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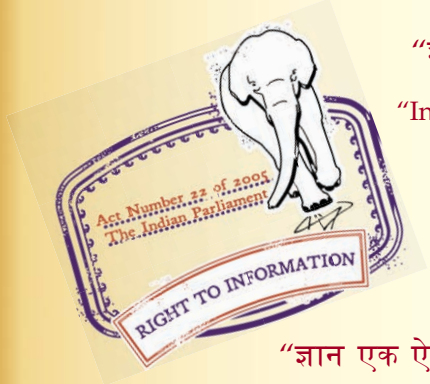
IS 2404 (1993): Malt Extract [FAD 16: Foodgrains, Starches and Ready to Eat Foods]



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भारतीय मानक

माल्टसार – विशिष्टि

(दूसरा पुनरीक्षण)

Indian Standard

MALT EXTRACT — SPECIFICATION

(Second Revision)

UDC 663·478·2

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

March 1993

Price Group 5

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Foodgrains and Foodgrain Industries Sectional Committee had been approved by the Food and Agriculture Division Council.

This standard was first published in 1963. The practical implementation of this Indian Standard through the BIS Certification Marking programme indicated the need for reconsidering the limits for certain characteristics. Malt extract is largely used in the manufacture of certain processed foods, pharmaceuticals and in the textile industry for designing. Enquiries from the consumers revealed that they preferred malt extract with known diastatic activity, which is a measure of the power of any material of converting starch into sugar and an important criterion for finding quality of malt extract from the view point of baking. In view of these reasons, the standard was revised. In the revised version, the limits for refractive index and total solids content were modified, besides making the diastatic value specific and including a new characteristic of total reducing sugar.

This standard was earlier not applicable to malt extract for brewery purposes. However it was felt necessary to cover brewery grade malt extract in this standard. The standard is therefore being revised again to include brewery grade malt extract which has a lower protein value than the other grades. A clause permitting use of benzoic acid as a preservative was earlier provided for, however this is being deleted as the same is not included under the PFA, Rules.

During the formulation of this standard due consideration has been given to the Prevention of Food Adulteration Act, 1954 and Rules framed thereunder and the Standards of Weights and Measures (Packaged Commodities) Rules, 1977. This standard is however subjet to the restrictions imposed under these Rules, wherever applicable.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

MALT EXTRACT — SPECIFICATION

(Second Revision)

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for malt extract for use in food industries.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard.

IS No.	*Title*
266 : 1977	Sulphuric acid (*second revision*)
376 : 1986	Sodium hydroxide, analytical reagent (*third revision*)
1070 : 1992	Reagent grade water (*third revision*)
2491 : 1972	Code for hygienic conditions for food processing units (*first revision*)
4905 : 1968	Methods for random sampling
5401 : 1969	Methods for detection and estimation of coliform bacteria in foodstuffs
5402 : 1969	Method for plate count of bacteria in foodstuffs
5403 : 1969	Method for yeast and mould count in foodstuffs

3 TYPES

Malt extract shall be of the following three types:

Type 1 - Diastatic Malt Extract
Type 2 - Non-Diastatic Malt Extract
Type 3 - Brewery grade Malt Extract

4 REQUIREMENTS

4.1 General

4.1.1 Malt extract shall be prepared by digesting with water sound malted grains of cereals (such as barley, wheat and millets, that is *cholam* or *ragi*) at a suitable temperature. The water extract is then strained and evaporated into a viscous product.

4.2 Description

4.2.1 Malt extract shall be a viscous liquid, amber or yellowish brown in colour and shall possess a characteristic odour and sweet taste. The material shall be free from any adulterants, off-odour, foreign flavour and impurities.

4.3 Malt extract shall be manufactured in premises maintained under hygienic condition (*see* IS 2491 : 1972).

4.4 The material shall also comply with the requirements given in Table 1 and 2.

Table 1 Requirement for Malt Extract
(*Clause* **4.4**)

Sl No.	Characteristic	Requirements			Method of Test, Ref to Annex
		Type 1	Type 2	Type 3	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Density at 20°C, *Min*	1.39	1.39	1.39	A
ii)	Refractive index at 20°C, *Min*	1.489	1.489	1.489	B
iii)	Total solids (as is basis), percent by mass, *Min*	77	77	77	C
iv)	Reducing sugar, on dry basis, (calculated as anhydrous maltose), percent by mass, *Min*	60	60	60	D
v)	Crude protein (on dry basis), percent by mass, *Min*	4	4	2.5	E
vi)	Diastatic activity (Lintner value), *Min*	10°L	—	—	F

Table 2 Microbiological Requirement for Malt Extract
(*Clause* 4.4)

Sl No.	Characteristic	Requirement	Method of Test, Ref to
(1)	(2)	(3)	(4)
i)	Total bacterial count, per g, *Max*	10 000	IS 5402 : 1969
ii)	Coliform bacteria	Absent	IS 5401 : 1969
iii)	Yeast count, per g, *Max*	500	IS 5403 : 1969
iv)	Mould count, per g, *Max*	500	IS 5403 : 1969

5 PACKING AND MARKING

5.1 Packing

Malt extract shall be packed in sealed, clean, sound and air-tight containers made of galvanized iron, glass or any other suitable material.

5.2 Marking

The following particulars shall be marked or labelled on each container:

a) Name and type of the material;
b) Source of manufacture;
c) Batch or code number;
d) Date of manufacture;
e) Net mass; and
f) Any other details required under the Standards of Weight and Measures (Packaged Commodities) Rules, 1977.

5.2.1 The container may also be marked with the Standard Mark.

6 SAMPLING

Representative samples of the material shall be drawn and conformity of the material to the requirements of the specification shall be determined according to the procedure given in Annex G.

7 TESTS

7.1 Tests shall be carried out in accordance with appropriate annexes and standards specified in col 6 of Table 1 and col 4 of Table 2.

7.2 Quality of Reagents

Unless specified otherwise, pure chemicals shall be employed in tests and distilled water (*see* IS 1070 : 1992) shall be used where the use of water as a reagent is intended.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the result of analysis.

ANNEX A
[*Table* 1, *Item* (i)]

DETERMINATION OF DENSITY

A-1 PROCEDURE

Dissolve about 25 g of the material, accurately weighed, in about 15 ml of water by warming gently in a 50-ml beaker. Cool and transfer to a tared 50-ml graduated flask and dilute to 50 ml with water. Adjust the temperature to 20°C and weigh.

A-2 CALCULATION

A-2.1 Mass per millilitre at 20°C $= \dfrac{0.9972\ M}{49.86 + M - m}$

Where

M = mass, in g, of malt extract taken for the test, and
m = mass, in g, of the malt extract solution.

ANNEX B

[*Table* 1, *Item* (ii)]

DETERMINATION OF REFRACTIVE INDEX

B-1 APPARATUS

B-1.1 Abbe's Refractometer

The temperature of the refractometer should be controlled to within ±0.1°C, and for this purpose it should be provided with a thermostatically controlled water-path and a motor driven pump to circulate water through the instrument. The instrument should be standardized, following the manufacturer's instructions, with a liquid of known purity and refractive index or with a glass prism of known refractive index. Distilled water, which has a refractive index 1.333 0 at 20.0°C, is a satisfactory liquid for standardization.

B-1.2 Light Source

If the refractometer is equipped with a compensator, a tungsten lamp or a daylight bulb may be used. Otherwise, a monochromatic light, such as an electric sodium vapour lamp, should be used.

B-2 PROCEDURE

B-2.1 Filter the sample through a filter paper to remove impurities, if any. Adjust the temperature of the refractometer to 20 ± 0.01°C. Ensure that the prisms are clean and completely dry and then place a few drops of the sample on the lower prism. Close the prisms, tighten firmly with the screw-head, and allow to stand for one or two minutes. Adjust the instrument and light to obtain the most distinct reading possible, and determine the refractive index.

ANNEX C

[*Table* 1, *Item* (iii)]

DETERMINATION OF TOTAL SOLIDS

C-1 APPARATUS

C-1.1 Flat-Bottom Dish

The dish shall be of nickel or other suitable material not affected by boiling water 7 to 8 cm in diameter and not more than 2.5 cm deep, provided with a short glass stirring rod having a widening flat end.

C-1.2 Sand

Sand which passes through a 500-micron IS Sieve and is retained on a 180-micron IS Sieve shall be used. It shall be prepared by digestion with concentrated hydrochloric acid, followed by thorough washing with water till free from chlorides. It shall then be dried and ignited to dull red heat.

C-1.3 Vacuum Oven

C-2 PROCEDURE

C-2.1 Heat the dish, containing about 20 g of the prepared sand and a stirring rod, in the oven for about one hour. Allow to cool in an efficient desiccator for 30 to 40 minutes. Weigh accurately about 2 g of the material into the tared dish. Add about 5 ml of distilled water in the dish and thoroughly mix the sand with the sample by stirring with the glass rod, smoothing out lumps and spreading the mixture over the bottom of the dish.

C-2.1.1 Place the dish on a boiling water-bath for 30 minutes, then wipe the bottom of the dish and transfer it, with the glass rod, to the vacuum oven maintained at a temperature between 60 and 70°C and at a pressure of not more than 50 mm of mercury.

C-2.1.2 After 2 hours, remove the dish to a desiccator, allow to cool and weigh. Replace the dish in the oven for a further period of one hour, remove to the desiccator, cool and weigh again. Repeat the process of heating, cooling and weighing after every one hour till consecutive weighings do not differ by more than 0.5 mg.

C-3 CALCULATION

C-3.1 Total solids, percent by mass $= \dfrac{100\ (M_1 - M_2)}{M_1 - M}$

where

M_1 = mass, in g, of the contents of the dish before drying,

M_2 = mass, in g, of the contents of the dish after drying, and

M = mass, in g, of the empty dish with the sand and the glass rod.

ANNEX D

[*Table* 1, *Item* (iv)]

DETERMINATION OF TOTAL REDUCING SUGARS

D-1 REAGENTS

D-1.1 Stock Solution of Dextrose

Weigh accurately 9.500 0 g of pure dextrose on a watch glass and transfer it to a one-litre volumetric flask with 100 ml water. Add 5 ml of concentrated hydrochloric acid (sp gr 1.19). Allow this to stand for 3 days at 20° to 25°C and then make up to volume with water (This is stable for several months.)

D-1.2 Standard Solution of Dextrose

Pipette 50 ml of the stock solution of dextrose (*see* **D-1.1**) in a 250-ml volumetric flask. Neutralize carefully with sodium hydroxide of about one percent (*m/v*) and make up to the volume.

D-1.3 Methylene Blue Indicator Solution

Dissolve 1.0 g of methylene blue in water and dilute to 100 ml.

D-1.4 Fehling's Solution (Soxhlet Modification)

Prepare by mixing immediately before use, equal volumes of solution A, prepared as described under **D-1.4.1** and solution B, prepared as described under **D-1.4.2.**

D-1.4.1 *Solution A*

Dissolve 34.639 g of copper sulphate ($CuSO_4$. $5H_2O$) in water, and 0.5 ml of concentrated sulphuric acid of sp gr 1.84 [conforming to analytical reagent grade of IS 266 : 1977 Specification for sulphuric acid (*revised*)], and dilute to 500 ml in a volumetric flask. Filter the solution through prepared asbestos.

D-1.4.2 *Solution B*

Dissolve 173 g of Rochelle salt [potassium sodium tartrate ($KNaC_4H_4O_6$, $4H_2O$)] and 50 g of sodium hydroxide, analytical reagent (conforming to IS 376 : 1986) in water. Dilute to 500 ml in a volumetric flask and allow the solution to stand for two days. Filter this solution through prepared asbestos.

D-1.4.3 *Standardization of Fehling's Solution*

Pour standard dextrose solution (*see* **D-1.2**) into a 50-ml burette (*see* Note 3 under **D-2.3**). Pipette 10 ml of Fehling's solution into a 300-ml flask and run in from the burette almost the whole of the standard dextrose solution required to effect reduction of all the copper, so that not more than one millilitre will be required later to complete the titration. Heat the flask containing the mixture over a wire gauze. Gently boil the contents of the flask for 2 minutes. At the end of 2 minutes of boiling, add without interrupting boiling, 3 to 5 drops of methylene blue indicator solution. While the contents of the flask continue to boil, begin to add standard dextrose solution (one or two drops at a time) from the burette till the blue colour of the indicator just disappears. The titration should be completed within one minute, so that the contents of the flask boil altogether for 3 minutes without interruption (*see* Note 2 under **D-2.3**). Note the titre (that is the total volume in millilitres of standard dextrose solution used for the reduction of all the copper in 10 ml of Fehling's solution). Multiply the titre (obtained by direct titration) by the number of milligrams of dextrose in one millilitre of the standard dextrose solution to obtain the dextrose factor. Compare this factor with the dextrose factor given in Table 3 and determine correction, if any, to be applied to the dextrose factors derived from the table.

Example :

Concentration of anhydrous dextrose in standard dextrose solution as mg/100 ml	= 167 mg
Titre obtained by direct titration	= 30.1
Dextrose factor for 30.1 ml of standard dextrose solution	= Titre in ml × number of mg of anhydrous dextrose in 1 ml of standard = 30.1 × 1.670 = 50.2670
Dextrose factor 30.1 ml from Table 2 (calculated by interpolation)	= 50.11
Correction to be applied to the dextrose factors derived from Table 2	= 50.2670–50.11 = +0.1570

D-1.4.3.1 Deduce maltose factor by reading corresponding values against corrected dextrose factor from Table 3.

D-1.5 Neutral Lead Acetate

Dissolve 100 g of lead acetate [$Pb(CH_3COO)_2$, $3H_2O$] in distilled water and dilute to one liter.

D-1.6 Sodium Phosphate-Potassium Oxalate Solution

Dissolve 70 g of disodium hydrogen phosphate, dodecahydrate (Na_2HPO_4, $12H_2O$) and 30 g of potassium oxalate ($K_2C_2O_4$, H_2O) in water and dilute to one liter.

D-1.7 Sodium Hydroxide Solution

Approximately 6 N, prepared by dissolving sodium hydroxide analytical reagent (conforming to IS 376 : 1986).

D-1.8 Concentrated Hydrochloric Acid

sp gr 1.029 at 20/4°C.

D-2 PROCEDURE

Table 3 Dextrose and Maltose Factors for 10 ml of Fehling's Solution

(Clauses **D-1.4.3** *and* **D-3.1)**

This table shows, for the standard method of titration, the values corresponding to integral millilitres of the sugar solutions, the values corresponding to intermediate figures being obtained by interpolation.

Titre in ml (1)	*Dextrose Factor (2)	*Maltose Hydrate ($C_{12}H_{22}O_{11} \cdot H_2O$) Factor (3)
15	49.1	81.3
16	49.2	81.2
17	49.3	81.1
18	49.3	81.0
19	49.4	80.9
20	49.5	80.8
21	49.5	80.7
22	49.6	80.6
23	49.7	80.5
24	49.8	80.4
25	49.8	80.4
26	49.9	80.3
27	49.9	80.2
28	50.0	80.1
29	50.0	80.0
30	50.1	80.0
31	50.2	79.9
32	50.2	79.9
33	50.3	79.8
34	50.3	79.8
35	50.4	79.7
36	50.4	79.6
37	50.5	79.6
38	50.5	79.5
39	50.6	79.5
40	50.6	79.4
41	50.7	79.4
42	50.7	79.3
43	50.8	79.3
44	50.8	79.2

*Milligrams of dextorose/maltose corresponding to 10 ml of Fehling's solution.

D-2.1 Preparation of Solution

Weigh accurately about 12.5 g of malt extract and transfer to a 250-ml volumetric flask. Add 25 ml of the lead acetate solution. Make up to volume, mix and filter. Reject the first few drops of the filtrate. To 100 ml of the clean filtrate in a 500-ml volumetric flask, add 10 ml of the sodium phosphate-potassium oxalate mixture. Make up to volume with water, shake and filter. Reject the first few drops of the filtrate and use the clear filtrate for preparation of invert solution (*see* **D-2.1.1**).

D-2.1.1 *Preparation of Invert Solution*

To 50 ml of the filtrate (*see* **D-2.1**), in a 100-ml volumetric flask, add 25 ml of water, and 10 ml of concentrated hydrochloric acid. Heat on a water bath to 70°C and regulate heat in such a way the the temperature is maintained at 70°C. Place the flask in a water bath, insert a thermometer and heat with constant agitation until the thermometer in the flask indicates 67°C. From the moment the thermometer in the flask indicates 67°C, leave the flask in the water bath for exactly 5 minutes, during which time the temperature should gradually rise to about 69.5°C. Plunge the flask at once into water at 20°C. When the contents have cooled to about 35°C, remove the thermometer from the flask, rinse it and add 10 ml of 6 N sodium hydroxide solution for neutralization of acid, leave the flask in the bath at 20°C for about 30 minutes and then make up exactly to volume with water. Mix the solution well.

D-2.2 Incremental Method of Titration

Pour the prepared solution (*see* **D.2.2.1**) into a 50-ml burette (*see* Note 3 under **D-2.3**). Pipette 10 ml of Fehling's solution into a 300-ml conical flask and run in from the burette 15 ml of the prepared solution (*see* **D-2.1**). Without further dilution heat the contents of the flask over a wire gauze, and boil. (After the liquid has been boiling for about 15 seconds, it will be possible to judge if the copper is almost all reduced by the bright red colour imparted to the boiling liquid by the suspended cuprous oxide). When it is judged that nearly all the copper is reduced, add 3 to 5 drops of methylene blue indicator solution (*see* Note 1). Continue boiling the contents of the flask for one to two minutes from the commencement of ebulition, and then add the prepared solution in small quantities (one millilitre or less at a time), allowing the liquid to boil for about 10 seconds between successive additions, till the blue colour of the indicator just disappears (*see* Note 2 under **D-2.3**). In case there appears to be still much unreduced copper, after the mixture of Fehling's solutions with 15 ml of the prepared solution has been boiling for a quarter of a minute, add the prepared solution from the burette in larger increments (more than one millilitre at a time, according to judgement), and allow the mixture to boil for a quarter of minute after each addition. Repeat the addition of the prepared solution at intervals of 15 seconds until it is considered unsafe to add large increment of the prepared solution. At this stage continue the boiling for an additional one to two minutes, add 3 to 4 drops of methylene blue indicator solution and complete the titration by adding the prepared solution in small quantities [less than one millilitre at a time (*see* also Note 2)].

NOTES

1 It is advisable not to add the indicator until the neighbourhood of the end point has been reached, because the indicator retains its full colour until the end point is almost reached and thus gives no warning to the operator to go slowly.

2 When the operator has had a fair amount for experience with the method, a sufficiently accurate result may often be obtained by a single estimation by the incremental method of titration, but for the utmost degree of accuracy of which the method is capable, a second titration should be carried out by the standard method of titration (*see* **D-2.3**).

D-2.3 Standard Method of Titration

Pipette 10 ml of Fehling's solution into a 300-ml conical flask and run in from the burette almost the whole of the prepared solution required to effect reduction of all copper (determined under **D-2.2**) so

that, if possible, not more than one millilitre shall be required later to complete the titration. Gently boil the contents of the flask for 2 minutes. At the end of 2 minutes of boiling, add, without interrupting boiling, one millilitre of methylene blue indicator solution. While the contents of the flask continue to boil, begin to add the solution (one or two drops at a time), from the burette till the blue colour of the indicator just disappears (*see* Note 1). The titration should be completed within one minute, so that the contents of the flask boil together for 3 minutes without interruption (*see* Note 2).

NOTES

1 The indicator is so sensitive that it is possible to determine the end point within one drop of the prepared solution in many cases. The complete decolorization of methylene blue is usually indicated by the whole contents in the flask in which the cuprous oxide is continuously churned up becoming bright red or orange in colour. In case of doubt, the flame may be removed from the wire gauze for one or two seconds and the flask viewed against a sheet of white paper. (A holder of paper, suitable fixed round the neck of the flask is very convenient for this purpose as it can be left round the neck of flask without risk of over balancing it.) The top edge of the liquid would appear bluish if the indicator is not completely decolorized. It is inadvisable to interrupt the boiling for more than a few seconds as the indicator undergoes back oxidation rather rapidly when air is allowed free access into the flask, but there is no danger of this as long as continuous stream of steam is issuing from the mouth of the flask.

2 It should be observed that with both incremental and standard methods of titration, the flask containing the reaction mixture is left on the wire gauze over the flame throughout the titration except when it may be removed from a few seconds to ascertain if the end point is reached.

3 In adding sugar solution to the reaction mixture, the burette may be held in the hand over the flask. The burette may be fitted with a small outlet tube bent twice at right angles, so that the body of the burette can be kept out of the steam while adding sugar solution. Burettes with glass tapes are not suitable for this work, as the taps become heated by the steam and are liable to jam.

D-3 CALCULATION

D-3.1 Refer to Table 2 for the dextrose factor corresponding to the titre (determined as given under **D-2.3**) and apply the correction previously determined.

$$\text{Milligrams of maltose present in 1 ml of the prepared solution} = \frac{\text{Maltose factor}}{\text{Titre}}$$

D-3.2 Reducing sugars (expressed as maltose), percent by mass

$$= \frac{C}{M}$$

where

C = milligrams of the maltose in 1 ml of the prepared solution (*see* **D-3.1**)

M = mass, in g, of the material taken for the test.

ANNEX E

[*Table* 1, *Item* (v)]

DETERMINATION OF CRUDE PROTEIN

E-1 APPARATUS

E-1.1 An assembly of the apparatus recommended for the determination of crude protein in malt extract is shown in Fig. 1.

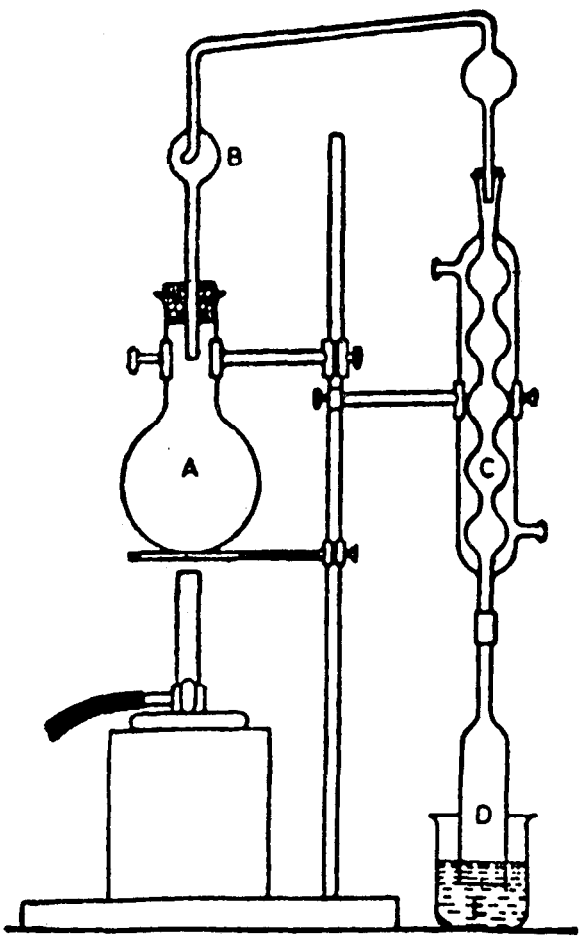

FIG. 1 ASSEMBLY OF APPARATUS FOR DETERMINATION OF CRUDE PROTEIN

E-1.1.1 *Description*

The apparatus consists of a round-bottomed flask *A* of 1 000-ml capacity fitted with a rubber stopper through which passes one end of the connecting bulb tube *B*. The other end of the bulb tube *B* is connected to the condenser *C* which is attached by means of a rubber tube to a dip tube *D* open at the other end. The dip tube dips into the liquid contained in a beaker *E* of 250-ml capacity.

E-2 REAGENTS

E-2.1 Anhydrous Sodium Sulphate

E-2.2 Copper Sulphate

E-2.3 Concentrated Sulphuric Acid — sp gr 1.84.

E-2.4 Sodium Hydroxide Solution — Dissolve about 225 g of sodium hydroxide in 500 ml of water.

E-2.5 Standard Sulphuric Acid — 0.1 N

E-2.6 Methyl Red Indicator Solution — Dissolve one gram of methyl red in 200 ml of rectified spirit (95 percent by volume).

E-2.7 Standard Sodium Hydroxide Solution — 0.1 N.

E-3 PROCEDURE

E-3.1 Transfer carefully about one gram of the material, accurately weighed, to a Kjeldahl flask, taking precaution to see that particles of the material do not stick to the neck of the flask. Add about 15 to 18 g of anhydrous sodium sulphate, about 0.2 g of copper sulphate and 25 ml of concentrated sulphuric acid. Place the flask in an inclined position. Heat below the boiling point of the acid until frothing ceases. Increase heat until the acid boils vigorously and digest for 30 minutes after the mixture becomes clear and pale-green or colourless. Wash down cautiously any particles sticking to the sides with a minimum quantity of concentrated sulphuric acid, and continue digestion for 60 to 90 minutes. Cool the contents of the flask. Transfer quantitatively, using water, to the round-bottomed flask *A* and dilute to 250 ml. Add a few pieces of pumice stone to prevent bumping, then add about 60 ml of sodium hydroxide solution or more (if necessary, to make the solution alkaline) carefully through the side of the flask so that it does not mix at once with the acid solution but forms a layer below it. Assemble the apparatus as shown in Fig. 1, taking care that the dip tube *D* extends below the surface of a known quantity of standard sulphuric acid contained in the beaker *E*. Mix the contents of the flask by shaking and distil until all ammonia has passed over into the standard sulphuric acid. Detach flask *A* from the condenser and then shut off the burner. Rinse the condenser thoroughly with water into the beaker *E*. Wash the dip tube *D* carefully so that all traces of the condensate are transferred to the beaker. When all the washings have drained into the beaker, add two or three drops of methyl red indicator and titrate with the standard sodium hydroxide solution.

E-3.2 Carry out a blank experiment using all reagnts to the same quantities but without the material to be tested.

E-4 CALCULATION

E-4.1 Total crude protein (on dry basis), percent by mass $= \dfrac{875\ (B - A)\ N}{W\ (100 - M)}$

where

B = volume, in ml, of the standard sodium hydroxide solution used to neutralize the acid in the blank determination;

A = volume, in ml, of the standard sodium hydroxide solution used to neutralize the excess of acid in the test with the material;

N = normality of the standard sodium hydroxide solution

W = mass, in g, of the material taken for the test; and

M = moisture, percent by mass, in the material (as calculated from **C-2.1**).

ANNEX F

[*Table* 1, *Item* (vi)]

DETERMINATION OF DIASTATIC ACTIVITY (LINTNER VALUE)

F-1 REAGENTS

F-1.1 Soluble Starch Solution

Rub 20 g of soluble starch into a cream with water and pour into about 700 ml of boiling water. Bring to boil, continue heating further for two minutes and then cool to about 20°C, shaking frequently to prevent the formation of a skin. Add 20 ml of acetate buffer solution (one litre containing 65 g of sodium acetate and 500 ml of the normal acetic acid) and dilute to one litre with water (10 ml of this solution should not reduce 0.1 ml of Fehling's solution).

F-1.2 Standard Sodium Hydroxide Solution — 0.1 N.

F-1.3 Fehling's Solution (Soxhlet Modification)

Pour by mixing immediately before use, equal volumes of solution *A* prepared as described under **F-1.3.1** and solution *B* prepared as described under **F-1.3.2**. Check against 0.1 percent standard invert sugar solution by the method of titration as described under **F-2.3** that 5 ml of Fehling's solution corresponds to 0.025 33 g of invert sugar.

F-1.3.1 *Solution A*

Dissolve 34.639 g of copper sulphate ($CuSO_4$, $5H_2O$) in water, and 0.5 ml of concentrated sulphuric acid of sp gr 1.84 (conforming to analytical reagent grade of IS 266 : 1977), and dilute to 500 ml in a graduated flask. Filter the solution through prepared asbestos.

F-1.3.2 *Solution B*

Dissolve 173 g of Rochelle salt [potassium-sodium tartrate ($KNaC_4H_4O_6$, $4H_2O$)] and 50 g of sodium hydroxide, analytical reagent (conforming to IS 376 : 1986) in water, dilute to 500 ml in a graduated flask and allow the solution to stand for two days. Filter this solution through prepared asbestos.

F-1.4 Methylene Blue Solution

Dissolve 1.0 g of methylene blue in water and dilute to 100 ml.

F.2 PROCEDURE

F-2.1 Preparation of Malt Extract Solution

Weigh 10 g of malt extract in a porcelain basin and mix with cold water. On no account shall heat be used to assist in weighing or in bringing the material into solution. Transfer the solution to a 200-ml graduated flask, dilute to the mark and shake well. The solution should not be filtered and has to be used as soon as possible for starch conversion.

F-2.2 Method of Starch Conversion

Measure 100 ml of the soluble starch solution into a 200-ml graduated flask and giving it a suitable support, immerse in a water-bath maintained at 21°C. Place a standardized thermometer in the flask and when the contents have attained the temperature of 21°C, add by means of a narrow-bore pipette a definite volume (which should not normally exceed 10 ml) of the malt extract solution and mix well. The volume needed will depend upon the diastatic activity of extract and will be about

$$\frac{80}{\text{Diastatic activity of the sample}}$$ ml of 5 percent solution.

Maintain the contents of the flask at 21°C for exactly one hour. Then add 20 ml of 0.1 N of the standard sodium hydroxide solution and mix immediately care being taken to allow the alkali to flow over the inner surface of the neck of the flask. Also wash down the thermometer in the flask. Cool the solution to 15°C, dilute to 200 ml with water and shake well (this solution is referred to in the method of titration as the conversion solution).

F-2.3 Method of Titration

Measure from a burette into a 200-ml round-bottomed flask 5 ml of Fehling's solution and heat over a naked flame with continuous rotation of the flask, until the solution boils. Run the conversion solution from a burette into the boiling liquid in 5-ml lots, and after each addition boil the liquid, the flask being continuously rotated. When the blue colour of the

copper solution has nearly disappeared, add 0.2 ml of the methylene blue solution. Continue the titration with small quantities of the conversion solution, say 0.5 to 0.1 ml or drop by drop, until the blue colour of the indicator just disappears.

NOTE — The indicator is not added until the end-point is nearly reached as the final change is very rapid. The complete decolourization of the methylene blue is indicated by the whole reaction liquid becoming bright red or orange in colour. The precipitated cuprous oxide is continually being churned up. To ensure that the end-point has been reached, hold the flask against a sheet of white paper. If the indicator is completely decolourized there will be no blue tint at the edge of the liquid. The boiling process shall be sufficiently continuous to prevent air obtaining access to the flask and so causing oxidation of the indicator.

F-2.3.1 If the volume of the conversion solution used to reduce 5 ml of Fehling's solution is less than 20 ml or more than 25 ml, the conversion shall be repeated using smaller or greater quantities of the malt extract solution, as the case may be, in order to obtain a titre value between these limits. If the extract solutions have become aerated in any way or subjected to warm condition, it shall be necessary to re-weigh and carry out the dilutions again.

F-2.3.2 A preliminary titration to obtain approximate results shall be carried out first which shall be followed by a second and third titration (if necessary) to determine the end-point accurately. A confirmatory titration shall be carried out in every case.

F-3 CALCULATION

F-3.1 Diastatic activity (or Lintner value) $= \frac{1000}{XY} - 9$

where

X = number of ml of 5 percent malt extract solution in 100 ml of the conversion solution, and

Y = number of ml of conversion solution required to reduce 5 ml of Fehling's solution.

ANNEX G
(Clause **6.1**)
SAMPLING OF MALT EXTRACT

G-1 GENERAL REQUIREMENTS OF SAMPLING

G-1.0 In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

G-1.1 Samples shall not be taken in an exposed place.

G-1.2 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

G-1.3 To draw a representative sample, the contents of each container selected for sampling shall be mixed thoroughly by shaking or stirring or both by suitable means, or by rolling.

G-1.4 The samples shall be placed in clean and dry containers made of glass or any other suitable material. The sample containers shall be of such a size that they are almost completely filled by the sample. The containers shall have wide neck.

G-1.5 Each sample container shall be sealed air-tight after filling and marked with full identification particulars, such as the sample number, the date of sampling, the month and year of manufacture of the material and any other relevant particulars of the sample.

G-1.6 Samples shall be stored in a cool place and protected from light and excessive variations of temperature.

G-1.7 Sampling shall be done by a person agreed to between the purchaser and the supplier and in the presence of the purchaser (or his representative) and the supplier (or his representative).

G-2 SCALE OF SAMPLING

G-2.1 Lot

All the containers in a single consignment of the same type manufactured under relatively uniform conditions of production and having similar composition shall constitute a lot.

NOTE — In case of small lots where the selection of three containers may be uneconomical, the method for judging the conformity of the lot to the requirements of the specification shall be as agreed to between the purchasers and the suppliers.

G-2.2 Samples shall be tested from each lot separately for ascertaining the conformity of a lot to the requirements of this specification.

G-2.3 The number of packages to the selected from a lot shall depend on the size of the package as well as the size of the lot and shall be according to Table 4.

Table 4 Number of Containers to be Selected for Sampling

(*Clause* G-2.3)

Lot Size	Number of Containers to be Selected
N	*n*
Up to 20	3
21 to 50	4
51 to 80	5
81 to 120	6
121 to 200	8
201 and above	10

G-2.3.1 The containers shall be selected from the lot at random, in order ensure randomness of selection, procedure given in IS 4905 : 1968 may be followed.

G-3 PREPARATION OF TEST SAMPLES AND REFREE SAMPLES

G-3.1 Before drawing the test sample, mix thoroughly the contents of each container selected, by shaking or by any other suitable means so as to bring all portions into uniform distribution. Draw small portions of the material from different parts of each container selected (*see* Table 4). The total quantity of material drawn from each container shall be not less than 250 g.

G-3.2 Mix thoroughly all the material drawn from the same container. A small but equal quantity shall be taken from each of the selected container and shall be mixed well together so as to form a sample of not less than 600 g. This sample shall be divided into three equal composite test samples, one for the purchaser, another for the supplier, and the third for the referee.

G-3.3 The remaining material drawn from a container (after the quantity needed for formation of the composite test samples has been taken out) shall be divided into three equal parts. These parts shall be immediately transferred separately to thoroughly dried sample receptacles which are than sealed air-tight and labelled with all the particulars of sampling given under **G-1.5**. The material in each such sealed sample receptacle shall constitute on individual test sample. These individual test samples shall be separated into three identical sets of individual test samples in such a way that each set has a sample representing each container selected (*see* Table 4). One of these three sets shall be marked for the purchaser, another for the supplier and the third for the referee.

G-3.4 Referee Sample

Referee samples shall consist of one of the composite test sample (*see* **G-3.2**) and a set of individual test samples (**G-3.3**) marked for this purpose and shall bear the seals of the purchaser and the vendor. These shall be kept at a place agreed to between the purchaser and the vendor to be used in case of dispute between the two.

G-4 NUMBER OF TESTS

G-4.0 The tests mentioned in **G-4.1** and **G-4.2** shall be first conduced in the test samples marked for the purchaser. In the contingencies, such as loss, spoilage, spilling, etc, of the purchaser's test samples or if the vendor so desires, the test samples marked for the vendor may be tested. In case of dispute, the referee test samples shall be tested and the test results obtained on the referred test samples shall be considered final.

G-4.1 Tests for the determination of total solids and diastatic activity when the material is declared to be of the diastatic type, shall be conducted on each of the individual samples separately.

G-4.2 Tests for the other determinations shall be conducted on the composite sample.

G-5 CRITERIA FOR CONFORMITY

G-5.1 For Individual Samples

The lot shall be declared to satisfy the requirements of total solids and diastatic activity, if each of the test results satisfies the corresponding requirements given in Table 4.

G-5.2 For Composite Samples

The test result on the composite sample shall meet the other requirements specified in this specification.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

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Doc : No. FAD 16 (4076)

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Printed at Printrade, New Delhi, India