Mitochondrial Mutation in Yeast

There are some characters that are controlled by mitochondrial genes. The inheritance pattern of petite mutants of Beaker's Yeast Saccharomyces cerevisiae in one such example. Yeast cells normally form large colonies called the grands on nutrient other agar plates. Rarely, small or minute colonies called as petite also appear among them. Petite colonies were small not because the cells were small, but because the growth rate of the mutant petite strain is significantly slower than that of the wild type. Thus, there are fewer cells in the petite colonies. These petite colonies grow slowly because of low respiration due to defects in the mitochondrial e' transport proteins.

When petite are crossed with W.T, three different types of petites are observed o:
The segregational, Neutral, Suppressive petites.

The segregation (Nuclear) petite, caused by mutation of a chromosomal gene, exhibits normal Mendelian segregation. In a cross with wild type, the diploid progeny are normal, and if the diploids are allowed to undergo meiosis half of the spores in an ascus produced petite colonies and half for Wild type colonies, i.e. segregation of ascospores into 2:2 ratio.
Two other classes of petites, the neutral petites and suppressive petites exhibit the traits of extranuclear inheritance.

When while a neutral petite is crossed with normal Wild type cells, the resulting diploids produce all grande colonies. The ~~main~~ name neutral, then refers to the fact that this class of petites doesn't affect the Wild type. The explanation for these results is that the majority of neutral petites lacks most or all mitochondrial DNA, in which many of the gene determined oxidity respiration. When a neutral petite cell match a Wild type cell, the cytoplasm of the letter is the source of the normal mitochondrial DNA in the resulting progeny spore. The third category of petites, suppressive petites, the cross between petite and wild type produced all petite colonies. The suppressive petites are different from the neutrals because they do have an effect on the wild type

Most petite mutants are of the suppressive types. Suppressive petites also have deletions of mitochondrial DNA, but they are not nearly as extensive as deletions in the neutral petites. Two major hypothesis have been given to explain suppressiveness; one suggest that the mutant mitochondrial DNA replicates more rapidly, resulting in the mutant mitochondria dominating the phenotype by numbers alone. The second hypothesis considers the view that recombination occurs between the mutant and wild type mitochondrial DNA, introducing an error into the normal mitochondrial DNA.

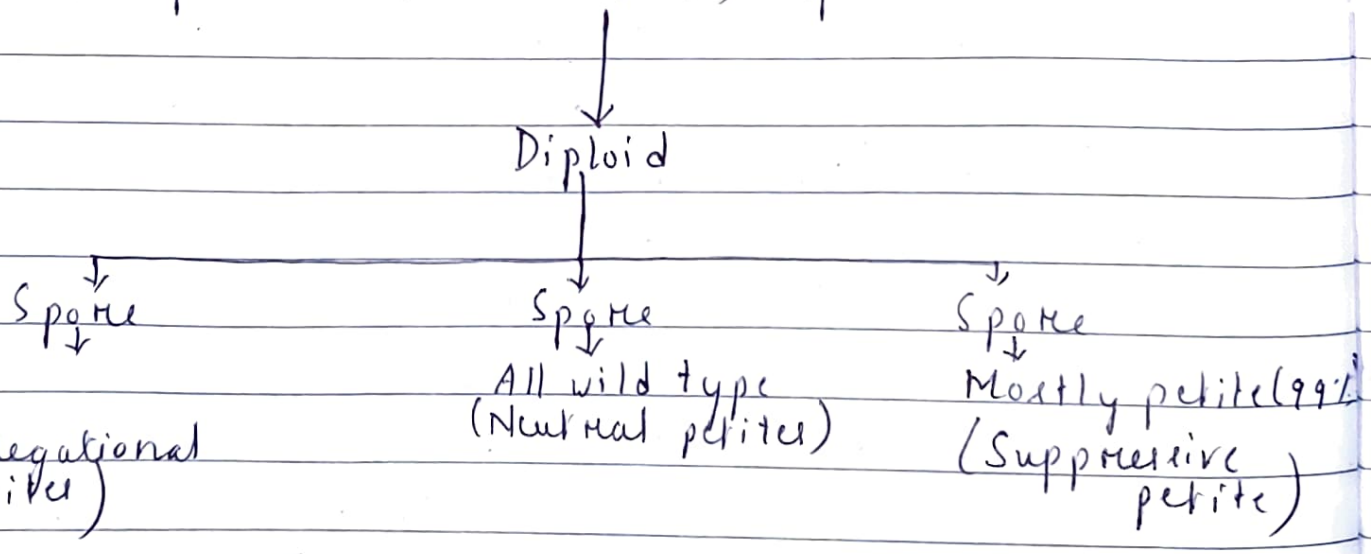

Fig: The categories of Petites Yeast based on segregation patterns.