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## Re-evaluation of metatartaric acid (E 353) as a food additive

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### Abstract

The Panel on Food Additives and Flavourings (FAF) provided a scientific opinion re-evaluating the safety of metatartaric acid (E 353) when used as a food additive. Metatartaric acid (E 353) had been previously evaluated by the Scientific Committee on Food (SCF) and Joint FAO/WHO Expert Committee on Food Additives (JECFA). Based on the presumption that metatartaric acid is fully hydrolysed pre-systemically to L(+)-tartaric acid, the Panel concluded that metatartaric acid (E 353) should be included in the group acceptable daily intake (ADI) of 240 mg/kg body weight (bw) per day, expressed as tartaric acid, for L(+)-tartaric acid-tartrates (E 334–337, 354) which was established by the EFSA FAF Panel in 2020. Exposure estimates were calculated for metatartaric acid (E 353) using a maximum level and refined exposure assessment scenario. The Panel also concluded that there is no safety concern for the use of metatartaric acid (E 353) at the reported use and use level. The Panel made a number of recommendations.

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## Summary

Following a request from the European Commission, the Panel on Food Additives and Flavourings (FAF) was asked to deliver a scientific opinion on the re-evaluation of metatartaric acid (E 353) when used as a food additive. Metatartaric acid (E 353) is authorised as a food additive in the European Union (EU) in accordance with Annex II to Regulation (EC) No 1333/2008 on food additives and specifications have been defined in the Commission Regulation (EU) No 231/2012. Metatartaric acid (E 353) is authorised to be used as a food additive (stabilising agent) in wine according to Regulation (EC) No 934/2019.

Metatartaric acid has been previously evaluated by the Scientific Committee on Food (SCF) in 1990. In that evaluation, the SCF did not establish an acceptable daily intake (ADI), but the continued use in wine up to 100 mg/L being accepted. In 2017, Joint FAO/WHO Expert Committee on Food Additives (JECFA) evaluated metatartaric acid (E 353) and concluded that it be included in the group ADI of 0–30 mg/kg body weight (bw) for L(+)-tartaric acid and its sodium, potassium and potassium–sodium salts, expressed as L(+)-tartaric acid.

The Panel noted that existing EU specifications for metatartaric acid (E 353) do not describe properly the food additive. The Panel considered that the chemical formula needs to be corrected, a proper definition and parameter for loss of drying, degree of esterification, a percentage of free tartaric acid, pyruvic acid and oxaloacetic acid, as well as information on optical rotation should be included in the EU specifications for E 353. In addition, the Panel considered that only L(+)-tartaric acid should be used in the manufacturing process of metatartaric acid (E 353).

The Panel noted that metatartaric acid is slowly hydrolysed to tartaric acid in wine and the hydrolysis rate depends on pH and temperature.

Based on information on distribution and activity of carboxylesterases in tissues, the Panel presumed that metatartaric acid is fully hydrolysed to tartaric acid by carboxylesterases in the lining epithelium of the gastrointestinal tract and the liver.

The toxicological database is limited to an acute toxicity study, a 18-week study in rats and a genotoxicity study. The acute toxicity of metatartaric acid is low. The Panel considered that given the marked reductions in water consumption in the 18-week study in rats, the data from this study could not be used for the safety assessment of metatartaric acid. In a bacterial reverse gene mutation assay, metatartaric acid was not mutagenic.

In response to the call for data, one use level was provided for metatartaric acid (E 353) by industry. No analytical data on the concentration of metatartaric acid (E 353) in foods were made available by the Member States. Exposure to metatartaric acid (E 353) was calculated based on (1) on maximum use level as set in Regulation (EC) No 934/2019 (defined as the *regulatory maximum level exposure assessment scenario*) and (2) one reported use level (defined as the *refined exposure assessment scenario*).

The exposure estimates to metatartaric acid (E 353) in the *regulatory maximum level exposure assessment scenario* were maximally 0.18 mg/kg bw per day at the mean and 0.59 mg/kg bw per day at the p95, both for the elderly. For the refined scenario, exposure estimates were maximally 0.01 mg/kg bw per day at the mean and up to 0.03 mg/kg bw per day at the p95, again for the elderly.

Based on the presumption that metatartaric acid is fully hydrolysed presystemically to L(+)-tartaric acid, the Panel concluded that metatartaric acid (E 353) should be included in the group ADI of 240 mg/kg bw per day, expressed as tartaric acid, for L(+)-tartaric acid-tartrates (E 334–337, 354), as previously established by the EFSA FAF Panel. The Panel also concluded that there is no safety concern for the use of metatartaric acid (E 353) at the reported use level. The Panel made a number of recommendations to the European Commission.

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## 1. Introduction

The present opinion document deals with the re-evaluation of metatartaric acid (E 353) when used as a food additive.

### 1.1. Background and Terms of Reference as provided by the European Commission

#### 1.1.1. Background

Regulation (EC) No 1333/2008<sup>1</sup> of the European Parliament and of the Council on food additives requires that food additives are subject to a safety evaluation by the European Food Safety Authority (EFSA) before they are permitted for use in the European Union. In addition, it is foreseen that food additives must be kept under continuous observation and must be re-evaluated by EFSA.

For this purpose, a programme for the re-evaluation of food additives that were already permitted in the European Union before 20 January 2009 has been set up under the Regulation (EU) No 257/2010.<sup>2</sup> This Regulation also foresees that food additives are re-evaluated whenever necessary in light of changing conditions of use and new scientific information. For efficiency and practical purposes, the re-evaluation should, as far as possible, be conducted by group of food additives according to the main functional class to which they belong.

The order of priorities for the re-evaluation of the currently approved food additives should be set on the basis of the following criteria: the time since the last evaluation of a food additive by the Scientific Committee on Food (SCF) or by EFSA, the availability of new scientific evidence, the extent of use of a food additive in food and the human exposure to the food additive taking also into account the outcome of the Report from the Commission on Dietary Food Additive Intake in the EU<sup>3</sup> of 2001. The report "Food additives in Europe 2000"<sup>4</sup> submitted by the Nordic Council of Ministers to the Commission, provides additional information for the prioritisation of additives for re-evaluation. As colours were among the first additives to be evaluated, these food additives should be re-evaluated with a highest priority.

In 2003, the Commission already requested EFSA to start a systematic re-evaluation of authorised food additives. However, as a result of adoption of Regulation (EU) 257/2010 the 2003 Terms of References are replaced by those below.

#### 1.1.2. Terms of Reference

The Commission asks the European Food Safety Authority to re-evaluate the safety of food additives already permitted in the Union before 2009 and to issue scientific opinions on these additives, taking especially into account the priorities, procedures and deadlines that are enshrined in the Regulation (EU) No 257/2010 of 25 March 2010 setting up a programme for the re-evaluation of approved food additives in accordance with the Regulation (EC) No 1333/2008 of the European Parliament and of the Council on food additives.

## 1.2. Information on existing authorisations and evaluations

Metatartaric acid (E 353) is authorised as a food additive in the EU in accordance with Annex II to Regulation (EC) No 1333/2008 on food additives and specific purity criteria have been defined in the Commission Regulation (EU) No 231/2012<sup>5</sup>.

Metatartaric acid, used as a food additive, has previously been evaluated by the SCF in 1990 (SCF, 1991). In that evaluation, the SCF did not establish an ADI but stated the following "the Committee could not establish an ADI on the basis of the available data. It considered acceptable, however, the continued use in wine at a level up to 100 mg/l".

<sup>1</sup> Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives. OJ L 354, 31.12.2008, p. 16–33.

<sup>2</sup> Commission Regulation (EU) No 257/2010 of 25 March 2010 setting up a programme for the re-evaluation of approved food additives in accordance with Regulation (EC) No 1333/2008 of the European Parliament and of the Council on food additives. OJ L 80, 26.3.2010, p. 19–27.

<sup>3</sup> COM(2001) 542 final.

<sup>4</sup> Food Additives in Europe 2000, Status of safety assessments of food additives presently permitted in the EU, Nordic Council of Ministers, TemaNord 2002, 560.

<sup>5</sup> Commission Regulation (EU) No 231/2012 of 9 March 2012 laying down specifications for food additives listed in Annexes II and III to Regulation (EC) no 1333/2008 of the European Parliament and of the Council. OJ L 83, 22.3.2012, p 1.

The Joint FAO/WHO Expert Committee on Food Additives (JECFA) (2017) considered that metatartaric acid undergoes enzymatic hydrolysis to tartaric acid prior to systemic absorption, and that the biochemical and toxicological data on tartaric acid were relevant to the safety assessment of the metatartaric acid (E 353). A bacterial reverse mutation test with metatartaric acid was available for the assessment. The Committee concluded that metatartaric acid (when used in winemaking) should be included in the group acceptable daily intake (ADI) of 0–30 mg/kg body weight (bw) for L(+)-tartaric acid and its sodium, potassium and potassium–sodium salts, expressed as L(+)-tartaric acid.

Metatartaric acid (E 353) was evaluated by a working group established by the Nordic Council of Ministers in 2000 (TemaNord, 2002). It was recommended to investigate to what extent metatartaric acid is actually being used and based on this information decide whether further data should be requested and an evaluation performed.

Tartaric acid (E 334) has recently been re-evaluated as a food additive by EFSA (EFSA FAF Panel, 2020) and the Panel established a group ADI for L(+)-tartaric acid and tartrates (E 334–337 and E 354) of 240 mg/kg bw per day, expressed as tartaric acid, applying the total uncertainty factor of 10 to the reference point of 3,100 mg sodium tartrate/kg bw per day, approximately to 2,440 mg tartaric acid/kg bw per day. This group ADI of 240 mg/kg bw per day, expressed as tartaric acid, does not apply to D(-)-, DL- or meso-tartrate.

Metatartaric acid (E 353) is authorised to be used as a food additive (stabilising agent) in wine according to Regulation (EC) No 934/2019.<sup>6</sup>

## 2. Data and methodologies

### Data

The FAF Panel was not provided with a newly submitted dossier. EFSA launched public calls for data<sup>7,8,9</sup> to collect information from interested parties.

The Panel based its assessment on information submitted to EFSA following the public calls for data, information from previous evaluations and additional available literature up to January 2020. Attempts were made at retrieving relevant original study reports on which previous evaluations or reviews were based, however these were not always available to the Panel.

Food consumption data used to estimate the dietary exposure to metatartaric acid (E 353) were derived from the EFSA Comprehensive European Food Consumption Database (Comprehensive Database<sup>10</sup>).

The Mintel's Global New Products Database (GNPD) was used to verify the use of metatartaric acid (E 353) in food and beverage products and food supplements within the EU's food market. The Mintel's GNPD is an online database that contains the compulsory ingredient information present on the label of numerous products.

### Methodologies

This opinion was formulated following the principles described in the EFSA Guidance on transparency with regards to scientific aspects of risk assessment (EFSA Scientific Committee, 2009) and following the relevant existing guidance documents from the EFSA Scientific Committee.

The FAF Panel assessed the safety of metatartaric acid (E 353) as a food additive in line with the principles laid down in Regulation (EU) 257/2010 and in the relevant guidance document: Guidance on submission for food additive evaluations by the SCF (2001).

When in animal studies, the test substance was administered in the feed or in drinking water, but doses were not explicitly reported by the authors as mg/kg bw per day based on actual feed or water consumption, the daily intake is calculated by the Panel using the relevant default values. In case of

<sup>6</sup> Commission Delegated Regulation (EU) 2019/934 of 12 March 2019 supplementing Regulation (EU) No 1308/2013 of the European Parliament and of the Council as regards wine-growing areas where the alcoholic strength may be increased, authorised oenological practices and restrictions applicable to the production and conservation of grapevine products, the minimum percentage of alcohol for by-products and their disposal, and publication of OIV files. OJ L 149, 7.6.2019, p. 1–52.

<sup>7</sup> Call for scientific data on miscellaneous food additives permitted in the EU and belonging to several functional classes. Published: 8 June 2010. Available from: <http://www.efsa.europa.eu/en/dataclosed/call/ans100609>

<sup>8</sup> Call for scientific data on L(+)-tartaric acid (E 334) and related food additives authorised in the EU. Published: 31 May 2016. Available from: <https://www.efsa.europa.eu/sites/default/files/consultation/160531.pdf>

<sup>9</sup> Call for food additives usage level and/or concentration data in food and beverages intended for human consumption (Batch 5). Available from: <https://www.efsa.europa.eu/sites/default/files/consultation/160524.pdf>

<sup>10</sup> Available online: <http://www.efsa.europa.eu/en/datexfoodcdb/datexfooddb.htm>

rodents the values as indicated in the EFSA Scientific Committee Guidance document (EFSA Scientific Committee, 2012) are applied. In the case of other animal species, the default values by JECFA (2000) are used. In these cases, the dose was expressed as 'equivalent to mg/kg bw per day'.

Dietary exposure to metatartaric acid (E 353) from its use as a food additive was estimated combining the food consumption data available within the Comprehensive Database with the maximum permitted levels and/or reported use levels submitted to EFSA following two calls for data. The exposure was estimated according to different exposure scenarios (see Section 3.4). Uncertainties in the exposure assessment were identified and discussed.

### 3. Assessment

#### 3.1. Technical data

##### 3.1.1. Identity of the substance

According to Commission Regulation (EU) No 231/2012, metatartaric acid (E 353) has as chemical formula  $C_4H_6O_6$  and its synonym is tartaric acid. The Panel noted that the molecular formula in the EU Regulation corresponds to that of L(+)-tartaric acid.

According to information provided by industry (CEEV, 2017 (Documentation provided to EFSA n. 1)), metatartaric acid (E 353) is a polyester of tartaric acid with a degree of intermolecular esterification around 40%. Metatartaric acid is a polydisperse polymer (i.e. a mixture of polymers with different molecular weights) with a molecular mass distribution between 2 and 9 kg/mol, what means that the product contains between 13 and 60 molecules of tartaric acid esterified. According to Sprenger et al. (2015), the molecular mass of the polymer is in the range of 1–10 kg/mol, which corresponds to 7.5–75 units of tartaric acid. The general molecular formula could be written as  $(C_4H_4O_5)_n$ .

Not all tartaric acid polymerises and a content of monomeric tartaric acid in the range of 9–18 g/100 g can be present (Sprenger et al., 2015). In a separate reaction, the tartaric acid is transformed, by elimination of water, to oxaloacetic acid (glyoxylic acid), that is quite unstable, and decarboxylates further to pyruvic acid. Pyruvic acid may also react with hydroxyl groups of tartaric or metatartaric acid (E 353), a reaction that will terminate polymerisation. Therefore, the main constituents of commercial metatartaric acid (E 353) are the polymer consisting of molecules up to 75 monomers chain-length, the free tartaric acid (9–18%, 13% as an average as described by Sprenger et al. (2015)), pyruvic acid (1–6%) and oxaloacetic acid (< 1%). It also contains around 20% water (CEEV, 2017 (Documentation provided to EFSA n. 1)).

The CAS number assigned to metatartaric acid is 39469-81-3 (SciFinder,<sup>11</sup> software online). No EC number is assigned for this CAS number (EC, inventory online<sup>12</sup>).

The Panel noted that the definition of the food additive metatartaric acid (E 353) is not well described in the Commission Regulation (EU) No 231/2012.

##### 3.1.2. Specifications

The specifications for metatartaric acid (E 353) as defined in Commission Regulation (EU) No 231/2012 and JECFA (2020) are listed in Table 1.

<sup>11</sup> SciFinder® the choice for chemistry researchTM.

<sup>12</sup> Available online: <https://echa.europa.eu/information-on-chemicals/ec-inventory>

**Table 1:** Specifications for metatartaric acid (E 353), according to Commission Regulation (EU) No 231/2012 and JECFA (2020)

	Commission Regulation (EU) No 231/2012	JECFA (2020)
<b>Definition</b>		Metatartaric acid is a polydisperse polymer of tartaric acid with a degree of esterification above 32%. It is manufactured by heating L-tartaric acid from natural sources at temperatures of 150–170°C under atmospheric or under a reduced pressure. The product contains ditartaric monoester and diester, other polyester acids of variable chain length, as well as free tartaric acid
Chemical name	Metatartaric acid	Metatartaric acid
Chemical formula	C <sub>4</sub> H <sub>6</sub> O <sub>6</sub>	(C <sub>4</sub> H <sub>4</sub> O <sub>5</sub> ) <sub>n</sub>
CAS Number		56959-20-7/39469-81-3
Assay	Not less than 99.5%	Not less than 105% as total tartaric acid
<b>Description</b>	Crystalline or powder form with a white or yellowish colour. Very deliquescent with a faint odour of caramel	Crystalline or powder form with an off-white colour. Very deliquescent with a faint odour of caramel
<b>Identification</b>		
Solubility	Very soluble in water and ethanol	Freely soluble in water and soluble in ethanol
Identification test	Place a sample of 1–10 mg of this substance in a test tube with 2 ml of concentrated sulfuric acid and 2 drops of sulfo-resorcinol reagent. When heated to 150°C, an intense violet coloration appears	Pass test for tartrate
pH		1.4–2.1 (1% solution)
Loss on drying		Not more than 5% at 105°C, 2 h
Free tartaric acid		Not more than 73%
Degree of esterification		Not less than 32%
Optical rotation		Between –34° and –41° (5% solution, 20°)
Molecular weight distribution and polydispersity index		Medium molecular weight range is 2–9 kDa Polydispersity index (Mz/Mn): not less than 10
<b>Purity</b>		
Arsenic	Not more than 3 mg/kg	Not more than 3 mg/kg
Lead	Not more than 2 mg/kg	Not more than 2 mg/kg
Mercury	Not more than 1 mg/kg	

The Panel noted that the chemical formula indicated in the EU specifications corresponds to tartaric acid rather than metatartaric acid (E 353).

The Panel noted that, according to the EU specifications for metatartaric acid (E 353), impurities of the toxic elements arsenic, lead and mercury are accepted up to concentrations of 3, 2 and 1 mg/kg, respectively. Contamination at those levels could have a significant impact on the exposure, which are already close to the health based guidance values or benchmark doses (lower confidence limits) established by EFSA (EFSA CONTAM Panel, 2009, 2010, 2012a,b, 2014).

According to information from industry (CEEV, 2017 (Documentation provided to EFSA n. 1)), preferably L(+)-tartaric acid is used as starting material for metatartaric acid (E 353). The Panel noted that the use of D(-)- or DL-tartaric acid is not excluded. The Panel noted that only L(+)-tartaric acid is authorised for the food additive E334. Given the adverse effects reported for DL-tartaric acid (EFSA FAF Panel, 2020), only L(+)-tartaric acid should be used in the manufacturing process of metatartaric acid (E 353).



The Panel noted that JECFA received information on optical rotation, infrared identification, free tartaric acid content, degree of esterification and molecular weight distribution, together with the analytical methods (JECFA, 2020). The Committee revised the specifications for free tartaric acid, optical rotation, molecular weight and molecular weight distribution and included a specification for polydispersity index. The status of the JECFA specifications for metatartaric acid as tentative was removed. The Panel considered that these parameters should also be included in the EU specifications for E 353.

The Panel noted that the description of the solubility in water in the EU specifications is different from the classification in the JECFA specifications.

The Panel noted that CAS 56959-20-7 indicated in the JECFA specifications corresponds to poly[oxy(1,2-dicarboxy-1,2-ethanediyl)] (SciFinder, software online).

### 3.1.3. Manufacturing process

According to information provided by Industry, the polymeric substance is obtained by dehydration of natural L(+)-tartaric acid at high temperature (> 150°C) under atmospheric or reduced pressure, resulting in an intermolecular esterification between the carboxylic group of one tartaric acid molecule and the secondary alcohol group of another molecule of tartaric acid. Chain growth is at random giving rise to undefined chemical formula and a polymer of high dispersity (Sprenger et al., 2015).

According to Ribéreau-Gayon et al. (2006), tartaric acid transforms to oxaloacetic acid, via elimination of water. The oxaloacetic acid is further decarboxylated to pyruvic acid.

The Panel noted that, according to the International Oenological Codex 'the primary constituents of the product are di-tartaric monoester and diester in variable proportions based on the combination of two molecules of tartaric acid with water loss, mixed with variable quantities of non-esterified tartaric acid, pyruvic acid and small quantities of poorly known polyester acids' (International-Oenological-Codex, 2016). The Panel considered that this definition is not consistent with the description provided by interested parties and JECFA.

Industry stated that preferably the L(+)-tartaric acid is used in production (CEEV, 2017 (Documentation provided to EFSA n. 1)); however according to the current EU specifications, D(-)- or DL-tartaric acid could be used. Chain growth is at random giving rise to undefined chemical formula and a polymer of high dispersity (Sprenger et al., 2015).

### 3.1.4. Methods of analysis in food

Cayotte et al. (2003) and Bouissou and Thomas (2011) described a method for the detection of metatartaric acid in grape juice. The method measures the 'Tartaric Instability Degree' (TID) by comparing the difference in conductivity of non-heated and heated grape juice. The aim of the heating treatment is to hydrolyse any metatartaric acid, which might be present in the juice.

OIV (International Organisation of Vine and Wine) described a method for the detection of metatartaric acid, based on the precipitation of metatartaric acid with cadmium acetate. The precipitate decomposes by heating in the presence of sodium hydroxide liberating tartaric acid. Tartaric acid is determined colorimetrically after reaction with ammonium metavanadate (OIV, 2007).

Chen et al. (2011, only abstract in English) used high-performance liquid chromatography (HPLC) to determine metatartaric acid in food (i.e. canned grape, soft drink) including wine.

Sprenger et al. (2015) described an HPLC method with mass spectrometry (MS) detection, to determine metatartaric acid in wines and grape juices. Anion-exchange cleaning was performed before chromatographic analysis.

### 3.1.5. Stability of the substance, and reaction and fate in food

According to information provided by industry (CEEV, 2019 (Documentation provided to EFSA n. 2)), commercial metatartaric acid is a highly hygroscopic powder. The food additive is added to wine as an aqueous solution. These solutions are unstable and hydrolyse. On hydrolysis, the esters split, liberate tartaric acid, and the acidity of the solution increases. After a 20 days storage at 18–20°C, the esterification number decreases considerably. Experimental data show that total hydrolysis of a 2% metatartaric acid solution occurs after three months at 23°C and after 10 months at 5°C (Peynaud and Guimberteau, 1961; Ribéreau-Gayon, 1977; Ribéreau-Gayon et al., 2006).

Morello (2012 (Documentation provided to EFSA n. 4)) showed the higher the pH of wine, the higher the instability of metatartaric acid.

Lasanta and Gomez (2012) described the use of metatartaric acid in wine and state that the main drawback of the use of the food additive is its low stability. The rate of hydrolysis depends on the pH and temperature and it may last from one week at 30°C to 2 years at 0°C. According to the authors, at common temperatures in cellars metatartaric acid may last from one year to 18 months.

### 3.2. Authorised uses and use levels

Maximum levels of metatartaric acid (E 353) have been defined in Annex II to Regulation (EC) No 1333/2008 on food additives, as amended. In this document, these levels are named maximum permitted levels (MPLs).

Currently, metatartaric acid (E 353) is an authorised food additive in two food categories at an MPL of 100 mg/kg as set by Annex II to Regulation (EC) No 1333/2008 (Table 2).

**Table 2:** MPLs of metatartaric acid (E 353) in foods according to Annex II to Regulation (EC) No 1333/2008

Food category number	Food category name	E-number/ Group	Restrictions/exception	MPL (mg/L or mg/kg as appropriate)
14.2.4	Fruit wine and made wine	E 353	Only made wine <sup>(a)</sup> and <i>wino z soku winogronowego</i> and <i>aromatyzowane wino z soku winogronowego</i>	100
14.2.8	Other alcoholic drinks including mixtures of alcoholic drinks with non-alcoholic drinks and spirits with less than 15% of alcohol	E 353	only <i>nalewka na winie z soku winogronowego</i> and <i>aromatyzowana nalewka na winie z soku winogronowego</i>	100

MPL: maximum permitted level.

(a): Made-wine means liquor which is of a strength exceeding 1.2% and which is obtained from the alcoholic fermentation of any substance or by mixing a liquor so obtained or derived from a liquor so obtained with any other liquor or substance but does not include wine, beer, black beer, spirits or cider. Made-wine, for example, will include products similar to wine but not made from fresh grape and some 'ready to drink' products (RTDs) that are made using fermented alcohol.<sup>13</sup>

Metatartaric acid (E 353) is not authorised according to Annex III to Regulation (EC) No 1333/2008 on food additives.

In addition to the authorised uses of metatartaric acid (E 353) as a food additive, according to Commission Regulation (EC) No 934/2019, metatartaric acid can be used in wine<sup>14</sup> as a food additive at a maximum use level of 100 mg/kg.<sup>15</sup>

### 3.3. Exposure data

#### 3.3.1. Reported use levels or data on analytical levels of metatartaric acid (E 353)

Most food additives in the EU are authorised at a specific MPL. However, a food additive may be used at a lower level than the MPL. Therefore, information on actual use levels is required for performing a more realistic exposure assessment.

In the framework of Regulation (EC) No 1333/2008 on food additives and of Commission Regulation (EU) No 257/2010 regarding the re-evaluation of approved food additives, EFSA issued a public call<sup>16</sup> for occurrence data (use levels and/or concentration data) on metatartaric acid (E 353). In response to this call, data were submitted to EFSA by industry. No analytical data on the concentration of metatartaric acid (E 353) in foods were made available by the Member States.

<sup>13</sup> From UK government services and information: <https://www.gov.uk/government/publications/excise-notice-163-wine-production/excise-notice-163-wine-production#trade-facility>

<sup>14</sup> i.e. for the following CATEGORIES OF GRAPEVINE PRODUCTS: wine, liqueur wine, sparkling wine, quality sparkling wine, quality aromatic sparkling wine, aerated sparkling wine, aerated semi-sparkling wine, wine from raisined grapes, wine of overripe grapes.

<sup>15</sup> <http://www.oiv.int/public/medias/5523/list-of-oiv-admitted-compounds.pdf>

<sup>16</sup> <https://www.efsa.europa.eu/en/data/call/160524>

## Summarised data on reported use levels in foods provided by industry

Industry (CEEV, 2017 (Documentation provided to EFSA n. 1)) provided one use level of metatartaric acid (E 353) in sparkling wines and vermouths. The level provided for both is of 10 mg/kg.

### 3.3.2. Summarised data extracted from the Mintel's Global New Products Database

The Mintel's GNPD is an online database which monitors new introductions of packaged goods in the market worldwide. It contains information of over 3 million food and beverage products of which more than 1,100,000 are or have been available on the European food market. Mintel started covering EU's food markets in 1996, currently having 25 out of its 28 member countries and Norway presented in the Mintel's GNPD.<sup>17</sup>

For the purpose of this Scientific Opinion, the Mintel's GNPD<sup>18</sup> was used for checking the labelling of food and beverages products and food supplements for metatartaric acid (E 353) within the EU's food market as the database contains the compulsory ingredient information on the label.

According to the Mintel's GNPD, metatartaric acid (E 353) was labelled on three products belonging to three food subcategories of Mintel's GNPD food classification: Fortified & other wines (n = 1), Flavoured alcoholic beverages (n = 1) and Baking ingredients & mixes (n = 1). The Panel noted that some of these uses are not authorised according to Regulation (EC) No 1333/2008. These products were published in this database between January 2015 and November 2016. No products were published between November 2016 and January 2020.

The Panel noted that the labelling of metatartaric acid (E 353) in beverages containing more than 1.2 % by volume of alcohol (e.g. wine) according to Commission Regulation (EC) No 1169/2011 is not mandatory.

Appendix A lists the percentage of the food products labelled with metatartaric acid (E 353) out of the total number of food products per food subcategory. The percentages were very low: 0.1–0.2%. The average percentage of foods labelled to contain metatartaric acid (E 353) belonging to the three food subcategories was 0.03%.

### 3.3.3. Food consumption data used for exposure assessment

#### EFSA Comprehensive European Food Consumption Database

Since 2010, the EFSA Comprehensive European Food Consumption Database (Comprehensive Database) has been populated with national data on food consumption at a detailed level. Competent authorities in the European countries provide EFSA with data on the level of food consumption by the individual consumer from the most recent national dietary survey in their country (cf. Guidance of EFSA on the 'Use of the EFSA Comprehensive European Food Consumption Database in Exposure Assessment' (EFSA, 2011a). Consumption surveys added in the Comprehensive database in 2015 were also taken into account in this assessment.<sup>10</sup>

The food consumption data gathered by EFSA were collected by different methodologies and thus direct country-to-country comparisons may not be appropriate. Depending on the food category and the level of detail used for exposure calculations, uncertainties could be introduced owing to possible subjects' underreporting and/or misreporting of the consumption amounts. Nevertheless, the Comprehensive Database includes the currently best available food consumption data across Europe.

Food consumption data of infants, toddlers, children, adolescents, adults and the elderly were used in the exposure assessment. For the present assessment, food consumption data were available from 33 dietary surveys carried out in 19 European countries (Table 3).

<sup>17</sup> Missing Cyprus, Luxembourg and Malta.

<sup>18</sup> <http://www.gnprd.com/sinatra/home/> accessed on 17/6/2019.

**Table 3:** Population groups considered for the exposure estimates of metatartaric acid (E 353)

Population	Age range	Countries with food consumption surveys covering more than 1 day
Infants	From more than 12 weeks up to and including 11 months of age	Bulgaria, Denmark, Finland, Germany, Italy, UK
Toddlers <sup>(a)</sup>	From 12 months up to and including 35 months of age	Belgium, Bulgaria, Denmark, Finland, Germany, Italy, Netherlands, Spain, UK
Children <sup>(b)</sup>	From 36 months up to and including 9 years of age	Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Latvia, Netherlands, Spain, Sweden, UK
Adolescents	From 10 years up to and including 17 years of age	Austria, Belgium, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Italy, Latvia, Netherlands, Spain, Sweden, UK
Adults	From 18 years up to and including 64 years of age	Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Netherlands, Romania, Spain, Sweden, UK
The elderly <sup>(b)</sup>	From 65 years of age and older	Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Romania, Netherlands, Sweden, UK

(a): The term 'toddlers' in the Comprehensive Database (EFSA, 2011a) corresponds to 'young children' in Regulations (EC) No 1333/2008 and (EU) No 609/2013.

(b): The terms 'children' and 'the elderly' correspond, respectively, to 'other children' and the merge of 'elderly' and 'very elderly' in the Comprehensive Database (EFSA, 2011a).

Consumption records were codified according to the FoodEx classification system (EFSA, 2011b). Nomenclature from the FoodEx classification system has been linked to the food categorisation system (FCS) as presented in Annex II of Regulation (EC) No 1333/2008, part D, to perform exposure assessments. In practice, the FoodEx food codes were matched to the FCS food categories.

### Food categories considered for the exposure assessment of metatartaric acid (E 353)

The food categories in which the use of metatartaric acid (E 353) is authorised were selected from the nomenclature of the Comprehensive Database (FoodEx classification system), at the most detailed level possible (up to FoodEx Level 4) (EFSA, 2011b).

Made wine and *wino z soku winogronowego and aromatyzowane wino z soku winogronowego*, from the FC 14.2.4, are not referenced in the Comprehensive Database and could therefore not be taken into account in the present estimate. This may have resulted in an underestimation of the exposure.

For FC 14.2.8 Other alcoholic drinks including mixtures of alcoholic drinks with non-alcoholic drinks and spirits with less than 15% of alcohol, the restrictions which apply to the use of metatartaric acid (E 353) could not be taken into account. Considering that the restriction is really narrow, taking into account the whole food category would result in a very high overestimation. This authorisation was not considered in the current assessment. This may have resulted in an underestimation of the exposure for some countries.

Out of the categories of grapevine products which can contain metatartaric acid (E 353) according to Regulation (EC) No 934/2019, wine (white and red), sparkling wine (white and red) and liqueur wine (vermouth and sherry) were taken into account in the regulatory maximum level exposure assessment scenario while only sparkling wines (white and red) and vermouths were considered in the refined exposure assessment scenario.

## 3.4. Exposure estimate

### 3.4.1. Exposure to metatartaric acid (E 353) from its use as a food additive

The Panel estimated the chronic dietary exposure to metatartaric acid (E 353) for the following population groups: infants, toddlers, children, adolescents, adults and the elderly. Dietary exposure to metatartaric acid (E 353) was calculated by multiplying concentrations of metatartaric acid (E 353) per food category (Appendix B) with their respective consumption amount per kilogram body weight for each individual in the Comprehensive Database. The exposure per food category was subsequently added to derive an individual total exposure per day. These exposure estimates were averaged over

the number of survey days, resulting in an individual average exposure per day for the survey period. Dietary surveys with only 1 day per subject were excluded as they are considered as not adequate to assess repeated exposure.

This was carried out for all individuals per survey and per population group, resulting in distributions of individual exposure per survey and population group (Table 3). Based on these distributions, the mean and 95th percentiles of exposure were calculated per survey and per population group. The 95th percentile of exposure was only calculated for those population groups with a sufficiently large sample size (EFSA, 2011a). Therefore, in the present assessment, the 95th percentile of exposure for infants from Italy and for toddlers from Belgium, Italy and Spain was not estimated.

Exposure assessment to metatartaric acid (E 353) was carried out by the FAF Panel based on (1) maximum use level as set in Regulation (EC) No 934/2019 (defined as the *regulatory maximum level exposure assessment scenario*); and (2) one reported use level (defined as the *refined exposure assessment scenario*). These two scenarios are discussed in detail below.

### Regulatory maximum level exposure assessment scenario

The regulatory maximum level exposure assessment scenario is based on maximum use level as set in Regulation (EC) No 934/2019.

The Panel considers the exposure estimates derived following this scenario as the most conservative since it is assumed that the population will be exposed to the food additive present in food at the MPL over a longer period of time.

### Refined exposure assessment scenario

This exposure scenario considers those food categories for which concentration data were provided to the Panel. As only one use level for metatartaric acid (E 353) for sparkling wines and vermouths was reported by food industry, just one refined exposure estimate was calculated.

### Dietary exposure to metatartaric acid (E 353)

Table 4 summarises the estimated exposure to metatartaric acid (E 353) from its use as a food additive in six population groups (Table 3). Detailed results per population group and survey are presented in Appendix C.

**Table 4:** Summary of dietary exposure to metatartaric acid (E 353) from its use as food additive in the *regulatory maximum level exposure assessment scenario* in six population groups (minimum–maximum across the dietary surveys in mg/kg bw per day)

	Infants (12 weeks– 11 months)	Toddlers (12–35 months)	Children (3–9 years)	Adolescents (10–17 years)	Adults (18–64 years)	The elderly (≥ 65 years)
<b>Regulatory maximum level exposure assessment scenario</b>						
• Mean	< 0.01	< 0.01	0–0.01	0–0.01	0.01–0.12	0.02–0.18
• 95th percentile	0	< 0.01	0–0.04	0–0.04	0–0.48	0.13–0.59
<b>Refined estimated exposure assessment scenario</b>						
• Mean	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0–0.01
• 95th percentile	0	0	0	< 0.01	0–0.02	0–0.03

bw: body weight.

In the *regulatory maximum level exposure assessment scenario*, mean exposure to metatartaric acid (E 353) from its use as a food additive equals zero for infants and toddlers and was maximally 0.18 mg/kg bw per day for the elderly. The 95th percentile of exposure to metatartaric acid (E 353) was zero in infants and maximally 0.59 mg/kg bw per day in the elderly.

In the *refined estimated exposure assessment scenario*, mean exposure to metatartaric acid (E 353) from its use as a food additive equals zero for infants and toddlers and was maximally 0.01 mg/kg bw per day for the elderly. The 95th percentile of exposure to metatartaric acid (E 353) was zero in infants, toddlers and children and maximally 0.03 mg/kg bw per day in the elderly.

The Panel noted that the authorised uses of metatartaric acid (E 353) as a food additive are limited to alcoholic beverages. Therefore, the Panel considered relevant only dietary exposure in adults and in

the elderly. The Panel acknowledged that data from the younger age groups (i.e. infants, toddlers, children and adolescents) showed some levels of intake from alcoholic consumption. Consumption of alcoholic beverages is not appropriate for these age groups, and these exposure estimates, which are very low, are most likely a result of the indirect consumption of alcoholic beverages as recipe ingredients of composite foods. Therefore, the Panel considered that these were not relevant for the current risk assessment.

### Uncertainty analysis

Potential sources of uncertainty in the exposure assessment of metatartaric acid (E 353) have been discussed above. In accordance with the guidance provided in the EFSA opinion related to uncertainties in dietary exposure assessment (EFSA, 2007), the following sources of uncertainties have been considered and summarised in Table 5.

**Table 5:** Qualitative evaluation of influence of uncertainties on the dietary exposure estimate

Sources of uncertainties	Direction <sup>(a)</sup>
Consumption data: different methodologies/representativeness/underreporting/misreporting/no portion size standard	+/-
Methodology used to estimate high percentiles (95th) long-term (chronic) exposure based on data from food consumption surveys covering only a few days	+
Food categories selected for the exposure assessment: exclusion of food categories due to missing FoodEx linkage (n = 2/2)	-
Regulatory maximum level exposure assessment scenario: – exposure calculations based on maximum level according to Regulation (EC) No 934/2019	+
Refined exposure assessment scenario: – exposure calculations based on the reported use level	+/-

(a): +, uncertainty with potential to cause overestimation of exposure; -, uncertainty with potential to cause underestimation of exposure.

Overall, the Panel considered that the uncertainties identified resulted in an overestimation of the exposure to metatartaric acid (E 353) as a food additive in European countries considered in the Comprehensive Database for the *regulatory maximum level exposure scenario*. Assuming that metatartaric acid (E 353) is used in sparkling wines and vermouths at the reported use level of 10 mg/kg and considering the low percentage of these products labelled with metatartaric acid (E 353) according to Mintel, the Panel considered that the uncertainties will also have resulted in an overestimation of the exposure in the refined scenario.

## 3.5. Biological and Toxicological data

### 3.5.1. Absorption, distribution, metabolism and excretion

No data on hydrolysis of metatartaric acid in the gastrointestinal tract was reported.

JECFA considered that metatartaric acid is anticipated to undergo rapid enzyme-mediated hydrolysis to L(+)-tartaric acid once exposed to carboxylesterases in the gastrointestinal tract (JECFA, 2017).

Based on information on distribution and activity of carboxylesterases in tissues (Laizure et al., 2013), the Panel presumed that metatartaric acid is fully hydrolysed to tartaric acid by carboxylesterases in the lining epithelium of the gastrointestinal tract and the liver.

### 3.5.2. Acute toxicity

According to the SCF working paper on metatartaric acid from 1982 (SCF, 1982), 'no appreciable effect, or ultimately, loss in weight, was shown in a Wistar rat given two doses of 400 mg metatartaric acid within a minute'.

The Panel considered that the acute toxicity of metatartaric acid is low.

### 3.5.3. Short-term and subchronic toxicity

In a 18-week oral toxicity study, Wistar rats (15 animals/sex per group) were given *ad libitum* drinking water containing 0, 0.1%, 0.5% or 3% metatartaric acid (equal to 0, 80, 330 and 1,810 g/kg bw/day, for the male rats and 0, 130, 520 and 2,520 mg/kg bw per day for the female rats) (Ingram

et al., 1982). Additionally, other groups of rats (5 animals/sex per group) were treated similarly 0, 0.5% or 3% metatartaric acid for either 2 or 6 weeks. The metatartaric acid used in the study complied with the EU specifications as a food additive, as defined in Commission Regulation (EU) No 231/2012, except from the degree of esterification which was of 27–35%. A urinary concentration and dilution test was performed after 2 weeks by measuring the specific gravity and volume of urine voided during a 6-hour period of water deprivation and in a 2-hour period following a water load of 25 mL/kg bw. In addition, at weeks 6 and 18 the same measurements were made on the urine collected during a 4-hours period starting after water deprivation for 16 hours.

Compared to the controls, significant reduction in mean water intake (27.6, 22.5, 17.8 and 15.00 mL/rat/day for male and 28.1, 23.4, 18.1 and 14.1 mL/rat/day for female for doses of 0, 0.1%, 0.5% or 3%, respectively) was observed in treated rats over the 18 week. Mean feed consumption was also reduced significantly over the 18 weeks in both sexes, the middle-dose and high-dose groups being statistically significant ( $p < 0.05$  and  $p < 0.01$  for females and males, respectively). A statistically significant reduction in body weight gain was only observed in high-dose males ( $p < 0.001$ ) compared to the controls. Relative to the controls, rats of both sexes at all dose groups treated for 2, 6 or 18 weeks excreted less urine of higher specific gravity, when deprived of water for 6 hours (concentration test) or during the 2-hours period following a water load (dilution test). On the other hand, at week 18 only male rats in the middle and high-dose groups excreted urine of lower specific gravity and in larger volumes than control animals in the 16–20 hours after the water load. Some statistically significant relative organ weight changes were reported (brain, heart, spleen, kidneys, stomach, caecum and gonads) in high-dose male and female rats at 6 or 18 weeks, but without concomitant histopathological changes, except for polymorphonuclear infiltration of the submucosal layer of the stomach observed in three high-dose males out of 15, after 18 weeks. The haematology examinations did not show any treatment-related adverse effects.

The authors of the study concluded that the 'no-untoward-effect level' was 0.1% metatartaric acid in the drinking water, equal to mean intakes of 80 and 130 mg/kg bw/day for male and female rats, respectively.

The Panel noted that a dose related significant reduction in mean water intake was observed in treated rats over the 18 weeks. The Panel considered that the observed effects (reduced feed consumption, reduced body weight, urine with increased specific gravity, changes in organs weight) were directly attributable to the decrease in water consumption probably due to the unpalatability of metatartaric acid in drinking water. Given the marked reductions in water consumption, the Panel considered that the data from this study could not be used for the safety assessment of metatartaric acid.

### 3.5.4. Genotoxicity

In order to assess the mutagenicity of the metatartaric acid, a bacterial reverse mutation assay was conducted (LAUS GmbH, 2016 (Documentation provided to EFSA n. 3)). The test was performed according to OECD Test Guideline 471 (OECD, 1997) and following Good Laboratory Practice (GLP) in five strains of *Salmonella* Typhimurium (TA97a, TA98, TA100, TA102 and TA1535) both in the presence and absence of metabolic activation of S9-mix (rat liver S9-mix induced by Aroclor 1254). Two experiments were conducted using the plate incorporation and the pre-incubation methods for experiment 1 and 2 respectively. The metatartaric acid (E 353) was tested in experiment 1 at five concentrations (ranging from 50 to 5,000  $\mu\text{g}/\text{plate}$ ), and in experiment 2 at six concentrations (ranging from 156 to 5,000  $\mu\text{g}/\text{plate}$ ) with and without S9-mix. All test and control substances were evaluated in triplicate plates. No precipitation was observed at any concentration of the substance in any tester strain with or without S9-mix. Toxicity of the 5,000  $\mu\text{g}/\text{plate}$  concentration was tested, and the testing substance did not cause toxicity in any of the bacterial strains. No increase in the mean number of revertant colonies was observed in any bacteria strains in both experiments with or without S9-mix. Metatartaric acid did not induce mutagenic activity in this bacterial gene mutation assay in the absence and presence of metabolic activation.

The Panel noted that no data on the two other relevant genetic endpoints (structural and numerical aberration) were available.

The QSAR toolbox profiling was not considered applicable to this polymer. However, the monomer ( $\text{L}(+)\text{-tartaric acid}$ ) was assessed in its re-evaluation as a food additive and there was no concern with respect to genotoxicity (EFSA FAF Panel, 2020).

### 3.5.5. Chronic toxicity and carcinogenicity

No data were available to the Panel.

### 3.5.6. Reproductive and developmental toxicity

No data were available to the Panel.

## 3.6. Discussion

The Panel noted that existing EU specifications for metatartaric acid (E 353) do not describe properly the food additive. The Panel considered that the chemical formula needs to be corrected, a proper definition and parameter for loss of drying, degree of esterification, a percentage of free tartaric acid, pyruvic acid and oxaloacetic acid, as well as information on optical rotation should be included in the EU specifications for E 353.

Commission Regulation 231/2012 does not stipulate which isomer of tartaric acid should be used for the manufacturing process of metatartaric acid (E 353) and, therefore, currently any isomer of tartaric acid can be used. The Panel considered that only L(+)-tartaric acid should be used in the manufacturing process of metatartaric acid (E 353).

The Panel noted that metatartaric acid is slowly hydrolysed to tartaric acid in wine and the hydrolysis rate depends on pH and temperature.

Based on information on distribution and activity of carboxylesterases in tissues (Laizure et al., 2013), the Panel presumed that metatartaric acid is fully hydrolysed to tartaric acid by carboxylesterases in the lining epithelium of the gastrointestinal tract and the liver.

The Panel noted that the toxicological database is limited to an acute toxicity study, an 18-week study in rats and a genotoxicity study. The acute toxicity of metatartaric acid is low. The Panel considered that given the marked reductions in water consumption in the 18-week study in rats, the data from this study could not be used for the safety assessment of metatartaric acid.

In a bacterial reverse gene mutation assay, metatartaric acid was not mutagenic. The Panel noted that no data on the two other relevant genetic endpoints (structural and numerical aberration) were available. The QSAR toolbox profiling was not considered applicable to this polymer, however, the genotoxicity of the monomer (L(+)-tartaric acid) was assessed in its re-evaluation as a food additive and there was no concern with respect to genotoxicity (EFSA FAF Panel, 2020).

Based on the presumption that metatartaric acid is fully hydrolysed presystemically to L(+)-tartaric acid, the Panel considered that it should be included in the group ADI of 240 mg/kg bw per day, expressed as tartaric acid, for L(+)-tartaric acid-tartrates (E 334–337, 354) which was established by the Panel (EFSA FAF Panel, 2020).

To assess the dietary exposure to metatartaric acid (E 353) from its use as a food additive, the exposure was calculated based on (1) on maximum use level as set in Regulation (EC) No 934/2019 (defined as the *regulatory maximum level exposure assessment scenario*) and (2) one reported use level (defined as the *refined exposure assessment scenario*).

The exposure estimates to metatartaric acid (E 353) in the *regulatory maximum level exposure assessment scenario* were maximally 0.18 mg/kg bw per day at the mean and 0.59 mg/kg bw per day at the p95, both for the elderly. For the refined scenario, exposure estimates were maximally 0.01 mg/kg bw per day at the mean and up to 0.03 mg/kg bw per day at the p95, again for the elderly. The refined scenario estimates were based on only one reported use level for sparkling wines and vermouths, considering only the use of metatartaric acid (E 353) according to Regulation (EC) No 934/2019. Assuming that metatartaric acid (E 353) is always used in sparkling wines and vermouths at the reported use level of 10 mg/kg, the Panel considered that the uncertainties (Section 3.4.1) will result in an overestimation of the exposure in the refined scenario.

Considering that metatartaric acid is expected to be fully hydrolysed and tartaric acid will be released, the exposure to tartaric acid from the use of metatartaric acid (E 353) and other food additives from which tartaric acid is released is addressed in the Scientific Opinion on the re-evaluation of tartaric acid-tartrates (E 334–337, 354) (EFSA FAF Panel, 2020).

Information retrieved from the Mintel's GNPD indicated that the use of metatartaric acid (E 353) according to Annex II to Regulation (EC) No 1333/2008 is very limited. However, this information does not include its use in wine according to Commission Regulation (EC) No 934/2019, since the labelling is not mandatory (Commission Regulation (EC) No 1169/2011) while it is mandatory for its use in FC 14.2.4 and 14.2.8 according to Annex II to Regulation (EC) No 1333/2008).



The Panel also noted that the refined exposure estimates are based on information provided on the reported level of use of metatartaric acid (E 353). If actual practice changes, these refined estimates may no longer be representative and should be updated.

#### 4. Conclusions

The Panel concluded that metatartaric acid (E 353) be included in the group ADI of 240 mg/kg bw per day, expressed as tartaric acid, for L(+)-tartaric acid-tartrates (E 334–337, 354) which was established by the Panel (EFSA FAF Panel, 2020).

The Panel also concluded that there is no safety concern for the use of metatartaric acid (E 353) at the reported use and use level.

#### 5. Recommendations

The Panel recommended that the European Commission considers:

- revising the definition of the food additive metatartaric acid (E 353).
- revising the EU specifications for metatartaric acid (E 353) by specifying that only L(+)-tartaric acid can be used in the manufacturing process.
- revising the EU specifications for metatartaric acid (E 353) to include parameters (e.g. free tartaric acid, optical rotation, molecular weight and molecular weight distribution and included a specification for polydispersity index) as in the JECFA specifications (2020) as well as maximum limits for pyruvic acid and oxaloacetic acid.
- setting lower maximum limits for toxic elements (arsenic, cadmium, lead and mercury) in the EU specifications for metatartaric acid (E 353) in order to ensure that their use as a food additive will not be a significant source of exposure to these toxic elements in food.
- revising the description of the solubility in water in the EU specifications.

#### Documentation provided to EFSA

- 1) Comité Européen des Entreprises Vins (CEEV), 2017. As a response to the call for scientific data on L(+)-tartaric acid (E334) and related food additives authorised in the EU in 2016. Submitted by CEEV, January 2017.
- 2) Comité Européen des Entreprises Vins (CEEV), 2019. Additional data. Submitted by CEEV, December 2019.
- 3) LAUS GmbH, 2016. Determination of the mutagenic potential of META with the Bacterial Reverse Mutation Test following OECD 471 and EU B.13/14. Study No. 16011904G803. Submitted by CEEV, January 2017.
- 4) Morello A, 2012. Influence of pH and Temperature on metatartaric acid efficiency in white wine tartaric stabilization. Thesis, Instituto Superior de Agronomia. Universidade Técnica de Lisboa. Submitted by CEEV, December 2019.
- 5) Pre-evaluation document. DTU (National Food Institute) finalised on 3 July 2013. Deliverable of procurement contract EFSA-Q-2010-00717.

#### References

- Bouissou D and Thomas F, 2011. Intra- and interlaboratory validation of the conductimetric method for detecting the addition of metatartaric acid in grape juice. *Fruit Processing*, 21, 138–144.
- Cayotte D, Batlle J-L, Saint-Pierre B and Roset M, 2003. Detection of the addition of metatartaric acid in grape juice. *Fruit Processing*, 13, 338–344.
- Chen J, Yang F, Huang X, Lin J and Lin Z, 2011. Determination of metatartaric acid in food by high performance liquid chromatography. *Zhongguo Shipin Tianji*, 2, 239–242.
- EFSA (European Food Safety Authority), 2007. Scientific opinion of the Scientific Committee related to uncertainties in dietary exposure assessment. *EFSA Journal* 2007;5(1):438, 54 pp. <https://doi.org/10.2903/j.efsa.2007.438>
- EFSA (European Food Safety Authority), 2011a. Use of the EFSA Comprehensive European Food Consumption Database in Exposure Assessment. *EFSA Journal* 2011;9(3):2097, 34 pp. <https://doi.org/10.2903/j.efsa.2011.2097>
- EFSA (European Food Safety Authority), 2011b. Evaluation of the FoodEx, the food classification system applied to the development of the EFSA Comprehensive European Food Consumption Database. *EFSA Journal* 2011;9(3):1970, 27 pp. <https://doi.org/10.2903/j.efsa.2011.1970>

- EFSA CONTAM Panel (EFSA Panel on Contaminants in the Food Chain), 2009. Scientific Opinion on arsenic in food. EFSA Journal 2009;7(10):1351, 199 pp. <https://doi.org/10.2903/j.efsa.2009.1351>
- EFSA CONTAM Panel (EFSA Panel on Contaminants in the Food Chain), 2010. Scientific Opinion on lead in food. EFSA Journal 2010;8(4):1570, 151 pp. <https://doi.org/10.2903/j.efsa.2010.1570>
- EFSA CONTAM Panel (EFSA Panel on Contaminants in the Food Chain), 2012a. Scientific Opinion on the risk for public health related to the presence of mercury and methylmercury in food. EFSA Journal 2012;10(12):2985, 241 pp. <https://doi.org/10.2903/j.efsa.2012.2985>
- EFSA CONTAM Panel (EFSA Panel on Contaminants in the Food Chain), 2012b. Scientific Opinion on lead dietary exposure in the European population. EFSA Journal 2012;10(7):2831, 59 pp. <https://doi.org/10.2903/j.efsa.2012.2831>
- EFSA CONTAM Panel (EFSA Panel on Contaminants in the Food Chain), 2014. Scientific Opinion on dietary exposure to inorganic arsenic in the European population. EFSA Journal 2014;12(3):3597, 68 pp. <https://doi.org/10.2903/j.efsa.2014.3597>
- EFSA FAF Panel (EFSA Panel on Food Additives and Flavourings), Younes M, Aquilina G, Castle L, Engel K-H, Fowler P, Frutos Fernandez MJ, Fürst P, Gürtler R, Gundert-Remy U, Husøy T, Mennes W, Shah R, Waalkens-Berendsen I, Wölfle D, Boon P, Tobback P, Wright M, Aguilera J, Rincon AM, Tard A and Moldeus P, 2020. Scientific Opinion on the re-evaluation of L(+)-tartaric acid (E 334), sodium tartrates (E 335), potassium tartrates (E 336), potassium sodium tartrate (E 337) and calcium tartrate (E 354) as food additives. EFSA Journal 2020;18(3):6030, 58 pp. <https://doi.org/10.2903/j.efsa.2020.6030>
- EFSA Scientific Committee, 2009. Guidance of the Scientific Committee on Transparency in the Scientific Aspects of Risk Assessments carried out by EFSA. Part 2: General Principles. EFSA Journal 2009;7(7):1051, 22 pp. <https://doi.org/10.2903/j.efsa.2009.1051>
- EFSA Scientific Committee, 2012. Guidance on selected default values to be used by the EFSA Scientific Committee, Scientific Panels and Units in the absence of actual measured data. EFSA Journal 2012;10(3):2579, 32 pp. <https://doi.org/10.2903/j.efsa.2012.2579>
- Ingram AJ, Butterworth KR, Gaunt IF and Gangolli SD, 1982. Short-term toxicity study of metatartaric acid in rats. Food and Chemical Toxicology, 20, 253–257.
- International-Oenological-Codex, 2016. Metatartaric Acid E-COEI-1-METACI. Available online: <http://www.oiv.int/public/medias/3318/codex-2016-en.pdf>
- JECFA (Joint FAO/WHO Expert Committee on Food Additives), 2000. Guidelines for the preparation of toxicological working papers for the Joint FAO/WHO Expert Committee on Food Additives. Geneva, Switzerland.
- JECFA (Joint FAO/WHO Expert Committee on Food Additives), 2017. Evaluation of certain food additives: Eighty-fourth report of the Joint FAO/WHO Expert Committee on Food Additives. Geneva, Switzerland.
- JECFA (Joint FAO/WHO Expert Committee on Food Additives), 2020. FAO and WHO. Compendium of Food Additive Specifications. Joint FAO/WHO Expert Committee on Food Additives (JECFA), 87th meeting June 2019. FAO JECFA Monographs no 23. Rome.
- Laizure SC, Herring V, Hu Z, Witbrodt K and Parker RB, 2013. The role of human carboxylesterases in drug metabolism: have we overlooked their importance? Pharmacotherapy, 33(2), 210–222.
- Lasanta C and Gomez J, 2012. Tartrate stabilization of wines. Trends in Food Science & Technology, 28, 52–59.
- OECD (Organisation for Economic Co-operation and Development), 1997. Test No. 471: Bacterial Reverse Mutation Test, OECD Guidelines for the Testing of Chemicals, Section 4, OECD Publishing, Paris, <https://doi.org/10.1787/9789264071247-en>
- OIV (The International Organisation of Vine and Wine), 2007. Determination of the presence of metatartaric acid. Resolution OENO, 10(2007), 1–3.
- Peynaud E and Guimberteau G, 1961. Recherches sur la constitution et l'efficacité anticristallinante de l'acide metatartrique. Bulletin de L'Association des Chimistes Agriculture et Industrie, 2, 130–135.
- Ribéreau-Gayon J, 1977. Traité d'œnologie. Sciences et techniques du vin, Dunod, Paris.
- Ribéreau-Gayon P, Glories Y, Maujean A and Dubourdiou D, 2006. Handbook of Enology, (2nd ed.). Chichester: John Wiley & Sons
- SCF (Scientific Committee for Food), 1982. Commission of the European Communities. Directorate-General for internal market and industrial affairs. Data Sheets Acids, Bases, Salts. III/1924/82
- SCF (Scientific Committee for Food), 1991. Reports of the Scientific Committee for Food, Twenty-fifth series.
- SCF (Scientific Committee for Food), 2001. Guidance on submissions for food additive evaluations by the Scientific Committee on Food. SCF/CS/ADD/GEN/26 Final. 12 July 2001.
- Sprenger S, Hirn S, Dietrich H and Frank W, 2015. Metatartaric acid: physicochemical characterisation and analytical detection in wines and grapes juices. European Food Research and Technology, 241, 785–791.
- TemaNord (Nordic Council of Ministers), 2002. Metatartaric acid (E 353). Food Additives in Europe 2000 - Status of safety assessments of food additives presently permitted in the EU, 349–350.

## Abbreviations

ADI	acceptable daily intake
bw	body weight

CAS	Chemical Abstract Service
CEEV	Comité Européen des Entreprises Vins
DTU	Technical University of Denmark
FAF	EFS Panel on Food Additives and Flavourings
GLP	Good Laboratory Practice
GNPD	Global New Products Database
HPLC	high-performance liquid chromatography
INS	International Numbering System
JECFA	Joint FAO/WHO Expert Committee on Food Additives
MPL	maximum permitted level
MS	mass spectrometry
OECD	Organisation for Economic Co-operation and Development
OIV	International Organisation of Vine and Wine
PCV	packed cell volume
QSAR	quantitative structure–activity relationship
RBC	red blood cells
SCF	Scientific Committee on Food
TID	Tartaric Instability Degree

**Appendix A – Number and percentage of food products labelled with metatartaric acid (E 353) out of the total number of food products present in the Mintel’s GNPD per food subcategory between 2015 and 2020**

**Appendix B – Concentration levels of metatartaric acid (E 353) used in the exposure assessment scenarios (mg/kg or mL/kg as appropriate)**

**Appendix C – Summary of total estimated exposure of metatartaric acid (E 353) from its use as a food additive for the regulatory maximum level exposure assessment scenario and the refined exposure assessment scenario, per population group and survey: mean and 95th percentile (mg/kg bw per day)**

Appendix A–C can be found in the online version of this output (‘Supporting information’ section): <https://doi.org/10.2903/j.efsa.2020.6031>