THE CHROMOSOME NUMBER OF *SACCHAROMYCES CEREVISIAE*

AFTER a survey of our knowledge of the cytology of yeasts Kater[1] concludes that while amitosis is of doubtful value as a process occurring during budding "the burden of proof still rests with both sides". We would like to add that an explanation should also be given as to why the chromosome number is given by Badian[2]

as two, by Sinoto and Yuasa[3] as four and by Kater[1] as probably eight. Badian is criticized (Guilliermond[5]) on the ground that his diagrammatic illustrations do not fit in with his own or Guilliermond's photomicrographs. Our uniform and consistent results[6] indicate that for the strain (S.C. 9, N.C.T.C.) investigated by us the chromosome number is two. This raises the question whether the different chromosome numbers given by various authors may not be due to studies of different races passing under the name of *S. cerevisiæ*? The numbers given by Sinoto and Yuasa and Kater are multiples of that given by Badian. Were they dealing with tetra and octoploids? If so, the results are not strictly comparable.

The previous workers must have seen what they described. Kater[1] while referring to his previous work on yeasts considers that since his success depended "to a certain extent on accident" it could not form the basis for a general acceptance of the conclusion by all workers until others manage to duplicate the results".

We have tried Bouin-fixation and subsequent staining with Heidenhain's hæmatoxylin and find that the above technique reveals the two chromosomes seen in Carnoy-iron-hæmatoxylin preparations. It is not at all necessary that the cells should contain picric acid. Smears treated in the usual way would give good pictures of the chromosomes if the following precautions are taken.

(1) Use of wort cultures.
(2) Control of cultures in such a way that all cells are almost at the same phase of development.
(3) Experimental determination of the time of division.
(4) Fixation of wet smears.
(5) Long staining with iron-hæmatoxylin.
(6) Careful differentiation.

Our results suggest that the "accident" mentioned by Kater[1] is not the delicate balance between the dye and the acid but that the cells should be at some phase of the mitotic cycle. We cannot also agree with Henrici[7] that "descriptions of details in morphologic structures less than 1 μ in diameter should always be taken *cum grano salis*", since in our preparations no other structure is present in the cells to complicate the picture seen.

Why is it then, that even after filling up the "possible leak" in Kater's technique we see only two chromosomes, while Kater gives the number as possibly eight? Under the belief that Badian, Sinoto and Yuasa and Kater have been using different strains we carried out some experiments with acenaphthene. Polyploidy could be induced and on cytological examination of wort cultures after a few hours' treatment with the above chemical, one finds in every field cells with varying chromosome numbers. It appears, therefore, possible to produce a tetraploid or octoploid by controlling the time of treatment with acenaphthene. One curious fact which emerged from the preliminary experiments was the observation that the measurements of the chromosomes of the tetraploids need not agree with that of the diploids. Viewed in the light of the above discovery, it appears probable that different observers have been investigating different races passing under the name of *S. cerevisiæ*! If the above contention is substantiated, much of the genetical work on yeasts may have to be revised in the light of new facts revealed by cytology.

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1. Kater, J. McA., *Bot. Rev.*, 1940, **6**, (4), 164–180. 2. Badian, J., *Bull. Inter. Acad. Polonaise, Sci. et Lettr. Ser. B*, 1937, 1/5, 61–87. 3. Sinoto, Y. and A. Yuasa, *Cytologia*, 1941, **11**, (3), 464–472. 4. Kater, J. McA., *Biol. Bull.*, 1927, **52**, 436–448. 5. Guilliermond, A., *Bot. Rev.*, 1940, **6**, (1), 1–24. 6. Curr. Sci., 1945, 14, 78. 7. Henrici, A. T., *Bact. Rev.*, 1941, **5**, (2), 97–179.