

RHIZOSPHERE

What is Rhizosphere?

It refers to the area of soil that is directly affected by a plant root system, associated root secretion and micro-organisms .

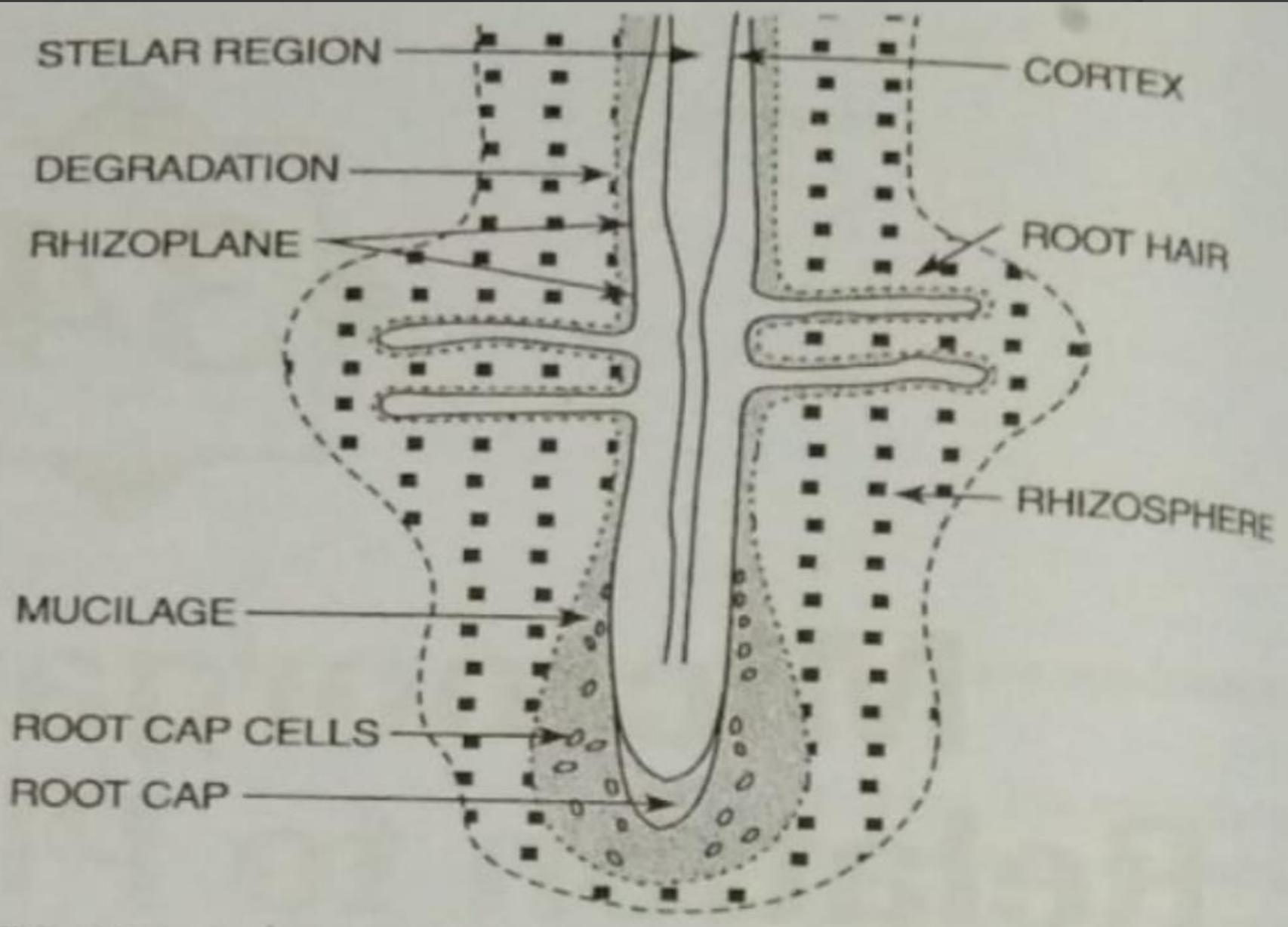
The term rhizosphere was first use by Lorenz Hiltner in 1904.

The Rhizosphere is the zone surrounding the roots of plants in which complex relations exist among the plant, the soil microorganisms and the soil itself.

Rhizosphere effect

Rhizosphere effect is the direct influence exerted by plant root on the micro-organisms with in the rhizosphere.

Several factors such as soil type, its moisture, PH and temperature and the age, condition of plants are known to influence the rhizosphere effect.



RHIZOSPHERE SURROUNDING A ROOT OF A GROWING PLANT

BACTERIA:-

The greater rhizosphere effect is observed with bacteria than other.

Gram negative, rod shaped, non sporulating bacteria which respond to root exudates are predominant in the rhizosphere.

The aerobic bacteria are relatively less in rhizosphere because of the reduced oxygen level due to root respiration.

FUNGI:-

In contrast to their effect on bacteria, plant roots do not enhance the total count of fungi in rhizosphere.

Rhizosphere effect is selective and significant on specific fungal genera like Fusarium, Penicillium, Aspergillus which are stimulated.

Several fungi e.g. Gibberella and Fujikurio produce phyto hormone and influence plant growth.

ACTINOMYCETES, PROTOZOA AND ALGAE:-

Stimulation of these are not studied in much detail so far. Its generally understood that these are less stimulated in the rhizosphere then bacteria.

When antagonistic actinomycetes increase in number they suppresses bacterial growth.

Among the actinomycetes, the phosphate solubilizer e.g. Nocardia, Streptomyces have a dominant role to play.

Importance of Rhizosphere:-

1. Plant health

It helps in developing the plant growth and its development.

2. Crop yield

It helps in increasing the production of the plant.

3. Nutrient cycling

It plays an important role in the nutrient cycle of the plant.



Plant affects the rhizosphere microorganisms through the release of root exudates.

What is root exudate?

Small molecules that are released from plant roots, which include sugars, amino acids, organic acids and amides.

These molecules influence soil nutrient availability both directly and indirectly by stimulating the activities of certain microbial and fungal components of the soil biota.

The exudates contain carbohydrates, organic acids, vitamins and many other substances essential for life

INFLUENCE EXERTED BY ROOT EXUDATES:-

- 1- Root exudates influence the survival and proliferation of dormant structures of various soil surviving pathogens.**
- 2- Root exudates may provide a food base to result in growth of antagonists which could suppress the growth of pathogenic microorganisms in soil.**
- 3- one of the attributes of root exudates is the possible role they play in neutralizing the soil pH and altering the microclimate of rhizosphere through liberation of water and carbon dioxide.**

Factors affecting the amount and the composition of root exudates:-

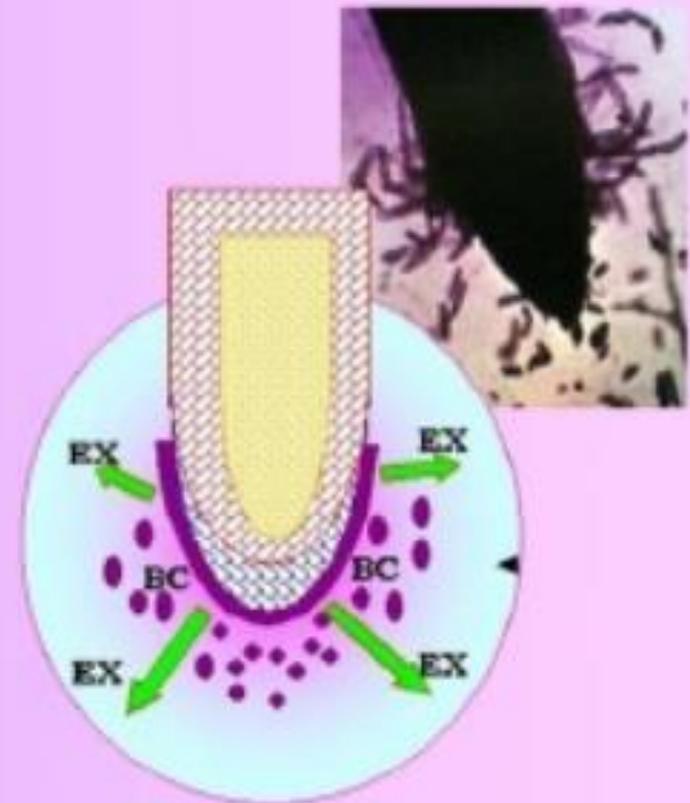
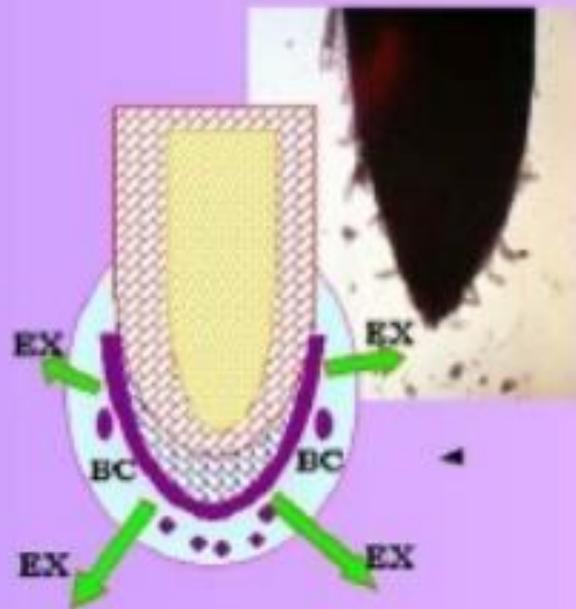
- 1. Plant species and developmental stage**
- 2. Variety**
- 3. Temperature**
- 4. Light**
- 5. Plant injury**
- 6. Atmosphere**
- 7. Foliar sprays**
- 8. Plant nutrient**
- 9. Moisture**
- 10. Microbial activity**

Participation of root border cells in root excretion

Root growth inhibition



Increase of border cells number, increase of mucilage, increase of polysaccharides contain



BC - border cells, EX - exudates

ORGANIC COMPOUNDS RELEASED BY PLANT ROOT:-

Sugars and polysaccharides.

Amino acids.

Organic acids.

Fatty acids.

Sterols.

Growth factors.

Enzymes.

Flavonones and Nucleotides.

THANK YOU