



MERLOTTA
VIGNAIOLI DAL 1962

LESSON 4

**THE COMPOSITION
OF WINE, BIOLOGICAL
PROCESSES**

(BY FRANCO DALMONTE)



THE COMPOSITION OF WINE

There are several hundred different substances that make up wine and which contribute to defining the sensory characteristics.

Water is the most abundant component; however to follow a useful breakdown for tasting purposes one needs to look at substances that affect the colour, the aroma and the flavour

COLOUR

The colour of red wines is principally due to the presence of phenolics, in particular of anthocyanins and their relation with tannins. In white wines it is the pro-

anthocyanidins (Leucoantociani). Their presence depends on the grape variety, the state of the grape and the wine making techniques.

AROMA

Terpenes (the strongest smelling are the monoterpenes or linalool and citronellol but also a-terpineol, nerol, geraniol, ho-trienolo)

Norisoprenoids (divided into Megastigmanes and non Megastigmanes ; amongst the main ones is beta-damascenone with a mixed aroma of flowers and exotic fruits, beta-ionone with a violet aroma, 3-oxy-alpha-ionolo, 3-hydroxy-beta- damascene and damascene for the aroma of tobacco; amongst the others TDN for the marked aroma of hydrocarbons in Reislings).

Methoxypyrazines

Nitrogenous composites deriving from the metabolism of aminoacids. Notes of green pepper in Sauvignon wines, Cabernet Sauvignon and Franc and Merlot

Sulfate composities

Usually indicated as responsible for nose defects. Nevertheless they combine to form pleasant aromas (fruity -blackcurrant) and above all the 4- mercaptan - 4 - methyl - pentane-2-one (aroma of Sauvignon)

FLAVOUR

Sweet

Sweetness: sugar (fructose and glucose), glycerine and the alcohols (above all ethyl alcohol)

Acidity: comes mainly from the original acids of the grape: tartaric, malic and citric. There are then the fermenting acids – pyruvic, lactic (usually obtained from the malolactic fermentation for the breakdown of malic acid), succinic, acetic, oxaloacetic and fu-

maric acids.

Astringency and/or bitterness: comes from the polyphenols, in particular the tannins.

Full flavouring: comes from the salts present in wine (potassium, calcium and sodium)

Also present are amino acids, proteins, anhydride dioxide, vitamins, polysaccharides.

BIOLOGICAL PROCESSES

ALCOHOLIC FERMENTATION

The most important phase of winemaking occurs on the grape must: alcoholic fermentation. It is a biochemical phenomenon in which the yeasts transform the sugars of the must into ethyl alcohol, anhydride dioxide and other secondary composites (glycerin , acids, superior alcohols etc.)

The yeasts which can transform the sugars are various, some “good” ones such as the Saccharomyces Cerevisiae, others defined as natural or wild are not always “good”.

To produce 1° of ethyanol, 16.5 -18 g/l of sugars are needed

MALOLACTIC FERMENTATION

This is an essential process which occurs in red wine with positive effects on the aromatic and microbiological stability. This phenomenon, which generally occurs immediately after the alcoholic fermentation in a natural or artificially induced way, is caused by bacteria (*Oenococcus oeni*). With this

process the breakdown of the malic acid occurs, from the unpleasant acidic taste to the "softer" tasting lactic acid.

From 1 g/l of malic acid is obtained 0.67 g/l of lactic acid and .33 g/l of anhydride dioxide.

DEFICIENCIES

DEFICIENCIES CAUSED BY SULPHUROUS COMPOSITES

These can be caused by the residue of anti-oxidic treatments, from an excess of sulphur (heightened smell of zolfanello and a slightly bitter flavour) from hydrogen sulphide or sulphured hydrogen (H₂S

which occurs in musts lacking in nitrogen, smell and flavour of rotten egg and sewers), from mercaptans disulphides (garlicky smells)

AROMATIC VARIATIONS OF PHENOLICS

White wines contain variable quantities of vinylphenols whilst red wines contain ethylphenols responsible for some aromatic variations.

Vinylphenols of white wines come from the enzyme decarboxylation of the yeasts dependent on the two cinnamic acids; the ethylphenols of red wine origi-

nate from the decomposition of the *Brettanomyces* yeasts on the two cinnamic acids mentioned above.

Rare in alcoholic fermentation, particularly dangerous during ageing (generating the Brett note), the smell of manure, animals and damp cloth.

SPOILAGE/ALTERATION

The alterations or "casse" are spoiling of the limpidity and stability of the wine.

Microbes

Originating from yeasts and bacteria

Oxidising spoilage

Above all due to polyphenol substances (browning) and aromatic (loss of freshness).

The intensity of the oxidation depends on:

- Composition of the oxidisable substance
- Presence of catalysers (enzymes, iron, copper)
- Disponibility of oxidising agents (oxygen, oxidising composites)
- Composition of the medium (temperature, pH)

Protein based spoilage

This occurs in white wine with darkening and opalescence caused by precipitation (flocculation) by protein based origin.

Natural sedimentation of tartrates

Potassium tartrates, calcium tartrates

Ferric spoilage

Occurs in white wines with an off-white clouding due to the formation of ferric phosphate and in red wines with a blueish clouding due to the formation of ferric tannates. This occurs when the quantity of iron exceeds 10 mg/l

Cuprous spoilage

Specifically found in white wines. The must contains high levels of copper (5mg/l), the majority coming from anti downy mildew treatment. In wine it is found in the form of Cu⁺⁺; when wines are kept away from air or are exposed to high temperatures and light, the copper is reduced to Cu⁺ and hence susceptible to muddying if the quantity gets close to 1mg/l.

The muddying occurs in two phases: the formation of unstable colloids + flocculation due to the effect of proteins.

MALATTIE

VINEGAR TAIN

Caused by bacteria of the *Acetobacter* and *Gluconobacter* genre. They transform the ethyl alcohol into acetic acid and water. The wine is classified as "tainted" when the alteration only effects the surface

layer of the wine, whilst the real and definitive volatility and sharpness is when the alteration effects all the wine.

LACTIC TAIN

Caused by lactic bacteria in red and white wines with sugary residue, few acids and little alcohol, in which occurs the breakdown of mannitol fructose. This illness, common to southern regions, consists in the formation of an alcohol with a sweetish flavour, which combines with the sourness of the acetic acid which always accompanies the bittersweet flavour. The lactic bacteria, carriers of this illness,

particularly effect young wines in hot regions that manifest a low acidity, with low alcohol and sugary rich residue; they create acetic acid, lactic acid and numerous secondary products. If it remains fructose it transforms into mannite or mannitol (mannitic fermentation) a polyalcohol with a sweet flavour which being unfermentable stays in the wine (bittersweet).

TOURNE / SPOILED

This disease develops because of lactic acids, which with the heat, in wines of low alcohol and low acidity, above all in young wines with an excess of nitrogenous substances which manifest a characteristic aspect:

In white wines the disease causes browning, whilst

in red wines it produces discolouring and blackening. For all wines affected there is the production of carbon dioxide at the expense of the potassium Bitartrate with the development of acetic acidity, a reduction of sugar and glycerine and the presence of a bitter flavour.

ACIDITY

Caused by the bacterial degradation of glycerine. A disease which is not that frequent in white wines whilst in red wines, particularly wines aged in barrels and in bottles, low in alcohol and acidity, rich in protein based substances obtained from downy mildew and mouldy grapes.

The symptoms of the disease are a bitter and disgusting flavour, muddying, vinegary smell, separation of the colouring substances into bits and pieces, with an orange deposit.

OILY OR “GRAISSE”

Common in young white wines but much less in reds. The wine becomes oily, cloudy, flat and with no taste.

Caused by the presence of:

Undecomposed sugars, weak acidity, little alcohol,

asphyxiated environment, heat and high number of protein based substances that create oily wine.

The disease is due to lactic bacteria which is sensitive to sulphur and hence produces a polysaccharide mucilage

FLOWER DISEASE

More commonly found on the surface of white wines than in red. At times it develops an off white layer, often wrinkly, which breaks up into small pieces like a myriad of small flower petals – hence the name of the disease.

The agents are the particular micodermic yeasts,

belonging to the genre of Candida, Pichia, Hansenula and Brettanomyces, that destroy the alcohol, oxidising it and turning it into water and carbon dioxide. These yeasts often combine with acetic bacteria, of the acerbacter genre, with the dangerous developments that follow.