

DEFECTS IN CIDER:

Common defects found in cider, causes and solutions, preventative measures.

Cider defects/faults are broadly split into three categories – OXIDATIVE faults, REDUCTIVE faults, and MICROBIAL SPOILAGE faults.

OXIDATIVE defects are cider faults, off aromas that occur due to oxidation – exposure to too much oxygen/air, without any compounds present to prevent spoilage (for example, Sulphites, polyphenols and phenolic structure, controlled low pH etc. These generally are Browning, loss of fresh fruit aroma, Sherry/Madeira character, Ethyl acetate (solvent/nail polish remover), Acetaldehyde (bruised apple, apple skin), Acetic acid production (when Acetobacter is present). In addition, oxidation assists many bacterial/microbial and spoilage yeast infections to thrive and develop.

REDUCTIVE DEFECTS are cider faults that usually appear due to strained yeast and lack of oxygen, caused by sulphur-containing compounds produced under low YAN/low O₂/stressed yeast conditions. These mainly are sulphur compounds such as Hydrogen Sulphide (H₂S; rotten egg), sulphur dioxide (struck match, burnt sulphur), mercaptans (burnt rubber, garlic) and DMS/DMDS/DEDS (Dimethyl sulphides and disulphides - onion, garlic, cooked vegetable aromas).

BACTERIAL/MICROBIAL SPOILAGE often occurs due to poor sanitation and storage, often accelerated due to high amounts of dissolved oxygen, sometimes from organic material (gross lees) if not racked/stored appropriately. Faults include off aromas from Brettanomyces (barnyard, horse sweat, leather, smoky), other spoilage bacteria causing indole, skatole (manure/feces), Mousiness (mouse cage, rodent bedding), flat oxidation style faults caused by film yeast, Volatile acidity (acetobacter).

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MOST COMMON CIDER FAULTS THAT WE WILL BE TESTING TODAY:

AROMA: Rotten egg.

Compound: Hydrogen Sulphide (H_2S).

Causes:

-Lack of nutrients during fermentation (AF), excessive clarification before fermentation (low turbidity, long clarification with pectic enzyme often leads to this), Nitrogen starvation (low YAN), fermentation temperature too low, yeast strain, lack of oxygen during the start of active fermentation, too much SO_2 during fermentation.

FIX: If identified early (during active fermentation), oxygenation/splashing, pump over to incorporate air. After fermentation – $CuSO_4$ (copper sulphate) + autolyzed yeast hulls to remove Cu remaining in solution.

N.B. Very careful with dosage – maximum residual copper allowed = 1 mg/L. Yeast hulls and mannoproteins can be also used on their own, for a Natural cidermaking or low SO_2 approach.

AROMA: BARNYARD, HORSE BLANKET, sometimes SMOKY, LEATHER.

Compound/bacteria: Brettanomyces (Or just Brett for short).

Cause: Hygiene and cleanliness, redox control. Brett contamination combined with inadequate microbial control (insufficient SO_2 , poor sanitation, oxygen exposure).

REMEDY: Nothing much can be done about this unfortunately once infected. Best remedy is to carefully blend with other cider, increasing SO_2 . Rate of infection/Brett can be reduced by filtering (very deep filtration – <0,45-0,65 micron sterile filter). This will not help much with aroma, but will stop further development.

HOW TO AVOID: clean, clean, clean! Wash apples before pressing, ensure tanks, hoses, pumps are sterilised. An excellent tool in reducing the amount of active Brett population and inhibiting its growth is a product called CHITOSAN (derived from *Aspergillus niger*). Use as a preventative, and also once infection is detected to reduce the effects and stop further contamination. Excellent for low/no SO_2 ciders.

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AROMA: Papery, wet cardboard, stale apple juice.

Bland (lacking fresh fruit/citrus/floral aromas)

Fault: OXIDATION (Trans-2-nonenal). This is an early oxidation fault.

Causes: Too much exposure to oxygen (Oxidation), lack of SO₂ control.

FIX: Hard to fix completely, but addition of SO₂ helps reduce stop further oxidation and “freshen” the cider up a bit, combined with CASEIN fining (potassium caseinate), which attaches to and fines/clarifies oxidized phenolic compounds and browning products from the cider). PVPP can also help, but Casein is usually the go-to solution. I would recommend blending this remedied cider with a younger fresher cider to build back character, as this fault is not something that can be completely fixed, just cleaned up a little.

AROMA: Vinegar (VA)

Fault/compound: Acetic acid (vinegar), produced by Acetobacter. This fault is also known as VA (Volatile acidity)

CAUSE: Hygiene and cleanliness, redox control. Acetobacter is basically always present in juice/cider. Acetobacter requires oxygen to produce acetic acid. Acetic acid production can be prevented with SO₂ control, low O₂ levels and additionally using products such as CHITOSAN or sterile filtration, to remove/inhibit acetobacter before its development.

FIX: Nothing can really be done once cider has a noticeable amount of Acetic acid. Acetic acid is detectable at very low concentrations and therefore blending with clean cider is also problematic.

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OTHER DEFECTS/AROMAS to take note of:

Mercaptans (Thiols)

AROMA: Burnt rubber, light garlic, plastic, skunky notes

Form when H_2S reacts with ethanol (if a cider with “EGG/ROTTEN EGG” fault is left to continue aging)

Cause: continued stress, reductive conditions

DMS (Dimethyl Sulfide)

Asparagus, sweetcorn, stewed vegetables

Appears post-AF (1–4 weeks)

Causes: SMM breakdown, low NTU, nutrition issues, reductive storage

Can sometimes be reduced with aeration + tannins + hulls

Disulfides (DMDS, DEDS)

Strong garlic, onion, fetid sulfur

Form when mercaptans oxidize

Cause: untreated mercaptans + oxygen exposure. Difficult to treat. Requires reduction to mercaptans to be treated.

Acetaldehyde

AROMA: Bruised apple, cut apple, apple skin, sherry aroma

Appears during fermentation as an intermediate and can remain as a side product after AF if fermentation is weak, stressed. Can also form later via oxidation of ethanol to acetaldehyde.

Cause: Stressed fermentation, nutrient deficiency (low YAN, lack of microelements, mannoproteins etc), too much SO_2 , oxidation during aging.

Can be reduced by keeping on lees after fermentation, battonage, SO_2 additions after ferment helps a little, but will not fix.

Small amounts add character, fruity aromas. Too much becomes a fault.

Ethyl Acetate

AROMA: Low concentration: Pear drops, fruity (sweet fruit). At high levels – nail polish remover (acetone), solvent, glue.

Caused by elevated amounts of acetic acid (VA). Ethyl acetate is an ester formed from ACETIC ACID + ETHANOL. Elevated VA + oxygen + ethanol will cause this to occur.

Can only be prevented, not really treated. (see microbial defects – acetic acid (vinegar). Avoid this to avoid Ethyl acetate).

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