**The second product to ferment the sugars :**

Next phase after the formation of alcohol from sugary solution such as syrup date, dates, , molasses, fruit juices is produce acetic acid, the second microorganisms (*Acetobacter aceti* ) is added to production of vinegar.

Acetobacter bacteria, all acetic acid bacteria are rod-shape, obligate aerobes, gram-negative which oxidized ethanol (ethanol is the common substrate in acetic acid fermentation formed as a result of fermentation of sugar) can produce vinegar up to 14% acetic acid, throw process called oxidative fermentations, acetic acid bacteria grow as a surface of the vessels due to their aerobic nature and active motility.

# Vinegar contains 4-8% acetic acid by volume.

Manufacture of vinegar into two steps:

1- Fermentation of sugar to alcohol (ethanol) – anaerobic process carried out by ***Saccharomyces cerevisiae***.

2- Oxidation of alcohol to acetic acid- aerobic oxidation carried out by acetic acid bacteria of genus ***Acetobacter aceti.***

**Vinegar**

**Sugar**

**Ethanol**

Backers Yeast Acetic acid bacteria

**:Practical experiments**

**1\* pH measure:**

**pH paper is a simple & easy but limited accuracy and is not suitable for colored solutions therefore prefer to use measuring devices.**

**2\* Titrable acidity :**

**To measure percentage of ionized & non-ionized acids ,unlike the pH reading which expresses the percentage of ionized acids only.**

The Titratable Acidity is a total amount of acid in the solution as determined by the titration using a standard solution of sodium hydroxide (NaOH) using the following formula.

1- Transfer (1 ml) of alcohol solution in 250 ml Erlenmeyer flask.

2- Add about 19 ml of distilled water and 12 drops of 10% Phenolphthalein as an indicator reagent.

3- Fill the burette with 0.1N NaOH Solution.

4- Titrate the mixture with 0.1N NaOH until the mixture starts to turn pinkish and stay pinkish, and then record the amount of 0.1N NaOH used for titration.

**ml of NaOH x Normality of NaOH x m.equivalent weight of acetic acid**

Titratable Acidity = × 100

**Weight of sample x Total titration volume**

**# m. equivalent weight of acetic acid = 0.06005**

**1 gm = Weight of sample #**

**20 ml (1 gm + 19 ml) Total titration volume =#**