Rust disease of wheat

(Disease cycle- aecidium, uredospore, teleutospore and control measures)

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Formation of aecidium :

- Meanwhile the hyphal mats beneath the lower epidermis develop into spherical masses of cells. These are known as the protoaecidia.
- By this time the secondary mycelium formed from the dikaryotic cells at the base of the receptive hypha reaches the young aecidium.
- Its cells mingle with the haploid tissue of young aecidium. As a result a palisade-like layer of binucleate cells is formed at the base of aecidium.
- These binucleate basal cells produce binucleate aecidiospores in terminal chains.
- The wall of the aecidium splits open.
- The aecidium now assumes a cup-shaped form . The lower epidermis also ruptures and the aecidiospores are now exposed.
- They are unable to re-infect barberry.

Aecidiospore :

- The aecidiospores are binucleate and are carried by air currents to the wheat host. Here the aecidiospores germinate each by putting out a germ tube or an infection hypha which enters the host tissue through a stoma.
- The tip of the infection hypha swells to form an appressorium which covers the mouth of a stoma.
- The contents of the aecidiospore migrate into the appressorium. A narrow, peg like infection hypha emerges from the appressorium, passes through the stomatal opening and enters the substomatal cavity to form a vesicle.

- From the substomatal vesicle arise hyphae which proceed intercellularly into the parenchymatous tissue of the host leaf to form the intercellular mycelium .
- The hyphae send small round or branched haustoria into the host cells.
- About ten days after the infection of the grain host (wheat) rusty red and powdery masses of uredospores appear on the stem and the leaves in oblong to circular sori .
- They appear in the months of February to March.

Uredospores :

- The uredospores are shortly stalked, oblong, echinulate structures with four equatorially arranged germ pores on the outer wall .
- These spores are binucleate. One of these nuclei is of plus strain and the other of minus strain. Being exposed they are easily carried by the wind to other wheat plants.
- Each uredospore germinates in the surface moisture provided by rain or dew. It develops a germ tube which enters the host tissue through a stoma, the new dikaryotic mycelium produces a new crop of uredospores.
- The uredospores are the only spores in the life cycle which can reinfect the host plant on which they are produced.

Teleutospore:

- When the grain is almost ripe, plus and minus strain nuclei in each cell fuses, black teleutospores begin to appear in the uredosori.
- Soon after the teleutospores develop in new and independent dark brown or black teleutosori or teliosori sss.
- The teleutospores are two-celled, thick-walled structures and represents the dikaryophase . They are the resting spores.

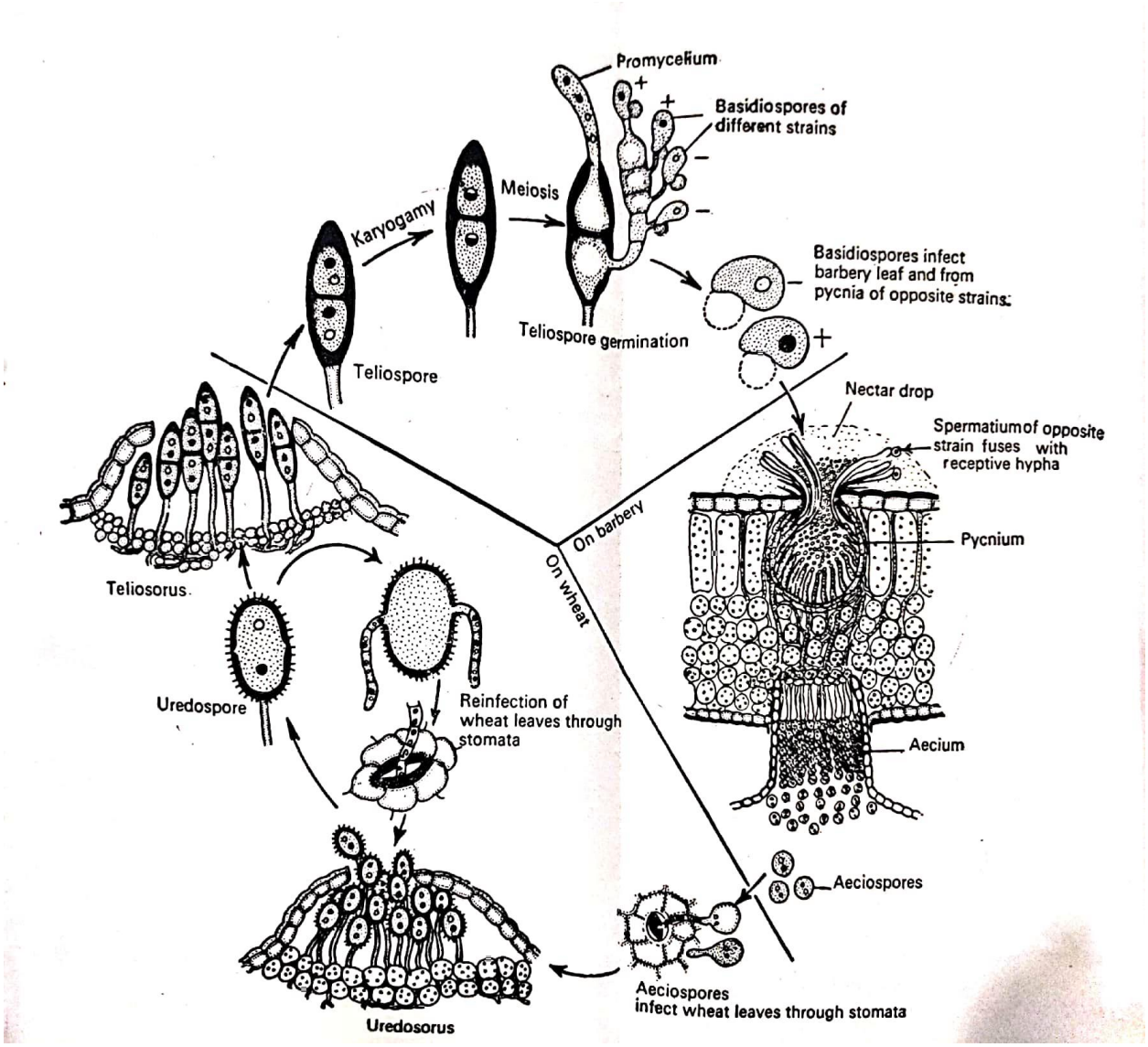

Fig.I.Life cycle of *Puccinia graminis tritici*

Control Measures of Rust Disease:

1. Cultivation of Rust Resistant Varieties:

The cultivation of varieties immune to the rust disease is an important means of combating the disease. Some rust resistant varieties of wheat are available in India. Np 710, Np 718 and Np 770 find favour with the farmers.

The newly bred hybrids Np 822, Np 823 and Np 825 have given good results. They possess high degree of rust resistance. In addition they are high yielders. The recently introduced dwarf

Mexican wheat varieties such as Sonora 64 and Lerma Rojo are almost completely resistanst to black rust.

2. Eradication of Barberry:

the eradication of the less important alternate host barberry is a possible means of eliminating the disease.

The uredospores which are able to survive on stray and self-sown wheat plants on the hills serve as an inoculum.

3. Use of Fungicides Including Antibiotics:

Hence the use of fungicides to control rust diseases has received much more attention in the recent years than in the past. Tandon et al (1968) recommended Zineb, Dithane Z-78 , Dithane M-45. and Maneb to control wheat rusts effectively..

Actidione has been recommended to be a useful antibiotic as a fungicide for the control of rusts plus zinc sulphate at fifteen days interval from the first week of February are quite effective.