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### **Stages of *Puccinia graminis* on Barberry Plant:**

The basidiospores, which fall over the upper surface of barberry leaf start germinating soon. They germinate by giving out a germ tube which penetrates through the epidermis.

The germ tube elongates and divides inside and develops into hyphae. These hyphae grow between all the cells lying in between the lower and upper epidermis. The hyphae are composed of uninucleate haploid cells (primary mycelium) and are of '+' or strain.

Several basidiospores of different strains may infect the same Berberis leaf. Thus, haplomycelium of two different strains ('+' or '-') is formed. It remains haploid for sometime and the fusion between these two strains ('+' or '-') may occur at a later stage.

### **Spermogonial or Pycnidial Stage:**

This stage is also known as Pycnial or spermatial stage. After about four days of the infection, the haplomycelium collects and forms dense mats both beneath the upper and lower epidermis. The mycelial mats beneath the upper epidermis are known as primordium of spermogonium while the mats beneath the lower epidermis are known as primordium of aecidium or protoaecidium.

In 7 to 10 days after infection, each primordium of spermogonia matures into a small flask shaped structure called spermogonium or pycnidium. The pycnidia appear as minute yellowish specks on the upper surface of the leaf. A vertical section through these specks reveals that each spermogonium opens on the upper surface of the host leaf through a pore like structure known as ostiole.

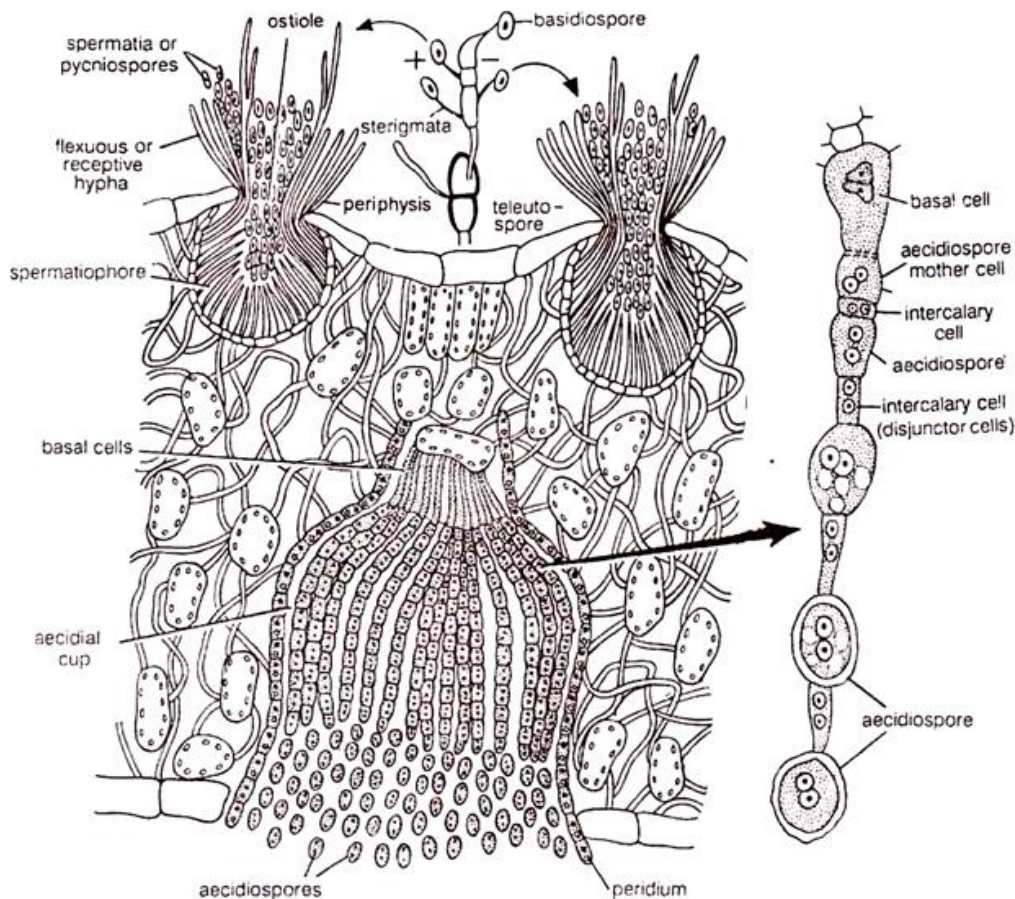


Fig. 7. Puccinia : Transverse section of barberry through pycnial and aecial cup

### Aecial or Aecial Stage:

The haplomycelium forms the primordium of aecidium or protoaecidium beneath the lower epidermis. The further development of protoaecidium into aecidium takes place only after the dikaryotization. The spermatial nucleus (male nucleus) by mitotic division forms a second male nucleus, which moves to the next cell, through septal perforation. In this way the male nuclei produced

by successive mitotic divisions pass down and all the cells of primary mycelium are dikaryotized.

The dikaryotic basal cells of the protoaecidium arrange themselves vertically beneath the lower epidermis and are called as sporophores. Each bi-nucleate basal cell then cuts off a chain of bi-nucleate cells in basipetal succession on the side towards the lower epidermis of the host.

These cells are the aecidiospore mother cells. These cells further divide transversely to form a large cell and a small cell. The large cell develops into aecidiospore while the small cell remains sterile and is known as disjuncter or intercalary cell. The latter dissolves and sets free the aeciospores.

With the development of the aeciospores some of the basal cells lying at the periphery of protoaecidium mature into a one-celled thick protective layer called peridium.

This entire structure is cup shaped and is known as aecium. The developing aeciospores rupture the peridium by exerting a pressure on it. Thus, the aeciospores are liberated. They are unicellular, polyhedral, thin walled, bi-nucleate and orange yellow colored.

### **Germination of Aeciospores:**

The aeciospores are disseminated by wind. They are capable of immediate germination but cannot infect barberry plants. Falling on suitable host i.e., what leaf they germinate by producing a germ tube or primary hyphae.

The further development of the germ tube is similar as described in the uredinal stage and ultimately the dikaryotic mycelium is produced. This is the mycelium which produces the uredospores and later the teleutospores on wheat. In this way, the life cycle of *Puccinia graminis* is completed.

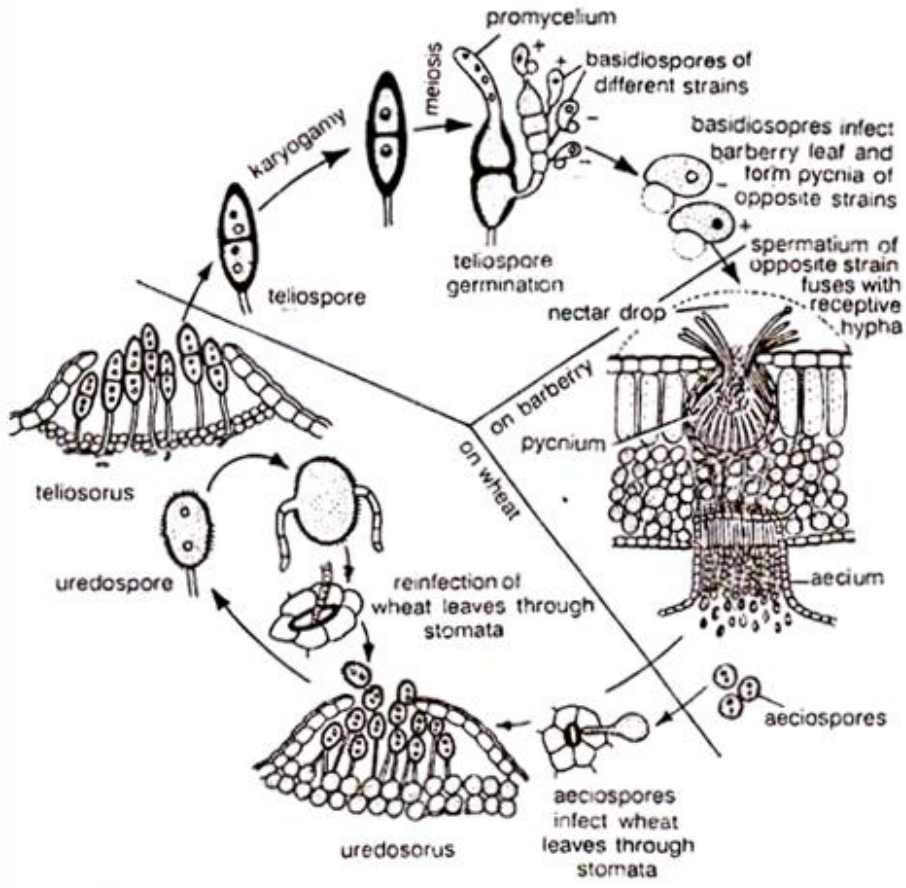


Fig. 11. Diagrammatic life cycle of *Puccinia graminis tritici*

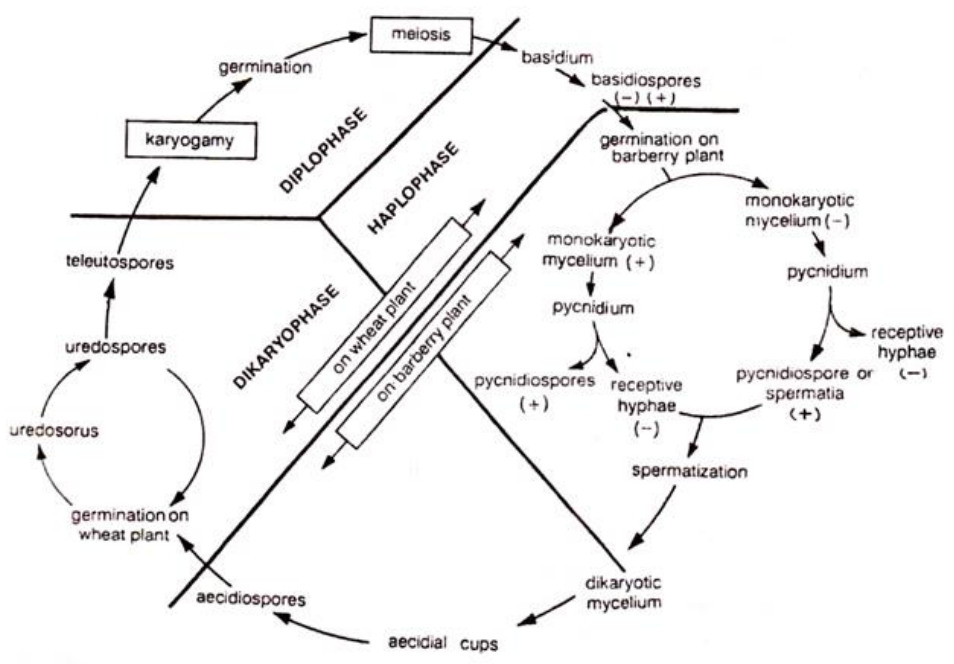


Fig. 12. Graphic life cycle of *Puccinia graminis tritici*

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