A hyphal fusion between a wild type black (B) strain and a mutant type tan (T) strain will produce hybrid octads that follow the first or second division segregation during meiosis. The first-division segregation (MI) asci follow a 4B:4T or 4T:4B ratio (non-recombinant, no crossing-over). The second-division segregation (MII) asci, due to crossing over, follow a 2B:2T:2B:2T or 2T:2B:2T:2B ratio. They also follow a 2B:4T:2B or 2T:4B:2T ratio. The percentage of recombinant is expected to be less than 50%.

# Experiment 2: Assigned cross between the two mutant gray (gr) or tan (tn) strains Question/purpose:

The purpose is to determine if the genes gray (G) and tan (T) genes are linked or unlinked. The two genes will be considered linked if their loci are located on the same chromoson and are close enough to not assort independently. If they are unlinked, never linked to be inherited together. <u>Hypothesis</u>:

A hyphal fusion between unuture gray (G) strain an O mutant tan (T) strain will produce octads based O Mendel's first law of stregginer, Mendel's second law and importantly the law of recombination in crossing over take place. If both genes are linked, they will not assort independently and have a recombination frequency of less than 50%. If they are unlinked, they will assort independently based on Mendel's second law.

#### Predictions:

A hyphal fusion between a mutant gray strain (G) and a mutant tan strain (T) would produce hybrid octads that are parental ditype spores (non-recombinant, no crossing over), non-parental ditype spores(recombinant due to crossing over) or tetratype spores( parental and recombinant, some crossing over). The parental ditype (PD) asci follow a 4G:4T or 4T:4G ratio. The nonparental ditype (NPD) asci either follow a 4B:4C or 4C:4B ratio, where C stands for colorless.

# <u>Appendix – 1</u>

# Part 1. Relative frequency and relative map distance calculation in drosophila melanogaster

#### Recombinant frequency formula (%RF):

The recombinant frequency and the map distance between the RI and SS gene can be calculated as follow:

% RF =  $\frac{\text{Total number of recombinant}}{\text{offspring sample size}} x100$ 

## Experimental data:

Number of observed +,+ recombinant (non-parental) drosophila offspring: 519

Number of observed RI,SS recombinant (non-parental) drosophila offspring: 523

Total number of offspring: 519 + 523 = 10035

<u>Appendix – 2</u>

## Part 2. Recombination, linkage, and mapping of genes in Sordaria Fimicola

Experiment 1: Assigned cross between the two mutant gray (G) or tan (T) strains

Relative map distance formula (cM or m.u)

The relative proportion of MII octads that are recombinant can be calculated with this formula:

cM or m.u =  $\frac{\left(\frac{1}{2}\right)$ (number of MII octads) Total number of hybrid (MI+MII)octads x100

In MII octads, only half of the ascospores (two pairs) are recombinants, the other half (other two pairs) are not recombinants.

Experimental data

Number of observed MI hybrid octads = 44