Hydrogen Sulfide Production During Fermentation of Apple Juice Concentrate from Different Geographic Origin Varies, Despite Initial Total Yeast Assimilable Nitrogen (YAN) Concentration

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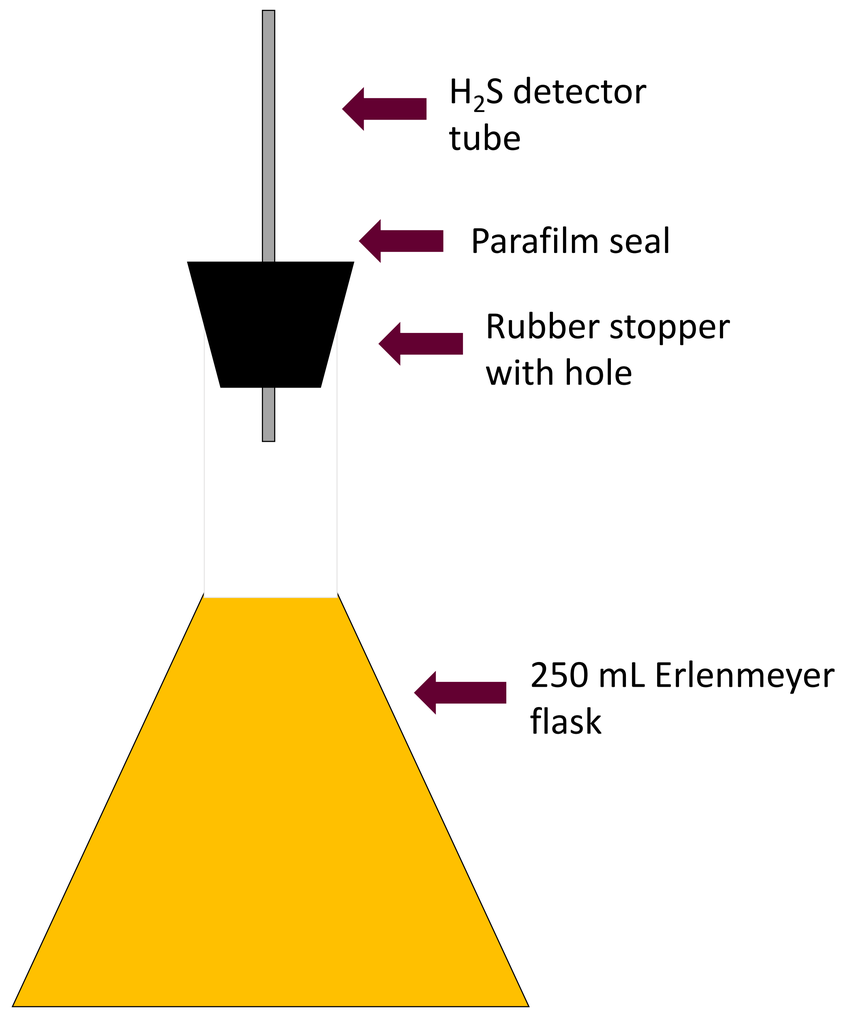
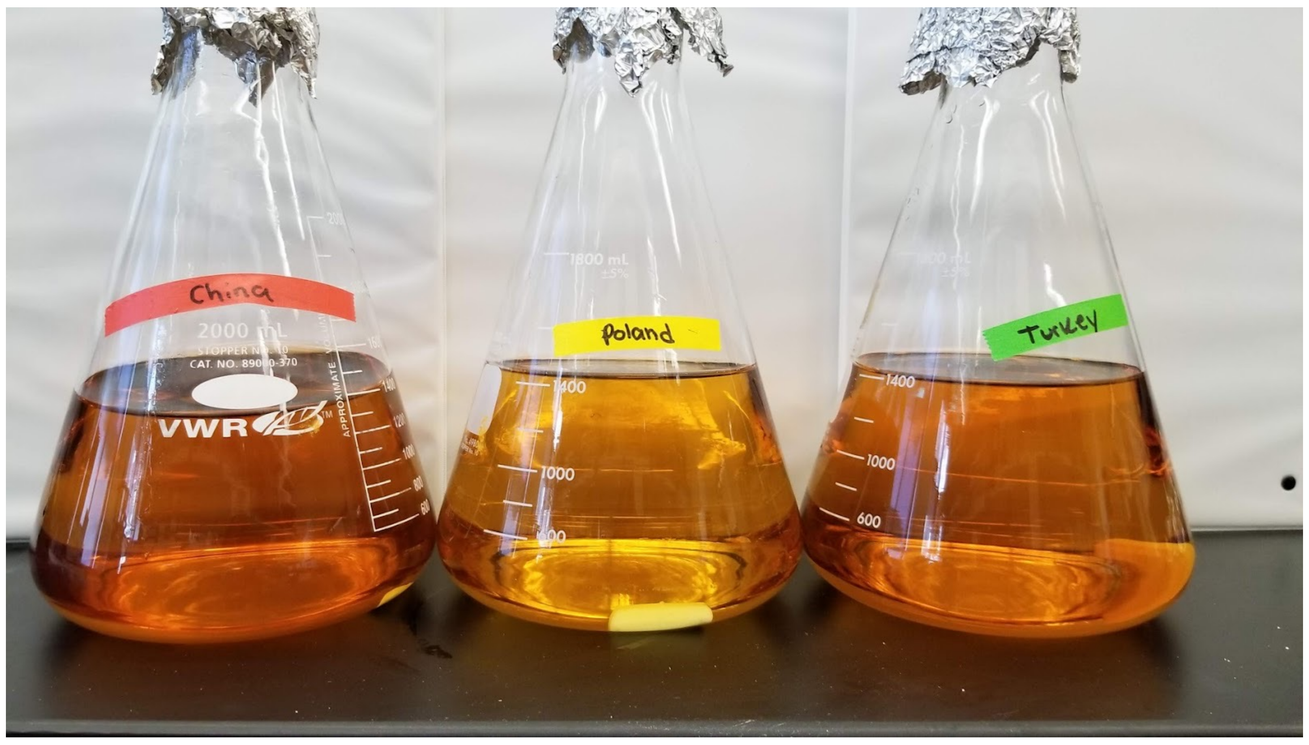
Abstract

Apple juice concentrate (AJC) is commonly used as a raw material for cider fermentation. AJC can be sourced from different geographic regions and may be obtained using very different evaporation conditions. Processing history and geographic origin of AJC are often not transparent to buyers of AJC. Hydrogen sulfide (H S) is a common volatile aroma fault arising during cider fermentation, and this fault has been linked to an insufficient prefermentation concentration of yeast assimilable nitrogen (YAN), which refers to the nitrogen available for yeast growth and metabolism during fermentation. As part of a project working toward optimization of YAN concentration for fermentation of AJC using different yeast strains, AJC samples were obtained from various sources and YAN was tested to find a suitable low-YAN substrate for the experimental model. Kroger brand frozen AJC was selected as the substrate, due to low baseline YAN value of 50mg/L. Kroger AJC cans were stamped with different countries of origin (Poland, China, Turkey) and upon visual inspection, the color of the reconstituted AJC samples varied from yellow to a deep orange, indicating potential chemical or processing differences. Despite color and geographic origin differences, YAN concentrations of the samples were consistent at or near 50mg/L. To compare the amount of H S produced upon fermentation of the reconstituted AJC from different regions, AJC was fermented using yeast strain UCD 522, a known high H S producing strain in 250mL flasks vented with H S detector tubes placed in a one-hole stopper, without the addition of yeast nutrients. The amount of H S generated during the fermentation of AJC from different geographic origins ranged from approximately 325 µg/ml to 600 µg/mL. This degree of variation was not expected and could reasonably translate to significant sensory differences in fermented cider. The variation may be attributable to differences in other chemical constituents that interact with YAN requirements for clean fermentation, such as low concentrations of vitamins and micronutrients, or the presence of anti-fermentative constituents such as furfural, which can result from Maillard reactions in fruit juice during the concentration process. Further research is warranted to determine the factors interacting with YAN concentration in AJC to contribute to elevated H S production in cider fermentation.

H_2S Measurement

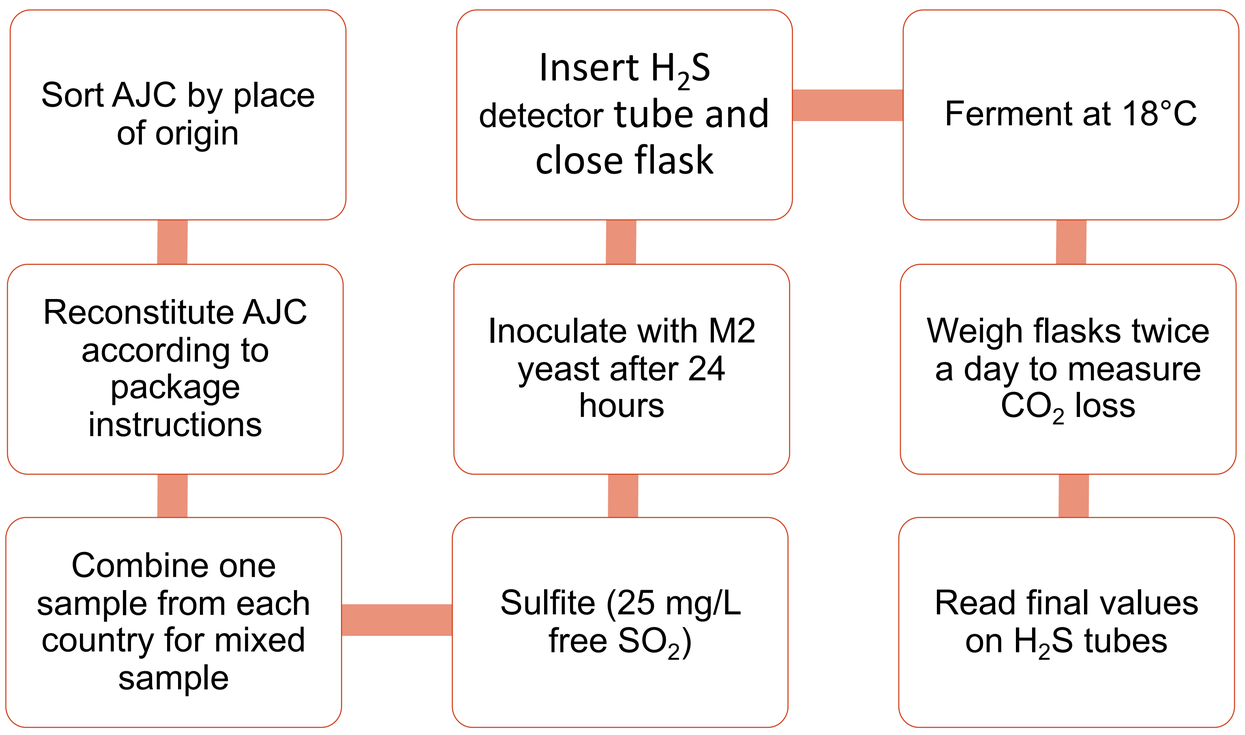


Color Differences Between Kroger Brand AJC



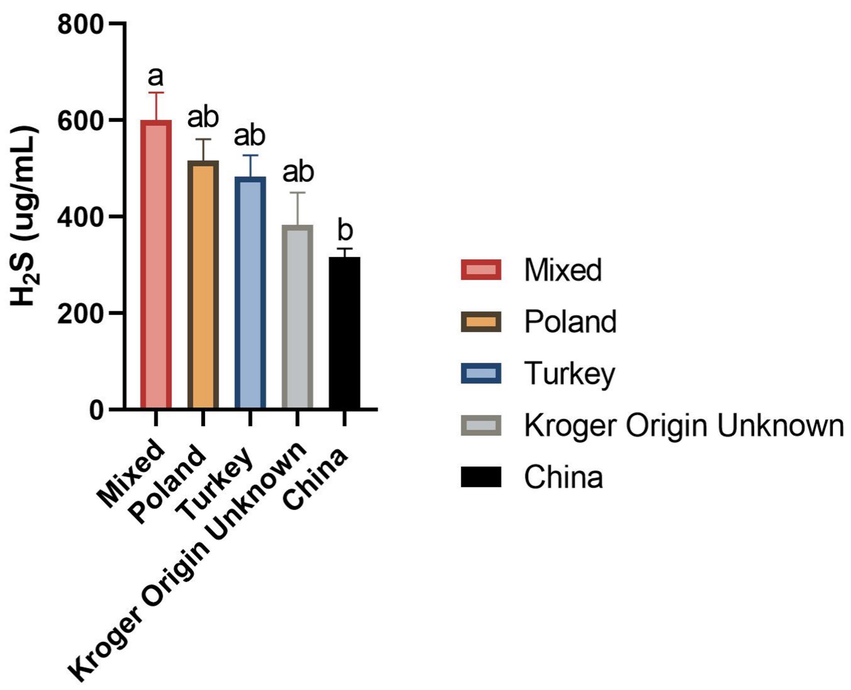
Methods

- AJC was bought from Kroger at the same time to test juice from the same or similar production lots.
- Microscale fermentation was used to ferment one can per sample.



H_2S Production

Total H_2S Produced from M2 Yeast Strain From Three Different Kroger AJC with Apples from Varying Origins



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