

## BIO -ETHANOL:

Bio-ethanol is an environmentally friendly fuel and a renewable source of energy while it burns more cleanly and with reduced emissions of CO<sub>2</sub>, a greenhouse gas. Bio-ethanol is a versatile transportation fuel and fuel additive that offers excellent performance and reduced air pollution compared to conventional fuels. Its production and use adds little, if any, net release of carbon dioxide to the atmosphere, dramatically reducing the potential for global climate changes.

Bio-ethanol is produced by the fermentation of sugar, Carbohydrates such as starch from cereal and tuber crops - which is enzymatically converted into simple sugars - and natural sugars from sugar beet, sugar cane and sweet sorghum crops are fermented using yeast to produce a mash containing ethanol and water. **ETHANOL**

### **PRODUCTION PROCESS:**

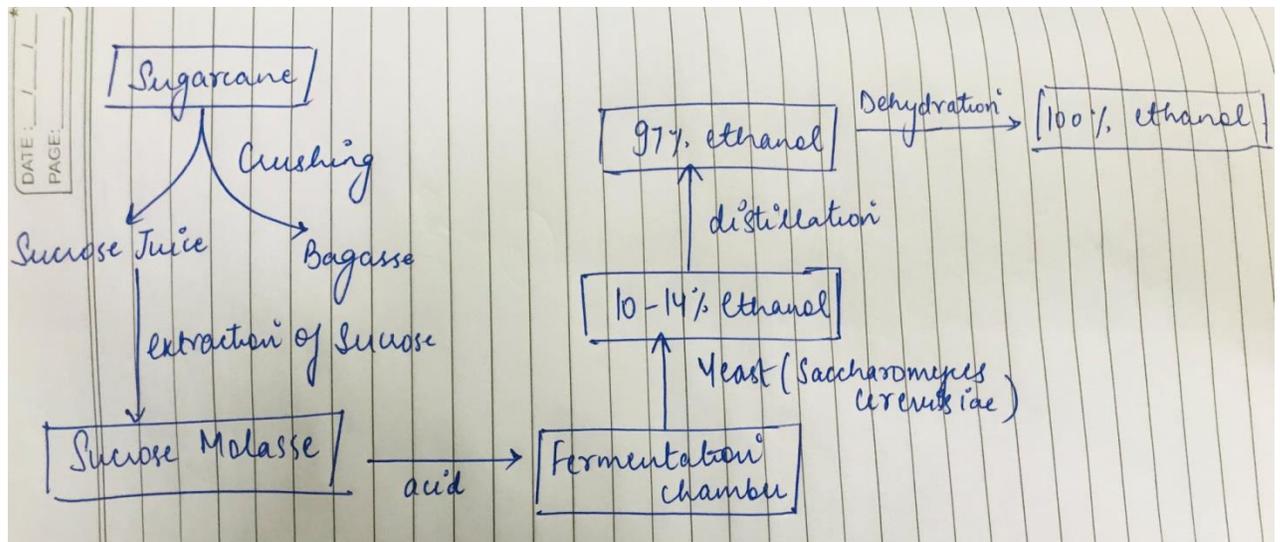
1) **CRUSHING-** sugarcane is harvested and then crushed which results into production of sucrose juice and bagasse (waste of sugarcane), after this sucrose is extracted producing sucrose molasse.

2) **FERMENT SUCROSE-** Molasses are then shifted to the fermentation chamber where acid is added which helps in killing bacteria. Then yeast is added which further helps in breakdown

of sugar resulting in production of 10-14% ethanol and 86-90% water.

**3) DISTILLATION-** Distillation separates ethanol and water mixture, it helps in purification that is removal of water and production of 97% ethanol and 3% water is left.

**4) DEHYDRATION-** Dehydration is the step of removing the last of the water to produce anhydrous ethanol, or bio-ethanol.



## Advantages Of Bio-ethanol

1. The overwhelming advantage of bio-ethanol for the environment is its potential to be carbon neutral on a lifecycle basis - meaning the carbon dioxide (CO<sub>2</sub>) emitted during its use is offset by the absorption from the atmosphere during crop growth.

2. *With emissions of CO<sub>2</sub> and nitrous oxide taken into account, some studies suggest that lifecycle greenhouse gas emissions can be reduced by 90% with bio-ethanol compared to petrol.*
3. *Using sugar cane as the crop and large amounts of bagasse (the remaining wood fibres after the juice is extracted) used for heat energy.*

## **DISADVANTAGES OF BIOETHANOL**

1. *Biodiversity - A large amount of arable land is required to grow crops. This could see some natural habitats destroyed including rainforests.*
2. *Due to the lucrative (profitable) prices of bioethanol some farmers may sacrifice food crops for biofuel production which will increase food prices around the world.*

## **Production of Bio fuel (Ethanol)**

*Ethanol can be commercially produced by a variety of methods. The fermentation method is the one, which make use of naturally occurring renewable raw materials. Any material, which is capable of being fermented by enzymes, can serve as a source for ethanol production. There is an abundance of farm crops/residues which can be of being used as raw materials in the fermentation process leading to ethanol production. Starch based feed stock include a variety of cereals, grains and tubers like cassava, yam, sweet*

potato etc. Starchy feed stocks can be hydrolyzed to get fermentable sugar syrup and give an average yield upto 42 litres of ethanol per 100 kg of feed stock.

### **General production process (STARCH COMPONENTS)**

The starch bearing materials are steamed for one to two hours at two to three atmospheric pressures to gelatinize the starch present. The resultant pulp is cooled to about 50°C and an equal volume of water and 10 per cent malt is added. The mixture is allowed to stand for a short while, when the starch is converted to dextrin. The temperature is gradually raised to about 50°C while dextrin is converted first to maltose and then to dextrose. Yeast is then added to the liquid mash and fermentation is allowed to proceed for a couple of days. The yeast converts sugar into ethanol. The ethanol water mixture is sent through additional distillation columns and dehydrations to produce ethanol.