AKAMIZU:THE TRADITIONAL RAPESEED OIL PROCESSING IN JAPAN

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INTRODUCTION

AKAMIZU is the traditional rapeseed oil for Tofu frying developed in Japan. AKA means red, MIZU means water or liquid. The rapeseed was introduced into Japan from China about 2000 years ago. At 8 century, the rapeseed oil was mainly used for lighting in the same way as perilla seed oil, hazelnut oil and camellia seed oil in Japan. The incipient device for press equipment of rapeseed was mentioned in "SEIYU MEIKAN" (Book title: The manufacture of refined oil, 1716). It was reported that the improved press for rapeseed increased the production of this oil at the middle of 17 century. Even in this era, many kinds of vegetable oil were used mostly for lighting, but few for cooking in Japan.

By the way, Tofu made from soybean was popularized as Japanese daily dishes in 18 century. The first Tofu cooking book published in 1782 reported that the Tofu could be cooked many ways such as boil, toast and fry. As the rapeseed oil was suitable for Tofu frying, the quality of this oil was improved to cook the better flavored fried Tofu. After several devices to processing of this oil, the specified frying oil for Tofu was produced, which was called AKAMIZU.

The quality of AKAMIZU was required 1)red brown color with clearness 2)good flavor and taste 3)little foaming during fry 4)heat-stable and etc. Before the middle of 19 century, the all processing of the vegetable oil was performed by man-power with small, simple equipments and without chemicals. According to "SEIYU ROKU" (Book title: The manufacture of vegetable oil, 1836), Japanese rapeseeds were roasted and ground at first, followed by steamed, pressed and water degummed, and finally filtered.

At that time, the rapeseed cultivated in Japan contained high glucosinolates and erucic acids. After 19 century the production of the AKAMIZU was increased with the popularization of fried Tofu which had high nutrient and good taste in low price. Even in these days, many Japanese like fried Tofu (fried in Canola AKAMIZU) as a healthy food.

We experimented on the original (19c's) methods of AKAMIZU processing and tried to find out the key substances which influenced to the quality of the AKAMIZU.

MATERIALS AND METHODS

The small scale roasting machine (temperature controllable, 50kg per batch) and expeller (60kg/hr) were used for pretreatment of seeds and press. But for degumming the glass

equipments and filter paper were used. 20kg of high erucic acid rapeseeds (HEAR, harvested at USA in 1990) were used to every experimental batches, as a control Canola (harvested at Canada in 1989) were tested. Analytical data of these seeds were shown in table 1. The roasting conditions were changed on temperature 130°C, 140°C and changed on time in minutes 10, 30 and 60. After the addition of 5% of water (v/w), the roasted seeds were pressed and the crude oil was obtained. It was degummed by adding 2% hot water, stirring 30min. at 40°C and stayed one night then filtered by double papers.

To evaluate of the products (AKAMIZU), the organoreputic test (smell, taste, color) and the analysis of residual phosphorous were performed.

Table 1. Analytical data of seeds

Seeds	Moisture%	Oil%	A.V.	Erucic A./TFA %
HEAR	5.12	46.36	0.85	53.2
Canola	7.90	40.09	1.70	0.7

RESULTS

By the preliminary experiments, it was detected the burned smells in AKAMIZU when seeds roasted at higher temperature than 150°C but raw smells at less than 130°C. The results of organoreputic tests about products classified roasting conditions and seeds were indicated in table 2. These results show that the best roasting conditions for both seeds were between 130°C,60min., 140°C,10min., 140°C,30min.

The Table 3 shows the residual phosphorous and color in AKAMIZU. The color of Canola's AKAMIZU was greenish brown (Lovibond blue color) compared with orange colored HEAR's AKAMIZU. In all cases, HEAR's AKAMIZU had lower phosphorous than Canola's. According to these results, the quality of AKAMIZU made from HEAR were better than them made from Canola in all conditions.

Table 2. Organoreputic tests on AKAMIZU

Roasting conditions	HEAR	Canola
130°C, 30min.	little raw & bitter	raw flavor
130°C, 60min.	good spicy flavor with little burned & bitter	spicy flavor with little raw
140°C, 10min.	good spicy flavor with little bitter	spicy flavor with bitter
140°C, 30min.	good spicy flavor	spicy flavor with little bitter

Table 3. Residual P and color of AKAMIZU

Roasting conditions	Residual P(ppm)		Color (Lovibond 1in.)					
	HEAR	Canola	HEAR			Canola		
			Y	R	B	Y	R	B
130°C, 60min.	13.8	48.8	50	3.1	0	70	4.8	1.1
140°C, 10min.	9.2	46.7	50	3.0	0	70	4.7	1.2
140°C, 30min.	8.0	51.7	50	3.0	0	70	5.1	1.1

DISCUSSION

To produce the spicy flavored and orange colored AKAMIZU, it was necessary that HEAR were roasted at 130°C for 60min. or at 140°C for 10 to 30min. The flavor and color substances which were necessary and desirable to the quality of AKAMIZU, were produced during the roasting process of rapeseeds. The flavor substances seemed to have carbonyl and sulfur compounds which originated in glucosinolate, protein and carbohydrate of rapeseeds. Carotenoids and Maillard's reactions substances were desirable to AKAMIZU but chlorophylloid were undesirable. AKAMIZU which contained less than 10ppm residual phosphorous were little foaming at high temperature. AKAMIZU which contained good flavor and color was developed in Japan at 18 century by simple equipments and old Japanese technology such as fine roasting conditions.

Further experiments were needed to elucidate the reason why the properly roasted HEAR's crude oil contained little chlorophilloid, nonhydratable phospholipids, and to find out the key substances of flavor and color.

REFERENCES

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