

Sodium Reduction in Canned Beans After Draining, Rinsing

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Health and culinary professionals and consumers increasingly seek practical ways to reduce sodium intake, as advised in science-based dietary guidance. In response, this study determined whether draining and rinsing significantly reduces sodium in canned beans. References in dietary guidance and popular literature support this practice; only limited, dated scientific data substantiate this advice, conducted only on past product formulations. Sodium per label-size serving was measured for multiple brands of five canned bean varieties: in packing liquid; drained of packing liquid; and drained of packing liquid and then rinsed. Both draining and draining followed by rinsing significantly reduce sodium in canned beans.

KEYWORDS *Sodium reduction, canned beans, legumes*

INTRODUCTION

From soups, stews, and salads to a broad range of vegetarian dishes and global cuisines, dry beans (legumes) are widely used on foodservice and consumer menus and recommended as part of the U.S. Department of Agriculture (USDA) Food Patterns within the 2010 Dietary Guidelines for Americans (USDA & U.S. Department of Health and Human Services [DHHS], 2010). Due to their convenience, storability, flavor, and affordability, canned beans are the commonly used form (Schneider, 2002). Many commercially canned beans contain sodium chloride (salt). Salt is added for flavor and it also helps to maintain the beans' desirable soft texture over the shelf life of

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the product. Occasionally other ingredients such as starches and seasonings are added in the canning process.

Sodium intake in the United States has increased steadily over the past 30 years, to more than double the Adequate Intake level for the day, as noted in the Dietary Reference Intakes (DRIs) (Institute of Medicine, Food and Nutrition Board, 2005). Using data from the National Health Examination and Nutrition Survey (NHANES) 2005–2006 Survey for the total population (2+ years), sodium intake is estimated at 3,400 mg daily (USDA, Agricultural Research Service [ARS], DHHS, & Centers for Disease Control and Prevention [CDC], 2010), the amount in about 1.5 teaspoons salt. The 2010 *Dietary Guidelines for Americans* (USDA & DHHS, 2010) recommends consuming less than 2,300 mg of sodium per day and to further reduce intake to 1,500 mg among people who are 51 years and older and those of any age (including children) who are African American or have hypertension, diabetes, or chronic kidney disease. The American Heart Association also advises consuming less than 1,500 mg of sodium per day (American Heart Association [AHA], 2010). Almost 70% of U.S. adults aged 20 years and older should limit their sodium intake (CDC, 2009) as a means to prevent or delay the onset of hypertension and to lower elevated blood pressure.

The Institute of Medicine (IOM) has recommended regulations for food manufacturers, restaurants, and food service companies that would lower the amount of salt that can be added to their products. Until new regulations are established, the IOM has advised voluntary sodium reduction (IOM & Food and Nutrition Board, 2010). Most sodium comes from salt added during food processing; salt added at the table and in cooking contributes only a small amount of the total sodium that Americans consume (USDA & DHHS, 2010a).

As one method of voluntary reduction, the public is often counseled to avoid canned foods, including canned beans, due to their sodium content (Kollipara et al., 2006). Foodservice and consumer recipes, as well as dietary guidance, frequently recommend draining and/or draining and rinsing canned food prior to use as a method of reducing sodium. Draining and rinsing canned beans is a widely practiced food preparation technique in foodservice and in home food preparation. A recent study (Synovate eNation, 2009) found that 65% of respondents reported draining (33%) or draining and rinsing (32%) canned beans before using them; sodium was reduced regardless of intent. A minority (35%) reported using the entire contents of the canned beans in their food preparation.

Researchers have conducted studies on the effectiveness of rinsing selected canned food products, showing that a tap-water rinse will reduce a food's sodium content (CNN, 2008; Rickman et al., 2007; Sinar & Mason, 1975). Other noncanned protein sources have also been studied, and they too have shown reduced sodium content after rinsing with tap water (Vermeulen et al., 1983). To date, however, there have been no definitive

studies to determine whether these practices will reduce the sodium in canned beans; only limited data are available.

The purpose of this study was to evaluate the effectiveness of draining beans from their packing liquid and draining followed by a tap-water rinse as two practical ways to reduce the sodium content of commercially canned beans. These methods are easily implemented in both home and commercial food preparation venues and should be evaluated as to their effectiveness in reducing sodium content of canned beans. As nutrition labeling initiatives on menus and recipes move forward, research-based evidence of the impact on sodium of draining, and draining and rinsing needs to be considered in nutrient analysis.

MATERIALS AND METHODS

Experimental Design

A completely randomized design, consisting of five brands of each variety of canned beans (red kidney, garbanzo, pinto, black, and great northern) were purchased from retail sources. An experimental unit was defined as an entire 16-oz can for this study. Three experimental units were evaluated for each brand, thus providing 15 experimental units for each treatment and bean variety ($n = 15$). Intact cases, composed of 12 cans, were obtained to reduce the possible effects of batch variation.

The sodium content was determined for five varieties of canned beans at three different points: treatment 1 for beans and their packing liquid together; treatment 2 for drained beans only; and treatment 3 for drained and rinsed beans only. For treatments 2 and 3, the beans were drained on a standard #8 sieve for 2 minutes before the sodium content was measured. In treatment 3, following draining, the beans were rinsed with 3.5 L of lukewarm tap water (approximately 22°C) to replicate the flow of water from a household sink in 10 seconds. The rinsed beans were then allowed to drain on the sieve for 2 minutes prior to measuring their sodium content.

Sodium Analysis

After treatments were applied, each experimental unit was blended in a kitchen blender until a homogenous mixture was achieved to determine sodium content. All sample preparation and analysis were conducted at a commercial analytical laboratory (Q Laboratories, Cincinnati, OH).

Experimental units were prepared and analyzed individually for sodium content with the inductively coupled plasma-atomic emission spectrometric method (ICP-AES; AOAC Method 990.08; Association of Official Analytical Chemists, 2000). Samples were mixed with 15.9 M nitric acid (Fisher Scientific, Pittsburgh, PA) and mildly heated. After digestion, the samples

were diluted with water to reduce the overall acid content to 2% (v/v). A Fison-ARL 3410 ICP-AES (Fisons Instruments, San Carlos, CA) was used for determining sodium content at wavelength of 588.995 nm. Sodium concentration (ppm) was determined based on a standard curve, taking into account sample dilution during preparation. Samples of known sodium content were also evaluated to determine whether the methodology was appropriate for accurate sample analysis.

Statistical Analysis

The sodium content per serving that was obtained for each treatment and bean variety combination was then analyzed for significant differences using JMP 7 software (SAS, Cary, NC). Data were found to be normally distributed, and therefore significant differences among treatments and mean separation were determined. Differences were determined using one-way analysis of variance, and Student's t-test was used to compare means for significant differences ($p \leq 0.05$).

RESULTS AND DISCUSSION

Both draining and draining followed by rinsing were found to be effective ways to reduce the sodium content of commercially canned beans. All varieties of beans tested demonstrated significant reductions in sodium after draining ($p < 0.05$). However, there were no significant differences in sodium content of drained beans and those that had been drained and washed, although sodium values did decrease.

For all bean varieties, the draining treatment alone reduced sodium content by 36%, from a mean of 503 mg/label serving (21% Daily Value [DV]) to 321 mg/label serving (13% DV). A label serving is a half cup of canned beans, which includes the packing liquid. The reduction by the drained-rinsed treatment reduced sodium content for all brands and bean varieties by 41%, from 503 mg/label serving (21% DV) to 295 mg/label serving (12% DV), although not significantly different from draining alone ($p > 0.05$). Table 1 indicates the sodium reduction in drained (treatment 2) and drained-rinsed (treatment 3) beans compared to the sodium content of canned beans with packing liquid (treatment 1). These results are very similar to those of another study that also evaluated the reduction in sodium of canned vegetables when they were rinsed prior to reheating where sodium was reduced 23–45% (Sinar & Mason, 1975).

The reduction in sodium obtained from drained and from drained-rinsed treatments did not vary significantly by bean variety. For drained treatments, the highest reduction in sodium occurred for red kidney, garbanzo, and pinto beans, and the lowest reduction occurred for great

TABLE 1 Sodium Content per Serving^a for Varieties of Canned Beans With Packing Liquid, With Packing Liquid Drained, and With Packing Liquid Drained and Rinsed

Variety	Treatment					
	Packing liquid and beans (treatment 1)		Packing liquid drained from beans (treatment 2)		Packing liquid drained from beans and beans rinsed (treatment 3)	
	Mean (n = 15) (mg/serving)	Mean (n = 15) (mg/serving)	% Sodium reduction ^b	Mean (n = 15) (mg/serving)	% Sodium reduction	Mean (n = 15) (mg/serving)
Black	473 A ^c	335 B	29	311 B	34	34
Red kidney	499 A	287 B	42	277 B	44	44
Garbanzo	494 A	305 B	38	261 B	47	47
Great northern	532 A	373 B	30	327 B	38	38
Pinto	530 A	315 B	40	307 B	42	42
Overall (n = 90)	503 A	321 B	36	295 B	41	41

^aServing defined as 1/2 cup canned beans including packing liquid.

^b% Sodium reduction = $\frac{\text{Mean of treatment 1} - \text{Mean of treatment 2}}{\text{Mean of treatment 1}} \times 100$.

^cMeans followed by different letters were found to be significantly different ($p \leq 0.05$).

northern and black beans, although not significantly different. Great northern and black beans tend to exude more starch and beans solids during the canning process than the other bean classes. This results in a solids-laden, thickened packing liquid that adheres to the bean surface and retains sodium with the beans during the draining treatment that may be contributing to this observation.

These results demonstrate the ability to easily reduce sodium content in a canned bean product. Actually, the effectiveness of drained and drained-rinsed treatments on sodium reduction in canned beans may be influenced by numerous intrinsic factors not addressed in this study that can vary widely by manufacturer. These factors include differences in processing procedures (e.g., bean hydration, blanching technique, and thermal processing) and interactions that impact whole seed integrity and processed bean breakdown. In addition, other factors not addressed in this study, such as bean-to-liquid ratio, packing liquid viscosity, and processed bean integrity, depending on the bean class and processing method, impact sodium reduction.

Though the study showed the impact of a prescribed time period of draining and perhaps rinsing and draining again, it did not measure how long the average consumer might drain and rinse. In addition, this study did not address the impact of rinsing and of rinsing and draining on other water soluble nutrients, in addition to sodium, which may have leached into the packing liquid.

CONCLUSIONS

The practices of both draining and draining/rinsing canned beans can effectively reduce the amount of sodium from that contained in the product as purchased. All brands and all varieties of canned beans tested demonstrated reductions in sodium content per serving after draining and draining and rinsing. Across all canned bean varieties and brands tested, the mean reduction in sodium content per serving resulting from draining and rinsing was 41%.

Instead of recommending that consumers limit or avoid canned beans, the common practice of draining or draining and rinsing canned beans has been shown to be effective and should be encouraged. Nutrition analysis for recipes using canned beans should reflect sodium reduction from draining or draining and rinsing.

This research supports that draining or draining and rinsing canned beans is an effective strategy for consumers and those in the hospitality industry to reduce sodium intake during meals. This can help the public stay within their sodium recommendations and enjoy the flavor, convenience, affordability, and nutritional and health benefits of canned beans.

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