
Compounded fish feed — Specification — Part 1: Tilapia and catfish



TABLE OF CONTENTS

Contents

1	Scope.....	1
2	Normative references	1
3	Terms and definitions	2
4	Requirements	2
5	Specific requirements.....	3
6	Feed additives	4
7	Contaminants	5
8	Hygiene, storage and transportation	5
9	Packaging and labelling	5
10	Sampling	6

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Introduction

Fish feeds are essential for semi-intensive and intensive aquaculture farming systems. Fish nutrition has therefore become one of the most important subjects in aquaculture. Aquaculture nutrition and feeding is concerned with the supply of dietary nutrients to fish either directly in the form of an exogenous 'artificial' diet or indirectly through the increased production of natural live food organisms within the water body in which the fish are cultured. Natural food organisms play a crucial role in the nutrition of fish within extensive and semi-intensive pond culture systems. In the intensive culture systems, with high stocking density natural food organisms play little or no role in the nutrition of the farmed species. The nutrition and feeding of fish within each culture system must be considered as being unique and evaluated on its own merits.

Feeding fish in their aqueous environment involves considerations beyond those for feeding land animals. These aspects include the nutrient contribution of natural aquatic organisms in pond culture, the effects of feeding and diet composition on dissolved oxygen and other water quality factors, and the loss of nutrients if feed is not consumed immediately. Fish feeds require processing methods that provide special physical properties to facilitate feeding in water, and variation in feeding behavior requires special feeding regimens for various species. The effects of diet composition and feeding practice on the quality of the effluent from the culture system is also an important consideration.

The manufacture of aquaculture feeds presents special challenges to the traditional feed milling concepts due to the aquatic medium in which the feed has to be delivered and ingested, and to the small size and variety of the animals being cultivated. For example, slow feeding animals like marine shrimp require the production of feeds which are physically stable in water for several hours. Moreover, farmed aquatic animals are generally considerably smaller than their terrestrial counterparts, such as pigs, poultry and cattle; marine shrimp reaching a marketable size at only 20 g.

Additionally, the nutrient requirements for fish feeds will inevitably vary between omnivorous and carnivorous fish. Omnivorous fish will eat almost anything from vegetable and plant matter, insects, crustaceans and meat proteins while carnivorous fish eat meat only.

To effectively achieve and increase fish production capacity, all nutrients must be provided in sufficient amounts formulated to meet maintenance and production needs. This standard contains the technical requirements on safety and quality of feeds for feeding fish.

Compounded fish feeds — Specification — Part 1: Tilapia and catfish

1 Scope

This Draft African Standard specifies the requirements, sampling and test methods for compounded fish feeds. This standard applies to Tilapia and cat fish feed.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

FDARS 2139, *Code of practice on good animal feeding*

FDARS 1828, *Animal feeds — Code of practice for production, processing, storage, transport, and distribution*

AOAC 2020.07, *Available Carbohydrates in Cereal and Cereal Products, Dairy Products, Vegetables, Fruit and Food Products, and Animal Feeds*

ISO/TS 17764-2, *Animal feeding stuffs — Determination of the content of fatty acids — Part 2: Gas chromatographic method*

ISO 5985, *Animal feeding stuffs — Determination of ash insoluble in hydrochloric acid*

ISO 6491, *Animal feeding stuffs — Determination of phosphorus content — Spectrometric method*

ISO 6496, *Animal feeding stuffs — Determination of moisture and other volatile matter content*

ISO 6497, *Animal feeding stuffs — Sampling*

ISO 6654, *Animal feeding stuffs — Determination of urea content*

ISO 6865, *Animal feeding stuffs — Determination of crude fibre content — Method with intermediate filtration*

ISO 6869, *Animal feeding stuffs — Determination of the contents of calcium, copper, iron, magnesium, manganese, potassium, sodium and zinc — Method using atomic absorption spectrometry*

ISO 14718, *Animal feeding stuffs — Determination of aflatoxin B₁ content of mixed feeding stuffs — Method using high-performance liquid chromatography*

ISO 16634-1, *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*

ISO 17375, *Animal feeding stuffs — Determination of aflatoxin B₁*

ISO 16050, *Determination of aflatoxin B₁, and the total content of aflatoxins B₁, B₂, G₁ and G₂ in cereals, nuts and derived products High-performance liquid chromatographic method for total aflatoxin*

ISO 27085, *Animal feeding stuffs — Determination of calcium, sodium, phosphorus, magnesium, potassium, iron, zinc, copper, manganese, cobalt, molybdenum, arsenic, lead and cadmium by ICP-AES*

DARS 1120: 2024

3 Terms and definitions

For the purposes of this African Standard, the following terms and definitions apply.

3.1

crude fibre

residue obtained after acid and alkaline digestion of a fish feed sample that contains cellulose, hemicellulose, lignin and pectin

Note 1 to entry: The cellulose, hemicellulose, lignin and pectin that form the plant cell wall are known as “structural carbohydrates” or “fibre”.

3.2

crude fat

total fat content of compounded fish *feed* determined by a laboratory test

Note 1 to entry: Crude fat includes some waxes, pigments and other lipids to a minor degree in addition to true fats

3.3

total ash

inorganic part of fish feed consisting of mineral elements determined in a laboratory by incineration at a high temperature and weighing the residue

3.4

digestible energy

DE

apparent energy of a compounded fish feed that is available to the fish by digestion

Note 1 to entry : Digestible energy is calculated as the difference between the gross energy content of a feed and energy contained in the feces (fecal energy or FE)

3.5

crude protein

total protein content of compounde fish feed, which is determined by analysing the nitrogen content of feed and multiplying the result by a factor

3.6

acid insoluble ash

4 Requirements

4.1 Ingredients for compounded fish feeds

4.1.1 All ingredients and raw materials shall be of good quality and not deteriorated. Ingredients listed in Annex B may be used in the production of compounded fish feed.

4.1.2 Where standards have been declared for ingredients or raw materials, such ingredients or raw materials shall conform to such standards.

4.1.3 Vitamin preparations added to fish feed shall be in a stabilized form.

4.2 General requirements

4.2.1 Compounded fish feeds may be in form of crumbs or pellets.

4.2.2 Compounded fish feeds shall be free from:

- a) metallic and glass objects;
- b) adulterants;
- c) physical moulds;

- d) pathogens or insect infestation;
- e) mustiness;
- f) rancidity; and
- g) any objectionable odours.

4.2.3 Compounded fish feed shall be palatable.

4.2.4 The level of free fatty acids in feeds shall not exceed 15 % of the crude fat content at the time of manufacture, when tested in accordance with the requirements of ISO/TS 17764-2.

4.2.5 Compounded fish feed shall be free of cotton seed meal, molasses and its products and non protein nitrogen.

4.2.6 Crude fibre content of compounded fish feed shall not exceed 7 % when tested in accordance with the requirements of ISO 6865.

4.2.8 The moisture content shall not exceed 13 % in compounded fish feed when tested in accordance with ISO 6496.

4.2.9 Where compounded fish feed is in the form of pellets, the size of the pellets shall confirm to the sizes indicated in Table 1 below.

Table 1 — Pellet size for compounded fish feed

S/N	Type of fish	Pellet size, mm			
		Starter	Grower	Finisher	Brood stock
i.	Tilapia	0,2 - 1	3 - 5	4-8	3-9
ii.	Catfish	0,2 - 1	3-5	4-8	3-9

5 Specific requirements

5.1 Specific nutrient requirements for catfish feed

Compounded catfish feed shall comply with the nutrient requirements stated in Table 2, when tested with the methods specified therein.

Table 2 — Nutrient requirements catfish feed

Nutrient level	Catfish			Test method
	Starter feed Fry and fingerlings	Grower	Brood stock	
Digestible energy, kcal DE/kg diet, min.	3 000	3 000	3 000	Annex by prof Bordeny
Crude fat, % min.	15	10	10	ISO 6492
Crude protein, % min.	40.0	35.0	35.0	ISO 16634-1
Crude fibre, % max.	4.0	5.0	5.0	ISO 6865
Carbohydrate, %, max.	40.0	40.0	40.0	AOAC 2020.07
Calcium, % min.	0,8	0.5	0.8	ISO 6490-1
Available phosphorus, % min.	0,6	0,5	0,6	ISO 6491
Magnesium, % min.	0,04	0,04	0,04	ISO 6869

Annex A provides further information on the tolerance limits for the analytical constituents in fish feed.

5.2 Nutrient requirements for tilapia feed

Compounded Tilapia feed shall comply with the nutrient requirements stated in Table 3, when tested in accordance with the test methods specified therein.

Table 3 — Specific requirements for tilapia feed

Nutrient level	Tilapia feed			Test method
	Starter feed Fry and fingerlings	Grower	Brood stock	
Digestible energy, kcal DE/kg diet, min.	3 000	3 000	3 000	Annex
Crude fat, %, min.	5	5	5	ISO 6492
Crude protein, % min.	42.0	35.0	30.0	ISO 16634-1
Crude fibre, % max.	4.0	6.0	7.0	ISO 6865
Carbohydrate, %, max.	40	40	40	AOAC 2020.07
Acid Insoluble ash, % max.	3	3	3	ISO 5985
Calcium, % min.	1	1	1	ISO 6490-1
Available phosphorus, % max.	0,5	0,5	0,5	ISO 6491

6 Feed additives

6.1 General requirements on additives

6.1.1 Additives in the following categories may be used in fish feeds:

- a) antioxidants;
- b) colourants;
- c) emulsifiers;
- d) stabilisers;
- e) thickeners and gelling agents;
- f) binders;
- g) anti-caking agents and coagulants;
- h) aromatic and appetising substances; and
- i) preservatives.

NOTE Material intended for mixing with animal feed as additives for use as feeding stuff should specify the kind of and, if appropriate the age group of the animal for which the feed is intended. In addition the quantity in grams per kilogram (or percent by weight) of the complete feed which conform to the provisions of this standard should be stated in the label (see Clause 11).

6.1.2 No antibiotic substance or drug may be added to or included in a feed

6.1.3 Where a consignment or a batch of feed or concentrate is prepared specifically for a consumer or group of consumers, substances may be added upon the express written instructions of the consumers provided that:

- a) such additions are made in accordance with the provisions of the competent authority and/or World Organization for Animal Health (WOAH); and
- b) the nature and quantities of such additions are clearly stated upon each and every container of the feed or concentrate.

6.1.4 Recommended additives and their limits are given in Annex C.

7 Contaminants

7.1 Aflatoxin

Compounded fish feeds shall comply with the maximum limits for aflatoxins stated in Table 4, when tested in accordance with the test methods specified therein.

Table 4 — Aflatoxin limit for compounded fish feed

S/N	Aflatoxin	Maximum limit µg/kg	Test method
i.	Total aflatoxin	10	ISO 16050
ii.	Aflatoxin B ₁	5	ISO 14718 ISO 17375

7.2 Pesticide residue

Compounded fish feed shall not exceed the limits of pesticide residues established in the Codex Alimentarius Commission on Contaminants.

7.3 Heavy metals

Compounded fish feeds shall comply with the limits of heavy metals stated in Table 5, when tested in accordance with the methods specified therein.

Table 5 — Heavy metal limits for compounded fish feed

S/N	Heavy metal	Maximum limit mg/kg	Test method
i.	Arsenic	2,0	ISO 27085
ii.	Lead	5,0	
iii.	Cadmium	1,0	
iv.	Mercury	0,1	

8 Hygiene, storage and transportation

8.1 Compounded fish feed shall be processed and handled in accordance with the requirements of FDARS 2139.

8.2 Compounded fish feed shall be produced, transported, received and stored in accordance with the procedure described in the appropriate sections of FDARS 1828.

8.3 Microbiological limits

Compounded fish feeds shall comply with the microbiological limits specified in Table 6 when tested in accordance with the methods specified therein.

Table 6 — microbiological contaminants limit for compounded fish feed

S/N	Parameters	Limits	Test method
i.	<i>Salmonella spp, cfu in 25 g</i>	absent	ISO 6579-1
ii.	<i>Escherichia coli, cfu/g</i>	absent	ISO 16654

9 Packaging and labelling

9.1 Packaging

DARS 1120: 2024

Compounded fish feeds shall be packaged in containers that are of sufficient strength, and sufficiently sealed so as to withstand reasonable handling without tearing, bursting or falling open. The containers shall be clean and not previously used.

9.2 Labelling

Each package of compounded fish feed shall be legibly and indelibly marked with the following information:

- a) name and type of fish feed;
- b) name and address or contact information of manufacturer;
- c) designation of the feed
- d) nutrient composition; CP, CF, DE, Ca and P
- e) weight in SI units;
- f) batch or Code number;
- g) directions and precautions for use
- h) date of manufacture;
- i) best before; and

10 Sampling

Sampling shall be done in accordance with the requirements of ISO 6497.

Annex A
(normative)

Tolerance limits on analytical constituents in compounded fish feeds

Analytical constituents	Limits of variation (% by weight except where otherwise stated)
Ash	If present in excess — 2 % for declaration of 10 % or more — 20 % for the amount stated for declarations 5 % or more but less than 10 % — 1 % for declarations of less than 5 %. If present is deficient — 3 % for declaration of 10 % or more — 30 % for the amount stated for declarations 5 % or more but less than 10 % — 1.5 % for declarations of less than 5 %.
Calcium	If present in excess — 3.6 % for declaration of 16 % or more — 22.5 % for the amount stated for declarations 12 % or more but less than 16 % — 2.7 % for declarations of 6 % or more but less than 12 %. — 45 % for the amount stated for declarations 1 % or more but less than 6 % — 0.45 % for declarations of less than 1%. If present is deficiency — 1.2 % for declaration of 16 % or more — 7.5 % for the amount stated for declarations 12 % or more but less than 16 % — 0.9 % for declarations of 6% or more but less than 12 %. — 15 % for the amount stated for declarations 1% or more but less than 6 % — 0.15 % for declarations less than 1 %.
Cystine	In case of deficiency 20 % of the amount stated
Fibre	If present in excess: — 1.8 % for all declarations If deficient: — 45 % of the amount stated
Lysine	In case of deficiency 15 % of the amount stated If present in excess — 4.5 % for declaration of 1 % or more — 30 % of the amount stated for declarations 7.5 % or more but less than 15 % — 2.25 % for declarations of 5 % or more but less than 7.5 %. — 45 % for the amount stated for declarations 0.75 % or more but less than 5 % — 0.3 % for declarations of less than 0.7 %.
Methionine	In case of deficiency 15 % of the amount stated If present in excess 1 % for declaration of 10 % or more 10 % of the amount stated for declarations 5 % or more but less than 10 % 0.5 % for declarations of less than 5 %.
Oil	In case of deficiency 1.5 % for declarations of 15 % or more 10 % of the amount for declarations of 8% or more but less than 15 % If present in excess 3 % for declaration of 15 % or more 20 % of the amount stated for declarations 8 % or more but less than 15 %

DARS 1120: 2024

Analytical constituents	Limits of variation (% by weight except where otherwise stated)
	0.8 % for declarations less than 8 %
Phosphorus	<p>If present in excess</p> <p>3.6 % for declaration of 16 % or more</p> <p>2.25 % of the amount stated for declarations 12 %</p> <p>45 % of the amount stated for declarations 1% or more but less than 6 %</p> <p>0.45 % for declarations of less than 1 %.</p> <p>In case of deficiency</p> <p>1.2 % for declaration of 16 % or more</p> <p>7.5 % of the amount stated for declarations of 12 % or more but less than 16 %</p> <p>0.9 % of the amount stated for declarations of 6 % or more but less than 12 %</p> <p>15 % of the amount stated for declarations of 1 % or more but less than 6 %</p> <p>0.15 % for declarations 1 % less than 1 %</p>
Sodium	<p>If present in excess</p> <p>4.5 % for declaration of 15 % or more</p> <p>30 % of the amount stated for declarations 7.5 % or more but less than 15 %</p> <p>2.25 % of the amount stated for declarations 5 % or more but less than 7.5 %</p> <p>0.45 % for declarations of 0.7 % or more but less than 5 %.</p> <p>In case of deficiency</p> <p>1.5 % for declaration of 15% or more</p> <p>10 % of the amount stated for declarations of 7.5 % or more but less than 15 %</p> <p>0.75 % of the amount stated for declarations of 5 % or more but less than 7.5 %</p> <p>15 % of the amount stated for declarations of 0.7 % or more but less than 5 %</p> <p>0.1 % for declarations less than 0.7 %</p>
Starch and total sugar	<p>If present in excess</p> <p>5 % for declaration of 25 % or more</p> <p>20 % of the amount stated for declarations 10 % or more but less than 25 %</p> <p>2 % of the amount stated for declarations less than 10 %.</p> <p>In case of deficiency</p> <p>2.5 % for declaration of 25 % or more</p> <p>10 % of the amount stated for declarations of 10 % or more but less than 25 %</p> <p>1 % for declarations less than 1 %</p>
Total sugar expressed as sucrose	<p>If present in excess</p> <p>4 % for declaration of 20 % or more</p> <p>20 % of the amount stated for declarations 10 % or more but less than 20 %</p> <p>2 % of the amount stated for declarations less than 10 %.</p> <p>In case of deficiency</p> <p>2 % for declaration of 20 % or more</p> <p>10 % of the amount stated for declarations of 10 % or more but less than 20 %</p> <p>1 % for declarations less than 10 %</p>
Ash insoluble in hydrochloric acid	<p>If present in excess</p> <p>10 % for declaration of more than 3 %</p> <p>0.3 % of the amount stated for declarations of 3 % or less</p>
Carotene	In case of deficiency, 30 % of the amount stated
Chlorides expressed as NaCl	<p>If present in excess</p> <p>10 % for declaration of more than 3 %</p> <p>0.3 % of the amount stated for declarations of 3 % or less</p>
Magnesium	In case of deficiency

Analytical constituents	Limits of variation (% by weight except where otherwise stated)
	1.5 % for declaration of 15 % or more 10 % of the amount stated for declarations of 2 % or more but less than 15 % 0.2 % for declarations less than 2 %
Minerals	
Cobalt	±50 % of the amount stated for declarations above 200 mg/kg
Copper	±30 of the amount stated for declarations above 200 mg/kg ±50 of the amount stated for declarations up to an including 200 mg/kg
Iodine	±50 % of the amount stated for declarations of 250 mg/kg or more
Iron	±50 % of the amount stated for declarations less than 250 mg/kg
Manganese	±50 % of the amount stated
Molybdenum	±50 % of the amount stated
Selenium	±50 % of the amount stated
Zinc	±50 % of the amount stated
Vitamins	
Vitamin D2 and D 3	±30 of the amount stated for declarations above 4000 IU/kg ±50 of the amount stated for declarations up to an including 4000 IU/kg
Vitamins other than D2 and D 3	In case of deficiency ±30 % of the amount stated

Annex B (informative)

Nutrient composition of common feed ingredients

Studies on nutritive value of feedstuffs show differences between analytical values and those which are already tabulated in various feeding standards. Chemical composition of feedstuffs play an important role in formulation of balanced and economical rations for various classes of animals. It is only possible when exact knowledge of chemical composition of feedstuffs are available. This table presents values of some chemical composition of common feedstuffs.

Ingredients	DM %	CP %	CF %	Ca %	P %	ME Kcal/kg	Lysine %	Methionine %
Maize	88	8	12	0.17	0.55	3 000	0.53	0.29
Maize bran	88	9.4	13	0.04	1.03	2 200	0.18	0.21
Maize/cob meal	88	7	8		0.30			
Rice bran	88	13.5	6.5	0.06	1.43	3 000	0.5	0.22
Cassava meal	88	2.8	4.0	0.3	0.05	3 000	—	—
Molasses	75	3.0		0.75	0.08	2 330	—	—
Millet	88	10.5	2.0	0.05	0.40	1 392	0.2	0.27
Sorghum	88	9.0	2.1	0.03	0.28	3 250	0.2	0.12
Fish meal	88	60.0	1.0	4.37	2.53	2 310	4.08	1.70
Blood meal	92	72.9	1.7	0.28	0.22	1 177	7.0	0.9
Cotton seed cake	88	40.0	14	0.20	1.20	968	1.6	0.52
Soya bean meal	88	43.0	6	0.53	0.64	2 800	2.84	0.65
Limestone	98	-	-	38.0	-	-	-	-
Oyster shells	98	-	-	35.0	-	-	-	-
Wheat pollard	98	15.0					0.60	0.35
Wheat bran	91.4	15.0	12.5		1.20		0.60	0.35
Sunflower cake	92	35.0	26.7				1.80	1.20
Groundnut cake	93	40.0	7.3				2.00	1.80
Rice polishings	92.5	12.0	4.2				4.0	0.40
Bone meal	94	24	1.5					
Dicalcium phosphate				24	18			
Tricalcium phosphate				38	19			
Meat meal		60.0					0.50	1.0
Alfalfa hay	87.5	18.9	33.1					
Sugarcane bagasse	90.5	1.7	50.3					
Sesame cake	93	36.1	6.7					
Sugarcane tops	33.5	6.2	29.5					
Whey	90	13.0	1.3	0.97	0.76	3 100		0.2

Annex C (informative)

Recommended additives used in fish feed

C.1 Requirements for antioxidants

No fish feed shall contain any added antioxidant other than an antioxidant of a name or description specified in the first column of the table below. Where an antioxidant if added should not exceed the maximum content, if any, specified in the second column of the Table 13.

Table C.1 — Requirements for antioxidants

Name or description	Maximum content in complete feed stuff mg/kg
L-Ascorbic acid Sodium L-ascorbate Calcium di (L-ascorbate) 5,6-Diacetyl-L-ascorbic acid 6-Palmitoyl-L-ascorbic acid Tocopherol-rich extracts of a natural origin Synthetic alpha-tocopherol Synthetic gamma-tocopherol Synthetic delta-tocopherol Propionic acid or Ca, Na or K salt Benzoic acid or Na salt Acetic acid Formic acid Citric acid Ascorbic acid or Ca or Na salt Gentian violet Gentian violet Potassium and sodium bisulphite Potassium and sodium metabisulphite Propylene glycol	According to the recommendation of GMPs
N-propyl gallate Octyl gallate Dodecyl gallate	100, singly or in combination
BHA (Mixture of 3-and 2- <u>tert</u> butyl 4-hydroxyanisole)	150
BHT (2,6-di (<u>tert</u> butyl)-4-methylphenol)	According to the recommendation of GMPs
*GMP – Good Manufacturing Practices	

C.2 Requirements for colourants

C.2.1 No feed shall contain any colorant other than a colorant named or described in Table 14. Any colorant named or described may be only used for fish listed opposite the colorant as is naturally present, the maximum content (if any) specified is not exceeded.

C.2.2 Egg yolk colouring or flavourings designed to improve the palatability of the feed may be included at the manufacturer's discretion.

Table C.2 — Requirements for colorants

Name or description	Maximum content in complete feed mg/kg
Citranaxanthin	According to the recommendation of GMPs
Patent Blue V Acid brilliant green BS	According to the recommendation of GMPs

C.3 Requirements for emulsifiers, stabilisers, thickeners and gelling agents

Compounded fish feeds shall contain no added emulsifier, stabiliser, thickener or gelling agent other than an emulsifier, stabiliser, thickener or gelling agent specified in CODEX STAN 192.

C.3.1 Sucrose esters or fatty acids

The following sucrose esters or fatty acids may be added to fish feeds:

- a) mixture of sucrose esters of monocyl and diacylglycerols (sucroglycerides, polyglycerides);
- b) polyglycerol esters of non-polymerised edible fatty acids;
- c) propylene glycol esters of fatty acids (propane-1,2-diol esters of fatty acids);
- d) stearyl-2-lactylic acid; sodium stearyl-1,2-lactylate; calcium stearyl-1,2-lactylate;
- e) stearyl-1-tartrate; glycerol poly (ethylene glycol) ricinolate; dextrans; sorbitan monostearate;
- f) sorbitan tristearate; sorbitan monolaurate; sorbitan mono-oleate; sorbitan monopalmitate;
- g) partial polyglycerol esters of polycondensed fatty acids of castor oil (polyglycerol polyricinoleate) polyoxyethylene (20) sorbitan monolaurate;
- h) polyoxyethylene (20) sorbitan monopalmitate, polyoxyethylene (20) sorbitan monostearate;
- i) polyoxyethylene (20) sorbitan tristearate, polyoxyethylene (20) sorbitan monooleate;
- j) polyoxyethylene (20) sorbitan trileate, polyoxyethylene (8) sorbitan stearate; and
- k) polyoxyethylene (40) stearate.

C.4 Requirements for binders, anti-caking agents and coagulants

C.4.1 General

Fish feed shall contain no added binder, anti-caking agent or coagulant other than a binder, anti-caking agent or coagulant of a named or description specified in 6.5.2.

C.4.2 Name or description

Lignosulphonates; Colloidal silica; Silicic acid, precipitate and dried; Sodium aluminosilicate, Sodium, potassium and calcium stearate; Kaolin and Kaslinitic clays free of asbestos natural accruing mixtures of minerals containing at least 65 % complex hydrated aluminium silicates whose main constituent in Kasolinite; Bentonite and other montmerillonitee clays; Vermiculite-hydrated silicate of magnesium, aluminium and iron; Citric acid; Kieselguhr (diatomaceous earth, purified); Calcium silicate (synthetic); Natural mixtures of steatite and chlorite free of asbestos.

C.5 Requirements for aromatic and appetising substances

C.5.1 Fish feed shall contain no added aromatic or appetising substance other than an aromatic or appetising substance of a name or description specified in Table 16 and taking account of any such substance which is naturally present, without exceeding the maximum content specified.

Table C.3 — Requirements for aromatic and appetising substances

Name or description	Maximum content in complete feed, mg/kg
Saccharin All natural products and corresponding synthetic products	According to the recommendation of GMPs

C.5.2 Fish feed shall contain no added preservatives other than a preservative of a name or description specified hereunder.

- a) sorbic acid, sodium sorbate, potassium sorbate, calcium sorbate;
- b) folic acid;
- c) ammonium formate, sodium formate, calcium formate;
- d) acetic acid, potassium acetate, sodium diacetate;
- e) lactic acid, sodium lactate, potassium lactate, ammonium lactate, calcium lactate;
- f) propionic acid, sodium propionate, potassium propionate;
- g) L-Tartaric acid;
- h) citric acid, sodium citrates, calcium citrates;
- i) orthophosphoric acid;
- j) fumaric acid;
- k) DL-Malic acid; and
- l) Hydrochloric acid or sulphuric acid for use in silage only.

D.6 Undesirable substances

D.6.1 The presence in poultry feed and feed ingredients of undesirable substances such as industrial and environmental contaminants, pesticides, radionuclides, persistent organic pollutants, pathogenic agents and toxins such as mycotoxins shall be identified, controlled and minimized.

D.6.2 Animal products that could be a source of the Bovine Spongiform Encephalopathy (BSE) agent should not be used for feeding directly to, or for feed manufacturing for ruminants.

D.6.3 Control measures applied to reduce unacceptable level of undesirable substances shall be assessed in terms of their impact on food safety.

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Bibliography

DEAS 973 - 1: 2023, Compounded fish feed — Specification – Part 1: Tilapia and catfish feeds

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