

BIO-FUEL PRODUCTION

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What is BIOFUEL?

- ▶ Bio fuel is a type of fuel whose energy is derived from biological Carbon fixation.
- ▶ Bio fuels derived from biomass conversion , liquid fuel & solid biomass.
- ▶ Rudolf diesel was inventor of biodiesel on the year 1890.

Common examples of Bio fuels

- ▶ 1) ETHANOL
- ▶ 2) VEGETATIVE OIL
- ▶ 3) ANIMAL FATS
- ▶ 4) GREEN DIESEL

Classification of Bio Fuel

- ▶ First generation Bio Fuel
- ▶ Second generation Bio Fuel

TYPES OF BIOFULES

First generation biofuels

- Bioalcohol
- Biodiesel
- Vegetable oil
- Biogas
- Syngas
- Solid biofuels

Main two types

Second generation biofuels

First generation Bio Fuel

- ▶ They are also called as conventional Bio Fuel.
- ▶ The first generation Bio Fuels refers to the fuels that have been derived from sources like starch , animal fats & vegetable oil .
- ▶ The oil is obtained using the conventional techniques of production.
- ▶ EX-bio diesel , green diesel , bio ether , bio gas etc.
- ▶ This is mostly used in European countries.
- ▶ It is mineral acid and chemically known as fatty acid methyl.
- ▶ It is very commonly used when it is mixed with mineral oil.

Second generation bio-fuel

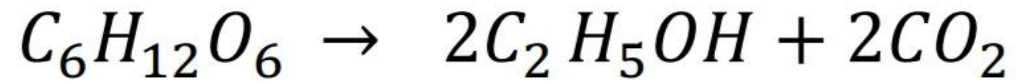
- ▶ These are the produced from sustainable feed stock.
- ▶ Sustainability of a feedstock is defined among others by availability of the feed stock on GHG gas emission and impact on biodiversity and land use.

Microorganisms in biofuel production

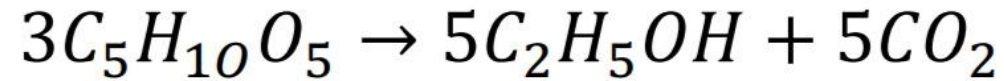
- ▶ Microalgae, bacteria ,fungi, yeast etc. are helps in biofuel production.
- ▶ Biodiesel production using microbial lipids, which is named as single cell oils has attracted great attention in the whole world.
- ▶ E.coli has the natural ability to synthesis fatty acids and amenable to genetic manipulation making it an ideal target for biofuel production.
- ▶ Most researched commercial micro organisms in biofuel production are
- ▶ FUNGI: *Trichoderma sp*, *Aspergillus sp*, *Saccharomyces sp*
- ▶ BACTERIA: *Zymomonas sp*. *Clostridium sp*.

Ethanol production

Carbohydrates: Cellulose Starch Glucose/sucrose

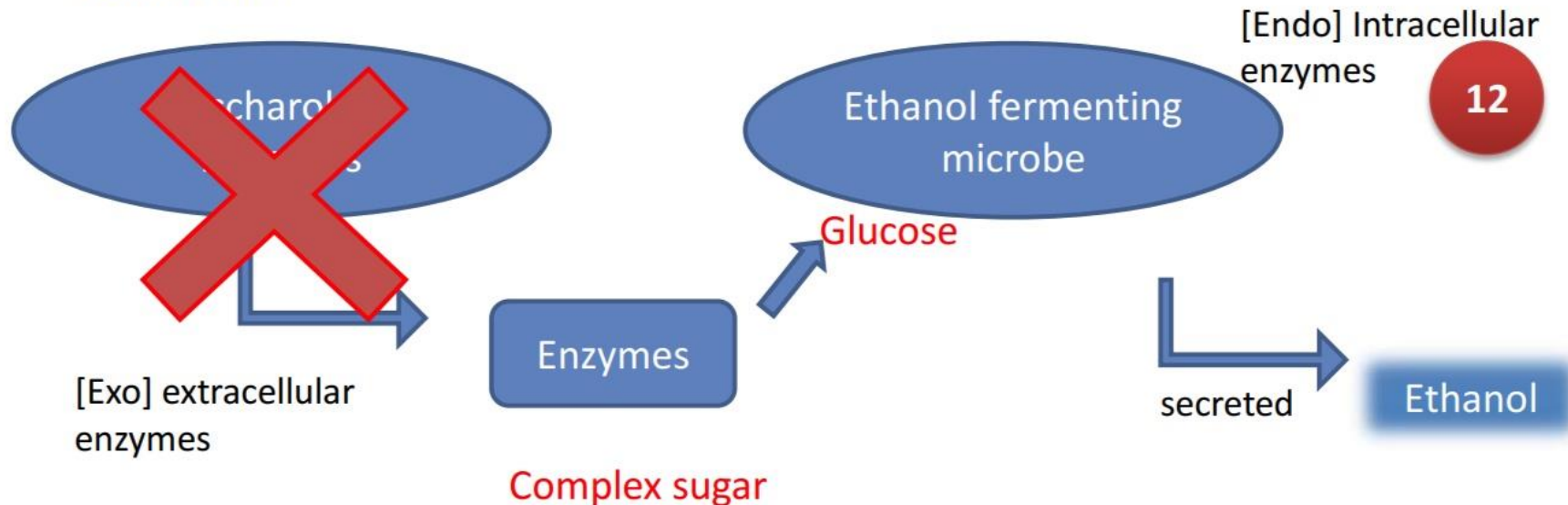


1 mole glucose = 2 moles ethanol + 2 moles carbon-dioxide



3 moles xylose = 5 moles ethanol + 5 moles carbon-dioxide

Commercial



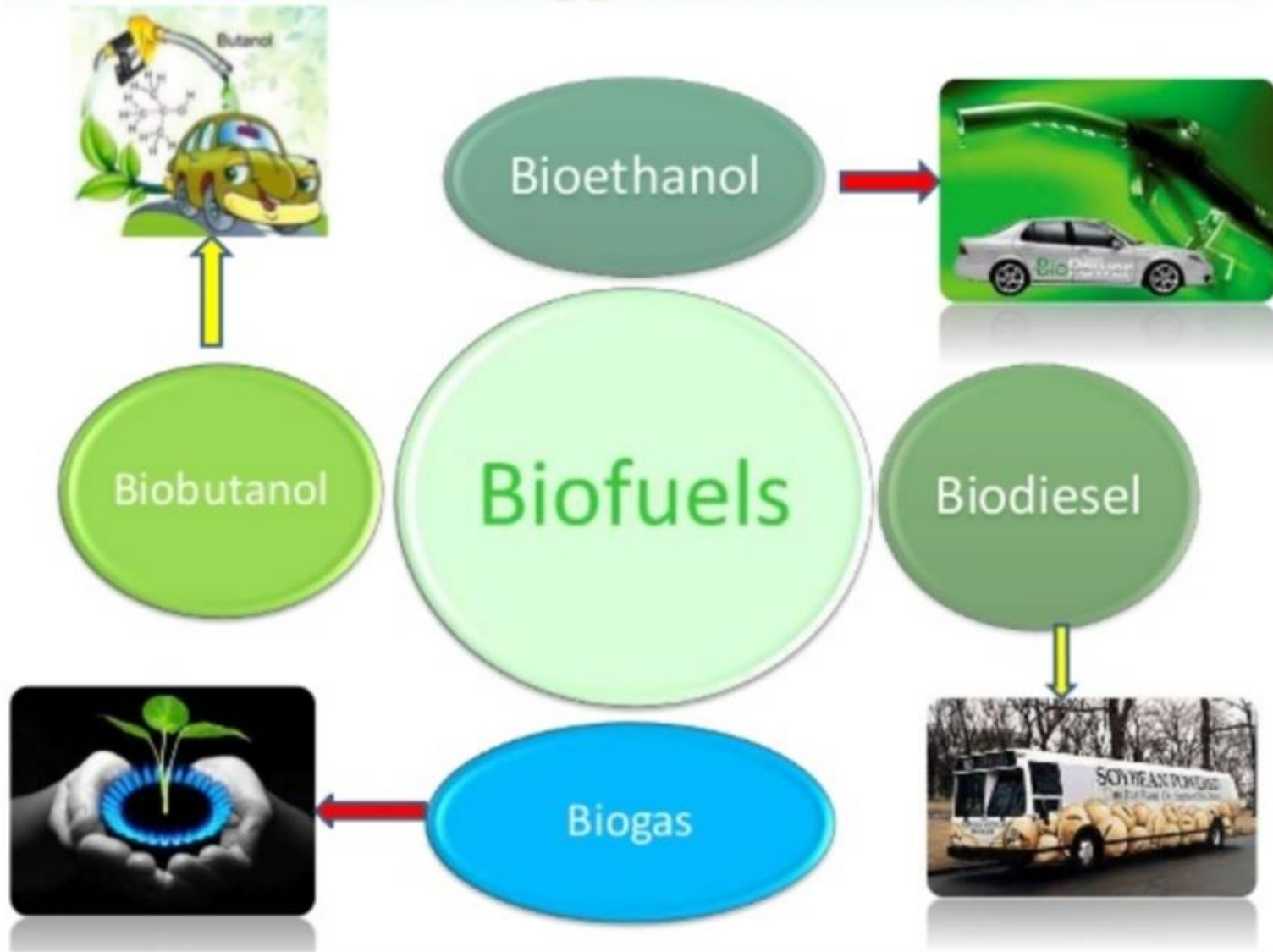
Positives of biofuel

- ▶ The energy content of bio diesel is 90% of the petroleum diesel.
- ▶ The energy content of ethanol is 50% of gasoline.
- ▶ The energy content of butanol is 80% of gasoline.
- ▶ Bio diesel is sulphur free fuel.
- ▶ Bio diesel has fewer polycyclic aromatic hydrocarbons, which has been linked to cancer.

DISADVANTAGES OF BIOFUEL

- ▶ During production of bioethanol, huge amount of CO₂ and other GHGs are released.
- ▶ Energy content of petrol is much higher than bioethanol (it's energy content is 70% of petrol).
- ▶ Used of phosphorous and nitrogen in the production causes negative effect on the environment.
- ▶ Pure ethanol is difficult to vaporise.
- ▶ Can only be transported by auto transport or railroad
- ▶ Due to the high prices of bioethanol some farmers may sacrifice food production for biofuel production which will increase the price of the food around the world.

Common Types of Biofuels



Use of Biofuels

Transportation

Energy generation

Provide heat

Cooking

Lubrication

- ▶ The methanogenic bacteria which utilise CO_2 and H_2 to produce CH_4 the hydrolytic and acetogenic groups of bacteria like Clostridium, bacteroids, bacillus etc.
- ▶ These bacteria are sensitive to pH and the optimum pH for CH_4 production is 6.8-7.2.

USE OF BIOGAS:

- ▶ Biogas containing CH_4 is a valuable product which can be utilised in the production of renewable energy.
- ▶ It can be used for generating electricity and heat.
- ▶ It can also be burned directly for cooking, lighting, heating and process heat.

Biogas manures;

- ▶ The material after fermentation and production of biogas are called as biogas manures which are used as manures to different crops.

THANK YOU