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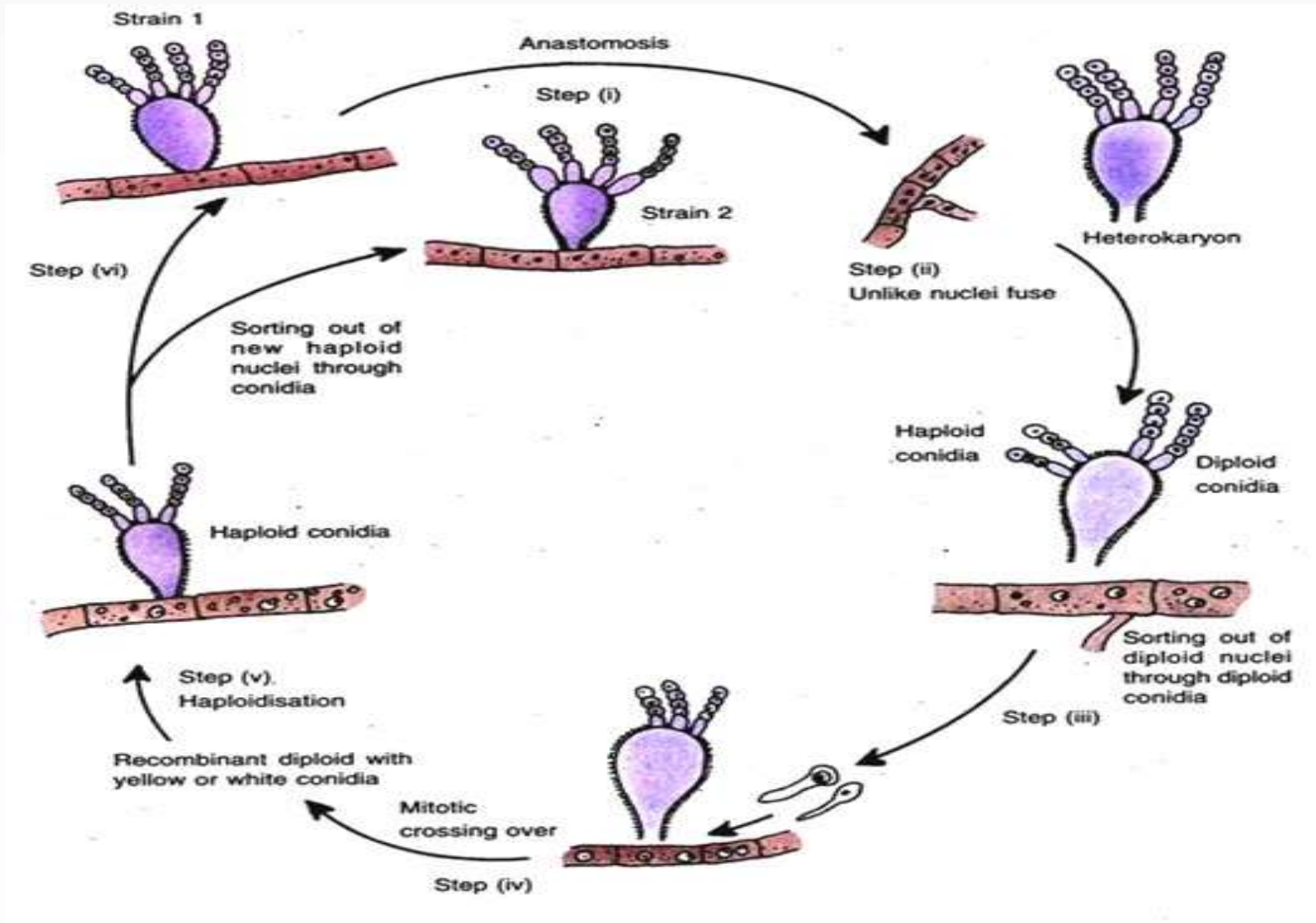
Parasexuality in fungi

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PARASEXUAL CYCLE IN FUNGI

- The Parasexual Cycle is defined as a cycle in which plasmogamy, karyogamy and meiosis take place but not at a specified time or at specified points in the life-cycle of an organism.
- Parasexual cycle was first discovered by Pontecarvo and Roper of University of Glasgow in 1952 in *Aspergillus nidulans*

- In some fungi, true sexual cycle comprising of nuclear fusion and meiosis is absent.
- Generally parasexual cycle occurs in those fungi in which true sexual cycle does not take place.
- The members of class Deuteromycetes (Deuteromycotina) in which sexual cycle does not occur, exhibit parasexual cycle generally.



Parasexual cycle

Steps Involved in Parasexual Cycle

(i) Formation of heterokaryotic mycelium

- Heterokaryotic mycelium is formed in several ways. The most common is by the anastomosis of somatic hyphae of different genetic combinations
- The foreign nucleus or nuclei introduced into a mycelium multiplies and its progeny spreads through the mycelium rendering it heterokaryotic.

- Mutation in one or more nuclei of a homokaryotic mycelium also makes it heterokaryotic
- It happens in some of the fungi belonging to Ascomycetes. Still a third way is by the fusion of some of the nuclei and their subsequent multiplication and spread among the haploid nuclei.
- In this type of heterokaryotic mycelium a mixture of haploid and diploid nuclei occur.

(ii) Fusion between two nuclei (Karyogamy)

- The fusion of nuclei in the mycelium has been demonstrated. The nuclear fusion may be of two types: (a) fusion between like nuclei and (b) fusion between unlike nuclei.
- The nuclear fusion results in the formation of homozygous or heterozygous diploid nucleus respectively.

- If the genotype of unlike nuclei present in the heterokaryotic mycelium is A and B, then five types of nuclei can be formed by their fusion: two types of haploid nuclei (A and B), two types of homozygous diploid nuclei (AA and BB) and one type of heterozygous diploid nucleus (AB)

(iii) Multiplication of diploid nuclei

- The above mentioned five types of nuclei multiply at about the same rate but the diploid nuclei are present in much smaller number than the haploid nuclei. Portecarvo (1958) estimates a proportion of one diploid heterozygous nucleus to 1000 haploid nuclei.

(iv) Occasional mitotic crossing over:

- During multiplication of diploid nuclei, mitotic crossing over may take place. This results in the formation of new gene combinations. These recombinations, which are dependent on the existence of heterokaryosis, give the fungus some of the advantages of sexuality within the parasexual cycle.
- According to Pontecarvo's (1958) estimates, the amount of recombinations which may be expected to occur in an ascomycete through its parasexual cycle is 500 times smaller than through its sexual cycle.

(v) Sorting out of diploid nuclei:

- In those fungi which produce uninucleate conidia, sorting out of the diploid nucleus occurs by their incorporation into conidia which germinate to produce diploid mycelia. Diploid strains of several important imperfect fungi have been isolated
- Roper (1952) first synthesized and isolated diploid strains of *Aspergillus nidulans*. The conidia of diploid strains are somewhat larger than those of haploid strains.

(vi) Occasional Haploidisation of the diploid nuclei:

- Occasionally, some hyphae of diploid mycelium form haploid conidia which form haploid mycelia on germination. The formation of haploid conidia by diploid mycelium indicates that haploidisation occurs in some diploid nuclei.

(vii) Sprting of new haploid strains:

- Some diploid nuclei undergo haploidisation in the mycelium and are sorted out by incorporation of haploid nuclei in the uninucleate conidia. Some of these haploid strains are genotypically different from their parents because of their mitotic recombinations.

Significance of parasexual fungi:

- Parasexual cycle is of importance in industrial processes. Several fungi which are used in various industrial processes belong to fungi imperfecti or Deuteromycetes
- Parasexuality can also be applied in the analysis of genetic and physiological processes of perfect and imperfect fungi
- Parasexual cycle has also been successfully employed in genetic control of pathogenicity and host-range in several species of *Fusarium*

References

- Alexopoulos, CJ, Mims, CW and Blackwell, MB, Introductory Mycology. 4th ed., John Wiley and Sons, New York, 1996.
- Webster, J and Weber, R, Introduction to fungi. 3rd ed., Cambridge University Press, USA, 2007.

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