Food and Agriculture Organization
of the United Nations

84th JECFA - Chemical and Technical Assessment (CTA), 2017

METATARTARIC ACID

Chemical and Technical Assessment (CTA)

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1. Summary

This Chemical and Technical Assessment (CTA) summarises data and information on metatartaric acid (MTA) submitted to the 84th meeting of the Joint FAO/WHO Expert Committee on Food Additives (JECFA) upon request by the 48th Codex Committee on Food Additives (CCFA, 2016). At the present meeting, JECFA was asked to evaluate all data necessary for the assessment of safety, dietary intake and specifications related to the use of MTA as a stabilizer in wine, to prevent growth and precipitation of potassium bitartrate and calcium tartrate crystals. Metatartaric acid is approved for use in red and white wines in the European Union, Argentina, Australia, Brazil, Chile, New Zealand, Norway, Paraguay, Uruguay, Russia, South Africa, and Turkey. This document discusses published information relevant to metatartaric acid, the production methodology, and the specifications.

JECFA at the 84th meeting prepared new tentative specifications for metatartaric acid.

2. Description

Metatartaric acid (CAS No. 56959-20-7/ 39469-81-3) is a polydisperse polymer mixture. It consists of a polymerized compound formed by the intermolecular esterification between the carboxylic group of one L-tartaric acid unit and the secondary alcohol group of another molecule of L-tartaric acid (Ribéreau-Gayon et al. 2006; Sprenger et al. 2015). The primary components of MTA are the di-tartrate monoester and diester, L-tartaric acid monomer, and polyester chains of varying degrees of polymerization.

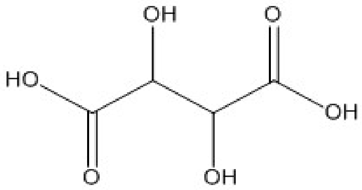
3. Methods of Manufacture

Metatartaric acid is produced by heating L-tartaric acid, from naturally occurring sources such as grapes, at 150-170 °C at atmospheric or reduced pressure for less than one hour. This produces a colourless liquid which is cooled, dried and ground into an off-white powder. Variations in production temperature, pressures, and time will allow manufacturers to control the degree of esterification in the final product.

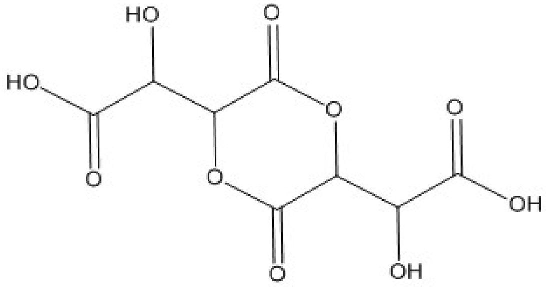
4. Chemical Characterization

4.1 Composition

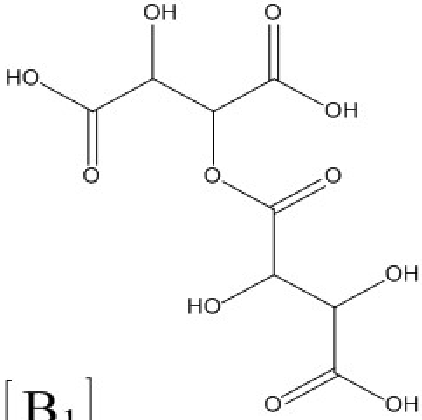
Metatartaric acid is a polydisperse polyester of L-tartaric acid. Primary components include the monoester and diester of di-tartaric acid, the monomeric L-tartaric acid, and polyester chains of varying degrees of esterification and polymerization. The exact composition of the final polymeric material has not been well characterized. The structural formulas of selected metatartaric acid components are found in Figure 1.



[A]



[B_1]



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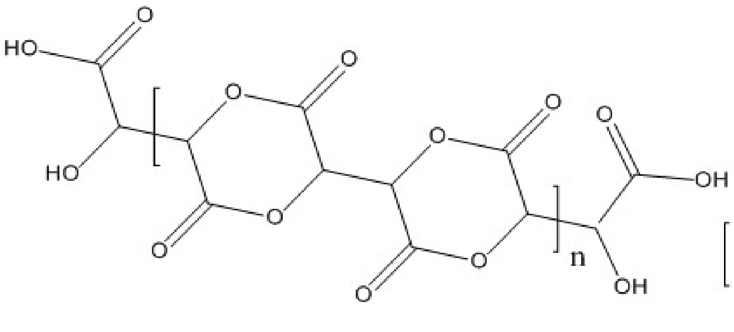

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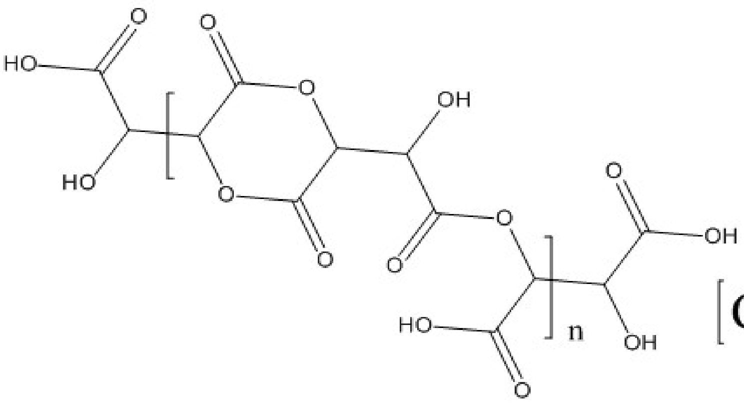

[C_2]

Figure 1: Structural formula of metatartaric acid components. [A] L-tartaric acid, [B_1] di-tartaric monoester, [B_2] ditartaric diester, [C_1] polymer with diester ring, [C_2] polymer with monoester ring.

The reported range of the molecular weight of metatartaric acid products is wide. The weight average molecular weight (Mw) values reported range from 2.2–8.9 kDa, number average molecular weight (M_n) values range from 0.43-0.85 kDa and polydispersity indices range from 14-50. (Sprenger et al. 2015**)**

The final product has a degree of esterification of above 32% and upon hydrolysis must contain 105% tartaric acid.

4.2 Possible impurities (including degradation products)

Possible impurities of metatartaric acid include (i) any inorganic impurities and heavy metals, and (ii) unreacted L-tartaric acid.
Analytical data of products in commerce indicated that loss on drying ranged from 0.73-1.62% and loss on ignition is almost 100%. Metallic impurities showed the following limits: lead <1.4 mg/kg, arsenic <1.3 mg/kg, cadmium <0.13 mg/kg and mercury <0.1 mg/kg. L-tartaric ranged from 9 – 18 %.

4.3. Analytical methods

The proposed assay for the determination of metatartaric acid is based on hydrolysis of metatartaric acid components using sodium hydroxide to form tartaric acid. This allows the calculation of the degree of esterification. Addition of an excess of sodium hydroxide solution followed by back titration with sulfuric acid using bromothymol blue indicator will allow the calculation of the total free and esterified acid present in the original sample. (OIV, 31/2000)

5. Functional uses and reactions and fate in food

5.1. Technological function

Metatartaric acid is intended for use as stabilizer and is used to prevent the growth and precipitation of potassium bitartrate and calcium tartrate crystals in wine.

Metatartaric acid hydrolyses to tartaric acid in solution over time with the rate dependent on both pH and temperature. In wine, complete hydrolysis has been reported to be as short as a few minutes at 45º and as long as several years at 10º (Peynaud and Guimberteau, 1961).

Table 1: Reported Stability / Hydrolysation of metatartaric acid in wine

Temperature	**Observation**
<0 – 0° C	Stable for several years
10 – 12° C	At least 2 years
10 – 16° C	At least 18 months
12 – 18° C	At least one year
20° C	Stable for three months
25° C	Stable for one month
30° C	Complete hydrolysation in one week
35 – 40° C	Complete hydrolysation in few hours
45 – 50 °C	Complete hydrolysation in few minutes

6. Food categories and use levels

Metatartaric acid is an approved EU food additive (E353) as an acidity regulator. It is also an approved EU winemaking additive in accordance with Regulation (EU) 1129/2011. Use levels are at or below 100 mg/L.

Metatartaric acid has also been for use as an additive in wine making in the following countries: Argentina, Australia, Brazil, Chile, New Zealand, Norway, Paraguay, Uruguay, Russia, South Africa, and Turkey.

7. References

1. Report of the 48th meeting of the Codec Committee on Food Additives (CCFA48, REP16,_FA) http://www.fao.org/fao-who-codexalimentarius/sh-proxy/en/?lnk=1&url=https%253A%252F%252Fworkspace.fao.org%252Fsites%252Fcodex%252FMeetings%252FCX-711-48%252FReport%252FREP16_FAe.pdf ,2016
2. Ribéreau-Gayon, P., Glories, Y., Maujean, A., Dubourdieu, D. 2006. Handbook of Enology. The Chemistry of Wine Stabilization and Treatments. (2nd ed.). (Vol. 2). France: Bordeaux. Wiley & Sons Ltd., Chichester, England
3. Sprenger S., Hirn S., Dietrich H., Will F. 2015. Metatartaric acid: physicochemical characterization and analytical detection in wines and grape juices. Eur Food Res Technol, 241: 785-791.
4. OIV International Oenological Codex, COEI-1-METACI: 2000, (Oeno 31/2000)
5. Peynaud, E., Guimberteau, G. 1961. Recherches sur la constitution et l'efficacité anticristalisante de l'acide métatartrique. Industries Agricoles et Alimentaires, 2: 131-135 and 413-418.