



**Basic Substance**  
Chitosan  
SANTE/10594/2021 Rev. 1  
28 January 2022

**Final** Review report for the basic substance **chitosan**  
finalised by the Standing Committee on Plants, Animals, Food and Feed  
on 28 January 2022 in view of the approval of chitosan  
as basic substance in accordance with Regulation (EC) No 1107/2009<sup>1</sup>

## **1. Procedure followed for the evaluation process**

This review report has been established as a result of the evaluation of an application for approval of chitosan as basic substance in accordance with Article 23 of Regulation (EC) No 1107/2009<sup>2</sup> concerning the placing of plant protection products on the market.

In accordance with the provisions of Article 23(3) of Regulation (EC) No 1107/2009, the Commission received on 19 December 2018 an application from KitoZyme, hereafter referred to as the applicant, for the extension of use of chitosan hydrochloride, as approved by Commission Implementing Regulation (EU) No 563/2014 of 23 May 2014<sup>3</sup> as basic substance. This application was not complete and a revised application was submitted on 28 November 2019.

The application and attached information were distributed to the Member States and the European Food Safety Authority (EFSA) for comments. The applicant was also allowed to address collated comments and provide further information to complete the application.

In accordance with the provisions of Article 23(4) of Regulation (EC) No 1107/2009 the Commission required scientific assistance on the evaluation of the application from EFSA, who delivered its views on the specific points raised in the commenting phase.

EFSA submitted to the Commission the results of its work in the form of a technical report on 8 July 2020<sup>4</sup>. Based on that technical report and the documentation provided by the applicant, it is appropriate to define the scope of the application as covering the active substance “chitosan” (and not “chitosan hydrochloride”).

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<sup>1</sup> Review Report established in accordance with Art. 13 of Regulation (EU) No 1107/2009; it does not necessarily represent the views of the European Commission.

<sup>2</sup> OJ L 309, 24.11.2009, p. 1-50.

<sup>3</sup> Commission Implementing Regulation (EU) No 563/2014 of 23 May 2014 approving the basic substance chitosan hydrochloride in accordance with Regulation (EC) No 1107/2009 of the European Parliament and of the Council concerning the placing of plant protection products on the market, and amending Commission Implementing Regulation (EU) No 540/2011, OJ L 156, 24.5.2014, p. 5.

<sup>4</sup> EFSA (European Food Safety Authority), 2020. Technical report on the outcome of the consultation with Member States and EFSA on the basic substance application for approval of chitosan hydrochloride for an extension of use in plant protection as an elicitor in horticulture, olive trees, grapes, grass and post-harvest fruit treatment. EFSA supporting publication 2020:EN-1900. 53 pp. doi:10.2903/sp.efsa.2020.EN-1900.

The Commission examined the application, the comments by Member States and EFSA and the EFSA Technical report on the substance together with the additional information and comments provided by the applicant, before finalising a draft review report, which was referred to the Standing Committee on Plants, Animals, Food and Feed for examination. The draft review report was finalised by the Standing Committee on 28 January 2022.

The present review report contains the conclusions of the final examination by the Standing Committee. Given the importance of the EFSA technical report, and the comments and clarifications submitted, all these documents are also considered to be part of this review report.

## **2. Purposes of this review report**

This review report, including the background documents and appendices thereto, has been developed in support of **Commission Implementing Regulation (EU) 2022/456**<sup>5</sup> concerning the approval of chitosan as basic substance under Regulation (EC) No 1107/2009.

The review report will be published and will thus be available to any interested party.

Without prejudice to the provisions of Regulation (EC) No 178/2002<sup>6</sup>, in particular with respect to the responsibility of operators, following the approval of chitosan as basic substance, operators are responsible for using it for plant protection purposes in conformity with the legal provisions of Regulation (EC) No 1107/2009 and the conditions established in sections 4 and 5 and Appendices I and II of this review report.

EFSA will make available to the public all background documents and its final Technical Report as well as the application without the Appendices and excluding any information for which confidential treatment has been requested and justified in accordance with the provisions of Article 63 of Regulation (EC) No 1107/2009.

Products containing exclusively one or more basic substances do not require authorisation in line with the derogation set under Article 28 of Regulation (EC) No 1107/2009. As a consequence, no further assessment will be carried out on such products. However, the Commission may review the approval of a basic substance at any time in conformity with the provisions of Article 23(6) of Regulation (EC) No 1107/2009.

## **3. Overall conclusion in the context of Regulation (EC) No 1107/2009**

The overall conclusion based on the application, including the results of the evaluation carried out with the scientific assistance of EFSA, and the comments and further additional information provided by the applicant to address the open points identified in the Technical report from EFSA, is that there are indications that it may be expected that chitosan fulfils the criteria of Article 23.

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<sup>5</sup> OJ L 93, 22.3.2022, p. 138.

<sup>6</sup> OJ L 31, 1.2.2002 p. 1-24 - Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

Chitosan is a linear cationic polysaccharide composed of randomly distributed (1-4)-linked D-glucosamine and N-acetyl-D-glucosamine produced commercially by the deacetylation of chitin, which is a component of the exoskeleton of crustaceans and the cell walls of fungi. The average molecular weight of chitosan is ranging from  $1 \times 10^4$  Da to  $1.5 \times 10^6$  Da depending on the origin.

The application submitted concerned chitosan of fungal origin, which is extracted from the mycelium of *Aspergillus niger*. According to the Technical Report of EFSA, the chitosan evaluation in view of approval as a basic substance is comparable with the material evaluated in the Scientific Opinion of the EFSA NDA Panel<sup>7</sup> on the safety of glucosamine hydrochloride from *Aspergillus niger* as food ingredient. Based on the same opinion of EFSA, “glucosamine hydrochloride” from *Aspergillus niger* was authorised as novel food ingredient and is listed in Commission Implementing Regulation (EU) 2017/2470 establishing the Union List of Novel Foods<sup>8</sup>. Furthermore, “chitosan extract from fungi (*Agaricus bisporus*; *Aspergillus niger*)” with a nearly identical specification as provided in the application for approval as a basic substance has been authorised as a novel food ingredient<sup>9</sup>. “Chitosan derived from *Aspergillus niger*” is also authorised for use or addition in organic products of the wine sector<sup>10,11</sup>. Therefore, the Committee concluded that chitosan from *Aspergillus niger* fulfils the criteria of a ‘foodstuff’ as defined in Article 2 of Regulation (EC) No 178/2002.

As regards other evaluations of chitosan and its derivatives carried out in accordance with EU legislation as referred to in Art. 23(2) of Regulation (EC) No 1107/2009, the form chitin-glucan from *Aspergillus niger* was authorised as novel food ingredient based on the Scientific Opinion of the EFSA NDA Panel on the safety of ‘Chitin-glucan’ as a Novel Food ingredient<sup>12</sup>. On basis of the data provided and taking into account the nature of the novel food ingredient, the Panel considered that there were no safety concerns under the proposed conditions of use.

According to the Scientific Opinions of the EFSA NDA Panel<sup>13,14</sup>, the *Aspergillus niger* strain used as the raw material for manufacture of chitosan derivatives glucosamine hydrochloride and the form chitin-glucan is not genetically-modified, pathogenic or toxic and does not

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<sup>7</sup> Scientific Opinion of the Panel on Dietetic Products Nutrition and Allergies on a request from the European Commission on the safety of glucosamine hydrochloride from *Aspergillus niger* as food ingredient. The EFSA Journal (2009) 1099, 1-19.

<sup>8</sup> Commission Implementing Regulation (EU) 2017/2470 of 20 December 2017 establishing the Union list of novel foods in accordance with Regulation (EU) 2015/2283 of the European Parliament and of the Council on novel foods; OJ L 351, 30.12.2017, p. 72–201.

<sup>9</sup> Commission Implementing Regulation (EU) 2017/2470 of 20 December 2017 establishing the Union list of novel foods in accordance with Regulation (EU) 2015/2283 of the European Parliament and of the Council on novel foods; OJ L 351, 30.12.2017, p. 72–201.

<sup>10</sup> Commission Implementing Regulation (EU) 2018/1584 of 22 October 2018 amending Regulation (EC) No 889/2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control; OJ L 264, 23.10.2018, p. 1–12.

<sup>11</sup> COMMISSION REGULATION (EU) No 53/2011 of 21 January 2011 amending Regulation (EC) No 606/2009 laying down certain detailed rules for implementing Council Regulation (EC) No 479/2008 as regards the categories of grapevine products, oenological practices and the applicable restrictions

<sup>12</sup> EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA); Scientific Opinion on the safety of “Chitin-Glucan” as a Novel Food ingredient. EFSA Journal 2010; 8(7):1687. [17 pp.]. doi:10.2903/j.efsa.2010.1687. Available online: [www.efsa.europa.eu/efsajournal.htm](http://www.efsa.europa.eu/efsajournal.htm).

<sup>13</sup> Scientific Opinion of the Panel on Dietetic Products Nutrition and Allergies on a request from the European Commission on the safety of glucosamine hydrochloride from *Aspergillus niger* as food ingredient. The EFSA Journal (2009) 1099, 1-19.

<sup>14</sup> EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA); Scientific Opinion on the safety of “Chitin-Glucan” as a Novel Food ingredient. EFSA Journal 2010; 8(7):1687. [17 pp.]. doi:10.2903/j.efsa.2010.1687. Available online: [www.efsa.europa.eu/efsajournal.htm](http://www.efsa.europa.eu/efsajournal.htm).

produce the mycotoxin ochratoxin A. Glucosamine hydrochloride evaluated in the EFSA NDA Panel opinion is comparable with chitosan intended for use as basic substance, thus it is appropriate to expect that the strain of *Aspergillus niger* used in production of chitosan for plant protection purposes should be the strain that is used in food production and should not produce mycotoxins, in particular ochratoxin A.

The specifications for novel food “chitosan extract from fungi” are laid down in Commission Implementing Regulation (EU) 2017/2470 establishing the Union list of novel foods, and correspond to the specification included in the application under evaluation. The documentation provided by the applicant refers to the use of chitosan and its derivatives as food ingredients. It is therefore appropriate to require that chitosan intended to be used as a basic substance should be of food grade quality, meeting the specifications for “chitosan extract from fungi” as set up in Commission Implementing Regulation (EU) 2017/2470.

For plant protection purposes, a solution of chitosan in water is used (pH of water may be adjusted to pH<5 with vinegar<sup>15</sup>). The proposed use as basic substance is intended as an elicitor for uses in cereals, spices, crops for animal feed, horticulture (outdoor and indoor ornamental plants), olive trees, grapes, grass, seed treatment (cereals, potatoes and sugar beet) and post-harvest fruit treatment.

The Technical Report by EFSA indicates that according to the hazard classification information notified to ECHA in REACH registrations, chitosan may have eye, skin and respiratory irritation potential. There is, however, no harmonised classification in Annex VI to the CLP Regulation, and a number of companies having notified a classification as irritant is limited, whereas most notifiers did not notify such a classification.

Furthermore, the Technical Report by EFSA indicates that chitosan is not of toxicological concern, a quantitative risk assessment is not necessary and a consumer dietary risk assessment can be waived.

EFSA indicated in its Technical Report that the information provided in the application in relation to the fate and behaviour of chitosan in the environment was limited. However, chitosan is a component of the exoskeleton of crustaceans and the cell walls of fungi, and is thus naturally present in environment. Considering the background natural levels of chitosan in the environment, levels resulting from other authorised uses of chitosan and its derivatives (including the use of chitosan hydrochloride approved as basic substance since 2014) and biodegradability of the substance, the environmental exposure from the intended use is likely to be negligible compared to background exposure. No risk to soil, surface and groundwater is therefore expected.

In the area of ecotoxicology, no concerns were identified by EFSA for the intended post-harvest uses to fruit. However, the information available was insufficient to assess the risk to non-target organisms from the remaining intended uses. Nevertheless, considering the nature of the active substance, the low toxicity identified, and given the exposure expected which is likely to be comparable to background levels (see previous paragraph), it can be assumed that there is no unacceptable risk to non-target organisms from intended uses of chitosan as a basic substance.

Therefore, considering the EFSA Technical Report, the opinions of the EFSA Panel on Dietetic Products, Nutrition and Allergies on chitosan and derivatives, the rate of application and the

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<sup>15</sup> See Appendix I, preparation to be used.

conditions of use which are described in detail in Appendix I and II, it is concluded that the use of chitosan would not lead to concerns for human health. Furthermore, no residues or unacceptable effects on the environment are expected given the conditions of use.

Chitosan is not a substance of concern if used according to the conditions as described in Appendix I and II, does not have an inherent capacity to cause endocrine disrupting, neurotoxic or immunotoxic effects and is not predominantly used for plant protection purposes but nevertheless is useful in plant protection in a product consisting of the substance and water. Finally, it is not placed on the market as a plant protection product.

It can be concluded that the substance has neither an immediate or delayed harmful effect on human or animal health nor an unacceptable effect on the environment when used in accordance with the supported uses as described in Appendix II.

In fact, these indications were reached within the framework of the uses which were supported by the applicant and mentioned in the list of uses supported by available data (attached as Appendix II to this review report) and therefore, they are also subject to compliance with the particular conditions and restrictions in sections 4 and 5 of this report.

Extension of the use pattern beyond those described above will require an evaluation at Community level in order to establish whether the proposed extensions of use can still satisfy the requirements of Article 23 of Regulation (EC) No 1107/2009.

#### **4. Identity and biological properties**

The main properties of chitosan are given in Appendix I.

Chitosan must be of food grade meeting the specifications for “chitosan extract from fungi” as set up in Commission Implementing Regulation (EU) 2017/2470<sup>16</sup> establishing the Union list of novel foods.

The *Aspergillus niger* strain used as the raw material for manufacture of chitosan for plant protection purposes must be the strain that was specifically selected for citric acid production and is used in food production. It must be non-genetically modified, non-pathogenic, non-toxic for humans and animals, and not produce mycotoxins, in particular ochratoxin A.

#### **5. Particular conditions to be taken into account in relation to the uses as basic substance of chitosan**

Chitosan must correspond to the given specifications in Appendix I and must be used in compliance with the method of preparation and conditions of use as reported in Appendices I and II.

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<sup>16</sup> Commission Implementing Regulation (EU) 2017/2470 of 20 December 2017 establishing the Union list of novel foods in accordance with Regulation (EU) 2015/2283 of the European Parliament and of the Council on novel foods; OJ L 351, 30.12.2017, p. 72–201.

## **6. List of studies to be generated**

No further studies were identified which were at this stage considered necessary.

## **7. Updating of this review report**

The information in this report may require to be updated from time to time to take account of technical and scientific developments, as well as of the results of the examination of any information referred to the Commission in the framework of Article 23 of Regulation (EC) No 1107/2009. Any such adaptation will be finalised in the Standing Committee on Plants, Animals, Food and Feed, in connection, as appropriate, with any amendment of the approval conditions for chitosan in Part C of Annex of the Regulation (EC) No 540/2011<sup>17</sup>.

## **8. Recommended disclosure of this review report**

Considering the importance of the respect of the approved conditions of use and the fact that a basic substance will not be placed on the market as plant protection product hence, no further assessment will have to be carried out on it, it is very important to inform not only applicants but also potential users of the substance on the existence of this review report.

Further to the publication of the review report SANTE-2020-10842, it is recommended that the competent authorities of Member States will make it additionally available to the general public and operators by means of their national relevant websites and by any other appropriate form of communication to ensure that the information reaches potential users.

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<sup>17</sup> OJ L 153, 11.6.2011, p. 1–186.

**APPENDIX I**  
**Identity and biological properties**  
**Chitosan**

<b>Common name (ISO)</b>	chitosan
<b>Chemical name (not IUPAC, not CA)</b>	poly[4-O-(2-acetamido-2-deoxy-β-D-glucopyranosyl)-2-amino-2-deoxy-β-D-glucopyranose]
<b>Common names</b>	poly-D-glucosamine, Poliglusam
<b>CAS No</b>	9012-76-4
<b>CIPAC No and EEC No</b>	618-480-0 (EC)
<b>FAO specification</b>	none
<b>Purity</b>	<p>≥ 85% chitosan</p> <p>heavy metals: max. 20 mg/kg</p> <p>Food grade, meeting the specifications for “chitosan extract from fungi” as set out in Commission Implementing Regulation (EU) 2017/2470.</p>
<b>Molecular mass and structural formula</b>	polycationic polysaccharide
<b>Origin</b>	<p><i>Aspergillus niger</i></p> <p>The strain of <i>Aspergillus niger</i> used in production of chitosan for plant protection purposes must be the strain that is used in food production and not produce mycotoxins, in particular ochratoxin A.</p>
<b>Mode of Use</b>	<p>Low-medium volume sprayer</p> <p>Post-harvest treatment by immersion/dipping</p>
<b>Preparation to be used</b>	<p>Soluble powder (SP) to be diluted in compliance with rate of application reported in Appendix II.</p> <p>Preparation 1: Chitosan powder should be added to a half-filled water tank, making sure the powder is evenly distributed over the water surface to avoid aggregation. The mixture should be stirred vigorously while adding the remaining water. The mixture should be used as soon as possible.</p> <p>Preparation 2: Chitosan powder can be dissolved in water with pH&lt;5. The pH of water should be regulated by adding 7 ml vinegar (8% of acetic acid) per 1 L of water).</p>
<b>Function of plant protection</b>	Plant elicitor

**APPENDIX II**  
**List of uses supported by available data**  
**CHITOSAN**

Crop and/ or situation (a)	F G or I (b)	Pests or group of pests controlled (c)	Formulation		Application of chitosan				Application rate of chitosan			PHI (days) (m)	Remarks*
			Type (d-f)	Conc of a.i. g/kg (i)	Method kind (f-h)	Growth stage & season (j)	No. of application min/max (k)	Interval between applications (min)	a.i./hl min max (g/hl)	Water l/ha min max	Total rate each application g a.i./ha min max (g/ha) (l)		
Olive trees <i>Olea europaea</i> OLVEU	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 10 to BBCH 79	4-8	2 weeks	50 - 100	200 - 400	100-400	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).
Grapevine <i>Vitis vinifera</i> VITVI	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 10 to BBCH 79	4-8	2 weeks	50 - 100	200 - 600	100-600	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).
Grass (Lawns) Grassland, English ryegrass <i>Lolium perenne</i> , Italian ryegrass <i>Lolium multiflorum</i> Timotheegrass <i>Phleum pratense</i> "Ornamental" grasses 3AMGC including <i>Miscanthus x</i> <i>giganteus</i>	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 09 to BBCH 89	4-8	2 weeks	50-100	200-400	100-400	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).



Crop and/ or situation (a)	F G or I (b)	Pests or group of pests controlled (c)	Formulation		Application of chitosan				Application rate of chitosan			PHI (days) (m)	Remarks*
			Type (d-f)	Conc of a.i. g/kg (i)	Method kind (f-h)	Growth stage & season (j)	No. of application min/max (k)	Interval between applications (min)	a.i./hl min max (g/hl)	Water l/ha min max	Total rate each application g a.i./ha min max (g/ha) (l)		
Grass (Sport fields, Golf courses)	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 09 to BBCH 89	4-8	2 weeks	50-100	200-400	100-400	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).

Crop and/ or situation (a)	F G or I (b)	Pests or group of pests controlled (c)	Formulation		Application of chitosan				Application rate of chitosan			PHI (days) (m)	Remarks*
			Type (d-f)	Conc of a.i. g/kg (i)	Method kind (f-h)	Growth stage & season (j)	No. of application min/max (k)	Interval between applications (min)	a.i./hl min max (g/hl)	Water l/ha min max	Total rate each application g a.i./ha min max (g/ha) (l)		
Ornamentals plants (Wood spurge Euphorbia amygdaloides subsp. Robbiae, EPHRO Magnolia 1MAGG Griffith's spurge Euphorbia griffithii EPHGH Philadelphus, 1PHIG Beech Fagus sylvatica, FAUSY Poplar tree Populus spp., 1POPG Hebe Hebe spp, 1HBEG Prunus sp, 1PRNG Wintergreen Gaultheria, 1GAHG Pear tree Pyrus sp., 1PYUG Maple Acer, 1ACRG Rose Rosa, 1ROSGCotoneaster 1CTTG Blackberry Rubus, 1RUBG Euonymus, 1EUOG Lilac Syringa, 1SYRG Forsythia, 1FOSG Blueberry Vaccinium, 1VACG	FGI	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 09 to BBCH 89	4-8	2 weeks	50-100	200-400	100-400	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).

Crop and/ or situation (a)	F G or I (b)	Pests or group of pests controlled (c)	Formulation		Application of chitosan				Application rate of chitosan			PHI (days) (m)	Remarks*
			Type (d-f)	Conc of a.i. g/kg (i)	Method kind (f-h)	Growth stage & season (j)	No. of application min/max (k)	Interval between applications (min)	a.i./hl min max (g/hl)	Water l/ha min max	Total rate each application g a.i./ha min max (g/ha) (l)		
Post-harvest fruit treatment (peelable fruit: Banana <i>Musa x paradisiaca</i> MUBPA Kiwis <i>Actinidia chinensis</i> ATICH Avocado <i>Persea americana</i> PEBAM Melon Mango <i>Mangifera indica</i> MNGIN Pineapple <i>Ananas comosus</i> ANHCO Citrus sp. 1CIDG)	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Immersion	Post- harvest BBCH 89+	1	-	1	-	-		Immersion/dipping of the fruit in a max of 2% (wt:vol) chitosan solution for a very short time (from a few second to 60 seconds) before being air dried, leading to a very thin film coating on the surface of the fruit (estimated to max ~0.02% of the fruit weight). Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).

Crop and/or situation (a)	F G or I (b)	Pests or group of pests controlled (c)	Formulation		Application of chitosan				Application rate of chitosan			PHI (days) (m)	Remarks*
			Type (d-f)	Conc of a.i. g/kg (i)	Method kind (f-h)	Growth stage & season (j)	No. of application min/max (k)	Interval between applications (min)	a.i./hl min max (g/hl)	Water l/ha min max	Total rate each application g a.i./ha min max (g/ha) (l)		
Fruits berries and small fruit	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 09 to BBCH 79	4-8	Two weeks	50 - 200	200 - 400	100-800	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).
Vegetables	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 09 to BBCH 79	4-8	Two weeks	50 - 100	200 - 400	100-400	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).
Cereals	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 09 to BBCH 77	4 - 8	2 week	50 - 100	200 - 400	100-400	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).
Spices	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 09 to BBCH 79	4 - 8	2 week	50 - 100	200 - 400	100-400	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).

Crop and/or situation (a)	F G or I (b)	Pests or group of pests controlled (c)	Formulation		Application of chitosan				Application rate of chitosan			PHI (days) (m)	Remarks*
			Type (d-f)	Conc of a.i. g/kg (i)	Method kind (f-h)	Growth stage & season (j)	No. of application min/max (k)	Interval between applications (min)	a.i./hl min max (g/hl)	Water l/ha min max	Total rate each application g a.i./ha min max (g/ha) (l)		
Crops for animal feed	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	Low- Medium volume spraying	BBCH 09 to BBCH 79	4 - 8	2 week	50 - 100	200 - 400	100-400	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).
Cereals Seed treatment	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	low volume spraying.	Before sowing (BBCH 00)	1	Not applicable	50 - 100	Not applicable	Not applicable	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).
Potatoes Seed treatment	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	low volume spraying/ dipping	Before sowing (BBCH 00)	1	Not applicable	50 - 100	Not applicable	Not applicable	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).

Crop and/ or situation (a)	F G or I (b)	Pests or group of pests controlled (c)	Formulation		Application of chitosan				Application rate of chitosan			PHI (days) (m)	Remarks*
			Type (d-f)	Conc of a.i. g/kg (i)	Method kind (f-h)	Growth stage & season (j)	No. of application min/max (k)	Interval between applications (min)	a.i./hl min max (g/hl)	Water l/ha min max	Total rate each application g a.i./ha min max (g/ha) (l)		
Sugar beet Seed treatment	FG	Plant elicitor, plant resistance against pathogenic fungi and bacteria	SP Soluble powder	≥ 85% chitosan	low volume spraying/ dipping	Before sowing (BBCH 00)	1	Not applicable	50 - 200	Not applicable	Not applicable	Not applicable	Chitosan can be prepared for use following any of the two recipes provided in Appendix I (preparation for use).

<p>* For uses where the column „Remarks. As above or other conditions to take into account</p> <p>(a) For crops, the EU and Codex classification (both) should be taken into account ; where relevant, the use situation should be described (e.g. fumigation of a structure)</p> <p>(b) Outdoor or field use (F), greenhouse application (G) or indoor application (I)</p> <p>(c) e.g. pests as biting and suckling insects, soil born insects, foliar fungi, weeds or plant elicitor</p> <p>(d) e.g. wettable powder (WP), emulsifiable concentrate (EC), granule (GR) etc..</p> <p>(e) GCPF Codes – GIFAP Technical Monograph N° 2, 1989</p> <p>(f) All abbreviations used must be explained</p> <p>(g) Method, e.g. high volume spraying, low volume spraying, spreading, dusting, drench</p>	<p>(h) Kind, e.g. overall, broadcast, aerial spraying, row, individual plant, between the plant – type of equipment used must be indicated</p> <p>(i) g/kg or g/L. Normally the rate should be given for the substance (according to ISO)</p> <p>(j) Growth stage at last treatment (BBCH Monograph, Growth Stages of Plants, 1997, Blackwell, ISBN 3-8263-3152-4), including where relevant, information on season at time of application</p> <p>(k) Indicate the minimum and maximum number of application possible under practical conditions of use</p> <p>(l) The values should be given in g or kg whatever gives the more manageable number (e.g. 200 kg/ha instead of 200 000 g/ha or 12.5 g/ha instead of 0.0125 kg/ha)</p> <p>(m) PHI - minimum pre-harvest interval</p>
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