Nutrient Composition of Fed Bison

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Executive Summary

The long-term goal of this project is to develop an adequate database on the nutrient composition of the North American bison. With mandated nutritional labeling of processed meat products, it is only a matter of time before nutritional labeling of fresh meats will be required. Physicians, dieticians, and consumers will be able to utilize this data to make intelligent, informed decisions. This project provides information which may be utilized in developing marketing strategies for both the domestic and international markets.

Individual cuts from the round, loin, rib, and chuck will be analyzed from 100 fed bison. Animals sampled will come from various geographic areas of the United States and Canada. They represent the current types of bison being marketed through restaurants and supermarkets. Nutrient parameters obtained will be moisture, protein, fat, saturated fat, cholesterol, energy, minerals (sodium, iron, calcium), and vitamins (A and C).

Dramatic changes are occurring in the food industry. Currently published data, based mainly on the loin eye muscle, indicates bison is a highly nutrient-dense food. The demand for live bison and bison meat already exceeds supply. The bison industry is one of the fastest growing alternative agriculture enterprises, and an increase of 25% every year until 2005 is expected. The industry response to this increasing demand is to provide consistent, highly palatable, nutritious meat to the consumer. This information will be used to comply with demands for nutrient labeling of products, to give consumers suggestions on the proper cooking of bison products to maximize nutritional value, and to develop marketing strategies, especially for international trade. Knowing the nutritive value of bison will encourage consumers to plan healthy meals with this wholesome, delicious product. Bison producers will be able to utilize this database to know their feeding regime is producing a quality product for the marketplace.

Objectives

The objective of the project was to determine the nutritional composition of bison meat cuts from the round, loin, rib, and shoulder for nutritional labeling. In addition to the required minerals for nutritional labeling, we were able to determine seven additional minerals. We have analyzed for calcium (Ca), copper (Cu), iron (Fe), magnesium (Mg), manganese (Mn), phosphorus (P), potassium (K), sodium (Na), zinc (Zn), and selenium (Se). Twelve long-chain fatty acids have been identified. We are initiating studies to determine thiamin, vitamin B-6, vitamin B-12, and E (alpha and gamma tocopherol), in addition to vitamins A and C.

Summary of Research Completed and in Progress

To date, we have collected and initiated chemical analysis on a total of 400 bison meat samples (100 animals) representing nine states and three provinces. The samples represent the four areas of the carcass (round, loin, rib, shoulder). Analysis has been completed on the number

(N) of animals indicated. All cuts averaged 74% moisture, 22% protein, 2% fat, 1.2% ash (mineral). Cholesterol content averaged 66 mg/100 gm, with energy value of 145 calories. If you calculate energy as food energy, it would be 110 calories. This is because energy is required to convert protein into calories or food energy.

When you compare the various parts of the carcass, you see differences in the various components. Moisture ranged from 74.0% in the ribeye to 75.4% in the clod muscle of the shoulder. Protein varied from a low of 21% in the clod to a high of 22.3% in the round. The round also had the least amount of fat, with 1.6%, while the sirloin contained 2.4%. The cholesterol content as determined by chromatography varied from 61 mg/100 gm in the ribeye to 71 mg/100 gm in the sirloin. These are similar to values we previously reported (Marchello et al., 1989). Recent results by other investigators have shown lower cholesterol levels. Those researchers are using a different technique to analyze for cholesterol. The technique they use gives lower cholesterol numbers for all animal species examined.

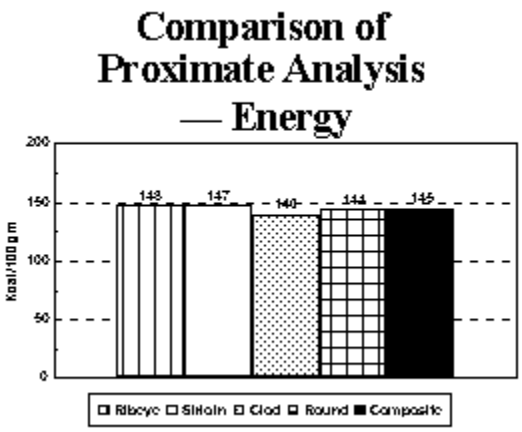
This type of research begs the question, “How does this compare with other meats?” This is difficult to answer in a strictly objective manner because of the many factors that influence nutritional composition (age, sex, type of feed, individual muscle, etc.). In order to be the most objective, I have given an example comparison that was conducted in our laboratory under the same conditions. Furthermore, the comparison was done on the type of meat that is normally found in the stores and is available to us as consumers. This is only a partial list of all the nutrients. As you can see, bison compares quite favorably with the other meats studied.

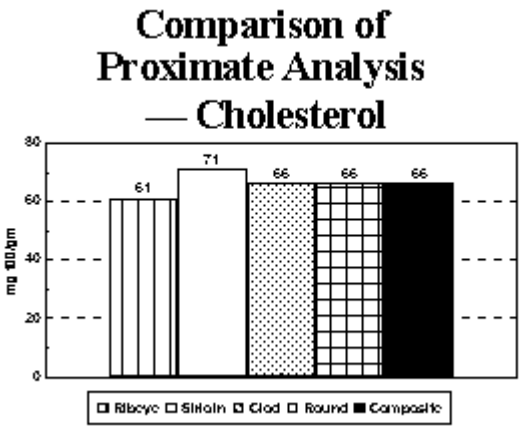
Minerals are an important part of the nutrient composition of animals. They are essential for many metabolic reactions. Information on three of these minerals is required for nutritional labeling, but other minerals may be included if you so desire. We have analyzed for 10 different minerals, and, as suspected, bison compares very favorably with other animals. Bison is low in calcium relative to Recommended Daily Requirements (RDA), ranging from 4.1 mg/100 gm in the clod muscle to 5.9 mg/100 gm in the ribeye. It is an excellent source of iron, containing around 3 mg/100 gm in the various muscles analyzed. Sodium has been criticized as contributing to hypertension. Bison is low in sodium, ranging from 48 to 60 mg/100 gm in the ribeye and clod muscles, respectively.

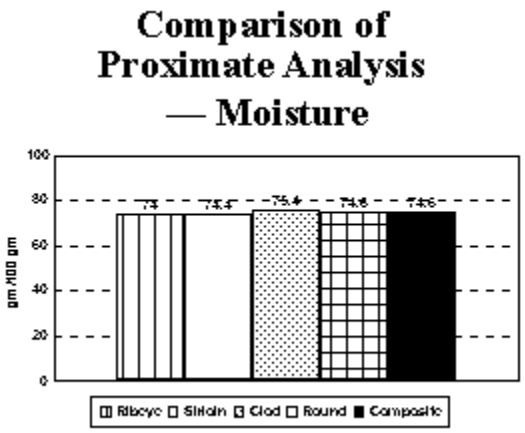
Vitamins A and E are fat-soluble and, because bison is low in fat, the quantity of these vitamins in bison meat is very small. Vitamin A averaged 0.00079 mg/100 gm, with a range of 0.00064 in the clod to 0.00094 in the sirloin. This extremely small amount is because of the low fat content of bison and the fact that vitamin A is fat-soluble. Alpha-tocopherol and gamma-tocopherol (two forms of vitamin E) content was 0.047 and 0.013 mg/100 gm, respectively. We were unable to detect any vitamin C in the various meat samples with our equipment. Additionally, we have analyzed for Vitamin B6. The results from 12 animals range from a low of .22 mg/100 gm to a high of .28 mg/100 gm in the top round. Ribeye and top sirloin contained .25 mg of Vitamin B6.

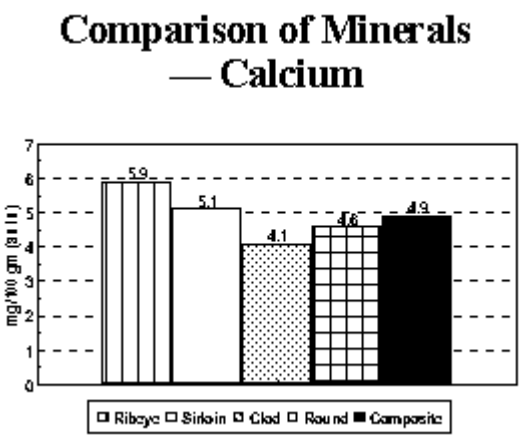
Even though fat in the diet has been touted as being bad, fats are a very important component of a balanced diet. Fat adds to the unique flavor and appetite appeal of bison, provides essential fatty acids, and aids in the absorption of fat-soluble vitamins. Bison meat is low in fat, having a balance of approximately 50% saturated, 37% monounsaturated, and 9% polyunsaturated fats. Sirloin contained the least amount of saturated fat with 49%, while round had the greatest amount with 52%. Round had 35% monounsaturated fat, with ribeye and sirloin possessing 39%. Bison is relatively high in polyunsaturated fat, ranging from 7% in the ribeye to 10% in the round.

Differences in nutrient composition of meat can be attributed to many factors, such as age, sex, function of the individual muscle in the live animal, and condition of the animal at the time it is harvested. Variations of a component can be as great among individuals within a species as between species. These differences are taken into account by analyzing a significant number of animals, as we have done in this study. Results of this study substantiate our previous study, although minor changes in some nutrients have occurred. This study confirms that bison meat is a highly nutrient-dense food because of the proportion of protein, fat, minerals, and vitamins in relation to its caloric content.

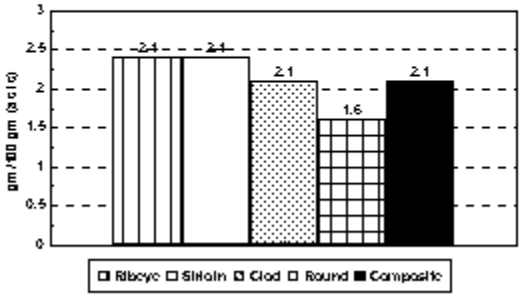








Comparison of Proximate Analysis — Fat



Comparison of Proximate Analysis — Protein