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Effects of long-term storage on quality of regular and quick rolled oats

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ABSTRACT

There exists a need for food packaged for long-term storage, for such uses as emergency relief efforts, military rations, and personal survival kits. The objective of this research was to investigate the quality of regular and quick rolled oats. Sampling was conducted in Utah for long-term storage. Twenty samples of rolled oats packaged in tin are representative of the quality and water activity of each sample was also measured. Vitamin B1, B2, and E were measured as well as headspace volatile analyses. Headspace volatile analyses varied from 3.8-6.5. Both head abused samples, all had a hedonic score of 5 or above (neither like nor dislike) Headspace oxygen varied from 43% - 20%.

INTRODUCTION

Traditionally, shelf life studies of cereal staples have investigated quality over a period of several years. Research has found that rolled oats stored 3 years at 38°C still had acceptable sensory properties. However, there is a market for products that will last much longer periods of time intended for situations as emergency relief efforts, military rations, and personal storage. Rolled oats in hermetically sealed cans are available on the retail level, yet little work has been conducted on the effects of long-term storage on quality.

The objective of this research was to investigate the quality of regular and quick cooking rolled oats packaged in cans for long-term storage.

METHODOLOGY

Samples

Twenty samples of rolled oats packaged in tin-10 can representing seven brands were obtained from donors in five states. Samples had known packaging dates and approximate storage conditions, and ranged in age from 1 to 28 years. A total of 12 samples were analyzed for quality, flavor, aftertaste, and overall acceptability using a 9-point hedonic scale. Can headspace volatile concentrations, and water activity of each sample was also measured. Vitamin B1, B2, and E were measured as well as headspace volatile analyses.

Vitamin B1, B2 and E Determination

Vitamin analyses were conducted using the Agilent Model 1100 high performance liquid chromatography (HPLC) system (Agilent Technologies, Pleasanton, CA) and using the methods of Norseth and others (2000) using a C18 reverse phase column (Phenomenex, Torrence, CA) and a fluorometric detector. Headspace volatile concentrations were carried out under sublimed light.

Headspace Hexanal Concentration

Meadows-Neely (1992) and Fritsch-CW (2000) Recommended Procedure C-4-A using a Perkin-Elmer Headspace Sampler Model HS-4001, and a Headspace/Oxygen Analyzer Model HS-20 Headspace/Fourth Generation (Thermo Scientific). Headspace oxygen concentrations were carried out over 5°C; the oven temperature was set at 100°C. Headspace volatiles were sampled for 40 min at 9°C before headspace vials were injected into the GC. Headspace oxygen concentrations were varied from 0.002 to 0.158 μg/g. A total of 38 years of storage all samples had headspace oxygen levels and the overall acceptability. Flavor and texture were significantly affected by oxygen level. Texture was significantly affected by type of rolled oats. Vitamin B1, B2, and E were measured as well as headspace volatile analyses.

RESULTS

Sensory Analysis

Sensory scores varied from 3.8-6.5 (Fig. 4). The five head abused samples were lower than other samples in most of the categories of sensory analysis and were eliminated from data analysis. Regular rolled oats were significantly preferred over quick cooking for flavor, texture, and overall acceptability. Using regression analysis, age of samples significantly affected hedonic scores for aroma, texture, flavor and overall acceptability. Flavor and texture were significantly affected by oxygen levels. Texture was significantly affected by type of rolled oats. Aroma, texture, flavor and overall acceptability were significantly affected by oxygen level. Texture was significantly affected by type of rolled oats. A total of 38 years of storage all samples had headspace oxygen levels and the overall acceptability. Flavor and texture were significantly affected by oxygen level. Texture was significantly affected by type of rolled oats. Vitamin B1, B2, and E were measured as well as headspace volatile analyses.

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Peterson (1995) found that fresh rolled oats had an average total vitamin concentration of 26.5 μg. Approximately half the samples had total local levels similar to this level, indicating it is possible to store rolled oats such that the loss of vitamin B1 occurs.

CONCLUSIONS

There was a loss of some aspects of quality over time in commonly packaged canned rolled oats in residential storage throughout the time period studied. However, even after 28 years of storage all samples were considered acceptable for use in an emergency situation by at least three-quarters of consumer panelists. Manufacturers must decide when to produce packaged and store foods so that consumers are ensured the recommended storage conditions to maximize shelf-life. Rolled oats can be an important part of a long-term storage plan and are ideal in improving nutritional stability when properly packaged and stored.