Relationship between the salty taste and salt content of surimi gel

K. Hatae

Department of Food & Nutrition, Ochanomizu University, 2-1-1, Otsuka, Bunkyo, Tokyo, Japan 112-8610

1. INTRODUCTION

A too high salt intake is said to cause hypertension and many other diseases. According to food guidelines, a salt intake of 10 g per day or less is recommended in Japan and of 4 - 6 g per day or less in the U.S.A.. The salt content of food does not necessarily reflect the strength of the salty taste when the food is eaten. This strength of taste is thought to be affected not only by the salt content, but also by the presence of other tastes, and by the composition and texture of the food. However the relationship has not been fully investigated previously. I therefore investigated the relationship between the strength of the salty taste and the textural properties of surimi gel. The texture of surimi can be modified by varying the setting procedure without changing the composition.

2. MATERIALS AND METHODS

2.1. Surimi gel samples

Frozen surimi of SA grade was purchased from Maruha Co. (Tokyo). This surimi contained at purchase 4.2% sucrose and 4.4 % sorbitol for protection from denaturation by freezing.
The surimi was added to a 10-fold volume of cold water and stirred before being centrifuged at 12,000 G for 30 min to eliminate the sucrose and sorbitol The treated surimi contained 0.37% sucrose, 0.44% sorbitol and 84.0% moisture. Four different amounts of NaCl (1.0, 1.5, 2.0 and 2.5% w/w) were added to the treated surimi, and 40 g each was loaded into polyvinylidene chloride tubes with a diameter of 20 nun Each of these four our kinds of surimi samples was divided into the following four groups:

A: without further treatment
B: unset and boiled at 85^{0}C for 30 min
C: set at 30^{0}C for 30 min and then boiled a at 85^{0}C for 30 min
D: set at 30 ^{0}C for 60 min and then boiled at 85 ^{0}C for 30 min.

Each of samples surimi A - D was cut into 10-mm lengths to provide sixteen kinds of surimi gel sample.

2.2. Sensory analysis

The sixteen kinds of the surimi gel sample were submitted to a sensory analysis by 15 female students of Ochanornizu University. The panel members had a detection threshold for a salt solution in the range of 0.5 mM to 8 mM so they were all normal or sensitive to a salty taste. The panel members were asked to masticate each gel sample 15 times and then to select one of ten salt solutions which was equivalent in saltiness to each gel sample. The ten salt solutions differed in salt content by freezing 1.1 times concentration interval. The mastication number and the concentration range of the ten salt solutions were selected according to the results of a preliminary sensory analysis. The sensory analyses were carried out in
separate booths. The saltiness efficiency ratio is defined as the ratio of the salt concentration of the surimi gel sample to that of the salt a solution selected by the panel. Values were calculated by the probit method with a computer using SPSS software.

2.3. Textural properties

The textural properties of the surimi gel samples were evaluated by the following eight parameters.
Breaking strength (kgf) and breaking stress (%): A sample was compressed by a Rheoner RE 3305 instrument (Yamaden Co.). The resulting chart trace provided the maximum height (kgf) and the time (a) to deformation as the breaking strength and breaking stress.

Firmness (kgf) and cohesiveness (T.U.): A sample was compressed twice by a Texturometer GTX-II instruments (ZenkenCo.). The resulting chart trace provided the height of the first bite and the aerial ratio of the first bite to the second bite as the firmness and cohesiveness.

Dynamic visco-elasticity (dyne/cm^2): The elastic modulus (E') and loss modulus (E") were measured by a Rheolograph-gel (Toyo Seiki Co.) under a 4-Hz vibration frequency.

Water-holding capacity (%): A #3 and #4 sheet of filter paper were respectively put under and over surimi gel sample of 1 g. A pressure of 10 kg/cm^2 was applied to the top of the sample for 20 min by a pressure transducer (Sankou lrika Co.). The released water was absorbed by the filter papers. The ratio of the weight before pressing to the weight loss of the sample after pressing is regarded as the water-holding capacity.

Moisture content (%): A sample of 1 g was dried at 105 ^{0}C until the weight was constant. The moisture content is regarded as the difference in weight before and after drying.

3. RESULTS AND DISCUSSION

The saltiness efficiency ratio of the 16 surimi gel samples ranged from 0.23 to 0.35. This means that the strength of the saltiness taste was only as 1/4 to 1/3 of the actual salt content. The moisture content of each surimi gel sample was about 80.0 % and was not significantly different among the 16 samples.

With surimi gel samples of the same salt content, the longer the setting time, the higher the breaking strength,,, breaking stress and firmness, and the lower the water-holding capacity. There was no specific trend for E' and E" among the samples.

The measurement parameters which had higher correlation to the saltiness efficiency ratio were the water-holding capacity (r: 0.91), breaking strength (r: -0.66), firmness (r: -0.62), loss modulus (r: 0.55) and cohesiveness (r: -0.54). The principal component analysis was applied for all 8 items of measurement. Using the first, second and the third principal component, they could explain 85% of total variance textural property of 16 kinds of surimi -gel samples were divided into four groups (Fig. 1). The saltiness efficiency ratio well characterized these four groups.

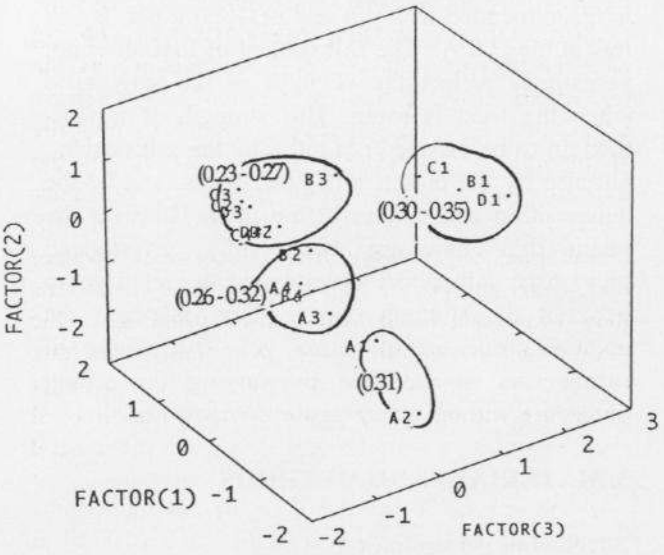

Fig. 1. Relation between the textural property of surimi-gel samples and the saltiness efficiency ratio. 1 - 4 are the NaCl content, 1: 1.0, 2:1.5, 3: 2.0, 4: 2.5%. Numbers in the parenthesis are the saltiness efficiency ratio.