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Palatability Changes in Successive Batches of Doughnuts[1]

IN view of the continuing efforts to improve organoleptic evaluation of fats and oils, the following observations may be of interest to readers of the Journal.

This laboratory has used doughnut frying extensively in taste panel testing of fats and oils (e.g., Grace, N. H., Lips, H. J., and Zuckerman, A., Can. J. Research, F, *28*, 401-411, 1950). Doughnuts are surface-fried two at a time, 1.5 min. on each side, in 500-ml. portions of the test oils held at 180°C. in two-liter glass beakers. They are reheated in a steam table, and small pieces are served warm to a panel of 24 members, who rate them for intensity of undesirable odor and flavor. A score of zero indicates absence of objectionable odor and flavor, with +1 to +5 indicating increasing intensity of the undesirable characteristics (Hopkins, J. W., Biometrics, *6* (1), 1-16, 1950). The ratings are examined statistically by means of analyses of variance.

In a study of taste panel techniques six batches of doughnuts were fried, three in fresh bland cottonseed salad oil, and three in refined weedseed screenings oil that had developed some off-odor after cold storage for one year. The scores for doughnuts fried in cottonseed oil showed no difference among the three batches, but abnormal odor and flavor scores for the first batch fried in weedseed oil were significantly higher (5% level) than for the two subsequent batches. The unexpected improvement in the cooking quality of the oil appeared to be related to the effect obtained by the household method of heating used cooking fat with slices of peeled raw potato or small amounts of water. The effect was studied with other oils of low quality, prepared by mixing refined weedseed, linseed, and seal oils and aging the mixtures 36 to 48 hours at 120°C.

The first of four batches of doughnuts fried in one of these mixed oils was given a significantly higher score than the subsequent batches, which did not differ appreciably from each other. A similar drop in scores was noted for doughnuts fried a longer time (1.75 min. per side) in another lot of the same oil.

An experiment to determine if the effect was due to removal of undesirable substances from the oil by steam distillation was next undertaken. Steam approximately equal to that lost by one batch of doughnuts during frying was bubbled through a portion of low quality oil at cooking temperatures. Then two successive batches were fried in both the untreated and steam-treated portions. The batches cooked in the treated oil and the second batch from the untreated oil received similar scores at a significantly lower level than the first batch from the untreated oil.

Repetition of this experiment with another mixed oil gave similar results. However, evidence of improvement of flavor and odor in successive batches of doughnuts prepared in steam-treated oils suggested that objectionable material was being removed from the oil by adsorption on the doughnuts as well as by vaporization.

The experiments described indicate that, in small-scale cooking tests with oils of poor quality, the first doughnuts fried in the oil have a deodorizing effect and that some of the materials causing the undesirable flavor and odor are carried off by water vapor. Hence the first doughtnuts prepared in such tests may be atypical and should not be used for assessing potential cooking qualities of an oil.

H. J. LIPS
ELINOR M. HAMILTON
Division of Applied Biology
National Research Laboratories
Ottawa, Canada

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