

Sensory perception of flaws

Product recognition, identification and classification of flaws

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MEAD AROMAS: GENERAL CLASSIFICATION

Primary aromas - *varietal aromas*

Secondary aromas - *vinous aromas.*

Tertiary aromas



PRIMARY AROMAS IN HONEY

Volatile Compound	Aroma Description
Benzaldehyde	Sweet, almond, marzipan
Furfural	Sweet, fruit, cherry soft almond
Phenylacetaldehyde	Sweet, honey-like
β -damascenone	Fruity, sweet, honey
Linalool	Sweet, citrus, forest, geranium
Sinensal	Sweet, orange
Benzene and phenolic acids	Ripe fruit and spicy
Nonanal	Aldehyde, citrus, fatty, floral Green,
Decanal and Octanal	Soap, fat, talloworange, lemon

(Bayraktar & Onoğur 2011, Wardencki et al. 2009, Castro-Vázquez et al. 2006, Huaixiang Tian et al. 2018, Manyi-Loh et al. 2011).



SECONDARY AROMAS

Chemical classification	Compound	Aroma description	Concentration [mg/L]
VOLATILE ACIDS	Acetic acid	VA, vinegar	100 – 1150
HIGHER ALCOHOLS	Propanol	Pungent, harsh	9.0 – 68
	Butanol	Fusel, spiritous	0.5 – 8.5
	Isobutanol	Fusel, spiritous	9.0 – 174
	Isoamyl alcohol	Harsh, nail polish	6.0 – 490
	Hexanol	Green, grass	0.3 – 12.0
ESTERS	2-Phenylethyl acetate	Flowery, rose, fruity	4.0 – 197
	Ethyl acetate	nail polish, fruity	22.5 – 63.5
	Isoamyl acetate	Banana, pear	0.1 – 3.4
	Isobutyl acetate	Banana, fruity	0.01 – 1.6
	Ethyl butanoate	Floral, fruity	0.01 – 1.8
	Ethyl hexanoate	Green apple	0.03 – 3.4
	Ethyl octanoate	Sweet soap	0.05 – 3.8
CARBONYL COMPOUNDS	Acetaldehyde	Sherry, nutty, bruised apple	10 – 75

(Lambrechts & Pretorius 2000, Swiegers & Pretorius 2005, Siebert et al. 2005, Smyth 2005, Styger et al. 2011, Swiegers et al. 2005).



TERTIARY AROMAS - MEAD BOUQUET DEVELOPMENT

- **Nonenzymatic oxidative reactions during slow oxygenation of wine**
- **Reactions between sugars and amino acids**
- **Oak extractives**



OAK EXTRACTIVES

Hydrolyzable tannins (ellagitannins)

Lignin-degradation products

- coniferaldehyde and **vanillin**, and **sinapaldehyde** and **syringaldehyde**

Hydrolysis of cellulose and hemicellulose during coopering

- substituted **furanes** and **pyranes** - toasty, caramel odors of wine matured in medium-toasted barrels

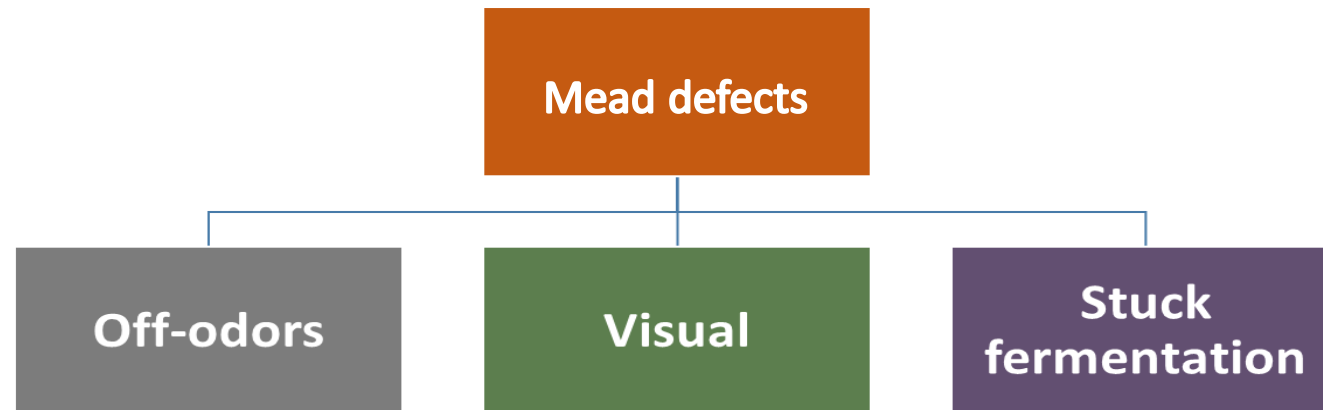
Oak lactones

- the principal volatile constituents in oak, but slowly dissolve into wine - berry, vanilla, and coconut



MEAD DEFECTS

Mead defects or wine faults are unpleasant characteristics that affect a meads aroma, smell or appearance.



CAUSES OF MEAD FAULTS

Yeast-induced spoilage

- *Brettanomyces sp.*
- *Zygosaccharomyces sp.*
- *Schizosaccharomyces sp.*

Bacteria-induced spoilage

- LAB
- *Acetobacter sp.*, *Gluconobacter sp.*

Mould-induced spoilage

- Cork taint

Technological fault

- Yeast taint, sulfur taint



BRETTANOMYCES SP.

- **a distinct haziness** is reported to develop at less than 10^2 cfu/ml.
- *B. intermedius* and *B. lambicus* produce compounds that possess **sweaty, leather, barnyardy or manure taints.**

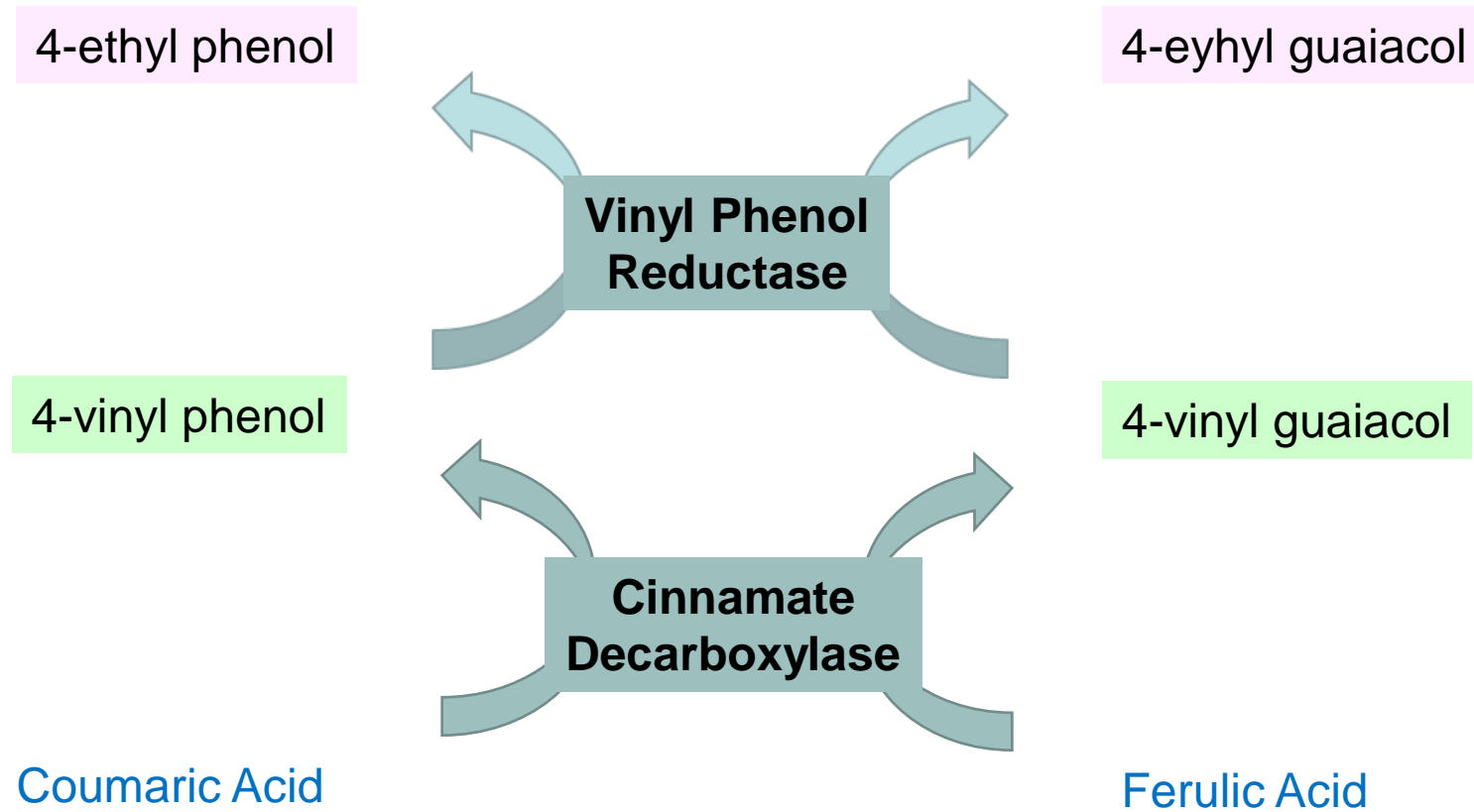
2-acetyltetrahydropyridines

Isovaleric acid

Volatile phenols



- How?



ZYGOSACCHAROMYCES SP.

- can generate both flocculant and granular deposits
- high resistance to yeast inhibitors, highly tolerant of ethanol (18%)
- produce enough **acetic acid**, **higher alcohols** and **diacetyl** to taint the wine.
- effectively **metabolizes malic acid**, resulting in an undesired reduction in acidity and rise in pH.



ACETIC ACID BACTERIA

How?

- Production of high levels of acetic acid (volatile acidity) and ethyl acetate.

Acetic fermentation



Estrification



TOURNE

Lactobacillus brevis, Oenococcus oeni

How?

- **fermentation of tartaric acid to oxaloacetic acid.**
- depending on the strain, oxaloacetate is subsequently metabolized to **lactic acid, succinic acid, or acetic acid and carbon dioxide.**
- other off-odors may develop.
These often are characterized as sauerkrauty or mousy.
- associated with the rise in pH is the development of a flat taste.



AMERTUME

Lactobacillus brevis, L. buchneri

How?

- The strains are characterized by the ability to **oxidize glycerol to acrolein**, or **reduce it to 1,3-propanediol**.
- Alternative metabolic routing of glycerol may increase the concentrations of aromatic compounds, such as **2,3-butanediol and acetic acid**.
- accumulation of carbon dioxide
- a doubling of the volatile acidity



GERANIUM TAIN

- in wines that have been preserved with sorbic acid (E200) or potassium sorbate (E202).
- How?

is reduced by the lactobacilli present in the wine to a compound called

2-ethoxy-3,5-hexadiene - it is the volatile ether responsible for the **smell of geranium.**



CORK TAINT

- **Odor type: musty, earthy, moldy, earthy, chemical.**

- compounds from the haloanisole group:

2,4,6-trichloroanisole (TCA) (86%)

2,4,6-tribromoanisole (TBA)

1-octen-3-one (73%)

2-methylisoborneol (41%)

guaiacol (30%) – *Streptomyces, Bacillus subtilis*

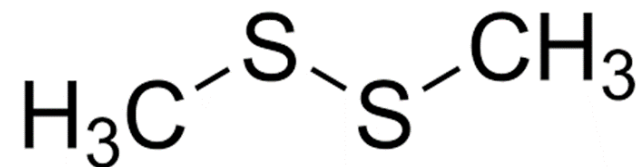
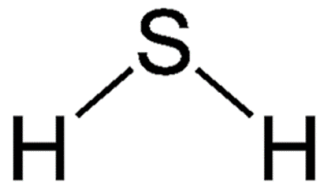
1-octen-3-ol (19%)

geosmin (14%) - *Penicillium, Streptomyces*



SULFUR COMPOUNDS, INCLUDING THIOLS, COMMONLY FOUND IN MEAD

Compound	Aroma description	Aroma threshold (µg/L)
Hydrogen sulfide	rotten egg	10–80
Methanethiol (methyl mercaptan)	cooked cabbage, onion, putrefaction, rubber	0.3
Ethanethiol (ethyl mercaptan)	onion, rubber, natural gas	1.1
Dimethyl sulfide	asparagus, corn, molasses	25
Diethyl sulfide	cooked vegetables, onion, garlic	0.93
Dimethyl disulfide	cooked cabbage, intense onion	1529
Diethyl disulfide	garlic, burnt rubber	4.3
3-(Methylthio)-1-propanol (methionol)	cauliflower, cabbage, potato	500
Thiazole	popcorn, peanut	50



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