

Recent Edamame Production Information and Research Advances in Japan

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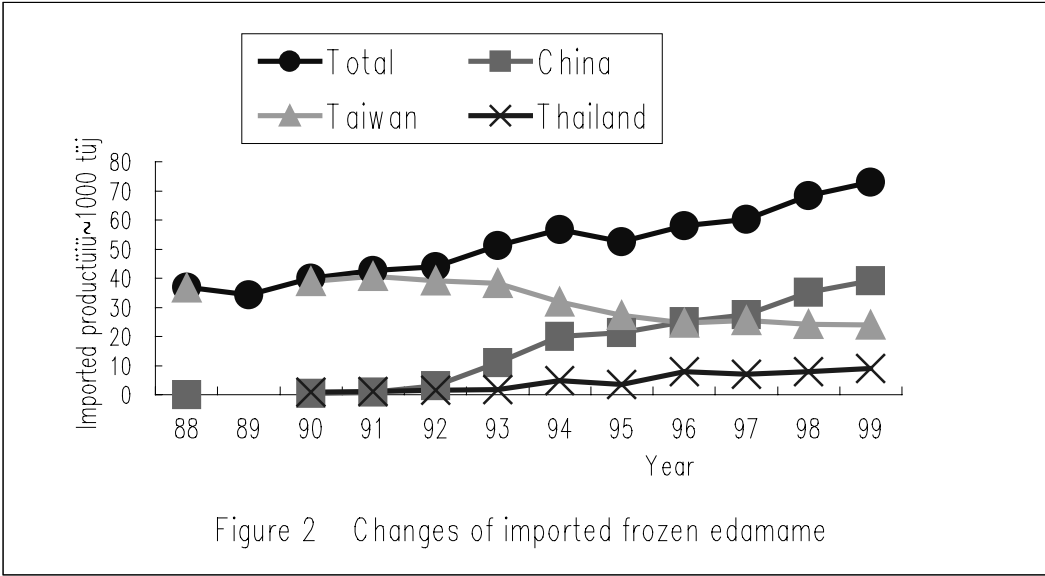
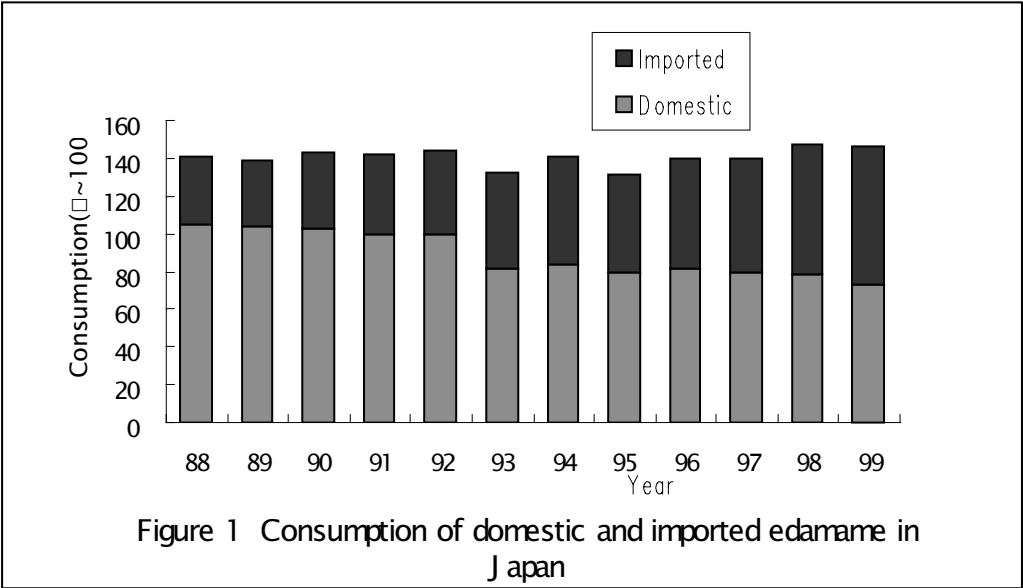
Introduction

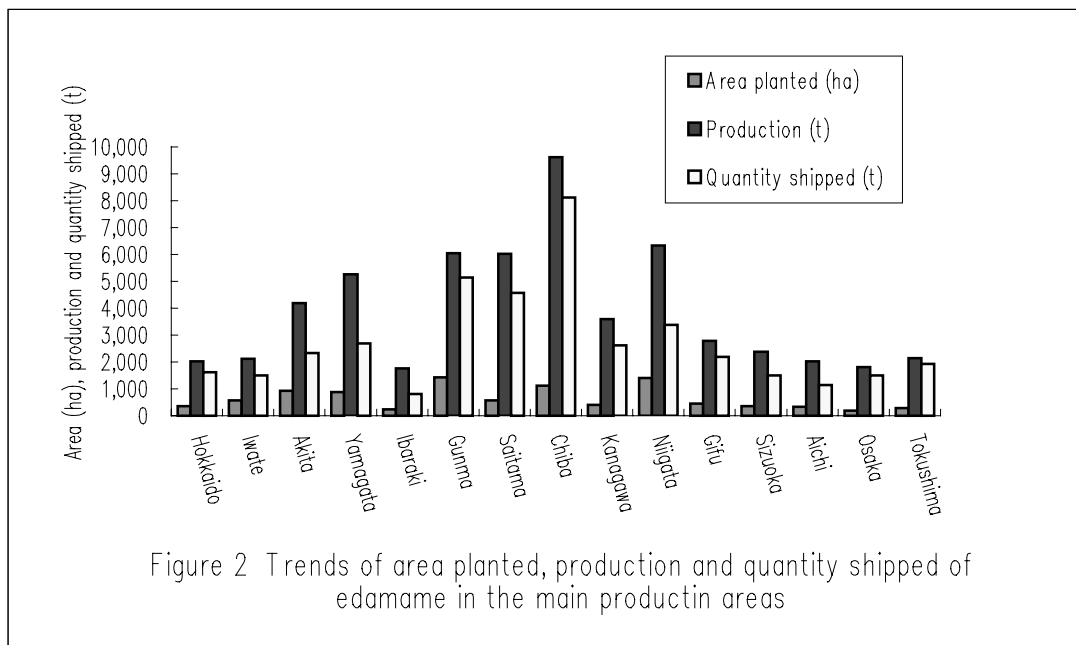
Edamame (immature soybean) was probably used as one of the sacred food offerings in early history since it is first mentioned as food in the Engishiki, a guide to religious affairs published in 927 A.D. By the Edo period, edamame became an inevitable and popular food, particularly during the Festivals of the Obon in mid August and the Tsukimi in September. Today, the year-round consumption has been gradually increasing with the growing popularity of imported frozen vegetable soybean. Though it is available by domestic production by forcing culture and by import from Taiwan and Thailand all year round, fresh edamame is mostly consumed during July to September. These days, fresh edamame is one of rare seasonal vegetables because of the marketing of many forced vegetables losing our sense of the seasons. It is thought that a combination of edamame and beer of which consumption is particularly high during the summer season has been well fixed in Japan.

Production and Consumption

Imported frozen edamame has gradually increased and amounts to about 70,000 t being equal to domestic production while a total of domestic and imported sums up to 140,000 t with no marked fluctuations during the last decade in Japan (Fig. 1). The major exporting countries are China, Taiwan and Thailand, and China has outrun Taiwan since 1995 (Fig. 2).

The contribution of various districts to the production and supply in Japan is shown in Fig.3. From around April, fresh edamame comes into market from warm districts such as Shizuoka and Chiba, from Kanto in the mid summer to early autumn then the major place of the production moves to Niigata and Tohoku. It is recognized that there is a remarkable difference between production of edamame and quantity shipped in Niigata, Akita and Yamagata prefectures, while most edamame produced in Gunma, Saitama, Chiba and Kanagawa prefectures near Tokyo are distributed as a commodity on the market. In the three prefectures, the consumption of edamame per household is largest, and people there traditionally consume lots of unique taste-edamame called Chamame produced by local farmers using a series of brown seeded cultivars.





Varietal Improvement

There are many local cultivars produced and consumed in various districts for many years throughout Japan. Chamame from Niigata and Yamagata prefectures noted for its unique taste, and Tanbaguro from Kyoto prefecture noted for its black and very large seed-size is particularly famous among them. It is considered that farmers and civilians have selected these local cultivars for years bearing the difference between edamame-type and grain-type soybeans. The local ones generally have good tastes and flavors, but do not have good quality of appearance such as pod and seed necessary for marketability.

Since public agricultural stations do not afford to breed edamame, private seed companies have bred and released many improved cultivars having early maturity, large pod, fresh green pod and white pubescence color enhancing their marketability. Today, they are distributed by private companies and cultivated for marketing of fresh edamame in most prefectures, while in Niigata and Yamagata prefectures, the unique cultivars are mainly cultivated for local consumption and marketing. In the recent strong gourmet boom, consumer demands for the good taste and flavor have become stronger. Therefore, the most important breeding objective is to introduce good palatable quality of some local cultivars such as Chamame and Tanbakuro into improved ones with the good appearances. By reflecting this or not, recent research activities have been focused on elucidating determinant factors of the eating quality of edamame.

Determinant Components and Factors of Eating Quality

It has been reported that sucrose as well as amino acids such as glutamic acid and alanine are highly related to the sweetness and tastes of edamame. Some papers have been recently published elucidating the differences and variations in the accumulation of free sugars and amino acids in immature seeds of the vegetable-type (edamame) and grain-type cultivars.

Changes in the concentrations of free amino acids

Concentrations of water-soluble N in immature seeds were shown to be higher in edamame than in grain-type cultivars (Yanagisawa, 1988). Akazawa et al. (1977) correctly discriminated the edamame and grain-type cultivars based on the concentrations of several amino acids such as asparagine, alanine, glutamic acid in immature seeds. Masuda (2001) reported that the cultivars could be classified to four groups based on the accumulation patterns of free amino acids at the ripening stages of more than 12 cultivars over years. Cultivars accumulating high amounts of glutamate and alanine may be suitable for the good tastes. It is interesting and noteworthy to be shown that the asparaginase activity of seed coat was lower and the glutamate synthase activity of cotyledons was higher in the glutamic acid rich edamame cultivar (Chakaori) than in the grain-type cultivar (Enrei).

Changes in the concentration of free sugars

Concentrations of free sugars in immature seeds were shown to be higher in edamame than in grain-type cultivars (Yanagisawa, 1988). By examining accumulation patterns of free sugars in immature seeds in 46 cultivars, Masuda (2001) revealed that the local edamame cultivars, Chakaori and Murasaki-dadachamame contained much sucrose at the maximum concentrations of 16g/100g DW more than two-folds that of Enrei, and that the cultivars, Tanbakuro and Koitozairai highly evaluated as edamame accumulated starch at a maximum concentration of 17-18g/100g DW although their sucrose concentrations were not high. Further, he observed that boiling of immature seeds resulted in enzymatic generation of maltose from starch, investigating that this may explain why starch rich Tanbakuro and Koitozairai are highly evaluated as edamame.

For Increasing Edamame Production and Consumption

An increase of domestic edamame production and consumption depends on how to develop technology to supply fresh and good taste edamame products all year round at reasonable costs, since it is well known among people that edamame is the perfect, healthy and fast foods. The tastes and flavors are mainly determined by genetic characteristics of cultivars, however they are significantly influenced by various environmental factors during pre- and post- harvesting. Therefore, it is demanded: 1) to develop technology through breeding and cultivation procedures that enables to control levels of the good tastes as well as the flesh flavors specific to edamame; 2) to improve a machine harvesting system for quick processing and freezing, thereby contributing to a stable year-round supply of high quality edamame products.

References

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