IS 2052 (2009): Compounded Feeds for Cattle [FAD 5: Livestock Feeds, Equipment and Systems]

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भारतीय मानक

पशुओं के मिश्रित आहार — विशिष्टि

(चौथा पुनरीक्षण)

Indian Standard

COMPOUNDED FEEDS FOR CATTLE — SPECIFICATION

(Fourth Revision)

ICS 65.120

BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 7

FOREWORD

This Indian Standard (Fourth Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Livestock Feeds, Equipment and Systems Sectional Committee had been approved by the Food and Agriculture Division Council.

This standard was first published in 1962 and revised thereafter three times, last being in 1978. Specifications of cattle feed need further revision in view of the new developments in the area such as processing of feed ingredients, and growing concern for the animal health and consumer's safety. Large population of Indian livestock have low potential for milk production, however, population of high yielding cows has registered an increase in the past decade and the trend is still continuing. All categories of livestock must be fed according to their nutritional needs to utilize our feed resources most judiciously and to harvest their potential. Therefore, it was felt strongly by cattle feed industry to develop specifications for separate type of feed meant for low, medium and high producing animals. Animal rations have to be balanced in such a way that both good quality materials as well as agro-industrial by-products complement each other in fulfilling the nutritional requirements of livestock of various categories. Keeping these facts in view specifications of animal feed are being proposed to revise again to facilitate the manufacturing of compounded feed as per the needs of animals.

For the guidance of those interested in compounding cattle feeds, a few feed formulae, which have been used in the research organizations and which have given satisfactory results have been included in this standard (*see* Annex D). However, if necessary, suitable modifications may be made in the feed formulae according to locality, season and availability of the ingredients. For the present, feed mixtures for buffaloes, cattle and working bullocks only have been included. These have been so computed that each formula is by and large expected to provide 20 to 22 percent of crude protein (CP) and 68 to 74 percent of total digestible nutrients (TDN). One kilogram of any of these mixtures would be required per 2.5 kg of milk in cows or 2 kg of milk in buffaloes. For working bullocks, 2 to 3 kg of any of these mixtures, depending upon the mass of the animal, added to the usual ration of roughages and green feeds or silage will be sufficient to take care of the requirements for light work, while for heavy work 3 to 4 kg of the mixtures would be required. The feed mixture may also be used to supplement the basal ration of the dry and non-producing animals in case the same does not meet the maintenance requirements. These quantities are only indicative and are based on working assumptions.

The composition of the Committee responsible for the formulation of this standard is given in Annex I.

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 : 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.

AMENDMENT NO. 1 NOVEMBER 2010
TO
IS 2052 : 2009 COMPOUNDED FEEDS FOR CATTLE — SPECIFICATION

(Fourth Revision)

(*Page* 1, *clause* **4.2**) — Substitute the following for the existing text:

'**4.2 Ingredients**

Besides, common salt, mineral mixture (Type II), Dicalcium Phosphate (DCP) (*see* IS 5470), calcite powder and vitamin A, any of the ingredients listed in Annex B may be used for compounded cattle feeds.'

(*Page* 1, *clause* **4.2.1**) — Delete the clause.

(*Page* 1, *clause* **4.2.3**) — Delete the clause.

[*Page* 1, *clause* **5.2**(c)] — Substitute 'Net quantity' *for* 'Net mass'.

(*Page* 1, *clause* **5.2**) — Insert the following new Sl No. (r) at the end:

'r) Any other requirements as given under the *Standards of Weights and Measures* (*Packaged Commodities*) *Rules*, 1977.'

[*Page* 2, *Table* 2, *Sl No.* (vi), *col* 5] — Substitute 'IS 15120' *for* 'ISO 14565'.

(*Page* 3, *Annex* A) — Substitute 'IS 15120 : 2002' *for* 'ISO 14565 : 2000'.

(*Page* 3, *Annex* A) — Insert the following at the appropriate place:

'*IS No.*	*Title*
IS 5470 : 2002	Dicalcium phosphate, animal feed grade — Specification (*first revision*)'

(*Page* 4, *Annex* B, *clause* **B-1**) — Substitute 'Besides, common salt, mineral mixture (Type II), DCP (*see* IS 5470), calcite powder and vitamin A, any of the following ingredients may be used for compounded cattle feeds' *for* the existing text.

(*Page* 5, *Annex* C) — Delete Annex C.

(FAD 5)

Reprography Unit, BIS, New Delhi, India

Indian Standard

COMPOUNDED FEEDS FOR CATTLE — SPECIFICATION

(Fourth Revision)

1 SCOPE

This standard prescribes the requirements and the methods of sampling and test for compounded cattle feeds for buffaloes, cattle and working bullocks.

2 REFERENCES

The standards, which are necessary adjuncts to these standards, are given in Annex A.

3 TYPES

3.1 Compounded cattle feeds shall be of two types, namely, Type I and Type II.

3.2 Compounded cattle feeds shall be in the form of a meal or cubes or pellets.

4 REQUIREMENTS

4.1 Description

The feed shall be free from harmful constituents, metallic pieces and adulterants. The feed shall also be free from fungal growth and insect infestation, and from fermented, musty, rancid or any other objectionable odour.

4.2 Ingredients

The ingredients listed in Annex B shall be used in the manufacture of compounded cattle feeds.

4.2.1 Chemical composition of some commonly used feed ingredients is given in Annex C.

4.2.2 The proportion of urea when incorporated shall not exceed 1 percent by mass. When urea has been added the compounded cattle feed shall contain not less than 10 percent by mass of easily digestible carbohydrates like molasses, cereal grains, potato starch, tapioca starch, etc.

4.2.3 Some model feed formulations for Type I and Type II feeds are given in Annex D.

4.3 The material shall also conform to the requirements specified in Tables 1 and 2.

5 PACKING AND MARKING

5.1 Packing

Compounded cattle feeds shall be packed in clean and sound plain or polyethylene lined jute or laminated paper bags. The mouth of each bag shall be machine-stitched.

5.2 Marking

Each bag shall be legibly marked or label to give the following information:

a) Name and type of the material;
b) Name of the manufacturer and address;
c) Net mass when packed, in kg;
d) Batch or Code number;
e) Crude protein percent;
f) Crude fibre content;
g) Total digestible nutrients per cent (calculated);
h) Metabolizable energy (calculated), in kcal/kg;
j) Aflatoxin B_1 content;
k) Urea per cent, if present;
m) Directions for use;
n) Date of manufacture;
p) Best before from date of manufacture; and
q) Directions for use (as inside literature).

6 SAMPLING

6.1 The method of drawing representative samples of the material and the criteria for conformity shall be according to the method prescribed in Annex H.

7 TESTS

7.1 Tests shall be carried out as prescribed in the relevant clauses of IS 7874 (Part 1) as specified in col 5 of Tables 1 and 2.

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 experimental results.

Table 1 Requirements for Compounded Feeds for Cattle

(*Clauses* 4.3 *and* 7.1)

Sl No.	Characteristic	Requirement		Method of Test, Ref to Clause No. of IS 7874 (Part 1)
		Type I	Type II	
(1)	(2)	(3)	(4)	(5)
i)	Moisture, percent by mass, *Max*	11	11	4
ii)	Crude protein (N × 6.25), percent by mass, *Min*	22	20	5
iii)	Crude fat, percent by mass, *Min*	4.0	2.5	7
iv)	Crude fibre, percent by mass, *Max*	10	12	8
v)	Acid insoluble ash, percent by mass, *Max*	3.0	4.0	10

NOTES

1 The values for requirements at Sl No. (ii) to (v) are on moisture-free basis.

2 For routine analysis, the characteristics mentioned above may be tested by near infra-analyzer. However, in case of dispute, the method given above shall be the referee's method.

Table 2 Requirements for Compounded Feeds to be Declared

(*Clauses* 4.3 *and* 7.1)

Sl No.	Characteristic	Requirement		Method of Test, Ref to	
		Type I	Type II	Other Indian Standard	Annex
(1)	(2)	(3)	(4)	(5)	(6)
i)	Salt (as NaCl), percent by mass, *Max*	1.5	1.5	Clause 4 of IS 7874 (Part 2)	—
ii)	Calcium (as Ca), percent by mass, *Min*	0.8	0.8	IS 13433 (Part 1/Part 2)	—
iii)	Total phosphorus, percent by mass, *Min*	0.5	0.5	Clause 6 of IS 7874 (Part 2) or IS 14828[1)]	—
iv)	Available phosphorus, percent by mass, *Min*	0.25	0.25	Annex C of IS 1374	—
v)	Urea, percent by mass, *Max*	1.0	1.0	IS 7874	—
vi)	Vitamin A, I.U./kg, *Min*	7 000	7 000	ISO 14565	—
vii)	Vitamin D_3, I.U./kg, *Min*	1 200	1 200	—	Annex E
viii)	Vitamin E, I.U./kg, *Min*	30	30	—	Annex F
ix)	Aflatoxin B_1 (ppb), *Max*	20	20	IS 13427	Annex G[2)]

NOTE — The values for requirements at Sl No. (i) to (ix) are on moisture-free basis.

[1)] IS 14828 shall be the referee's method, in case of dispute.

[2)] In case of dispute, HPLC method shall be the referee's method.

ANNEX A
(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1070 : 1992	Reagent grade water (*third revision*)
1162 : 1958	Specification for cane molasses
1374 : 1992	Poultry feeds — Specification (*fourth revision*)
1509 : 1972	Specification for tapioca as livestock feed (*first revision*)
1712 : 1982	Specification for cottonseed oilcake as livestock feed ingredient (*second revision*)
1713 : 1986	Specification for decorticated groundnut oilcake as livestock feed ingredient (*second revision*)
1781 : 1975	Specification for urea, technical (*first revision*)
1932 : 1986	Specification for mustard and rapeseed oilcake as livestock feed ingredient (*second revision*)
1934 : 1982	Specification for sesamum oilcake as livestock feed ingredient (*first revision*)
1935 : 1982	Specification for linseed oilcake as livestock feed ingredient (*first revision*)
2151 : 1985	Specification for maize germ oilcake as livestock feed ingredient (*first revision*)
2152 : 1972	Specification for maize gluten as livestock feed ingredient (*first revision*)
2153 : 1985	Specification for maize bran as livestock feed ingredient (*first revision*)
2154 : 1986	Specification for coconut oilcake as livestock feed ingredient (*second revision*)
2239 : 1971	Specification for wheat bran (*first revision*)
3160 : 1965	Specification for *Tur chuni*
3161 : 1965	Specification for gram *chuni*
3591 : 1985	Specification for solvent-extracted coconut oilcake (meal) as livestock feed ingredient (*second revision*)
3648 : 1975	Specification for rice bran as livestock feed (*first revision*)
4193 : 1986	Specification guar meal as livestock feed ingredient (*first revision*)
4905 : 1968	Methods for random sampling
5064 : 1980	Specification for tapioca spent pulp as livestock feed (*first revision*)
5862 : 1970	Specification for solvent extracted nigerseed oilcake (meal) as livestock feed
6242 : 1985	Specification for solvent extracted undecorticated safflower oilcake as livestock feed ingredient (*first revision*)
7874	Methods of tests for animal feeds and feeding stuffs:
(Part 1) : 1975	General methods
(Part 2) : 1975	Minerals and trace elements
10671 : 1983	Specification for mango seed kernels as livestock feed ingredient
10759 : 1983	Specification for brewer's yeast
12829 : 1989	Mango seed kernels (solvent extracted) as livestock feed ingredient — Specification
13427 : 1992	Animal feeds and feeding stuffs — Determination of aflatoxin B_1 content
13433	Animal feeds and feeding stuffs — Determination of calcium:
(Part 1) : 1992	Titrimetric method
(Part 2) : 1992	Atomic absorption spectrometric method
ISO 14565 : 2000	Animal feeding stuffs — Determination of vitamin A content — Method using high-performance liquid chromatography
14702 : 1999	Sunflower oilcake as livestock feed ingredient — Specification
14828 : 2000	Animal feeding stuff — Determination of total phosphorus content — Spectrophotometric method

ANNEX B

(*Clause* 4.2)

INGREDIENTS FOR COMPOUNDED CATTLE FEEDS

B-1 Besides common salt, mineral mixture (Type II), DCP, calcite powder and vitamin A, the following ingredients shall be used for compounded cattle feeds:

B-1.1 Grains and Seeds

a) Barley (*Hordeum vulgare*),
b) Gram (*Cicer arietinum*),
c) Guar seeds (*Cyamposis tetragonoloba*),
d) Horse gram or *Kulthi* (*Dolichos biflorus*),
e) Jowar (*Sorghum vulgare*),
f) Maize (*Zea mays*),
g) Oats (*Avena sativa*),
h) Ragi (*Eleusine coracana*),
j) Sunhemp seed,
k) *Bajra* (*Pennisetum typhoides*), and
m) Wheat (*Triticum aestivum*).

B-1.2 Grain By-products

a) *Arhar or Tur* (*Cajanus cajan*) *chuni* (*see* IS 3160),
b) Gram *chuni* (*see* IS 3161),
c) Gram husk (*see* IS 3161),
d) Guar meal (*see* IS 4193),
e) Maize bran (*see* IS 2153),
f) Maize gluten feed (*see* IS 2152) and maize screenings,
g) *Moth* (*Phaseolus aconitifolius*) *chuni*,
h) *Moong* (*Phaseolus aureus*),
j) Rice bran (*see* IS 3648),
k) *Urad* (*Phaseolus mungo*) *chuni*, and
m) Wheat bran (*see* IS 2239).

B-1.3 Oilcakes and Meals

a) Coconut oilcake (*see* IS 2154), and solvent extracted coconut oilcake (meal) (*see* IS 3591),
b) Cottonseed oilcake (*see* IS 1712), and solvent extracted cottonseed oilcake (meal) (*see* IS 3592),
c) Groundnut oilcake (*see* IS 1713), and solvent extracted groundnut oilcake (meal) (*see* IS 3441),
d) Linseed oilcake (*see* IS 1935), and solvent extracted linseed oilcake (meal) (*see* IS 3591),
e) Maize germ oilcake (*see* IS 2151),
f) Mustard and rape oilcake (*see* IS 1932), and solvent extracted mustard and rape oilcake (meal),
g) Nigerseed oilcake, and solvent extracted nigerseed oilcake (meal) (*see* IS 5862),
h) Sesamum (*Til*) oilcake (*see* IS 1934), and solvent extracted sesamum oilcake (meal) (*see* IS 3591),
j) Soyabean (Glycine, *Max*) oilcake (*see* IS 1934), and
k) Sunflower oilcake (decorticiated or undecorticated) (*see* IS 14702).

B-1.4 Tuber and Roots

a) Tapioca spent pulp (*see* IS 5064),
b) Tapioca (*see* IS 1509), and
c) Tapioca starch.

B-1.5 Greens

a) Berseem (*Trifolium alexandrium*) meal, and
b) Lucerne (*Medicago sativa*) meal.

B-1.6 Waste Materials and Industrial By-products

a) *Babul* (*Acacia nilotica*) seeds *chuni*,
b) *Prosopis juliflora* pods not exceeding 15 percent,
c) *Tamarind* seed power,
d) Ambadi (*Hibiscus cannibus*) oilcake/ extraction,
e) Bijda (*Citrulus vulgaris*) cake/extraction,
f) Brewers yeast (*see* IS 10759),
g) Cottonseed bran,
h) Cottonseed hulls,
j) Distillery waste,
k) Mango seed kernel (dried) (*see* IS 12829 and IS 10671),
m) Molasses (*see* IS 1162), and
n) Urea (*see* IS 1781).

ANNEX C

(*Clause* 4.2.1)

CHEMICAL COMPOSITION OF COMMONLY USED INGREDIENTS FOR COMPOUND CATTLE FEED (AS SUCH BASIS)

Ingredients	Moist. Percent	CP Percent	EE Percent	CF Percent	AIA Percent
A) *Grains and Seeds*					
Maize	10.0	9.0	4.0	2.0	0.5
Jowar	9.0	8.0	3.0	1.0	0.2
Bajra	9.0	10.0	5.0	3.0	0.4
Barley	10.0	9.0	2.0	4.0	0.7
Oat	7.0	11.0	6.0	9.0	1.0
Gram	9.0	22.0	3.0	10.0	1.0
Horse gram	9.0	25.0	1.0	6.0	0.5
B) *Grain By-products*					
Tuar chuni	7.0	20.0	3.0	18.0	0.5
Gram chuni	8.0	17.0	1.0	15.0	2.0
Arhar chuni	7.0	18.0	2.0	9.0	4.0
Mung chuni	8.0	20.0	1.0	16.0	2.0
Maize bran	8.0	11.0	2.0	9.0	0.5
Moth chuni	7.0	13.0	3.0	12.0	5.0
Wheat bran	8.0	15.0	4.0	10.0	1.0
Rice bran	9.0	13.0	16.0	12.0	5.0
Deoiled rice bran	10.0	15.0	—	15.0	5.0
Guar meal	9.0	46.0	5.0	7.0	1.0
Gram husk	8.0	6.0	1.0	48.0	5.0
C) *Oil Cakes and Meals*					
Rapeseed oil cake	9.0	34.0	8.0	8.0	2.0
Rapeseed meal	10.0	38.0	—	11.0	2.0
Sunflower meal	10.0	28.0	—	29.0	0.6
Soyabean meal	10.0	45.0	—	7.0	0.6
Cottonseed oil cake (Undecorti.)	10.0	22.0	6.0	23.0	2.0
Cottonseed meal	10.0	37.0	—	15.0	1.5
Coconut oil cake	9.0	23.0	8.0	8.0	0.5
Coconut meal	10.0	27.0	—	9.0	0.5
Groundnut oil cake	10.0	42.0	8.0	7.0	1.5
Groundnut meal	10.0	44.0	—	11.0	1.5
Maize cake	7.0	22.0	11.0	11.0	0.5
Til oil cake	7.0	34.0	10.0	8.0	2.0
Nigerseed oil cake	9.0	36.0	6.0	16.0	1.0
Tapioca thippi	6.0	3.0	0.5	11.0	4.0
Safflower meal	6.0	20.0	—	33.0	1.0
Linseed oil cake	7.0	32.0	5.0	9.0	1.5
D) *Waste Materials and Industrial By-products*					
Babul chuni	8.0	16.0	4.0	13.0	2.0
Prosopis juliflora pods	5.0	14.0	3.0	18.0	0.5
Tamarind seed powder	7.0	14.0	5.0	4.0	1.0
Ambadi oil cake	6.0	22.0	5.0	18.0	3.0
Mango seed kernel	8.0	6.0	9.0	3.0	0.5
Cottonseed hull	8.0	7.0	2.0	42.0	0.2
Bijda cake	5.0	26.0	2.0	30.0	5.0

ANNEX D

(*Clause* 4.2.3)

RECOMMENDED FEED FORMULAE

D-1 A few model formulae for Type I and Type II feeds are given below, which could serve as guidelines for the feed manufacturers as well as dairy farmers. Depending upon the availability of raw materials on regional basis, several such formulations could be worked out.

D-1.1 Type I

a) *Model formula A*

Sl No.	*Ingredients*	*Percent*
i)	Maize	20
ii)	Rice polish	15
iii)	Rapeseed extraction	15
iv)	Groundnut extraction	19
v)	Rice bran extraction	15
vi)	Molasses	10
vii)	Calcite powder	1.5
viii)	Common salt	1.5
ix)	Mineral mixture (Type II)	2.0
x)	Urea	1.0

b) *Model formula B*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	25
ii)	Rice polish	15
iii)	Rapeseed extraction	15
iv)	Groundnut extraction	19
v)	Rice bran extraction	10
vi)	Molasses	10
vii)	Calcite powder	1.5
viii)	Common salt	1.5
ix)	Mineral mixture (Type II)	2.0
x)	Urea	1.0

c) *Model formula C*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	21
ii)	Copra extraction	10
iii)	Rice polish	15
iv)	Rapeseed extraction	12
v)	Groundnut extraction	15
vi)	Rice bran extraction	12
vii)	Molasses	10
viii)	Calcite powder	1.5
ix)	Common salt	1.5
x)	Mineral mixture (Type II)	2.0

d) *Model formula D*

Sl No.	*Ingredients*	*Percent*
i)	Maize	20
ii)	Rice polish	15
iii)	Rapeseed extraction	15
iv)	Groundnut extraction	18
v)	Rice bran extraction	14
vi)	Sunflower extraction	2
vii)	Mola sses	10
viii)	Calcite powder	1.5
ix)	Common salt	1.5
x)	Mineral mixture (Type II)	2.0
xi)	Urea	1.0

e) *Model formula E*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	22
ii)	Rice polish	15
iii)	Rapeseed extraction	5
iv)	Guar meal	10
v)	Groundnut extraction	21
vi)	Rice bran extraction	7
vii)	Sunflower extraction	5
viii)	Molasses	10
ix)	Calcite powder	1.5
x)	Common salt	1.5
xi)	Mineral mixture (Type II)	2.0

f) *Model formula F*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	25
ii)	*Prosopis juliflora*	10
iii)	Rice polish	12
iv)	Rapeseed extraction	5
v)	Guar meal	3
vi)	Soyabean extraction	19
vii)	Rice bran extraction	10
viii)	Molasses	10
ix)	Calcite powder	1.5
x)	Common salt	1.5
xi)	Mineral mixture (Type II)	2.0
xii)	Urea	1.0

g) *Model formula G*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	25

Sl No.	*Ingredients*	*Percent*
ii)	Rice polish	15
iii)	Rapeseed extraction	10
iv)	Guar meal	3
v)	Soyabean extraction	13
vi)	Rice bran extraction	13
vii)	Sunflower extraction	5
viii)	Molasses	10
ix)	Calcite powder	1.5
x)	Common salt	1.5
xi)	Mineral mixture (Type II)	2.0
xii)	Urea	1.0

h) *Model formula H*

Sl No.	*Ingredients*	*Percent*
i)	Maize	21
ii)	Rice polish	15
iii)	Rapeseed extraction	10
iv)	Guar meal	5
v)	Soyabean extraction	12
vi)	Rice bran extraction	21
vii)	Molasses	10
viii)	Calcite powder	1.5
ix)	Common salt	1.5
x)	Mineral mixture (Type II)	2.0
xi)	Urea	1.0

D-1.2 Type II

a) *Model formula A*

Sl No.	*Ingredients*	*Percent*
i)	Maize	10
ii)	Rice polish	15
iii)	Rapeseed extraction	18
iv)	Groundnut extraction	12
v)	Rice bran extraction	30
vi)	Molasses	10
vii)	Calcite powder	1.5
viii)	Common salt	1.5
ix)	Mineral mixture (Type II)	2.0

b) *Model formula B*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	17
ii)	*Babul chuni*	2
iii)	Rice polish	15
iv)	Rapeseed extraction	12
v)	Groundnut extraction	15
vi)	Rice bran extraction	24
vii)	Molasses	10
viii)	Calcite powder	1.5
ix)	Common salt	1.5
x)	Mineral mixture (Type II)	2.0

c) *Model formula C*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	20
ii)	Copra extraction	10
iii)	Rice polish	15
iv)	Rapeseed extraction	15
v)	Groundnut extraction	7
vi)	Rice bran extraction	17
vii)	Molasses	10
viii)	Calcite powder	1.5
ix)	Common salt	1.5
x)	Mineral mixture (Type II)	2.0
xi)	Urea	1.0

d) *Model formula D*

Sl No.	*Ingredients*	*Percent*
i)	Maize	12
ii)	*Babul chuni*	3
iii)	*Tamarind seed*	3
iv)	Rice polish	15
v)	Rapeseed extraction	15
vi)	Groundnut extraction	6
vii)	Rice bran extraction	25
viii)	Sunflower extraction	5
ix)	Molasses	10
x)	Calcite powder	1.5
xi)	Common salt	1.5
xii)	Mineral mixture (Type II)	2.0
xiii)	Urea	1.0

e) *Model formula E*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	20
ii)	*Babul chuni*	3
iii)	Rice polish	15
iv)	Rapeseed extraction	5
v)	Guar meal	3
vi)	Groundnut extraction	9
vii)	Rice bran extraction	24
viii)	Sunflower extraction	5
ix)	Molasses	10
x)	Calcite powder	1.5
xi)	Common salt	1.5
xii)	Mineral mixture (Type II)	2.0
xiii)	Urea	1.0

f) *Model formula F*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	7
ii)	*Prosopis juliflora*	10
iii)	Rice polish	15
iv)	Rapeseed extraction	5

Sl No.	*Ingredients*	*Percent*
v)	Guar meal	4
vi)	Groundnut extraction	10
vii)	Rice bran extraction	33
viii)	Molasses	10
ix)	Calcite powder	1.5
x)	Common salt	1.5
xi)	Mineral mixture (Type II)	2.0
xii)	Urea	1.0

g) *Model formula G*

Sl No.	*Ingredients*	*Percent*
i)	Jowar	7
ii)	*Prosopis juliflora*	10
iii)	Rice polish	15
iv)	Rapeseed extraction	5
v)	Guar meal	3
vi)	Soyabean extraction	9
vii)	Rice bran extraction	35
viii)	Molasses	10
ix)	Calcite powder	1.5
x)	Common salt	1.5
xi)	Mineral mixture (Type II)	2.0
xii)	Urea	1.0

h) *Model formula H*

Sl No.	*Ingredients*	*Percent*
i)	Maize	15
ii)	Rice polish	15
iii)	Rapeseed extraction	10
iv)	Guar meal	3
v)	Soyabean extraction	6
vi)	Rice bran extraction	35
vii)	Molasses	10
viii)	Calcite powder	1.5
ix)	Common salt	1.5
x)	Mineral mixture (Type II)	2.0
xi)	Urea	1.0

ANNEX E

[*Table* 2, *Sl No.* (vii)]

METHOD FOR ESTIMATION OF VITAMIN D_3

E-1 SAMPLE PREPARATION

a) Take 1.0 g feed sample in amber colour vial,
b) Add 5 ml of diethyl ether,
c) Shake vigorously and keep vial in a beaker containing acetone in freezer until lower portion is freezed,
d) Take out supernatant from the vial into another vial,
e) Add 4 ml (methyl chloride: methanol, 3 : 1) in each vial and collect the supernatant,
f) Take out supernatant in another vial,
g) Add 5 ml of 0.1M phosphate buffer in each vial and collect the supernatant,
h) Dry it in water bath at 34-36°C or in oven,
j) Complete drying under nitrogen gas,
k) Reconstitute in mobile phase,
m) Filter through 0.22 µ filter paper, and
n) Inject known quantity in HPLC column.

E-1.1 HPLC Conditions

a) Temperature — 25°C
b) Flow rate — 2.0 ml/min
c) Detector — UV
d) Wave length — 265 nm
e) Runtime — 10 min
f) Maximum pressure — 400 kg/cm^2
g) Column — C 18 (150 × 4 mm)
h) Mobile phase — Acetonitrile (100 percent)

E-1.2 Calculation

$$\text{Vitamin } D_3\ (\mu g/g) = \frac{V_e \times SA \times SdC \times \text{ Purity of vitamin } D_3}{V_i \times SdA}$$

where

V_e = volume in which the dried was dissolved,
SA = sample area from peak,
SdC = standard concentration (Vit D_3),
V_i = volume injected, and
SdA = standard area from the peak.

ANNEX F

[*Table* 2, *Sl No.* (viii)]

METHOD FOR ESTIMATION OF VITAMIN E

F-1 SAMPLE PREPARATION

a) Take 1.0 g feed sample in amber colour vial.

b) Saponify with 10 ml of 95 percent ethanol and 2 ml of 60 percent KOH.

c) Keep the vial in hot water bath till one or two bubbles appear.

d) Keep it in ice bath for 5 min.

e) Add 10 ml of petroleum ether (BP 40-60°C).

f) Shake it on water bath shaker (35-40°C) for 15 min.

g) Remove ether portion in another tube.

h) Repeat the extraction with petroleum ether three times.

j) Treat the pooled ether extract with 0.5N KOH (10 ml).

k) Give three washings with distilled water to remove KOH and collect the upper portion of petroleum ether.

m) Pass the ether extract through anhydrous Na_2SO_4 or phase separator filter paper.

n) Dry ether extract at 40-50°C under nitrogen gas.

p) Reconstitute in mobile phase.

q) Filter through 0.22µ filter paper.

r) Inject known quantity in HPLC column.

F-1.1 HPLC Conditions

a)	Temperature	:	17°C
b)	Flow rate	:	1.5 ml/min
c)	Detector	:	UV
d)	Wave length	:	290 nm
e)	Runtime	:	6 min
f)	Maximum pressure	:	350 kg/cm^2
g)	Column	:	C 18 (150 × 4 mm)
h)	Mobile phase	:	Acetonitrile: tetrahydrofuran: water (47 : 42 : 11)

F-1.2 Calculation

$$\text{Vitamin E}\,(\mu g/g) = \frac{V_e \times SA \times SdC \times \text{ Purity of vitamin E}}{V_i \times SdA}$$

where

V_e = volume in which the dried was dissolved,

SA = sample area from peak,

SdC = standard concentration (Vit E),

V_i = volume injected, and

SdA = standard area from the peak.

ANNEX G

[*Table* 2, *Sl No.* (ix)]

ESTIMATION OF AFLATOXIN B_1

G-1 SAMPLE PREPARATION

a) Weigh 50 g sample in a conical flask.

b) Add 150 ml of petroleum ether and keep over night.

c) Filter through ordinary filter paper and add 250 ml of chloroform.

d) Well mix the contents for 30 min in mechanical shaker.

e) Filter the contents through ordinary filter paper with anhydrous Na_2SO_4 bed.

f) Extract ready for purification through column chromatography.

G-1.1 Preparation of Column Chromatography

a) Take 300 mm × 10 mm ID of glass column. Put some glass wool inside the column and remove air bubbles by using 10 ml of chloroform.

b) Add 1 g of anhydrous Na_2SO_4.

c) Add 2 g of slurry of activated silica gel into the column. [Silica gel dried for 1 h at 105°C and add chloroform (1 ml/gm) to the dried silica gel. Keep it for 15 h.]

d) Add stabilised chloroform into the column. It should be 3 cm above the silica gel.

e) Again add 2 g of anhydrous Na_2SO_4 to form a bed. Remove air bubbles by using chloroform, which should be above the bed.

G-1.2 Sample Purification

a) Elute 75 ml extract of aflatoxin through the column slowly and collect it.

b) Pour one by one, 25 ml of each of toluene: glacial acetic acid (9 : 10), *n*-hexane and acetonitrile: diethyl ether: *n*-hexane [10 : 30 : 60 (*v/v*)] on the column and discard it.

c) Finally elute aflatoxin with 50 ml of chloroform: acetone [4 : 1 (*v/v*)], mix and collect it in a 250 ml round bottom flask.

d) Concentrate the extract in a rotary vacuum evaporator. Dry the concentrate extract on a water bath under a stream of nitrogen gas at 50°C.

e) Reconstitute the dried extract with mobile phase and inject it in HPLC column.

G-1.3 HPLC Conditions

a) Temperature : 30°C

b) Flow rate : 0.5 ml/min

c) Detector : Fluorescence

d) Wave length : Ex 369 nm, Em 430 nm

e) Runtime : 5 min

f) Maximum pressure : 300 kg/cm^2

g) Column : C 18 (200 × 8 mm)

h) Mobile phase : Acetonitrile: water (65 : 35)

G-1.4 Calculation

$$\text{Aflatoxin } B_1 \text{ (µg/l)} = \frac{B_{af} \times V_{ext}}{V_B \times W \times V_{f/250}}$$

where

B_{af} = concentration of aflatoxin B_1 as determined from the calibration curve (ng);

V_B = volume of sample extract injected (micro litre);

V_{ext} = volume in which dried extract was dissolved;

W = weight of the sample;

V_f = volume of filtrate taken in the column for elution, in ml; and

250 = volume (ml) of chloroform used in the extraction, in ml.

ANNEX H

(*Clause* 6.1)

SAMPLING OF COMPOUNDED FEEDS FOR CATTLE

H-1 GENERAL REQUIREMENTS OF SAMPLING

H-1.0 In drawing, preparing, storing and handling samples, care should be taken that the properties of the material are not affected. The following precautions and directions shall be observed.

H-1.1 Samples shall be taken in a protected place not exposed to damp air, dust or soot.

H-1.2 The sampling instrument shall be clean and dry when used.

H-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

H-1.4 The samples shall be placed in clean and dry glass containers. The sample containers shall be of such a size that they are almost completely filled by the sample.

H-1.5 Each container shall be sealed air-tight with a stopper or a suitable; closure after filling in such a way that it is not possible to open and reseal it without detection, and marked with full details of sampling, date of sampling, batch or code number, name of the manufacturer and other important particulars of the consignment.

H-1.6 Samples shall be stored in such a manner that there is no deterioration of the material.

H-1.7 Sampling shall be done by a person agreed to between the purchaser and the vendor and if desired by any of them, in the presence of the purchaser (or his representative) and the vendor (or his representative).

H-2 SCALE OF SAMPLING

H-2.1 Lot

The quantity of the cattle feed of a particular type, produced under relatively similar conditions in a day shall constitute a lot.

NOTE — Relatively similar conditions would mean the use of raw material having insignificant variations and similar conditions of manufacture.

H-2.1.1 Samples shall be tested for each lot for ascertaining conformity of the material to the requirements of this standard.

H-2.2 The number of bags to be selected from the lot shall depend on the size of the lot and shall be in accordance with col 2 and 3 of Table 3.

Table 3 Number of Bags to be Selected for Sampling

(*Clauses* H-2.2 *and* H-3.1)

Sl No.	Lot Size *N*	No. of Bags to be Selected *n*
(1)	(2)	(3)
i)	Up to 50	1
ii)	51-100	3
iii)	101-300	4
iv)	301-500	5
v)	501 and above	7

H-2.3 The bags shall be chosen at random from the lost and for this purpose a random number table as agreed to between the purchaser and the vendor shall be used (*see* IS 4905). If such a table is not available, the following procedure shall be adopted.

Starting from any bag count 1, 2, 3 ..... etc, up to *r* and so on in a systematic manner and withdraw the *r*th bag; *r* being the integral part of *N*/*n*; where *N* is the total number of bags in the lot, and *n* the number of bags to be selected according to Table 3.

H-3 TEST SAMPLES AND REFEREE SAMPLES

H-3.1 Preparation of Individual Samples

Draw with an appropriate sampling instrument, equal quantities of the material from the top, bottom and the sides of each bag selected according to Table 3. The total quantity of the material drawn from each bag shall be not less than 1.5 kg. Mix all the portions of the material drawn from the same bag thoroughly. Take out about 0.75 kg of the material and divide it into three equal parts. Each portion, thus obtained, shall constitute the test sample representing that particular bag and shall be transferred immediately to clean and dry sample containers and sealed airtight. These shall be labelled with particulars given in **H-1.5**. The individual samples thus obtained shall be formed into three sets in such a way that each set has a test sample representing each bag selected. One of the sets shall be for the purchaser, another for the vendor, and the third for the referee.

H-3.2 Preparation of Composite Samples

From the mixed material from each selected bag

remaining after the individual samples have been taken, equal quantities of the material from each bag shall be taken and mixed up together so as to form a composite sample weighing not less than 0.75 kg. This composite sample shall be divided into three equal parts and transferred to clean and dry containers and labelled with particulars given under **H-1.5** and sealed airtight. One of these samples shall be for the purchaser, another for the vendor, and the third for the referee.

H-3.3 Referee Samples

Referee samples shall consist of a set of test samples (*see* **H-3.1**) and a composite sample (*see* **H-3.2**) and shall bear the seal of the purchaser and the vendor and shall be kept at a place agreed to between the two.

H-4 TESTING OF SAMPLES

H-4.1 Test for crude protein shall be conducted individually on each of the samples constituting a set of test samples (*see* **H-3.1**).

H-4.2 Tests for the remaining characteristics, prescribed in Tables 1 and 2 shall be conducted on the composite sample (*see* **H-3.2**).

H-5 CRITERIA FOR CONFORMITY

H-5.1 A lot shall be declared as conforming to this standard when;

a) each of the test results for crude protein satisfies the requirement as specified in Table 1, and

b) the test results in the composite sample satisfy the relevant requirements specified in Tables 1 and 2.

ANNEX I
(Foreword)

COMMITTEE COMPOSITION

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