Remediation of Volatile Phenols in Smoke-Exposed Fruit

Tech ID: 34319 / UC Case 2023-9A6-0

ABSTRACT

Researchers at the University of California, Davis have developed novel enzyme compositions and methods that effectively hydrolyze smoke-derived phenolic glycosides in fruits and beverages to reduce undesirable smoke aromas and flavors.

FULL DESCRIPTION

This technology provides a suite of novel enzymes that hydrolyze glucoside and/or gentiobioside to break down smoke-associated volatile phenols bound in phenolic glycosides. These volatile phenols originate from wildfire smoke contamination affecting fruits, such as grapes, leading to smoky off-flavors in wines and other fermented beverages. The disclosed enzymes with identified amino acid sequences or mutants thereof, facilitate hydrolysis of bound phenols to aid in both accurate quantification and remediation of undesirable smoke aromas and flavors. Methods of remediating smoke aromas and flavors include enzymatic treatment of smoke-exposed fruit products and/or fermented beverages to release volatile phenols for removal or measurement, improving product quality and marketability.

APPLICATIONS

- Wine industry – treatment of smoke-exposed grapes and wines (red, white, rosé, dessert, fortified, sparkling.)
- Other fermented beverages – beer, spirits, cider, mead, sake, liqueurs, brandy.
- Fruit juice and concentrate production – apples, berries, stone fruits, tropical fruits.
- Analytical laboratories – precise quantification of volatile phenolic markers via enzymatic hydrolysis combined with mass spectrometry.
- Fermentation equipment and processing aids for volatile phenol reduction during production.
- Biotechnology companies developing enzyme formulations for sensory quality improvement.

FEATURES/BENEFITS

- Selective and effective enzymatic hydrolysis of phenolic glycosides linked to smoke aromas and flavors.
- Enables improved quantification of volatile phenols using mass spectrometry.
- Reduces undesirable smoky flavors without stripping desirable aromas or flavors.
- Compatible with a wide range of fruit products and fermented beverages, including diverse wine types.
- Operates under mild conditions avoiding harsh chemical treatments.

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OTHER INFORMATION

KEYWORDS

enzymatic hydrolysis, fruit fermentation, glycosidase enzymes, phenolic glycosides, smoke taint, volatile phenols, wine quality, wildfire smoke, winemaking, yeast lees

CATEGORIZED AS

- **Agriculture & Animal Science**
  - Other
  - Processing and Packaging

- Genetically engineered enzyme variants allow activity optimization.
- Can be applied during various stages including fermentation and post-fermentation processing.
- Mitigates smoke aromas and flavors in wines and other beverages caused by wildfire exposure.
- Addresses difficulties in detecting and accurately measuring bound volatile phenols.
- Addresses limitations of current remediation strategies that often remove desirable sensory components.
- Solves need for cost-effective, gentle alternatives to chemical or physical smoke aroma and flavor removal methods.
- Overcomes challenges in processing smoke-exposed fruit to produce marketable products.
- Functions in a wide range of sugar concentrations and pH profiles.

- **Biotechnology**
  - Food

RELATED CASES

2023-9A6-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20250129315	04/24/2025	2023-9A6
United States Of America	Published Application	20250122451	04/17/2025	2023-9A6

RELATED MATERIALS

- Discovery of Potent Glycosidases Enables Quantification of Smoke-Derived Phenolic Glycosides through Enzymatic Hydrolysis - 05/10/2024

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Engineered Phosphite Dehydrogenases for Recycling Orthogonal Noncanonical Cofactors
- Biological Conversion of Ethylene to n-Butanol and Other Chemicals Using E. Coli
- A Thermostable Lipase for PU Degradation
- Novel Enzymes Enabling Microbial Fermentation of Sugar into Long Chain Alcohols

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