

Present Situation of Chinese Hawthorn Picking

Chunxiao Li^{1, a}, Xin Zhu^{1, b}, NDEGWA IAN MAINA^{2, c}, Lukuan Shao^{2, d}, Jing Li^{1, e}

¹ School of Agricultural Engineering and Food Science, Shandong University of Technology, Shandong 255000, China

² School of Mechanical engineering, Shandong University of technology, Shandong 255000, China

^a1932950383@qq.com, ^b2931020014@qq.com, ^cianndegwa007@gmail.com, ^d2966288007@qq.com, ^e1211400300@qq.com

Abstract

Hawthorn is a kind of deciduous tree in the hawthorn family, the highest can grow to about 6 meters, in the north of China, especially in China's Shandong province is the main planting area of Hawthorn, China's south in Yunnan province also have planting. Hawthorn yield is big, the trunk is tall, so there is personnel easy to cause casualty accident in picking process, and artificial operation efficiency is low, artificial cost is high. At the same time, in the process of existence, the staff labor intensity is big, hawthorn collision is serious, there is poor quality. Therefore, the present situation of the existence of Hawthorn in China is studied and discussed in this paper to provide some reference for the development of the machinery of the existence of Hawthorn in China.

Keywords

Hawthorn Picking; Artificial Operation Efficiency; Hawthorn Collision.

1. Quote:

Hawthorn has had 1700 years planting history in our country, and in a few famous medical works of our ancient times, there are some records about the common knowledge of hawthorn. Hawthorn is a kind of warm fruit, not only can promote the digestive effect of the human intestine, but also can dissolve the congestion in the human body. As the development of medical technology now, experimental instruments and technology more advanced and perfect, hawthorn more medical value was excavated, and through the study of hawthorn leaf and hawthorn nuclear, researchers discover hawthorn leaf and nuclear also have very big medical value.

There are already many examples of hawthorn being used in clinical medicine. Our country has applied hawthorn and a few hawthorn products to the medicine that treats cardiovascular disease. Our country still has the medicaments that a few use at treating tall blood fat, also regard hawthorn as its main component among them, and after edible in a few patients, medical researcher checks discovery, hawthorn pharmaceutical can have the effect that reduces cholesterol better. Hawthorn is best known for its medical use in promoting absorption of the digestive system, treating indigestion in children, as well as treating diarrhea and improving probiotics in children.

Hawthorn taste slant acid, but in our country still many people like hawthorn to serve as a kind of fruit to eat, especially because of the anti-oxidation effect of hawthorn is very strong, so a few people can often eat hawthorn to maintain his beauty. In addition, hawthorn can also be made into sugar hulu, is a very famous characteristic food in China, loved by the public.

2. The Present Situation of Hawthorn Planting in China

2.1 The Main Varieties of Hawthorn in China

There are two main varieties of Chinese hawthorn. One is hawthorn, which grows in the lower Yellow River, and the other is Yunnan hawthorn. In these hawthorn planting area, which located in the Yellow River downstream - Shandong and China's northeast three provinces of hawthorn planting area are the most important production area of Chinese hawthorn, its total output is as high as 90% of China's total output.

2.2 Planting Area and Yield of Hawthorn in China

At present, the total planting area of Hawthorn in China can reach 670,000 hm², and the total output can reach about 1.5 million tons. Shandong is China's important hawthorn production, its planting area and yield have a large proportion of the overall situation of China's hawthorn. In 1987, the total output of Shandong province reached 61,000 tons, accounting for 41.5% of China's total output, ranking first in China. But since 1990, Shandong hawthorn planting area and production declined sharply, but in recent years with a certain warming phenomenon, and according to the Shandong Provincial Department of agriculture survey statistics show that by 2019, Shandong province's hawthorn planting area reached 1.860,000 hm², the output reached 300,000 tons. Hawthorn's planting is affected by the price rise in our country, and thus has great change, which in the middle of the 1970s, Chinese hawthorn planting area and increasing dramatically because of the price of profits, but too much hawthorn led to inflation, since then, the sharp decline in the price of the hawthorn, planting area is also greatly reduced accordingly. In recent years because of hawthorn market prices tend to be stable and have a growing trend, especially because of China's hawthorn varieties to improve, taste better, become a popular fruit, China to Shandong as an example of most areas began to increase the planting area of Hawthorn.

2.3 Hawthorn Planting Management Technology in China

Hawthorn tree is planted in the mountainous area with good illumination intensity more, and the planting geomorphology of our country belongs to hilly mountainous area and plain little geomorphology exactly, because this suits planting hawthorn very much. Hawthorn growth environment requires the average temperature of a year in 10 degrees or so, and precipitation can not be too much, soil needs to be lower water content of the sandy loam, so this is our country's hawthorn planting big province for Shandong province. Shandong is hilly mountainous area, soil is dry, soil layer is thicker and fertile, therefore suitable for the growth of hawthorn. Hawthorn is higher to the illumination requirement, so when planting hawthorn, we should pay attention to the distance between tree and tree, generally need to keep in the row distance and column distance are 3 meters or so, keep this distance is still conducive to mechanical operation. Hawthorn in the planting of the building also need to pay attention to the groove used to prevent soil erosion, because the root of the hawthorn tree can not be very deep, so sometimes also need to hawthorn film mulching operations.

Hawthorn tree pruning is also a very important operation in planting management, when hawthorn tree's growth reach to a certain extent, it is needed to trim the branches properly, generally people will retain 3 the most robust branches as the main branches, and later every winter to its pruning. At the same time, when pruning, ensure that the main stem of hawthorn tree is 70~100cm, and if the degree of drought in the planting area is high, the main stem needs to be pruned in 60~70cm or so.

3. Our Country Existing Hawthorn Picking Method

3.1 Manual Picking

China's current main hawthorn picking method is artificial picking, its process needs staff to carry a basket for picking operations, staff also need to climb ladder pedal. Because hawthorn trees are different from other fruit trees, their trunks are thinner and some trees are as high as 6 meters, so the ladder that workers have to climb is higher and more dangerous, resulting in higher risk of disease

and injury. Hawthorn fruit is round, small, bearing a large number of fruit, so picking efficiency is low. Now most farmers will choose to use PVC to make hawthorn leaves ripen, the leaves drop quickly, so it is more easier to pick hawthorns, although this method can achieve the purpose of saving time and labor, but this method will lead to the staff in the process of spraying aspiration of pesticides, pesticide poisoning, affect the health of the operator. Also, spraying ethephon on hawthorn trees can cause the fruit to become contaminated, making the fruit more dangerous.

3.2 Existing Chinese Hawthorn Picking Machinery

3.2.1 Five Degrees of Freedom Hawthorn Picking Mechanism

Our country exists a five degrees of freedom, which is developed in view of the hawthorn picking mechanism, due to the special nature of hawthorn, the fruit more smaller compared with apples, pears and peaches, existing fruit picker is difficult to use, so the Chinese hawthorn picking machine research and development is very little, at present our country has a few special picking mechanism used in hawthorn. The picking mechanism can not only achieve five degrees of freedom of hawthorn operation, but also use $D \sim H$ parameter method to establish the movement equation of the picking mechanism. Additionally, Matlab software is used to fit the corresponding motion curve to find the best working characteristics of the mechanism, and verify whether the picking mechanism has a certain rationality.

The base of the picking mechanism can be rotated, in order to determine whether manipulator and hawthorns, located on the same line. The big arm and the base of mutual rotation is used to determine the picking manipulator to a certain height. With the cooperation between the forearm and the big arm, it will help determine the fruits arrived at the plane. The mechanism also determines the hawthorn fruit within a certain range through the rotation deviation of the connecting mechanism between the forearm, and finally uses the cutting device of the mechanical hand to cut the identified fruit according to the corresponding region. For fruits in different orientation, the mechanism can also realize the flexible movement of picking mechanism through the mutual rotation of cutting mechanism and connecting mechanism.

3.2.2 An Intelligent Robot for Hawthorn Automatic Picking

China has a patent for hawthorn picking robot invention, the hawthorn picking robot is mainly composed of picking device, walking device and image acquisition device. Among them, the picking device of the robot includes a mechanical arm and a small capacity fruit collection container, which can realize the function of picking and recycling. The picking robot uses electricity as energy and crawler walking mode, which can achieve flexible rotation. Its mechanical arm can achieve dead corner hawthorn picking operation after optimized design. Each degree of freedom of the robot has independent motor and computer control, and the device consists of three retractable racks, which are controlled by a CCD camera and a computing device respectively, to achieve high-precision picking function.

The innovation of this hawthorn picking robot is to overcome the uneven road in the planting area by using the crawler walking mode. Because hawthorn is generally planted in the complex terrain of hills and mountains, the crawler robot can have good driving stability. The robot also carried out an innovative design of the scissors net, so that the scissors are in a smooth state when they just touch the fruit, and then the sensor will transmit the information to the computing device, after calculation, the computing device will send instructions to the scissors net, and then cut the work. Among them, scissors net is through an independent camera device to absorb the image to an independent computing device, through the analysis of the image of the computing device, and then work out the instructions, finally sent to the receiving device scissors net, to achieve the whole process of picking. In addition, the CCD camera can calculate the ripeness of the fruit, so as to plan the time for the next harvest, and store the data so that the next harvest no leakage.

4. Problems Existing in Chinese Hawthorn Picking

4.1 Problems Existing in Manual Picking

China's existing hawthorn picking machine is very few, and the technology did not develop very mature, China is now almost the use of artificial picking methods. Ethephon should be sprayed on hawthorn trees before picking, so that the leaves of the hawthorn trees fall off in advance. Pickers need to pick through constant climbing, hawthorn trees are high, so after picking hawthorn staff need to be placed in the basket on the body. This process is not only inefficient, but also poses a great threat to the safety of the pickers. It is easy to cause the possibility of disease, strain and fall injury. In addition, as China's living standard is getting higher and higher, more young and middle-aged people from rural areas flood into cities and do not want to engage in farming activities any more. Therefore, with the labor shortage existing in rural areas now, most of them can only be picked by the older labor force or female labor force, the operating efficiency is very low, the cost is also increased, the profits of hawthorn growers can not reach a more ideal level.

4.2 Problems of Mechanical Picking

China's existing hawthorn picking machines are mostly mechanical arms, or picking robots. The manufacturing of these machines is complex, and the parts need to reach a higher level in the manufacturing process, and higher assembly accuracy is also needed in the mechanical assembly engineering, so the manufacturing cost of the machine is high. In addition, hawthorn picking robot is equipped with a large number of sensors and intelligent equipment, can be independent of the implementation of the hawthorn picking operation, but also in hilly complex terrain of autonomous driving, so the picking robot can liberate the workforce, improve the level of our country's agricultural machinery automation. but the costs of the picking manipulator and picking robot production are high, hawthorn farmers in our country have mostly small orchards, and even most of them are planted by family units, they do not have the economic ability to buy the machine. Therefore, China's existing hawthorn picking mechanical arms and robots are difficult to promote in a large range, and it is difficult to obtain the investment support of enterprises. In general, China's hawthorn picking machinery is difficult to develop, there is no market purchasing power support, research and development of the fund is difficult to ensure, hinder the pace of the development team, inhibit the enthusiasm of team members.

5. Conclusion

In recent years, with the price of hawthorn tends to stabilize, China's hawthorn planting area and production gradually increase, the price of hawthorn also has a certain trend of growth, so China's hawthorn planting area and production has a lot of room for rise. However, the development of China's hawthorn picking mechanization is slow, China can only use the method of artificial picking, low efficiency, high cost. And although China now has some research and development of hawthorn picking mechanical arm and picking robot, but because of the manufacturing cost and sales price is high and can not be promoted to use, so China's current hawthorn picking machinery field is yet to broaden the development.

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