RESEARCH REPORT

IMPROVE THE TEXTURE OF WET PET FOOD

TECHNO-FUNCTIONAL

FUNCTIONAL POULTRY PROTEIN

WHERE WORLDS MEET

Natural Ingredients. Smart Solutions.

sonac

DARLING INGREDIENTS

FUNCTIONAL POULTRY PROTEIN

Functional Poultry Protein (FPP) is a binder that can be used in food and pet food applications. Approximately 80% of it consists of pure poultry protein, of which about 30% is collagen.
FPP disperses well in water and forms a reversible gel after heating and cooling.
The binding and gelling properties of FPP are very well suited to supporting the meat matrix (chunk and loaf) formation process of wet pet food manufacturing. On top of that, this functional ingredient enriches formulas with nutritious, highly digestible and palatable proteins.

IMPROVE THE HARDNESS, COHESIVENESS AND GUMMINESS OF WET PET FOOD

Wet pet food is a growing market, and the forecast is that wet cat food will become the largest cat food market in Europe in value. Functional Poultry Protein can be a valuable addition to the wet pet food industry due to its characteristics. It has important binding and gelling properties, as well as a high protein level and a natural poultry taste and aroma.

In order to clarify how Functional Poultry Protein can be used, its potential benefits in wet pet food were investigated. The first part of this research focused on how FPP improves the texture of loaf. The second part focused on how it improves the texture of chunks.

STUDY 1
FUNCTIONAL POULTRY PROTEIN IMPROVES THE TEXTURE OF LOAF

METHODOLOGY

In this first study, the Functional Poultry Protein (FPP) was added on top of loaf formulations at four inclusion levels: 0.5%, 1.0%, 1.5% and 2.0%. The raw materials were mixed in a Stephan cutter, followed by a Hobart mixer. Cans were filled directly with the meat emulsion and sterilized at 121°C (core temperature), for 15 minutes.

The aim of the study was to investigate how the functional protein affects the texture when added to a loaf formulation. A reference loaf (containing a standard amount of carrageenan) was developed, based on relevant literature. After sterilization, a texture profile analysis (TPA) was used to determine the hardness, cohesiveness and gumminess of the loaf. TPA was chosen as part of the methodology as it mimics the mouth's biting action by compressing the product twice. This was performed using a Texture Analyzer. A bite-size food sample was placed on a base plate and was compressed and decompressed twice, to mimic two consecutive bites. The force-time curve that was obtained gave important information about several mechanical or textural characteristics of the food sample.

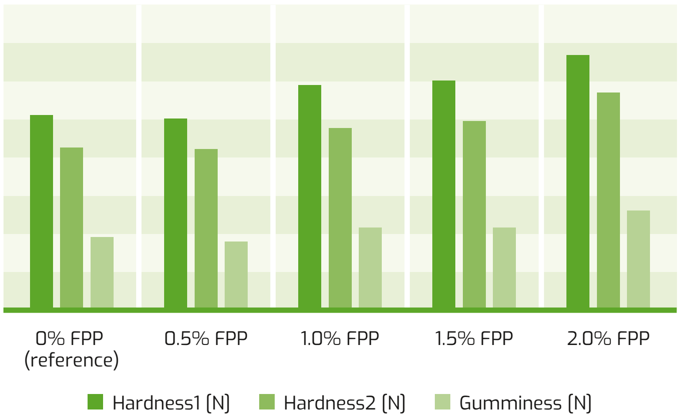
The force of the first bite was noted as Hardness 1, and the force of the second bite as Hardness 2 (expressed in Newton).
The cohesiveness was an indication of the strength of the bonds holding the food together. It was measured by the degree to which a food sample can be compressed between the teeth before it breaks.
The gumminess noted was an indication of the energy required to break down a semi-solid food to a state ready for swallowing.

RESULTS

Addition of FPP to the reference loaf resulted in an increase in both hardness and gumminess as a function of FPP concentration, as can be seen in Figure 1. In general, the addition of gelatin decreases the hardness and gumminess of a loaf, whereas the addition of plasma powder and specifically carrageenan, which are both well-known thickeners, further increases the hardness and gumminess.

FPP in loaf

Figure 1. Hardness 1, hardness 2 and gumminess of the reference loaf as a function of FPP concentration.



STUDY 2

FUNCTIONAL POULTRY PROTEIN IMPROVES THE TEXTURE OF CHUNCK IN GRAVY FORMULATIONS

METHODOLOGY

In this second study, the Functional Poultry Protein (FPP) was added on top of chunk formulations at four inclusion levels: 0.5%, 1.0%, 1.5% and 2.0%. The raw materials were mixed in a Stephan cutter and then a Hobart mixer to form a meat emulsion. Ropes (13 mm) were baked in an oven at 80°C for 10 minutes. After a short rest period, the ropes were cut into small chunks (10-13 mm) and filled into cans. The composition of the cans was 50% chunks and 50% gravy. The cans were then sterilized at 121°C, for 15 minutes.

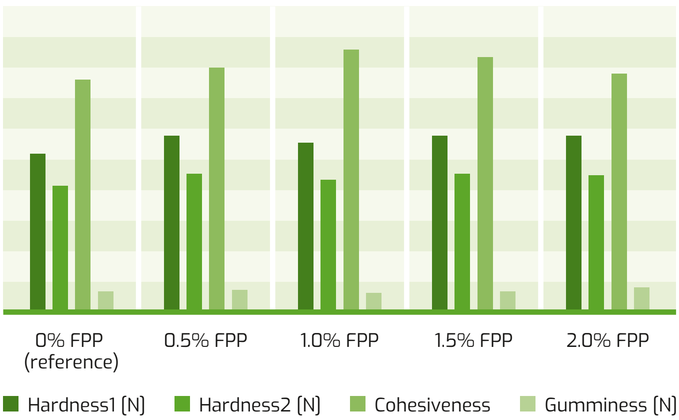
The aim of the study was to investigate how the functional protein affects the texture when added to a meat emulsion used to form chunks. 'A reference formulation for chunks (containing a standard amount of carrageenan) was developed, based on relevant literature.' After sterilization, a texture profile analysis (TPA) was used to determine the hardness, cohesiveness and gumminess of the chunks.

RESULTS

The addition of FPP to the reference chunk resulted in a slight increase in hardness and a not significant increase in gumminess, as can be seen in Figure 2. The cohesiveness initially increased with the addition of 1.0% FPP, but decreased with the addition of 2.0%. Overall, the impact of FPP addition on the textural properties of the final chunks was relatively small.

FPP in chunks

Figure 2. Hardness 1, hardness 2 and gumminess of the reference chunk as a function of FPP concentration.



DISCUSSION OF STUDIES 1 & 2

It is known that texture does impact the feeding behavior of cats and dogs. The reference loaf (obtained with the addition of carrageenan alone) was pretty hard, and might be difficult for cats to consume. On the other hand, owners often cut a loaf into smaller pieces before offering it to their cat. FPP proved to be ideal for creating small adjustments to the texture.

The behavior of FPP during processing, for example during the extrusion and cooking of the chunks, was determined by analyzing the storage modulus (G') with a rotational rheometer. FPP increases the storage modulus (G') of a model liver system during heating, which indicates that the structure of the model system increases, most likely as a result of the denaturation and aggregation of proteins. At the end of the time sweep (stress) there is a loss of structure, but during cooling extra structure is gained, partially due to the crystallization of fat.

In a lean meat model system, a similar increase in storage modulus (G') and thus structure was observed. Correlating this to the chunk production process, it can be hypothesized that the meat ropes are easier to cut into chunks because of the increased structure of the ropes as a result of the addition of FPP.

STUDY 3

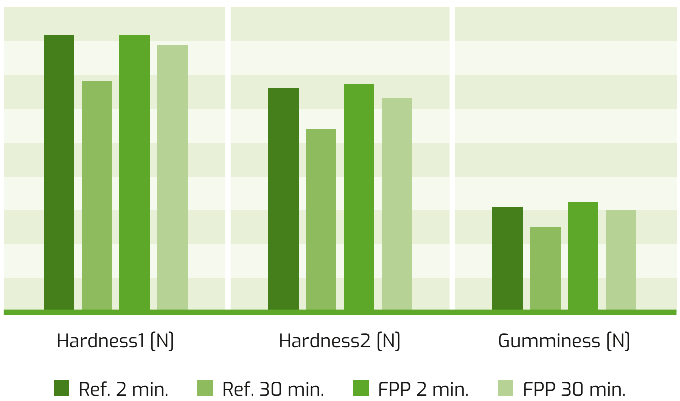
HEAT STABILITY OF FPP IN LOAF FORMULATION

In this third study the Functional Poultry Protein (FPP) was added on top of the reference loaf at an inclusion level of 1.0%. The aim of the study was to investigate what the heat stability is of the functional protein by varying the sterilization time. The same textural properties as in study 1 and study 2 are measured on a loaf after either 2 minutes (short time) or 30 minutes (long time) sterilization at 121°C.

For the reference loaf, the hardness decreases significantly when a sterilization time of 30 minutes is used, as is shown in Figure 3. Addition of 1% FPP, however, results in a very stable loaf, whereby the texture does not change even after 30 minutes of sterilization. These results show that with the addition of FPP, the heat stability of the loaf is improved, most likely due to the presence of collagen proteins in FPP which can withstand high temperatures for a longer time period.

Sterilization Time

Figure 3. Effect of sterilization time on the textural properties of the reference loaf and the effect of 2% FPP inclusion.



CONCLUSION

Figure 4. Reference loaf with 2.0% FPP.

The present results indicate that the addition of Functional Poultry Protein (FPP) to a reference loaf or chunk formulation increases the hardness and gumminess. However, it is important to note that the efficiency of the functional poultry protein will depend on the particular formulation and matrix. The binding and gelling capability of FPP is especially important during chunk processing, as it strengthens structures such as of the meat ropes in the steam tunnel, improving their cuttability. FPP helps the formation of meat ropes during the chunks production process. Because the meat emulsion contains more structure, it is easier to form it into strands and cut it into cubes. Furthermore, FPP improves the heat stability of a loaf, as a result of which it can withstand longer sterilization times without adversely changing its texture. It also can be concluded that FPP is ideal for creating small textural adjustments.

These studies have shown that there is a lot of potential for the application of FPP in wet pet food. Functional Poultry Protein helps manufacturers to manipulate textural properties in order to achieve the desired hardness, cohesiveness and gumminess. In addition, FPP helps to correct macronutrient composition, and naturally enhances poultry taste and aroma.

The communication to the end user is the responsibility of the pet food producer.

BRINGING TOGETHER PRODUCTS, PEOPLE AND PETS

WHERE **WORLDS** MEET

Operating on a unique residuals-to-resources concept, Sonac develops bio-functional, techno-functional and nutritional ingredients that benefit the pet food industry, pet owners and pets. We operate at the intersection of these three different stakeholders' worlds.

We are a leading producer of reliable, sustainable ingredients worldwide, with representation on 4 continents and activities in 60 different locations. As a dependable one-stop shop for smart, volume-driven, ingredient solutions, our constant aim is to help manufacturers improve recipes and reach the highest levels of quality and environmental performance.

Sonac is part of Darling Ingredients.

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