



Lecture No.: 20

Date: 27th April, 2020

CORE CONCEPT OF
Group B - Mycology

HONOUR'S PART 1
Paper - 1

LIFE HISTORY AND ECONOMIC IMPORTANCE OF PUCCINIA

CLASSIFICATION :

Class - Basidiomycetes

Order - Uredinales

Family - Pucciniaceae

Genus - Puccinia

OCCURRENCE - The genus includes about 1800 species that grow as **obligate parasites** on a large number of angiospermous plants including wheat, barley, water, oat etc. The wheat infecting species, causing wheat rust disease are of great economic importance. Three types of wheat rust are known from our country.

(I) Yellow rust - Caused by *P. glumarum*.

(II) Brown rust - Caused by *P. triticana*

(III) Black rust - Caused by *P. graminis* (most well known)

Puccinia graminis

(A) It is a -



- (I) **Macrocytic** (long duration of life cycle),
- (II) **Polymorphic** (producing many types of spores)
- (III) **Heteroecious rust** (requiring wheat plants as one host and Barberry (*Berberis Vulgaris*) as the alternate host)

(B) Five different types of spores are produced : Of these -

- (I) **Spermatia (pycniospores)** and **Aecidiospores** are produced on Barberry
- (II) **Uredospores, Teleutospores** and **Basidiospores** are produced on the wheat host.

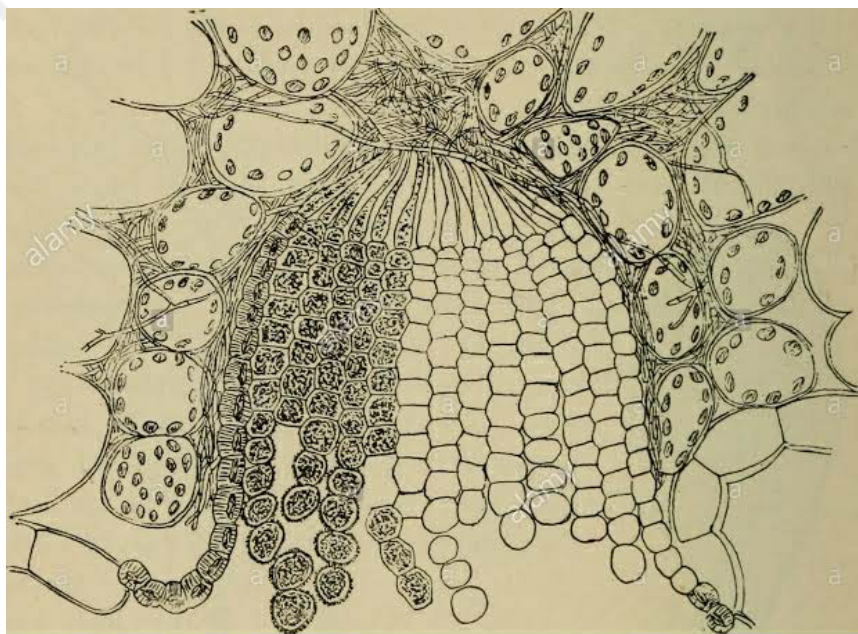
Plant body- The mycelium is septate ramifies between the cells of the host, developing haustoria and causing malformation of the infected parts.

The cell of the mycelium are uninucleate (**monokaryotic**) in some part of the life cycle. (before sexual phase), while in major part of the life cycle (after sexual phase) it is **dikaryotic** (binucleate).

REPRODUCTION- There is no sex-organ. In fact every somatic cell of the rust acts as a gametangium. The sexual fusion (**spermatization**) is achieved by the union of haploid **spermatium (+)** and a **receptive hypha (-)** or **viceversa**.

The whole life cycle is divided into following sequential stages-

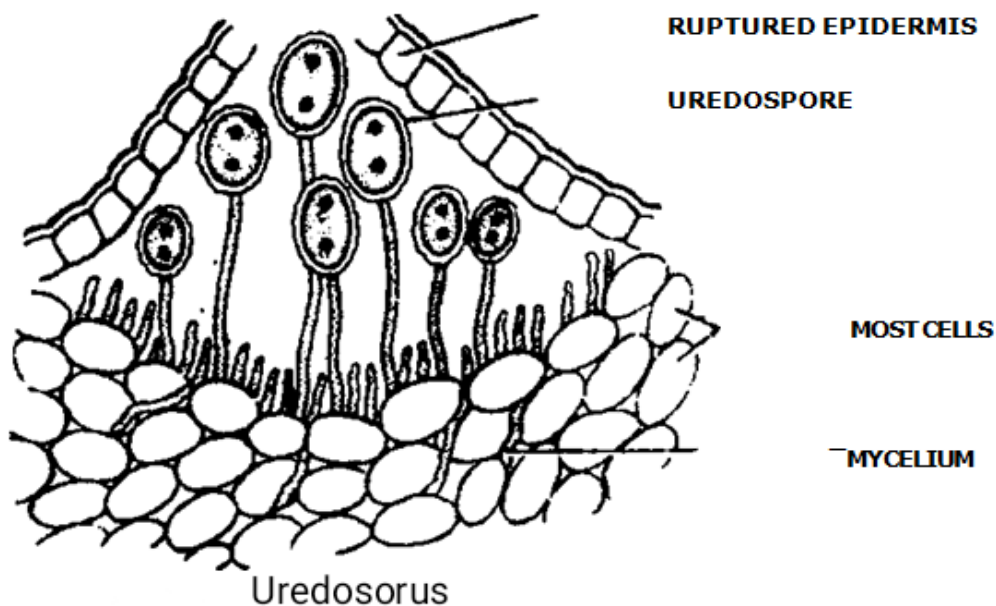
(A) **Spermatogonial (pycnial) stage** (*stage 0*) - Infection on Barberry plant initiates with the basidiospores (*n*) of two opposite sexes i.e (+) and (-) carried away by wind. These spores germinate to form germ tubes, which penetrate the upper epidermis of leaf, divide repeatedly and form separate **primary (monokaryotic) mycelia** in the form of flask-shaped body called **spermatogonium (pycnium)**.





(B) **Aecial stage** (*stage 1*) - The dikaryotic cells by repeated conjugate divisions, the lower epidermis and form cup shaped *aecia* or *aecidia*, which produce binucleate **aeciospores** or **aecidiospores**.

(C) **Uredo stage** (*stage 2*) - Aeciospores, so produced, cannot reinfect the Barberry plant. They migrate to the wheat plant, produce germ tube and enter the leaf (or stem) tissue through stomata, producing dikaryotic ($n + n$) **mycelium**.



(D) **Teleuto stage** (*stage 3*) - Towards the middle of the growing season of wheat, the same mycelia which had been producing uredospores, now begin to produce dark black coloured spores called **teleutospores** in **teleutosori**.

(E) **Basidial stage** (*stage 4*) - Each teleutospore germinates and forms a hypha. The $2n$ nucleus in the hypha divides meiotically to produce 4 haploid (n) nuclei. Septa divide the hypha into a 4 celled **basidium**. Each of the 4 cells produces a single uninucleate **basidiospore** (**sporidium**) on a short **sterigma**. Two basidiospores are of (+) and two of (-) strain.

