Lab2

Production of ethanol and vinegar

Ethanol, also called ethyl alcohol, is a volatile flammable, colorless liquid, also called (spirit) it dissolve many ionic compounds.

Ethanol can be produced by fermentation of sugar from sugar can, sugar beets, molasses and fruits. The most widely used is black strap molasses, which contain 35-40 % sucrose, 15-20% glucose and fructose, Molasses collected as a byproducts of can sugar manufacture.

The fermentation of molasses to ethanol is by the yeast called ***Saccharomyces cerevisiae***. Under anaerobic condition at 23-26 °C and its activity to 32 °C.

Vinegar production:

Vinegar was known as food preserving agent.

Vinegar is defined as "a liquid fit for human consumption, produced from a suitable raw material of agricultural origin, containing starch, sugars, by the process of double fermentation, alcoholic and acetous, and contains a specified amount of acetic acid."

Vinegar fermentation is essentially a two-stage process being the first one the anaerobic conversion of fermentable sugars to ethanol by yeasts. Usually ***Saccharomyces ellipsoideas*** or ***S. cerevisiae***, and the second is the aerobic oxidation of ethanol to acetic acel by bacteria, ***Acetobacter aceti*** or ***A.xylinium.***

1- $C_6H_{12}O_6 \xrightarrow{Anaerobie} 2C_2H_5OH + 2Co_2$ at 30-32 °C

glucose ethanol

2- $C_2H_5O + O_2 \xrightarrow{Aerobic} CH_3COOH + H_2O$

Ethanol acetic acid

Lab2

Acetic acid yield from fermented sugar is about 40% vinegar is a clear aqueous liquid, colorless or the color of the raw material which used for its production, it contain amino acids about 18 amino acids, vitamins and 40% acetic acids. However, vinegar is not called vinegar until it contains 4% acetic acid.

There are many kinds of vinegar, which are:

1- Wine vinegar: which obtained from wine fermentation.
2- Cider vinegar: which is prepared from apple wine.
3- Honey vinegar: which obtained from honey.
4- Malt vinegar: is produced from malted barley.
5- Rice vinegar: is prepared from rice.
6- Molass vinegar, is produce from sugar syrup or molasses, it serves to make use of the byproducts of the sugar industry.

Procedures:

1- Put 200 ml of molass (20-25%) into sterile flasks, then inoculiate it with the yeast ***Saccharomyces cerevisiae*** [1.5 g/100 ml]
2- Close the flasks, to obtain anaerobic condition then incubate at 20-30 °C for one week.
3- Alcohol must be obtained by precipitation or filtration of the fermented molass.
4- Take 1 ml of filtrate + 5 ml of potassium dichromate + 1 ml of H_2So_4 (Cone) $\xrightarrow{\text{heating}}$ green color appeared which indicate the presence of alcohol.
5- Take the filtrate and put it in to the flasks, then inoculate it by 5 ml of **Acetic aceti** culthure or by **old vinegar**.

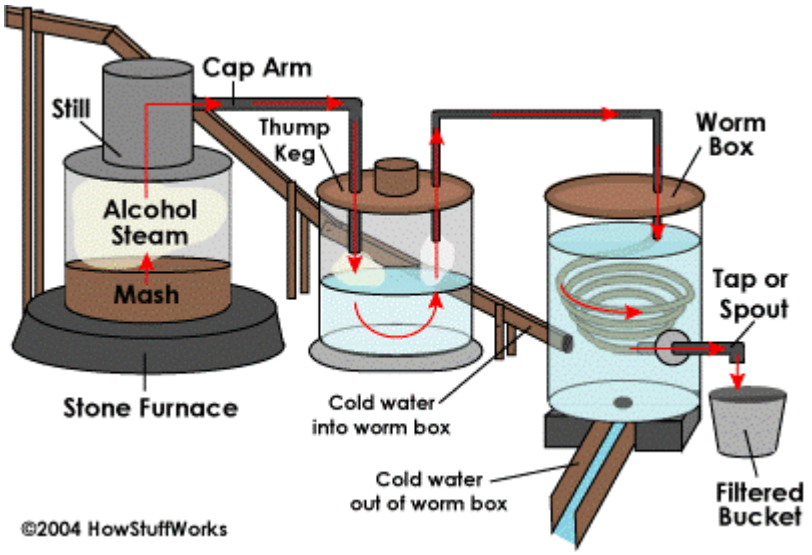
6- Incubate the flasks in shaker incubator at 28-30 °C for a week. We can know the finishing af fermentation by detect the concentration of alcohol which must reach 0.3% , at this state the fermentation must be stopped because the vinegar may be oxidate to Co2 and H2O again.

7- Vinegar must be filtrated and pasteurized by heating before it canned.

Estimation of total acidity of vinegar.

Total acidity was evaluated by acid-base titration with standardized solution of 0.1 N Sodium hydroxide, (NaoH), using phenolphthalein as an indicator and the results were expressed as acetic acid conc.

$$\%\,TA\,(total\ acidity)\ = \frac{(ml\ of\ NaoH\ )N.of\ NaoH\ X\ 60.05\ (equevelent\ weight)}{sample\ volume}$$



(1) Production of ethanol