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Teleutospores or Telial Stage of *Puccinia graminis*:

Towards the end of the growing season of wheat crop, the environmental conditions become unfavorable (hot and dry) for the growth of the uredospore's. Now uredosori produce another kind of spores called teleutospores. First, they develop among the uredospore's within the same sorus, but later they develop in separate sori known as teleutosori or teleutopustule.

As the crop matures, the number of uredospores is reduced and the sori contain only teleutospores. This stage is known as the black stage and hence the name black rust is given to the disease. The teleutospores are dark brown or black in color. They are bi-celled and spindle shaped structures with a pointed apex and thick smooth wall.

Each cell of a teleutospore has a single germ pore and two nuclei (one of plus strain and the other of minus strain). As the teleutospores reach towards maturity, karyogamy takes place and the two nuclei fuse to form a diploid nucleus. The development of teleutospores is entirely similar to the uredospores.

At this stage the teleutospores undergo a period of rest. During resting period they lie on the ground or still attached to the host. These are the dormant cells and are capable of tiding over unfavorable period.

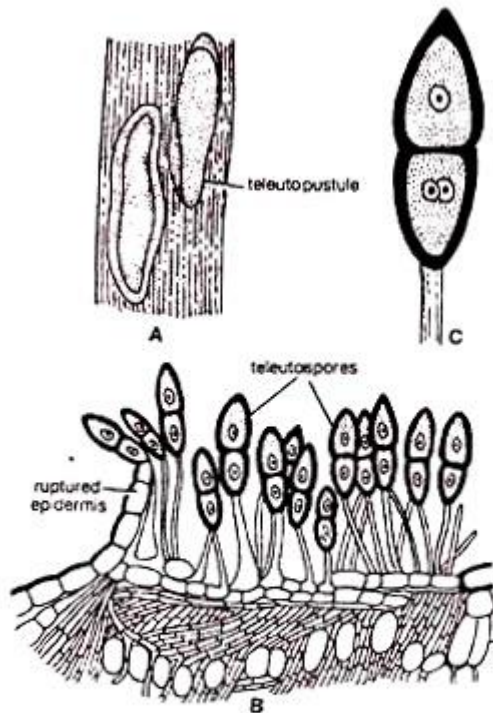


Fig. 5 (A–C). *Puccinia graminis* : (A) Teteutopustule on wheat. (B) Vertical section of leaf passing through teleutosorus; (C) A single teleutospore

Basidial Stage:

After the resting period, the teleutospores germinate during the early part of spring. They germinate in situ and either one or both of its cells give rise to a germ tube. known as promycelium. The promycelium together with the teleutospore cell is called basidium. However, many authors prefer to call the teleutospore cell as the hypo-basidium and the promycelium as the epibasidium.

The diploid nucleus of the teleutospore migrates into the promycelium and divides meiotically into four haploid nuclei. The septa appear between the nuclei and divide the promycelium into four haploid cells. Each haploid cell of the promycelium produces a slender, short, lateral, tube-like structure known as sterigma. The sterigma swells up at the end to form a spore like cell. The haploid nucleus from each promycelium cell migrates into this developing spore cell through its respective sterigma. Thus, at the tip of each sterigma, a minute spore is formed.

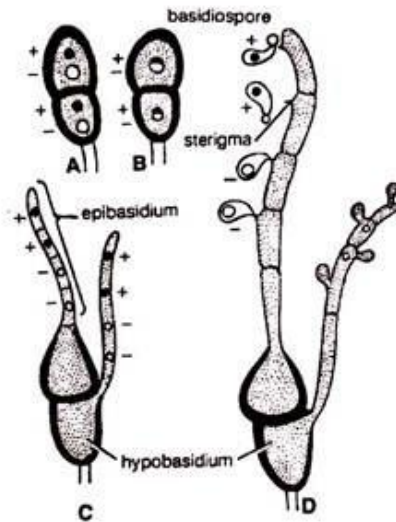


Fig. 6 (A–D). *Puccinia graminis tritici* : Basidial stage. (A) Young teleutospore, (B) Mature teleutospore; (C) Germinating telutospore; (D) Basidial stage

This spore is called basidiospore. Each cell of promycelium produces a single basidiospore. Thus, from a single cell of teleutospore four haploid, unicellular, uninucleate basidiospores are formed. Two, out of the four telutospore basidiospores are of '+' strain and the other two of strain.

Soon after the basidiospore formation they are forcibly ejected by the 'water droplet method'. (In this method a liquid begins to collect in the form of a droplet at the base of the basidiospore.

This droplet gradually attains a bigger size and suddenly pushes off the basidiospore forcibly into the air to a short distance.) The basidiospores are carried away by wind. They are capable of germinating only on Barberry plants (*Berberis vulgaris*) available on hills. They perish soon if the alternate host is not available.

*******(continued in next lecture...)*******