VW1

Prepared for

The Alcohol School Concise

in Collaboration With

WIRSPA

(October 8-11 2019)

By Vivian Wisdom

Email :vivwisd@gmail.com

High Ester Production via Spontaneous Fermentation & Bacterial Growth

The Alcohol School Concise
Caribbean Distilling Seminar

Introduction

- As a rule presence of high esters is also associated with that of higher alcohols, usually spicy in nature
- High ester rum fermentations are usually associated with long and slow fermentation processes
- Rums with high esters are more full bodied

Introduction

"No two estates produce the same character of flavour.

The differences are due to the variations in the bacterial flora and

in the composition of the material being fermented and

the conditions under which it exists".

(HH Cousins, 1908)

Context of high ester Rum

- Two main categories of flavor active esters
- Acetate esters
  - Ethyl acetate (solvent like)
  - Isoamyl acetate(ripe banana)
  - Isobutyl acetate(fruity)
  - Phenylethyl acetate (floral)
- Medium to long chain fatty acid esters
  - Ethyl hexanoate (apples, pear)
  - Ethyl octanoate (apple)
  - Ethyl decanoate (floral)

Constituents of High Ester rums

- 97% ethyl Acetates
- 2% butyric Acid Esters
- 0.75% esters of higher molecular weights
- Traces of hexanoic alcohols
- Traces of higher alcohols of an aromatic nature

Development of Higher Ester Rums

- Ester levels vary in different Rums from as low as 0-10 ethyl acetate to as high as 1600ppm ethyl acetate.
- Not everyone will produce high ester rums for consumption but possibly want to add some flavor to an otherwise bland rum by blending.
- Lets consider 100 ppm as a starting point for high ester and move upwards.

How are they Made

For esters at lower end of the scale:

- Normally fermented wash is allowed to age by transferring to a separate holding tank and holding for at least a week.
- Fresh cane juice can be added to wash mixture,this will give a different bouquet to the rum.

- Can achieve up to 200ppm by this method
- Alcohol level will fall depending on amount of time held in store.

How are they Made

For higher ester levels:

- Usually associated with longer fermentation times,fifteen to twenty one days
- Media is more acidic pH as low as 3.
- Composition of the media is critical.
- Bacterial contamination is encouraged.

Generating the Media

- Cane Juice is produced by crushing fresh harvested cane
- Spontaneous fermentation of the cane juice by natural yeast
- Secondary fermentation by acetobacter producing Vinegar
- Allowing fermented juice to sit for long periods increase acidity
- Reuse of dunder to add acidity and also some high molecular weight organic acids

Critical Components

- Established Method
- Cane juice as a source of acidity
- Source of High molecular weight organic Acids
- Amount of Acid used in mix
- Water source
- Fermentation Capacity

Culturing Organic Acid Bacteria

Naturally occurring bacteria cultured as part of acid slops

Culturing of bacteria from fermented residue which is allowed to propagate in the soil

Bacterial acid production

- Bacteria will feed on sugars forming acids
  - Acid slops provides a good source for bacterial culture
    - This is where yeast is added to acidic cane juice along with wash
    - This is allowed to ferment similarly to yeast propogation
    - Medium and long chain fatty acids are formed during this time
    - Propogated culture is then used as the innoculum for a fermenter

Bacterial acid production

- Organic acid producing bacteria from the ferment can be used as culture for a propogating pit.
- This pit can be maintained by periodically adding fresh wash mixture
- Pit can be agitated to allow some oxygenation and so add to the diversity of bacterial flora present
- Yeast will utilize these fatty acids in ester synthesis.

Yeast Metabolism During Fermentation

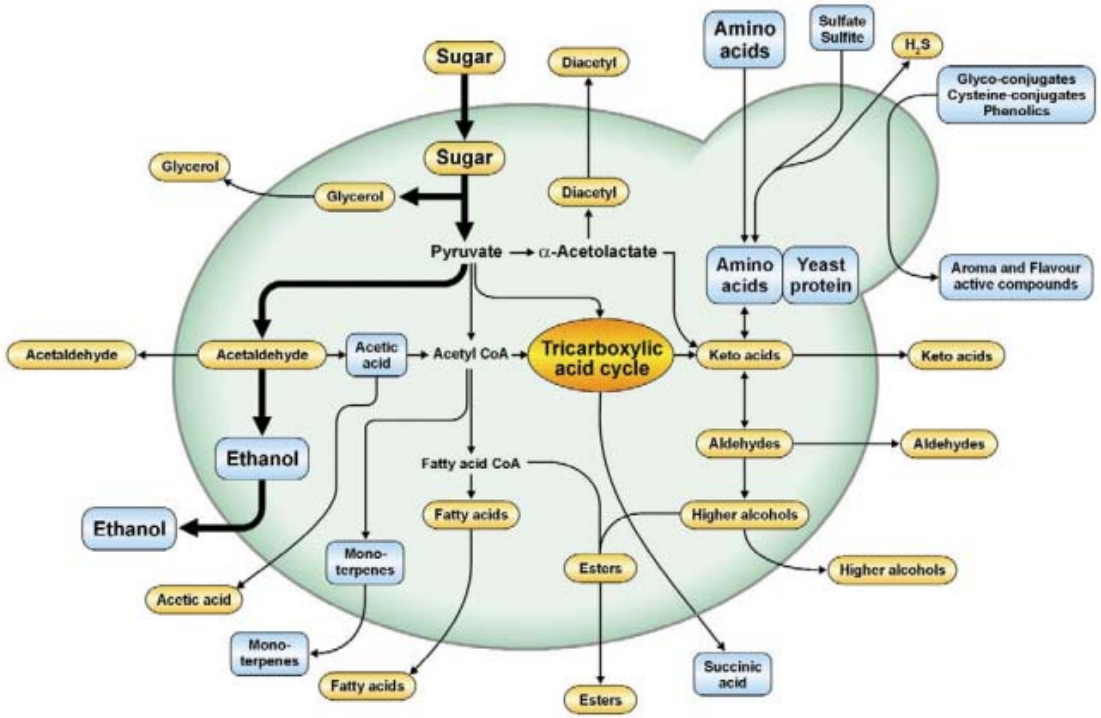
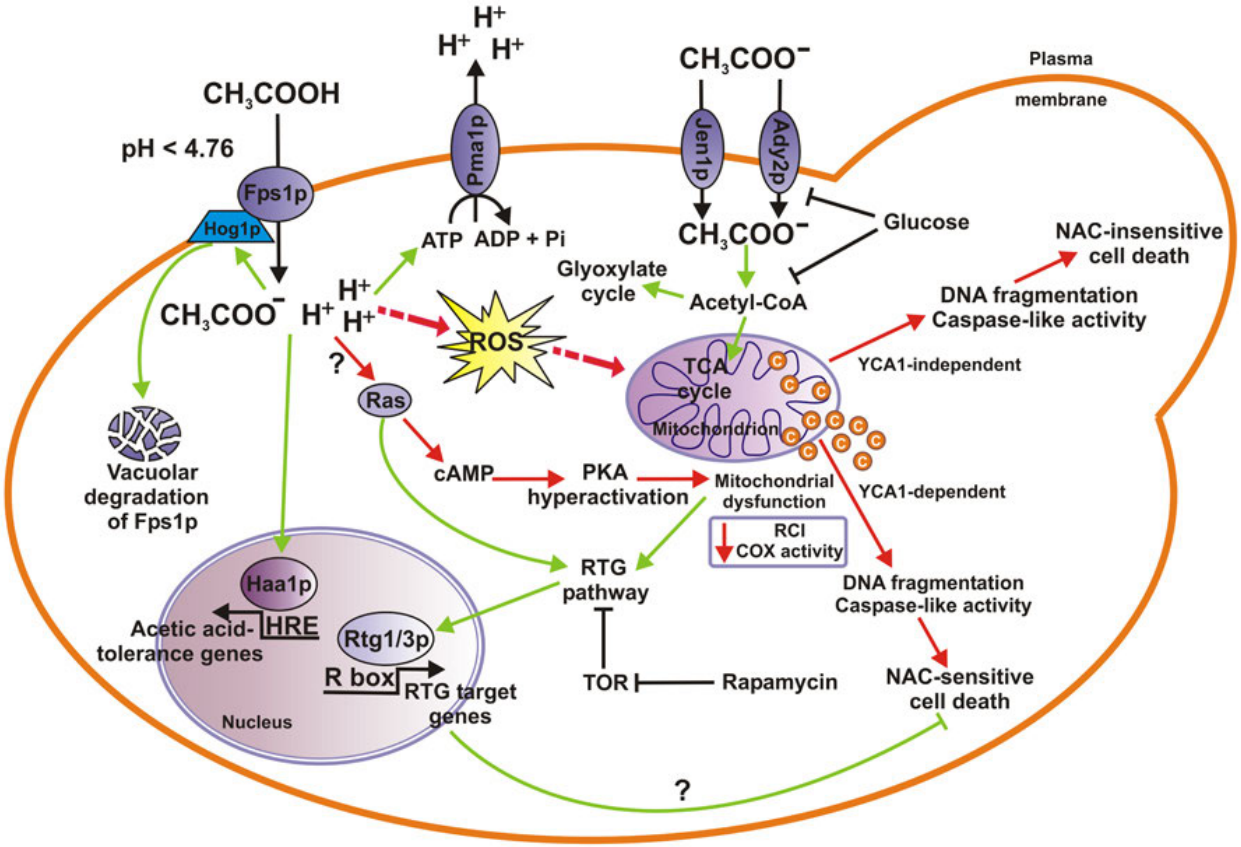


Figure 5. A schematic representation of derivation and synthesis of flavour-active compounds from sugar, amino acids and sulfur metabolism by wine yeast.

Yeast Metabolism during Fermentation



The End

Thanks for listening