

Advantages of Nanchong City in Developing Late-maturing Citrus and Countermeasures

Zhen HE¹, Guoqin WEN^{2*}

1. Nanchong City Fruit Tree Technical Guidance Station of Sichuan Province, Nanchong 637000, China; 2. College of Life Science, China West Normal University, Nanchong 637000, China

Abstract Nanchong City has the advantages of developing late-maturing citrus in ecology, no-quarantine diseases and insect pests, base construction starting taking shape, production and management technology becoming increasingly mature, leaders paying close attention and market recognition, and significant income increase of fruit growers. However, there are also problems such as weak infrastructure and weak anti-disaster ability, inadequate technology extension system, unmatched cold chain warehouses, and uneven quality of seedlings. Therefore, it is recommended to make scientific plan in accordance with actual local situations, regulate fine variety breeding and market supervision, build orchards with high standard and strengthen management, do a good job of propaganda and branding, improve post-harvest processing, extend the industrial chain, and issue preferential policies to promote the development of citrus industry in Nanchong City.

Key words Late-maturing citrus, Advantages, Problems, Countermeasures, Nanchong City

1 Introduction

Nanchong City, located in the northeast of the Sichuan Basin and the middle reaches of the Jialing River, belongs to the humid subtropical monsoon climate zone in China. It has four distinct seasons and rainy and hot days come in the same season. With a long history of planting citrus, Nanchong City is the main producing area of Sichuan citrus, and also the core area of national "citrus orange belt in the middle and upper reaches of the Yangtze River", and has the gifted natural conditions for developing the late-maturing citrus. At both home and abroad, the competition in the citrus market is becoming increasingly fierce. Nanchong City should make full use of the advantages of no hot days in summer and no cold bitter cold in winter, to energetically develop late-maturing citrus, so as to avoid grabbing the market with early-maturing citrus of Hubei and Hunan and middle-maturing citrus of south Jiangxi. Avoiding competition with other advantageous areas is a wise and inevitable choice for sustainable development of citrus industry in Nanchong City.

2 Advantages of Nanchong City in developing late-maturing citrus

2.1 Gifted ecological advantages China is located in a continental monsoon climate zone. Except for the low-altitude river valleys in Yunnan and areas along the Yangtze River's upper and middle reaches, the development of late-maturing citrus varieties is restricted by the low temperature in winter in most domestic production areas. The annual average temperature of Nanchong is

17.2°C, the effective accumulated temperature of $\geq 10^\circ\text{C}$ is 5 500°C, the annual sunshine is 1 100–1 200 h, the annual rainfall is about 1 100 mm, the sunshine is rich, rainfall is plentiful, no severe cold in winter, no hot days in summer, very suitable for late-maturing citrus.

2.2 No quarantine diseases and insect pests At present, no citrus quarantine insect pests or diseases have occurred or spread in Nanchong City. Although there have been many incidents of inoculation of citrus seedlings with canker disease in recent years, citrus canker disease has been effectively curbed by active treatment and close prevention and control by relevant agricultural departments. Besides, the local government attached great importance to the establishment of the system of seedling breeding and strict control of seedling quality. There was no quarantine disease such as citrus canker disease and greening disease in the whole city, and the risk of devastating insect pests and diseases in the citrus industry was relatively low.

2.3 Base construction starting to take shape In 2009, Nanchong Municipal Party Committee issued *Opinions of Nanchong City People's Government Office and Municipal Party Committee on Implementing Double Hundred Project* (No. 2009-21), taking the development of late-harvesting and late-maturing citrus as an important gripper of citrus industry in Nanchong City. In accordance with the principle of "foundation first and four networks supporting", Nanchong City launched the movement of citrus base construction. Counties (cities, districts) took the construction of citrus bases as the first choice project for increasing agricultural efficiency and helping farmers to get rich, social participation became unprecedentedly high. This attracts a large number of owners from Meishan of Sichuan Province, Zhejiang and Guangdong to go to Nanchong City to develop the citrus industry. At present, Nanchong has built many large areas of high-standard late-matu-

Received: January 5, 2018 Accepted: April 3, 2018

Supported by the Meritocracy Research Fund of China West Normal University (17YC348); the Scientific Research Project of China West Normal University (12B021).

* Corresponding author. E-mail: 44000712@qq.com

ring citrus bases in south Dongba - Tiefata - Meijia, basin of Jialing Qushui River, basin of Xichong Longtan River, and Yilong Saijin. By the end of 2017, Nanchong had built 10 000 ha late-maturing citrus base.

2.4 Maturity period gradually becoming matched In 2000, Nanchong City Fruit Tree Technical Guidance Station established the fine citrus breeding ground in Xichong County, introduced many new citrus varieties such as Buzhihuo and Qingjian. However, due to backward supporting technology research and development, and extension, the promotion area was small and the benefit was low. In 2010, late-maturing citrus in Meishan and Pujiang of Sichuan appeared as a dark horse, which promoted the development of late-maturing citrus in the whole Province. In the same year, Nanchong municipal government promulgated the *Opinions on Vigorously Implementing the One Million Ton Citrus Industry Project* (No. 2010-112), and successively introduced W. Murcott, Chunjian, Qingjian, Daya, Walter, and Tarocco late-maturing varieties. At present, late-maturing citrus in Nanchong City are mainly Chunjian, Buzhihuo, Tarocco and Qingjian maturing in February - May of the next year. From Spring Festival to June and July, there are fresh citrus fruits on the market. In addition, Nanchong City has introduced more than 30 varieties of late-maturing citrus to conduct adaptive observation experiment.

2.5 Production and management technology becoming increasingly mature Through years of planting practices, explorations, demonstrations, and summaries, the scientific and technical personnel and fruit growers in Nanchong City have developed key integration technologies for citrus, including container seedling breeding, wide cage deep furrow ridging, film covering, fertility and water integration, shearing-free saplings, and delayed cultivation, winning the first prize for scientific and technological progress in Nanchong City in 2014 - 2016, which provided strong technical support for the development of local late-maturing citrus industry.

2.6 Leaders paying close attention and market recognition Previous municipal governments and party committee leaders have taken the citrus industry as the first pillar industry of agriculture, and have issued many guidance documents to promote the development of citrus industry. In 2017, Nanchong Municipal Party Committee No. 1 document set forth "building a modern plantation industrial park with the citrus as the basis" to raise the citrus industry to a new height. In recent years, late-maturing citrus, especially high-quality ones, have been highly favored by consumers. The market demand for late-maturing citrus is constantly growing. Because the production of late-maturing citrus needs specific planting conditions, many areas are not suitable for planting late-maturing citrus. The market gap is large, thus the development of late-maturing citrus in Nanchong City just meets such requirement.

2.7 Significant benefit increase of citrus growers The sales of fresh oranges in China are mainly concentrated from November to January of the following year. Late-maturing citrus is mainly

sold in February to May, and can last till August by technical means. Late-maturing citrus has advantage of high quality and easy peeling, high market price, the average price is above 10 yuan/kg, and the average output value is higher than 20 000 yuan/667 m², and the benefit increase of fruit growers is significant.

3 Problems in development of late-maturing citrus in Nanchong City

3.1 Weak foundation and weak anti-disaster ability (i) Most orchards have weak infrastructure, especially the construction of water storage and water transmission pipeline lags behind, basically "living at the mercy of natural forces", and the ability of resisting drought and disasters is low. Some orchards do not have water source, no water storage for irrigation. Thus, once there is drought, it will be short of water; once rainstorm occurs, there will be floods. (ii) In recent years, abnormal weather frequently occurs, which brings different degrees of impact on the citrus production and sales. For example, due to extreme cold weather in early 2016, the late-maturing citrus suffered huge losses, some orchards were even completely destroyed.

3.2 Inadequate technology extension system Compared with 6 to 9 months of early and middle maturing citrus varieties, late-maturing citrus varieties have a fruiting period of 10 to 13 months. They have a long period of time for management and maintenance, especially they have to pass the winter, so the management is difficult. The production of late-maturing citrus needs technical support. However, most of the township agricultural technical service centers in the city are not equipped with professional citrus technicians. The contradiction between the "large citrus industry and small technical teams" is relatively prominent.

3.3 Cold chain warehouse not matched The post-harvest, transportation and short-term preservation of late-maturing citrus require refrigeration and cold chain transport facilities. The whole city of Nanchong has the fresh citrus storage capacity of about 50 000 t, while the annual production output of agricultural products is about 7.6 million t, showing that the storage capacity is quite inconsistent with the output capacity.

3.4 Uneven quality of seedlings Since the late-maturing citrus market is booming, the demand for seedlings has increased rapidly. The quality of seedlings purchased in some places is not strictly controlled, leading to input of weak or sick seedlings, and bringing hidden danger to the development of citrus industry.

4 Countermeasures

4.1 Making scientific plan in accordance with actual local situations Focusing on the overall goal of the "100 billion yuan cluster of modern agriculture" in the whole city, it is recommended to break administrative divisions, make unified plans, and promote citrus production in large areas. The municipal citrus base townships (towns) must be connected together, implement "all-in-one" development without interference from other industri-

al projects. In the region, it is recommended to bring into play resource advantages, take the basin of Jialing River as the main axis, build Jialing River late-maturing citrus belt, to form an industrial scale. In the aspect of species, it is recommended to select varieties suitable for the ecological conditions in Nanchong such as Chunjian, Tarocco and Qingjian, to tackle the problems of concentrated coming into market, sales difficulties, and low benefit. Once the plan is confirmed, it is required to maintain its seriousness and continuity, so that changing teams do not change the industry, changing ideas does not lose the market, so that the development of the industry is not interrupted.

4.2 Regulating fine variety breeding and market supervision

According to the idea of "the city building a female parent orchard, variety comparison orchard, and county (district) building seedling base" in the city, it is recommended to establish effective fine citrus breeding system. First, the municipal government should allocate special funds to support municipal business department to establish citrus seed bases. It is recommended to select good local varieties with good performance and introduce the best domestic and foreign varieties, municipal business department should build female parent orchard and variety comparison orchard, to provide citrus variety resources for sustainable and healthy development of the citrus industry. Second, it is recommended to regulate the construction of nursery bases and cultivate qualified and healthy citrus seedlings. Third, it is recommended to strengthen supervision, implement strict quarantine over citrus seedlings, to avoid input of dangerous insect pests and diseases.

4.3 Building orchards with high standard and strengthening management

It is recommended to take the infrastructure first, integrate the four networks (water network, power network, road network, and field network), connect four ditches (main ditch, lateral ditch, side ditch, and back ditch), implement scale development, promote in the whole village and township, and make plan at high starting point, construction with high standard, and maintenance at high level, to ensure citrus growers can obtain real benefits and strengthen their development confidence. It is recommended to do a good job in technical training and comprehensively improve the fruit technology level of fruit growers, vigorously implement standardized management, promote the new technologies such as gathering soil and ridging cultivation, soil testing and formula fertilization, reasonable intercropping, shear-free of saplings, green prevention and control of insect pests and diseases, delayed cultivation, and film covering, and mechanized cultivation. In addition, it is recommended to carry out construction of high-yield demonstration orchard, revitalize existing resources, increase the yield, and increase benefits of fruit growers, to make the fruit industry become the industry that can help farmers getting rich.

4.4 Doing a good job of propaganda and branding Relying

on the construction of regional brand "Nanchong Jiazuo", it is recommended to take the key leading enterprises or professional associations as leaders to develop products with the right to use trademark and the right to make packaging, and the right of advertising, encourage various production and operation organizations to be unified to the regional brand "Nanchong Jiazuo", build the flagship of production and operation, and go to the overseas market together. Nanchong City should make effort to hold "China – Nanchong Citrus Festival" every two years, hold 2 – 3 times of product promotion meetings, news conferences, to raise the popularity and influence power of Nanchong citrus.

4.5 Improving post-harvest processing and extending the industrial chain

It is recommended to strengthen the construction of fruit commercialization production lines and fruit cold chain facilities and equipment. (i) The primary processing of production areas. It is recommended to comprehensively promote the production line in every city-level base town (township) with 3 – 5 years of effort. Every town (township) should at least introduce one set of commercialization production line and build one primary processing base. (ii) The construction of cold chain facilities and equipment. Every county and city should build one cold chain storage platform. (iii) It is recommended to strengthen the establishment of post-harvest supporting marketing facilities for citrus, set up a citrus market information platform, and establish stable and smooth sales channels and marketing networks at both home and abroad.

4.6 Issuing preferential policies to promote the development of citrus industry

All counties (cities, districts) should formulate preferential policies to attract owners, leading enterprises and other organizations to develop the citrus industry, stimulate the construction of industrial bases, and consolidate the achievements of industrial development. (i) It is recommended to provide reasonable compensation for the establishment of the system of fine variety breeding system, the purchase of citrus seedlings, the rent before the start of new-type business entities, the daily management of orchards, and the construction of associations (cooperatives). (ii) It is recommended to encourage and support professional technicians to retain their post and their salaries, lead to set up citrus orchards or set up citrus orchards by themselves or contract citrus orchards. (iii) It is recommended to establish and improve the agricultural insurance system and enhance the ability of enterprises, professional cooperatives and large citrus clients to resist risks. (iv) It is recommended to increase capital investment, integrate projects such as transformation of middle-and-low-yielding fields, water and soil conservation, modern industrial base construction, and land consolidation, and coordinate financial funds and encourage social capital investment in the citrus industry.