

# Yuzu in Japan and South Korea: A Comparative Study of Usage

Nami FUKUTOME\*

日本と韓国のユズ利用法の比較

福留 奈美

## Summary

Yuzu (*Citrus junos* Sieb. ex Tanaka), a fruit originally from China, has been actively cultivated in both Japan and Korea in recent years. The objective of this study was to shed light on the different uses of yuzu in Japan and Korea. We investigated traditional usage of yuzu in food preparation in Japan and Korea through interviews and a study of cookbooks; investigated the main yuzu products available through market research; and analyzed differences in equipment on production lines at yuzu processing factories in yuzu-growing regions, namely Kochi in Japan and Goheung in Korea. In Japan, the main uses found were: 1) yuzu fruit juice in ponzu and seasoning; 2) fresh yuzu rind for flavoring dishes and in the spicy condiment yuzu-kosho; 3) in heated preserved foods like *yubeshi* and yuzu-miso. In Korea, 1) the main use is in the production of candied yuzu, called *yuja-cheong*; 2) *yuja-cheong* is in turn used in tea; 3) many sweets and sauces are also made from *yuja-cheong*. In Japan, the rind and juice of yuzu are usually separated and used fresh or heated. In comparison, yuzu in Korea is most commonly candied and the candied form is used in a variety of ways. It was also observed that characteristic usages have been mutually adopted by the two countries and are undergoing steady change. (This is the translation of a paper originally published in Japanese in *Dento-shokuhin no Kenkyu* (Studies of Traditional Foods), No.43, 2016).

## 抄 録

中国が原産の柑橘類ユズ(*Citrus junos*)は、近年、日韓での栽培が盛んに行われている。本研究では、その利用法に国ごとの食文化の違いがあると考え、日韓両国におけるユズの利用法の違いを明らかにすることを目的とした。本研究では、インタビューと料理書における料理・菓子類への伝統的な利用法と市場に流通する代表的なユズ製品について調べたほか、ユズ産地(高知県と高興郡)のユズ加工・製造ラインの比較を行った。日本での利用は主に、1) ユズ果汁のぼん酢、調味料、2) 生果皮の料理や柚子胡椒、3) 柚餅子や柚子味噌など加熱した保存食であった。韓国では1) ユジャチョン(ユズの砂糖漬け)への加工が主で、2) 茶への二次利用、3) 菓子、ソースへの二次利用が多かった。日本では、果皮と果汁を分けて生のまま、または加熱して利用することが多いのに対し、韓国ではユズの砂糖漬けとその二次利用が主流であることがわかった。また、両国でそれぞれ特徴的な利用法が相互に取り入れられ、変化している現状も観察された。(本報告は『伝統食品の研究』No.43(2016)に掲載された論文を翻訳したものである)

Keywords: usage of yuzu, comparative study, cultural differences, Japan and Korea

\* Faculty of Health and Nutrition, Tokyo Seiei College

## 1. INTRODUCTION

Yuzu (*Citrus junos Siebold ex Tanaka*) originated in the upper reaches of China's Yangtze River. Japanese botanist Chozaburo Tanaka, known for his work on citrus classification, reported its existence as a remarkable wild citrus found in the provinces of Hubei, Sichuan, Yunnan, and Gansu and also in Tibet. A description of yuzu from 772 in *Chronicle of Japan, Continued* (Shoku Nihongi, published 797) suggests yuzu was already well-established in Japan in the Nara period (710-794). Yuzu undergoes asexual seed reproduction called nucellar embryony, a trait also found in other citrus fruits that can repeat indefinitely. Trees grown from such seeds are clones of the parent meaning yuzu found in Japan and Korea are genetically very close, complicating claims in botanical terms that the crop is unique to either country.

Since the 1980s, active exchange between top French chefs and mainly chefs of Kyoto kaiseki cuisine led to the introduction of yuzu on the French gastronomy scene. In addition, yuzu became known as the scent of Japan as a result of presentations by Sawamura et al. on the characteristics and efficacy of yuzu essential oil at academic conferences in Japan and abroad<sup>3,4</sup>. In response to the requests of French chefs incorporating ingredients from around the world in their cuisine, the export of fresh whole yuzu from Kitagawa Village, Kochi Prefecture, to the EU began in November 2012. Nowadays, Nordic cooks also use fresh yuzu in winter dishes.

South Korea, on the other hand, produces large volumes of yuzu tea made from candied yuzu rind. Export volumes of yuzu tea increased from 10,464 tons in 2009 to 14,713 tons in 2014, of which about 90% was sent to China, Japan, Hong Kong and Taiwan. In China, where imports of yuzu tea from South Korea have increased, yuzu is said to be primarily associated with Korean yuzu tea. To date, yuzu fruit growing was almost exclusively undertaken in Japan and South Korea, but China has recently begun cultivation too.

Given the difficulty in asserting disparate regional characteristics of yuzu as a crop, this paper considers

different uses stemming from distinctive food cultures and reports the results of a study focused on post-war modern times. The purpose of this study was 1) to capture the current situation and changes in yuzu cultivation in Japan and South Korea, and 2) to clarify fundamental differences in modern yuzu usage between the two countries.

## 2. METHOD

### 2.1 Comparison of Yuzu Cultivation in Japan and South Korea

Statistical data released by Japanese and South Korean ministries was checked and confirmed through direct enquiries to government agencies. Analysis of shifts in yuzu production areas and trends in South Korea was based on interviews with yuzu producers in Namhae County and Geoje City in South Gyeongsang Province, and with the director of the yuzu processing facility in Goheung County in neighboring South Jeolla Province, conducted in November 2014.

### 2.2 Comparison of Yuzu Usage in Japan and South Korea

Yuzu usage was examined through a literature review, primarily of modern cookbooks held at South Korea's Nongshim Co., Ltd. Library of Food Culture (Table 1 annotations), and yuzu specialty books and cookbooks of kaiseki cuisine in Japan.

This information was analyzed alongside research into yuzu products available on the market at department stores, supermarkets, convenience stores, and online sites, as well as details from interviews with food product and cooking specialists (five times total; August and November, 2014, and February, April and August, 2015).

Processing steps for key yuzu products were recorded through visits to agricultural cooperative factories in each country's most active yuzu production areas: Kochi Prefecture in Japan and South Korea's Goheung County (November 2014). Two separate visits to the home of a Seoul housewife committed to homemade products provided insight

into the cooking process for candied yuzu and traditional sweets incorporating candied yuzu (November 2014 and February 2015). Interviews with yuzu farmers took place in Geoje City and Namhae County, South Korea (December 2014), and a visit to a Geoje City yuzu processing facility enabled a comparison of raw materials in their bottled yuzu tea products. In Japan, interviews were held during a visit to a yuzu farmer in Kitagawa Village, Kochi Prefecture, and details on juice extracting equipment were recorded (February 2014). In addition, focus was placed on “yuzu tea”, consumption of which has increased in Japan in recent years, and we classified domestically produced yuzu tea available through a Japanese online retail site (Amazon.co.jp as of January 2016).

### 3. RESULTS

#### 3.1 Yuzu Cultivation in Japan and South Korea: Current Circumstances and Shifting Trends

Figure 1 shows the yuzu producing regions of Japan and South Korea and their respective production volumes. Figures 2 to 5 show production ratios by region for both volume and cultivation area, as well as annual trends in yields and area under cultivation.

Among the 17 first-level administrative districts of South Korea, yuzu is primarily cultivated in the southern provinces of South Jeolla, South Gyeongsang, and Jeju. Until 2004, yuzu was under cultivation in approximately ten hectares of Busan Metropolitan City, but that has decreased to less than 2 hectares since 2009. Intensive yuzu cultivation takes place in two major production areas in South Jeolla Province – Gwangyang and Wando counties. In addition to Geoje City in South Gyeongsang, Namhae County has been known since ancient times as a yuzu production area.

In Japan, more than 80% of yuzu production takes place in three prefectures of Shikoku and two prefectures in Kyushu. In contrast to South Korea, however, commercial growing is widespread with 38 of the country’s 47 prefectures yielding 1 ton or more annually, from the northern limit of Miyagi Prefecture

to Kagoshima Prefecture in the south. Confirmation with local governments revealed, however, that far north Iwate Prefecture has branded their local crop “Northern Limit Yuzu”, revising the northern limit for yuzu cultivation as of 2015 to Iwate Prefecture. As global warming progresses, Akita Prefecture has raised the possibility of conducting test cultivation of cold-resistant yuzu, potentially further increasing the cultivation area for yuzu in Japan.

There are two types of yuzu: a grafted variety in which a yuzu scion is grafted to the rootstock of trifoliolate orange (*Citrus trifoliata* or *Poncirus trifoliata*), and seedling yuzu grown from seeds. Seedling yuzu is known for the especially long time it takes to produce fruit, as seen in a Kochi Prefecture saying: “peach and chestnut 3 years, persimmon 8 years, and the great idiot yuzu 18 years”. In contrast, grafted yuzu bears fruit three to five years after grafting and has the added advantage of being easy to prune and harvest because the branches grow low and horizontally – a trait of trifoliolate orange. Annual yuzu yields soared over 50 years from 19 tons in 1963 to 2,216 tons in 2012 as a result of growing demand due to high economic growth from the 1960s onwards and the spread of grafting technology. Despite stabilization of the growth rate of cultivated acreage since, yields continue to increase.

South Korea has seen an overall decline in both total yield and cultivation acreage since 2000, but in Goheung County those figures remain largely unchanged, and there have even been increases on Jeju Island. The overall falls are thought to be owing to a rapid decline in small-scale growing areas in parts of South Jeolla outside of Goheung County and in South Gyeongsang. The following is a summary of the interviews with yuzu producers in Namhae County and Geoje City, South Gyeongsang Province, and the head of the yuzu processing facility in Goheung County, South Jeolla Province.

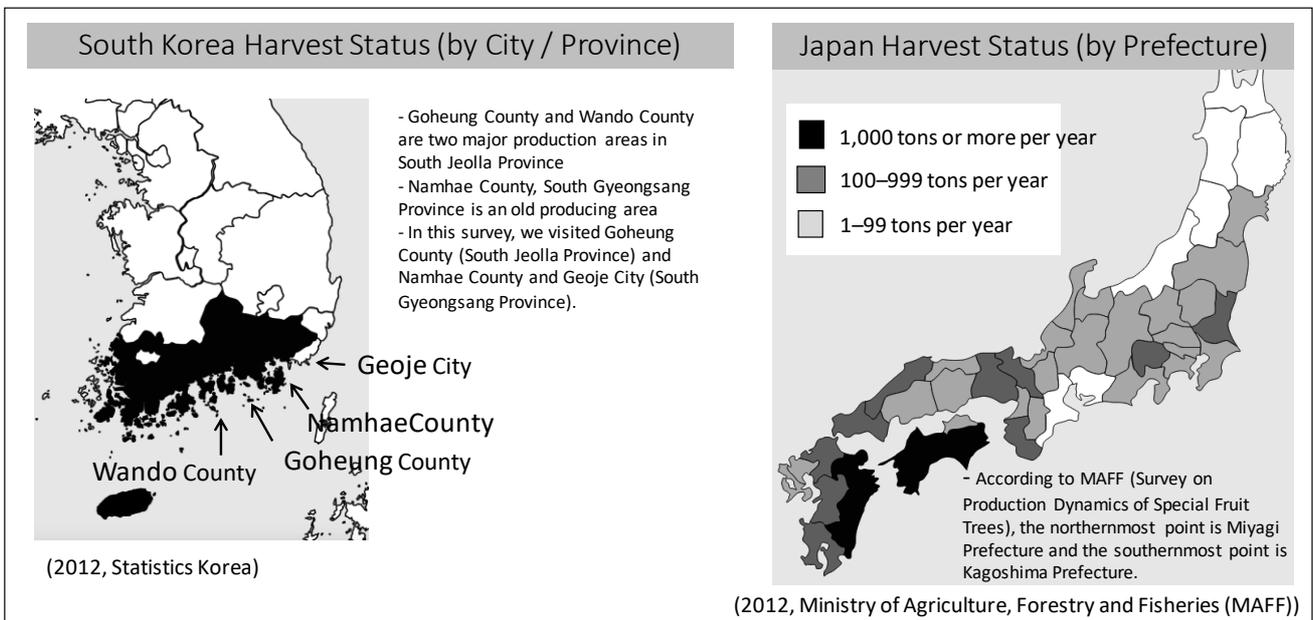
Namhae County is a long-standing production area famous for its seedling yuzu, formerly referred to as the “university tree”. Yuzu was so highly valued that one tree provided enough income to send a child to

university, and the largest trees produced over 1,000 fruits.

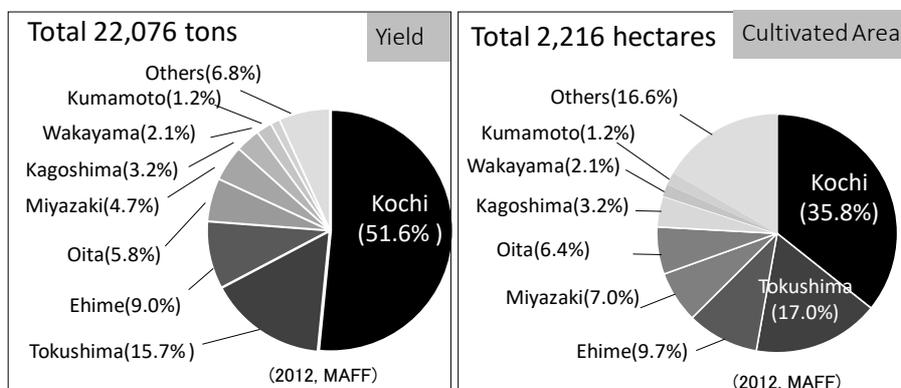
In the city of Geoje, east of Namhae County, yuzu growing expanded with many attracted by the high price the crop commanded about 30 years ago, but the rapid increase in yuzu growers caused prices to fall. The falling price prompted many yuzu farmers to switch to shipbuilding about 20 years ago, and then production began to decline. Over the same period, a large-scale yuzu processing facility was built in Goheung County, leading to more intensive engagement in yuzu cultivation and processing. It is said that yuzu cultivation techniques and seedlings

were originally brought to Goheung from Geoje. We learned that the yuzu processing plant in Goheung is unable to produce yuzu tea fast enough to meet growing demand from China, and thus current production remains focused on yuzu tea even though there is interest in new product development.

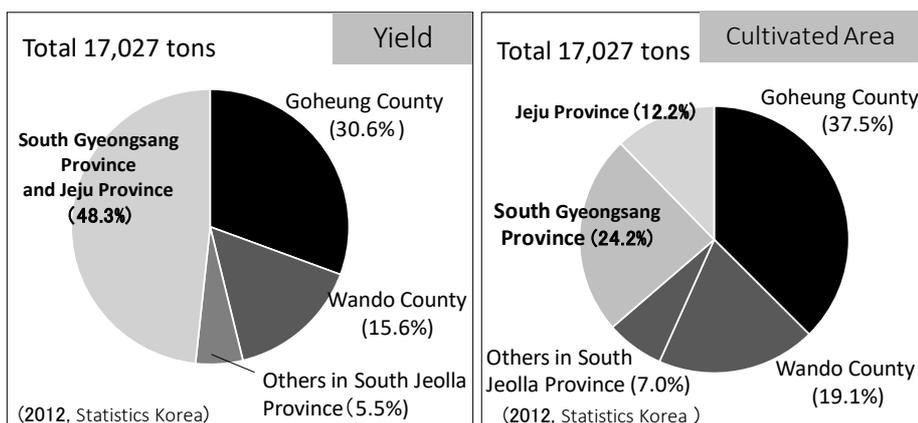
The above findings show that yuzu has been a commercially produced crop in both Japan and South Korea over the last 40 to 50 years, and that whereas in Japan we see trends of increased production and expanded cultivation areas, South Korea is seeing continued consolidation in the key areas of cultivation.



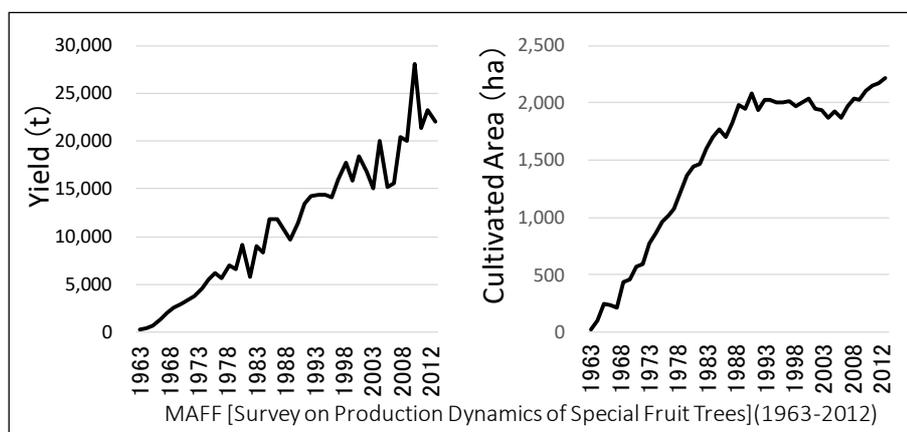
**Figure 1** Yuzu Harvest Status by Region in South Korea and Japan



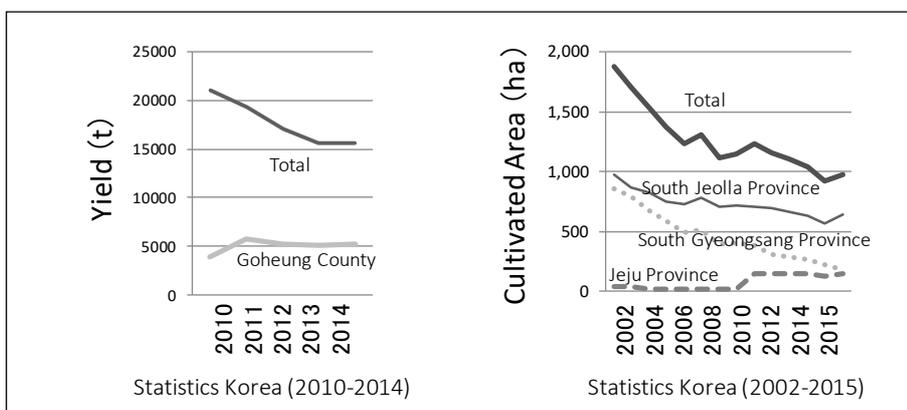
**Figure 2** Japan Yuzu Yield and Cultivated Area Ratios by Prefecture



**Figure 3** South Korea Yuzu Yield and Cultivated Area Ratios by Region



**Figure 4** Annual Change in Yuzu Yield and Cultivated Area in Japan



**Figure 5** Annual Change in Yuzu Yield and Cultivated Area in South Korea

### 3.2 Traditional Uses for Yuzu in Japan and South Korea

#### 3.2.1 Traditional Korean Recipes for Yuzu From Cookbooks

As shown in Table 1, apart from the use of strips of raw outer rind (flavedo) in the *yuja-hwa-cha* drink, there is very little use of raw yuzu rind in South

Korea; in most cases the rind has already been processed in some way as in *yuja-cheong* (yuzu candied in sugar or honey).

Though strips of candied yuzu are the most common type nowadays, various traditional methods for making *yuja-cheong* involved preserving the whole fruit, cutting the outer rind into large pieces for

candying, or stuffing the rind and tying with thread to maintain the round shape during preservation.

*Yuja-hwa-chae* and *wonsobyong* are classified as traditional beverages using syrup-preserved ingredients, and were once elaborate products reserved for high-ranking people. In many cookbooks, *yuja-hwa-chae* recipes called for raw yuzu rind, but according to a renowned researcher of Korean food culture, Yun Seo-seok, it is also possible to cut just the yellow outer rind into large pieces and preserve them in sugar for *yuja-hwa-chae*. Sugar or honey-candied yuzu can be used for either the resulting syrup, as in *tenjachon* (honey-preserved trifoliolate orange pulp), or for the solid peel. The solid component is sometimes used as filling in mochi-style confectionery, or for coloring and flavoring in the same way as sesame or mugwort. Present-day recipes for *yugwa*, deep-fried rice puffs coated with various toppings, do not call for *yuja-cheong*, but in the past the *yuja-cheong* syrup was used to bind the coating. We can see that in South Korea there has long been a culture of using sugar- and honey-candied fruits in various ways.

### 3.2.2 Yuzu Usage in Japan by Fruit Part

As shown in Table 2, in Japan, we can see various examples of yuzu usage, including applications of just the outer skin, the whole skin, both the skin and the pulp, and the juice. Examples of use in Western-style confectionery are also included, but it is clear that there has been widespread use of yuzu across kaiseki cuisine, regional cooking, and home cooking in Japan since ancient times.

#### i) Flavored Uses

One distinctively Japanese tradition is the use of raw yuzu rind to flavor or add aroma to dishes. In Japanese cuisine, raw flavored rind shaved with a knife is floated in soup as a fragrant garnish. The different cuts of yuzu rind have names based on their shape (Table 2), and slight variations are all accounted for in detailed names like *kizami-yuzu* (shredded yuzu) and *hari-yuzu* (needle-like yuzu), *ore-matsuba-yuzu* (bent pine needle yuzu) and *sanbon-matsuba-yuzu* (triple pine needle yuzu). In

addition, the method of sprinkling finely grated yuzu rind, called *furi-yuzu*, is applied to flavor a wide range of simmered, steamed, and grilled dishes, as well as in noodles, soups, dressings, vinegared dishes and pickles. Rind is also found in Japanese sweets in the form of *yuzu-an*, yuzu-flavored sweet bean pastes, and *yuzu-mochi* glutinous rice cakes. It is custom in Japan to enjoy the aroma of yuzu over a long season from the quintessential summer ingredient green yuzu found in soups and as *furi-yuzu*, right through until the fruit turns yellow. In contrast, green yuzu is not used in South Korea. When yellow yuzu is in season in Japan, *sarashina soba* restaurants make *yuzu-kiri* by kneading yuzu flavored into the noodle dough. Yuzu miso – one type of *name-miso* eaten straight – is made as a side dish for rice or used as *dengaku-miso* to top grilled ingredients.

#### ii) Whole Yuzu Rind Uses

One method using the whole pericarp called *yuzu-gama* or *yu-gama*, means yuzu pot. A small carved out yuzu is used as a bowl and filled with ingredients like *kohaku-namasu* vinegared white radish and red carrot for Osechi new year's celebratory dishes, or as the vessel for steaming ingredients. Variations in presentation include yuzu pots with leaves still intact, decorative carving of the lid to look like a chrysanthemum, and green yuzu cut into three large pieces to mimic the splitting of Japanese *sansho* pepper buds known as *wari-zansho*.

Large yuzu pots are used to make *maru-yubeshi*, a traditional steamed yuzu dumpling unique to Japan. Nakai<sup>17)</sup> and Ito et al.<sup>18)</sup> have reported on their research into *yubeshi*, detailing regional and historical differences in production methods.

One method for sweet-simmered yuzu rind is often found in *hassun*, a dish served with sake in *cha-kaiseki* tea ceremony kaiseki cuisine. Chef Koichiro Goto of Ryuun-an *cha-kaiseki* restaurant in Shinjuku shared his method with us (Table 3). The recipe is almost identical to that for *Amigasa-Yuzu* – sweet-simmered yuzu rind shaped like traditional straw hats – found in one cookbook referenced in our research<sup>13)</sup>.

**Table 1.** Yuzu in Traditional Confectionery and Beverages in Korea

<b>Candied with sugar and/or honey</b>	
<b><i>Yuja-cheong</i>:</b>	Made by traditional methods also used with honey-candied trifoliate orange and other fruits, such as punching holes from outside with chopsticks, and alternating layers of sugar and fruit in a glass jar for candying*10. Divide fruit into four equal parts and remove thin white part of rind before preserving in sugar to ensure resulting juice is transparent*10.
<b><i>Yuja-cheong</i> - whole type:</b>	A traditional method using the whole rind. A sugar-dusted paste of julienned chestnuts, jujube fruit, and rock tripe lichen is wrapped in yuzu rind and preserved in honey water*5-7. Another recipe calls for yuzu rind to be blanched in boiling water and divided into 6 to 8 pieces. Combine yuzu pulp with sugar and julienned jujubes, chestnut, and mushrooms, return the mixture into the rind, tie it with a thread and preserve in sugar water *10.
<b><i>Yuja-cheong</i> - julienne type</b>	Most common modern method. Pulp is removed from the fruit; rind is julienned and candied. In home recipes, julienned raw rind and chopped pulp are often preserved together in sugar and honey*1, 2, 12.
<b>Traditional beverages</b>	
<b>Sweet beverages : <i>Hwa-cha</i></b>	Traditional punch containing cut fruit, edible flowers and other ingredients in a liquid of sugar water, honey water or cordial flavored with <i>omija</i> (Schisandra fruit/ magnolia berry). Raw or candied pears, strawberries, peaches, plums, watermelons, yuzu, and other fruits are used. The yuzu variety includes raw outer rind (flavado), julienned pear, pomegranate, pine nuts and other ingredients*1,3-6,7. Another style includes plentiful yuzu flavado strips, that have been candied in an equal amount of sugar, floating in either sugar water or <i>omija</i> water*10.
<b>Sweet beverage with dumplings : <i>Wonsobyeong</i></b>	Sugar or honey water beverage containing dumplings of boiled glutinous rice flour mixed with jujubes or yuzu rind* 5. Traditionally served to high-ranking people after meals or instead of tea*11. Yuzu variety uses syrup of <i>yuja-cheong</i> *1,6, solid part of <i>yuja-cheong</i> *4, or raw yuzu rind*1,3.
<b><i>Yuja-cha</i></b>	Drink of <i>yuja-cheong</i> (yuzu candied in sugar or honey) mixed in hot water. The processed and bottled <i>yuja-cheong</i> sweet paste may also be referred to as <i>yuja-cha</i> *13. Sometimes the julienne type <i>yuja-cheong</i> is called <i>yuja-cha</i> to distinguish it from the whole type <i>yuja-cheong</i> *5.
<b>Traditional Confectionery</b>	
<b><i>Yugwa</i>: <i>Gangjeong</i></b>	Glutinous rice flour that has been moistened with alcohol and steamed is kneaded well and spread flat before being cut and dried in the shade. It is then deep-fried twice in oil, coated with honey, and dusted with various toppings (sesame, pine nuts, cinnamon)*9. <i>Gangjeong</i> is the name for the thin rectangular shape of the confection. The syrup of <i>yuja-cheong</i> is sometimes used instead of honey*2,10.
<b>Deep-fried Confectionery: <i>Ssal-gangjeong</i></b>	Rice confectionery of boiled and dried ordinary rice that is deep fried and hardened by coating with a boiled down syrup of glucose syrup, sugar and a little salt*12. The yuzu variety called <i>yuja-gangjeong</i> adds <i>yuja-cheong</i> to the syrup used for coating*12. In some cases, only the solid portion of <i>yuja-cheong</i> is used.
<b>Steamed rice cake: <i>Sourgi, sourgi-tteok</i></b>	Rice cake made from steamed non-glutinous rice flour*9. In addition to white <i>sourgi</i> made only from rice flour and sugar, other types include black beans, azuki beans, mugwort, and others*8. Yuzu referred to in a <i>yuja-sourgi</i> recipe *2 is thought to be <i>yuja-cheong</i> *11.
<b>Steamed rice cake with solid ingredients: <i>Duteop-tteok</i></b>	Glutinous rice flour combined with <i>ganjang</i> (Korean soy sauce), honey, and other ingredients, and filled with yuzu, pine nuts, or azuki bean paste before steaming*8. Yuzu in these recipes is thought to indicate <i>yuja-cheong</i> *11.
<b>Steamed rice cake: <i>Japgwabyeong</i></b>	Sugar, chestnuts, jujubes, dried persimmon, walnuts, the solid portion of <i>yuja-cheong</i> , and other ingredients are added to non-glutinous rice flour. The mixture is steamed and cut into squares *1
<b>Boiled confectionery: <i>Jeonggwa</i></b>	Generic name for fruits and vegetable roots and stems stewed with honey, glucose syrup, and sugar*5. <i>Yuja-jeonggwa</i> is prepared by stewing candied yuzu rind strips in sugar or honey*10, or by drying sugar-candied yuzu rind* 2.
*1	Park Ojin, Kim Young Sun, Jeong Pyobeom Choe, Mun Hwi Bun, 2007, <i>Hangug-ui Tteog, Eumlyosu-lyu</i> (Korean Rice Cakes and Drinks), Hunmin-sa, Seoul, pp 34,76, 212, 236, 238.
*2	Che Seun Jya, 2003, <i>Jayeon-ui Eunhyeul Dam-eun Mas-issneun Eumlyo</i> (Delicious Drinks Filled with Nature's Goodness), Hangug Oesig Jeongbo Jusighoesa, Seoul, pp 17,25,120.
*3	Jusighoesa Julo Chingu, 1983, <i>Jubu Saenghwal Kadeu Yoli</i> ㉞ ( <i>Tteog · Hangwa · Hangug Yoli Eumlyo</i> (Housewife Living Cooking Cards 18: Rice Cakes, Korean Sweets, Korean Dishes and Drinks), Seoul, pp 28,31.
*4	Gang-In Ji, 1987, <i>Hangug-ui Mas</i> (Korean Taste), Daehan Gyogwaseo Jusighoesa, Seoul, pp 344,346.
*5	Kim Dok Ki, 2006, <i>Tteog, Hangwa, Eumlyosu-lyu</i> (Rice Cakes, Korean Sweets and Drinks), Silakawa Chulpansa, Seoul, pp 329,331,333.
*6	Kim Hae Yeong, 2002, <i>Hangug-ui Eumlyosu-lyu</i> (Korean Drinks), Doseo Chulpansa Hyoilu, Seoul, pp 176,224.
*7	Library of Food Culture, NONGSHIM Food Culture Research, web-site: www.agroheartco.kr/arg/culture/season_lst.jsp
*8	Cheong Eun Saeg, 2005, <i>Korean Cooking Glossary to Make Eating Tours More Fun</i> , Nihon Keizai Shinbunsha, Tokyo, pp 232-252.
*9	Yun Seo Seog, 1995, <i>Korean Food Culture History</i> , Domesu Publishers Inc., Tokyo, pp 41-48, 94-100.
*10	Interview with Dr. Yun Seo Seog, Seoul, November 2014.
*11	Interview with Ms. Li Lin Hwa, Seoul, November 2014, and February and April 2015.
*12	From the production process of Ms. Kim Bok Kyum (Seoul resident), November 2014.
*13	From the manufacturing process of the Goheung County Agricultural Cooperative Yuzu Processing Plant, November 2013.

**Table 2.** Japan Yuzu Usage by Part

As a flavoring in soup*1; to finish simmered foods, grilled foods and steamed foods; as a topping/garnish on noodles ( <i>udon</i> etc.) and <i>chirashi-sushi</i> ; in vinegared dishes and dressed vegetables dishes; in vinegared miso; in pickles ( <i>yuzu daikon</i> etc.); incorporated into <i>soba</i> noodle dough; <i>mochi</i> sticky rice cakes ( <i>yuzu-mochi</i> ); yuzu flavored sauce; yuzu-flavored miso.
<b>Pericarp (flavedo and albedo)</b>
As a serving pot ( <i>yuzu-gama</i> )*2; yuzu dumpling( <i>maru-yubeshi</i> ); yuzu-kosho chili pepper paste; soy sauce-pickled <i>tsukuda-ni</i> ; candied in sugar or syrup; simmered yuzu; to flavor pickled vegetables ( <i>ni-namasu</i> ); sugar candied; peels; glaze; in powdered dried foods such as seven spice mix <i>yuzu-shichimi</i> ; dried peel in yuzu tea with tea leaves.
<b>Rind and pulp</b>
Sauces ( <i>yuko-yaki</i> , <i>yuan-yaki</i> ); steamed dishes ( <i>yuko-mushi</i> ); marmalade and jam; noodles; whole yuzu paste ( <i>yuzu-neri</i> ); Korean-style yuzu tea.
<b>Fruit juice</b>
<b>- As vinegar substitute</b>
In vinegared rice and vinegared dishes; dipping soy sauce for sashimi; in vinegared soy sauce and vinegar/soy sauce/ sugar mixes; vinegared miso; dressings.
<b>- As citrus juice (incl. some pulp use)</b>
100% fresh juice; <i>yuzu-ponzu</i> ; yuzu yokan gelled bean paste; juices and alcoholic beverages; sauces and syrups (e.g. for shaved ice); ice cream and sherbet; jelly and mousse; chocolate, gummi candy and hard candy; other sweets; as a lemon substitute.
Other than food, also used in lotions (seed), and for baths (whole fruit), etc.
*1 In addition to grated <i>furi-yuzu</i> , various decorative cuts are used and each named according to its shape, incl. <i>kizami-yuzu</i> (finely carved), <i>hari-yuzu</i> (needle-like), <i>naga-yuzu</i> (long), <i>matsuba-yuzu</i> (pine leaves-like), <i>ore-matsuba-yuzu</i> (bent pine leaves-like), <i>sanbon-matsuba-yuzu</i> (three pine leaves-like), <i>hegi-yuzu</i> (thinly peeled), <i>mangetsu-yuzu</i> (full moon-like), <i>kake-yuzu</i> (waning moon-like), <i>hanabira-yuzu</i> (flower petal-like), <i>momiji-yuzu</i> (maple leaf-like), <i>shikishi-yuzu</i> (square paper card-like), <i>tsumagata-yuzu</i> (sashimi garnish-like), <i>tanzaku-yuzu</i> (thin strip), etc.
*2 Several variations of <i>yuzu-gama</i> exist such as <i>hatsuki-yuzu-gama</i> (with leaf), <i>yuzu-no-kiku-gama</i> (with chrysanthemum), <i>ao-yuzu-no-warizansho-gama</i> (green yuzu with sansho pepper), etc.

**Table 3.** Recipe for *Yuzu-amani*, sweet-simmered yuzu

- 1) Gently grate the outside of the outer rind to remove bitterness and discard.
- 2) Peel the rind, cut into bite-sized pieces, and boil in water for about 5 minutes.
- 3) Soak in water to remove bitterness for half a day to a whole day.
- 4) Combine equal parts water and sugar and bring to boil to make a syrup. Add rind from 3 and simmer.
- 5) After simmering a little, turn off the heat and allow flavor to permeate fully. Suitable for long-term storage if boiled down.

A seasoning paste of finely grated yuzu rind, green chili peppers and salt called *yuzu-kosho* originated in Oita Prefecture. It has gained nationwide popularity in recent years and new versions made with yellow yuzu and peppers or red chili peppers have appeared in addition to the standard green type. Green *yuzu-kosho* can only be made from August to September when green chili peppers and green yuzu are in season concurrently, thus it is stored for use year-round. In the Kyushu region especially, it is often served as a condiment for soups and hot pots, as well as for grilled and steamed dishes such as *yakitori* grilled chicken. These days, *yuzu-kosho* is also exported to the United States and is marketed as a distinctively Japanese seasoning.

At a taste workshop conducted by the author at NYCAS2016 (New York Conference on Asian Studies, Vassar University)<sup>19</sup> introducing dashi products, Japanese tea, miso, soy sauce and *shichimi* seven spice seasoning, yuzu products (*maru-yubeshi*, yuzu mochi, rind, and *yuzu-kosho*) were especially well-received, and many participants listed yuzu as their ingredient of particular interest.

### iii) Combined Rind and Pulp Uses

In *Yuan-yaki*, a Japanese grilled dish, equal parts of yuzu fruit round slices, soy sauce, mirin, and sake are combined in a marinade to flavor raw fish fillets. *Yuko-mushi* is a dish in which yuzu fragrance is transferred by steaming the main ingredient topped with yuzu slices. *Yuzu-neri* is a preserved food made by cooking whole fruit until it collapses before kneading and mixing with glucose syrup.

#### iv) Fruit Juice Uses

There are two main uses for yuzu fruit juice: as a substitute for vinegar, and instead of lemon where citrus juice is called for, particularly when a highly acidic and fragrant juice, or *kosan-kankitsu*, is desired.

In Kochi Prefecture, Japan's largest yuzu growing area, many families plant one or two trees of *kosan-kankitsu* (called *su-mikan* vinegar oranges in Kochi) in their gardens and use the high acid fruit juice as a vinegar substitute. The sushi rice in well-known local dishes *Inaka-zushi* (countryside sushi) and *Saba-zushi* (whole mackerel sushi) is often made with yuzu juice instead of sushi vinegar (Figure 6). If you visit daily street markets, such as a Sunday market, yuzu juice is available throughout the year. Before refrigeration, 1800 milliliter bottles of yuzu juice were preserved by adding salt in a ratio of 10 to 20 percent, and bottles were buried underground in valleys to ensure year-round usability. The juice of seedling yuzu fruit is recognized as especially valuable given its stronger fragrance compared to grafted yuzu.

The most typical application of yuzu juice is in ponzu – a tangy soy sauce-based seasoning. Ponzu



**Figure 6** Yuzu Juice Sales in Kochi Prefecture

was originally made with juice from especially succulent *daidai* bitter orange fruit and served at restaurants specializing in pufferfish hot pots. In recent years, many bottled products incorporating yuzu juice can be found with the name *yuzu-ponzu*. A survey at a Tokyo grocery store (November 2014)

revealed that of a total of 38 ponzu items stocked, 14 included “yuzu” in their product names; 10 included other citrus varieties (*sudachi* 2, *daidai* 3, *kabosu* 1, lemon 1, *shikuwasa* 2, *dekopon* 1); and a further 14 types contained no citrus name, showing the popularity of the *yuzu-ponzu* style.

Yuzu fruit juice is often used in juices, alcoholic drinks and other beverages, and is also widely used in Western sweets such as ice cream, sherbet, and jelly. Traditionally, yuzu fruit juice and/or finely grated flavedo rind has been used to make a gelled confection called *yuzu-yokan*.

### 3.3 Production of Main Processed Yuzu Goods in Japan and Korea

#### 3.3.1 Main Korean Processed Yuzu Goods – Yuja-cheong Production

##### i) At a Yuzu Processing Plant

In Korea, the target product is sugar-candied rind (*yuja-cheong*), thus the juice is a by-product mainly exported to Japan. Fresh yuzu fruit is delivered to the facility and the stalk and black spots on the outer rind are manually removed. This process is not conducted in Japan but it is essential in Korea where yuzu rind is the key component. The yuzu are washed, drained, and put on a conveyor to be halved and pressed to separate pulp and seeds from the rind through a drum type separator. Any seeds and flesh still attached to the rind are manually removed before the rind is sent through a special cutting machine – another process unique to *yuja-cheong* in Korea. The julienned strips of rind are weighed and mixed well with an equal amount of sugar before bagging. A lot of manual work is required to ensure high-quality rind, and this need for human input is a distinguishing feature of the Korean process (Figure 7).

##### ii) Making Yuja-cheong at Home

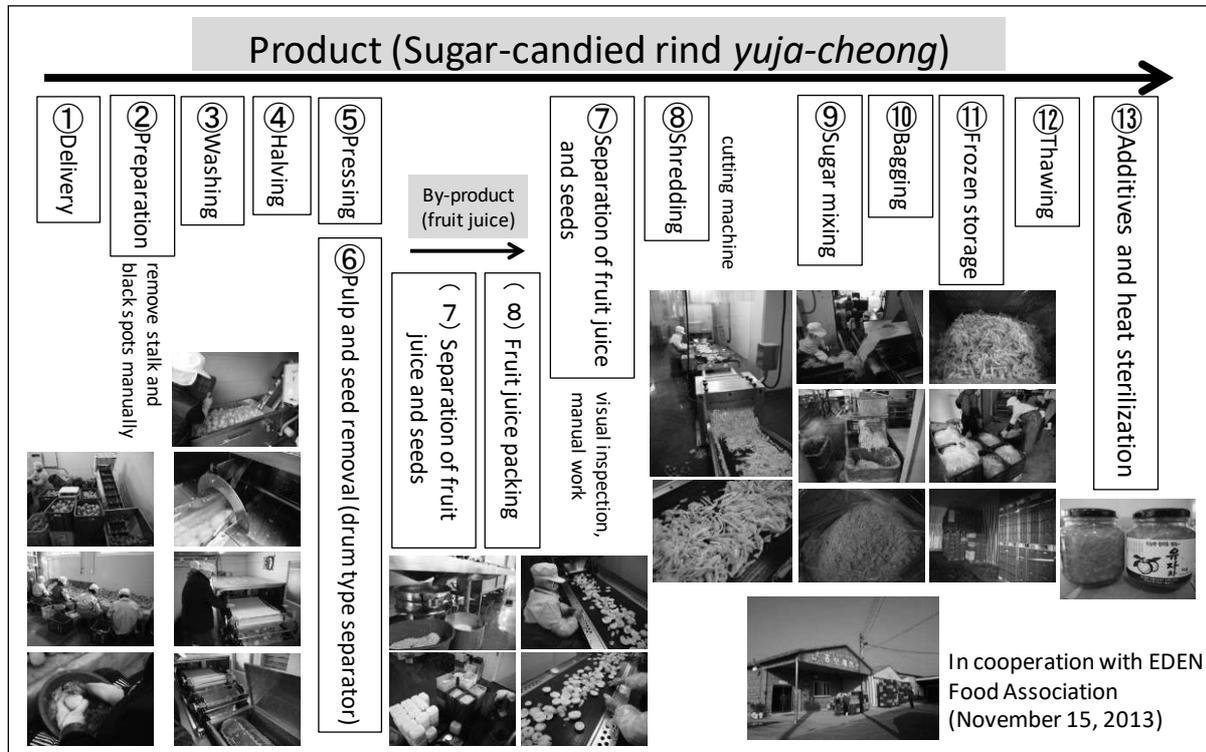
As shown in Figure 8, homemade *yuja-cheong* differs from factory-made products in that it includes not only rind but also yuzu flesh. In the home where our photo shoot took place, the method was handed down from mother to daughter. The yuzu, ordered

from Goheung County at a cost of 65,000 won per 10 kg (approximately 6,900 yen as of November 2014), was used in its entirety to make the most of the purchase without waste. Because the flesh increases sourness in the resulting *yuja-cheong*, sugar and honey are added in a slightly higher ratio (8 kg total) than the fresh yuzu itself, 8 kg of which yields 7 kg of rind and flesh.

Listening to the Korean family talk, I learned that Korean-made and in particular homemade *yuja-cheong* is very highly valued. Although it takes time and effort, the homemade variety is totally different to commercially available bottled *yuja-cha*. In addition to use in yuzu tea just by adding hot water, it can be used as is in traditional rice confectionery *ssal-ganjeong* (see Table 1), and the syrup can be mixed with ganjang (Korean soy sauce) to make sauces in cooking. In the room next to the kitchen, alongside a large kimchi refrigerator stands a food storage shelf filled with bottles of various fermented

seasonings, pickles, and sugar- or honey-candied fruits and vegetables such as trifoliate orange, plums and ginseng. The trifoliate orange fruit is far too bitter to be edible, but the syrup has various applications. In contrast, *yuja-cheong* proves more efficient as there are uses for both the solid and syrup components.

Yuzu fruit fills the Seoul fruit and vegetable market from November to early December but is not available anywhere outside that season. The situation in Japan is very different, with green yuzu available from summer. And right through December, fresh yuzu fruit is widely distributed to meet demand for yuzu baths at the winter solstice and for New Year celebrations. Even outside this extended season, yuzu can be found commercially for use at department stores and in restaurants to flavor dishes. The above shows clear differences between Japan and Korea not only in usage and application of yuzu but also in seasonality.



**Figure 7** Yuzu Rind and Juice Processing in South Korea (Goheung County, South Jeolla Province)

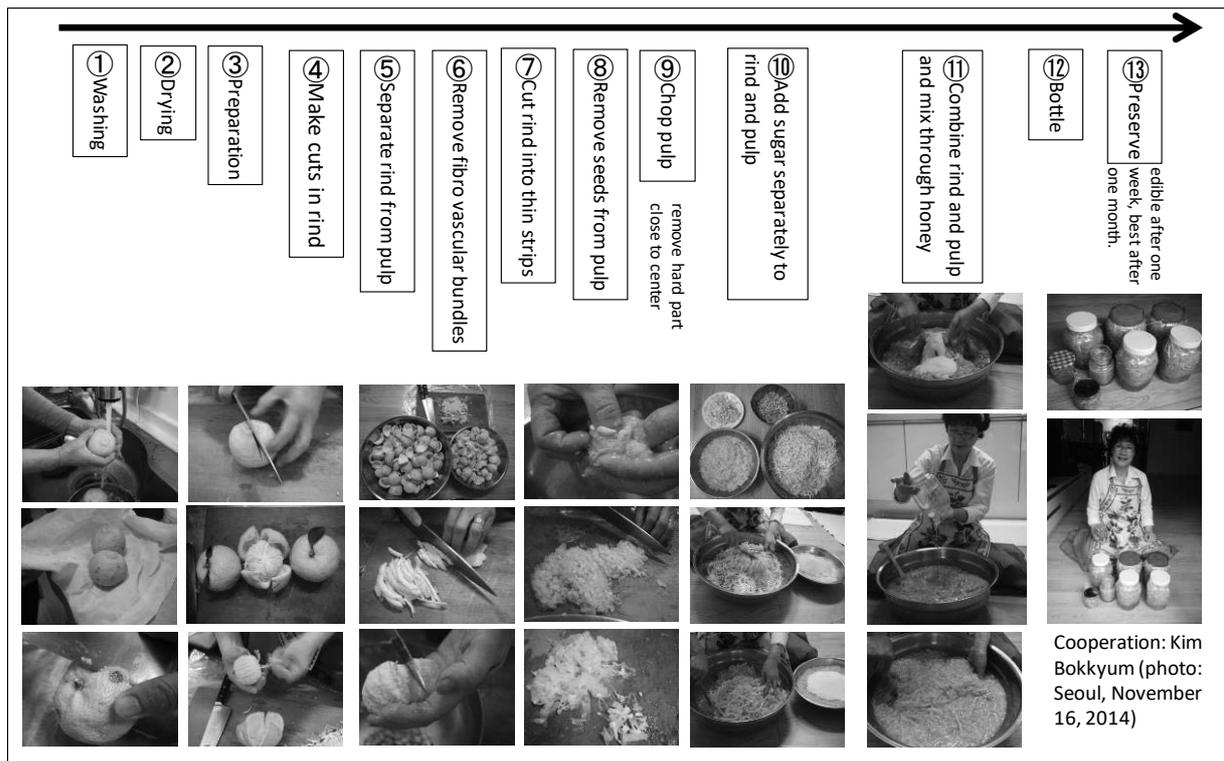


Figure 8 South Korean Homemade *Yuja-cheong* Recipe

### 3.3.2 Korean *Yuja-cheong* and *Yuja-cha*

*Yuja-cheong* unheated candied yuzu rind can be eaten about a week after production, but bottled *yuja-cheong* products are only available in small quantities even in yuzu growing areas. Bagged *yuja-cheong* made at processing facilities are stored frozen in containers and often distributed for business use as the raw material in other products, including *yuja-cha*. Because *yuja-cheong* is not heated, the color changes quickly at room temperature and it has a short expiration date. On the other hand, *yuja-cha* (yuzu tea; in this case referring just to the sweet paste before hot water is added) lasts a long time because of various additives to the base *yuja-cheong* and because it undergoes heat treatment. *Yuja-cha* processing facilities can be found all over Korea because they only need to purchase and process *yuja-cheong*, whereas facilities making *yuja-cheong* must be located in yuzu growing areas because their raw material is the fresh fruit. Figure 9 provides a comparison of the raw materials for *yuja-cha* and *yuja-cheong*.

		<p><b>꿀유자차 Honey <i>yuja-cha</i> ingredients</b></p> <ul style="list-style-type: none"> <li>유자과육: yuzu pulp 65% (국내산 domestic)</li> <li>과즙: yuzu fruit juice 10%</li> <li>정백당: refined sugar 8%</li> <li>벌꿀: honey 4%</li> <li>구연산: citric acid 0.2%</li> <li>비타민: vitamin C 0.5%</li> <li>푸드젤: food gel BF-100 0.3%</li> <li>정제수: purified water 12.0%</li> </ul> <p>*Label notation “Honey Citron Tea”</p>
		<p><b>유자청 <i>Yuja-cheong</i> Ingredients</b></p> <ul style="list-style-type: none"> <li>유자: yuzu 47%</li> <li>정백당: refined sugar 53%</li> </ul> <p>*Label notation “Citron Tea”</p> <p>Products of yuzu processing company, Geoje City, South Gyeongsang Province</p>

Figure 9 Differences in Raw Materials for Bottled *Yuja-cha* and *Yuja-cheong* Products

### 3.3.3 Yuja-cheong in Traditional Korean Confectionery – Yuja-ganjeong –

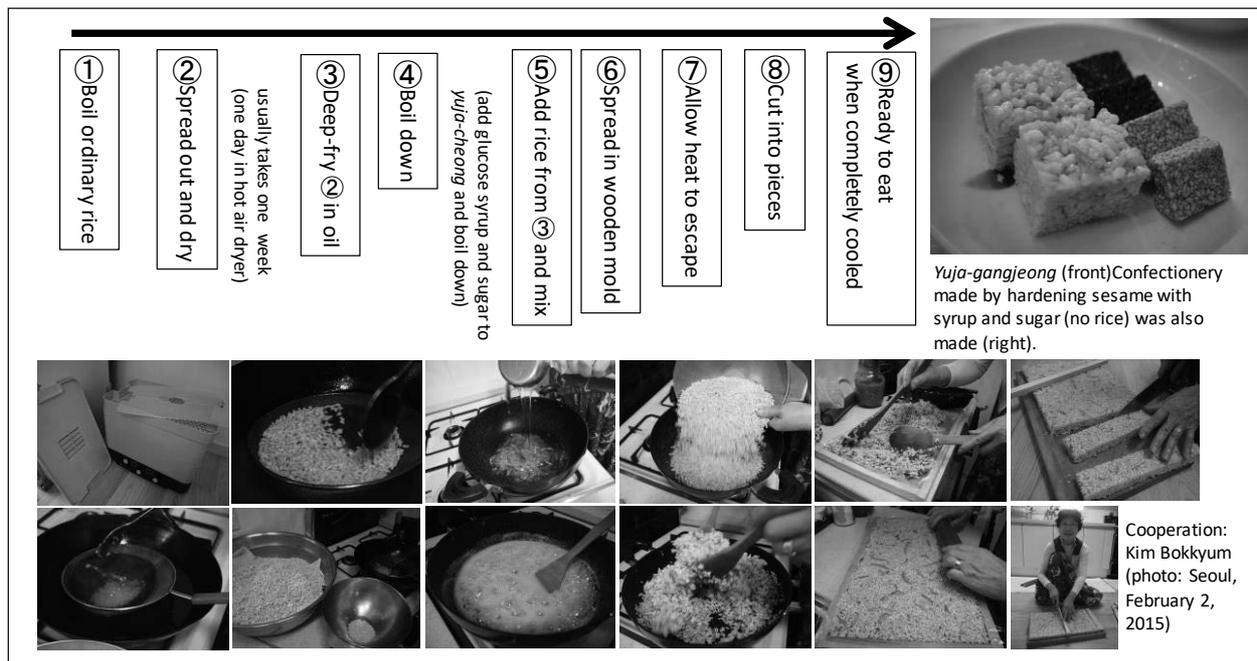
A Korean family showed us how to make yuzu-flavored *ssal-ganjeong* – traditional confectionery using ordinary rice (*ssal* means rice). It is often made for the Lunar New Year celebration using *yuja-cheong* made in November. The recipe, apparently learned from a cooking teacher 45 years ago, requires the ordinary rice to be boiled and dried a week prior to preparation. The rice which has been deep-fried and coated with sugar/honey is spread in a special thin wooden mold and cooled slightly and then quickly cut before completely hardening (Figure 10).

### 3.3.4 Main Japanese Processed Yuzu Goods – Yuzu Juice Production

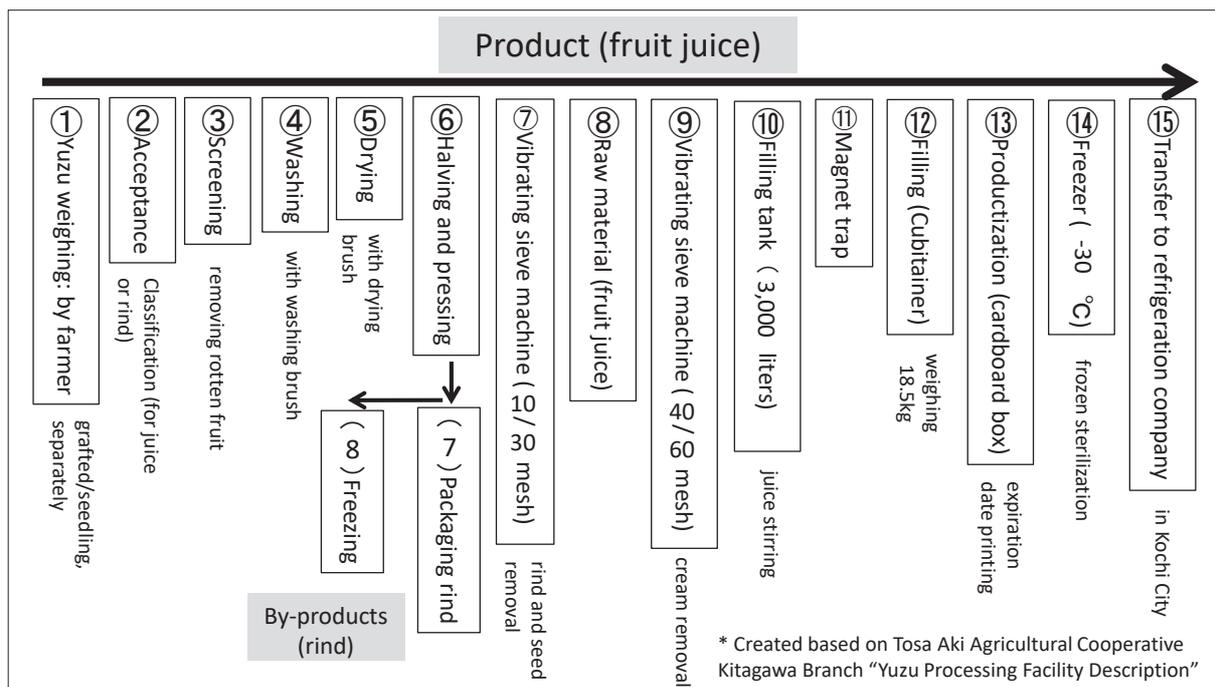
#### i) Japanese Production Process (Kitakawa Village, Kochi Prefecture)

In Japan, the target product is yuzu juice, and the rind is a by-product. In order to obtain highly fragrant juice, whole yuzu fruit is pressed firmly thereby transferring the essential oil found in the oil glands of the flavedo into the juice. After the halved fruit is squeezed through a narrow opening in the press machine, the juice is passed through a sieve in two stages to remove seeds, flesh and cream, and the resulting juice is frozen at -30°C for shipment. The juice is defrosted in portions as needed for use in various processed products.

The rind left after pressing is a by-product that is bagged and either discarded or frozen and stored for external secondary use (Figure 11).



**Figure 10** South Korean Homemade Traditional Confectionery (*Ssal-ganjeong*) Recipe



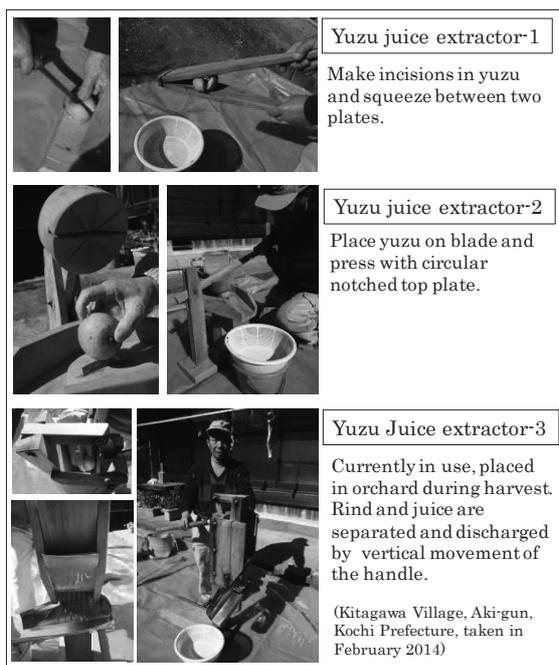
**Figure 11** Yuzu Juice and Rind Processing in Japan (Aki County, Kochi Prefecture)

ii) Yuzu Farmer's Harvesting and Pressing Methods

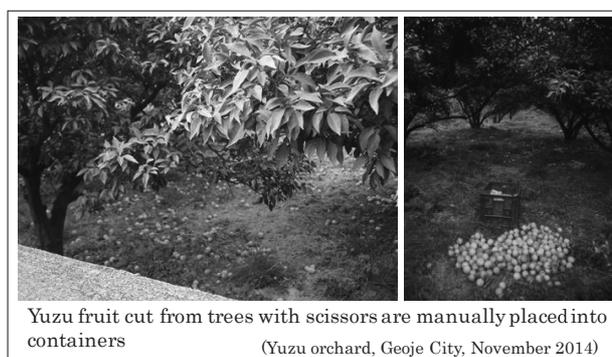
When harvesting yuzu, utmost care must be taken to not damage the fruit in order to avoid spoilage of the juice. The fruit is picked by hand before it falls to the ground. These days, more and more farmers ship whole fruit to juice factories, but in the past it was common for yuzu farmers to press their own yuzu. As shown in Figure 12, specially designed wooden juice

presses are made locally in the growing area, but at present, there is only one woodworker in neighboring Umajimura village who makes juice presses. Some farmers are even said to take their juice presses out into the orchards with them to press immediately after harvesting. In those cases, the rind is discarded in the orchard.

The harvesting method in Geoje, South Korea, in contrast, involved collecting yuzu fruit cut from the trees and dropped on the ground, and putting them in containers (Figure 13). Because the yuzu are harvested for rind, not juice, and because the rind is candied in an equal amount of sugar, the feeling is there is no need to worry about a few blemishes.



**Figure 12** Hand-press Juice Extractor at Yuzu Farm



**Figure 13** Yuzu Harvesting in South Korea

### 3.4 New Yuzu Trends in Japan and South Korea

#### 3.4.1 Yuja-cheong in Western Cuisine and Confectionery and New Applications for Juice and Raw Rind

##### i) In Dressings and Cakes

Yuzu dressing represents a common modern use for yuzu in South Korea. *Yuja-cheong* was found in salads at Korean restaurants and in bottled dressings sold at department stores. The key difference is that in South Korea, *yuja-cheong* is used to flavor and sweeten the dressing, whereas in Japan, yuzu juice is used as a substitute for vinegar.

At a department store in South Korea, a Western-style cake shop was selling chiffon cakes decorated with *yuja-cheong*, and yuzu macarons were becoming standard fare at French confectionery stores. In all cases, the ingredients were thought to be those first processed by candying or heating during the yuzu harvest season for secondary use throughout the year.

##### ii) Use of Yuzu Juice in South Korea

In recent years, there has been a movement to use yuzu juice in South Korea. The ongoing development of various applications of yuzu juice, which until now was simply a by-product of *yuja-cheong* production, were confirmed through regular visits to South Korea, and included yuzu syrup to be diluted to make yuzu beverages, yuzu juice, and yuzu liquor.

In November 2014, when I visited the Goheung County Agricultural Cooperative Facility Factory, the person in charge offered me a taste of yuzu syrup. It was a liquid made of sweetened yuzu juice and honey, sufficiently sweet and delicious to me, but I will never forget how the factory manager and town office staff member offered up the same grimace, rating the juice too sour.

In Japan, the use of ponzu sauces containing highly acidic citrus juice is widespread, and the variety of those containing yuzu has increased in recent years. In South Korea, soy sauce called *ganjang* is combined with vinegar to make *cho-ganjang*, which is frequently served as a dipping sauce for *buchimgae* Korean-style

savory pancakes. However, it is not common in South Korea to mix *ganjang* with citrus juices to make ponzu-style sauces. A major South Korean seasoning company is developing ponzu as a signature Japanese seasoning, but as of 2015 only one type of yuzu ponzu has been identified.

Yuzu juice, not found in 2013, was identified at a convenience store after autumn 2014. Since then, yuzu juice has become a standard product, with glass and plastic bottle products becoming more common. Figure 14 shows yuzu juice varieties purchased in Seoul, Busan and other cities.



**Figure 14** Bottled Yuzu Juice Obtained in South Korea

##### iii) Raw Rind Applications in South Korea

A chocolate shop in Seoul opened by a young female Korean chocolatier in July 2014 sells yuzu chocolate (Figure 15). Here, raw yellow yuzu rind is grated and frozen during the yuzu season for use throughout the year in a mixture with ganache. Awareness of yuzu macarons made by a French pâtissier in charge of product development at a Western-style cake shop in Seoul got the chocolatier thinking that there must be a way to use yuzu besides the traditional Korean application of *yuja-cheong*. Her hint appears to have come from grated lemon zest, which can be found in Western foods and sweets, because she had not considered the equivalent Japanese technique for sprinkling raw yuzu rind called *furi-yuzu*.



When yuzu is in season, the outer rind is grated and frozen to store. It is mixed with fresh cream as needed to make a ganache. Yuzu chocolate is offered year-round until the stock of frozen yuzu rind runs out. (Seoul, November 2015)

**Figure 15** Yuzu Method at South Korean Specialty Chocolate Store

### 3.4.2 Japanese Yuzu Tea Production and Usage

#### i) Use of Korean Yuja-cha in Japan

In recent years, products labeled “*yuzu-cha*” have begun to appear in Japan. South Korean *yuja-cha* (*yuzu-cha*, yuzu tea) is classified into two types. One is prepared by pouring hot water over sugar-candied *yuja-cheong*, and the other is prepared by pouring hot water into *yuja-cha* – a sweet paste of pasteurized *yuja-cheong* with additives that is the base of yuzu tea. The Japanese word “*yuzu-cha*” includes many types in a much broader sense. For the purposes of this paper, Korean-style yuzu tea refers to South Korean *yuzu-cha*.

In recent years, private exchanges have flourished, and food information is regularly shared between Japan and South Korea, leading to mixing of ingredients and mutual influence on the use of ingredients and eating styles. One prominent example is Korean-made Korean-style yuzu tea and the increasing use of it.

In Tsuruhashi, Osaka, where there are many Korean food stores, a wide selection of Korean-style yuzu tea drinks and shaved ice items can be found on coffee shop menus. These are clearly Korean-style items reflective of the locale. But there are also examples in quintessentially Japanese places where Korean-style yuzu tea is served without playing on its connection to Korean-style sweets. Yuzu shaved ice was listed as one Japanese-style shaved ice variety at a Japanese cafe in Arashiyama, Kyoto; and yuzu tea can be found on the menus of nationwide coffeehouse

chains (Figure 16). Korean-style yuzu tea may over time come to be perceived as a Japanese product. I think it will be important going forward to investigate changing trends in distribution of yuzu products as well as the degree of recognition and consumption rates among general consumers.



**Figure 16** Korean-style Yuzu Tea in Japan

#### ii) Classification of Japanese Yuzu Tea

To identify the kinds of yuzu-flavored tea drinks, other than Korean-style yuzu tea, available in Japan, I searched major online retailer amazon.co.jp using Japanese keywords for “yuzu tea” and “domestically produced”. Of course, it only offers a snapshot of one point in time, namely January 2016, but the search results are introduced here for reference (Table 4).

While most were Korean-style yuzu tea products, there were also various flavored tea products made by blending green tea or black tea leaves with dried yuzu rind.

One such commercial flavored tea product blending yuzu rind from Jeju Island with green tea leaves was identified in South Korea in 2014. In Japan, some of the product names specified whether the green tea was regular, *sencha* (middle-grade), or roasted tea. In addition, there were several flavored yuzu tea varieties made by blending yuzu with Japanese black tea.

Because Japan has its own Japanese tea culture using tea leaves, in addition to the uptake of Korean-style sweet yuzu tea, we can also see the development of innovative products made with tea leaves. Separately, the technique of blending green tea with various herbs and dried fruits is thought to have entered Japan from Europe, where flavored teas are common. Interestingly, in Japan, we also found tea made only from yuzu seeds and a flavored tea containing yuzu flowers.

**Table 4** Classification of Japanese-made Yuzu Tea Varieties

<b>Yuzu tea</b>	
Paste	30
Powder	6
<b>Yuzu tea (with tea leaves)</b>	
Green tea blend *1	9
Black tea blend	6
<b>Other yuzu-flavored tea *2</b>	3
<b>Total</b>	<b>54</b>
Total of 153 items returned in search on Amazon.co.jp for “yuzu cha” (as of January 7, 2016), after removing duplicates and non-tea items.	
* 1 Breakdown of tea leaves: green tea 4, sencha 4, roasted tea 1	
* 2 Tea breakdown: Blend of flower and health food tea 1, only seed 1, rind and herbal tea 1	

#### 4. CONSIDERATION

Through examples of yuzu usage in Japan and South Korea, I have outlined the key differences in usage between the two countries and have included examples that show how distinctions are gradually disappearing. Traditionally in Korea, yuzu has been processed into sugar- or honey-candied *yuja-cheong* for secondary use, whereas in Japan, yuzu fruit juice and raw rind have been the key products. However, recent trends show increasing use of Korean-style yuzu tea in Japan and increasing use of yuzu fruit juice in Korea.

When each country uses yuzu to add a local twist to newly introduced Western dishes or confectioneries, the difference in traditional yuzu usage becomes very clear. One good example is yuzu dressing. While the common feature of yuzu use in Japan and South Korea is to enjoy the fragrance, the fundamental

difference is that South Korea uses *yuja-cheong* to add sweetness and Japan uses yuzu juice to add acidity.

Saga-Mizuo in Kyoto City has long been known as a yuzu growing region, and it was there I had the chance to drink yuzu tea at a specialty yuzu restaurant. A simple drink made by cutting raw yuzu fruit in half and adding sugar and hot water was called yuzu tea. Although it is similar to hot lemonade, this method of serving yuzu tea using raw yuzu seems to embody the Japanese preference for raw foods.

Food cultures interact and become blended, but it takes a significant amount of time for fundamental differences to change.

A researcher specializing in citrus fruits with extensive experience visiting Japan, South Korea, and China, suggested there may be differences between South Korea and Japan in preferences for sour citrus flavors. With a regular diet of sour kimchi that has undergone lactic acid fermentation, South Koreans are thought to be accustomed to sour food in general. However, there seems to be some divergence in tolerance for the sourness of citrus fruits, high in citric acid, and the preference for sweetness between Japanese and South Koreans. If so, the development of fresh yuzu juice usage in South Korea will be affected by taste preferences cultivated over many years. Citrus juice preferences in Japan and South Korea is best covered as a separate research topic.

#### 5. CONCLUSION

Full-fledged yuzu cultivation has been undertaken in Japan and Korea for the last 40 to 50 years. We can identify differences in traditional applications of yuzu: South Korea has typically processed yuzu into the sugar- or honey-candied *yuja-cheong* for secondary use, whereas Japan has typically used the juice and raw rind of fresh yuzu fruit. Despite these fundamental differences, mutual influences seem to be leading to the emergence of new and different uses for yuzu in both countries. With further globalization and ever-increasing cross-cultural exchanges, there is a need for qualitative and quantitative fixed-point observations of these changes in yuzu usage.

## 6. ACKNOWLEDGMENTS

I would like to express deep gratitude to the Asahi Group Science Promotion Foundation for their support in conducting this research. I would also like to thank Dr. Masayoshi Sawamura (Kochi University) and Ms. Yoon Mizushi (South Korean food culture researcher) who provided advice for this research, Dr. Mi Sook Cho (Ewha Womans University) and Ms. Li Linwa (DiaryR, Food Culture Portal Co., Ltd.) for their extensive contribution to information gathering in South Korea, and to the many people in South Korea and Japan who cooperated in this survey.

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