YEASTS

A news letter for persons interested in yeasts.

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We regret that this is such a thin issue, but no news has been turned in from the East or the Mid-West this time.

Cost of Operation

Funds on hand to cover the costs of mimeographing and mailing are meager. Therefore, it would be most helpful if each of those sufficiently interested, would care to contribute a quarter to the kitty. Many thanks to those who have already contributed.

The Editors

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I. Research in Yeasts:

University of California, Division of Viticulture, J. G. B. Castor.

J. Castor and J. F. Guymon of the Enology Laboratory have recently presented data which shed additional light on the mechanism of fusel oil formation during alcoholic fermentation (Science, 115, 147 (1952). Additional papers on factors influencing fusel oil formation are in preparation.

Mr. Ramon Barraquer is experimentally testing the theory that the Spanish Sherry "flor" species of Saccharomyces can multiply and cause clouding in bottled white table wines. A study of the thermal death time of wine yeasts, when electronic heating is employed, is under way.

University of Washington, Division of Botany, H. C. Douglas.

Genetic investigation of heterothallic strains of Saccharomyces carried on by H. L. Roman and H. C. Douglas have yielded the following results:

1. Clones grown from haploid ascospores develop into a mixture of haploid and diploid cells.

2. The diploids are of two kinds. They are either homozygous for the mating type alleles, aa or $\alpha\alpha$, or are heterozygous, $a\alpha$. Cells of composition aa have been found only in clones grown from a ascospores and $\alpha\alpha$ cells have been found only in clones grown from α ascospores.

3. The diploid homozygotes do not sporulate but they do cross with clones of opposite mating type. That is, aa x $\alpha\alpha$ gives tetraploid zygotes and aa x α or a x $a\alpha$ gives triploid zygotes.

4. The $a\alpha$ diploids are of null mating type, i.e., they do not mate with either a or α cells or with the diploid homozygotes. The $a\alpha$ cells do sporulate and give a 2:2 segregation for mating type.

5. The $\alpha\alpha$ diploids arise, in part at least, from fusions of α haploid cells. Tests relating to the origin of aa cells are in progress. The $a\alpha$ cells arise as a result of mutation at the mating type locus in either a or α clones, followed by fusion of the cells of opposite mating type.

6. Tetraploids sporulate freely, are of high fertility, and give expected genetic ratios. A cross between a clone that is homozygous dominant and a clone that is homozygous recessive for a given locus produces segregations of dominant: recessive in the ratios 4:0, 3:1, or 2:2. A cross between a heterozygous clone and a clone that is homozygous recessive produces 2:2 and 1:3 ratios. The 0:4 ratio (not dominants to 4 recessives) has not been obtained from these crosses but it is to be expected from clones in which $a\alpha$ cells, derived as the result of mating-type mutation, exist.

7. Triploids are highly sterile and asci are relatively scarce in which all four spores can be made to grow. The genetic segregations in the few 4-spored asci that have been analyzed are of the types expected.

The studies to date of the mutation of galactose non-fermenters to fermenters may be summarized as follows:

1. The parent type is actually a slow oxidizer and a slow fermenter of galactose, while the mutant is a rapid oxidizer and fermenter of galactose. Genetic tests have shown parent and mutant to differ by a single gene. The mutants are stable; that is, they do not revert to non-galactose fermenters after continued cultivation on glucose.

2. An analysis of the phosphorylated hexoses that accumulate when cell free extracts derived from galactose grown cells of parent and mutant act upon galactose has revealed no qualitative or quantitave differences in the enzymatic make up of the two types.

From the information at hand it appears that the mutation is one involving the rate of galactose utilization rather than the aquisition of an enzyme by the mutant which is absent in the parent. However, the nature of the rate limiting step which the mutation affects has not yet been determined.

We have been investigating the mitochondria of yeast. Extracts of yeasts prepared by Mickel disintegration and centrifugation to remove unbroken cells, cell walls, etc., are extremely turbid and possess the cytochrome components. Centrifugation of such extracts at high speed results in the sedimentation of particulate matter containing the cytochrome system. An examination of this material with the electron microscope has shown it to consist of small disk-shaped particles which are 0.1 to 0.3 microns in diameter. Suspensions of these structures, which we call mitochondria, take up oxygen, but extensive tests of their physiological activity have not yet been made.

As a by-product of the isolation of yeast mitochondria we have also obtained a second type of structure from ruptured yeast cells. These objects are much larger than the mitochondria, are spherical in shape and show internal structure. They appear to be identical to the large central vacuole (or nucleus -- depending on who is right here) of the yeast cell.

Note

Michigan State College will be celebrating the opening of their new bacteriology building this fall, probably sometime in September or October. A speaker, or panel on zymology will most likely be on the program, in recognition of Dr. F. J. Fabian's work in this field.

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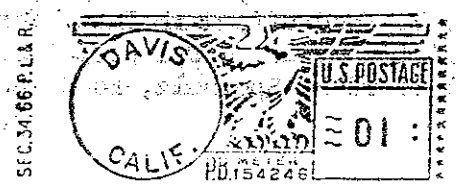

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