

COMMUNICATION TO THE EDITOR

A Freezing Technique for Concentrating Pre-Ferments

DEAR SIR:

Some methods devised for the concentration of pre-ferments used in bread baking employ techniques such as drum drying, spray drying, and lyophilization (1,2,3). They produce pre-ferment concentrates that are incomplete, in that loss of compounds due either to volatilization

or to thermal decomposition has occurred. This note describes a method based on the principle of concentration by freezing, which possesses certain advantages over the procedures mentioned above. It has been used successfully to concentrate pre-ferments in a relatively short time, with no appreciable loss of volatile constituents, such as organic acids, carbonyl compounds, and alcohols, which may be important precursors of flavor and aroma of fresh bread.

The pre-ferment formula used contained 6.6% sucrose and 4.4% bakers' yeast as its basic ingredients (4). One-liter quantities were prepared at a time and fermented for 6 hr., then the yeast cells were removed by centrifugation at 2° to 4°C. The top portions of 16-oz. polyethylene bottles with 3-in. outside diameters were cut off, to give cylindrical containers of 450-ml. capacity (Fig. 1, C). The pre-ferment

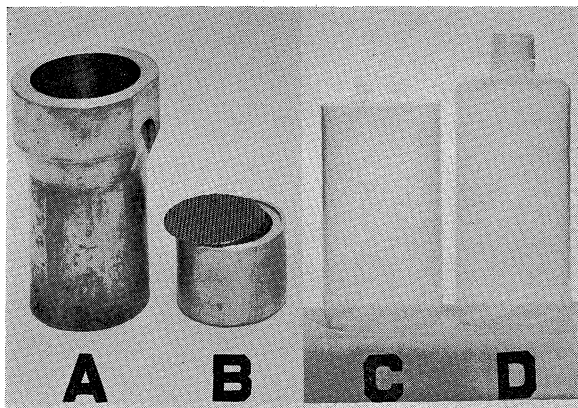


Fig. 1. A, 500-ml. centrifuge cup. B, stage that fits into the centrifuge cup. C and D, polyethylene bottles (16-oz.) with and without tops cut off.

supernatant, in 400-ml. quantities, was poured into these cylinders and covered with waxed paper. To determine the optimum freezing temperature, the filled cylinders were placed in cold rooms overnight at several temperatures ranging from +20° to -30°F. (See Table I.) The concentrate was separated from the frozen pre-ferment by centrifugation under refrigeration. The device used to accomplish this step was constructed from a Duralumin¹ cylinder, 2 in. high with 3-in. outside diameter and 5/16-in. wall thickness. The top of this cylinder was partly recessed to hold in place a 20-gage stainless steel disk 2¾ in. in diameter and perforated with 1/16-in. holes on 1/8-in. centers, stag-

¹Reference to a company or product name does not imply approval or recommendation of the product by the U.S. Department of Agriculture to the exclusion of others that may be suitable.

TABLE I
EFFECT OF VARIOUS FREEZING TEMPERATURES ON THE RECOVERY OF
PRE-FERMENT CONSTITUENTS

TEMPERATURE	VOLUME OF CONCENTRATE ^a	RECOVERY		
		Ethanol	Carbonyls	Acids
°F.	ml.	%	%	%
20	Did not freeze
12	123	100	91	97
10	88	98	87	95
0	62	90	86	91
-10	53	90	86	88
-20	36	95	78	80
-30	26	91

^a Volume of pre-ferment prior to concentrating was 400 ml.

gered (Fig. 1, B). The cylinder with disk on top was fitted loosely into the bottom of a 500-ml. Duralumin centrifuge cup. For operation, the plastic cylinder containing the frozen pre-ferment was removed from the cold room, inverted, and quickly placed in the centrifuge cup assembly on top of the Duralumin cylinder and screen (Fig. 2, B).

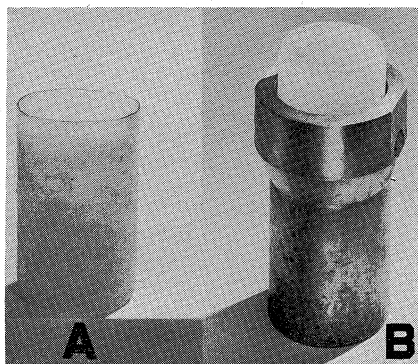


Fig. 2. A, polyethylene bottle full of frozen pre-ferment. B, same as A, inverted in the centrifuge cup ready for centrifugation.

The entire cup assembly was placed in the centrifuge set at temperatures of 28° to 30°F. The centrifuge was brought rapidly to a speed of 2,000 r.p.m., and stopped by braking after 1 min. The inverted polyethylene cup containing the ice was removed, and the concentrate, which separated from the ice, was poured carefully from the bottom of the centrifuge cup. The ice obtained from this centrifuge step was free of liquid, tasteless, and had a white appearance. The concentrate had a slightly yellowish color and a strong fermented odor. In order to determine the efficacy of this pre-ferment concentration procedure and the extent of recovery of the concentrate from the ice crystals, the total carbonyl compounds, ethanol, and acids were

determined in the supernatant before and after concentration. The percent recovery of these constituents in the concentrate was an index of the effectiveness of the concentration step. The ethanol and total carbonyl contents of the pre-ferment supernatant and concentrates were determined by methods described in a previous paper (4). For the determination of total acids, 10 ml. of the pre-ferment supernatant or 1 ml. of the concentrates was used. Samples were passed through a glass column containing 3 g. of Dowex-50 (hydrogen form) to remove cations. The eluate was titrated with sodium hydroxide; phenol red indicator was used.

The best recoveries of ethanol, carbonyls, and acids were obtained at 10° to 12° F. (Table I). At optimum temperature used for freezing, 10°F. (-12°C.), the supernatant could be concentrated approximately fivefold. The concentrate in sealed containers, such as plastic bottles, can be stored at 0°C. for several months. Pre-ferment concentrates could be used as a tool to study bread flavor and aroma. Dough proofing and fermentation are ordinarily time-consuming steps required to produce fresh bread aroma for chemical and organoleptic analysis. Through use of these concentrates in chemically leavened doughs, the bread flavor could be produced in a short time, since the lengthy dough fermentation and proofing periods would be eliminated. Pre-ferment concentrates also might find industrial use in the continuous-breadmaking process, where their introduction at some appropriate stage in the dough mixing could enhance the flavor of the bread prepared.

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January 11, 1963

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