

Hydrolyzed keratin protein, an alternative poultry protein source for pet food

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It is common knowledge that cats are very meticulous when it comes to their food. That is why digestibility and taste are such important parameters for producing pet food. Parameters that can be influenced by an optimal production process and ingredients used. For instance, hydrolyzed keratin protein is a digestible and tasteful alternative poultry protein compared to poultry meal.

Hydrolyzed keratin protein is the result of hydrolyzing poultry feathers in such a way, that both a digestible and a tasteful alternative poultry protein are created compared to poultry meal. Due to its high protein level (80-85%, Kjeldahl-method), the product is interesting to enhance the protein level of the diet. Furthermore, it's economically attractive and may be labelled as poultry in most countries.

Digestibility - optimal production process

By variation in the processes used, a lot of different qualities of hydrolyzed keratins can be found in the market. For pet food parameters like smell, taste, freshness, color and digestibility are very important. This can be evaluated by several in vitro (laboratory; pepsin and Boisen) and in vivo (animal) tests. The pepsin test tries to mimic the digestibility step in the stomach, whereas the Boisen test¹ uses enzymes pepsin and pancreatin to mimic both the stomach and the small intestine step. For the in vivo digestibility the mink² is used as a model animal because a mink has a digestion tract resembling that of the cat.

¹ Boisen test: Laerke, H.N., Boisen, S.&C. Hejlesen (2003). An in vitro method for estimating protein digestibility in mink feed. Annual report 2002, 65-75. Danish Fur Breeders Research Centre, Holstebro, Denmark.

² Mink trials performed at the Copenhagen Fur Centre, Copenhagen, Denmark.

A HTST production process (the combination of hydrolyzing and drying) seems to result in a better digestibility.

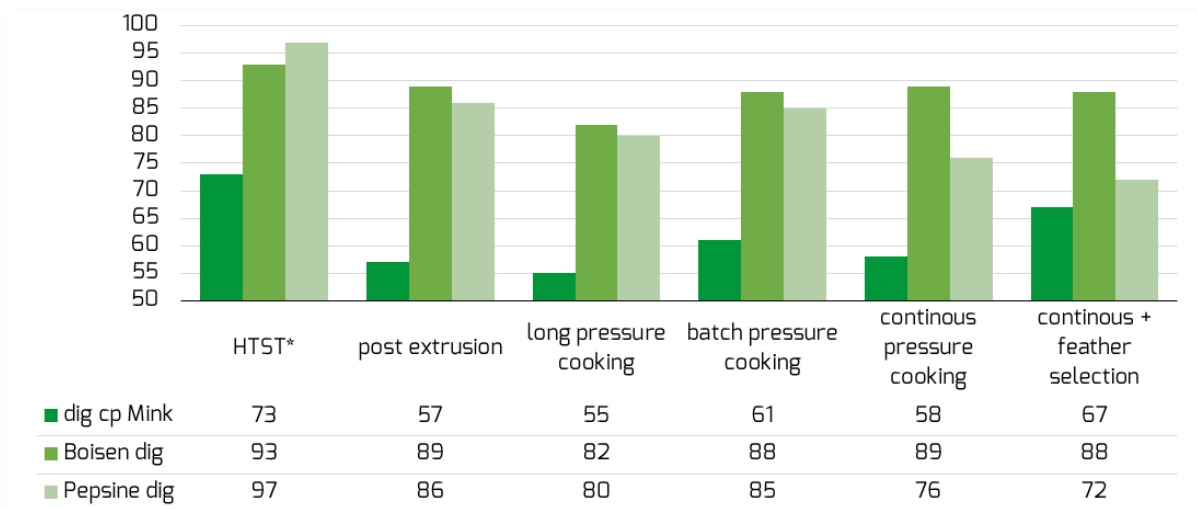


Figure 1 - Digestibility of the protein and amino acids in relation to the production process

* HTST = High Temperature Short Time

When processing hydrolyzed keratin protein, the cysteine and lysine content are also important parameters. Cysteine is an important amino acid present in the fur of cats and dogs. Keep in mind that cysteine is a very sensitive amino acid and will be easily destroyed by severe processing. Lysine is important for the development/growth of cats and dogs.

	HTST	Batch pre cooking	Continues pre cooking
Crude protein mink digestibility%	73	61	59
Cysteine level	4.4	2.8	3.96
Lysine level	2.1	1.82	2.11
Digestible lysine in mink %	56	43	51

Table 1 - Total cysteine level and digestibility of lysine measured at the model animal, the mink³

When evaluating a hydrolyzed feather protein on digestibility the damage to the amino acids should be taken into account. Based on the protein digestibility the conclusion could be that this particular batch and continuous process are the same. When checking the lysine digestibility, the difference becomes clear.

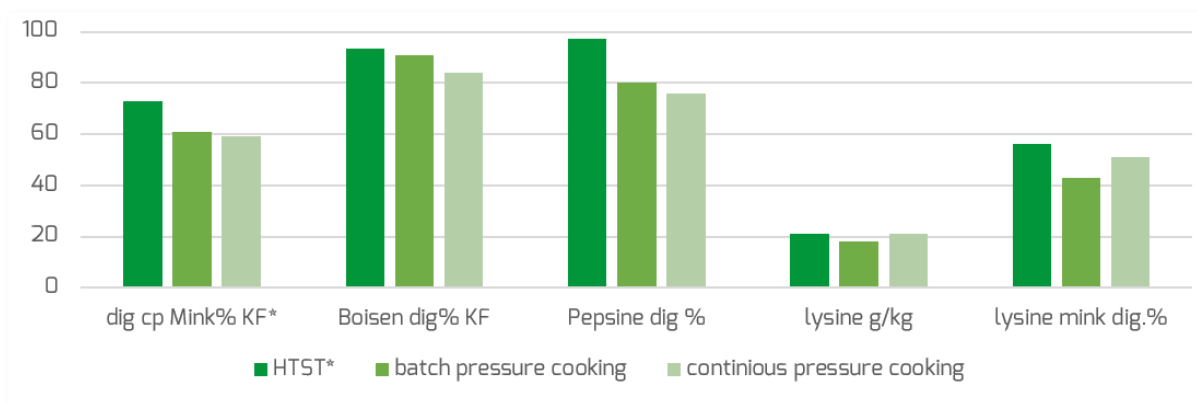


Figure 2 - Digestibility (protein and amino acids) and lysine levels

* KF = Copenhagen Fur

³ Mink trials performed at the Copenhagen Fur Centre, Copenhagen, Denmark.

Indicator for high temperature process

Due to high temperature processing of cysteine, hydrogen sulfide (H₂S) can escape and lanthionine can be formed. Lanthionine is physiologically without value. A high level of lanthionine also decreases the level of cysteine - which is undesirable.

	Standard Novus	Enzyme treated Novus	Batch long pressure cooking	Continuous pressure cooking	Continuous pressure cooking	Batch pressure cooking with enzyme	Batch pressure cooking	HTST
Lanthionine in g/kg	19	10	24,3	21,2	21,4	17,9	19,2	7,79

Table 2 - Lanthionine and indicator for high temperature processing

Analysed by Nutricontrol (Veghel, NL)

Taste

There are several chemical parameters to evaluate different hydrolyzed keratin proteins. A joined research project with a customer was conducted to see how freshness of feathers used related to taste, using an aroma profile. The higher the total aroma value, the less fresh the raw materials were. Using more fresh feathers show lower aromatic compounds. Hydrolyzed keratins produced from fresh feathers have a lower value of FFA, as an indicator for the lipase activity in the raw materials. The biogenic amines show degradation of the protein as caused by absence of freshness. The lower the values, the more neutral the taste.

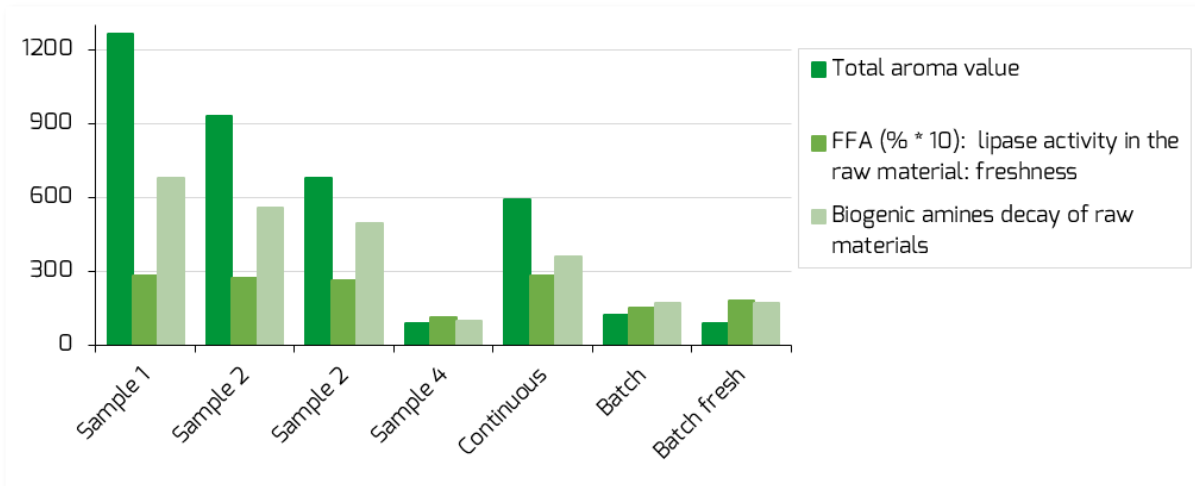


Figure 3 - Aroma profile

Analysed by Nutricontrol (Veghel, NL)

In a study done to perceive preference of cats the effect was shown of using feathers directly processed at the slaughterhouse (positive reference), against fresh collected feathers and standard collection of feathers. The study shows that freshness of the raw material is an important parameter.

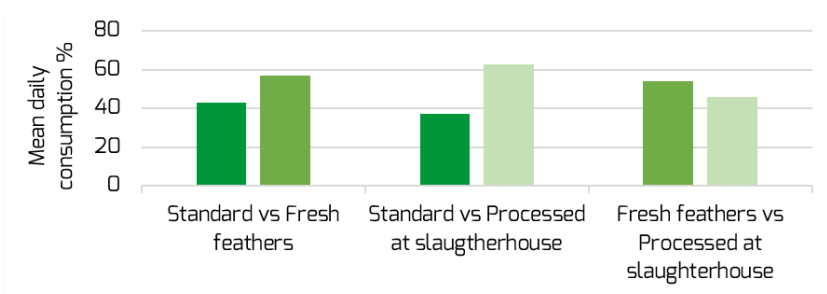


Figure 4 - Preference study amongst cats

Conclusion

Hydrolyzed keratin proteins are valuable protein and amino acid sources for diets for pets. Production process (processing) and raw material quality are very important for the resulting product. Using only in vitro protein digestibility is not sufficient to evaluate the protein quality. The in vitro digestibility of the protein can be high, but at the same time the amino acids can be damaged. A balanced production process is essential.

And as can be expected because cats are very meticulous, for cats freshness of the raw materials is key. ■