ECOLOGY SHORT NOTES

Contents

## BIOMOLECULE TESTS:

### Testing for carbohydrates

Testing for the presence of starch (complex sugar)

Lugol's reagent (**iodine test**) changes from yellowish-brown to dark purple/black.

Testing for simple carbohydrates (monosaccharides and some disaccharides)

Benedict's solution

### Testing for lipids

Grease spot test/Brown paper test

As we all know from experience, lipids leave translucent spots (grease spots) on unglazed brown paper bags.

**Sudan Red test**

Sudan red is a fat-soluble dye that stains lipids red. Using Sudan red can show the amount and the location of lipids.

### Testing for proteins

Buiret test.

## Monera kingdom

## Bacteria family

### Nitrogen fixers

Free living Non symbiotic bacteria:

*Azotobacter*,

*Beijerinckia*, and

*Clostridium*

*Nostoc (Both live free and in symbiosis)*

Symbiotic Mutualism:

Rhizobium 🡪 Pea plant

Frankia

Anabaena🡪 Azola

(cyno bacteria/BGA)

Nostoc 🡪 Gunnera (Unique endo symbiosis)

(cyno bacteria/BGA)

### Nitrifying Bacteria:

Aerobic bacteria

Converts soil ammonia to nitrates(used by plants for growth)

Ammonia to Nitrites

Nitrosococcus

Nitrosomonas

Nitrites to Nitrates

Nitrobacter

Nitrococcus

### Milk bacteria

Lacto bacillus

Curding of milk

Production of butter milk

Stepto coccus

Cheese production

Yogurt production

### Decomposers:

Bacillus mycoids

Bacillus vulgaris

### Cyno bacteria

BGA

Anabaeana and Nostoc

Important Nitrogen fixers

Azola is grown with rice in china as Bio fertilizer.

Pollution:

Oil zapper: by Indian scientist

Pseudomonas

### Bioremediation:

Sewage:

Methanogens:

Anaerobic bacteria

**Archean bacteria(ancient bacteria)/Prokaryotes**

Methanogenesis🡪converts co2 and waste to methane

Methane emission

Methane important greenhouse gas

Break only organic materials

M*ethanococcus , Methanobacterium*

### Anti biotics

*Bacillus subtilis*

Anti biotics manufactured.

Bacillus subtilis bacteria secrete enzymes, "such as amylase, protease, pullulanase, chitinase, xylanase, lipase, among others. These enzymes are produced commercially and this enzyme production represents about 60% of the commercially produced industrial enzymes

Stepto coccus

Steptomycin

E coli

Insulin

### Bio pesticides

Bacillus Thuringiensis

Used in BT crops

Protection from pests

## Protista

**Eukaryotes**

**Single celled or can be multi cellular**

Organisms can not be classified into animal, plants and fungi

**They are primary species in Aquatic system**

Some cause disease in humans like malaria and sleeping sickness

Further classified into Protozoans and Algae

### Protozoans:

Plasmodium

Plasmodium 🡪 Malaria 🡪 effect RBC and liver

Vaccine 🡪RTS,S (or Mosquirix) recently developed by glaxo smith USA

Vector 🡪Culex mosquito

Cilia

Flagela

Leishmania 🡪 causes Liechmaniasis/Dum dum fever/Kala azar

🡪 Vector Sand fly

🡪 endemic in Bihar, Jharkhand, Uttar Pradesh and West Bengal

### Algae/or Sea weed

**All algae are Phytoplankton**

Chrysophytes

organisms of the kingdom Protista consisting of the diatoms (class Bacillariophyceae), the golden, or golden-brown, algae (class Chrysophyceae), and the yellow-green algae (class Xanthophyceae)

Green algae

Desmids

 occur in standing freshwaters

Red algae

Red sea red due to red algae

Agar agar produced by them used in laboratory medium and cosmetics

It is a jelly like substance

Brown algae

Golden algae

Fire algae

Store food in starch and oil

causes the 'red tide phenomenon'

#### Diatoms

Silica is main component

Autotrophs and uses photosynthesis

At base of aquatic food webs in marine and freshwater habitats

Environment indicators

Ph level and Salinity

Ecological function

quarter of Earth's oxygen comes from diatoms

diatoms also reduce the amount of carbon dioxide about 23% of global co2 is fixed by them

important part of algal blooms

Economic

**Diatomite/Diatomaceous earth**, a substance composed of fossil of diatoms at seabed, is used in filters, insulation, abrasives, paints, and varnishes and as a base in dynamite.

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### Slime Molds

A **saprophyte** or saprotroph is an organism which gets its energy from dead and decaying organic matter

They are saprophytes

They contribute to the decomposition of dead vegetation, and feed on bacteria, yeasts, and fungi

Fungi

Heterotrophs: do not produce their own food/get their food from other sources

Mycology🡪study of Fungi

Eukaryotic

Multicellular

**Cell wall made of CHITIN**

Store food in starch

Act as Saprophytes,

Penicillium

Parasites

Symbionts

Mycorrhiza

Mutual benefits

In roots of Higher plants

Lichens

Symbiotic association of algae (usually green) or **cyanobacteria/Algae and fungi**

Used for sources of medicine and dye.

Because **lichens** enable algae to live all over the world in many different climates, they also provide a means to convert carbon dioxide in the atmosphere through photosynthesis into oxygen

Industry

Use in cheese production

Bakers yeast/Brewers yeast

In production of wine, alcohol

yeast is used to cause fermentation and leavening.

The fungi feed on sugars, producing alcohol (ethanol) and carbon dioxide; in beer and wine manufacture the former is the desired product, in baking it is the latter

Medical Uses

Commercial yeast is 50 percent protein and is a rich source of vitamins B1, B2, niacin, and folic acid can be used as vitamin Supplement

Pencilin , First anitbiotic

fungi contain chemicals that are extracted and used to produce drugs **known as statins**, which **control cholesterol levels and ward off coronary heart disease.**

Ergot is a source of several chemicals used in drugs that induce labour in pregnant women and that control hemorrhage after birth

## Kingdom animilia

### sponges

Primitive animals

Color of sponges due to Live in symbiotic relationship with both algae and BGA

complete regeneration of an adult from fragments or even single cells

crustaceans, mainly crabs, use sponges for camouflage by removing a piece of a living sponge and holding it against their carapace (shell);

Mutualism Hermit crab and sponge:

The advantage to the sponge is that it is carried by the mollusk;

the hermit crab gains protection not only by living in the shell of the mollusk but also through the disagreeable smell and taste of the sponge, which discourages attack by fishes and other enemies.

parasitic association

Mites lay eggs in them

Larvae feed on them

Mutualism Sponge and algae

Symbiotic algae provide oxygen and sponge provide protection from enemies.

### Cnidaria

They have stomach and cavity for respiration.

Decentralized nervous system

**Corals**

Coral reefs with zooxanthella only in shallow waters

In deep water only corals lives alone called **as cold corals/no zooxanthellae**

Symbiotic relation with algae zooxanthellae

Algae provide oxygen and energy

Corals provide co2.

i.e why corals grow near to surface where algae grows

**Anemone**

Commensalism i.e no one is -vely effected by relationship

Hermit crab picks anemone to attach to his shell

Hermit crab provides mobility

Anemone provides protection from predators using his tentacles

**Moon jelly(jelly fish)**

**Portuguese man of war**

Ecological importance

Cnidarians form coral reefs which are the most diverse habitats for many species

Mutualistic relationship🡪 Anemones act as places of hiding for small fish like **clown fish**

* Anemone and hermit crab
* Coral and zooxanthellae

### Platyhelminthes/flatworms

Simplest animals

No body cavity

Parasites

Primitive brains

Have reproductive organs

**Hermaphroditism**, the condition of having both male and female reproductive organs.

Tapeworms

Found in poke meat

Effect brain, liver, lungs and are fatal

### AsChelmenthes/round worms

Nematoda

Endoparasites

Example Ascaris

Ascariasis is an infection of the small intestine caused by Ascaris

### Annelids

a body divided into segments or rings, or annulations, from which they take their name.

segmented bodies

Hermaphrodites

Leeches

**Hirudin**, which is extracted from the body tissues of the European medicinal leech (Hirudo medicinalis), is used to prevent blood clots following surgery;

It anesthize wound area and prevent blood cloting

anticoagulant Hirudin

Earthworms

abundant near sewer outlets and thus an **indicator of water pollution.**

Excreta used by plants for nitrogen phosphorous

sometimes known as ‘ecosystem engineers’ because they significantly modify the physical, chemical and biological properties of the soil profile

they burrow in soil and make small pores which help in aeration and water recharging

eat dead animal and plant and unlocks nitrogen and phosphorous

decomposing dung and plant litter and processing 2–20 tonnes of organic matter per hectare each year

Parasitism

leeches, all of which feed on blood, attach to the host only during feeding. Marine leeches, however, attach permanently to their fish host.

Commensalism

### Arthropods

Largest group in animal kingdom about 84%

Presence of EXOSKELETON made of CHITIN

JOINTED feet

Further divisions

Crustaceans

Hard exoskeleton

**2 pairs of antenna**

**5 pairs of jointed legs**

**Cray fish, crabs ,shrimps**

Important zooplanktons

Act as food for other fishes even whales

Arachnids

 No antennae

6 pair of legs

Spider, scorpion, ticks and mites

Scorpions are nocturnal

Ticks and mites

4 pair legs

Microscopic

ticks are mostly bloodsucking parasites

mites are parasites of birds and mammals

Insects

a pair of antenna

**3 pairs of legs (hence “Hexapoda”)**

one or 2 pair wings

Largest among Arthropods

Entomologists who study insects

important pollinators as well as some act as pest that destroy vegetations

commercially shelp in honey generation,silk,wax,dyes.

Centipedes

14 to 150 pair of legs

1 pair leg per segment

without a backbone or spinal column’

Millipedes

Eat plant decay

As many as 200 legs

Have 2 pair legs per segment

### MolLusca Kingdom

Second largest after arthropods.

calciferous shell calcium carbonate shell secreted by soft **MANTLE**

Body is covered by a mantle and shell.

circulatory system is open, with heart and aorta

Further division:

**Cephalopods:** nautiluses, cuttlefishes, squids, and octopuses/ devifish

Camouflage or frightening coloration in cuttlefish and octopus

**Bi valvia:** mussels, scallops, oysters, shipworms,

Bivalve Mollusca are used as bioindicators of the freshwater and marine environments

bivalves contribute to the organic turnover in the intertidal (littoral) zones of marine and fresh water because, as filter feeders, they filter up to 40 litres (10 gallons) of water per hour

**Gastropods:** snails, and slugs

source of food as well as jewellery

### Reptiles

Cold blooded

Egg laying

### Birds

Warm blooded

Wings

### Mammals

Means breast

young are nourished with milk from special mammary glands of the mother

Warm blooded

Egg laying Mammals

Echidnas

Duck billed platypus

Marsupials

the newborns are incompletely developed at birth and continue to develop outside the womb, attaching themselves to the female’s body in the area of her mammary glands.

kangaroos, opossums, and wallabies

Cetaceans

Marine mammals which are carnivore

Dolphin, Porpoises ,whales

Sirenians

Plant eating marine mammals

Dugong Manatee

Importance

humans have depended on other mammals for food and clothing. Domestication of mammals helped to provide a source of protein for ever-increasing human populations and provided means of transportation and heavy work as well.

Today, domesticated strains of the house mouse, European rabbit, guinea pig, hamster, gerbil, and other species provide much-needed laboratory subjects for the study of human-related physiology, psychology, and a variety of diseases from dental caries to cancer.

## Kingdom Plantae

Hydrophytes

a hydrophyte is an aquatic plant,

Flat Leaves

In order to float on the surface of a pond, most aquatic plants have flat leaves which act as floation to a portion of the plant

hydrophytes have air sacks that help the plant float on the surface of the water

Reduction of Roots

Open stomata

Xerophytes

Spikes instead of leaves o avoid water loss

Reduction in surface area

Thick waxy cuticle

The cuticle cuts down water loss in two ways: it acts as a barrier to evaporation and also the shiny surface reflects heat and so lowers temperature

Sunken stomata: Reduce evaporation

Shallow Root System

The inner surface is covered in hairs.

Hairs help trap moist air and reduce transpiration

Halophytes

grows in waters of high salinity

**Pneumatophores** are roots that grow into the air and are filled with a specialized parenchyma called **aerenchyma**. The large, intercellular spaces of aerenchyma are filled with oxygen and other gases. The pneumatophores seem to assist in aerobic respiration and gas exchange and are abundant on woody plants like cypress and mangrove, which grow in water‐logged soils.