

EFFECTS OF BITTERN COMPONENTS INCLUDED IN EDIBLE SALT ON TASTE

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1. Introduction

In Japan, A lot of edible salts that contain the bittern components are circulated into the market. About the influence of such a salt on the taste, there are Matsumoto et al's research etc, but preparative methods of samples and assessment words varied depending on researches, so systematic results haven't been obtained until present.

Therefore, in this study, we prepared sample solutions from several kinds of salts with different concentrations of bittern and examined strength of saltiness and bitterness by sensory evaluation. Also, we examined saltiness, bitterness and umami taste in case of adding sodium glutamate as umami compound.

2. Experiments

2.1 Edible salts

Edible salts for this study are three kinds of salts available in the market. See Table 1 as the composition of edible salts. Salt A is a concentrated product of brine by a crystallization plant which is obtained by dissolving solar salt and its purity of sodium chloride (NaCl) is extremely high. Salt B includes concentrated bittern from brine by a crystallization plant which is obtained by concentrating seawater by ion exchange membrane method. Salt C is made by spraying concentrated seawater on heating iron sheet and crystallizing it and includes more bittern than other salts in the market comparatively.

Table 1. Composition of each edible salt (%)

	H ₂ O	NaCl	Ca	Mg	SO ₄	K
salt A	0.01	99.99	0	0	0	0
salt B	3.87	94.47	0.13	0.17	0.02	0.35
salt C	7.68	67.02	1.49	3.43	8.31	0.94

2.2 Experimental method

Sensory evaluations with ranking or two-point discrimination methods were carried out in each experiment³⁾. The indexes of Sensory evaluations are saltiness,

We prepared 0.8g/100ml as the sample solution by dissolving each salt in water, with

bitterness and umami taste and 7 to 15 members were selected as the panel.

2.2.1 Evaluation concerning saltiness and bitterness

reference to "Sumasi-jiru (light soup)" commonly drunk in the Japanese home. Further, we prepared 0.8g/100ml NaCl

concentration solution with each salt. The strength of saltiness by sensory evaluations

2.2.2 Evaluation concerning bitterness and umami taste

Monosodium glutamate (MSG) to become 0.08g/100ml was added to two kinds of sample solutions made by the above-mentioned.

Further, as shown in Table 2, to become equal to the NaCl concentration contained in salt C, we prepared sample solution as 0.54g/100ml by dissolving Salt A and another sample solution as 100ml in total by dissolving Salt C

with using each sample solution was examined.

(0.4g) and Salt A (0.27g) in water as half amount of bittern including in Salt C. Also, we prepared sample solutions of Salt A (0.54g/100ml) by adding MSG (0g to 0.08g/100ml).

Table 2 Composition of sample solution

	Salt	Sodium chloride	Glutamicacid Sodium
MSG0.08	saltA	0.54	0.08
MSG0.04	saltA	0.54	0.04
MSG0.02	saltA	0.54	0.02
MSG0	saltA	0.54	0
saltC1/2	saltA:saltC=1:1	0.54	0

3. Results and discussion

3.1 Evaluation concerning saltiness and bitterness

Results of saltiness and bitterness to be tested as 0.8g/100ml from each sample determined

by ranking method are shown in Figure 1. The vertical axis of Figure indicates total of rank orders answered by each panel. Therefore, the smaller the numerical value is, the more the taste shows that it is stronger.

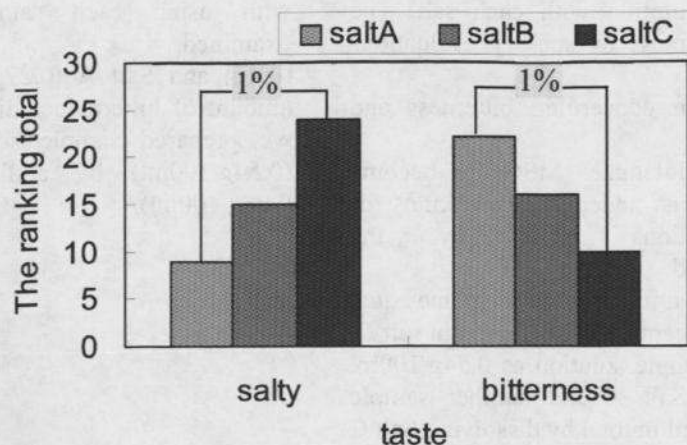


Figure 1 Strength of Saltiness/Bitterness on ranking test (Sample solution as wet weight 0.8g/100ml)

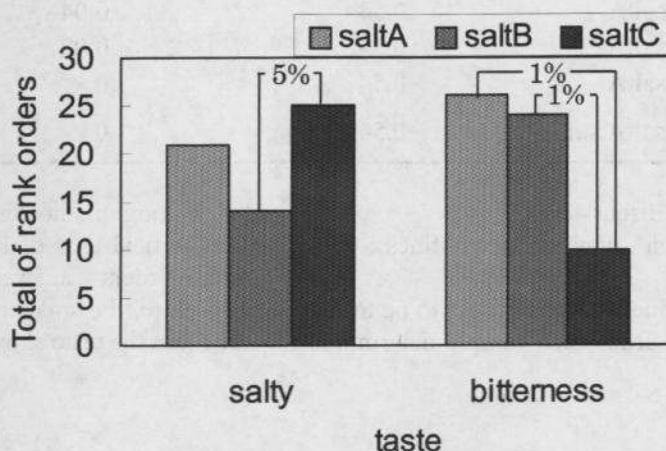


Figure 2 Strength of Saltiness/Bitterness on ranking test (constant NaCl concentration)

Saltiness was sensed stronger by Salt A with the highest NaCl purity and there is a tendency that the larger the amount of bittern is, the lesser the saltiness is sensed. Also it shows significant differences in Salt A and Salt C. Bitterness was sensed the stronger by Salt C with the highest amount of bittern and there is a tendency that the higher the NaCl purity is, the lesser the bitterness is sensed. Also, it shows significant differences in Salt A and Salt C.

Then, the results of saltiness and bitterness to be tested with constant NaCl concentration as 0.8g/100ml determined by ranking method are shown in Figure 2. Saltiness was sensed

the strongest by Salt B and it shows significant differences in Salt B and Salt C, but there is no correlation with NaCl purity. There is little difference between Salt A and Salt C and it is considered that saltiness was almost equally sensed by each sample solution. As for bitterness, there is a tendency that the larger the amount of bittern is, the stronger the bitterness is sensed as same as Figure 1. Also, it shows significant differences among samples.

Their results indicate that saltiness is mainly sensed by NaCl and bitterness is sensed by the amount of bittern.

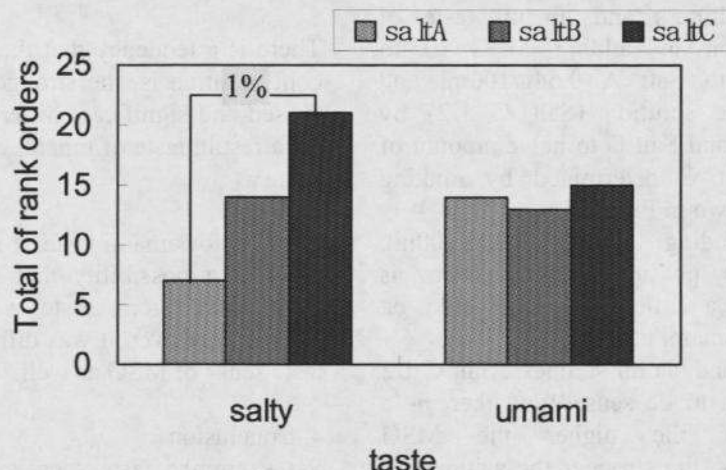


Figure 3 Strength of Saltiness/Umami taste on ranking test (wet weight 0.8g/100ml)

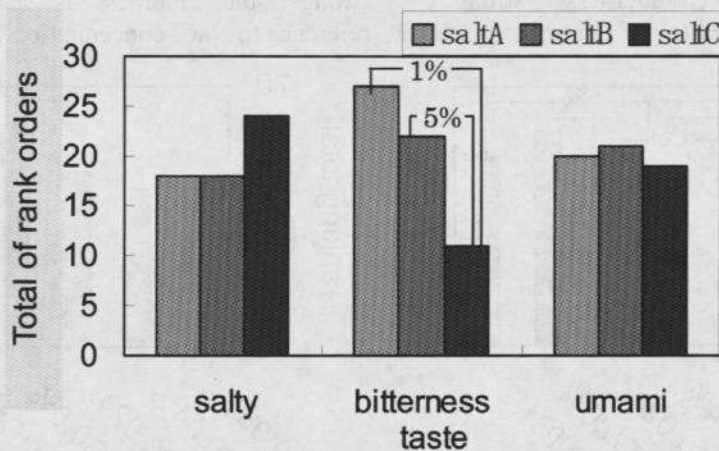


Figure4 Strength of Saltiness/Bitterness/Umami taste on ranking test (constant NaCl concentration)

3.3 Evaluation concerning bitterness and umami taste

Results of strength of saltiness and umami taste determined by ranking method, using 0.08g/100ml of MSG₃ solution to be tested including 0.8g/100ml of each sample are shown in Figure 3. Rank orders of saltiness is same as that of NaCl concentration of dissolved edible salt and it shows significant differences between Salt A and Salt C. On the other hand, there is no difference in rank

orders of umami taste.

Also, results of saltiness, bitterness and umami taste of seawater with NaCl concentration as 0.8g/100ml determined by ranking method are shown in Figure 4. As for bitterness, the higher the amount of bitter is, the stronger the bitterness is sensed and significant differences are shown. On the other hand, there is no difference in rank orders of saltiness and umami tastes.

But, the panel answered that, "It's difficult to discriminate between bitterness and umami taste.", "Bitterness of Salt C is strong, and other tastes are difficult to discriminate." during sensory evaluations. Therefore, it is Results of saltiness and umami taste of sample solution by adding MSG (0 to 0.08g/100ml) to Salt A 0.54g/100ml and another sample solution (Salt C 1/2) by mixing Salt A and Salt C to halve amount of bitter of Salt C determined by ranking method are shown in Figure 5.

solution including MSG 0.02g/100ml. Therefore, the possibility of answers is indicated that a little bitterness could be recognized as umami taste.

On the other hand, as for saltiness, Salt C 1/2 is the strongest to be sensed and there is a tendency that the higher the MSG concentration is, the stronger the saltiness is sensed. And saltiness of Salt C 1/2 is stronger to be sensed than salts including MSG. As a result, saltiness of solution from salts including bitter is stronger to be sensed than solution from high purity salt with the same concentration of NaCl. During previous experiments, the panel answered that, "As for the solution of Salt C, bitterness is strong.", "As for mixing taste of bitterness and

necessary to inspect whether the panel discriminate saltiness, umami taste and bitterness appropriately.

3.4 The possibility of answers by recognizing bitterness as umami taste

There is a tendency that the higher the MSG concentration is, the stronger umami taste is sensed and significant differences are shown. As a result, taste of umami of Salt C 1/2 is as same as

Also, as for umami taste, it is considered that there is a possibility that sample solutions which had strong taste were answered as umami taste even it was different from actual taste sense of MSG as well.

4. Conclusion

We examined taste sense of salts including bitten by sensory evaluation. In consequence, as for saltiness, the higher the NaCl concentration of sample solution is, the stronger the saltiness is sensed and there is no noticeable difference among samples with the same concentration. As for bitterness, the higher the concentration of bitter is, the stronger the bitterness is sensed without reference to NaCl concentration.

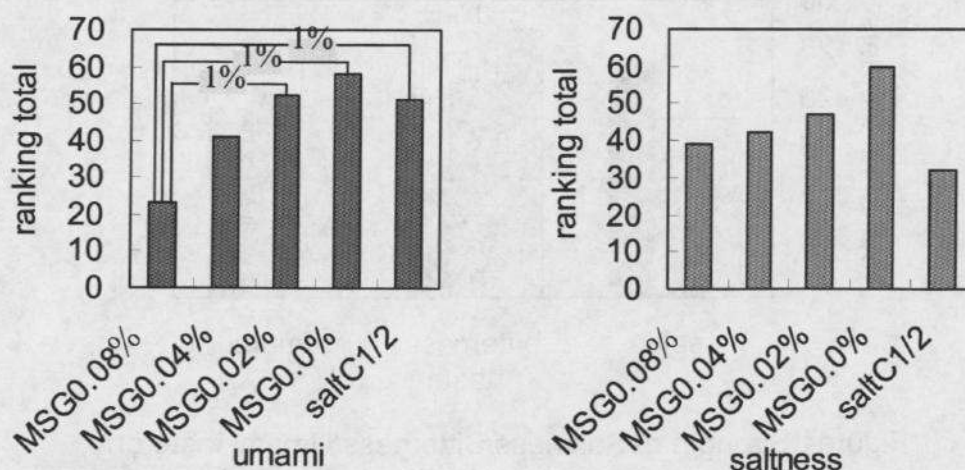


Figure 5 Strength of Saltiness/Umami taste(constant NaCl concentration, MSG concentration 0 to 0.08g/100ml, inspecting possibility of answers by recognizing bitterness as umami taste)

saltiness, it's difficult to discriminate between saltiness and bitterness." Therefore, it is considered that there is a possibility in the results of this research that sample solutions which had strong taste were answered as "Saltiness is strong", "Bitterness is strong.", because it was difficult for the panel to discriminate between saltiness and bitterness.

In case of sample solutions adding MSG as umami components, the umami taste was sensed stronger in proportion to MSG concentration, and the saltiness tended to be increased with it. In addition, it is difficult to discriminate between umami taste and bitterness and there is a tendency that bitterness is recognized as umami taste.

On the basis of these results, to compare taste sense of samples which have different qualities of taste, we considered that the student's training of the panel and the inspection methods for sensory evaluation.

5. References

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