils** max 400 mg/kg
	Dioxins max 0.75 ng WHO-PCDD/F-TEQ/kg
	Animal proteins Absent
Microbiological	
Salmonella	Absent in 25 g (0+ %)
Moulds/Fungus	Max. 10,000 KVE/g.
Physical	
Vermin, Insects	Absent (0+ %)
Glass, metal parts	Absent (0+ %)
Other Parameters	
pH	3.9 – 4.2
Specific Gravity	1.25
Relative Density	1.25 – 1.30
Appearance	blackish liquid
Viscosity	3,000 – 5,000
Solubility	>38.7 g/L @ 20 ^{0}C
Maximum Moisture	The maximum moisture for dehydrated products must not exceed 12%

4. Minimum and Maximum Levels of CMS in Various Animal Classes

4.1General Considerations

4.1.1 The inclusion level of Condensed Molasses Solubles (CMS) in animal diets shall be determined based on the species of the animal, its stage of growth or production, and the formulation of the diet. Diets shall be formulated to account for the variable nutrient composition of CMS, particularly its lower energy content and higher levels of moisture, potassium, and sulfur.

Table 2: Maximum and Minimum Levels of CMS for Various Animal Classes.

Animal Class	Optimum level of CMS inclusion (%)	Minimum level (%)	Maximum Level (%)
Cattle (Dairy Cows)	2	-	3
Sheep	-	-	10
Pigs (growing)	2	-	-
Poultry (Broilers)	-	-	10
Poultry (Laying Hens)	-	2.5	-
Ducks (Hybrid)	-	-	-

Note 1: If diets are not properly balanced, even relatively low inclusion rates can cause adverse effects on animal performance, health, and product quality.

5. Hygiene Requirements for Condensed Molasses Solubles (CMS)

5.1 Environmental Contamination and Pest Control

5.1.1 Producers shall take all reasonable measures to control and minimize environmental contamination from soil, air, water, and other sources. Measures shall also be in place to prevent infestation or contamination by pests, vermin, or birds throughout the production, storage, and transportation processes.

5.2 Monitoring and Testing

5.2.1Producers shall implement risk-based inspection and monitoring protocols including:

a) Sampling and analysis of CMS and feed ingredients for undesirable substances (e.g., mycotoxins, pesticides, heavy metals).

b) Verification of compliance with microbiological and physical contaminant limits outlined in this standard.

5.3 Traceability and Recall

5.3.1 CMS producers shall maintain records to facilitate traceability of raw materials, finished products, and their distribution. In the event of detection of contamination or risk to animal or public health:

a) Immediate notification to the competent authority shall occur.

b) Effective measures shall be taken to withdraw or recall affected lots.

c) All actions shall be documented and available for regulatory review.

5.4 International Trade and Emergency Measures

5.4.1 The producer shall establish procedures to address situations where CMS intended for export are deemed unsafe or do not meet the safety requirements of the importing country. The procedures shall be consistent with the relevant technical specifications and at minimum include batch or lot identification, nature of the issue, manufacturer details etc.

6. Requirements for establishments producing Condensed Molasses Solubles

6.1 Buildings and facilities

6.1.1 Buildings used in the manufacture or storage of shall be of suitable size, design and construction to permit unobstructed placement of equipment, orderly storage of materials and products, sanitary operation and adequate cleaning and maintenance.

6.1.2 Floors, walls and ceilings shall be constructed of smooth easily cleanable surfaces and shall be kept clean and in good repair.

6.1.3 Fixtures, ducts and pipes shall be installed in such a manner that drip or condensate does not contaminate cosmetic materials, utensils, cosmetic contact surfaces of equipment or finished products in bulk.

6.1.4 Lighting and ventilation shall be sufficient for the intended operation and comfort of personnel.

6.1.5Water supply, washing and bathroom facilities, floor drainage and sewage system shall be adequate for sanitary operation and cleaning of facilities, equipment and utensils, as well as to satisfy employee needs and facilitate personal cleanliness.

6.2 Equipment

6.2.1 Equipment and utensils used in processing, handling, holding, transferring and filling shall be of appropriate design, material and workmanship to prevent corrosion, build-up of material, or adulteration with lubricants, dirt or sanitizing agents.

6.2.2 Utensils, transfer piping and contact surfaces of equipment shall be well maintained and cleaned and shall be sanitized at appropriate intervals.

6.2.3 Cleaned and sanitized portable equipment, utensils and contact surfaces shall either be covered and protected, or stored and located in a manner that protects them from splash, dust, harmful micro-organisms or other contamination.

6.3 Personnel

6.3.1 The personnel supervising or performing the manufacture or control of the CMS shall have the education, training and/or experience to perform the assigned functions.

6.3.2 Persons coming into direct contact with materials used to make CMS, finished products in bulk or contact surfaces, shall wear appropriate outer garments, gloves, hair restraints among others and shall maintain adequate personal cleanliness, to prevent adulteration of the CMS.

6.4 Raw materials

6.4.1 Raw materials and primary packaging materials shall be stored and handled in a manner which prevents their mixing, contamination with micro-organisms or other chemicals, or decomposition from exposure to excessive heat, cold, sunlight or moisture.

6.4.2 Containers of raw materials shall be closed and bagged or boxed. Raw materials shall be stored off the floor.

6.4.3 Containers of raw materials shall be labelled and colour coded with respect to identity. They shall also be labelled with respect to lot identification and control status.

6.4.4 Raw materials shall be sampled and tested or examined in accordance with documented procedures assuring the absence of contamination with filth, micro-organisms or other extraneous substances to the extent necessary to prevent adulteration of finished products.

6.4.5 Materials not meeting acceptance specifications shall be properly identified and controlled to prevent their use in the manufacture of the CMS.

6.5 Production control

6.5.1 Manufacturing and control procedures shall be established and written instructions, that is, formulations, processing, transfer and filling instructions, in-process control methods among others shall be maintained.

6.5.2 The equipment used for processing, transfer and filling, and the utensils and the containers for holding raw and bulk materials, shall be clean, in good repair and in sanitary condition.

6.5.3 Samples shall be taken, as appropriate, during and/or after processing, transfer or filling, for testing for adequacy of mixing or other forms of processing, absence of hazardous micro-organisms or chemical contaminants and compliance with any other acceptance specifications.

6.5.4 Major equipment, transfer lines, containers and tanks used for processing, filling or holding the hand sanitizer shall be identified to indicate contents, batch designation, control status and other pertinent information.

6.5.5 The equipment for processing, holding, transferring and filling of each batch shall be labelled regarding identity, batch identification and control status.

6.6 Laboratory control

6.6.1 Raw materials, in-process samples and finished products shall be tested or examined to verify their identity and determine their compliance with specifications for physical and chemical properties and microbial contamination, as well as for hazardous or other unwanted chemical contaminants normally associated with the raw material.

6.6.2 Reference samples of approved lots or batches of raw materials and finished products shall be retained for a specified time period, shall be stored under conditions that protect them against contamination or deterioration, and shall be retested for continued compliance with established acceptance specifications.

6.6.3 The water supply used in processing or cleaning should be of suitable quality. Where necessary, potable water shall be used to avoid contamination.

6.7 Records

6.7.1 Control records shall be maintained for raw materials, primary packaging materials,

batch manufacturing and distribution purposes.

6.7.2 Documentation of the handling, storage, laboratory control and use of raw materials and primary packaging materials, as well as disposal of rejected material shall be maintained.

6.7.3 During the manufacture of batches, the following shall be documented:

(a) names, lot numbers and quantities of raw materials used;

(b) processing, handling, transferring, holding and filling;

(c) sampling, controlling, adjusting and reworking; and

(d) code marks of batches and finished products.

6.7.4 Details of sampling, individual laboratory controls, test results and control status of the finished products shall be recorded.

6.7.5 For distribution and traceability purposes, records of initial shipment, code marks and consignees shall be kept.

7 Packaging and Labelling

The product shall be labelled in accordance with JS CRS 5.

8 Sampling

The method of routine sampling and criteria for acceptance shall be as in Annex A. A sample of feed for analysis should be of sufficient quantity to be satisfactory for analytical purposes and should be taken as follows:

8.1.1 Sampling of co-product or by-product feeds, such as CMS, shall be carried out with particular care due to the potential for significant nutrient variation between processing plants and, in some cases, between individual loads from the same plant.

8.1.2 **Condensed Molasses Solubles in Barrels**: For lots containing 1 to 10 barrels, every barrel shall be sampled. For lots containing 11 barrels or more, a minimum of 10 barrels shall be selected for sampling. A uniform quantity shall be taken from each selected barrel and combined to create a composite sample, which shall then be reduced to the quantity required for testing. Two airtight jars shall be filled with the composite: one shall be placed in cold storage, and the other shall be sent to the testing laboratory.

8.1.3 **Condensed Molasses Solubles in Small Retail Containers**: Samples shall consist of the contents of intact, unopened containers.

8.1.4 **Condensed Molasses Solubles in Tank Cars, Tank Trucks, or Storage Tanks**: For lots of less than 5,000 gallons, a minimum of 1 quart shall be collected. For lots exceeding 5,000 gallons, 1 pint shall be drawn for each 5,000 gallons, with the total sample size being no less than 1 quart.

8.1.5 Samples shall be taken from a minimum of four to five different locations within each load received. These samples shall be composited and submitted for laboratory analysis.

8.1.6 For high-moisture co-product feeds, moisture content can vary widely. A dry matter

analysis shall be conducted, and feeding rates shall be adjusted on an as-fed basis accordingly.

8.1.7 Co-product feeds may contain elevated levels of certain minerals, particularly sulphur in distillers' co-products, which can pose health risks to cattle. Mineral testing shall therefore be included in the analysis request.

8.1.8 The laboratory conducting the analysis shall be consulted to ensure that all necessary tests are performed to support accurate feed formulation and safe feeding decisions.

ANNEX A (Informative)

Table 3: Condensed Molasses Solubles (Sugar Cane) – Product Specification and Recommended Testing Methods

Parameter	Typical Range (Sugar Cane CMS)	Recommended Testing Method	Inclusion Level – Potassium *Not* Sequestered	Inclusion Level – Potassium Sequestered
Total Solids (%)	55 – 65	AOAC 930.15 (Oven Dry Method)	3–4% in ruminant diet; ≤1–2% in monogastrics	Up to 10% in ruminant diet; ≤4% in monogastrics
Brix (°Bx)	55 – 70	ISO 2173 (Refractometry)	As above	As above
Crude Protein (% as fed)	16 – 25 (mostly NPN)	AOAC 984.13 (Kjeldahl or Dumas)	As above	As above
Ash (% DM)	25 – 33	AOAC 942.05	As above	As above
Potassium (K, % DM)	7 – 10	AOAC 985.35 (Flame Photometry or ICP-OES)	Limit to ≤3–4% inclusion due to K load	Can increase inclusion by 2–3× once K is removed or reduced
Sulphur (S, % DM)	0.8 – 1.4	AOAC 923.01 or ICP-OES	Keep total dietary S <0.4% DM to avoid PEM risk	Same
Sodium (Na, % DM)	0.6 – 0.8	AOAC 985.35	Watch DCAD balance	Watch DCAD balance
Chloride (Cl, % DM)	0.7 – 1.0	AOAC 943.01	Adjust salt in diet accordingly	Adjust salt in diet accordingly
pH	3.9 – 4.2	pH meter (AOAC 981.12)	As above	As above
Moisture (% as fed)	35 – 45	AOAC 930.15	—	—
Viscosity (cP @ 40°C)	3,000 – 5,000	Brookfield Viscometer	Impacts pumpability and mixing	Same

ANNEX B (Informative)

Given the significant variability in CMS composition, the raw material and fermentation process, regular analysis of batches is crucial for accurate feed formulation. The following specification outlines ideal ranges:

A) Cattle (Dairy Cows):
Optimal inclusion is 2% of the diet.
CMS can practicably substitute a part of concentrates in lactating cows' diets up to **3% of the diet**.
However, higher additions (e.g., more than 3%, like 4%) could decrease production performance, negatively affect rumen fermentation (ruminal pH dropping below 6), nutrient digestibility, and immunity.

B) Cattle (Feedlot/Growing Calves):
When diets are formulated to be iso-energetic and iso-nitrogenous, CMS has the potential to replace molasses and can be included up to **15% of the diet** without adverse effects on weight gain, feed intake, or feed conversion ratio in feedlot bull calves.

However, in studies where energy levels were not fully compensated, inclusion around **5% of the diet** was effective and promoted carcass composition, while higher levels (10% and 15%) had negative effects on performance, nutrient digestibility, and volatile fatty acid (VFA) production.
General ruminant recommendations suggest that effects can be seen above 5-10% if not balanced.

C) Sheep:
When diets are formulated to be iso-energetic and iso-nitrogenous, CMS can be included up to **12% of the diet** (replacing molasses) without adverse effects on intake, growth performance, digestibility, or rumen parameters.

Conversely, for fattening lambs, inclusion at 10% or 20% has been reported to reduce feed intake and growth rate if diets were not balanced for energy.

D) Pigs (Growing):
An optimal inclusion is **2% of the diet** to replace molasses without adversely affecting growth performance or nutrient digestibility.

Adding 1.5% and 3% CMS to the diet of growing-finishing pigs has shown significantly higher results than molasses in some studies.

High levels (e.g., 16% and 43%) have been reported to reduce feed digestion in pigs.

E) Poultry (Broilers):
CMS can be incorporated into broiler starter feed at levels up to **10%** without statistically significant differences in performance (body weight, feed efficiency, mortality).

F) Poultry (Laying Hens):
Inclusion of **2.5% or more of CMS** has been associated with a significant increase in egg production, though it may also lead to a reduction in egg weights and Haugh units.

G) Ducks (Hybrid):

While specific feeding trial inclusion levels are not provided in the sources for ducks, CMS is identified as a "high protein source" with "strong potential" as a feed ingredient, demonstrating beneficial nutritional and antimicrobial properties for hybrid ducks.

Standards Council

The Standards Council is the controlling body of the Bureau of Standards Jamaica and is responsible for the policy and general administration of the Bureau.

The Council is appointed by the Minister in the manner provided for in the Standards Act, 1969. Using its powers in the Standards Act, the Council appoints committees for specified purposes.

The Standards Act, 1969 sets out the duties of the Council and the steps to be followed for the formulation of a standard.

Preparation of standards documents

The following is an outline of the procedure which must be followed in the preparation of documents:

1. The preparation of standards documents is undertaken upon the Standard Council's authorisation. This may arise out of representation from national organisations or existing Bureau of Standards' Committees of Bureau staff. If the project is approved it is referred to the appropriate sectional committee or if none exists a new committee is formed, or the project is allotted to the Bureau's staff.

2. If necessary, when the final draft of a standard is ready, the Council authorises an approach to the Minister in order to obtain the formal concurrence of any other Minister who may be responsible for any area which the standard may affect.

3. The draft document is made available to the general public for comments. All interested parties, by means of a notice in the Press, are invited to comment. In addition, copies are forwarded to those known, interested in the subject.

4. The Committee considers all the comments received and recommends a final document to the Standards Council

5. The Standards Council recommends the document to the Minister for publication.

6. The Minister approves the recommendation of the Standards Council.

7. The declaration of the standard is gazetted and copies placed on sale.

8. On the recommendation of the Standards Council the Minister may declare a standard compulsory.

9. Amendments to and revisions of standards normally require the same procedure as is applied to the preparation of the original standard.

Overseas standards documents

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