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Enzymatic diversity among pectinolytic activities in yeast

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It has been reported that certain yeast species display pectinolytic activities, which mainly result from the activity of polygalacturonases.

These yeasts have reported positive effects on taste complexity and organoleptic richness in winemaking and cocoa production.

Nevertheless, a detailed understanding of how pectinolytic yeasts contribute to wine and cocoa quality needs further scientific work.

In this work, strains from different wine-associated yeast species will be screened for their native polygalacturonase activities.

Background

Yeast in winemaking

- Conventional yeast (S. cerevisiae)
  - Complete fermentation of must sugars to ethanol due to high ethanol tolerance and low pH (3.0-4.0 pH)

- Non-conventional yeast (Non-S. cerevisiae)
  - Produce broad range of secondary metabolites
  - Secretion of extracellular enzymes

Pectinolytic enzymes in winemaking

- Increase juice yield
- Increase concentration & variety of flavor compounds
- Greater colour stability
- Easy filterability
- Speeds up settling
- Shortens filtration time and stabilization processes
- Color and flavor extraction

Aim: Screen pectinolytic yeasts for improving clarification and organoleptic properties in winemaking

Method

1. 5 μL of 0.2 OD pre-grown cells
2. Rich medium pH 5.0
3. 2% polygalacturonase
4. Synthetic grape must medium pH 3.5-5.5% polygalacturonase
5. 30°C
6. Wash with 6 % HCl for 20 min
7. Measure halos

Results

In total, 306 yeast strains from 17 different yeast species have been screened for polygalacturonase activity.

YEAST SPECIES STUDIED

- Saccharomyces cerevisiae
- Hanseniaspora uvarum
- Kluyveromyces marxianus
- Torulaspora delbrueckii
- Kloeckera apiculata
- Candida sp.
- Cryptococcus sp.
- Rhodotorula mucilaginosa

68 of the 306 yeast strains showed polygalacturonase activity in rich medium pH 5.0 at 30°C

14 of the 68 yeast strains also showed polygalacturonase activity in synthetic grape must medium pH 3.5 at 20°C

Conclusions and Future Perspectives

- Yeast strains from different species were studied for phenotypic diversity in polygalacturonase enzyme secretion under optimum and winemaking conditions.
- The 14 strains that are PG-positive under winemaking conditions will be characterized for the quantification of their PG activity, their aroma contributions, and their impact on winemaking processing such as filtration time, clarity, and color for future studies.
- To understand the genetic basis of the enzymatic and metabolic information acquired so far, the genomic DNA of superior strains will be subjected to whole-genome sequencing (WGS), and bioinformatics analysis will be conducted to search also for other potential Cgt7-like genes.

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