MMB - E305
ELECTIVE - V MICROBIAL ECOLOGY

L T Credit
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Learning objectives:

- To learn about classification of microorganism on the basis of oxygen and carbon source.
- To understand plant-microbes interactions.
- To provide a framework for understanding the relationship between microorganisms and their role in biogeochemical cycling in natural communities.
- To understand the technical aspect of biogas production.

Learning outcomes:

At the end of course student will be able to

- Classify the bacteria on the basis of oxygen and carbon requirement.
- Differentiate positive and negative association of microbes with plants.
- Explain the application of Extremophile.
- Explain setting up of a biogas plant.

UNIT - I

Ecological groups of microorganisms: Based on O_2 requirement (aerophile, microaerophiles, Anaerobic bacteria) requirement, based on C sources (methanotrophs, methylotrophs) , temperature, and habitat, Microbial diversity- distribution, ecological niche: plant-microbe interactions

(12 Lectures)

UNIT – II

Population interaction- population within biofilm; positive and negative interaction- neutralism, commensalisms, synergism, mutualism, competition, antagonism, parasitism, and predation.

(10 Lectures)

UNIT – III

Extremophiles- Psychrophiles, acidophiles, alkaliphiles, thermophiles, barophiles and osmophiles, halophiles- membrane variation, electron transport; Application of extremophiles; methanogens and biogas production; *Rumen microbiology-* rumen anatomy, rumen microorganisms and action.

(14 Lectures)

UNIT – IV

Stress Microbiology: Environmental stress (density-dependent and density-independent) stress, stress sequestration by bacteria and other organisms, heavy metal detoxicants (metal-microbe interaction, biosorption, bioaccumulation and metal scavenging by microbes).

(12 Lectures)

UNIT – V

Chemolithotrophs: Methylotrophs; microbial leaching (bioleaching) - microbes and mechanism of bioleaching of iron, copper and uranium; oxidative transformation of metals- sulphur oxidation, iron oxidation, ammonia oxidation, hydrogen oxidation.

(12 Lectures)

Suggested Reading

1. Dubey R.C. and Maheshwari, D.K. *A Textbook of Microbiology*. 3rd ed., S. Chand & Co, Ram Nagar, New Delhi, p. 1034. ISBN 81-219-2620-3
2. Singh and Purohot, Microbial Ecology, AGROBIOS
3. Atlas. Microbial Ecology, Pearson Education ISBN13: 9788129707710.
4. Osborn A.M. Smith CCJ (2005). Molecular microbial ecology, Taylor & Francis US.

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