

## SCP PRODUCTION USING METHANE

### Bacteria which utilize methane:

- There is an excess of Methane, the chief component of natural gas, for a desirable SCP production.
- Methane can be obtained as a very pure gas.
- Cannot easily be liquefied, making long distance transport difficult and expensive.
- Considerable security measures must be taken when handling methane, due to the risk of explosion.
- Methane oxidizing bacteria are classified the obligate methyltrophus.
- This group only grow on carbon substrate(methane, methanol, methylamine, formaldehyde, formate).

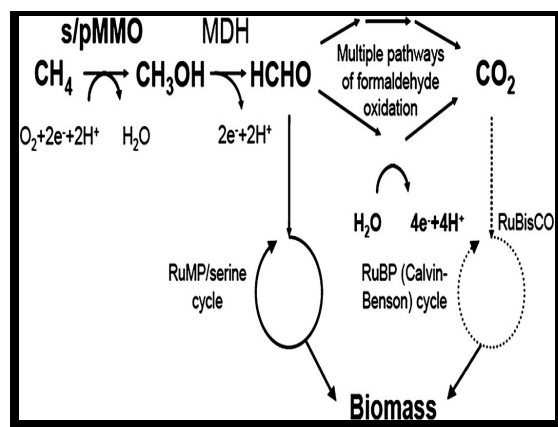
- yeast which assimilate methane have not been isolated, few methane utilizing bacteria have been identified,
- Among the bacteria methylomonas methanica, methylcococcus capsulatus unclassified micro organism.
- enzyme methane oxygenase oxidized methane to methanol.
- Which is further converted into primary metabolites.
- Methanol accumulates Result of oxidation process inhibitthe growth of bacteria.
- primary metabolite such as amino acid, sugar, acetate also inhibit growth of Methane oxidation.

### Methanol fermentations:

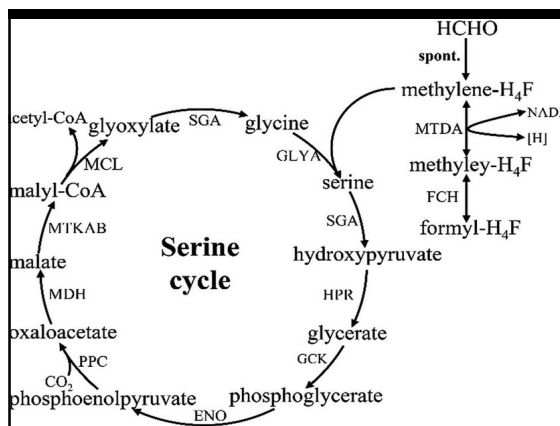
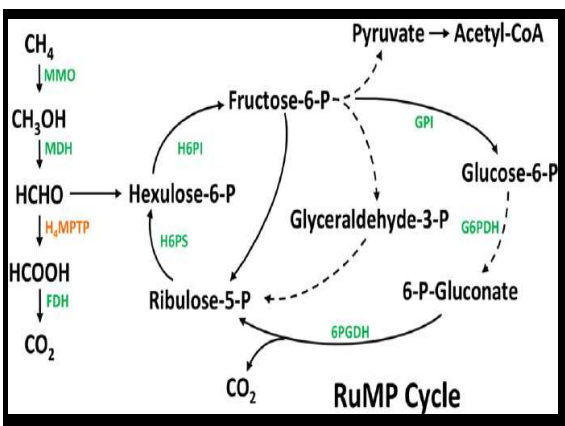
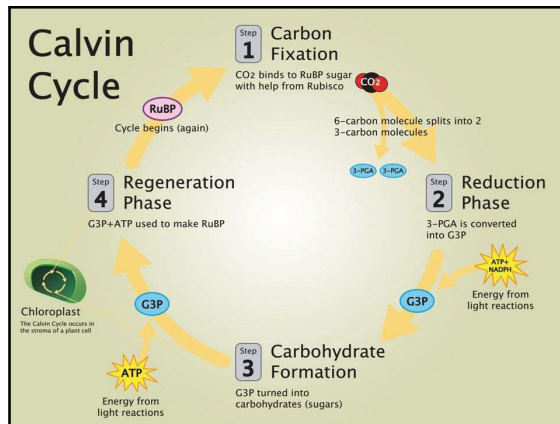
- methanol was at one time the most important substrate for single cell protein production.
- Methanol may be obtained from synthesis of gas, natural gas, methane, oil or coal.
- Bacteria, yeast and fungi may all be considered for the production of SCP from methanol.
- Besides the obligate methylotrophic bacteria which only grown carbon compound.
- methanol fermentation:
- For SCP production, bacteria rather than yeasts are employed essentially all existing production processes for the following reasons:
- Rapid growth, higher protein content, better yeilds, simpler culture medium requirement.

### Methanol oxidation:

- Methanol is oxidized to CO<sub>2</sub> by the bacteria
- The first step to formaldehyde require and inducible non-specific = methanol dehydrogenase.
- Conversion of formaldehyde to format with reduced glutathione, by means of an in NAD-dependent of formaldehyde dehydrogenase.
- The last step, format is common to all methanol utilizing microorganism in which format is converted into cO<sub>2</sub>.
- Carbon assimilation by methanol oxidizing organism:
- Bacteria growing on methanol must produce a three carbon molecule.
- Which then feed into primary metabolism at pyruvate.
- Three distinct pathway for one carbon assimilation have been recognized;



- ❑ 1. Calvin cycle: CO<sub>2</sub> may be taken up in the photosynthetic organism.
- ❑ 2. Quayle cycle.
- ❑ 3. serine pathway.



- Production process:**
- ❑ Imperial chemical industries which first company to develop the continuous methanol fermentation for the commercial production of SCP.
  - ❑ The studied the effect of CO<sub>2</sub>, oxygen and methanol concentration on productivity and the effect of the pressure differential between the bottom and the surface of the bioreactor.
  - ❑ Imperial chemical industry pressure cycle fermenter is used for SCP production.
  - ❑ This is a combination of airlift and loop reactor,
  - ❑ Microorganism used for SCP production,
  - ❑ After production of SCP recovered by partial cell lysis which is achieved by heat and acid treatment,
  - ❑ The nutrient solution is then clarified by the decanting.

