

Key Technology of Peach Industry Chain Development in Zunyi City

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Abstract In order to promote the development of the characteristic industry of fragrant crisp peach in Honghuagang District of Zunyi City, Guizhou Province, and assist the implementation of the rural revitalization strategy, based on the actual situation of the local forest land, this paper studied the development of under-forest economy and the development of products with high added value. Through the combination of field investigation and laboratory analysis, the technology of interplanting soybean in peach orchard was discussed in depth, and the processing technology of high-quality preserved peach was developed. This paper is intended to expand and extend the industrial chain of fragrant and crisp peaches, and to promote the development of modern mountain characteristic and efficient agriculture.

Key words Fragrant crisp peach, Industrial chain, Interplanting soybean, Preserved fruit processing

0 Introduction

Industrial revitalization is the core of rural revitalization. Zunyi City, with its beautiful ecological environment and numerous mountains and hills, has bred abundant characteristic biological resources. In order to make full use of these "local products", peach, as a plant of Rosaceae, *Prunus* and *Amygdalus*^[1], has strong growth adaptability, rich in Ca, P, K and other minerals and vitamins^[2], and has been cultivated for 5 000 years in China^[3]. Peach industry has become one of the important pillar industries to promote modern agriculture and rural revitalization in China^[4].

Zunyi Peach and Plum People's Agricultural Development Co., Ltd. is located in Shenxi Town, Honghuagang District, Zunyi City. With its unique geographical advantages, it is committed to the cultivation and sales of fragrant crisp peach varieties. However, at present, the overall output value of the company is relatively small, and the industrial chain is not perfect. In this study, the peach orchard planting base of Zunyi Peach and Plum People's Agricultural Development Co., Ltd. was taken as the test point, and the research was devoted to the study of under-forest planting technology and the research and development of high-quality preserved peach processing technology. By expanding and extending the industrial chain of fragrant and crisp peaches, and

planning to extend these technologies to similar enterprises in the surrounding areas, the aim is to help local governments vigorously develop modern mountain characteristic and efficient agriculture, thus promoting the revitalization of rural industries.

1 Study on interplanting soybean in peach orchard

Under-forest economy is an ecological agriculture model that makes full use of under-forest land resources and shade advantages to engage in three-dimensional complex production and management such as under-forest planting and breeding, so as to realize resource sharing, complementary advantages, recycling and coordinated development of agriculture, forestry and animal husbandry^[5]. Based on the actual situation of Shenxi Town, the technical regulations for interplanting soybean in peach orchard were formulated.

1.1 Peach orchard and its producing environment Peach trees are suitable for planting in orchards from 6 to 10 years after planting. The environmental conditions of the producing area should meet the following requirements: the pH of the soil should be between 6.5 and 7.5, and the loam with deep soil layer and good drainage and irrigation conditions should be preferred. In addition, the soil environmental quality must comply with the relevant provisions of the *Soil Environmental Quality Agricultural Land Soil Pollution Risk Control Standard (Trial Implementation)* (GB 15618-2018). When planting, it is recommended to use a row spacing of about 4 m × 4 m.

1.2 Preliminary preparation

1.2.1 Seed preparation. Seed preparation includes variety selection and seed treatment. Soybean seeds should be selected from varieties approved by the state or Guizhou Province and suitable for planting in Zunyi area. Varieties with medium and short stalk, strong stress resistance and wide adaptability should be selected. The seed quality shall conform to the provisions of the *Quality Standard for Seeds of Food Crops (Legumes)* (GB 4404.2-1996).

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For seed treatment, complete and healthy seeds should be selected and pre-treated.

1.2.2 Soil preparation and fertilization. It is not suitable for direct cropping or continuous cropping, and the rotation cycle is not less than one year. The topsoil should be loosened and the ploughing depth should be 10 to 20 cm without damaging the peach tree and its root system. About 6 000 kg/ha of decomposed farmyard manure (which can be livestock and poultry manure from the base) and about 600 kg/ha of balanced compound fertilizer were applied.

1.3 Sowing The sowing time should be from late April to early May every year. Three to five rows of soybeans are sown in the forward direction in the wide rows, and the soybeans are dibbled, with 3 to 5 seeds in each hole. The sowing depth is 3–5 cm, the row spacing is 35–45 cm, and the plant spacing is 10–15 cm.

1.4 Field management It is necessary to promptly check and supplement the seedlings, complete the seedlings and fix the seedlings at the right time, and keep 45 000–67 500 seedlings/ha. Weeding shall be carried out within 2–3 d after sowing, and directional spraying shall be carried out at the stage of 3–4 compound leaves. The use of herbicides shall comply with the provisions of the *General Technical Specifications for Safe Use of Herbicides* (NY/T 1997-2011). The foliar fertilizer is sprayed together with the foliar fertilizer of the peach tree in the flowering and podding period. Sprinkler irrigation is used to keep the soil moist. In addition, it is required to adhere to the principle of "prevention first, integrated control", focus on the coordinated control of major local pests and diseases, and use biodegradable pesticides.

1.5 Harvesting It is necessary to harvest in time, conduct threshing and drying, and measure the yield.

2 Study on the processing technology of preserved fruit with milk flavor

Due to the concentrated marketing time of crispy peaches and the short storage time at room temperature, in order to avoid the decay of fresh fruits, some high-quality fresh fruits were processed into preserved fruits to further enhance the added value of products.

2.1 Materials and instruments The main materials are crispy peaches, white granulated sugar, Hetao degreased pure milk powder, food-grade calcium chloride, food-grade sodium chloride and food-grade sodium citrate. The main instruments and equipment include electronic balance, electric blast drying oven, digital display constant temperature heating table, induction cooker.

2.2 Main process flow The technological process of processing preserved peach with milk flavor includes the steps of boiling residual liquid with sugar, mixing defatted pure milk powder at 50–60 °C, material selection → pre-treatment → color protection (hardening) → boiling with sugar → soaking peach slices in sugar → draining sugar → baking → shaping and packing → finished

product.

2.3 Process research method

2.3.1 Selection and treatment of raw materials. Fresh and crisp peaches with uniform size (fruit diameter of 5–6 cm), hard texture, complete appearance and regular fruit shape were selected, peeled, pitted and cut into slices with thickness of 9–10 mm after cleaning.

2.3.2 Color protection and hardening of raw materials. The slices of fragrant and crisp peaches were soaked in the mixed solution of 1.0% calcium chloride, 2.5% sodium citrate and 3.5% sodium chloride for one hour to protect the color and harden, and then drained.

2.3.3 Sugar boiling and soaking of raw materials. First, it is necessary to put the pretreated, color-protected and hardened crispy peach slices into a stainless steel pot, then add 40% white sugar and 100 mL water, and boil them for 15 min at a constant temperature of 100 °C on a constant temperature heating table, take them out and cool them. Then, it is necessary to add 7% skimmed pure milk powder into the remaining sugar solution (50–60 °C) for sugar boiling to fully dissolve and mix well. Finally, it is necessary to immerse the crispy peach slices after pre-treatment, color protection, hardening treatment and sugar boiling in the milk solution for sugar boiling for 6 h, and then take out and drain the sugar solution on the surface.

2.3.4 Drying and shaping of raw materials. It is necessary to put the drained peach slices on a tray lined with baking paper (to prevent sticking), and dry them in an electric blast drying oven at 60 °C for 10 h, so that the preserved fruit can be heated evenly. Then, turn it over every two hours, mainly to prevent surface cooking. When the preserved peach is not sticky, take it out and cool it naturally, and then shape and pack it.

2.4 Analytical methods

2.4.1 Determination method of physical and chemical indicators. (i) Determination of moisture (g/100 g). According to the drying method (atmospheric drying method) of the executive standard method of *National Standard for food safety-Determination of Moisture in Food* (GB 5009.3-2016), three times of repeated determination were carried out, and the final results were averaged. (ii) Determination of total sugar (based on glucose)/(g/100 g). According to the Fehling's Solution method of *National Standard for food safety-General Rules for the Quality of Canned Fruit* (GB/T 10782-2021), three times of repeated determination were carried out, and the final results were averaged. (iii) Determination of fat (g/100 g). According to the executive standard method Soxhlet extraction method of *National Standard for food safety-Determination of Fat in Food* (GB 5009.6-2016), three times of repeated determination were carried out, and the final results were averaged.

2.4.2 Method of microbiological determination. The total number of bacteria was determined according to the standard method of *National Standard for Food Safety Microbiological Examination*

Determination of Total Number of Colonies in Food (GB 4789.2-2022). The plate colony counting method was used for three times, and the final results were averaged.

2.4.3 Sensory evaluation method. Twenty individuals (10 males, 10 females) were selected who were representative, trained, and able to accurately describe sensory experiences. Students of food specialty who had similar food sensory experience and understood the characteristics and evaluation criteria of preserved peach with milk flavor formed a fixed sensory evaluation group. The comprehensive sensory evaluation of preserved peach with milk flavor was carried out from four aspects of color, taste, shape and flavor, and the final result was taken as the average score of sensory evaluation. The total score is 100 points, in which the color accounts for 30 points, including uniformity and transparency; the taste accounts for 30 points, including sweetness and sourness and chewiness; the shape accounts for 20 points, including integrity and texture; the flavor accounts for 20 points, including milk flavor, fruit flavor and no odor.

2.5 Determination results

2.5.1 Results of physical and chemical indicators. The total sugar content of the preserved peach with milk flavor was 61.6% by Fehling solution method, the moisture content was 20.78% by drying method, and the fat content was 0.2% by Soxhlet extraction method.

2.5.2 Results of microbiological indicators. The total bacterial count of preserved peach with milk flavor was ≤ 40 CFU/G by plate counting method.

2.5.3 Results of sensory evaluation. The preserved peach with milk flavor has light yellow color, bright color, uniform and con-

sistent finished product and no impurities, and has the characteristics of rich milk flavor, sweet and sour taste, moderate hardness and chewiness of defatted pure milk powder, full and complete shape, no stickiness, no sand return, sugar flow and the special aroma of fragrant and crisp peaches. The results showed that the optimum processing technology of preserved fruit was as follows: the thickness of fragrant crisp peach slices was 9–10 mm, the formula of color protection liquid was composed of 3% sodium chloride, 2.5% sodium citrate and 1% calcium chloride, hardening treatment for 1 h, the addition of white sugar was 50%, the cooking time was 15 min, and the addition of skim pure milk powder was 7%. Under the condition of soaking in sugar for 4 h, after baking at 60 °C for 10 h, the product was light yellow, bright color, moderate sweet and sour, rich in nutrition, rich in milk flavor, and good compound taste.

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