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Effects of Pre-salting on the Components Changes in the Preparation of Salted Anchovy (*Engraulis japonica*)

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To investigate pre-salting conditions in the preparation of salted anchovy from large anchovy, anchovy were salted with various salt concentration and stored at 5℃ and 20℃ for 10 days. Moisture content decreased with the increase of salt and the salinity increased in proportion to salt concentration at 20℃. Total nitrogen decreased slightly as the increase of salt concentration during pre-salting at 20℃. The nitrogenous components such as amino nitrogen and extractable nitrogen were invariable or decreased until 7 days in salt concentration over 25% during pre-salting at 5℃. These results imply that soluble nitrogen with moisture run out of anchovy body in high salt concentration and the hydrolysis was inhibited by salt over 25% at 5℃. VBN content were constant in salt concentration over 25% until 7 days, regardless of curing temperature. The POV were under the influence of salt concentration and temperatures. We concluded that the optimal condition for preparation of salted anchovy were pre-salting with salt over 25% at 5℃ for 7 days.

Key words: Salted anchovy, Pre-salting, Nitrogenous components.

Introduction

Salted anchovy, generally favored in Europe, is one of the traditional fermented fish products in southern European countries. After aging in 20~30% NaCl solution for 6 months (Ishida et al., 1994), these products are steeped in oil in glass jar or can, and marketed. The salt-fermented fish sauce, such as anchovy sauce and shrimp sauce are typical fermented seafood from fish in Korea. However, salted anchovy have hardly processed in Korea. This may be due to the difference in seafood preference between Asia and Europe. When salted anchovy in Japan are preserved under warm condition, sometimes the fillets are solubilized (Ishida et al., 1994). The hydrolysis of raw anchovy meat was demonstrated that powerful action of proteolytic enzyme may be involved (Pyeun et al., 1995). However, a great quantity of salt was added to raw anchovy in the preparation of salted anchovy. Salted anchovy were prepared by fermentation after salting through the processing of pre-salting. Although curing conditions for low salt mackerel fillet were reported (Lee et al., 1985; Lee et al., 1998), the pre-salting conditions for preparation of salted anchovy have not been fully understood.

Our objective was to establish pre-salting conditions for processing of Korean style salted anchovy using large anchovy.

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Materials and Methods

Materials

Anchovy (*Engraulis japonica*, length 12.5 cm, weight 14.9 g) were purchased just after landing of a fishing boat at Kijang in Pusan and transported to laboratory in ice storage (0℃). Anchovy were beheaded, gutted and divided as 4 groups of samples (8, 15, 25 and 35%) following by washing with 3% of NaCl solution. Salted samples were preserved in tank for 10 days at 5℃ and 20℃, respectively.

Methods

Moisture and NaCl content were measured by AOAC (1995) procedure. Total nitrogen content and extractive nitrogen were determined by the micro-Kjeldahl method (AOAC, 1995) and VBN was measured by Conway's micro diffusion method (Miwa and Iida, 1973). Amino nitrogen content and POV were determined by Copper-salt method (Spies and Chamber, 1951), and AOAC (1995) procedure, respectively. Extractive nitrogen was measured by the method of Hoyle et al. (1994).

Results and Discussion

Changes of moisture and salinity

As shown in Fig. 1, moisture content of salted anchovy was decreased as increasing of salt concentration during pre-salting. The moisture content of raw anchovy was 76.3% and decreased during salted storage. The moisture decreased remarkably with the increase of salt and decreased rapidly within 3 days of storage. The moisture content were over 60% in 8% and 15% salt after 10 days in pre-salted anchovy, while about 55% in 25% and 35% salt. These results suggest that the minimum salt concentration for dehydration of anchovy was 25%. The salting condition for mackerel fillet demand 10% brine (Lee et al., 1998); however condition for salted anchovy over 25% of salt as much as salt-fermented anchovy sauce. Moisture content according to curing temperature decreased slightly higher in pre-salted anchovy at 20℃ than at 5℃. Fig. 2 shows results which devide salt content into moisture content during pre-salting. The salinity of raw anchovy was 1.29% and increased in proportion to increase of salt concentration during pre-salting. The salinity were higher in pre-salted anchovy at 20℃ than at 5℃, and no significant changes was observed after 7 days. Dehydration and permeation of salt occurred rapidly in early curing stage and the infiltration of salt was under the influence

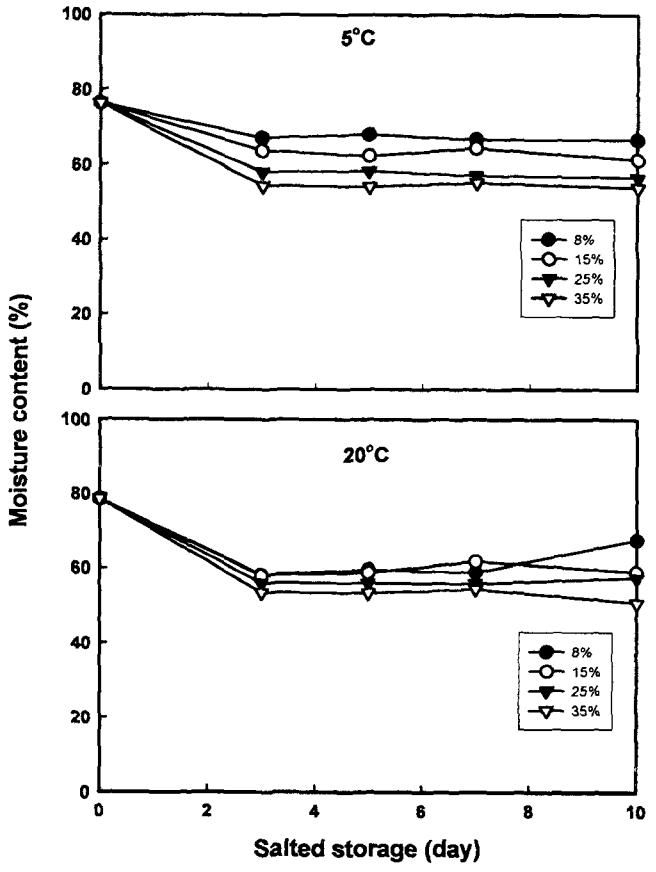

Fig. 1. Effect of NaCl and temperature on moisture content during pre-salting of anchovy.

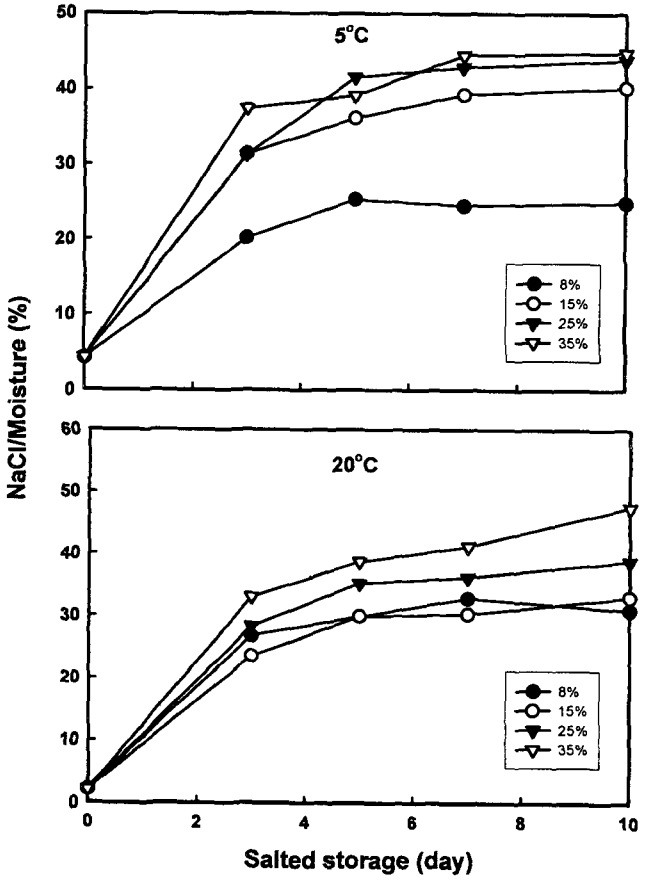

Fig. 2. Effect of NaCl and temperature on salinity during pre-salting of anchovy.

of salt concentration used and curing temperature, judging from the changes of moisture content and salinity during pre-salting.

Changes in nitrogenous components

The total nitrogen content was expressed on dry basis according to salt concentration during pre-salting (Fig. 3). The total nitrogen content of raw anchovy were 12.2~13.1%, and decreased during pre-salting. The total nitrogen decreased slightly with the increase of salt and showed relatively lower content at high temperatures. Total nitrogen content decreased remarkably in early curing stage at 20℃. These results indicate that soluble nitrogen drain out with moisture and the dehydration occurred severely in pre-salted anchovy at 20℃. Fig. 4 presents the changes of amino nitrogen content on dry basis during pre-salting. The amino nitrogen content of raw anchovy was 339 mg/100 g and showed rise and fall during pre-salting. Amino nitrogen content in early curing stage increased or decreased just a little with increase of

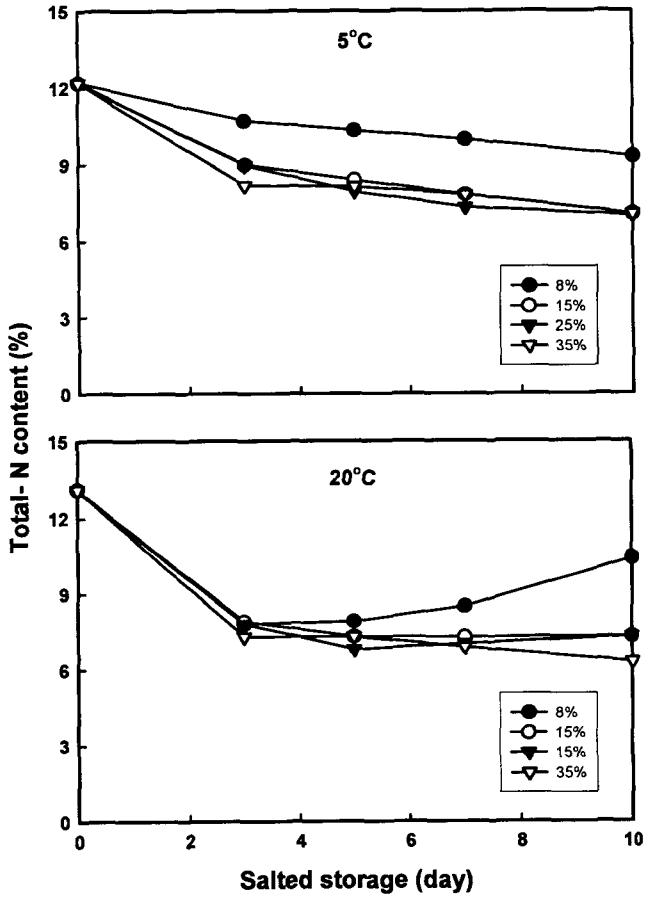

Fig. 3. Effect of NaCl and temperature on total nitrogen content during pre-salting of anchovy.

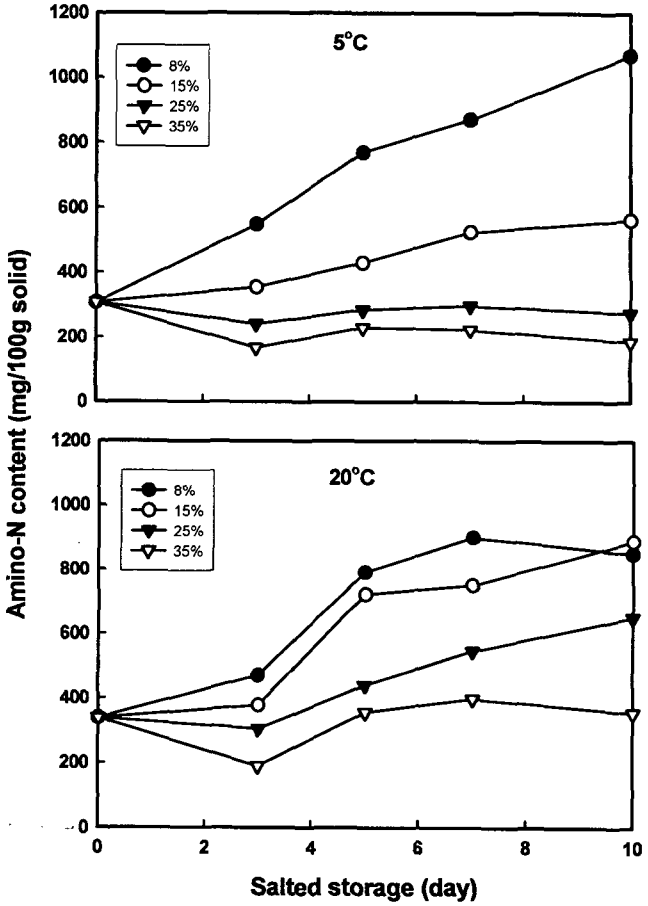

Fig. 4. Effect of NaCl and temperature on amino nitrogen content during pre-salting of anchovy.

salt concentration during pre-salting at 20℃. These results imply that soluble nitrogen with moisture run out from anchovy body as affected by high salt concentration. Amino nitrogen content increased in 8% and 15% salt concentration during pre-salting at 20℃, while decreased in 25% and 35% salt concentration at 5℃. These results suggest that the increase of amino nitrogen attributed to autolysis or microbial protease, and the action of protease was inhibited in salt concentration over 25% and at low temperature of 5℃. Uyenco et al. (1952) reported that bacteria play only a minor role because of high salt content in fish sauce and Lee et al. (1989) reported that the hydrolysis during fermentation of anchovy sauce was inhibited with the increase of salt concentration. The extractive nitrogen content on dry basis according to salt concentration during pre-salting were shown as Fig. 5. Extractive nitrogen content decreased with the increase of salt concentration during salted storage at 5℃, while increased after 5 days at 20℃. These results

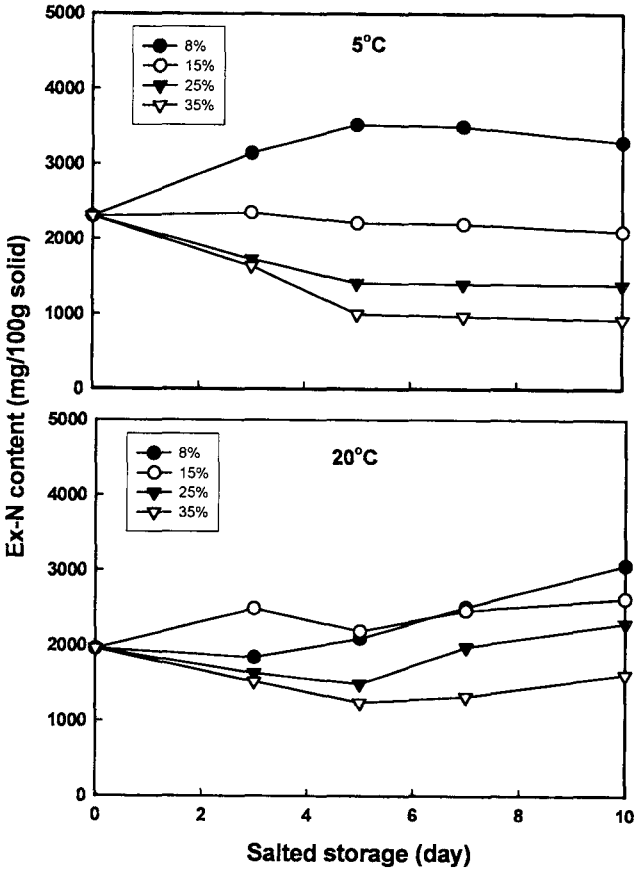

Fig. 5. Effect of NaCl and temperature on extractive nitrogen content during pre-salting of anchovy.

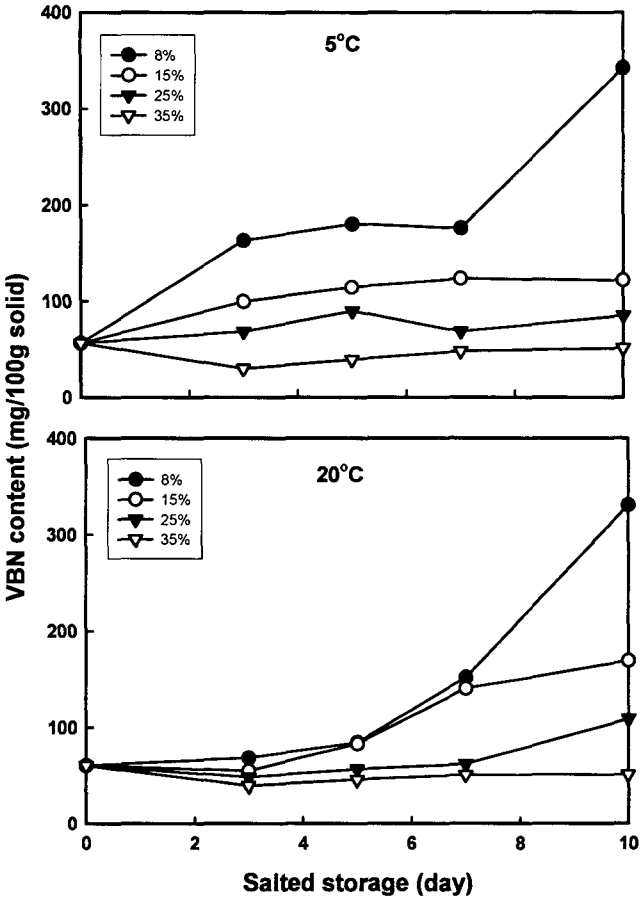

Fig. 6. Effect of NaCl and temperature on volatile basic nitrogen content during pre-salting of anchovy.

demonstrated that the drain of soluble nitrogen were occurred in high salt concentration similar to the changes in amino nitrogen content as shown Fig. 4. During salted storage at 5℃, extractive nitrogen content decreased generally in salt over 25%, remarkably in 35% salt.

These facts represent that the hydrolysis of muscle protein was repressed when anchovy was salted over 25% salt at 5℃. Fig. 6 shows the changes of VBN content on dry basis with salt concentration during pre-salting. The increase of VBN were accelerated in pre-salted sample at 20℃ compared to at 5℃ and increased considerably as salt concentration decreased. VBN content showed an immaterial increase in 25% salt and did not show any changes in 35% salt until 7 days after salting, regardless of curing temperatures. These results reveal that the increase of VBN does not matter if pre-salting of anchovy was conducted over than 25% salt concentration.

Lipid oxidation

Fig. 7 shows changes of peroxide value (POV) during pre-salting. The POV of raw anchovy was 19.3 meq/kg, and increased during pre-salting. The increase of POV during pre-salting were repressed with the increase of salt concentration and the changes of POV were slightly under the influence of curing temperature. POV were slightly higher in pre-salted anchovy at 20℃ than in pre-salted anchovy at 5℃. These may be due to increased free radical and free fatty acid with hydrolysis of lipid as dehydration and hydrolysis progressed (Fig. 1, Fig. 4).

Our objective was to processing individual packed jeotkal having high quality with large anchovy like anchovy fillet favored in southern Europe. Differently from salt-fermented fish sauces, dehydration and infiltration of salt were accomplished effectively during pre-salting and hydrolysis of protein should be repressed to inhibit softness of muscle. Fig. 1

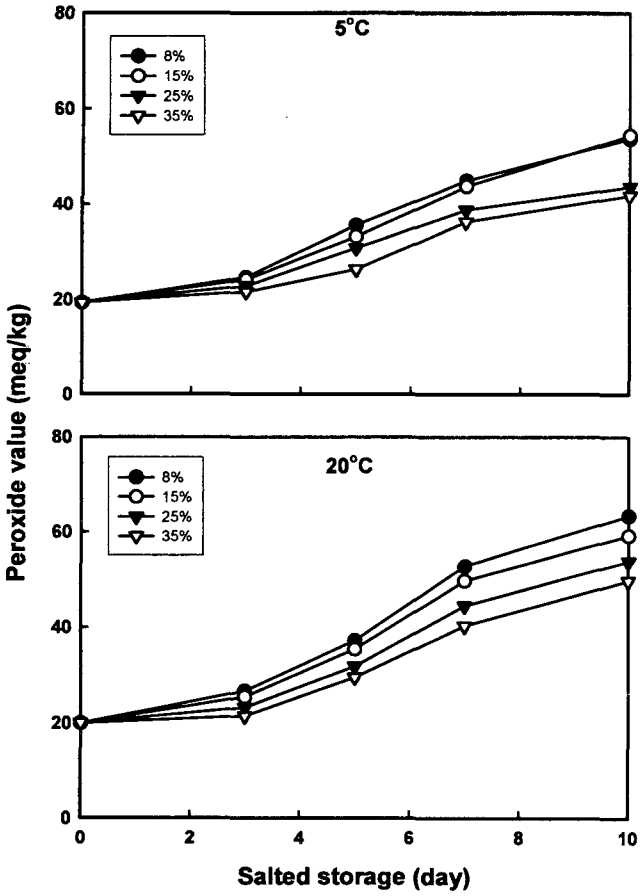

Fig. 7. Effect of NaCl and temperature on peroxide value during pre-salting of anchovy.

and Fig. 2 suggest that the addition of salt over 25% was effective in dehydration and filtration of salt. The hydrolysis of muscle protein was inhibited in 35% salt, resulting from the changes of amino nitrogen, extractive nitrogen and VBN. And the hydrolysis of muscle protein and POV were higher in pre-salting of anchovy at 20℃ than at 5℃, and nitrogenous components during pre-salting at 5℃ were not particular to change until 7 days. From the serious of results, we concluded that the optimal pre-salting condition for preparation of individual packed jeotkal with high quality was to conduct pre-salting large anchovy with 25% salt for 7 days at 5℃.

Acknowledgements

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