

## Introduction

Treats are products given to dogs to strengthen bonds between owners and pets. Most treats on the market are made of wheat, mostly because of gluten binding properties that contribute to the appealing texture and flavor (Case et al., 2011). Sorghum is a prominent grain that is a rich source of dietary fiber, resistant starch, and B vitamins (Anglani, 1998). However, it lacks gluten which limits its application in baked treats. Soluble animal proteins have been shown to improve binding in extruded kibbles (Manbeck et al., 2017). These ingredients also have a strong flavor and aroma profile which could affect their appeal in a pet treat application.

## Objective

To determine the effect of soluble animal proteins as binders in white and red sorghum-based rotary molded baked dog treats on their appearance, aroma, flavor, texture/mouthfeel, and aftertaste.

## Materials and Methods

**Materials.** Dog biscuits which were manufactured with whole wheat flour (Ultragrain Hard, Ardent Mills, Denver, CO); whole white and red sorghum flours (White Whole Grain and Burgundy Whole Grain, Nu Life, Scott City, KS); spray-dried plasma (Innomax Porcine Plasma, Sonac, Maquoketa, IA); egg protein (OvaBind®, Isonova, Spencer, IA); and gelatin (Pro-Bind Plus 50, Sonac, The Netherlands).

**Experimental Design.** The experimental diets were manufactured as a 2x4+1 augmented factorial arrangement of treatments. It was used two types of whole sorghum flours, white (WS) and red (RS), four types of soluble animal proteins, spray-dried plasma (SDP), gelatin (GL), egg protein (EP), and a negative control with no added protein (NC). A treatment produced with whole wheat flour (WF-GTN) served as a positive control for both type of cereal and binding protein.

**Sensory Analysis.** Five highly trained panelists scored the treats for appearance, flavor, aroma, texture/mouthfeel, and aftertaste intensity using a consensus method with scores based on a 15-point scale (0= none to 15=extremely high) with 0.5 increments (Di Donfrancesco et al. 2012).

**Statistical Analysis.** Multivariate analysis with XLSTAT (Addinsoft, New York, USA) and Pearson's correlation coefficients ( $P < 0.05$ ) were used and summarized in a PCA. In addition, radar charts were plotted in Excel.

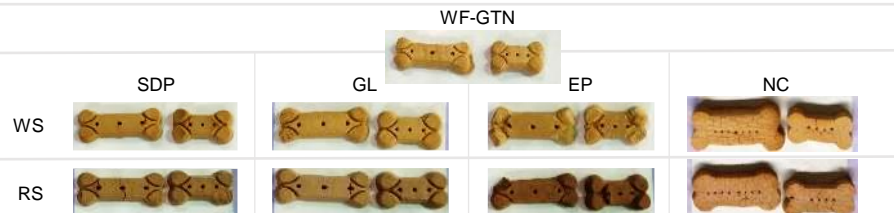


Figure 1. Rotary molded baked dog treats

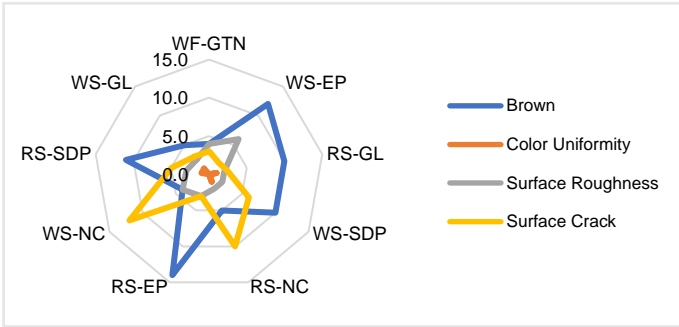


Figure 2. Appearance scores of rotary molded baked dog treats

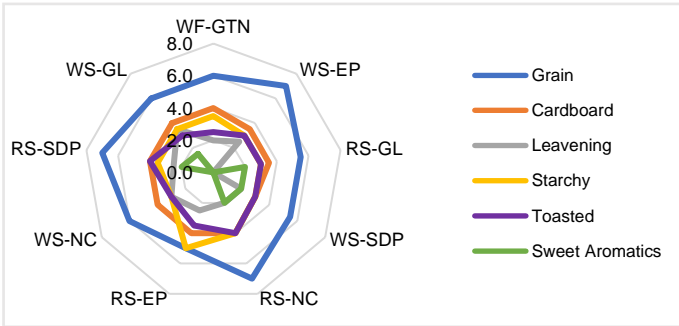


Figure 3. Flavor scores of rotary molded baked dog treats

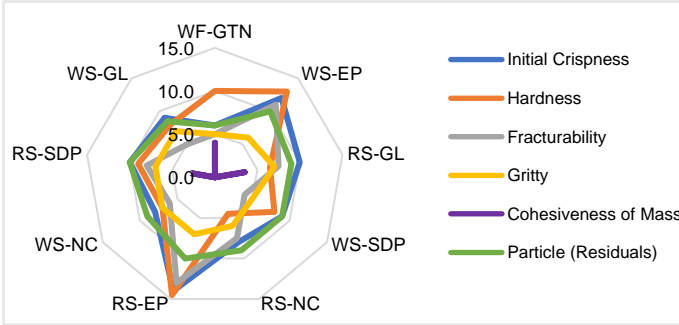


Figure 4. Texture scores of rotary molded baked dog treats

## Results

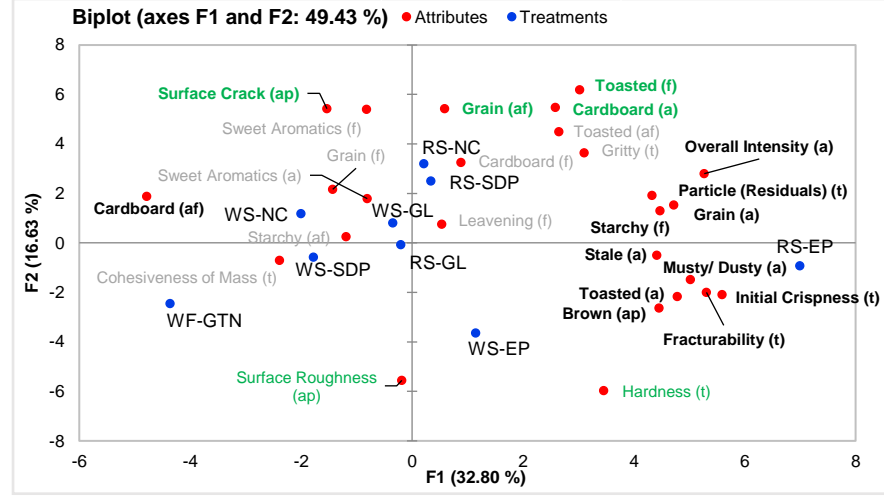


Figure 5. PCA of the sensorial attributes of rotary molded baked dog treats

## Discussion and Conclusions

The addition of protein in the sorghum treatments reduced noticeably the surface cracks of the products as would be expected from an effective binder. In addition, SDP and EP increased the darkness.

The predominant flavor and aftertaste was grainy with no other higher-scored attributes. This suggests that the proteins used at the level of inclusion 4.0-9.0%, did not interfere with the typical cereal notes. In addition, most samples were perceived to have mild sweet aromatics attributes. This sweet taste may be preferred by dogs.

The inclusion of protein to the sorghum treatments increased the hardness of the biscuits creating products more comparable to those made with whole wheat flour. This finding is important from a processing stand-point because significant additions of sorghum (48.0-53.0%) in combination with nutritious proteins did not impair the shaping or handling of rotary-molded biscuits.

This work indicated that formulation had a bigger effect on texture and product appearance over flavor, aroma, or aftertaste. However, an animal evaluation should be performed to find relationships among attributes between dogs and the human panelists.