Aspergillus (Eurotium)

Kingdom - Mycota
Division - Eumycota
Sub-Division - Ascomycotina
class - Plectomycetes
order - Eurotiales (Aspergillales)
family - Eurotiaceae (Aspergillaceae)

- 132 spe. in all world.
- saprophytic fungus,
- 30 spp. in india A. Niger. A. repens, A-flavus.
- row on fruits, vegetable & pickles, jams, jellies. and others
- A. is found on plant as parasites.
- A- flavus secret aflatoxins caus many disease in human
- A- niger. is detect quantities of trace elements. (Zn, Ca, Mn, Mo,)

Vegetative structure.

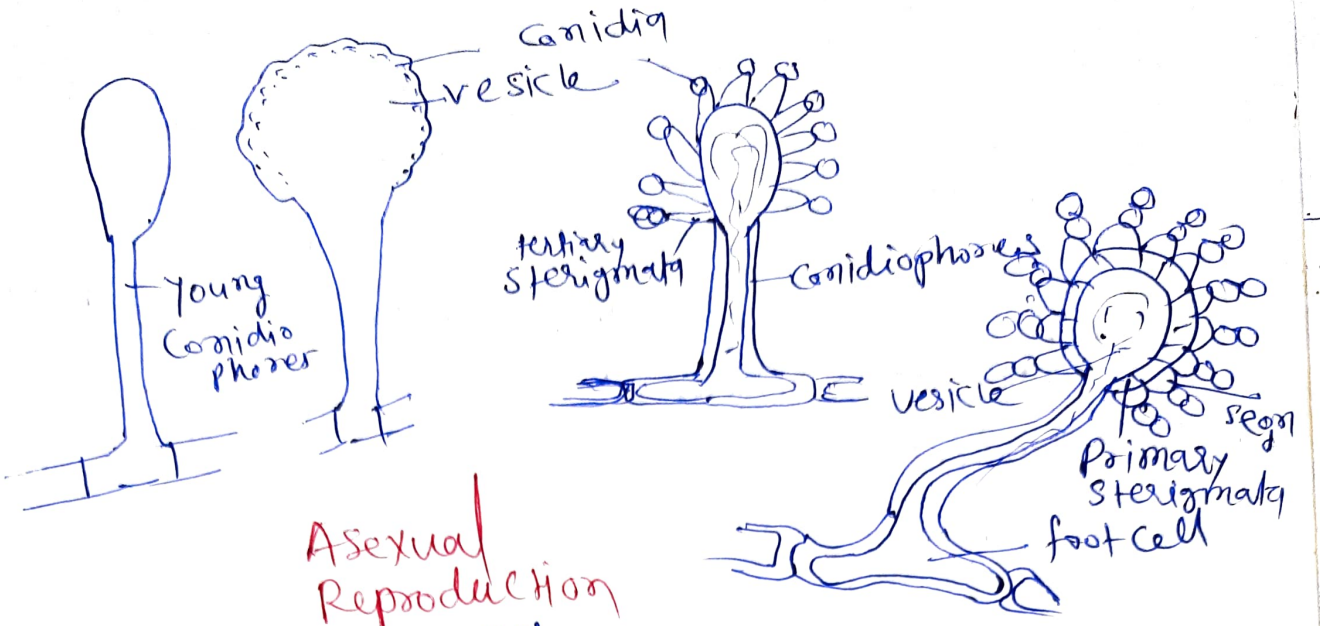
- Mycelium well developed
- Profusely branched.
- septed hypae are homokaryotic some are hetero. (+-) Strain

Reproduction →

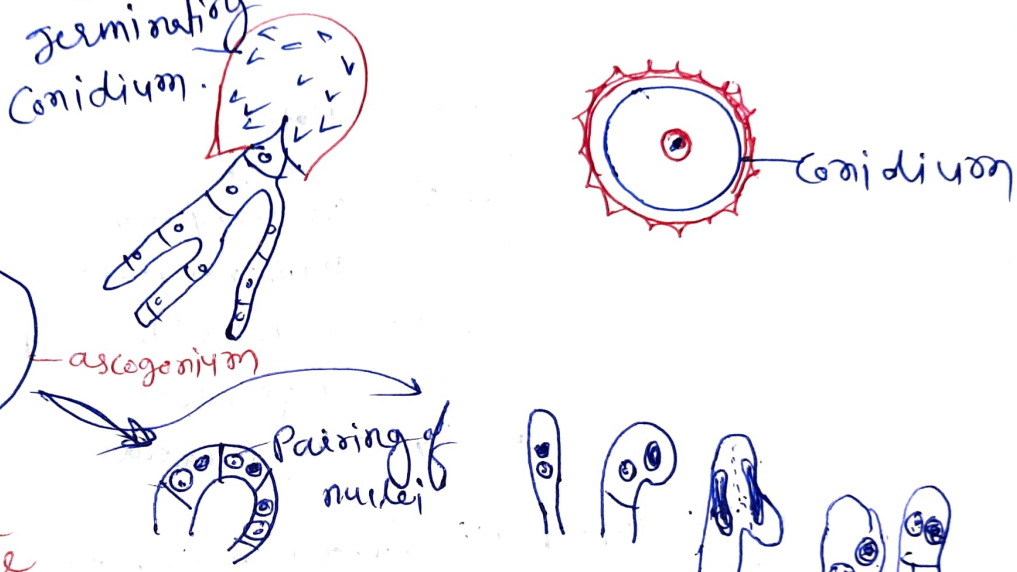
(I) Vegetative Reproduction takes placed by fragmentation

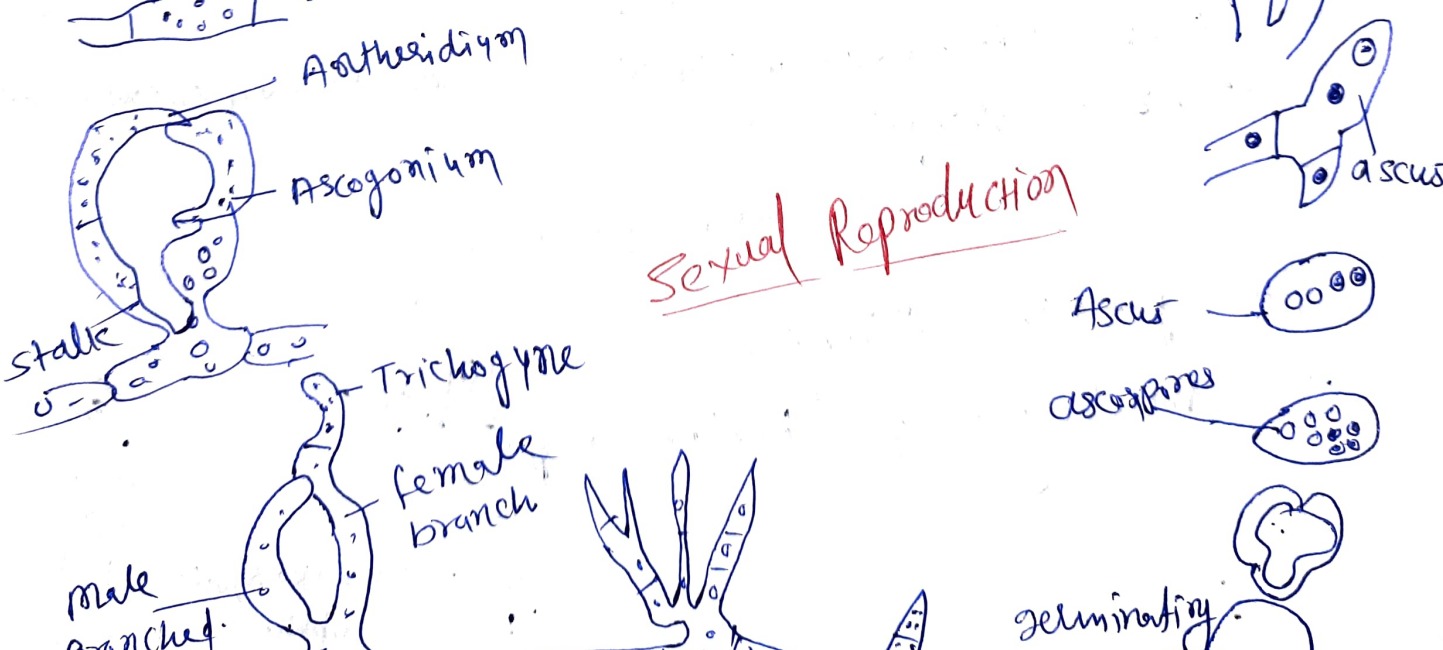
Each detached fragment is capable to develop into a new mycelium.

(II) Asexual Reproduction



Asexual Reproduction





Sexual Reproduction

① Development of the ascogonium.
② development of the Antheridium.
③ Fertilization — gametangial contact
dikaryon donot fusion female and

⇒ Development of Asci → male nuclei
⇒ Development of Ascocarp

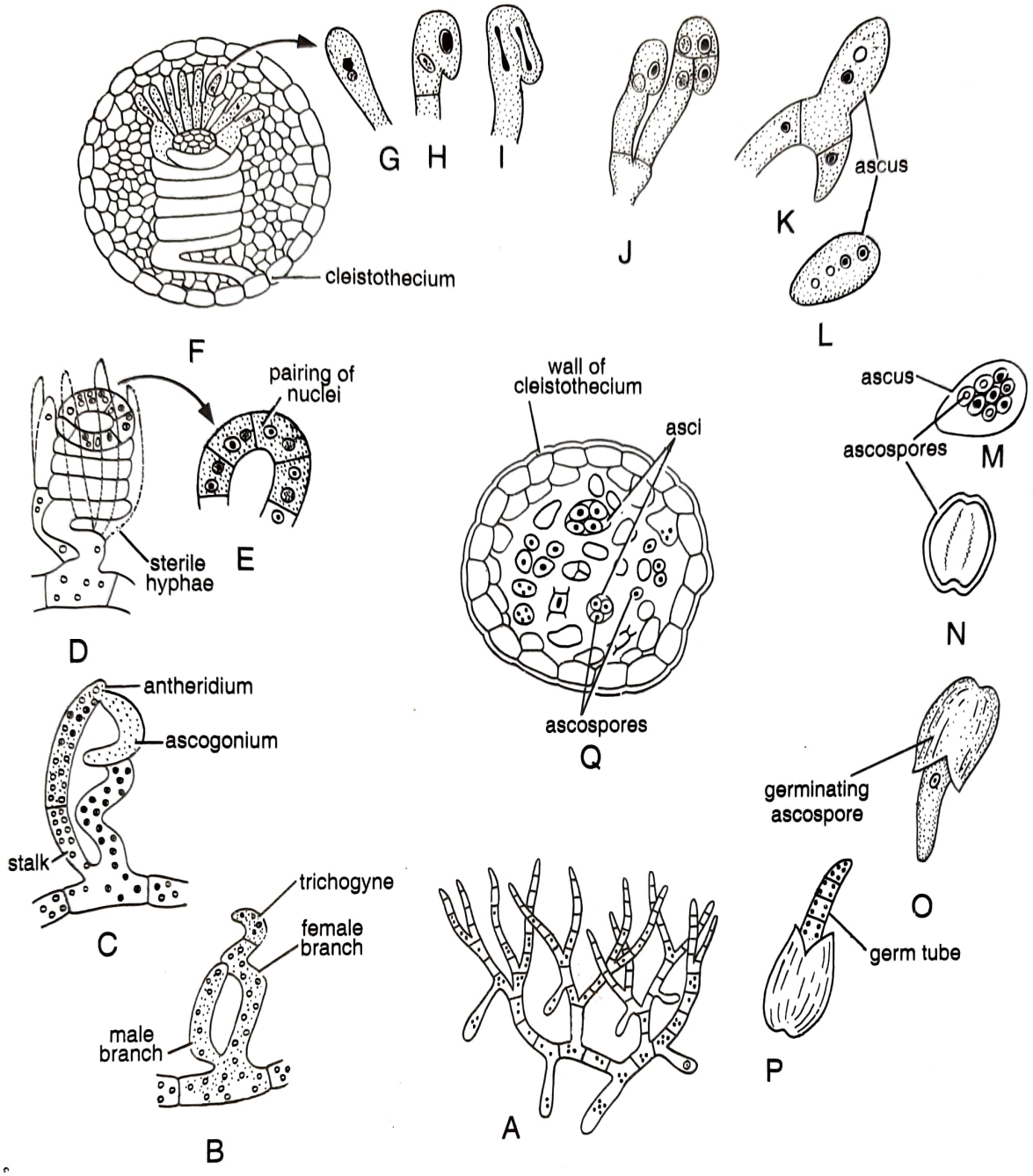


Fig. 2 A-Q. ***Aspergillus*:** Stages of sexual reproduction.

The conidium is a small, globose, echinulate, and uninucleate structure (Fig. 1 E). It contains various pigments, such as yellow, green, brown or black, in different species. Conidia are dispersed by wind. They germinate on suitable substratum, each producing a new mycelium (Fig. 1 F, G).

[II] Sexual reproduction

Sexual reproduction is uncommon in *Aspergillus*. It has been studied in details in *A. herbariorum* and *A. repens*. Most species of *Aspergillus* are homothallic, but a few (e.g., *A. fischeri* and *A. heterothallicus*) are heterothallic. The sexual reproduction may be isogamous (e.g., *A. nidulans*) or anisogamous (e.g., *A. repens*). The male and female sex organs are known as **antheridia** and **ascogonia** (archicarp) respectively. In homothallic species, the antheridium and ascogonium develop on the same hypha or on two adjacent hyphae of the same mycelium (Fig. 2 A).

1. Development of the ascogonium. The hyphal branch which forms ascogonium soon becomes septate and loosely coiled. As ascogonium

develops the coil becomes dense and looks as a spring-like structure. It is now known as **archicarp**. It is differentiated into the following three regions (Fig. 2 B-D).

(1) The terminal unicellular and multinucleate part is known as **trichogyne**. It acts as the receptive region.

(2) The middle part is also unicellular and uninucleate. It functions as female gametangium and is known as **ascogonium**.

(3) The basal part is multicellular and multinucleate. It forms the stalk of the ascogonium.

2. Development of the antheridium. The antheridium develops close to the ascogonium on the same or nearby hypha. It begins to initiate just before or during the septation of the ascogonial hypha. The antheridial branch, also known as **pollinodium**, becomes 2-celled by the formation of a septum. The upper cell forms the **antheridium proper** and the lower one, the **stalk**. Both the antheridium and stalk are multinucleate and remain unicellular even at maturity (Fig. 2 B-D).

There is a gradual elimination of antheridia in the various species of *Aspergillus*. The following stages of progressive degeneration can be seen.

(1) In species like *A. herbariorum* antheridia are well developed and functional.

(2) In *A. repens* and some other related species though antheridia are well developed, their cytoplasmic contents are not transferred to the ascogonium.

(3) In many species of *Aspergillus* though antheridia are formed, the male nuclei soon degenerate and there are no functional nuclei in mature antheridia.

(4) In *A flavus, A. fischeri* and *A. fumigatus* antheridia do not develop at all.

3. Fertilization. Before fertilization, the stalk of the antheridium elongates, and coils and grows upwards in close contact with the ascogonium until the antheridium touches the trichogyne. This is known as **gametangial contact**. The intervening walls at the point of contact of the antheridium with the trichogyne dissolve and the contents of the antheridium are transferred into the ascogonium through the trichogyne (Fig. 2 C). The contents of the antheridium and the ascogonium readily mix but the fusion of male and female nuclei do not take place at once. The male and female nuclei arrange themselves in pairs within the ascogonium and this is known as **dikaryon** (Fig. 2 D, E).

In some species of *Aspergillus* the process of fertilization differs from the one described above. In these species the role of antheridium in sexual process in not definitely known. For instance, in *A. repens* although the antheridium is present the male nuclei are not transferred to the ascogonium. In some species, such as *A. flavus, A. fumigatus* and *A. fischeri,* though antheridia do not develop at all, fruiting bodies are formed. There is pairing between the nuclei of the ascogonium itself.

Development of Ascus

As described earlier, after fertilisation a dikaryon is formed in the ascogonium. This is followed by the septation of the ascogonium. Each cell thus formed contains a dikaryon (Fig. 2 F, G) and develops into a multicellular ascogenous hypha. In turn each cell of the ascogenous hypha also has a dikaryon. The terminal cell of the ascogenous hypha curves to form a hook-like structure, known as **crozier**. The two nuclei of the dikaryon present in this cell divide by a conjugate division and thus four daughter nuclei are formed. Now septa are formed in the crozier in such a way that the penultimate cell has two daughter nuclei, and the terminal and basal cells one daughter nucleus each (Fig 2 G-J). The two nuclei present in the penultimate cell fuse to form a diploid nucleus. This cell now functions as the ascus mother cell and elongates to form an ascus. The diploid nucleus of the ascus first undergoes a meiotic division, followed by mitotic division. Eight haploid nuclei are thus formed in an ascus and each of these ultimately transforms into an ascospore (Fig. 2 K- M). In this way eight globose or pyriform ascospores are formed in each ascus. The wall of the ascospore is differentiated into an outer thick and sculpturous **epispore** and an inner thin **endospore**.

Development of Ascocarp

Simultaneously with the development of ascogenous hyphae, many sterile hyphal branches also develop from the cells lying below the ascogonium. These branches form a pseudo-parenchymatous structure, known as **peridium**. The peridium, which is two layered structure, encloses ascogenous hyphae. The inner layer of the peridium is consumed by the

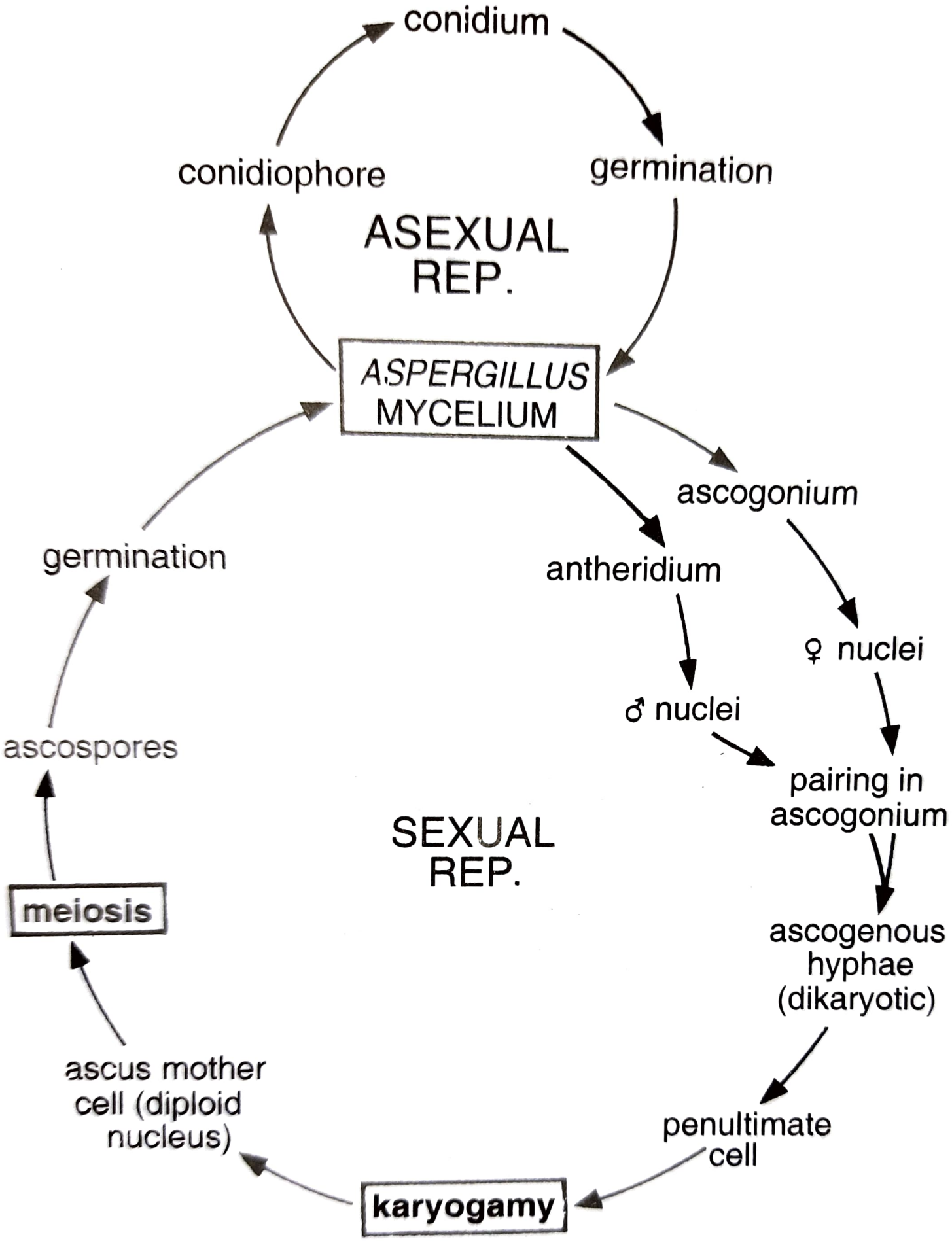


Fig. 3. *Aspergillus*: Life-cycle.