

# Puccinia

Q. What is rust? Describe life history of any rust studied by you?

→ Rusts are obligate parasite which grow on living ferns, conifers and angiosperms. The rust which we have studied is black rust of wheat caused by *Puccinia graminis*<sup>tritici</sup>. It belongs to

Sub-division - Eumycetes.

class - Basidiomycetes.

Sub-class - Heterobasidiomycetes.

Order - Uredinales.

Family - Pucciniaceae.

Genus - Puccinia

Sp. - graminis

*Puccinia graminis*<sup>tritici</sup> is an obligate parasite, heteroecious, polymorphic, macro-cyclic. It is cosmopolitan in distribution. Its two hosts are wheat and barberry. The rust mainly infects the stem, leaf and leaf sheath of cereals. The mycelium spreads intercellularly forming haustoria.

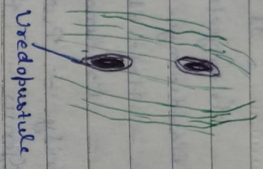
## Spores found on wheat plant

Two types of spores are reported on wheat as follow -

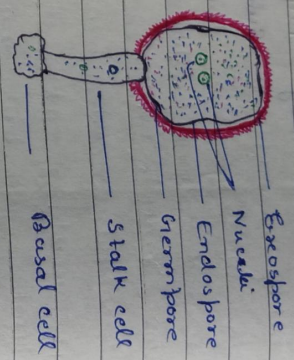
### Uredospore →

Uredospore are formed by the germination of aecidiospores on the leaf of wheat. It appears on the stem or leaf as reddish-brown, vertical pustules by the end of February. Each uredospore is oval or pear shaped with a long, unicellular stalk, binucleate, two layered the outer being thick, spiny, brownish

exospores with four germ pores and the inner layers delicate hyaline endospore containing dense cytoplasm, oil and brown pigment. Uredospores are disseminated by wind. These serve to multiply and propagate the disease vegetatively.



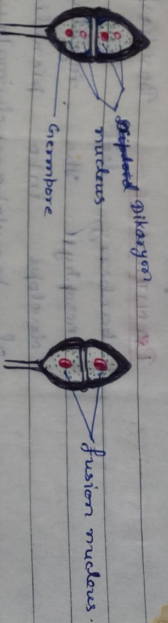
Uredopustule



A mature uredospore

TELEUTIOSPORE → Towards the end of the growing season or by the time the crop begins to ripen the uredospore's mycelium produce teleutospore.

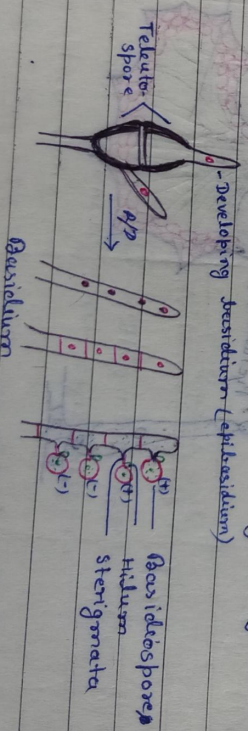
Each teleutospore is a spindle shaped black bicelled, with pointed or rounded apex two layered. The outer being thick and black exospore and the inner being thin and delicate endospore. The lower cell possesses a stalk and a germ-pore at the side below the septum. Each cell is dikaryotic at first but on maturity the nuclei fuse to form a single diploid nucleus. The teleutospore under a period of rest and tides over the unfavourable condition. So far as wheat is concerned, this completes the life history of parasite.



Binnucleate Teliospore.  
Diploid nucleus.

DN Spore

Basidiospore → On the return of favourable condition, teliospore germinates to form epibasidium in which the diploid nucleus divides by reduction division to form 4 haploid nucleus which are separated by transverse wall. Each cell forms an uninucleate basidiospore. out of four basidiospores two are of (+) strain and the other two are of (-) strain. These spores are discharged by explosive mechanism and are spread by wind. It infects Barberry leaf.

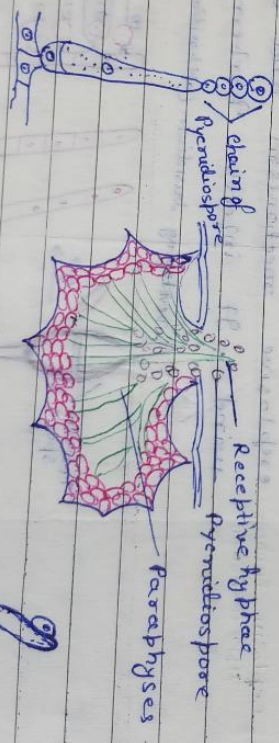


Spores on barberry leaf.

Two types of spores ♀ gaminis reported on barberry leaf. Barberry leaf gives nourishment to basidiospores for germination.

PERIDIOSPORE :- Peridiospores germinate on

barberry leaf and penetrate into mesophyll. The mycelium with single nucleus develops into perithecia flask-shaped bodies of pseudoparenchymatous mass of uninucleate cells which forms uninucleate sporophores. The nucleus of sporophore divides into two, one remain in sporophore while other passes into terminal cell - pyrenidiospore. Peridiospores are small, oval, haploid bodies of (+) or (-) strain with a thin wall and a large nucleus and less cytoplasm. Its chain makes ostiole by rupturing epidermal cells. Peridiospores are lined by sterile, uninucleate paraphyses. Some paraphyses project beyond ostiole and are called receptive hyphae. Peridiospores are disseminated by insects which are attracted by honey secretion of Perithecia.



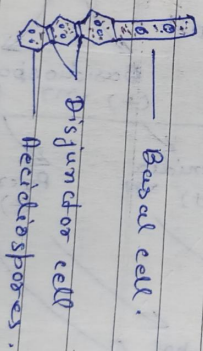
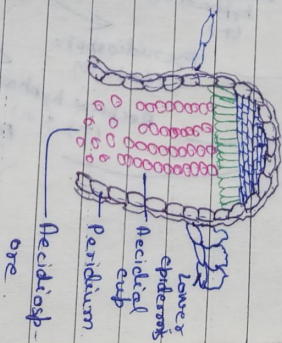
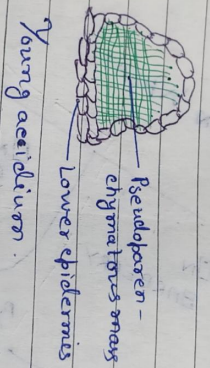
fusion of Peridiospore with receptive hyphae.

receptive hyphae with dikaryotic septum.

Dikaryotic hyphae,

ACRIDIOSPORE :- The monokaryotic mycelium of the lower surface of leaf forms.

Protoacidium of pseudoparenchymatous mass of cells. This protoacidium becomes cup-like acidium after dephlogidation by dikaryotic hyphae. The tip of dikaryotic sporophores divides in basipetal succession to form a chain of yellow multinucleate spherical acidiospores which are separated from each other by intercellary sterile disjuncter cells. The wall of the cup is made up of vertical rows of sterile cells forming peridium. The acidiospore infects wheat plant and germinate to give rise uredospore and in this way I.H. of P. graminis is complete.



### NUCLEAR LIFE CYCLE :-

Acidiospores are formed by the fusion of two nuclei one with (+) strain and another (-) strain as dikaryon in basal cells. Stage persists up to teliospore and it is the greater part of P. graminis life history. Basidiospores are formed after meiosis division which ultimately give rise to pycnidiospore.

of either (+) or (-) strain. This is the short period in which cells are uninucleate which is followed by dikaryotic stage.

Graphical life history may be represented as follows: —

