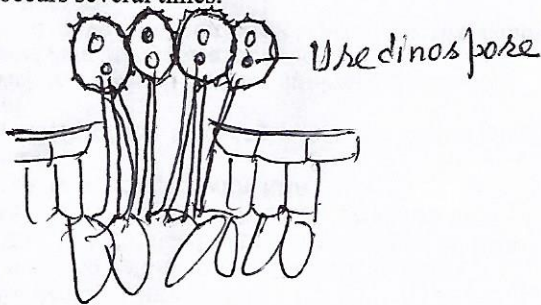


— Urediniospores germinate to produce binucleate mycelium that grows between cells of grass plant and in a few days produce new uredinia and a new crop of urediniospores. This cycle occurs several times.

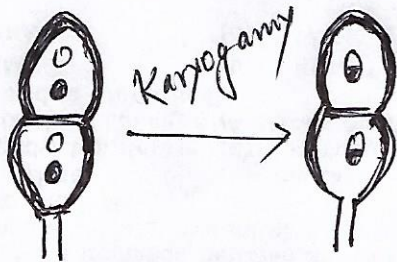


— With ripening of grain the uredinia begin to produce teliospores/ teleutospores. With progress of season more and more teliospores and fewer urediniospores are produced until finally only teleutospores are only produced.

— The pustules that produce teliospores are known as telia and constitute the black stage of rust.

— Teleutospores / Teliospores are stalked, thick walled, smooth and two celled. The top cell is thickened at the apex. They are slightly constricted at septum. Each cell has a germ pore which is present at the tip and just below the septum in apical and lower cell, respectively.

— Each cell is dikaryotic when young but karyogamy occurs at maturity.



Teleutospore

— They do not germinate immediately. So they are not responsible for rapid spread but are resting spores to carry the fungus over to following season.

— After resting in the open they germinate freely.

— Their survival in Indian plain is difficult since during summer temperature is considerably high.

— Teleutospore perennates in the uninucleate diplophasic condition after karyogamy has occurred.

— Early in the spring each cell of teleutospore germinates and produce promycelium into which diploid nucleus migrates and undergoes meiosis and

forms four haploid nuclei. Septa are laid down separating the nuclei from one another.

— Each cell of promycelium produces sterigmata on which a minute basidiospore is produced.

— Two basidiospores are of one strain and two basidiospores are of other strain.

— Soon after their formation the basidiospores are forcibly ejected and are carried away by the wind.

— Germination of basidiospore is successful only when it germinates on *Barberry* leaf, because *Barberry* protoplasm is the only food for the mycelium. With germination life cycle of fungus continues.

Black stem rust of wheat is caused by *Puccinia graminis*

Epidemiology in India:

— *Barberry* grows exclusively in hills and time of formation of teleutospore and some other factors do not favour infection of *Barberry*.

— In plains wheat is sown in Oct- Nov and harvested in March- April or May. In spite of favourable

conditions rust break out appears 2-3 months after sowing.

— Urediniospores can't survive in intense summer heat of plains.

— So, first appearance of rust on wheat crop is due to dissemination of inoculums which is most likely from sources other than plains.

— K.C. Mehta proved that urediniospores and teliospores cannot survive in the plains in summer, but they can survive in hills, because there summer temperature is congenial and rust survives in uredial stage on self sown wheat plants or other grasses (eg. *Briza minor*).

— From the infected wheat crop disease spreads to wheat plants growing near the foot of the hills by wind borne urediniospores.

— Again from these infected wheat plants the disease gradually spreads to plains. This is how Mehta explained recurrence of rust in plains.

— However, study of Joshi et al indicates that inoculums builds up in the south and its dissemination towards north appears to be principal source of black stem rust inoculums of northern wheat crop.

Macrocylic: Life cycle of *Puccinia* is macrocylic. Macrocylic rust exhibits all five reproductive stages.

Heteroecism: Heteroecious rusts require two hosts to complete their life cycle. They produce O and I one host and stages II, III, and IV on another. The host on which rusts produce stage IIIrd telial stage is called the primary host and other host is known as alternate host.