OIV-MA-AS2-07B Chromatic characteristics

Type IV method

1. Definitions

The "chromatic characteristics" of a wine are its luminosity and chromaticity. Luminosity depends on transmittance and varies inversely with the intensity of color of the wine. Chromaticity depends on dominant wavelength (distinguishing the shade) and purity.

Conventionally, and for the sake of convenience, the chromatic characteristics of red and rosé wines are described by the intensity of color and shade, in keeping with the procedure adopted as the working method.

2. Principle of the methods

(applicable to red and rosé wines)

A spectrophotometric method whereby chromatic characteristics are expressed conventionally, as given below:

- The intensity of color is given by the sum of absorbencies (or optical densities) using a 1 cm optical path and radiations of wavelengths 420, 520 and 620 nm.
- The shade is expressed as the ratio of absorbance at 420 nm to absorbance at 520 nm.

3. Method

3.1. *Apparatus*

3.1.1. Spectrophotometer enabling measurements to be made between 300 and 700 nm.

3.1.2. Glass cells (matched pairs) with optical path *b* equal to 0.1, 0.2, 0.5, 1 and 2 cm.

3.2. Preparation of the sample

If the wine is cloudy, clarify it by centrifugation; young or sparkling wines must have the bulk of their carbon dioxide removed by agitation under vacuum.

3.3. Method

The optical path *b* of the glass cell used must be chosen so that the measured absorbance A, falls between 0.3 and 0.7.

Take the spectrophotometric measurements using distilled water as the reference liquid, in a cell of the same optical path *b*, in order to set the zero on the absorbance scale of the apparatus at the wavelengths of 420, 520 and 620 nm.

Using the appropriate optical path *b*, read off the absorbencies at each of these three wavelengths for the wine.

3.4. Calculations

Calculate the absorbencies for a 1 cm optical path for the three wavelengths by dividing the absorbencies found (A_{420}, A_{520} and A_{620}) by *b*, in cm.

3.5. *Expression of Results*

The color intensity I is conventionally given by:

$$I = A_{420} + A_{520} + A_{620}$$

and is expressed to three decimal places.

The shade N is conventionally given by:

$$N = \frac{A_{420}}{A_{520}}$$

and is expressed to three decimal places.

Table 1

Converting absorbance into transmittance (T%)

Method: find the first decimal figure of the absorbance value in the left-hand column (0-9) and the second decimal figure in the top row (0-9).

Take the figure at the intersection of column and row: to find the transmittance, divide the figure by 10 if absorbance is less than 1, by 100 if between 1 and 2 and by 1000 if between 2 and 3.

Note: The figure in the top right hand corner of each box enables the third decimal figure of the absorbance to be determined by interpolation.

	0	1	2	3	4	5	6	7	8	9
0	23 1000	22 977	22 955	21 933	21 912	20 891	20 871	19 851	19 932	19 813
1	18 794	18 776	17 759	17 741	16 724	16 708	16 692	15 676	15 661	15 646
	14	14	14	14	13	13	13	12	12	12

2	631	617	603	589	575	562	549	537	525	513
3	11 501	11 490	11 479	11 468	10 457	9 447	9 436	10 427	10 417	9 407
4	9 398	9 389	9 380	8 371	8 363	8 355	8 347	339	7 331	8 324
5	7 316	309 71	7 302	7 295	6 288	7 282	6 275	6 269	6 263	6 257
6	6 251	5 245	6 240	5 234	5 229	5 224	5 219	5 214	5 209	5 204
7	4 199	5 195	4 190	4 186	4 182	178	4 174	4 170	4 166	4 162
8	3 158	4 155	3 151	4 148	4 144	3 141	3 138	3 135	3 132	3 129
9	3 126	3 123	3 120	2 117	3 115	2 112	3 110	2 107	3 105	2 102

Example:

Absorbance	0.47	1.47	2.47	3.47
T%	33.9%	3.4%	0.3%	0%

Transmittance (T%) is expressed to the nearest 0.1%.

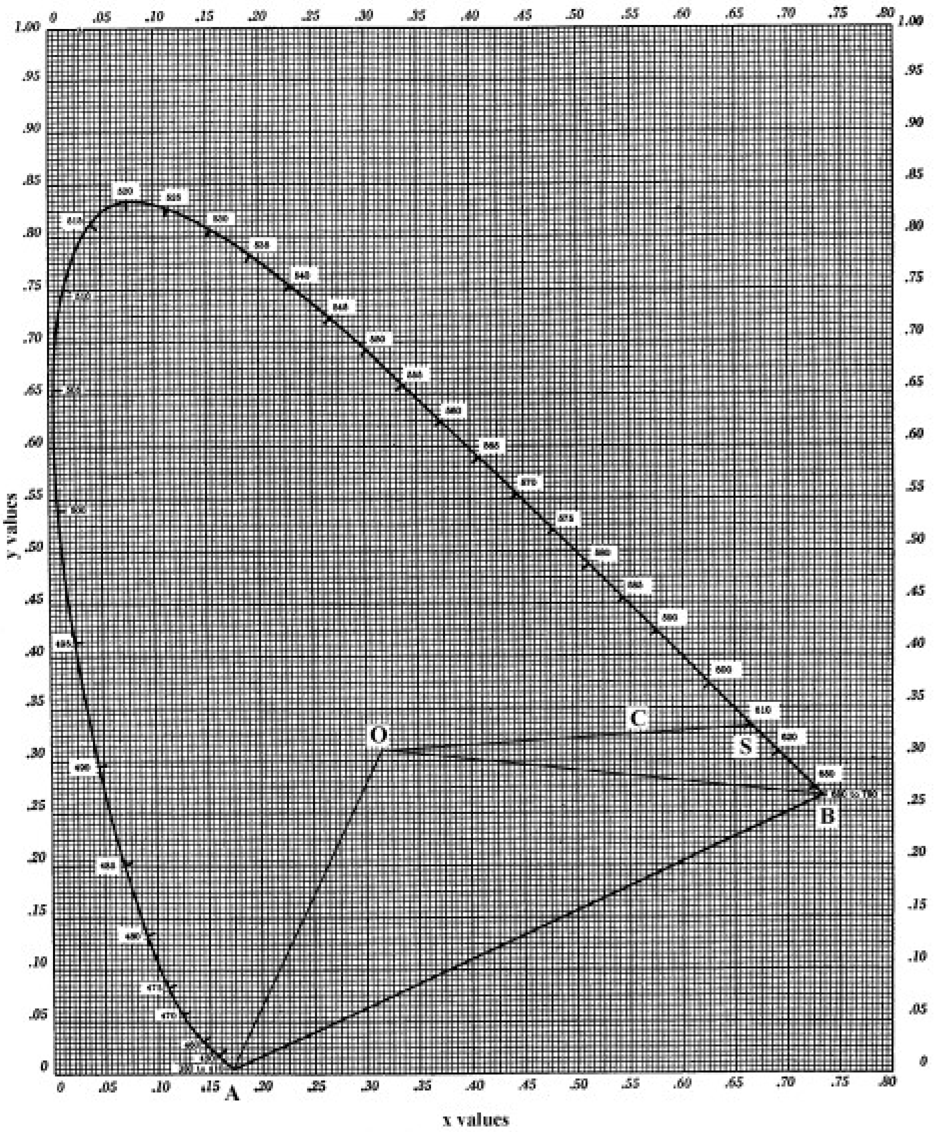

Figure 1: Chromaticity diagram, showing the locus of all colors of the spectrum

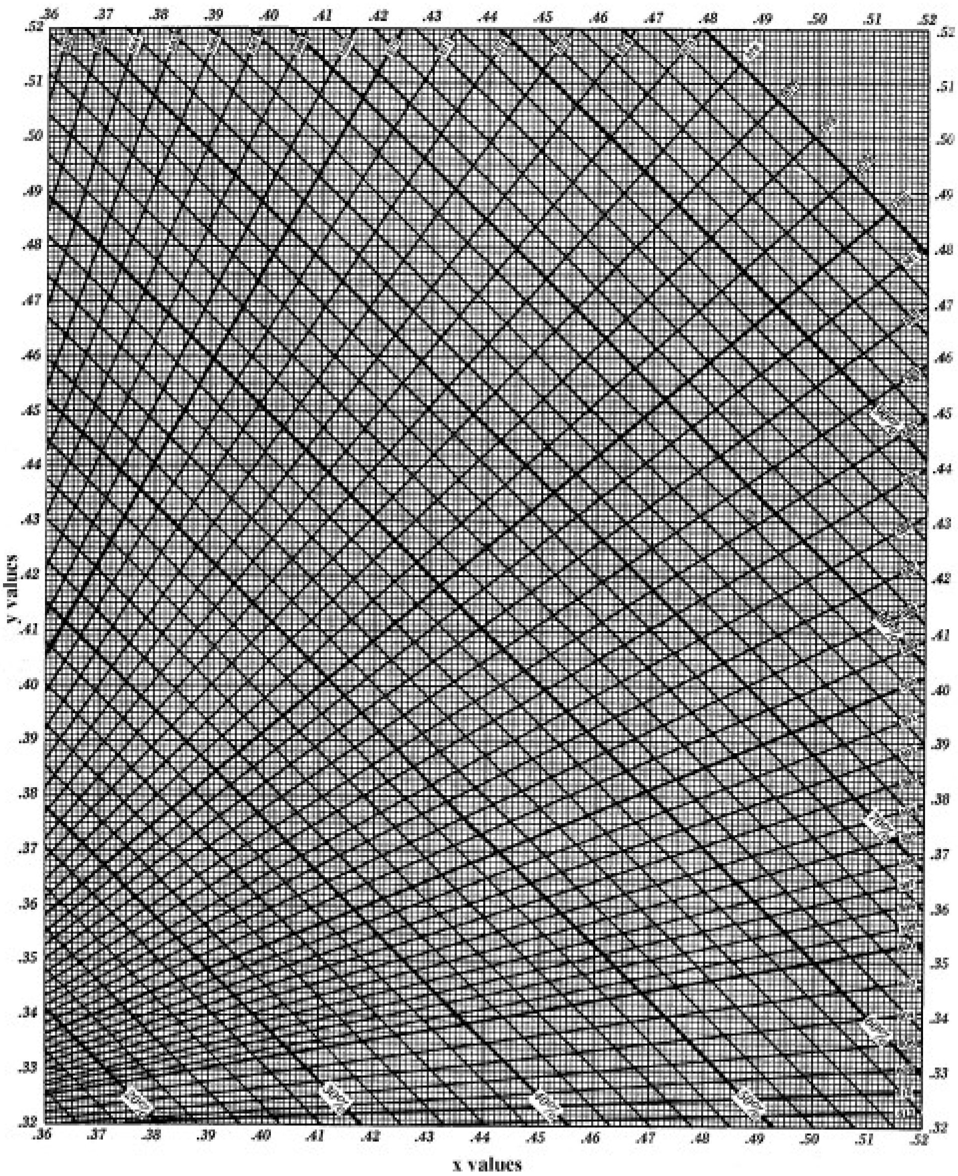

Figure 2: Chromaticity diagram for pure red wines and brick red wines

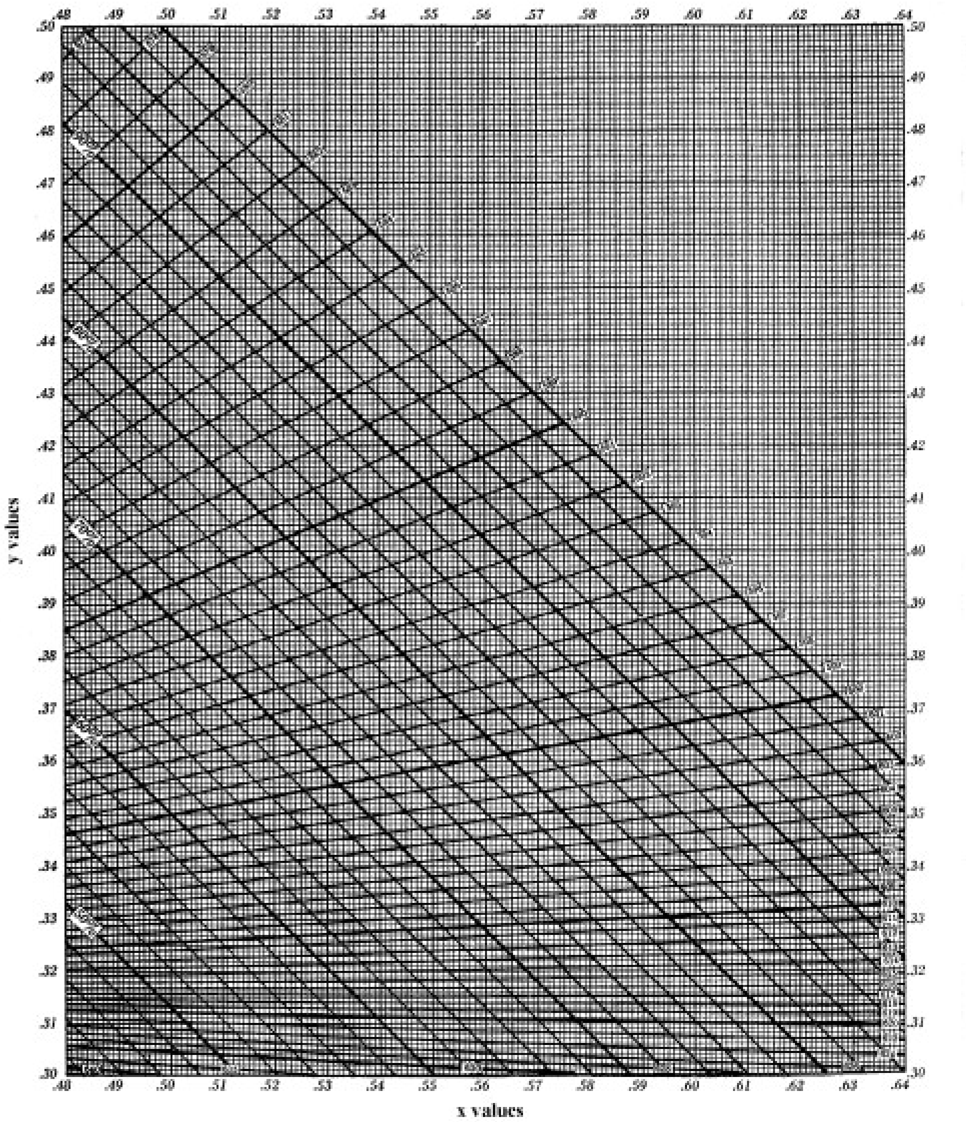

Figure 3: Chromaticity diagram for pure red wines and brick red wine

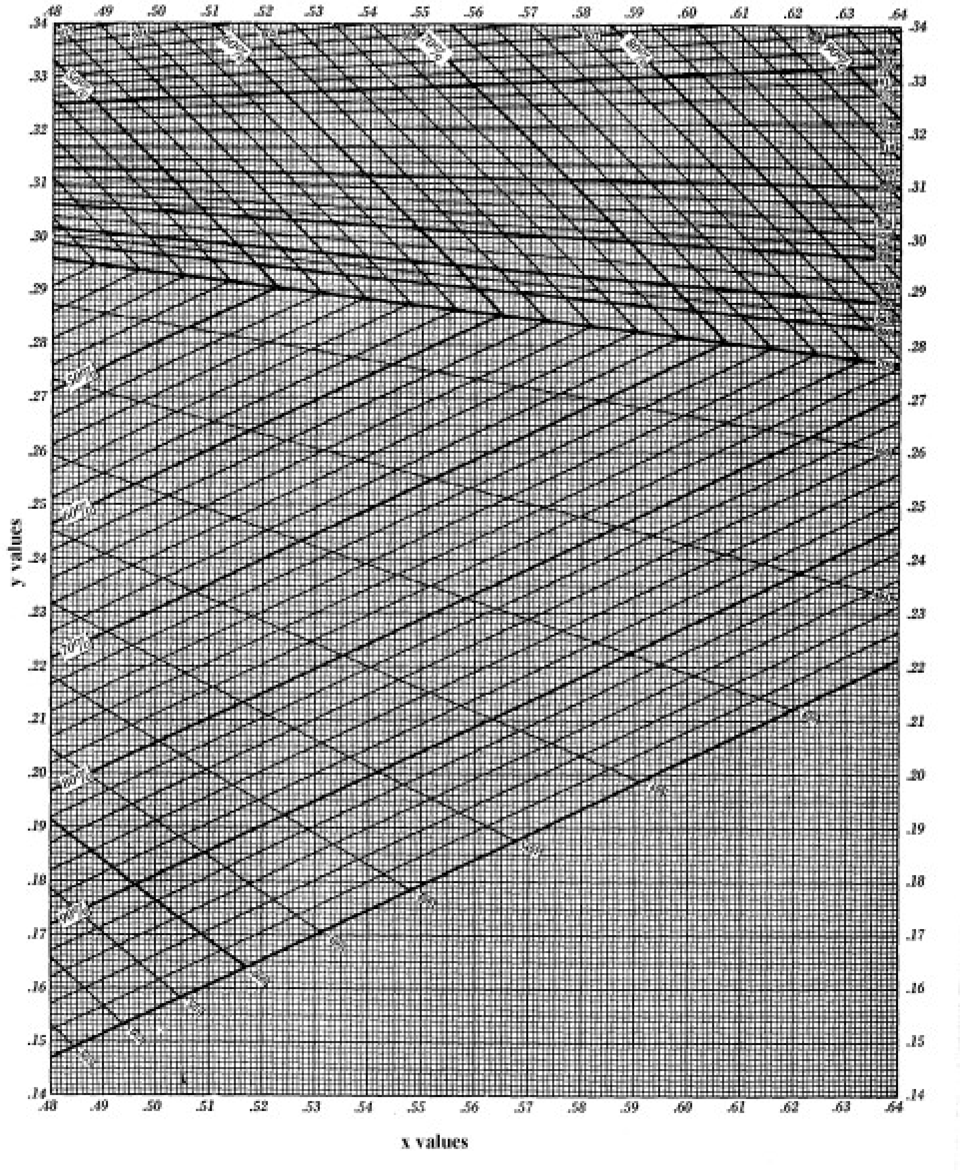

Figure 4:Chromaticity diagram for pure red wines and purple wines

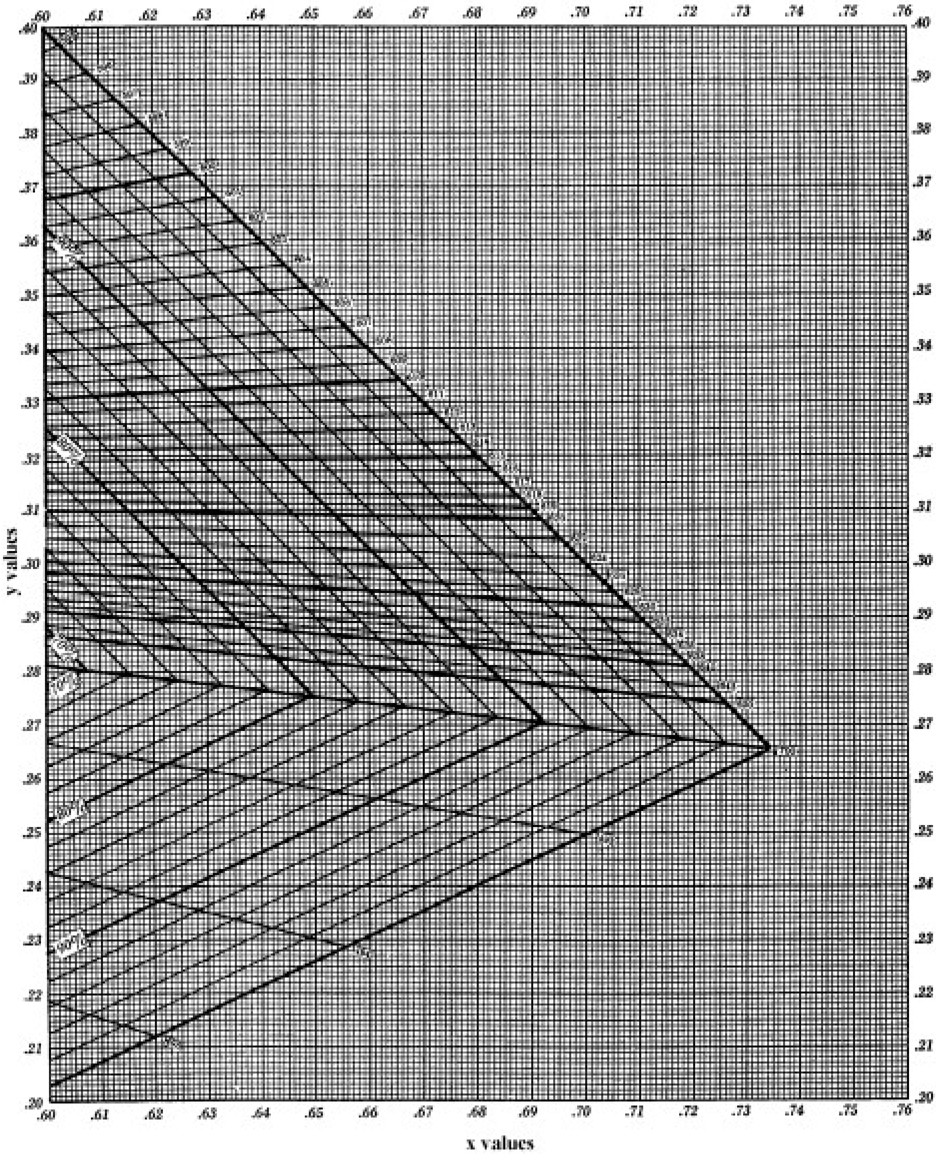

Figure 5:Chromaticity diagram for pure red wines and purple red wines

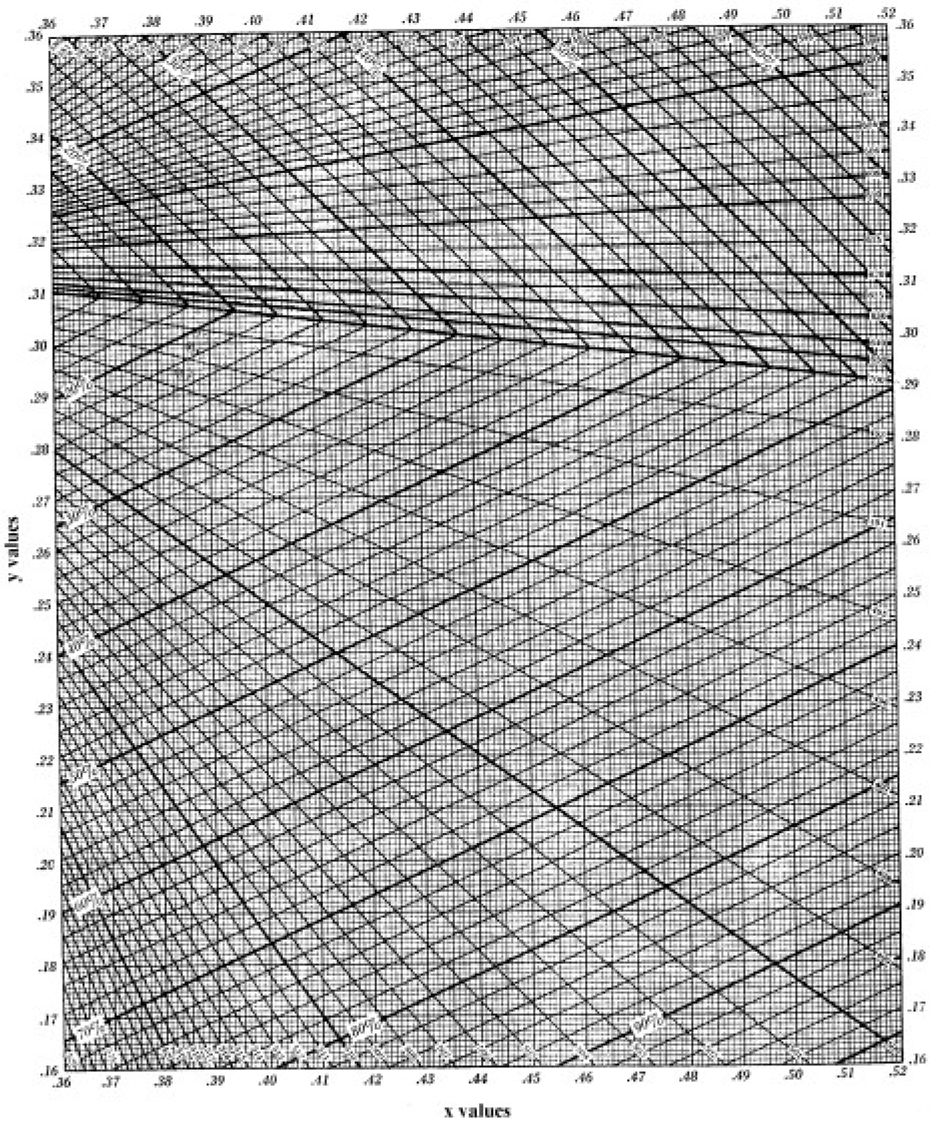

Figure 6: Chromaticity diagram for brick red wines and purple red wines

Bibliography:

- BOUTARIC A., FERRE L., ROY M., *Ann. Fals. Fraudes,* 1937, 30, 196.
- SUDRAUD P., *Ann. Technol. Agric.,* 1958, no 2, 203.
- MARECA CORTES J., *Atti Acc. Vite Vino,* 1964, 16.
- GLORIES Y., *Conn. vigne et Vin,* 1984, 18, no 3, 195.

Annex: Operative instructions for the determination of Chromatic Characteristics of wines and/or musts obtained by grape varieties characterized by high concentrations of colouring pigments and/or high sulfur dioxide levels

1. Principle of the method

1.1. Field of application

Applicable to red wine with high concentrations of colouring pigments, must, and must with high sulphur dioxide levels.

A spectrophotometric method whereby chromatic characteristics are expressed, conventionally, as given below:

- The intensity of colour is given by the sum of absorbencies (or O.D. = Optical Densities) using a 1 cm optical path and radiation of wavelengths 420, 520 and 620 nm.
- The shade is expressed as the ratio of absorbance at 420 nm to absorbance at 520 nm.

For grape varieties characterized by high concentrations of colouring pigments, given the nature of the chemical structure of these substances, the determination of the chromatic characteristics requires the dilution of the sample with a buffered solvent at pH 3.2. The use of a buffered solvent compared to dilution with water reduces the effect of the matrix and normalizes the O.D as the dilution increases.

2. Method

2.1. Apparatus

2.1.1. Spectrophotometer enabling measurements to be made between 300 and 700 nm.

2.1.2. Glass cuvettes or single use plastic cuvettes with optical path equal to 1 cm.

2.1.3. Volumetric glassware with variable volume according to needs

2.1.4. Syringe filter 0.45 µm

2.2. Reagents

2.2.1. Type II water for analytical use, ISO 3696 standard, or of equivalent purity

2.2.2. Tartaric acid 99.5% (CAS 87-69-4)

2.2.3. Sodium hydroxide NaOH 1 N (CAS 1310-73-2)

2.2.4. Hydrogen peroxide 30% w/w (CAS 7722-84-1)

2.3. Working solutions

2.3.1. Buffer at pH 3.20

Daily preparation: weigh 7   0.1 g of tartaric acid (2.2.2) in a 1000 mL volumetric flask, add 35 ml of NaOH 1 N (2.2.3) and make up to 1000 mL with water (2.2.1). Check the pH with a pH meter and verify that pH is 3.20¤0.05. The solution should be checked and filtered (2.1.4) at the time of use.

2.3.2. Hydrogen peroxide 3% (v/v)

Dilute 1.0 mL of hydrogen peroxide (2.2.4) to 10 ml. The solution should be prepared at the time of use.

2.4. Preparation of the sample

If the sample is cloudy, clarify it by centrifugation (10 min, 1146 rcf); If there is carbon dioxide remove it by agitation under vacuum (or similar systems).

In the case of grape must whose alcoholic fermentation is inhibited by adding sulphur dioxide, add 0.1 mL of 3% hydrogen peroxide solution (2.3.2) per mL of sample used and make up to volume, depending on the dilution chosen, with the buffer solution at pH 3.2 (2.3.1). Wait 20 minutes, then proceed with spectrophotometric reading.

2.5. Spectrophotometric reading for wine and must with high colour intensity or high sulphur dioxide levels

Take the spectrophotometric measurements of the samples: the absorbance (A) will fall between 0.3 and 1.0 (the absorbance acceptability range can be extended if instrumental technology allows it) If the A-value is above the maximum limit, make an appropriate number of dilutions (d) of the sample using the buffer solution (2.3.1) to meet the acceptability criteria.

Take the spectrophotometric measurements using the buffer solution as the reference liquid to set the absorbance scale of the apparatus to zero at the wavelengths of 420, 520 and 620 nm.

2.6. Calculations

Calculate the optical densities (O.D.) for each of the three wavelengths by multiplying the detected absorbances (A420, A520 and A620) by the number of dilutions made (d):

$$\text{DO } 420\text{ nm} = A_{420} \times d$$

$$\text{DO } 520\text{ nm} = A_{520} \times d$$

$$\text{DO } 620\text{ nm} = A_{620} \times d$$

2.7. Expression of results

The colour intensity (I) is conventionally given by:

$$I = A_{420} + A_{520} + A_{620}$$

and is expressed to three decimal places.

The shade (N) is conventionally given by:

$$N = A_{420}/A_{520}$$

and is expressed to three decimal places.