Bio 122 Lab: Group 1: Section 073

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Saccharomyces Cerevisiae Mating and Mendelian Inheritance

Introduction

The yeast mating experiment examined the sexual and asexual reproduction that occurred in Saccharomyces cerevisiae. In the S. cerevisiae, common name yeast, asexual reproduction cycle, one diploid cell will divide mitotically to form two diploid cells. The two diploid cells then divide meiotically to form four haploid cells (Tannenbaum, 2008). After the four haploid cells are formed, the cells reproduce through sexual reproduction.

Two different mating types occur in yeast—the a-factor and the alpha-factor (Tannenbaum, 2008). The pheromone secreted from one of the haploid cells binds the receptor with the opposite mating type. Two haploid cells are fused to form one diploid cell (Michealis, Barrowman, 2012).

The experiment examined the mitotic and meiotic divisions occurring in a eukaryote cell. Genes that coded for the character of color in yeast were examined. In this experiment, two different alleles encoded for color. R represented the dominant allele, white color, and r recessive, red coloration.

Mendel conducted monohybrid crosses between plants that were both heterozygous—possessing a dominant and recessive allele. His results indicated a genotypic ratio of 1:2:1 of homozygous dominant, heterozygous, and homozygous recessive respectively (Mason, et. al 2011). However, the phenotypic ratio represented was 3:1 with the dominant trait more frequently represented (Mason, et. al 2011). Mendel's model was used in this experiment. Thus, we hypothesize that the genotypic ratios of the yeast cross will be 1:2:1 and the phenotypic ratio of white to red will be 3:1.

Methods

- Week 7: A mating grid was cut out and taped to the bottom of a YED agar plate. By following the grid, the proper haploid cells were scored into the respective alleles. The YED plate was incubated to grow the *alpha* and *a* haploid strains. Predictions were made about the genotypic and phenotypic ratios that would result when the strands were mated.
- Week 8: The visible colors of the haploid strains were recorded. Haploid strains were mated and once again, incubated to grow strains.
- Week10: The resultant colors of the crossed haploid strains were recorded. The final genotypic and phenotypic ratios were recorded and compared to the initial predictions made in week 7.

Results

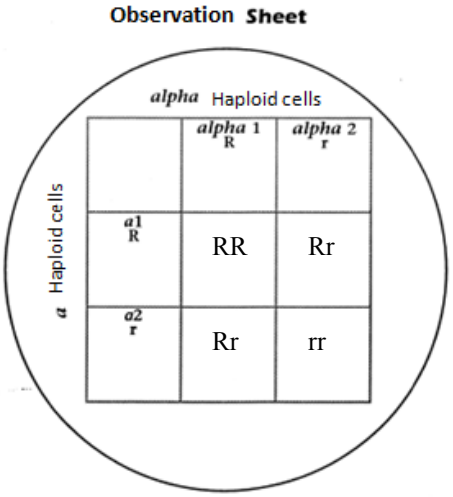

Figure 1: Initial cultivation of yeast strains; predicted genotypes.

Yeast strains were scraped from cultures grown in petri dishes and swabbed into correlating squares. Predicted inheritance was expected to follow Mendelian inheritance in a monohybrid cross—1:2:1; 1 – RR, 2 – Rr, and 1 – rr.

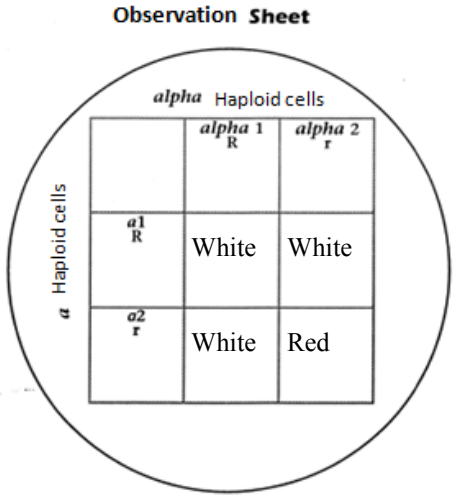

Figure 2: Initial cultivation of yeast strains; predicted phenotypes.

A phenotypic ratio of 3:1 was predicted in accordance with the Mendelian model. The dominant trait was predicted to appear more frequently in cross results, representing 75% of the generation.

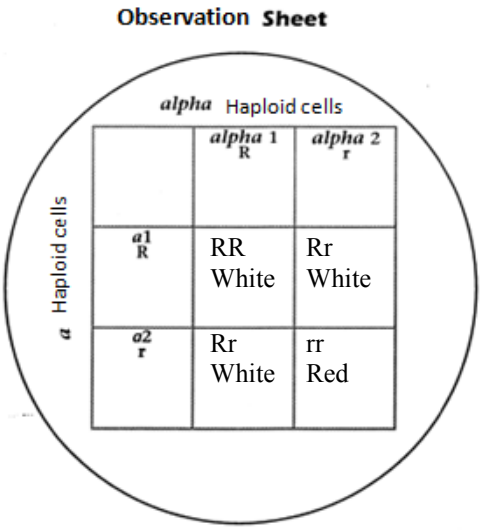

Figure 3: Yeast Mating grid with observed genotypes and phenotypes.

Observed genotypes and phenotypes were consistent with original hypothesis, however evidence of cross-contamination was present in the results of the yeast mating. The phenotypic ratio was 3:1 with a dominant trait tendency, and genotypic ratio was 1:2:1.

Conclusion

- The hypothesis was accepted. Results from the yeast mating between the heterozygous "Rr" diploids were consistent with the initial prediction.
- Classical dominance was observed and Mendelian inheritance was the framework used.
- One allele had complete dominance over the other when coding different traits for the same character in an organism.
- When the two heterozygotes were crossed, the alleles produced diploid cells with a genotypic ratio of 1:2:1 and a phenotypic ratio of 3:1.
- Where some yeast cultures displayed slight pink discoloration, it was attributed to cross-contamination rather than incomplete dominance.

References

Mason. Kenneth A., & Losos, Jonathan B. (2011) *Biology: (9th Edition).* New York: McGraw-Hill.

Michealis. S., Barrowman, J. C.C. 2012 Biogenesis of the Saccharomyces cerevisiae Pheromone a-Factor, from Yeast Mating to Human Disease. *Microbiology and Molecular Biology Reviews*, **76**(3): 626-+

Porman A. A., Alby K. B., Hirakawa M. C., C.C. 2012. Discovery of a phenotypic switch regulating sexual mating in the opportunistic fungal pathogen Candida tropicalis. *Proceedings of the National Academy of Sciences of the United States of America.* **108** (58), 21158-21163.

Tannenbaum, E. A., C.C. 2008. A comparison of sexual and asexual replication strategies in a simplified model based on the yeast life cycle. *Theory in Biosciences*. **127**(4): 323-333