CHANGES OF NON-PROTEIN NITROGEN AND FREE AMINO ACIDS DURING DRY-CURED DUCK PROCESSING

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Key Words: Dry-cured duck, Total nitrogen, Non-protein nitrogen, Free amino acid

Introduction:

Meat is a food which alters rapidly because of its special characteristics. Man has looked for ways to conserve and curing has been one solution. Today, curing has become more than a method of conserving but diversification and adaption to the habits of the consumer. Regardless of whether the proteolysis has a microbial or an endogenous origin, it leads to an increase in non-protein nitrogen (Martín, Antequera, Ruiz,Cava,Tejeda & Córdoba,1998), free amino acid (Buscailhon, Saccani, Virgili & Bordini, 1994). Such changes in nitrogen compounds are very important, because the overall acceptance of meat products depends to a large extent on their flavor, which is mainly determined by taste and odour compounds (Jurado, Á.et al, 2006). This is not strange since it is well known that amino acids and peptide contribute to the taste of a wide variety of foods (Kato. Rhue & Nishimura, 1989).

Dry-cured duck is manufactured mainly in the southeast of China which has a large market for this product. The stages of the process are similar to those of dry-cured ham, but the existing information in scientific literature related to dry-cured duck is very scarce because of the dietetic differences between China and western countries. In order to protect this traditional product and also improve the quality of the product, studies of proteolysis in dry-cured duck during processing are carried out in this laboratory.

Materials and methods

Twenty-five raw ducks, selected and grouped randomly by weight (about 1.5kg), were processed following the traditional methods. They were dry-salted with coarse salt for about 2 days, the temperature of the salting room keeping about 4℃ and relative humidity between 80 and 90%. After salted, the ducks are transferred to a room at 10℃, and 70% of relative humidity and dried for ripening. They remained in this room for about half a month. They were sampled at five different stages of processing: raw duck, at the end of salting, at the end of drying for 5 days, 10 days and 15days. The samples were skinned and boned and the breasts were triturated in a high capacity mincer and stored at -20℃ for no more than 4 weeks.

Moisture and total nitrogen (Kjeldahl) were determined following the recommended methods (ISO/R 1442, ISO/R937 respectively).

Non-protein nitrogen (NPN) was measured according to G. M. Zhao et al. (2006); 4g minced muscle were mixed with 20ml citric acid (0.05 M, pH 6.0) and the mixture was centrifuged at 10000g for 15 min at 4℃. After filtration, 20ml solution were added to 20ml trichloroacetic acid in water (10g/100ml) and allowed to react overnight at 4℃. The mixture was centrifuged, filtered and analysed for NPN (Kjieldahl).

Free amino acid (FAAs) were analysed with an 835-50 amino acid auto-analyzer(Hitachi Co.,Japan).

Proteolytic index (P.I) was calculated by NPN/ TN.

FAAN was calculated by the contents of nitrogen in FAA.

One-way analysis of variance (ANOVA) was performed on the data using SASS 8.2. Duncan;s new multiple range method was calculated to compare the means for the different.

Results and discussion

Table 1and Fig 1 show us the changes of TN, NPN, FAA, FAAN and P.I contents in breast during dry-cured duck processing. There was a significant reduction ($p<0.05$) in TN at the stage of salting. As to NPN, a reduction was also found at the same stage, but not significant ($p>0.05$) while the increase in drying period was significant ($p<0.05$).A progressive increase in free amino acids (FAAs) was observed from raw duck to the stage of drying for 15 days except for the salting stage with a significant decrease ($p<0.05$). The FAAN content significantly increased ($p<0.05$) after drying compared with that before drying, while there was a non-significant increasing trend during the whole drying periods. The proteolytic index (P.I) increased steadily and reached 8.16 at the end of processing.

Table 1. Changes of TN, NPN, FAA and FAAN contents in breast during Dry-cured duck processing

	raw	end of salting	drying for 5 days	drying for10 days	drying for 15 days
TN(g/100g)	15.328±0.255[a]	14.079±0.259[cd]	14.267±0.520[bc]	14.597±0.374[b]	13.726±0.147[d]
NPN(g/100g)	0.905±0.020[c]	0.877±0.066[c]	1.045±0.020[b]	1.092±0.042[ab]	1.120±0.063[a]
FAA(g/100g)	1.324±0.084[c]	1.121±0.057[d]	1.665±0.022[b]	1.797±0.195[ab]	1.896±0.035[a]
FAAN(g/100g)	0.174±0.015[a]	0.145±0.009[a]	0.236±0.002[b]	0.252±0.026[b]	0.260±0.018[b]
P.I%(NPN/ TN)	5.9	6.23	7.32	7.48	8.16

[A] in the same raw values followed by different letters were significantly different at a level of 5% and expressed as means ± standard error

[B] referred to dry matter

The significant reduction at the stage of salting of TN may due to the loss of water-soluble protein after salting. NPN, with reference to the nitrogen fraction including FAAs, small polar peptide and phosphopeptides below 1000Da, it increased in the drying processing. As to FAAs, the content was similar to the other duck products (Yuan Liu, et al.), but much lower than the dry-cured ham (Jurado, Á.et al, 2006). The increase in FAAs was mainly due to the activity of aminopeptidases while the decrease after salting may due to the nitrogen loss. Fate of FAAs relies on the balance between their formation and degradation to volatile and nonvolatile compounds. As to the volatile compounds, some FAAs may undergo Maillard condensations with reducing compounds such as hexanal, nonanal and heptanal formed during the drying processing, while other FAAs, throughout Strecker degradation, yield branched volatile compounds (esters, alcohol and ketones). Most such molecules, together with produces of lipid oxidation, are the basis of dry-cured duck aroma.

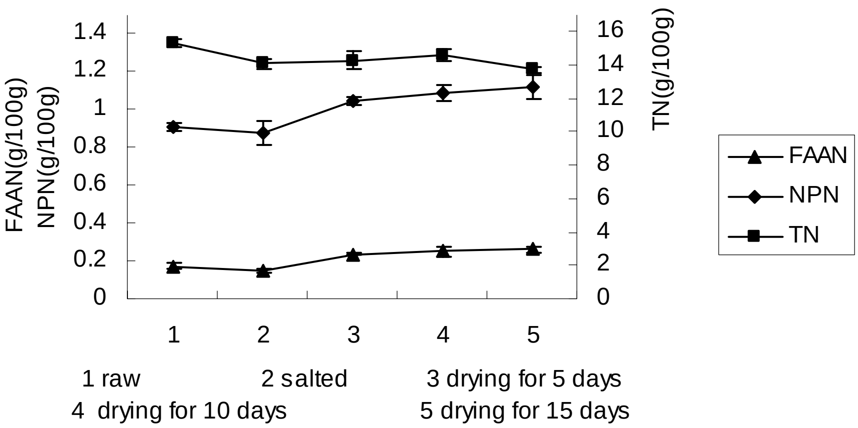

Figure 1. Changes of TN, NPN and FAA contents in breast during Dry-cured duck processing:

Conclusions

According to the obtained results, it is possible to conclude that dry-cured duck, throughout the elaboration process, goes through a very slightly pronounced proteolysis, both in extension and in intensity, because of the short period of processing, but the increase of NPN and FAAs may contribute the flavor qof final product.

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