Heterothallism in Ascomycetes and Basidiomycetes.

Many of the Ascomycetes are *homothallic or homomictic* while many others are *heterothallic or dimictic* with a well-defined genetic control of their mating systems.

In heterothallic Ascomycetes, compatibility is determined by a pair of genes A1 and A2.These genes are segregated at **meiosis** just before the formation of ascospore. Only because of this, out of eight ascospores of an ascus four contain geneA1 and the remaining four ascospores contain gene A2. On germination, each of these ascospore will give rise to such a mycelium whose mycelium nuclei will carry only one gene, i.e. either A1 or A2. Antheridia and ascogonia are formed on this mycelium. Both these sex organs (male and female) will carry the same gene factor i.e either A1 or A2, and therefore will remain unable to mate among themselves.

For sexual fusion, therefore, two thalli of different genetic makeup must be brought together, so that an A1 ascogonium may come in contact with an A2 antheridium, and vice-versa.in this type of heterthallism the mating individuals consists of two groups that differ in their genetic make-up for the compatibility factor, and hence it is called **Bipolar heterothallism.**

Some Ascomycetes show ***tetrapolar heterothallism.*** Instead of two, **four mating types of mycelia** are contained in these fungi, and the compatibility in them is controlled by two pairs of factors, i.e. A1A2 and B1B2. These two pairs of factors are located on different chromosomes. Only those thalli are compatible whose nuclei contain opposite genes of both Mendelian pairs A1A2 and B1B2.

Heterothallism in Basidiomycetes

Heterothallism in Basidiomyctes is of common occurrence.

Bipolar Compatibility- Basidiomycetes homokaryon Compatiblity is controlled by a single gene, designated as A. Homokaryons with different A alleles (e.g. A1+A2; A1+A3) are compatible, and in them the fusion of the hyphae results in the formation of dikaryon, whereas with the same A alleles these fungi are incompatible. Compatibility control of this type is called **Bipolar.** Due to involvement of only a single factor (or single gene), the genetic basis for the bipolar compatibility is called ***Unifactorial,*** as in most of the rusts and smuts.

In some Basidiomycetes the existence of two factors (or two genes), called A and B with two alleles at each locus, of which both have many alleles, e.g. A1, A2, A3, A4……..An. Due to involvement of two separate factors, the genetic basis is called *bifactorial.* In such cases, the compatibility occurs only when alleles of both A and B are different, i.e. A1,B1 and A2,B2. If one or other allele is common, the hyphal fusion, of course, may occur, but there is no formation of a dikaryon.

A and B factors are located in the different chromosomes and 4 combinations of A and B alleles (e.g A1 B1, A1 B2, A2 B1 and A2 B2) are derived in basidiospores from a single basidum in equal frequency. Two gene systems are therefore present. The species having the two gene system are called ***Tetrapolar .***