

TRADITIONAL PROCESSED FOODS FROM FRUITS AND VEGETABLES AND THEIR PROCESSING TECHNOLOGY IN THAILAND

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ABSTRACT

There are 15 methods of traditional processed fruits and vegetables illustrated in this report. Each process can be applied to the other kinds of fruit and vegetable. These processes are the old methods which are used to preserve the seasonal surpluses of fruits and vegetables in Thailand. According to the principles of food preservation, they are divided into four methods, i.e. drying by sun-drying or evaporation to produce high total solid products, addition of sugar, salt, acid, or combination of them at high concentration, fermentation, and canning.

Most of the traditional processed foods are produced in the home-scale industries. Some products are made day to day and sold directly to consumers. In the past, many products had low quality and short shelflife due to the lack of basic technology and careless of hygienic practice. Recently, basic technology has been transferred to producers by short-course training, personal contact, self-study from newspapers, magazines, text-books and scientific journals. Therefore, most of the problems have been solved. The packages which are commonly used to pack the products are paper bag, plastic bag, plastic bottle, glass and can.

INTRODUCTION

Thailand is an agricultural country which at present can be considered as self-sufficient in the production of foodstuffs for the total population of about 49.0 millions. About 80 percent of the total population, or amount to 39 millions people, are farmers. Total area of 542,373 square kilometres is divided into four regions namely northern, north-eastern, central plain, and southern parts. Fruits and vegetables are grown in all regions of the country. Most of fruits and vegetables such as banana, mango, pineapple, Chinese cabbage, cucumber and chilli are grown in the central plain. Semi-tropical fruits such as longan, leechy and strawberry, and some vegetables such as cauliflower, garlic and onion are grown well in the mountainous northern part. The high production of tomato for processing of paste and Chinese radish for curing are in the north-eastern. *Rambutan* (*Rong Rian* variety) is grown in Surat Thani province (southern part) and *Chompoo* variety is grown in Chanthaburi province (central plain). A good variety of *durian* is presently come from Chanthaburi, Rayong and Prachinburi.

Due to the dense population and high purchasing ability in Bangkok, the central markets of fresh fruits and vegetables are also located in Bangkok. The biggest central market of fresh fruits is the Mahanak market, and of fresh

vegetables is the Pak-klong market. From the central markets, fruits and vegetables are transported to the consumers.

The processing areas of traditional processed foods from fruits and vegetables are located in all regions, but are densely in Bangkok and in the vicinity provinces namely Ayutthaya, Samut Prakan, Nakhon Pathom, Ratchaburi, Nonthaburi and Pathum Thani. All traditional processed foods are in small production, and the processing techniques are transferred in the family from generation to generation. Many processed foods such as dried banana, preserved fruits, dried chilli, cured garlic, ginger, cucumber and Chinese radish, are presently enlarged to small scale industries. Some amount of these products are exported to many countries for Asian people including overseas Thai people.

TRADITIONAL PROCESSED FOODS

Most of the agricultural products especially fruits and vegetables are perishable raw materials. In addition to the hot and humid climate of the country, the rate of deterioration is relatively high due to the chemical reactions and microbial spoilages. The seasonal surpluses and short shelflife of fruits and vegetables are the main reasons to preserve these food materials.

Drying and fermentation are the common methods which are used to preserve most of the fruits and vegetables, since these traditional processes fit very well with the way of living and they involve very simple processes in preparation and also result in highly acceptable products with better keeping quality.

Dried products are divided into two kinds, i.e. directly sun-drying products such as dried banana, dried longan, dried red chilli and dried mushroom, and the others are evaporated products with or without addition of sugar. The evaporated products are mostly in the form of dried fruit pastes such as *durian* paste, pineapple paste, mango paste, papaya paste, tarmarine paste, and *jujube* paste. Some products are in the form of fruit toffee such as banana toffee and tarmarine toffee. Due to the low water content and high total soluble solid, these products are kept very well in the ambient temperature.

The fermented foods are generally produced from vegetables rather than fruits. They involve lactic fermentation. The fermented products include sour Chinese cabbage and sour bamboo shoot. Most of the green fruits are cured in brine to make them constantly in color and texture and better improvement in flavor, such as cured green mango, cured green guava, cured mature tarmarine (unripe stage) and cured garlic.

Many kinds of processed food are cured in high concentrations of sugar, salt and acid, such as mango preserve, banana preserve, pomelo-peel candy, salted Chinese raddish, chilli sauce and cured ginger. One kind of traditional

processed food which is produced directly under heat treatment is the bamboo shoot in brine, packing in 20 litres can.

In the past, many products had low quality and short shelflife due to the lack of basic technology and careless of hygienic practice. Now, the processes and quality of products are improved since the producers have better understanding on basic technology. The shelflife of products is prolonged by using various packages.

PROCESSING TECHNOLOGY

The processing methods that are illustrated in Fig. 1 to 15 are the processes of Thai traditional processed foods from fruits and vegetables. Each process is the example of a particular product and it can be applied to the other fruits and vegetables to produce similar products. However, one should know that some steps in the process may have a little change according to the different raw material which may be different in its characteristics, composition and maturity. The example is in the processing of pomelo peel candy, if the raw material is pineapple, some steps in the process can be skipped such as kneading, boiling in brine, and pressing.

Sun-Dried Banana

Sun-dried banana is a popular traditional food product in Thailand. The relative sweetness, texture and golden brown in color are affected by the stages of maturity of banana. An overripe banana has the maximum sugar content that is suitable for drying. The peel of fully ripe banana is very easy to remove. In the old method, sun-dried banana has a very dark brown color due to the browning reaction. At present, potassium metabisulfite is used by some producers in a concentration of 0.1—0.2 percent solution. Immersion in this solution for 20 minutes is needed to retard the browning reaction. The appearance of treated banana after drying is good in color. The oven drying of banana at 55°C produce a better quality of dried banana than sun-drying, but most consumers prefer sun-dried banana because it has fermented flavor that occur during drying in the dry yard. The moisture content of dried banana is about 15—18%. The method of producing sun-dried banana is shown in Fig. 1. This process can be applied to other types of fruit.

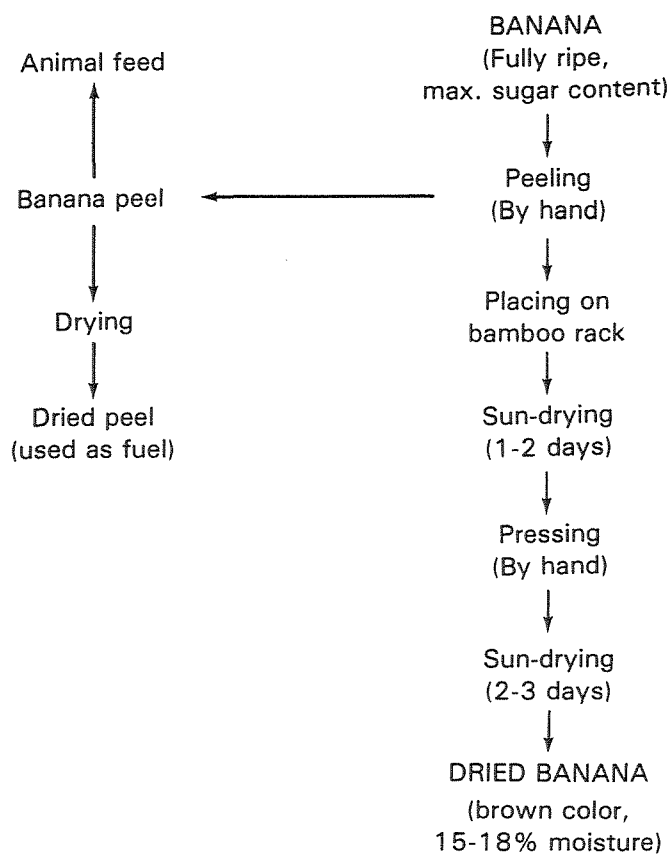


Fig. 1. The method of producing sun-dried banana.

Banana Paste and Banana Toffee

Fig. 2 shows how to produce banana paste and banana toffee. Bananas are types of fruit that are plenty all year, and Thai people do not like an over-ripe banana. Therefore it is necessary to process the over-ripe bananas into different products. The banana paste and banana toffee are products that are made from over-ripe bananas. After peeling, banana is chopped and finished through a screen to remove seeds and produce homogenous banana pulp. The pulp is mixed with sugar and hydrolyzed starch, and sometimes coconut milk, salt and lime juice are added to improve the flavor. The mixture is evaporated in a pan (made of brass) and heat directly until it achieves a proper viscosity of the banana paste. During heating it must be stirred all the time to prevent burning. To further evaporate, the paste is heated until it is more viscous, and the viscous paste is molded into small bars or balls which are known as banana

toffee. The banana toffee is usually wrapped in a plastic sheet or cellophane. The process can be applied to the other types of fruit like mango, durian, pineapple and tarmarine.

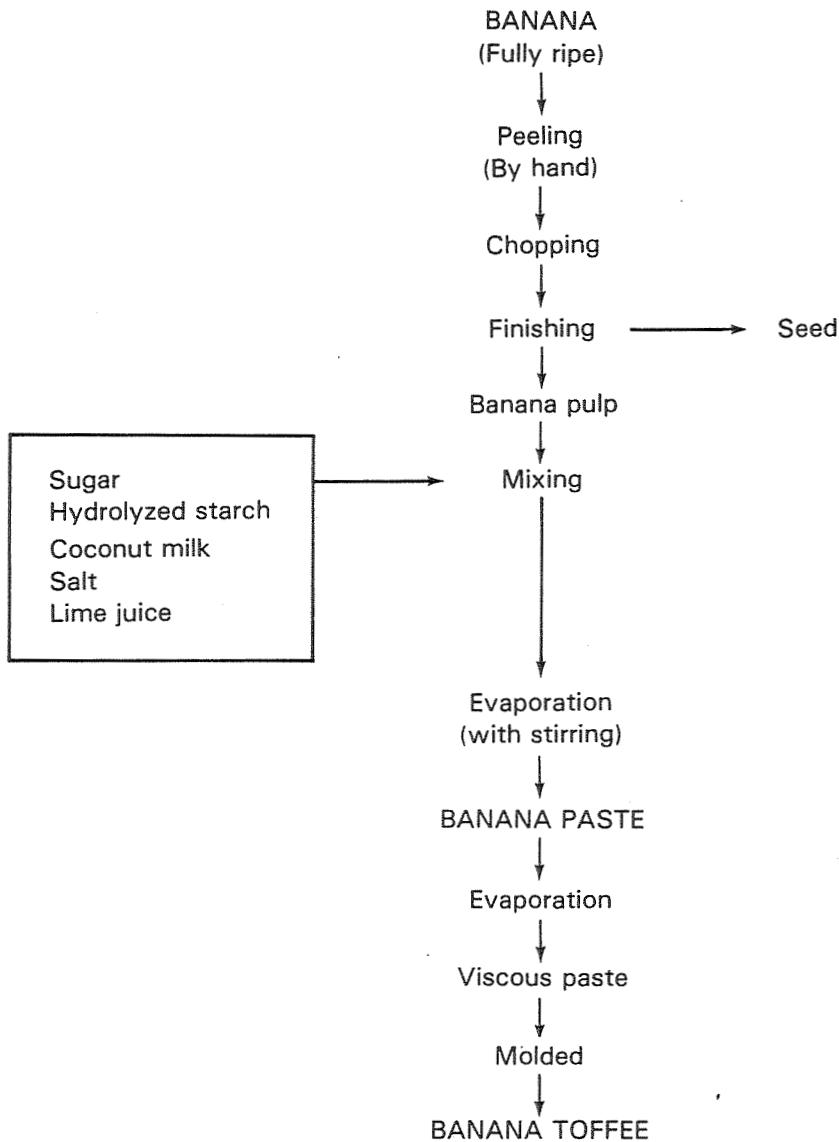


Fig. 2. The method of producing banana paste and banana toffee.

Sugar-Coated Banana

Fig. 3 shows the method of producing sugar-coated banana from green banana. A green banana is difficult to peel and also exudes gum on the cutting surface. To solve the problems, unpeeled banana is sliced with a knife or slicer and then washed in brine or alum solution to remove gum and peel. The sliced banana is soaked in 1 percent lime solution for 20–30 minutes. After draining, it is fried in vegetable oil at temperature about 120°C for 15–20 minutes, and then mixed with viscous syrup. The sugar-coated banana has crystallized sucrose on the surface. This product has short shelflife due to the melting of sugar, loss of crispness and rancidity. This process is also used for producing sugar-coated sweet potato and taro, and these products are classed as snack.

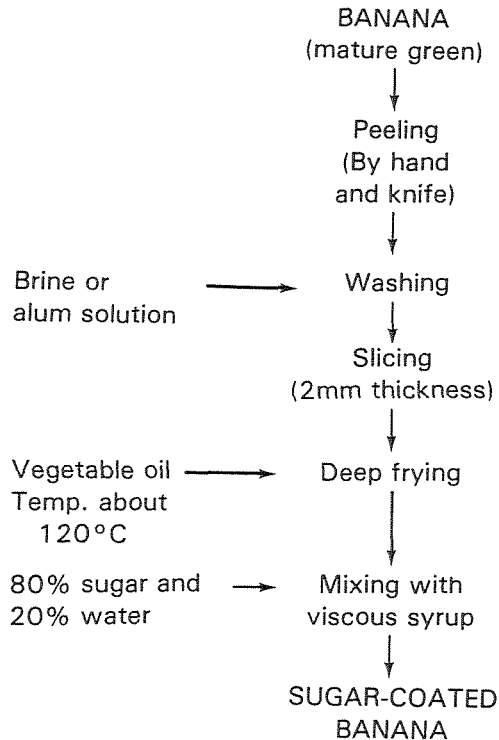


Fig. 3. The method of producing sugar-coated banana.

Toasted Whole Banana

The toasted whole banana is a very old traditional fruit product. It can be made from green or ripe banana. Most consumers like hard texture of toasted whole banana rather than the soft texture. We can make a sweet taste product by pressing the toasted whole banana and soaking in 50% concentration of sugar palm syrup and then toasting again to dry the surface. The process which is shown in Fig. 4 can be used for making sweet-toasted whole cassava root.

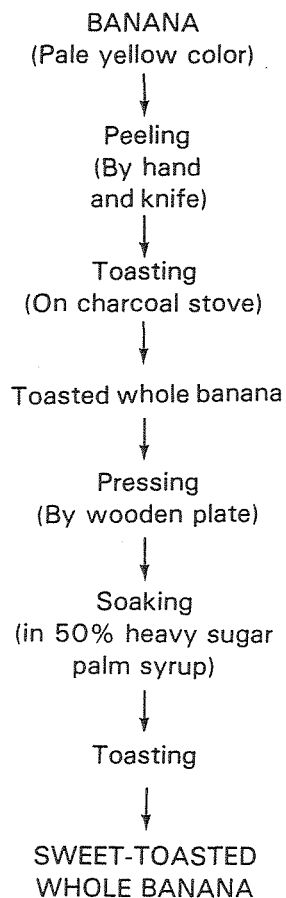


Fig. 4. The method of producing sweet-toasted whole banana.

Mango Paste

The method of processing mango paste is similar to the process of banana paste. It is a dry product which has moisture content about 10–15%. This process can be used to make durian paste, pineapple paste, jujube paste, papaya paste and other fruit pastes.

Mango Preserve

Fig. 5 shows the method to produce products from green mango. There are two steps, the first step is curing the green mango in 15–20% solution of salt, and the second step is producing sweet-sour mango preserve. The cured mango is also a popular product, especially for women. It is sold in the market in the form of desalted whole green mango. From desalted whole green mango, it is peeled, cut and sliced into big pieces. Then it is cured in a mixed

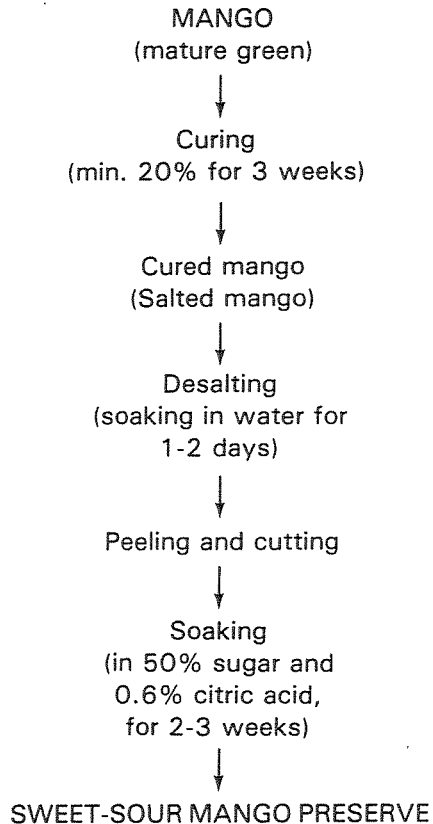


Fig. 5. The method of processing mango preserve.

solution of 40–50% sugar and 0.6–1.0% citric acid. The curing time is about 2 weeks at room temperature. After curing, it is drained and packed in a plastic bag for sale. To prolong the shelflife, sodium benzoate is added to the solution at a concentration of 1000 ppm or less. This process can be applied for producing cured green guava and papaya preserve.

Banana Preserve in High Sugar Concentrated Syrup

Banana preserve in high sugar concentrated syrup is a fruit product made from mature green banana. It is peeled and washed in brine or alum solution to remove gum from the surface. The peeled banana is cut in cross section about

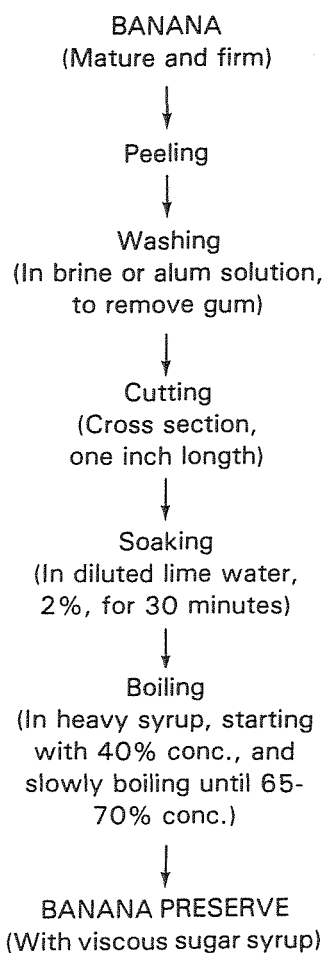


Fig. 6. The method of producing banana preserve.

one inch of length. Then it is soaked in 2% lime juice for 30 minutes to make it firm in texture. The cut banana is slowly boiled in heavy syrup of 40% concentration. By slowly evaporating the water, the syrup is increased in soluble solid and the end point of syrup is at 65–70% concentration. During boiling of banana, its color turns dark red. The banana preserve is normally prepared day to day in market and sold directly to consumers. However, it can be kept for 2–3 days at room temperature without fermentation. This process which is shown in Fig. 6 is applied to make sweet potato preserve, taro preserve and cassava preserve.

Pomelo Peel Candy

Pomelo is a variety of citrus fruit. Its peel is a waste material that can be made into a pomelo peel candy. A thick pomelo peel is suitable for processing rather than a thin one. The detail process is given in Fig. 7. The process involves the step to eliminate the bitter taste from the peel. By boiling the peel in 2–3% sodium chloride brine for 2–3 times, the bitter taste can be eliminated. The kneading and boiling are very important in this process. A consumer does not accept the bitter taste in a pomelo peel candy. Due to the high sugar content in the product, it must be kept well in a moisture proof container. It is normally packed in a glass bottle or plastic box. This process can also be applied to other fruits such as pineapple, tomato, rambutan, longan, papaya and gourd.

Cured Lime in Heavy Brine

Fig. 8 is illustrated to show the process for lime curing in 20% sodium chloride solution. This product is a preserved food. It is commonly used as a flavoring material for special dishes such as duck soup and chicken soup. The selected lime which has yellow skin is boiled in water for 15 minutes or steamed for 20 minutes, and then dried for 4–5 days. It is then cured in 20% sodium chloride brine, and kept in an earthen jar for 3 months. The lime should be kept under brine and the jar should be sealed hermetically. This process can be applied to preserve garlic and onion.

Fermented Chinese Cabbage

A specific variety of Chinese cabbage which has leaves with dark green color and thick stems is used for curing in 2–3% brine. The lactic acid fermentation occurs in 4–5 days. The quality and shelflife of fermented Chinese cabbage are dependent upon the amount of lactic acid which should be not less than 0.5%. Chinese cabbage generally has low sugar content, therefore it is necessary to add a carbohydrate base such as sugar or starch in the curing brine. Some producers prefer to add coconut juice which is a waste product from market, which has about 5% sugar content. The kneading and

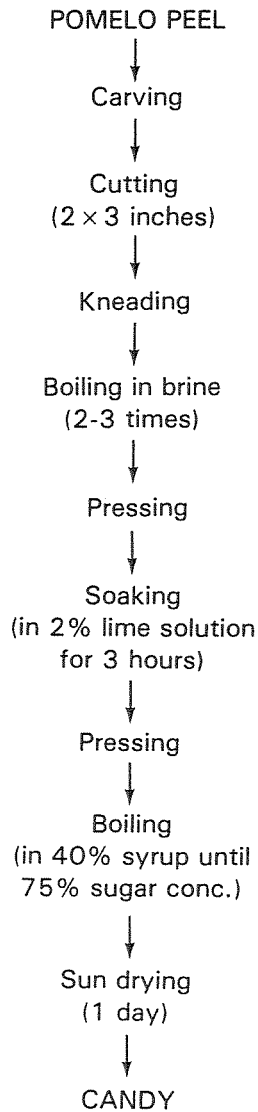


Fig. 7. The method of processing pomelo peel candy.

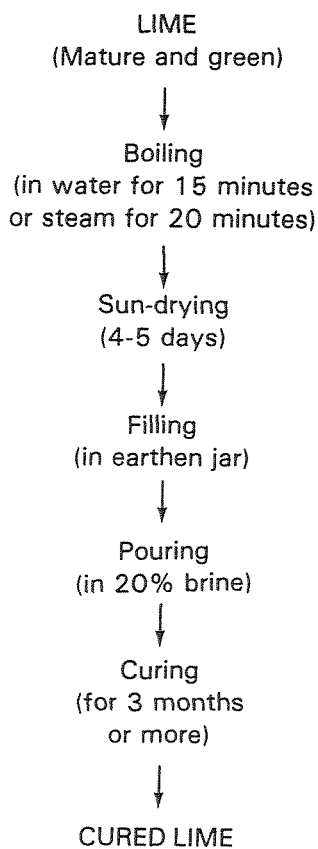


Fig. 8. The method of processing lime in brine.

curing are the important steps in this process. Without kneading or curing properly, a fermented cabbage may have off-flavor and sometimes may have a bad smell. The process that is shown in Fig. 9 can be applied to process sliced bamboo shoot and other vegetables.

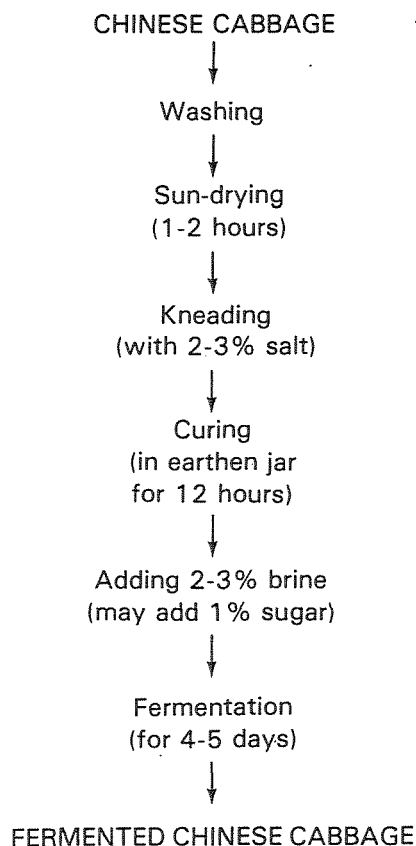


Fig. 9. The method of processing cured Chinese cabbage.

Salted Chinese Radish

The salted Chinese radish is a preserved food for further processing of seasoned salted Chinese radish. It contains about 20% salt. The most important of the process that is shown in Fig. 10 is dry-curing technique. The purposes of this step are as follows:

- a. To use high concentration of salt to exude the water out from tissues.
- b. To salt the tissue for preservation of radish.
- c. To produce a dark brown color, good flavor and aroma during curing process.

The radish is brought to sun-drying in the day and curing in the night or until properly dried, and then it is cured for a month to improve the flavor, odor and color. All the cured radishes are heaped on the wooden floor and the top is

covered with salt and the upper layer is covered with plastic sheet to protect a wet climate, insects and dirt.

The seasoned salted Chinese radish is a product which has a proper sweet and salty taste. The salted radishes were partially desalted and then drained and cured in very heavy syrup for 1–2 weeks. The seasoned salted Chinese radishes are partially dried and packed in a plastic bag of ½ kg or 1 kg and sold to the market. The process in Fig. 10 may be used to make salted Chinese cabbage.

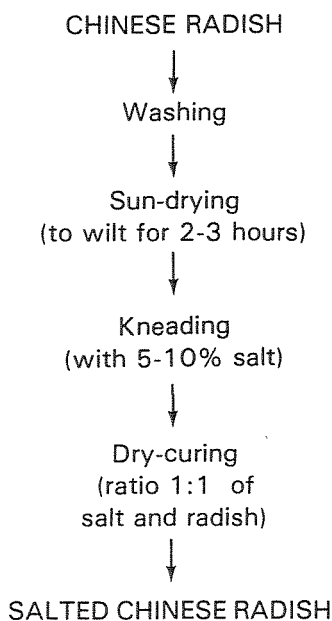


Fig. 10. The method of processing salted Chinese radish.

Sun-Dried Red Chili

Dried red chili is a seasoning product for making curry. Dried red chili powder is commonly added to finished foods such as rice noodle and egg noodle for hot taste and increasing flavor. It is a common process. The red chili is washed and directly dried on sun-dry yard (Fig. 11). Presently, many producers improve their processes, for example by washing the red chili in chlorinated water and also blanching the red chili in hot water before drying. These improvements are done due to the short shelflife of the product, especially the low quality of dried red chili powder. The two main problems with sun-dried red chili are too high microbial load and change of color from red

to dark red color. Washing in chlorinated water and blanching in boiling water can improve the final quality of the product.

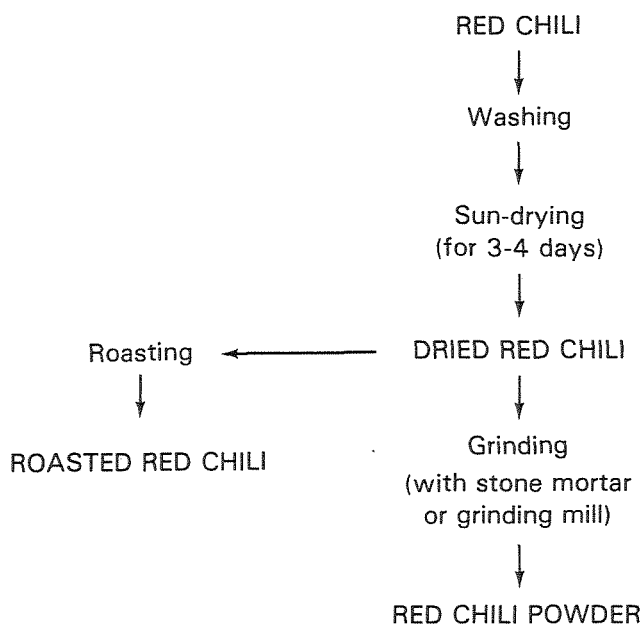


Fig. 11. The method of processing sun-dried red chili.

Chili Sauce

Chili sauce is a product which is made from red chili and mixed with garlic, sugar, vinegar and salt. Other spices can also be added to the chili sauce. This product was firstly processed at the Amphur Siracha in Chon Buri province. Therefore the common name is called Siracha chili sauce. The method of processing chili sauce is illustrated in Fig. 12. The curing of red chili in mixed solution of salt and acid is done to soften the tissue and it is an important step in the process. After curing for a week, the cured red chili is ground using a stone mill to get a very fine homogenous paste. An amount of 10–30% of garlic and 2–5% of sugar are mixed during grinding. The chili sauce is used as a seasoning for fried chicken, fish and others. There are two kinds of chili sauce selling in the market, one is the red chili sauce made from red chili, and the other is the yellow chili sauce made from yellow chili. The popular one is the red chili sauce.

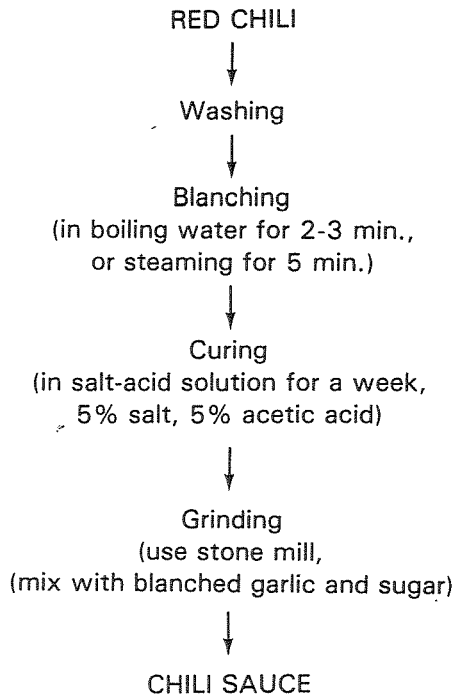


Fig. 12. The method of processing chili sauce.

Ginger Pickle

Ginger is grown plenty in the northern part of Thailand. Most of the young ginger is preserved in high concentration of salt-acid solution before shipping to Japan. In traditional pickling ginger process, the selected young gingers are cured in a mixed solution of fish sauce and sugar for a week. The traditional method of pickling ginger is shown in Fig. 13. This process can be applied to other raw materials such as raw papaya, cucumber and water-melon peel. The pickling products are not commonly used in the Thai diet. They are used with some special diets. The young ginger is also used to make ginger sauce as a seasoning for boiled chicken.

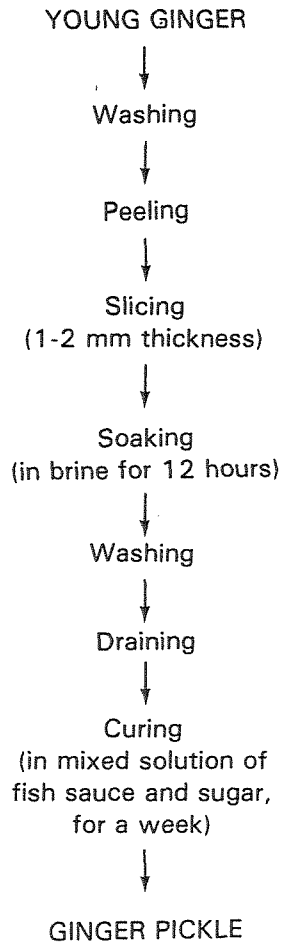


Fig. 13. The method of processing ginger pickle.

Bamboo Shoot in Brine

There are many varieties of bamboo shoots selling in the market. The bamboo shoot of Tong and Luak varieties are used for the process of bamboo shoot in brine. They are commonly packed in a 20 liter can. The bamboo shoot in brine in a 20 liter can is directly boiled using a cooking-gas stove for one hour or more. Before boiling, a small hole is made on the top of the can for vapor outlet and immediately closed after processing. The process of making bamboo shoot in brine is shown in Fig. 14. The bamboo shoot in brine is a very popular product in Thai diet. They have been sold in the market all the year.

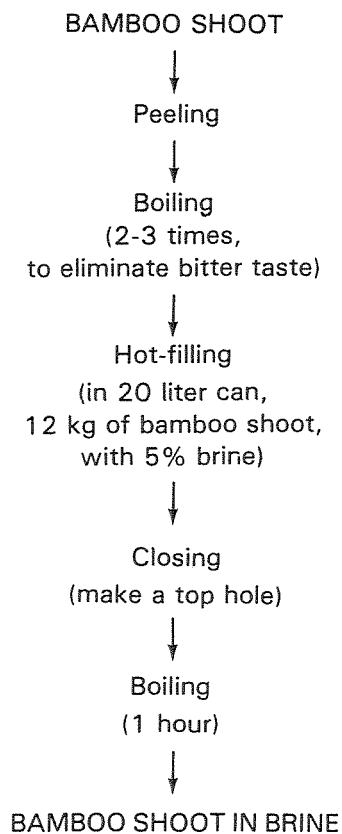


Fig. 14. The method of processing bamboo shoot in brine.

Thai people normally use the boiled bamboo as vegetable to cook with chicken curry. The most popular product from boiled bamboo shoot is yam Noo-Mai which is a food from north-eastern part of Thailand.

CONCLUSION

There are more than hundreds of traditional processed foods from fruits and vegetables have been selling in the market in Thailand. Most of the fruit and vegetable products are processed as small-scale home industries, however, many products are presently processed as business scale. The development of the food products and processing improvements occurred year by year because the basic technology is transferred to producers in several ways. The

qualities of most of the food products are improved to obtain a good appearance, color, texture and flavor. The main objective of the processing development is to prolong the shelflife of the food products. Some food products are processed for a long time and accepted by the consumers, then these products were brought about to set the industrial standard such as standard for chili sauce, seasoned salted Chinese radish, and chili powder. Almost all of the processed foods are packed in small containers to prolong the keeping quality. The containers which are commonly used are plastic film pouch, plastic film bag, plastic box, glass jar, glass jar, glass bottle and can.

The fruit and vegetable products which are selling in the market can be divided into four groups according to the preservation methods. There are dried products or products with high total soluble solids which is achieved by evaporation, products with high sugar, salt and acid concentration or combination of them, fermented products, and canned products. Most of the traditional processed foods are in the first three groups. The bamboo shoot in 20 liter can is the only product that still uses a primitive process by direct heating on a cooking-gas stove.

However, Thai people like to eat fresh fruits and vegetables more than processed foods. So the enlargement of production of the traditional processed foods can not be increased very fast as export processed foods. In the survey, we observed that teenagers prefer the processed foods especially fruit preserves. Therefore the producers should consider the eating habit of this group for the future development, improvement and enlargement of the processed foods.

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