MODES OF SPECIATION

ALLOPATRIC SPECIATION — It is based on the concept that new species arise when some physical geographic barrier divides the large population of species into two or more small populations. The individuals of these isolated populations cannot interbreed. Thus geographic barrier obstructs free gene flow between the populations. Each new population accumulates differences and evolves independently into new species. Allopatric divided the process of allopatric speciation into three steps.

i), Formation of isolated population by geographic barriers.

ii), Persistence of isolated populations and their differentiation from parental population, the genetic divergence.

iii), Establishment of reproductive isolation between new populations and formation of new species.

Various geographic barriers that interplay important role during speciation may be large expanses of ocean, high mountain ranges, glaciers, deep river valley, wide river or desert etc. Even a long distance separating two population of a species interferes with the free gene flow and helps in speciation. Initially these might have a very similar genetic composition but no two environments, how so ever close they may be, are likely to be identical biologically or physically. Therefore each population is exposed to a somewhat different selection pressure. Thus random mutations together with genetic drift and selection pressure establish genetic differences and morphological and physiological variations in formerly similar or identical population. These differences gradually

accumulate and cause more and more divergence in the genetic constitution of populations and this leads to establishment of geographical races and finally the distinct subspecies. Additions of certain more mutations in their gene pool so as to affect their interbreeding leads to reproductive isolation. Therefore the groups of subspecies or races become reproductively isolated and are ranked as species. A very good example of allopatric speciation is of Darwin finches. A South American ground finch Geospiza magnirostris from the mainland of south America colonised Galapagos. These islands were separated from mainland by vast stretch of Ocean which acted as geographical barrier and the new population evolved independently of the parent population and became reproductively isolated to form new species. Subsequent speciations from the species occured later on, when some of its representatives colonised new island. Presently, each island of Galapagos is occupied by different species of Darwin's Finches.

SYMPATRIC SPECIATION

The evolution of new species within one locality is c/as sympatric speciation. It involves establishment of new populations of a species in different ecological niches within the normal range of parental population. Sympatric speciation can occur by a rapid development of reproductive isolation between members of the populations in different niches. The rapid reproductive isolation can arise due to changes in the chromosome number and. The change in the chromosome number may occur by polyploidy, aneuploidy, haploidy or translocation.

eg Different species of Drosophila have different number and appearance of chromosomes

(a) Drosophila melanogaster and D. americanus have 4 pair of chr's
(b) D. virilis has 6 pairs of chr's
(c) D. pseudo-obscura and D. persimilis possess 5 pair of chr's
(d) D. willistoni have 3 pairs

The chromosome composition of D. virilis is regarded to be of ancestral type, which have 5 pair of rod shaped and one pair of dot like chromosome. The chromosomal complement of D. pseudoobscura and D. persimilis could be derived from D. virilis by translocation between X chr and one of the autosomes so that these possess a pair of V-shaped and 3 pairs of rod-shaped and a pair of dot like chr's.

Sympatric speciation might also result from a combination of sexual selection and ecological factors such as Pig frog and Gopher frog (details in habitat isolation)