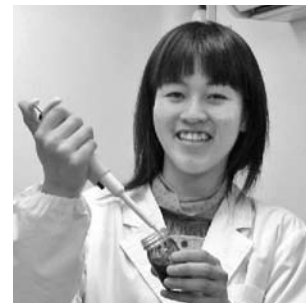


Health Benefits and Cultural Role of Sodabushi in Tosashimizu, Kochi

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Introduction

Tosashimizu City is located in the southwest part of Kochi Prefecture and is wellknown for Ashizuri cape and also as the hometown of John Manjiro, a famous leader from the Edo Period. Tosashimizu City belongs to the Ashizuri-Uwakai National Park where agriculture and fishery are thriving (Refer to p. 113). The population of the city is approximately 17,000. This small city produces a special food called “sodabushi”. Tosashimizu can be considered as having the highest sodabushi production in Japan. The yearly turnover in Tosashimizu for this product is about two billion yen. Sodabushi is a kind of katsuobushi (dried bonito). On average, a Japanese person consumes around 320 g of katsuobushi per year. Katsuobushi is an essential part of the Japanese diet. Sodabushi is characterized by a pungent aroma and a strong taste unlike katsuobushi. Sodabushi is added as seasoning when making broth and various noodle soups. The manufacturers of sodabushi in Tosashimizu consistently assure the high quality of their product. This paper explores the socioeconomic role and health benefits of sodabushi to the people of Tosashimizu.

1. Raw Material for Sodabushi

Katsuobushi is made from katsuo (*Katsuwonus pelamis* Linnaeus, 1758) while sodabushi is made from marusoda (*Auxis rochei*). The standard catch length for katsuo is about 20-60 cm but for marusoda it is around 10-30 cm. The major sources of katsuobushi are Makurazaki City and Yamagawa Town in Kagoshima Prefecture, and Yaizu City in Shizuoka Prefecture. But most of the katsuo coming from these fishing ports results from commercial fishing particularly from

Micronesian waters. The method being used is known as purse seiner net fishing and is accomplished through the following process; First, the fish is enclosed within a large net. Next, the net is wrung just like a bag and then straightened and the fish is then extracted. This can be considered to be the most commonly used fishing method by Japanese fishermen especially in Micronesia and in other foreign seas. On the other hand, marusoda, which is used for making sodabushi, contains a large amount of dark red flesh which rots easily (Fig. 1). This



Fig.1 Marusoda caught near Ashizuri Cape

is the reason why it is not transported long distances from fishing areas. In Tosashimizu, fishers catch marusoda mainly for the purpose of making hushi. However, fishers from other places do not catch marusoda for consumption because they lack the facilities for processing this fish and instead use it as feed for other cultured fish. To catch marusoda near the Ashizuri cape, fishers from Tosashimizu use pull nets, utilizing a single-hook fishing method. Single-hook fishing which catches one fish at a time and can be considered to be a sustainable fishing method although significantly less efficient than purse seiner net fishing. In fact, a study indicated that the purse

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seiner method is 400 times more efficient than single-hook fishing. However, single-hook fishing is viewed positively in the field of resource management and is well regarded for its low cost of utilization, since purse seiner requires a large fishing boat and several crews while single-hook fishing needs only a small boat and a single crew. This means large returns for one fisher who can catch hundreds of kilograms in a day which in a sense contributes to the local fishing economy without putting too much pressure on marine resources. In conclusion, the sodabushi that is consumed all over Japan is made in Tosashimizu in an earth-friendly way which makes this product very special indeed.

2. Role of Women in the Production of Sodabushi

The production of sodabushi involves a number of steps and is essentially the same as the katsuobushi production process. First, fresh fish are placed inside a boiling net (Fig. 2). Second, the fish are submerged in boiling water until well-cooked. Third, the heads and internal organs are removed and the fish are then dried under the sun. This step known as “hadaka-bushi,” is a practice that is widely observed in the Kansai area (Fig. 3). A step whereby the fish becomes covered with mold is known as “hongare-bushi” and is usually seen in the Kanto area. When this process is extended over a three to six month period a richer moldy taste is achieved. Katsuobushi production is mechanized which makes the process simple but sodabushi is made by hand because the small size of marusoda fish makes the machine impractical.



Fig. 2 Fresh fish placed inside the boiling nets



Fig. 3 Hadaka-buzhi (left) and Hongare - bushi (right)

The local women of Tosashimizu play an important role in the production of sodabushi. They perform a step known as “seiro-tori,” the purpose of which is to tighten the meat of the boiled fish (Fig. 4). This also includes separating the bone and the head from the meat and arranging them on the net as carefully as possible which requires skill and expertise on the part of the women. There are 24 sodabushi mills in Tosashimizu and an average of 13 people work in each mill. Marusoda which is caught nearby is processed by local women...a very interesting activity to behold.



Fig. 4 The step known as seiro-tori

3. Connection between Sodabushi and Mountains

Sodabushi production somehow affects the surrounding mountains. At present, the manufacture of this fish product does not take into account the effects on the immediate environment of boiling and roasting the fish. Both of these processes consume wood and expel smoke at the same time. The people concerned should consider making the cooking more efficient since at present the drying and roasting processes are not combined. The fire-wood used for smoking the fish come from trees known as kashi (*Quercus phillyraeoides*). Lumberjacks who cut these trees around Tosashimizu are called “Yamashi” and earn their living by selling this wood to the mills. Yamashis cut trees that are 20 years or older. Although there are a few yamashis in Tosashimizu, they still have an effect on the local economy and they help to maintain the succession of vegetation in the mountains which ensures growth and prevents landslides. In other words, yamashis are an important part of the production of sodabushi and the maintenance of the Tosashimizu environment.

4. Health Benefits of Sodabushi

To explore the more fascinating benefits of Tosashimizu sodabushi, we studied the effect on health of this fish product. Results suggest that sodabushi may have some anti-allergic and anti-hypertensive proper-

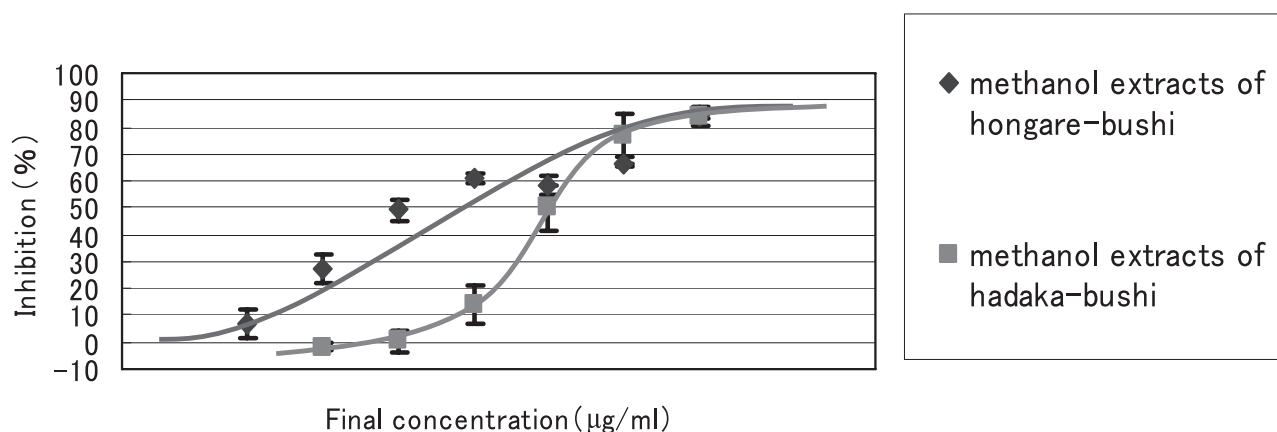


Fig. 5 Inhibitory effects of a methanol extracts of sodabushi on the hyaluronidase activity

ties. With regard to anti-allergic properties, sodabushi extracts were found to inhibit degranulation of RBL-2H3 and hyaluronidase (Fig. 5). Hyaluronidase is known to be associated with inflammation and allergic response. In this experiment Sodabushi's inhibitory effects were confirmed by *in vitro* test. Sodabushi extract was also found to significantly inhibit the release of histamine that was induced by antigen. It was also noted that the inhibitory effect of sodabushi was stronger than that of katsuobushi using a lipid soluble extract. With regard to anti-hypertensivity, the inhibitory effects of sodabushi extracts were observed on the activity of angiotensin-converting enzyme (ACE). ACE is important for the control of blood pressure acting to catalyze the formation of vasopressor angiotensin II from angiotensin I, an indication of the importance of ACE inhibition in anti-hypertension research.

This study on the inhibitory properties of sodabushi involved water soluble extracts which probably contained a peptide. At present, a diet low in salt and cholesterol is recommended for hypertensive patients and adding sodabushi as food seasoning may be a very promising intervention. However, these results are still at the laboratory stage and require extensive confirmation to determine the actual effectiveness before treatment can be administered to patients.

Conclusion

The process of sodabushi production can be summarized in the following steps. The raw material for

sodabushi, marusoda, is first transported to Tosashimizu after being caught in the waters off Ashizuri Cape through single-hook fishing. The fish is then handled by Tosashimizu women during cleaning, smoking and drying, using firewood harvested from nearby mountains. This indicates that the production of sodabushi is more sustainable and more closely associated with nature in Tosashimizu, in contrast to the production of katuobushi where fish is caught in distant seas and processed in a completely different manner. Nonetheless, the quality and taste do not vary greatly, although sodabushi is less popular than katuobushi because of the latter's larger volume of commercial production. Additionally, this study found a special property of sodabushi in that it contains a substance with anti-allergic and anti-hypertensive effects. Although it is still premature to firmly claim a medicinal use for sodabushi in the field of allergy and hypertension management, it would still be helpful to more closely examine the health benefits of sodabushi consumption. Furthermore, this will also bring attention to a local industry closely tied to nature at a time when the whole country is becoming increasingly dependent on imported food, a fact that certainly adds flavor to this special product from Tosashimizu.

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