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भारतीय मानक मसौदा
पशुधन चारे के रूप में मक्का साइलेज — विशिष्टि

Draft ***Indian Standard***
MAIZE OR CORN SILAGE AS LIVESTOCK FODDER — SPECIFICATION

ICS 65.120

Animal Feeds and Nutrition Sectional Committee, FAD 05	Last date for Comments: 06.10.2025

FOREWORD

(*Formal clauses would be added later*)

Green fodder is considered an economical source of nutrients for the dairy animals. Conservation of green fodder in the form of silage is important to ensure regular supply of quality fodder through different seasons of the year.

Silage is fodder made from green foliage crops which have been preserved by fermentation to the point of souring. The exact methods vary, depending on available technology, local tradition and prevailing climate. Silage is usually made from grass crops including maize, sorghum or other cereals, using the entire green plant (not just the grain). Silage is very nutritious and is a cost effective and convenient way to feed cattle. By making silage, the digestibility of the nutrients of the fodder increases, due to which the animal remains healthy and stress-free. As a result, a positive effect is seen on the milk production of animals.

The formulation of this standard has been undertaken to specify requirements for maize silage used as fodder for ruminant animals. It is expected that this standard will assist the feed industry in proper utilization of fodder and improve nutritional standards of livestock.

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 or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)' . The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

MAIZE OR CORN SILAGE AS LIVESTOCK FODDER — SPECIFICATION

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for maize or corn (*Zea mays* L.) silage used as fodder for ruminant animals.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 DESCRIPTION

Maize silage is a type of animal feed made from whole, ensiled maize plants. It is the conserved green fodder having moisture content in the range of 62 percent to 70 percent which is produced by harvesting the entire maize plant, chopping and then fermenting it in a silo (or similar structure) for 45 to 50 days under anaerobic conditions. It preserves the plant and makes it a palatable and nutritious feed source for livestock.

4 REQUIREMENTS

4.1 General

Colour of maize silage shall be light green to yellow light having pleasant fruity sweet aroma. The material shall be free from harmful constituents, rancidity, adulterants, insect or mould infestation and fermented, musty or other objectionable odour. It shall be free from dirt and extraneous matter including iron or other metallic pieces.

4.2 The material shall also conform to the requirements prescribed in Table 1.

Table 1 Requirements for Maize or Corn Silage
(*Clause* **4.2**)

Sl. No. (1)	Characteristic (2)	Requirement (3)	Method of Test, Ref to (4)
i)	Moisture, percent by mass	62 - 70	**4** of IS 7874 (Part 1)
ii)	*p*H	3.5 – 4.4	Annex B
iii)	Crude protein (N×6.25), percent by mass, *Min*	7.0	IS/ISO 5983 (Part 1)* or IS 5983 (Part 2) or IS/ISO 16634-1

iv)	Crude fibre, percent by mass, *Max*	35.0	IS/ISO 6865
	or		
	Neutral detergent fibre, percent by mass, *Max*	60.0	IS 17902
v)	Acid insoluble ash, percent by mass, *Max*	5.0	Annex A of IS 1712 or IS 14826*
vi)	Aflatoxin B_1 (ppb), *Max*	20.0	IS 14718* or IS 18143 or AOAC 2003.02

NOTES

1) The values specified for requirements at Sl. No. (iii) to (v) are on moisture-free-basis.
2) In case of dispute, the test method indicated by '*' shall be the referee method.
3) For crude fibre, the manual method given in IS/ISO 6865 shall be the referee method.

5 PACKING AND MARKING

5.1 Packing

The product shall be packed in clean, dry and sound bales or bags. The bale shall be of round or any other shape which may be machine-packed using poly-film. Maize Silage may also be packed in airtight HDPE/Polypropylene film/bag or prepared in a silo pit.

5.2 Marking

5.2.1 Each bag shall be legibly and indelibly marked to give the following information:

a) Name of the material;
b) Name and address of the manufacturer;
c) Batch or code number;
d) Net mass in kg;
e) Date of packing;
f) Best before date in month & year format; and
g) Any other requirements as specified under the *Legal Metrology* (*Packaged Commodities*) *Rules*, 2011.

5.2.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act,* 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

6 SAMPLING

6.1 Silage packed in bale or bag: Representative samples of the material for ascertaining conformity to this standard shall be drawn according to the method prescribed in Annex D of IS 2052.

6.2 Silage prepared in silo pit: Representative samples of the material for ascertaining conformity to this standard shall be drawn according to the method prescribed in Annex C of this standard.

7 TESTS

7.1 Tests shall be carried out as prescribed in co1 (4) of Table 1.

7.2 Quality of Reagents

Unless specified otherwise, pure chemicals and distilled water (*see* IS 1070) shall be employed in tests.

NOTE —'Pure chemicals' shall mean chemicals that do not contain impurities which affect the test results.

ANNEX A
(*Clause* **2**)
LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 1070 : 2023	Reagent grade water — Specification (*fourth revision*)
IS 1712 : 2022	Cottonseed oilcake as livestock feed ingredient — Specification (*third revision*)
IS 2052 : 2023	Compounded feeds for cattle — Specification (*fifth revision*)
IS 7874 (Part 1) : 1975	Methods of tests for animal feeds and feeding stuffs Part 1 General methods
IS/ISO 5983 (Part 1): 2005	Animal feeding stuffs — Determination of nitrogen content and calculation of crude protein content Part 1 Kjeldahl method
IS/ISO 5983 (Part 2) : 2021/ ISO 5983-2 : 2009	Animal feeding stuffs — Determination of nitrogen content and calculation of crude protein content Part 2 Block digestion and steam distillation method (*first revision*)
IS/ISO 6865 : 2000	Animal feeding stuffs — Determination of crude fibre content — Method with intermediate filtration
IS 14826 : 2021/ISO 5985 : 2002	Animal feeding stuffs — Determination of ash insoluble in hydrochloric acid (*first revision*)
IS/ISO 14718 : 1998	Animal feeding stuffs — Determination of Aflatoxin B_1 content of mixed feeding stuffs — Method using high-performance liquid chromatography
IS/ISO 16634 -1: 2008	Food products — Determination of the total nitrogen content by combustion according to the dumas principle and calculation of the crude protein content — Part 1: Oilseeds and animal feeding stuffs
IS 17902 : 2022 /ISO 16472:2006	Animal feeding stuffs — Determination of amylase-treated neutral detergent fibre content (aNDF)
IS 18143: 2023/ ISO 17375 : 2006	Animal feeding stuffs — Determination of Aflatoxin B_1

ANNEX B
[*Table* 1*, Sl. No.* ii)]
ESTIMATION OF *p*H IN SILAGE SAMPLE

B-1 REAGENTS

Commercially available 4.0 and 7.0 colour coded buffer solutions (solutions must be checked for current expiry date).

B-2 APPARATUS

a) Weighing Balance;

b) Beakers, 250 ml Beaker;

c) Volumetric Flask 100 ml;

d) *p*H Meter; and

e) *p*H Electrode.

B-3 PROCEDURE

B-3.1 Sample Preparation

a) Take fresh silage sample and cut finely using scissors.

b) Weigh 20 g chopped silage into a beaker and add 100 ml distilled water.

c) Cover the beaker with aluminum foil and keep it for 30 minutes.

B-3.2 Calibrate *p*H Meter

a) Turn the *p*H meter on and allow to stabilize.

b) Calibrate *p*H meter using 4.0 and 7.0 buffers according to the instrument manual.

c) Once calibrated, rinse electrode thoroughly using distilled water.

B-3.3 Record Sample *p*H

a) Place the electrode into the silage solution and read the *p*H after allowing the *p*H meter to equilibrate for 30 seconds.

NOTES

1) It is important at this stage to ensure the electrode is immersed in the solution and is not obstructed by the forage material being tested.

2) Ensure that the pH electrode is rinsed thoroughly with distilled water between measurements.

3) Store the electrode in 0.1 M KCl solution following use.

ANNEX C
(*Clause* **6.2**)
METHOD OF SILAGE SAMPLING FROM SILO PIT

C-1 GENERAL

Silage sampling should take place 6 weeks after ensiling.

C-2 PROCEDURE

a) After first opening of silo pit, take 5 random samples (1 kg each) from 5 different locations at different depth after digging 20 cm deep from top, bottom or sides of walls of 50 MT capacity silo pit.

b) If available, a long core sampler may be used for more precise sampling.

c) Thoroughly mix the 5 samples from each silo pit and make a composite sample & send around 1 kg representative sample for analysis.

d) Place the silage sample into a clean, air-tight plastic bag. Use vacuum-sealed bags if possible, as they help remove air and preserve the sample's condition. If using zip-lock bags, squeeze out as much air as possible before sealing.

e) Pack silage samples as tightly as possible in sampling bag, excluding air and sealing well.

f) Double packing of silage sample and sealing ensures zero air entry, preventing spoilage and avoiding aerobic conditions, which can skew analysis results.

g) Sealed plastic bags must be packed in non-destructible and moisture retention /leak proof packing with proper labelling and sent to lab for analysis.

h) Proper labelling of samples should be done and keep record of type of crop, harvesting stage, silage additives etc.

j) Regular sampling (ideally every month) is advisable to monitor deterioration and any change in quality.

C-3 PRECAUTIONS

a) Sampling from top, bottom and side layers should be avoided.

b) Avoid areas of spoilage (silage with black colour or mold).

c) Don’t freeze the sample, send immediately for analysis.