Guidance Document #07
Identification and Characterization of Feed Ingredients
September 2023
At Step 7: Steering Committee Endorsement

IDENTIFICATION AND CHARACTERIZATION OF FEED INGREDIENTS

Endorsed by the Steering Committee
September 2023

It is recommended for the companies planning to submit applications/dossiers for pre-market authorization, to contact the jurisdictions of the countries to confirm their acceptance of the current guidance document.

The International Cooperation for Convergence of Technical Requirements for the Assessment of Feed Ingredients (ICCF) was launched in 2017 and aims to develop and establish common guidance documents to provide technical recommendations for the assessment of feed ingredients, including new uses of existing feed ingredients.

This guidance document has been developed by the appropriate ICCF Experts Working Group and was subject to consultation by the Parties, in accordance with the ICCF Process.

The founding members of the ICCF include the Canadian Food Inspection Agency (CFIA), the European Commission (DG SANTE), the U.S. Food and Drug Administration (FDA), as well as the American Feed Industry Association (AFIA), the Animal Nutrition Association of Canada (ANAC), the EU Association of Specialty Feed Ingredients and their Mixtures (FEFANA) and the International Feed Industry Federation (IFIF).

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IDENTIFICATION AND CHARACTERIZATION OF FEED INGREDIENTS

1. INTRODUCTION

1.1. Objective of the Guidance

Proper description of a feed ingredient is a prerequisite for the assessment of its safety and effectiveness[1]. This document provides guidance on the information to be included in a submission package for the pre-market approval or authorization of feed ingredients, with regards to their identification and characterization.

While this guidance document describes the information to be provided, including the technical data supporting it, applicants are advised to consult the jurisdiction's legislation and, if applicable, the guidance documents established by individual regulatory authorities during the development phase of new feed ingredients or a new use of an approved or authorized feed ingredient. This will help to determine whether the information is necessary for a specific pre-market approval or authorization.

1.2. Definitions

The definitions, provided below, are to be used in the context of this guidance document.

Active substance[2]: Any substance in a feed ingredient that contributes to the intended effect[3].

Carrier: A feed ingredient or water used to physically facilitate handling of the feed ingredient under assessment and its incorporation into ingredient market formulations, premixtures, feeds or water. The use of a carrier does not alter the feed ingredient's intended effect and purpose.

Characterization: The description of the feed ingredient(s), including its composition, purity, intrinsic properties, considering its manufacturing process, potential contaminants as appropriate, and its intended use in feed.

Class of animals: The type of animals, based on livestock production system (e.g., piglet, sow, broiler chicken)

[1] Other ICCF Guidance Documents cover additional information to be provided for the safety and effectiveness of feed ingredients.
[2] Active substance includes microorganisms that contribute to the intended effect.
[3] The intended effect refers to the desired effect under the conditions of use of the feed ingredient and not to the potential hazardous effect of the substance.

Contaminant[4]: Any substance[5] not intentionally added to feed, which is present in such feed as a result of the production, manufacture, processing, preparation, treatment, packaging, transport or holding of such feed, or as a result of environmental contamination[6].

Feed (Feedingstuff)[7]: Any single or multiple materials, whether processed, semi-processed or raw, which is intended to be fed directly to animals.

Feed Ingredient[7]: A component part or constituent of any combination or mixture making up a feed, whether or not, it has nutritional value in the animal's diet. Ingredients are of plant, animal, microbial or aquatic origin, or other organic or inorganic substances.

Identification: The name of the feed ingredient(s), using internationally recognized nomenclature and/or other appropriate information.

Ingredient market formulation: The feed ingredient under assessment formulated with carrier(s) and/or other feed ingredient(s). It is the commercial product used to incorporate the feed ingredient under assessment into premixtures, feeds or water.

Materials: Substances, including raw materials and other inputs (excluding processing aids and carriers) used for the manufacturing process[8].

Processing Aid[9]: Any substance or material, not including apparatus or utensils, and not consumed as a feed ingredient by itself, intentionally used in the processing of materials, feed or feed ingredient, to fulfil a certain technological purpose during treatment or processing and which may result in the non-intentional but unavoidable presence of residues or derivatives in the feed ingredient or its ingredient market formulation, provided that these residues and derivatives do not have an adverse effect on animal health, human health or the environment[10].

Purity: Concentration or other quantitative measurement of the active substance in the feed ingredient.

Specification: The set of appropriate criteria to which a feed ingredient and material must conform to be considered acceptable for its intended use.

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[4] Adapted from the CODEX Alimentarius General Standard for contaminants and toxins in food and feed (CXS 193-1995), considering CAC/GL 80-2013. This definition covers the impurities linked to the process or carried over from the materials. This term does not include insect fragments, rodent hairs, and other extraneous matter.
[5] Substances considered include chemical, physical and microbiological contaminants.
[6] See Annex II of the ICCF Guidance Document 'Manufacturing Process and Specification'.
[7] Adapted from Codex Alimentarius, Code of Practice on good animal feeding (CAC/RCP 54-2004).
[8] See Annex I-1 of the ICCF Guidance Document 'Manufacturing Process and Specification'.
[9] Adapted from the CODEX Alimentarius general Standard for the labeling of food additives when sold as such and from the definitions in the Regulation 1831/2003/EC on additives in animal nutrition.
[10] Note that some processing aids may also be used as functional feed ingredients.

1.3. Scope of the Guidance

This guidance document covers all categories of feed ingredients, including mixtures of feed ingredients, when submitted for an assessment.

Characterization should consider the information provided on the manufacturing process steps and the defined specification of the feed ingredient (see Guidance Document 'Manufacturing Process and Specification').

2. GENERAL PRINCIPLES

This guidance document provides recommendations of information to be part of the submission package for a transparent and coherent description of the form in which the feed ingredient is marketed (i.e., feed ingredient or ingredient market formulation). The identification and characterization of the feed ingredient should consider its conditions of use, its manufacturing process steps, and the contaminants that may require consideration.

The guidance document is organized to provide recommendations regarding the information to be provided for the different types of feed ingredients, accounting for their manufacturing process steps (see Guidance Document 'Manufacturing Process and Specification'). The following categories of feed ingredients are considered:

- Feed ingredients manufactured by chemical reactions,
- Feed ingredients of plant origin,
- Feed ingredient containing (a) viable microorganism(s),
- Feed ingredient manufactured by fermentation/biological steps, not containing viable microorganism(s),
- Feed ingredients of animal origin,
- Feed ingredients of mineral origin.

To facilitate the application of this Guidance Document, an annex (Section 8) has been included to provide a summary of recommended information for the different types of feed ingredients.

Feed ingredients may be marketed in the jurisdiction in the form of an ingredient market formulation. In this case, the applicant should indicate this fact. Further identification and characterization of ingredient market formulation(s) containing the feed ingredient should be provided in the submission package, for the complete assessment of the feed ingredient, as fed to the animals.

For supporting the assessment of the feed ingredient, it is recommended to refer to the conditions of use of the feed ingredients:

- Intended effect (e.g., protein sources, anticaking agent),
- Target animal species (e.g., pigs) and/or classes (e.g., piglets),
- Intended method of feeding (e.g., to be incorporated in feed or use in drinking water for animals),
- An indication, whether the feed ingredient is marketed in the form of an ingredient market formulation,
- Directions for use (e.g., specific period and timing of use, concentration in feed, mixing approach in feed).

3. IDENTIFICATION

This section provides recommendations on the information necessary to identify the feed ingredient. While some information is common for all categories of feed ingredients, some may require specific information. A summary of recommended information to be provided for each type of feed ingredient is provided in Section 8.

3.1. General information

The following information should be provided:

- Name (as proposed by the applicant). When applicable, the following information should also be provided:
    - The common name(s), as applicable,
    - The name according to internationally recognized nomenclature, with a reference to the nomenclature used (e.g., IUPAC[11], CAS[11], EC[11], ICN[11]),
    - Any other identifier(s) (e.g., brand name) used in the submission package.

3.2. Specific information

Depending on the type of the feed ingredient, additional information may be necessary to properly identify the ingredient.

[11] Acronyms descriptions are provided in Section 7 of the guidance document.

3.2.1. Feed ingredients manufactured by chemical reactions

For feed ingredients manufactured by chemical reactions, the following information should be provided:

- Chemical formula (molecular and structural),
- Chemical Abstract Service (CAS) Number.

3.2.2. Feed ingredients of plant origin

For feed ingredients of plant (terrestrial or aquatic) origin, the following information should be provided:

- Botanical classification (family, genus, species) of the plant,
- Part of the plant used to produce the feed ingredient, e.g., leaves, stems, flowers, seeds, or other.

3.2.3. Feed ingredients containing viable microorganisms

For feed ingredients containing viable microorganisms, the following information should be provided:

- Taxonomic classification of the microorganism, including genus, species, and any substantiated changes in nomenclature, if applicable,
- Strain identification, if relevant, (e.g., the designation number in a nationally/internationally recognized culture collection[12] or strain number designated by applicant).

3.2.4. Feed ingredients manufactured by fermentation/biological steps

For feed ingredients manufactured by fermentation/biological steps, not containing viable microorganisms, the following information should be provided:

- Taxonomic classification of the microorganism used in the fermentation, including genus, species, and any substantiated changes in nomenclature, if applicable,
- Strain identification, if relevant, (e.g., the designation number in a nationally/internationally recognized culture collection[12] or the strain number designated by the applicant) of the microorganism used in the fermentation process step,
- part (e.g., cell wall) of the microorganism used to produce the feed ingredient.

[12] Internationally recognized culture collections are culture collections having acquired the status of International Authority under the Budapest Treaty.

In addition, depending on the feed ingredient resulting from the fermentation/biological steps, the following additional information should be submitted:

For chemically defined feed ingredients:

- Chemical formula (molecular and structural),
- CAS Number.

For feed ingredients containing enzymes:

- Name according to the Enzyme Commission (EC) of the International Union of Biochemistry and Molecular Biology.

3.2.5. Feed ingredients of animal origin

For feed ingredients of animal origin (including fish and insect), the following information should be provided:

- Animal classification (family, genus, species),
    - when the exact classification is not known (e.g., mix of species), the source and origin should be identified,
- Part of the animal or product of animal origin used to produce the feed ingredient, such as blood, tissue, gland, bone, feather, milk, egg or other.

3.2.6. Feed ingredients of mineral origin

For feed ingredients of mineral origin, relevant information on the origin of the feed ingredient should be provided.

In addition, for chemically defined feed ingredients of mineral origin, the following additional information should be submitted:

- Chemical formula (molecular and structural),
- CAS Number.

4. CHARACTERIZATION

This section provides recommendations on the information necessary to properly characterize the feed ingredient. General information is common for all categories of feed ingredients. Specific information is listed for each type of feed ingredients.

When the feed ingredient contains more than one active substance, the information should be provided for each active substance.

A summary of recommended information to be provided for each type of feed ingredient is provided in Section 8.

4.1. General information

It is recommended to provide the following information, supported by data (e.g., certificates of analysis), as appropriate:

- The composition of the feed ingredient:
  - For chemically defined feed ingredients, the name of the active substance(s) and its (their) purity,
  - For enzymes, the name of the active substance(s) and its (their) purity (minimum enzymatic activity),
  - For viable microorganisms, the name of the active substance(s) and its (their) purity (minimum counts, cfu/g),
  - For feed ingredients intended for the provision of nutrients, the nutritional composition of the feed ingredient,
  - For other feed ingredients, typical composition summing to 100 % w/w or w/vol (ranges are acceptable) or other units, as applicable, including the active substance(s),
- The type of extraction[13], when extraction is a manufacturing process step (e.g., solvent-based extraction, water-based extraction),
- The presence of contaminants (see recommendations in Annex II of the Guidance Document on 'Manufacturing Process and Specification'). It is recommended that the proposed specification limits for all parameters are established based on analytical results of multiple representative batches. Hence, certificates of analysis should be provided for at least three independent and non-consecutive batches, preferably from the most recent lots. For feed ingredients, not yet produced at an industrial scale, it is possible to use pilot batches, if justifications are provided to demonstrate that these batches are representative of the future production from the industrial process,
- The estimated shelf life (measured as described in the Guidance Document 'Stability Testing of Feed Ingredient') for the form of the feed ingredient marketed (i.e., feed ingredient or ingredient market formulation),
- The physical state (i.e., solid or liquid), including moisture level and water activity, when there is a risk of microbial contamination,
- The appearance (e.g., color),

[13] Note that the description of the extraction method should be provided in the manufacturing process (see ICCF Guidance Document on Manufacturing Process and Specification).

- The dusting potential, for solid form(s) of the feed ingredient marketed (i.e., feed ingredient or ingredient market formulation. The particle size of the dust produced may be required if the active substance of the feed ingredient raises concern when inhaled,
- The particle size range of the form(s) of the feed ingredient marketed (i.e., feed ingredient or ingredient market formulation),
- The flowability of the form(s) of the feed ingredient marketed (i.e., feed ingredient or ingredient market formulation)
- Any known incompatibilities of the feed ingredient in a feed,
- Other characteristics relevant to the assessment.

4.2. Specific information

Depending on the type of the feed ingredient, additional information, supported by data (e.g., test results) may also be necessary/recommended.

4.2.1. Feed ingredients manufactured by chemical reactions

For feed ingredients manufactured by chemical reactions, the following additional information should be provided:

- Solubility/Dispersibility (with an indication of the solvent(s) used),
- Octanol/water partition coefficient (K_{ow}),
- Molecular weight,
- Density/specific gravity, for liquid feed ingredients,
- pH.

Other information may be required when necessary to characterize the feed ingredient, such as, melting point, boiling point, flash point, autoignition temperature, vapor pressure, vapor density, polymerization/isomers, or others.

4.2.2. Feed Ingredients of plant origin

For feed ingredients of plant (terrestrial and aquatic) origin, the following additional information should be provided:

- Solubility/Dispersibility (with an indication of the solvent(s) used),
- Intrinsic/endogenous toxic compound(s) (e.g., erucic acid in rapeseed) relevant to the source of the feed ingredient,
- Antinutritional compound(s) relevant to the source of the feed ingredient,
- If the plant used as the source of the feed ingredient is genetically modified, the characterization as per published guidance documents from the relevant jurisdiction.

In addition, for chemically defined feed ingredients of plant origin:

- Octanol/water partition coefficient (K_{ow}) of the active substance(s),
- Molecular weight of the active substance(s),
- Density/specific gravity, for liquid feed ingredients,
- pH.

4.2.3. Feed ingredients containing viable microorganisms

For feed ingredients containing viable microorganisms, the following additional information should be provided:

- Classification[14] of the microorganism,
- Origin of the isolate,
- Phenotypic traits (e.g., morphology, substrate usage, fermentation products),
- Unambiguous identification at species level based on up-to-date methods (closest match to a known species),
    - Whole Genome Sequencing (WGS),
    - other molecular taxonomic methods relevant for comparison to a reference strain (16S or 23S ribosomal Ribonucleic Acid (rRNA) sequencing, or other molecular taxonomic methods relevant for comparison to a reference strain),
- Intrinsic/endogenous toxic compound(s) relevant to the microorganism,
- Capability of the microorganisms to produce toxin(s), when the species of the microorganism is taxonomically related to species that are pathogenic to humans or animals,
- Presence of virulence factors in the microorganism(s),
- Capacity of the microorganism(s) to exhibit antimicrobial activity[15],
- Absence of acquired antimicrobial resistance,
- Presence of plasmid(s) relevant for the safety assessment,
- If the microorganisms are genetically modified, the description may be required, depending on relevant jurisdiction.

[14] Classification can be found in the EFSA QPS list of microorganisms with the relevant qualifications, in the AAFCO Official Publication, the GRAS list or Directive of the European Parliament and of the Council No2000/54.
[15] Especially relevant to the WHO list of critically important antimicrobials for humans or the OIE list of antimicrobials of veterinary importance, under the proposed conditions of use.

4.2.4. Feed ingredients manufactured by fermentation/biological steps

For feed ingredients manufactured by fermentation/biological steps, the following information may be necessary/recommended for the production microorganism and feed ingredients manufactured by fermentation/biological steps, not containing viable microorganisms:

- Classification[14] of the production microorganism,
- Phenotypic traits (morphology, substrate usage, fermentation products),
- Unambiguous identification at species level based on up-to-date methods (closest match to a known species),
    - Whole Genome Sequencing (WGS),
    - other molecular taxonomic methods relevant for comparison to a reference strain (16S or 23S ribosomal Ribonucleic Acid (rRNA) sequencing, or other molecular taxonomic methods relevant for comparison to a reference strain),
- Intrinsic/endogenous toxic compound(s) relevant to the fermentation step or the microorganism used,
- Antinutritional compound(s),
- Absence of the production microorganism or the viability of the production microorganism, if present in the feed ingredient,
- Absence of acquired antimicrobial resistance, relevant to the production microorganism, in the feed ingredient,
- If the production microorganism is genetically modified, the characterization of the genetic modification as per published guidance documents from the relevant jurisdiction.

In addition, for feed ingredients consisting of biomasses and/or fermentation supernatants:

- Indication of the fermentation substrate used for the fermentation process step, if relevant.

In addition, for chemically defined feed ingredients manufactured by fermentation/biological steps:

- Octanol/water partition coefficient (K_{ow}) of the active substance,
- Molecular weight of the active substance,
- Solubility/Dispersibility (with an indication of the solvent(s) used).

4.2.5. Feed ingredients of animal origin

For feed ingredients of animal origin, including fish and insects, the additional information to be provided will depend on the types of feed ingredients:

For feed ingredients containing whole (e.g., insects), parts of animals (e.g., meat meal), or product of animal origin (e.g., milk powder):

- Description of the animal (original source and potential selection),
- Substrate(s) used as a source of nutrients (for insects),
- Intrinsic/endogenous toxic compound(s) or disease vector (such as prions) relevant to the source of the feed ingredient,
- Antinutritional compound(s) relevant to the source of the feed ingredient,

For feed ingredients, such as isolates, extracts, or purified proteins of animal origin:

- Solubility/Dispersibility (with an indication of the solvent(s) used).

For chemically defined feed ingredients of animal origin:

- Octanol/water partition coefficient (K_{ow}) of the active substance(s),
- Molecular weight of the active substance(s),
- Solubility/Dispersibility (with an indication of the solvent(s) used).

If the animal used as the source of the feed ingredient is genetically modified, the characterization as per published guidance documents from the relevant jurisdiction.

4.2.6. Feed ingredients of mineral origin

For feed ingredients of mineral origin, the following information should be provided:

- Solubility/Dispersibility (with an indication of the solvent(s) used),
- Intrinsic toxic compound(s).

In addition, for chemically defined feed ingredients of mineral origin:

- Octanol/water partition coefficient (K_{ow}) of the active substance(s),
- Molecular weight of the active substance(s).

5. INGREDIENT MARKET FORMULATION

When the feed ingredient is proposed to be marketed in the form of an ingredient market formulation, the following information should be provided, as applicable for each ingredient market formulation included in the submission package, in addition to the information provided for the feed ingredients, as described in the Section 3 and 4 of this guidance document:

- The designated name of the ingredient market formulation,
- Other identifiers (e.g., other internal names, names used in reports),
- The qualitative and quantitative[16] composition of the ingredient market formulation(s), including the feed ingredient(s), carrier(s), and other feed ingredient(s),
- The estimated shelf life of the ingredient market formulation(s) (measured as described in the Guidance Document 'Stability Testing of Feed Ingredients'),
- The physical state of the ingredient market formulation(s) (i.e., solid or liquid),
- The appearance (e.g., color),
- The dusting potential, for solid ingredient market formulation(s). The particle size of the dust produced may be required if the active substance of the feed ingredient, included in the ingredient market formulation, raises concern when inhaled,
- The particle size range of the solid ingredient market formulation(s),
- The flowability of the ingredient market formulation(s),
- The solubility/dispersibility of the ingredient market formulation(s) in water, if relevant for the intended use,
- Other applicable characteristics.

A summary of recommended information to be provided for ingredient market formulations is provided in Section 8. If the ingredient market formulation is a mixture of feed ingredients, the information relevant for each feed ingredient present in the mixture should be provided based on their origin as summarized in the table of Section 8.

6. BIBLIOGRAPHY

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2. OECD consensus documents: Work on harmonization of regulatory oversight in biotechnology – Biology of plants.

[16] The quantitative composition may contain ranges.

6.2. United States of America

3. Guidance for Industry #221 Recommendations for Preparation and Submission of Animal Food Additive Petitions (2005)
4. United States Current Animal Food GRAS Notices inventory. https://www.fda.gov/animal-veterinary/generally-recognized-safe-gras-notification-program/current-animal-food-gras-notices-inventory.
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6. Directive 2000/54/European Commission (EC) of the European Parliament and of the Council of 18 September 2000 on the protection of workers from risk related to exposure of biological agents at work – Official Journal of the European Community L262 -17/10/2000, p.21.
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13. European Food Safety Authority (EFSA), 2021. EFSA Statement on the requirements for whole genome sequence analysis of microorganisms used in the food chain. EFSA Journal 2021;19(7):6506: doi:10.293/j.efsa.2021.6506.

6.4. Canada

14. Regulatory Guidance, Chapter 2 – Data requirements for single ingredient approval and feed registration – 2.6 Guidelines for the assessment of novel feeds: plant sources.
15. Regulatory Guidance, Chapter 2 – Data requirements for single ingredient approval and feed registration – 2.7 Guidelines for the assessment of novel feeds: microbial sources.
16. Novel Feeds from Biotechnology-Derived-Animals.

6.5. Others

17. Budapest Treaty on the International Recognition of the Deposit of Microorganisms for the Purposes of Patent Procedure. Done at Budapest on April 28, 1997 and amended on September 26, 1980.

7. ABBREVIATIONS

CAS	Chemical Abstracts Service
CFU	Colony Forming Unit
EC	Enzyme Commission of the International Union of Biochemistry and Molecular Biology
IUPAC	International Union of Pure and Applied Chemistry
ICN	International Code of Nomenclature
QPS	Qualified Presumption of Safety
WGS	Whole Genome Sequencing

8. ANNEX – RECOMMENDATIONS REGARDING INFORMATION TO BE PROVIDED DEPENDING ON THE TYPE OF FEED INGREDIENT

This annex provides a summary of the recommendations for the different types of feed ingredients. In case of mixture of feed ingredients, the information should be provided for each of the feed ingredient contained in the mixture.

Items	Feed ingredients					
	manufactured by chemical reactions	of plant (terrestrial and aquatic) origin	containing viable micro-organisms	manufactured by fermentation/biological steps, not containing viable micro-organism	of animal origin (including fish and insect)	of mineral origin
Conditions of use						
Intended effect	√	√	√	√	√	√
Target animal species or class	√	√	√	√	√	√
Intended use	√	√	√	√	√	√
Form of the feed ingredient marketed (i.e., feed ingredient or ingredient market formulation)	√	√	√	√	√	√
Directions for use	√	√	√	√	√	√
Identification						
Name (as proposed by the applicant)	√	√	√	√	√	√
Common name(s)	√	√	√	√	√	√
Name according to internationally recognized nomenclature, with a reference to the nomenclature used	√	√	√	√	√	√
Other identifiers	√	√	√	√	√	√
Chemical formula (molecular and structural)	√	√[1]		√[1]	√[1]	√[1]

Items	Feed ingredients					
	manufactured by chemical reactions	of plant (terrestrial and aquatic) origin	containing viable micro-organisms	manufactured by fermentation/biological steps, not containing viable micro-organism	of animal origin (including fish and insect)	of mineral origin
Chemical Abstracts Service (CAS) Number	√	√[1]		√[1]	√[1]	√[1]
Taxonomic classification, including substantiated changes in nomenclature			√	√		
Strain identification			√	√		
EC number			√	√		
Botanical classification (family, genus, species)		√				
Animal classification (family, genus, species)					√	
Part of the plant used to produce the feed ingredient		√				
Part of the microorganism used to produce the feed ingredient				√[2]		
Part of the animal or product of animal origin used to produce the feed ingredient					√	
Other relevant information	O	O	O	O	O	O
Characterization						
Composition						
Name and purity of active substance(s)	√	√[1]		√[1]	√[1]	√
Name and purity (minimum enzymatic activity) of active substance(s)		√		√	√	

Items	Feed ingredients					
	manufactured by chemical reactions	of plant (terrestrial and aquatic) origin	containing viable micro-organisms	manufactured by fermentation/biological steps, not containing viable micro-organism	of animal origin (including fish and insect)	of mineral origin
Name and purity (minimum count, cfu/g]) of active substance(s)			√			
Nutritional composition	√[3]	√[3]		√[3]	√[3]	√[3]
Typical composition (w/w or w/vol) summing to 100%	√	√		√	√	√
Type of extraction	√	√		√	√	√
Contaminants						
PCBs and dioxins	√	√	O[1]	O[1]	√	√
Heavy metals	√	√	√	√	√	√
Pesticides		√				
Chemical residues	√		√	√	O[1]	√
Microorganisms		√	√	√	√	
Drug/Antibiotic residues	√		√	√	√	
Biotoxins (incl. mycotoxins)		√	√	√	O[1]	
Animal disease vector					√	
Other(s)	O	O	O	O	O	O
Estimated shelf life	√[4]	√[4]	√[4]	√[4]	√[4]	√[4]
Physical state	√[4]	√[4]	√[4]	√[4]	√[4]	√[4]
Appearance	√[4]	√[4]	√[4]	√[4]	√[4]	√[4]
Dusting potential	√[4]	√[4]	√[4]	√[4]	√[4]	√[4]
Particle size range	√[4]	√[4]	√[4]	√[4]	√[4]	√[4]
Flowability	√[4]	√[4]	√[4]	√[4]	√[4]	√[4]
Known incompatibilities	√	√	√	√	√	√
Other characteristics relevant for the assessment	O	O	O	O	O	O

Items	Feed ingredients					
	manufactured by chemical reactions	of plant (terrestrial and aquatic) origin	containing viable micro-organisms	manufactured by fermentation/biological steps, not containing viable micro-organism	of animal origin (including fish and insect)	of mineral origin
Solubility/Dispersibility (with an indication of solvent(s) used)	√	√	√	√	√	√
Octanol/Water partition coefficient (K_{ow})	√[1]	√[1]		√[1]	√[1]	√[1]
Molecular weight	√[1]	√[1]		√[1]	√[1]	√[1]
Density/Specific gravity	√[1]	√[1]		√[1]	√[1]	√[1]
pH	√[1]	√[1]		√[1]	√[1]	√[1]
Intrinsic/Endogenous toxic compound(s)		√		√	√	√
Antinutritional compound(s)		√	O[1]	√	√	
Genetic modification		√	√	√	√	
Classification of the microorganism			√	√		
Origin of the isolate			√	√		
Description of the animal (original source and potential selection)					√	
Phenotypic traits of the microorganism			√	√		
Unambiguous identification						
Whole Genome Sequencing			√	√		
Other molecular taxonomic methods			√	√		
Capacity to produce toxin(s)			√	√		
Presence of virulence factor(s)			√	√		
Capacity to exhibit antimicrobial resistance			√	√		
Absence of acquired antimicrobial resistance			√	√		

Items	Feed ingredients					
	manufactured by chemical reactions	of plant (terrestrial and aquatic) origin	containing viable micro-organisms	manufactured by fermentation/biological steps, not containing viable micro-organism	of animal origin (including fish and insect)	of mineral origin
Presence of plasmid(s)			√	√		
Viability of the microorganism in the feed ingredient			√	√		
Substrate(s) used for the fermentation process			√	√		
Substrate(s) used as source of nutrients (for insects)					√[5]	

√: Recommended.

O: Optional.

O[1]: Optional with justification on why the information is not needed.

√[1]: if the feed ingredient is chemical defined.

√[2]: if the feed ingredient contains part of the production microorganism.

√[3]: if the feed ingredient is intended to provide nutrients.

√[4]: if the answer to the question on 'ingredient market formulations' in the section of conditions of use is 'NO'.

√[5]: if the animal source is an insect.

Items	Ingredient Market Formulations containing feed ingredients[17]					
	manufactured by chemical reactions	of plant (terrestrial and aquatic) origin	containing viable micro-organisms	manufactured by fermentation/biological steps, not containing viable micro-organism	of animal origin (including fish and insect)	of mineral origin
Name of ingredient market formulation	√	√	√	√	√	√
Other identifiers	O	O	O	O	O	O
Composition	√	√	√	√	√	√
Estimated shelf life	√	√	√	√	√	√
Physical state	√	√	√	√	√	√
Appearance	√	√	√	√	√	√
Dusting potential	√	√	√	√	√	√
Particle size range	√	√	√	√	√	√
Flowability	√	√	√	√	√	√
Solubility/Dispersibility in water	√[1]	√[1]	√[1]	√[1]	√[1]	√[1]
Other characteristics	√	√	√	√	√	√

√: Recommended.

O: optional.

√[1]: if the ingredient market formulation is intended to be used in water.

[17] Recommendation to be used if the answer to the question on ingredient market formulation in the section on conditions of use of the feed ingredient is 'yes'.