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Effect of long-term storage on baking powder functionality

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ABSTRACT
Six samples of double-acting baking powder in original commercial packaging were obtained from donors, and two fresh samples were purchased. Samples had an age range of 0 to 29 years and were stored in cool (15-25°C) and dry conditions. Moisture content of baking powder samples ranged from 1.5-3.2%, total CO2 ranged from 67.9-70.5%, and pH ranged from 6.68-6.75. Total CO2 and pH did not significantly decrease over storage time. The amount of CO2 reached 67.9% of the control made without baking powder after 29 years. The average CO2 content (calculated from the average measured heights and diameters) ranged from 96-79 cm³, with the control averaging 47 cm³. Average height and volume did not change significantly over time. Moisture L*a*b* color values for biscuits held at 66.0-70.0, 6.7-7.4, and 25.9-31.2%, respectively, with control biscuits averaging 6.7-6.8, 25.9-26.9, and 7.1-7.2 cm³, respectively. Biscuits produced acceptable biscuits, indicating that baking powder retains its functionality over time and can be included in applications requiring long-term storage.

RESULTS

Biscuit Crumb Color
The mean color values ranged from 66.0-70.5 for L*, 1.5-8.7 for a*, and 18.6-32.4 for b* (Table 3). The higher L* value indicates a lighter color, higher a* means more red hues than green, and higher b* means more yellow hues than blue. The biscuits made without leavening were lighter in color and had more green and blue hues than the biscuits made with any age baking powder.

Sensory Quality
All of the biscuit samples received over 95% acceptance for eating in an emergency situation, indicating that all of the baking powder samples made acceptable biscuits. All of the biscuits received over 65% acceptance for eating in an everyday situation (Fig. 4).

Hedonic scores for appearance, aroma, texture, and overall acceptability were in the “like slightly” to “like moderately” category (Table 4). Although there were some statistical differences between samples, there were no trends relating to samples age.

INTRODUCTION
Baking powder is widely used to leaven baked products. Several researchers have studied the functionality of baking powder components as well as the effects of storage on baking powder. The industry standard for baking powder shelf-life is eighteen to twenty-four months, but little information is available on baking powder functionality when stored beyond this time. A longer shelf-life would prove beneficial in certain situations, such as personal food storage, disaster relief efforts, and space missions. The objective of this research was to determine the effect of long-term storage on baking powder functionality.

METHODOLOGY

Samples
Six samples of double-acting baking powder in original commercial packaging were obtained from donors and two fresh samples were purchased. Samples had an age range of 0 to 29 years and were stored in cool (15-25°C) and dry conditions.

Percent Moisture and Carbon Dioxide Evolved
Moisture content was determined gravimetrically using an Ohaus MB 200 moisture analyzer at 100°C for 10 minutes (Ohaus, Pine Brook, NJ). The amount of CO2 was determined by reacting the powder with 100% phosphoric acid and quantization using a gas extraction line. Total CO2 was measured according to the procedure of McCrea (1950).

Biscuit Dimensions
Figure 3 shows a representative biscuit made from each baking powder sample. The average biscuit volume ranged from 66-79 cm³ (Table 2), while the control biscuit (made without any baking powder) averaged 47 cm³, indicating that all of the baking powder samples leavened the biscuits significantly better than those made without leavening.

Biscuit Crumb Color
The mean color values ranged from 66.0-70.5 for L*, 1.5-8.7 for a*, and 18.6-32.4 for b* (Table 3). The higher L* value indicates a lighter color, higher a* means more red hues than green, and higher b* means more yellow hues than blue. The biscuits made without leavening were lighter in color and had more green and blue hues than the biscuits made with any age baking powder.

Sensory Quality
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Hedonic scores for appearance, aroma, texture, and overall acceptability were in the “like slightly” to “like moderately” category (Table 4). Although there were some statistical differences between samples, there were no trends relating to samples age.

CONCLUSIONS
The functionality of double-acting baking powder stored up to 29 years in non-abusive conditions in residential storage does not significantly decrease as measured by total CO2, evolved CO2, dry biscuit volume, biscuit crumb color, and consumer evaluations.

Under optimal storage conditions, it appears that baking powder retains its functionality as a leavening agent for many years and can be included in applications requiring long-term food storage.

REFERENCES


Gallay and Bell 1935; Halliday and Noble 1943). The industry standard for baking powder shelf-life is eighteen to twenty-four months, but little information is available on baking powder functionality when stored beyond this time. A longer shelf-life would prove beneficial in certain situations, such as personal food storage, disaster relief efforts, and space missions. The objective of this research was to determine the effect of long-term storage on baking powder functionality.

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