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Quality of dehydrated mashed potatoes retail packaged in No. 10 cans

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ABSTRACT

Manufacturers of further processed potato products recognize consumer demand for convenience and the economy of transporting dehydrated commodities. Because of their bulkiness, dehydrated potato products are often sold in large containers, including No. 10 cans. The quality of such products available at the retail level has not been reported. The objective of this research was to compare the quality of several brands of dehydrated instant mashed potatoes packaged in No. 10 cans for retail sale.

Eight brands of instant mashed potatoes, including two types (4 granules, 4 flakes) packaged in No. 10 cans were obtained from retail outlets representing at least five different manufacturers. A 50-member consumer panel evaluated aroma, flavor, texture, and overall acceptability using a 9 point hedonic scale. Other observations included can headspace oxygen, can seam evaluation, water activity, and vitamin C content.

Regarding overall acceptability, mean hedonic scores for flakes and granules were 6.2 and 4.5 respectively. Within the sub categories of flakes and granules, overall acceptability of the highest brand was significantly different than the lowest brand: flakes ranged from 6.5 to 5.9 and granules ranged from 5.0 to 4.0. Headspace oxygen ranged from 0.02% to 18%. The highest scoring flake brand had low headspace oxygen (0.02%), suggesting that quality would be optimally retained during storage. However, several brands of flakes that scored high in sensory evaluation were not packaged to exclude oxygen and would likely not retain high quality during an extended storage period. Most observations of can seams fell within specifications. Water activity ranged from 0.33 to 0.45. Wide variation was found in vitamin C content, ranging from 0 to 199 µg/g.

There was significant variation in quality between brands of dehydrated instant mashed potatoes packaged in No. 10 cans for retail sale. Those who purchase instant potatoes should be aware of possible differences in headspace oxygen, sensory quality and vitamin C content among types and brands.

INTRODUCTION

In 2001, 25.1 billion pounds of potatoes were processed in the United States. Of these, 16% were dehydrated. Many studies have examined the effects of processing and storage on dehydrated mashed potato quality (Boggs, 1964; Gorinstein, 1988; Norseth, 1986; Sapers, 1975; Sapers, 1972; Wang, 1992). These studies found wide variation in quality parameters depending on processing and storage conditions.

Manufacturers of further processed potato products recognize consumer demand for convenience and the economy of transporting dehydrated commodities. Because of their bulkiness, dehydrated potato products are often available at the retail level in large containers, including No. 10 cans. The quality of such products available at the retail level has not been reported. The objective of this research was to compare the sensory and nutritional quality of several brands of dehydrated instant mashed potatoes packaged in No. 10 cans for retail sale.

METHODOLOGY

Samples

Eight brands of instant mashed potatoes, including two types (4 granules, 4 flakes) packaged in No. 10 cans were obtained from retail outlets representing at least five different manufacturers. The conditions of processing and storage were unknown. Cans of all brands were less than 1 year old, except brand A which was 2.5 years old and possibly brands F and H which did not have decipherable codes.

Headspace Oxygen, Can Seams and Water Activity

Headspace oxygen was measured using the 3500-Series Headspace Oxygen Analyzer (Illinois Instruments, Inc., Johnsburg, IL). Can seams were evaluated by an using the SeamMate System (Onevision Corporation, Westerville, OH) to measure the following seam dimensions: thickness, width, body hook, cover hook, and overlap. Seam tightness was rated on a scale of 0-100%. The seams were given an overall rating of good, satisfactory, or poor by an experienced evaluator. Water activity was measured using an Aqualab CX-2 (Decagon Devices, Inc., Pullman, WA).

Sensory Analysis

Sensory analysis was conducted at the BYU Sensory Laboratory using standard procedures. Samples were prepared according to package directions and served in a randomized manner to a 50-member consumer panel in 4 visits. Panelists evaluated aroma, flavor, texture and overall acceptability using a 9-point hedonic scale.

Vitamin C

Vitamin C analysis followed the method of Wang (2000) using an Agilent Model 1100 high performance liquid chromatograph (Agilent Technologies, Palo Alto, CA) equipped with a C18 reverse phase column (Phenomenex, Inc., Torrence, CA) and a diode array detector. Determinations were carried out under subdued light. Recovery rate was 105%.

Data Analysis

Data was analyzed for significance using Statistical Analysis System software (SAS Institute, 1999). A mixed model analysis of variance (PROC MIXED) was used for the sensory data. PROC GLM was used for the water activity and vitamin data. Both models used Duncan's multiple range test to determine significant differences between means. Significant differences were defined as $p<0.05$.

RESULTS AND DISCUSSION

Headspace Oxygen, Can Seams, and Water Activity

Wide variation was found in headspace oxygen, ranging from 0.02% to 18% (Fig. 1). This was influenced by oxygen removal method which included nitrogen flush, oxygen absorbers, no treatment, and one brand in which the method was unknown. Cans with high oxygen likely would not retain quality over an extended storage time. All cans seems were found to be acceptable. Water activity ranged from 0.31 to 0.46 (Fig. 2).

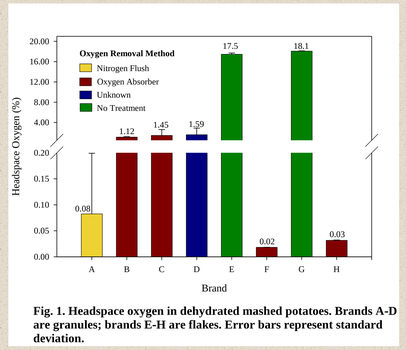


Fig. 1. Headspace oxygen in dehydrated mashed potatoes. Brands A-D are granules; brands E-H are flakes. Error bars represent standard deviation.

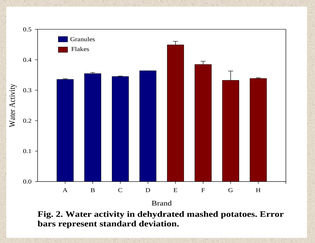


Fig. 2. Water activity in dehydrated mashed potatoes. Error bars represent standard deviation.

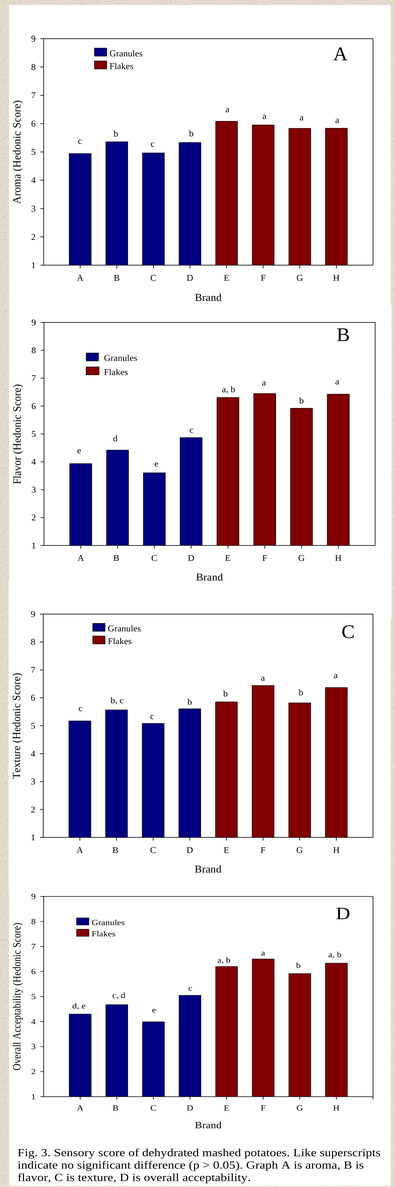


Fig. 3. Sensory score of dehydrated mashed potatoes. Like superscripts indicate no significant difference ($p > 0.05$). Graph A is aroma, B is flavor, C is texture, D is overall acceptability.

Sensory Analysis

Hedonic Scores for aroma ranged from 4.9 to 6.8 (Fig. 3). Flavor varied greatly from brand to brand and ranged from 3.6 to 6.5. Texture showed the least amount of variation among brands, ranging from 5.1 to 6.4. Overall acceptability ranged from 4.0 to 6.5. Flavor scores mirrored overall acceptability scores, indicating the importance of flavor in judging overall acceptability.

Differences in sensory attributes were found between types of instant mashed potato. Regarding overall acceptability, mean hedonic scores (data not shown) for flakes and granules were 6.2 and 4.5 respectively. Within the subcategories of flakes and granules, overall acceptability of the highest brand was significantly different than the lowest brand: flakes ranged from 6.5 to 5.9 and granules ranged from 5.0 to 4.0.

Vitamin C Content

Vitamin C content of the potato products is shown in Fig. 4. Half of the brands studied (brands A,B,C and E) had amounts of vitamin C that were below the amount claimed on their label. The amount in all brands was lower than the amount reported in the USDA National Nutrient Database for Standard Reference for granules and flakes, 370 µg/g and 836 µg/g respectively. Wide variation between cans of the same brand was found for brands F and G. The label value for brand C was over three times the USDA value for granules, yet none was detected in the sample. Brand D did not report any vitamin C on the label, yet 180 μg/g of sample was found.

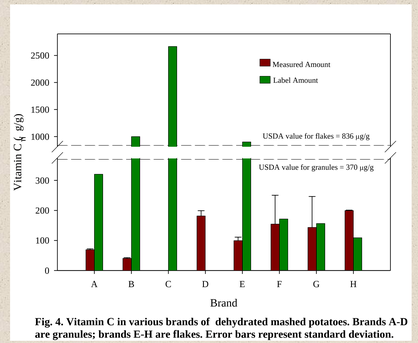
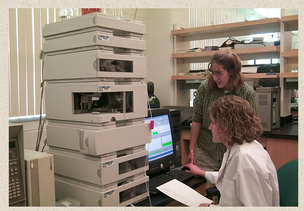


Fig. 4. Vitamin C in various brands of dehydrated mashed potatoes. Brands A-D are granules; brands E-H are flakes. Error bars represent standard deviation.



CONCLUSIONS

There was significant variation in sensory and nutritional quality between brands of dehydrated instant mashed potatoes packaged in No. 10 cans for retail sale. Those who purchase instant potatoes should be aware of possible differences in headspace oxygen, sensory quality and vitamin C content among type and brand.

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