A Faster Way to Measure Bone Content

Abstract

Meat processing plants are constantly faced with the challenge of maximizing the amount of yield per animal in a cost-effective manner, while staying within the USDA guidelines of less than 1% bone content. Mechanically separated meat is no different. The Phoenix BLACK™ bone content analyzer, developed by CEM, provides a rapid and accurate determination of the bone content of a sample, without the use of chemicals. When coupled with the ProFat™ meat analyzer, it will determine the moisture, fat, protein, and bone content of a given raw meat sample. The information is generated quickly enough to make adjustments to the processing line and further increase the yield. To demonstrate the speed and accuracy of the Phoenix BLACK, values were generated for bone content in 30 minutes with results comparable to standard reference values, including the USDA method FSIS SOP No: CLG-CAL 2.00, "Calcium, Inductively Coupled Plasma (ICP) Determination."

Introduction

In order to maximize the yields and remain within the USDA guidelines of mechanically separated products, a precise bone content determination is necessary. Traditional techniques require long digestion and titration times, expensive equipment, and/or out-of-house results; none of which is the best option for a plant in need of a quick and accurate answer in order to make a process control adjustment.

A rapid determination of bone content allows the most efficient adjustment of the mechanical deboning process. Quick feedback tells operators if the screen needs to be adjusted or has become old and needs to be replaced. This information can allow the operator to generate a product that is much closer to the desired specifications than would otherwise be possible when information takes hours or days to generate.

In order to determine bone content, the traditional procedure requires several steps. First, calcium is separated from the rest of the sample, and then either titration or Inductively Coupled Plasma (ICP) is used to determine the amount of calcium. This number is used to calculate the amount of bone in the sample. Included in the process are factors such as: human error, calculation error, hazardous chemicals, and a significant amount of time. The Phoenix BLACK completely eliminates three factors and substantially reduces the fourth.

Instrumentation

The Phoenix BLACK directly measures the bone content of the sample by burning off any excess organic material, leaving only the bone fragments. The operator takes a sample from the mechanically deboned product, places it into the Phoenix BLACK, and starts the heating process; no need for pre-processing, hazardous chemicals, or complicated calculations. Results are available in 30 minutes, or less and the bone content is automatically calculated. Quartz-fiber crucibles are used in the test, reducing the amount of cool-down time and providing a reusable vessel that is not prone to breakage.

Experimental

Method Parameters

Temperature: 550 °C
Dwell Time: 30 min*

Samples that have been pre-dried in the ProFat meat analyzer or SMART 6™ can be analyzed in just 15 minutes.

Samples were each blended in a consumer-grade food processor, until reaching a paste-like consistency. Approximately 4 g of sample was weighed into a pre-ashed 50 mL quartz-fiber crucible, using the integrated balance, and placed in the Phoenix BLACK furnace at a temperature setting of 550 °C. All organic materials were rapidly burned off at this temperature, leaving the bone intact. Samples were reweighed and the bone content displayed as the difference in weight. Data was collected and displayed on the computer, which also stores historical results.

In order to further accelerate the process, the ProFat meat analyzer can be used to determine the moisture, fat, and protein of the sample in just 2.5 minutes. Once tested in the ProFat, the sample can be taken directly to the Phoenix BLACK for a bone content analysis in only 15 minutes. For more information on the ProFat meat analyzer, visit cem.com/profat-meat-analyzer.

Results

As demonstrated in **Table 1** , the analysis is comparable to the USDA method FSIS SOP No: CLG-CAL 2.00, "Calcium, Inductively Coupled Plasma (ICP) Determination." In addition, unlike the titration method, it does not require chemicals and exhibits far greater reproducibility of results.

Table 1: Bone Results for Mechanically Separated Chicken

(MSC) Sample	% Bone	USDA Bone	Difference
1	0.77	0.83	-0.06
2	0.70	0.76	-0.06
3	0.80	0.62	0.18
4	0.59	0.55	0.04
5	0.64	0.56	0.08
6	0.50	0.50	0
7	0.83	0.85	-0.02
8	0.85	0.88	-0.03

Conclusion

The Phoenix BLACK provides a direct bone content determination for mechanically separated products without the use of harsh chemicals. The fast, accurate test results help meat producers improve their process control and keep bone content within USDA guidelines. Processors can make quick adjustments on the production floor to maximize yield, without the use of solvents or time-consuming procedures.

United States (Headquarters)

800-726-3331
704-821-7015
info@cem.com

France

33 (01) 69 35 57 80
info.fr@cem.com

Germany, Austria, Switzerland

(49) 2842-9644-0
info@cem.de

Ireland

+353 (0) 1 885 1752
info.ireland@cem.com

Italy

(39) 35-896224
info.srl@cem.com

Japan

+81-3-5793-8542
info@cemjapan.co.jp

United Kingdom

(44) 1280-822873
info.uk@cem.com

www.cem.com