Introduction

This is a preview which only displays sample 1: wet cardboard.

Get the full document here: https://artoftasting.nl/product/wine-faults-information-booklet/

This document provides extensive information about 10 flavour compounds that compounds that are associated with wine faults. It is meant to accompany the set of wine faults, which are available in a tasting kit and in flavouring vials. These are linked below.

Tasting kit (containing wines with the compounds pre-added):
https://artoftasting.nl/product/tasting-kit-faults/

Flavouring vials (allowing you to make your own flavour additions to wine):
https://artoftasting.nl/product/flavouring-vials-wine-faults/

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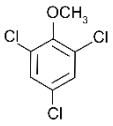
1. Wet cardboard

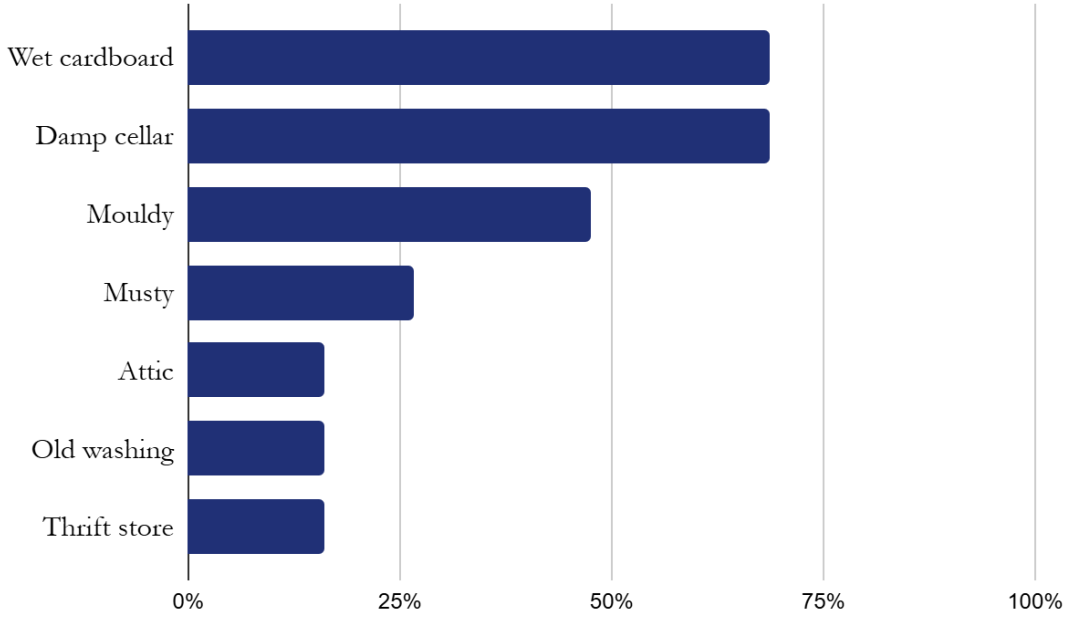


Flavour compound ⓘ

TCA (2,4,6-trichloroanisole)

Descriptors ⓘ

Wet cardboard, damp cellar, mouldy, musty, attic, old washing, thrift store, mushroom, swimming pool, leather, wet dog



Fault ⓘ

Cork taint

Origins ⓘ

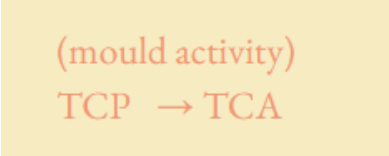
Taint originating from contaminated natural corks.

Moulds can produce TCA from its precursor TCP. These mould types include *Penicillium, Fusarium,* and *Trichoderma*.

The formation of cork taint starts in the growing environment of cork trees. In this environment, biocides (herbicides, pesticides and fungicides) are commonly used. These products contain chlorine. Consequently, chlorine contaminates the soil, and the chlorine is taken up by the roots of the trees. The chlorine then binds to bark-derived phenolic compounds to form TCP.

(biocide-derived) chlorine + (bark-derived) phenolics → TCP

TCP is an antimicrobial compound. It is actually the active compound in the commercial liquid antiseptic "TCP". Moulds convert TCP into TCA, which is a defensive mechanism. TCP is highly toxic to moulds, whereas TCA is not.



While TCP has an odour, its detection threshold is around 500 ng / litre (roughly a 100 times higher than TCA) and therefore it usually does not impact wine aroma.

TCA is a problem in all wine styles, i.e. white, red and rose, when fitted with a natural cork, all have equal chance of getting cork taint.

Other origins ⓘ

Incidentally, TCA can contaminate wine without the cork being the culprit. TCA can build in the winery environment as a result of mould growth, and subsequently taint wine. Using chlorine-based cleaning products predisposes the winery to this problem.

Mould growth on wooden pallets can lead to formation of a related flavour compound TBA (2,4,6-tribromoanisole), which can subsequently taint wine. TBA smells very similar to TCA.

Prevention ⓘ

Using alternative closures such as screw caps, glass stoppers or synthetic corks greatly reduces the incidence of cork taint.

Techniques have also been developed to produce TCA-free corks. DIAM has pioneered the supercritical carbon dioxide (CO_2) process, which they named the Diamond process. Supercritical refers to a state where CO_2 has properties of both liquid and gas. This is achieved through applying the right amount of pressure to CO_2. Ground cork particles are cleaned using supercritical CO_2. The CO_2 extracts any TCA present in the cork. The TCA and other substances are subsequently removed from the CO_2, and the CO_2 can be reused. Corks are created from the cork granules using a food-grade adhesive.

Amorim uses a system known under the name ROSA. This is essentially steam distillation, where steam under pressure forces out TCA and other volatiles from cork particles. The particles can then be assembled into a cork. Amorim has, more recently, created ROSA Evolution which can be applied to natural corks.

Amorim has continued to innovate and has recently released Naturity. This cleaning method relies on vacuum desorption. Applying a vacuum to corks drastically reduces the boiling point of TCA and therefore it volatilizes quickly. TCA can be efficiently removed using this method and it is applied to natural corks.

Remedies ⓘ

Polyethylene film can be used to absorb TCA effectively. This involves simply soaking the film into the wine. The downside is these films will also remove other (positive) wine flavour compounds.

Zeolite filters can absorb TCA in contaminated wines and are commercially available. Although it can affect other wine flavour compounds as well, preference tests have shown no difference between filtered wine and unfiltered wine.

Incidence ⓘ

Of bottles fitted with a natural cork, 1.3% have TCA, as determined by sensory analysis from bottles submitted to International Wine Competition between 2007 and 2017. For non-cork closures, this figure is 0.2%.

Bottle ageing ⓘ

TCA is a stable compound which is unaffected by bottle ageing.

Wine styles ⓘ

Cork taint is not acceptable in any wine style.

Assessment technique ⓘ

After swirling the wine, a short sniff of about one second should be enough to detect any TCA present. The flavour is moderately noticeable on the palate.

Compound class ⓘ

TCA is a phenolic compound, or more specifically, a haloanisole. Haloanisole denotes the compound contains a halogen group, such as chlorine or bromine.

Precursor ⓘ

TCP (2,4,6-trichlorophenol)

Threshold ⓘ

The detection threshold is about 2 nanogram / litre. This sample contains 16 ng / litre.

Concentrations in wine ⓘ

Severely cork-tainted wine can contain as much as 37 ng / litre [1].

Presence elsewhere ⓘ

TCA can also be a problem in other products, such as coffee and tea.

Specific anosmia ⓘ

1% (internal data), 4% (study [3])

Further reading ⓘ

1. Pollnitz, A., et al., *The analysis of 2, 4, 6-trichloroanisole and other chloroanisoles in tainted wines and corks.* Australian Journal of Grape and Wine Research, 1996. **2**(3): p. 184-190.
2. Tarasov, A., et al., *State-of-the-Art knowledge about 2, 4, 6-trichloroanisole (TCA) and strategies to avoid cork taint in wine.* Grapes and Wine, 2022: p. 324-353.
3. Teixeira, M. I., San Romão, M. V., Bronze, M. R., & Vilas Boas, L. (2006). 2, 4, 6-Trichloroanisole: a consumer panel evaluation. *Ciência Técnica Vitivinícola*, *21*(2), 53-65.

Glossary

Flavour compound

Name of the molecule/chemical compound.

Descriptors

A range of descriptors will be provided for each flavour compound, starting with the commonly agreed upon descriptor. These are intended to help you to build an association with the flavour compound. This list is a collection of descriptors that wine tasters have provided when smelling the compound. If you have an association with the flavour which is not in the list, feel free to share with Sietze (sietze@artoftasting.nl).

It is followed by a graph that shows the number of mentions of those descriptors by a group of wine tasters. On top is the most frequently mentioned descriptor.

Fault

The wine fault that this flavour belongs to.

Origins

Origin and formation of the flavour compound are discussed.

Other origins

How the compound may find its way into wine via a different route than its main origin.

Prevention

An ounce of prevention is worth a pound of cure. Ever so true in the context of wine faults. This section describes how to avoid the fault from forming in the first place.

Remedies

How to correct wines that are affected by the fault.

Incidence

How common the wine fault is.

Bottle ageing

How the flavour compound is affected by storage after bottling.

Wine styles

Some compounds, that would have otherwise been a fault, are acceptable in certain wine styles. If so, the styles are listed here.

Assessment technique

The most effective method of detecting the flavour compound is presented here. This is related to the volatility of the compound. Volatile compounds are easily picked up by swirling the glass and taking a short, one-second sniff. Less volatile compound are more easily picked up with the following method: cover the glass with your hand (make sure your hand is free of odours!), swirl for about five seconds, release the hand and simultaneously take a long, two-second sniff.

The palate is also mentioned here: compounds range from being very noticeable on the palate to not being present on the palate at all. For flavours that should be very noticeable on the palate, the following technique

may help: pinch your nose, take wine into your mouth, move the wine around in your mouth, swallow/spit the wine, release your nose. The flavour should now come through noticeably.

Compound class

Describes the chemical class/family of the flavour compound. This section may list related compounds.

Precursor

A precursor is a compound that becomes something else during a chemical conversion. In other words, this is your starting material before it becomes the flavour compound in question.

Some precursors have a flavour of their own (for example: TCP). Sometimes they are flavourless (for example: cysteine).

Threshold

The detection threshold is the minimum required quantity present of the compound to impart a flavour for 50% of the human population. For example, the threshold of TCA is 2 ng / litre. At this concentration, half of the population will be able to differentiate this wine from the same wine with 0 ng / litre of TCA. The detection threshold for flavour compounds may vary slightly between wine styles.

The conversion table is as follows:

1 g (gram) = 1000 mg (milligram)

1 mg (milligram) = 1000 µg (microgram)

1 µg (microgram) = 1000 ng (nanogram)

For reference, 1 mg is about the equivalent of a sugar granule.

The level of flavour addition to the sample in the tasting kit is also mentioned here (typically formulated at 8 times the threshold).

Concentrations in wine

Concentrations of the flavour compound, based on analytical data from literature.

Presence elsewhere

Presence of the compound other than in wine.

Specific anosmia

The percentage of the population that has specific anosmia towards this compound. This rate is based on academic studies and/or data collected during The Art of Tasting courses.

Specific anosmia is an inability to smell specific compounds, where your sense of smell is otherwise intact. We are equipped with around 400 types of olfactory receptors, however, individual differences exist. Some people may have some receptors not functioning or missing altogether. If one of the samples is not different to the reference sample to you, you may have specific anosmia towards the compound. This is genetically determined.

For example, about 1 in 8 people have specific anosmia to geraniol, which smells of roses. That does not mean that roses are odourless to you, because you will still be able to detect the other aroma compounds that

are released by roses. However, a rose will smell slightly different to you than to someone who is able to pick up geraniol.

Miscellaneous

Miscellaneous information about the compound.

Further reading

A list of references used in the text, this may also lists additional sources not mentioned in the text.