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The Color Measurement and Sensory Evaluation for the Accelerated Fish Sauce Products

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Abstract

The color distribution of fish sauces was studied by using the change in log absorbance per 100 nm as a parameter of color tone. A linear relationship was found between the logarithm of absorbance (log A) and wavelength at 450 nm to 650 nm in the color of fish sauces. Change in log A per 100 nm (ΔA) in the color of the fish sauce products was in the range of 0.55 to 0.59. Absorbance at 450 nm (A 450) of the fish sauce treated with soy sauce koji was high in comparison with A 450 of the fish sauce treated by pronase and control. The color of fish sauces treated with soy sauce koji was dark reddish orange, and was similar to the color of soy sauce. A 450 of every fish sauce increased with the progress of fermentation, but ΔA of the fish sauces slightly increased at the beginning of fermentation and then decreased at the end of fermentation.

In the results of sensory evaluation for the flavor of fish sauce products, the fish sauce product treated with soy sauce koji that 20% salt was added at the first stage was the most desirable in the strength of flavor, tastefulness and after taste, and the fish sauce was also the best in acceptability.

Key words: fish sauce, color distribution, sensory evaluation.

Introduction

In the previous paper,[1] the authors investigated the changes in chemical components treated with soy sauce koji and pronase during fermentation to see the effects of the soy sauce koji and commercial proteolytic enzyme on the acceleration of fish sauce production.

The color of soy sauce has been studied by the parameter of color tone and color components were fractionated with DEAE-cellulose.[2-4] A linear relationship was found between the logarithm of absorbance (log A) and wavelength (450-650 nm) in the color of distribution of soy sauce and melanoidine prepared from model system.

After desalting of soy sauce by Sephadex G-15, color materials of soy sauce were fractionated into 8 peaks by DEAE-cellulose with stepwise elution. Color tone of each peak was darkened with the progress of elution. However, it has not been studied on the color of fish sauce.

In the present paper, the color of fish sauces was measured and sensory evaluation for the fish sauces was performed. The changes in color distribution of fish sauces were also studied by the parameter of color tone during fermentation.

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Materials and Methods

Materials

Materials used in this experiment were the same as the previous paper[1]. Fish sauces were prepared from small horse mackerel. The soy sauce koji and commercial proteolytic enzyme were used for the acceleration of fish sauce production.

Color measurement

The color distribution of the fish sauces was studied by the parameter of color tone[2]. The fish

Table 1. Score card for sensory evaluation of fish sauce products.

Name _____ Date_____ Code_____

Please taste the samples of fish sauce and answer each question in sequence, marking a symbol at the point on the scale that is corresponding to descriptive terms for each variables in the sample.

After you have answered all the question, return this sheet and the sample, and wait for the next sample.

If you have any questions, ask the experimenter.

Thank you.

1. Appearance						
(1) Deepness in color						
very light	light	slightly light	moderate	slightly deep	deep	very deep
(2) Transparency						
very turbid	turbid	slightly turbid	moderate	slightly transparent	transparent	very transparent
2. Flavor						
(1) Strength of aroma						
very weak	weak	slightly weak	moderate	slightly strong	strong	very strong
(2) Stimulate odor						
very weak	weak	slightly weak	moderate	slightly strong	strong	very strong
(3) Unpleasant odor						
very weak	weak	slightly weak	moderate	slightly strong	strong	very strong
(4) Strength of taste						
very weak	weak	slightly weak	moderate	slightly strong	strong	very strong
(5) Saltiness						
very weak	weak	slightly weak	moderate	slightly strong	strong	very strong
(6) Tastefulness						
very weak	weak	slightly weak	moderate	slightly strong	strong	very strong
(7) Bitterness						
very weak	weak	slightly weak	moderate	slightly strong	strong	very strong
3. After taste						
very bad	bad	slightly bad	moderate	slightly good	good	very good
4. Acceptability						
very poor	poor	slightly poor	moderate	slightly good	good	very good

Comments: _____

sauces were diluted with 10% brine and the logarithm of absorbance (log A) of the diluted fish sauces was measured at the wavelength from 450 nm to 650 nm by Double-Beam spectrophotometer, Shimadzu Model, UV-210 A and Recorder, Shimadzu Model U-125 MU. On the other hand, the CIE color Y × y value was measured by S and M color computer, Model SM-3, Suga Test Instrument Co., Japan.

Sensory evaluation

Sensory evaluation for the fish sauces was performed in sensory evaluation laboratory, National Food Research Institute, Japan.

The panel was asked to evaluate the fish sauces for the attributes of deepness in color, transparency, strength of aroma, stimulus odor, unpleasant odor, strength of taste, saltiness, tastefulness, bitterness, after taste and acceptability, and to mark the appropriate symbol on the seven point objective scale structured with descriptive terms as shown in Table 1. The symbols were later converted from the sheets into numerical scores and the data were analyzed by the method of quantitative descriptive analysis[5].

Results and Discussion

Color measurement for the fish sauces

Color distribution of final fish sauce products is shown in Fig. 1. A linear relationship was found between the logarithm of absorbance (log A) and wavelength at 450 nm to 650 nm in the color of fish sauces as well as soy sauce[2]. Change in log A per 100 nm, designated as ΔA, can be used as a parameter for color tone. When ΔA is large, color distribution exhibits bright tone, and when ΔA is small, it exhibits dark tone.

As the results of color measurement shown in Table 2, ΔA of the color of fish sauce products was in the range of 0.55 to 0.59. Absorbance at 450 nm (A 450) of the fish sauces treated with soy sauce koji was high in comparison with A 450 of the fish sauces treated by pronase and control.

The Y value of No. K-5 treated with soy sauce koji was 1.13. Its value was the lowest in all samples. This suggested that No. K-5 showed the most dark color in all samples. Based on the results that the CIE color Y x y value of No. K-5 treated with soy sauce koji were 1.13, 0.6152, 0.3694, it was found that the color of fish sauces treated with soy sauce koji was dark reddish orange. The color of fish sauces treated with soy sauce koji was similar to the color of soy sauce[6]. But the color of fish sauces treated by pronase and control was bright orange, and its color was out of the range of the

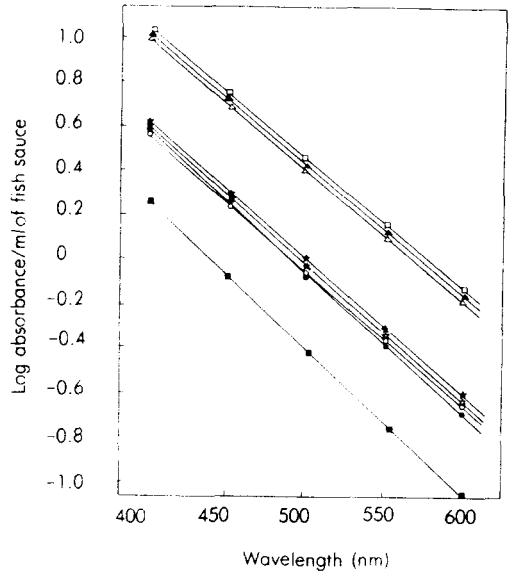

Fig. 1. Changes in color distribution of final fish sauce products.
○—○ : Sample No. C-1, ●—● : Sample No. C-2, △—△ : Sample No. K-1, ▲—▲ : Sample No. K-2, □—□ : Sample No. K-5, ■—■ : Sample No. P-1, ☆—☆: P-3, ★—★: Sample No. P-5

Table 2. Color measurement of the final fish sauce products

Items	Sample No.							
	C-1	C-2	K-1	K-2	K-5	P-1	P-3	P-5
A 450	1.73	1.77	4.73	5.39	5.74	0.84	1.81	1.94
ΔA	0.55	0.59	0.56	0.59	0.58	0.59	0.55	0.56
Y	11.34	9.24	2.15	1.25	1.13	23.53	9.41	9.45
x	0.5364	0.5529	0.6054	0.6094	0.6152	0.4881	0.5426	0.5427
y	0.4388	0.4305	0.3874	0.3745	0.3694	0.4461	0.4362	0.4371

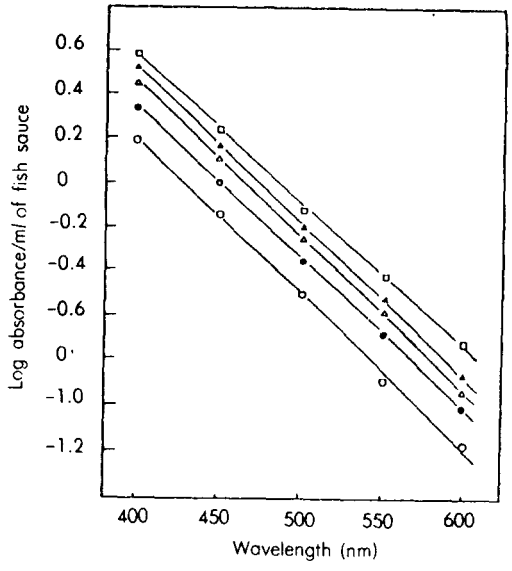

Fig. 2. Changes in color distribution of control, No. C-2, during fermentation.
○—○ : 7 days, ●—● : 15 days, △—△ : 25 days, ▲—▲ : 35 days, □—□ : 45 days

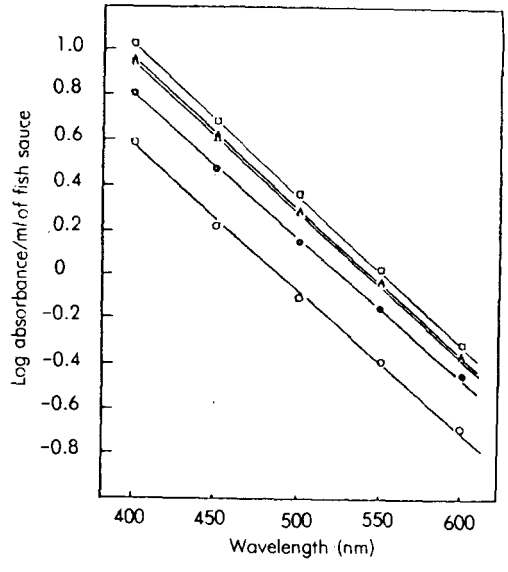

Fig. 3. Changes in color distribution of No. K-5 treated with soy sauce koji during fermentation.
○—○ : 7 days, ●—● : 15 days, △—△ : 25 days, ▲—▲ : 35 days, □—□ : 45 days

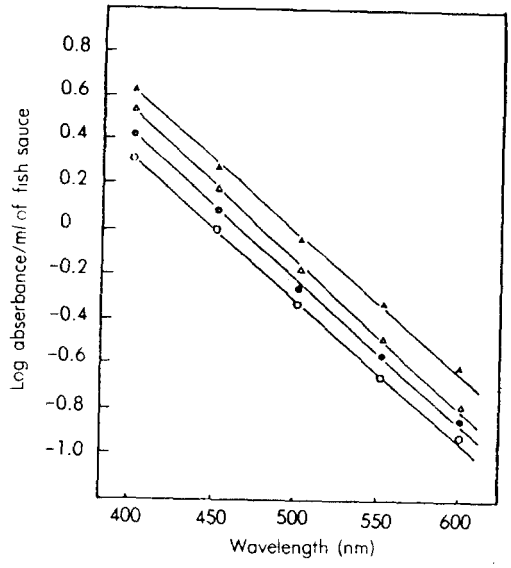

Fig. 4. Changes in color distribution of No. P-5 treated by pronase during fermentation.
○—○ : 7 days, ●—● : 15 days, △—△ : 25 days, ▲—▲ : 35 days

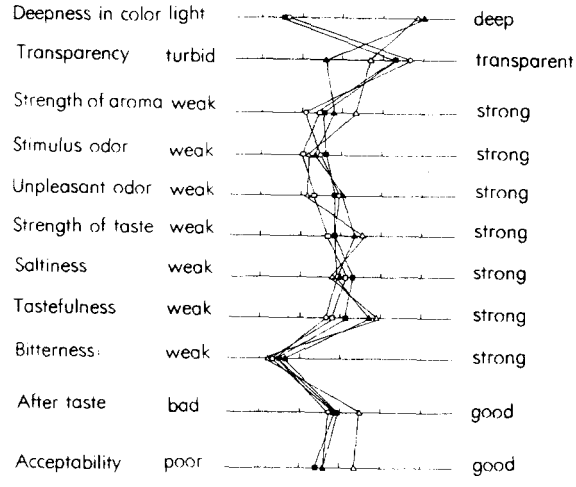

Fig. 5. The results on sensory evaluation for the final fish sauce products.
○—○ : Control, No. C-2
△—△ : No. K-2 treated with soy sauce koji
▲—▲ : No. K-5 treated with soy sauce koji
□—□ : No. P-3 treated by pronase
■—■ : No. P-5 treated by pronase

Table 3. Changes in color distribution in control, No. C-2, during fermentation

Items	Fermentation time (days)				
	7	15	25	35	45
A 450	0.73	1.02	1.29	1.43	1.69
Δ A	0.69	0.73	0.75	0.67	0.63

Table 4. Changes in color distribution in No. K-5 treated with soy sauce koji during fermentation

Items	Fermentation time (days)				
	7	15	25	35	45
A 450	1.69	2.96	4.01	4.10	4.79
Δ A	0.61	0.63	0.67	0.67	0.67

Table 5. Changes in color distribution in No. P-5 treated by pronase during fermentation

Items	Fermentation time (days)			
	7	15	25	35
A 450	0.98	1.25	1.53	1.89
Δ A	0.64	0.64	0.64	0.57

standard color guide for soy sauce.

The change in color distribution of the control No. C-2, No. K-5 treated with soy sauce koji and No. P-5 treated by pronase during fermentation are shown in Figs. 2, 3 and 4, respectively. As the results of color distribution shown in Tables 3, 4 and 5, A 450 of every fish sauces increased with the progress of fermentation. But ΔA of the fish sauces slightly increased at the beginning of fermentation, and the it was decreased at the end of fermentation. ΔA also decreased during the aging period. This suggested that the color tone of fish sauce was brightened during fermentation, while it was darkened by oxidation during the aging period.

Sensory evaluation for the fish sauces

The results of sensory evaluation for five kinds of fish sauce products are shown in Fig. 5.

In the appearance of fish sauce products, the color of No. K-2 and K-5 treated with soy sauce koji was deep, while the color of the control No. C-2 and No. P-3 and P-5 treated by pronase was slightly light, and most of the fish sauces were transparent except that No. K-5 treated with soy sauce koji was slightly turbid.

In the sensory evaluation for the flavor of fish sauce products, 25 times diluted fish sauces were used. No. K-2 treated with soy sauce koji was the most desirable in the strength of flavor, tastefulness and after taste, and No. K-2 was also the best in acceptability. This suggested that these sensory attributes contributed to the acceptability of fish sauce products. Compared the fish sauces treated by pronase with control, the fish sauces treated with soy sauce koji were strong in the strength of aroma and taste. It seemed to be the reason why the fish sauce products treated with soy sauce koji were rich in free amino acid composition. On the other hand, soy sauce was so popular in Japan that the fish sauce products treated by pronase seemed to have relatively unpalatable taste to Japanese people.

Acknowledgement

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速釀 魚醬油에 대한 色 測定 및 官能檢査

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速釀 魚醬油의 色의 分布가 100 nm 당 log 흡광도의 변화(ΔA)를 色調의 파라메터로 이용하여 연구되었다.

魚醬油의 色에 있어서 log 흡광도와 450 nm 와 650 nm 사이의 파장간에는 직선관계가 성립하였다. 速釀 魚醬油의 ΔA 값은 0.55~0.59 범위에 있었으며, 450 nm 에서의 흡광도(A450)는 醬油코오지가 첨가된 魚醬油가 對照 및 시판 단백분해효소 첨가 魚醬油에 비하여 높았다.

醬油코오지가 첨가된 魚醬油의 色은 어두운 赤黃色이었으며, 그 色은 醬油의 色과 비슷하였다. 모든 魚醬油에 있어서 A450은 발효가 진행함에 따라 증가되었으나 ΔA는 발효 초기에 약간 증가되다가 발효 후기에는 감소되었다.

速釀 魚醬油에 대한 관능검사 결과 醬油코오지를 첨가하고 초기에 20% 식염을 가하여 제조한 魚醬油가 풍미강도, 맛, 후미 등에 있어서 가장 바람직하였으며 또한 종합적인 選好度에 있어서도 가장 우수하였다.