Effects of Long-term Storage on Quality of Wheat Packaged in No. 10 Cans

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ABSTRACT

Samples of hard red wheat, from seven donors, were analyzed for various chemical and sensory attributes. Thousand kernel weight, moisture, protein, free fatty acids, and flavor were measured. Samples were stored under various conditions to simulate long-term storage in a disaster setting. Free fatty acids increased with age; however, all wheat samples maintained >70% acceptance for use in a regular diet and >97% acceptance for use in emergency situations. Results indicate that, regardless of headspace oxygen level, wheat stored up to 16 years of age showed no significant difference in headspace oxygen or flavor. The changes that occurred in wheat during storage have been previously reviewed (Wang and Flores 1999; Pomeranz 1999). Under the proper conditions, wheat stores extremely well, and is therefore useful to include in food storage regimens.

INTRODUCTION

There is interest in the long-term storage of food for applications such as space flight, military rations, and disaster relief. Wheat is a major component of the American diet and is therefore important to include in food storage settings. The changes that occur in wheat during storage have been previously reviewed (Wang and Flores 1999; Pomeranz 1999). Under the proper conditions, wheat stores extremely well, and is therefore useful to include in food storage regimens.

METHODOLOGY

Sampling

Seven donors (samples) were used to simulate long-term storage of wheat. Wheat kernels were obtained from multiple donors and may not have come from the same source. However, the results were consistent with a previous study of whole wheat (Halverson and Zeleny 1988). To simulate long-term storage, wheat was ground using a Quadramat Jr. laboratory mill, and aged in closed paper bags for two weeks. Bread was then made according to AACC Method 74-09 (AACC International 2000), except strain was decreased to 25% and trigger force increased to 10 g.

Quality Assessment

Data were analyzed using Statistical Analysis System (SAS) Institute (1989) using a mixed model analysis of variance (MIXED). A mixed model approach was used to account for differences among donors. Cornell University’s ANOVA service was accessed to perform regression analysis (MIXED routines). Significance differences were identified at p < 0.05.

RESULTS AND DISCUSSION

Can Analysis

Can moisture content was too low to allow all samples to present mold growth (Table 1). (Rong and Flores 1999). CIE L* value for wheat kernels ranged from 41.64 to 53.77. The L* value ranges from zero (black) to 100 (white). Protein content ranged from 11.86% to 14.61%, indicating all samples were whole wheat. Minimum L*, and protein content were not correlated with can age. Differences in L* were observed on the relationship between can age and each of the measured sensory attributes, with no significant correlation observed. Results indicated that, regardless of age, wheat kernels maintained nutritional quality and making bread that is acceptable to a majority of consumers after 16 years of storage at ambient temperatures.

Acceptability of the bread was determined by a sensory panel consisting of 50 panelists. The sensory panel was conducted at the Brigham Young University Sensory Laboratory using standard procedures. Panelists evaluated all samples in four sessions over a two day period. Panelists were asked to evaluate aroma, texture, flavor, and overall acceptability using a 9-point hedonic scale. Acceptance for use in a regular diet and in an emergency situation (A) and an everyday situation (B). Dashed lines represent 95% prediction interval.

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REFERENCES


