RESOLUTION OIV-OENO 690-2023

MONOGRAPH ON FUMARIC ACID

THE GENERAL ASSEMBLY,

IN VIEW OF Article 2, paragraph 2 iv of the Agreement of 3rd April 2001 establishing the International Organisation of Vine and Wine,

CONSIDERING the work of the “Specifications of Oenological Products” Expert Group,

DECIDES, at the proposal of Commission II “Oenology”, to add the following monograph COEI-1-FUMARI in Chapter I of the International Oenological Codex as follows:

Monograph on Fumaric acid

FUMARIC ACID
trans-Butenedioic acid
trans-1,2-Ethylene-dicarboxylic acid
COOH-CH=CHCOOH
C4H4O4 = 116.07
CAS number 110-17-8
INS No. 297

1. OBJECTIVE, ORIGIN AND SCOPE OF APPLICATION

Fumaric acid is produced naturally in eukaryotic organisms from succinate in complex 2 of the electron transport chain via the enzyme succinate dehydrogenase, which is involved in ATP production. The food grade product can be obtained by chemical synthesis or by biosynthesis. It is used for controlling malolactic fermentation in wines under conditions stipulated by regulation.

Production by chemical synthesis is the most common: It involves the isomerisation of maleic acid obtained from the hydrolysis of maleic anhydride, produced from the oxidation of butane or benzene. Production by biosynthesis, which is more sustainable, should develop rapidly. It involves the fermentation by Rhizopus oryzae, in particular, of agri-food residues (e.g. from apples).

The fumaric acid is prepared in solution in a volume of wine before incorporation.

2. LABELING

The label should indicate in a clear manner that the product is FUMARIC ACID. It must indicate the batch number, the expiry date, the purity percentage (greater than 99%), storage requirements and security.

3. PROPERTIES

Fumaric acid is found as colourless white crystals, sometimes acicular, in monoclinic prisms or in sheets when exposed to water, or as crystalline powder or granules. It is odourless and has a tangy, fruity taste.

The melting point is 287 °C. The melting range is 286 °C to 302 °C (closed capillary, rapid heating).

4. SOLUBILITY

- Low solubility in water: 6.3 g/L in water at 25 °C
- Good solubility in alcohol: 98 g/100 g of alcohol 95% by vol. at 30 °C
- Insoluble in chloroform and benzene
- Slightly soluble in oils

5. IDENTIFYING CHARACTERISTICS

5.1. 1,2-Dicarboxylic acid

Place 50 mg of the sample in a test tube, add 2 to 3 mg of resorcinol and 1 ml of sulfuric acid, shake, heat at 130 °C for 5 min and cool. Dilute with water to 5 ml and add sodium hydroxide solution (40% w/w) dropwise to render the solution alkaline, cool and dilute with water to 10 ml. A greenish blue fluorescence is observed under an ultraviolet lamp.

5.2. Test for double bond

Add 10 ml of water to 0.5 g of the sample and dissolve by boiling. Add 2 or 3 drops of bromine TS to the hot solution. The colour of bromine TS disappears.

6. TESTS

6.1. Preparation of the test trial solution

For purity trials, dissolve 0.5% m/v of fumaric acid in a 10% hydroalcoholic solution.

6.2. Loss on drying

The loss after drying at 120 °C for 4 hours should not be more than 0.5%.

6.3. Sulfated ash

Sulfated ash content should not be more than 0.1%. Test 2 g of the sample. Ignite a suitable crucible at 600 °C for 30 minutes, allow to cool in a desiccator and weigh. Place 2 g of sample in the crucible and weigh. Moisten the sample with a small amount of sulfuric acid (usually 1 mL) and heat gently at low temperature until the sample is thoroughly charred. After cooling, moisten the residue with a small amount of sulfuric acid, heat gently until white fumes are no longer evolved and ignite at 600 °C until the residue is completely incinerated. Allow the crucible to cool in a desiccator, weigh it again and calculate the weight of the residue.

6.4. Malic acid

Using the method OIV-MA-AS313-04 described in the Compendium, analyse quantitatively the malic acid in the solution prepared for testing (6.1). Malic acid content should not be more than 0.1%.

6.5. Chlorides

By potentiometry using an Ag/AgCl electrode, as described in the method OIV-MA-AS321-02 in the Compendium, analyse quantitatively the chloride content in the solution prepared for testing (6.1). Chloride content expressed in terms of hydrochloric acid should be less than 1 g/kg.

6.6. Sulfates

Using the method OIV-MA-AS321-05A described in the Compendium, analyse quantitatively the sulfates in the solution prepared for testing (6.1). Sulfate content expressed in terms of sulfuric acid should be less than 1 g/kg.

6.7. Iron

Using the method OIV-MA- AS323-07 described in the Compendium, analyse quantitatively iron in the solution prepared for testing (6.1). Iron content should be less than 10 mg/kg.

6.8. Heavy metals

Using the method OIV-MA-AS323-07 described in the Compendium, analyse quantitatively heavy metals in the solution prepared for testing (6.1). The content (expressed as Lead) should be less than 5 mg/kg.

6.9. Lead

Using the method OIV-MA- AS323-07 described in the Compendium, analyse quantitatively lead in the solution prepared for testing (6.1). Lead content should be less than 2 mg/kg.

6.10. Mercury

Using the method OIV-MA-AS323-07 described in the Compendium, analyse quantitatively mercury in the solution prepared for testing (6.1). Mercury content should be less than 1 mg/kg.

6.11. Arsenic

Using the method OIV-MA-AS323-07 described in the Compendium, analyse quantitatively arsenic in the solution prepared for testing (6.1). Arsenic content should be less than 3 mg/kg.

7. QUANTITATIVE ANALYSIS

Wine organic acids may be separated and simultaneously determined by high performance liquid chromatography (HPLC) in C18 columns with UV detection at 210 nm, according to method OIV-MA-AS313-04 Type IV of the International Compendium of Methods of Analysis.

8. STORAGE

Fumaric acid should be stored in hermetically sealed containers.

Certified in conformity Jerez, 9th June 2023
The Director General of the OIV
Secretary of the General Assembly
Pau ROCA