



# The Research Status and Future Development of a New Chestnut Cultivar “Huaqiao 2”

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## Abstract

“Huaqiao 2” is a new chestnut (*Castanea mollissima*) cultivar developed from seeding tree by Xiangtan Research Institute of Forestry Sciences. It comes into blossom 2 - 3 years after planting. It has early maturity, good quality and glossy surface. The average mass of fruit is 16.2 g. The yield is 6900 kg·hm<sup>-2</sup> (yield of test tree), with high and stable yield, and suitable for planting in the neutral to acidic gravel soil. Xiangtan Research Institute of Forestry Sciences has built some successful “Huaqiao 2” chestnut orchards.

## Subject Areas

Plant Science

## Keywords

A New Chestnut Cultivar, “Huaqiao 2” Chestnut, Research Status, Future Development

## 1. Introduction

Huaqiao chestnut originated in Xiangtan County; it is a seed breeding community. It is famous in Xiangtan city and in Hunan province; it is the main local specialty in Hunan province. Huaqiao chestnut breeding and cultivation technology research team was established in Xiangtan research institute of forestry sciences in 1996. “Huaqiao 2” is a new chestnut (*Castanea mollissima*) cultivar developed from seeding tree by Xiangtan Research Institute of Forestry Sciences [1]. “Huaqiao 2” chestnut was succeeded in the examination by Hunan province forestry good varieties organization committee in 2007, number: Hunan S0730-cm9. “Huaqiao 2” chestnut was approved by the State Forestry Bureau in 2012, number: 20120132. 2 scientific and technological achievements obtained science and technology progress prize of city. The two local standards of Huaqiao chest-

nut are established. Two huaqiao chestnut professional cooperatives are founded. A “Huaqiao 2” chestnut seedling base is founded. A “Huaqiao 2” chestnut cutting orchard is founded. Taking four national promotion demonstration projects of huaqiao chestnut, taking three hunan province projects, 15 articles which studied science and technology of huaqiao chestnut have been published, a monographs.

## 2. Research Status

From early 1996, the huaqiao chestnut’s botanical expression, growth, development and fertile characteristics have been studied for three years. Variety comparisons and technologies for increasing the production of huaqiao premature chestnut have been studied from early 1999 [2].

Germination on the first 10 days of March, female flower appear at the end of April, full-bloom period is on the first and behind 20 days of May, fruit-growth period is from middle 10 days of June to first 10 days of August, fruit ripe period is from the end of August to the first 10 days of September, deciduous period is on the middle and behind 20 days of November. The average weight of each fruit is 16.2 g [3]. Nutrients of “huaqiao 2”: starch 29.0%, 6.91% of total sugar, 6.48% of crude protein, 3.5% of crude fat, water 50.0%. The data are based on wet basis. The data are provided by the center for food testing and analysis of the agricultural products processing research institute of Hunan province.

2-year-old grafted seedlings were planted, they begin to bear fruit in the second year, the yield per plant was 1.8 kg in the fourth year. The yield is 6900 kg·hm<sup>-2</sup> (yield of test tree of planted 8 years), with high and stable yield, and suitable for planting in the neutral to acidulous of gravel soil. Xiangtan Research Institute of Forestry Sciences has built some successful Chinese chestnut orchard (new chestnut cultivar “huaqiao 2”).

Taking “huaqiao 2” and “shaoyang tali” as the research object, comparative study on breeding, natural condition, characteristics etc., huaqiao 2 and shaoyang tali have certain similarities and have their own advantages and disadvantages. Suggestions to foster strengths and avoid weaknesses, passing the implementation of industrialization of Chinese chestnut to achieve chestnut industry development in hunan province [4].

For propagation of rootstocks, plants derived from direct seed-sowing either in winter or spring grew better than plants transplanted in spring. Grafting with one-year-old rootstocks in autumn was the best, while grafting with two-year-old transplanted rootstocks in spring was inferior, although the latter could also achieve reasonably good nursery plants [5].

In order to seek high-efficient, practical and simple grafting methods, to establish scientific and effective technology system of raising seedlings by grafting, and to achieve the intensive cultivation of huaqiao 2 chestnut, the grafting techniques of huaqiao 2 chestnut were studied through experiments, including Autumn grafting and Spring grafting. Taking “huaqiao 2” chestnut grafted seedlings as the research object, through the investigation of the rootstock grafted

seedlings ground diameter, new branch diameter and length, survival rate and other content, established the rootstock grafted seedlings ground diameter, new branch diameter and length relationship equation, the chestnut Spring and Autumn grafting were compared. The results show that: Fall and Spring grafting require that the rootstock diameter is in 0.5 cm above, in favor of grafting operation and growth of the seedlings. Survival rate of Autumn grafting is better than that of the Spring grafting [6]. Experiment on scion grafting of one-year Chinese chestnut in Autumn, the best scion grafting time is from 15 to 30 in September. A new method that patch budding in autumn with seedling bred in spring without cutting the stock, it showed over 85% survival rate [7]. The background information and parent plant of new chestnut cultivar “Huaqiao 2” is introduced, study nothing of parent plant of new chestnut cultivar “Huaqiao 2” [8].

In order to find the relationship between diameter of the new branch and the length of the new branch, two kinds of grafting methods in Spring and Autumn on “huaqiao 2” were compared. Taking the grafted seedlings of “huaqiao 2” as the research object, diameter of the new branch and the length of the new branch were studied in this research. The results are shown as follows: The relation of length and diameter of new branch of grafting in Autumn:  $y = 43.838\ln(x) + 75.439$ , correlation  $r = 0.9550$ ; the relation of length and diameter of new branch of grafting in Spring :  $y = 45.869\ln(x) + 83.612$ , correlation  $r = 0.9486$ . Two kinds of grafting methods in Spring and Autumn were compared, diameter of the new branch and the length of the new branch are same [9].

Through making the analysis of all-round depth to orchard of Chinese chestnut of a success, offer successful main factor of the orchard of Chinese chestnut, supply the theories for successfully building orchard of Chinese chestnut: First of all, must have the determination and responsibility of doing work, and you should state clearly your goals. Secondly, must rely on national policy and technology, and you should get financial support from your institution or government. Last, must rely on the market, do a variety of business and combination of long and short benefit. It will be great if you can match your interest. Otherwise, it is hard to achieve your goals [10].

Introducing natural conditions, cultivation history, research situation, spreading situation, developing superiority of “huaqiao 2”. Suggesting main measure and research prospects of developing “huaqiao 2”. Making excellent achievement of scientific research on existing resources, breeding new bright points of scientific research according to the future. Making full use of advantages, noticing local characteristic, taking a overlapping route of scientific research and application. Expounding views from training and importing excellent, professional and technical personnel, making excellent achievement of scientific research on existing resources, realizing sustained development of scientific research [11].

The results show that new chestnut cultivar “huaqiao 2” has many good attributes, such as early maturity, big size of the nut, high resistance, easy management, fruitfulness and high economic value as well. It has a promising perspective for development in the central hunan as an excellent local variety [12].

Research work of “huaqiao 2” got help from the Central South University of Forestry and Technology and made a number of scientific and technological achievements. Results registration number: 943Y20060340 and 943Y20130689. The local standard of chestnut was established: Construction Technology Regulations of Cutting Orchard of *Castanea mollissima* “huaqiao 2” and Technological Standard of Nursery and Cultivation for Improved Variety of Huaqiao Chestnut [13].

Nursery land should be close to the afforestation area center, convenient transportation, water, power supply. The soil depth is not less than 30 cm, the pH value is (5.5 - 6.5). The soil is rich fertile, and has no insect pest. Cultivation of chestnut grafted seedlings with the rootstock should use fully mature, uniform size, no plant diseases and insect pests, late mature local chestnut seeds, 135 - 180 particle per kg is appropriate [14]. Chinese chestnut seeds were sowed for breeding stocks in January to February. In September 15 to 30, patch hardwood grafting was taken when the ground diameter of stock grafting location (above ground 6 cm) grew over 0.5 cm [15].

The planting hole size is 60 cm × 60 cm × 60 cm. Decomposed manure 25 kg and 0.25 kg phosphate fully mixed with the soil, then cover a layer 20 - 30 cm thick soil. Planting seedlings in the center of the planting hole so that the root system can spread evenly, with a fertile soil cover the root system. Soil cover 10 - 15 cm, and gently lift righting seedlings, then stratified compaction. The depth of planting should make the stock grafting location exposed, a timely watering root after planting. Seedlings height retain 40 - 50 cm [16]. No affecting on growth and fruit of using seedling branches scion on chestnut adult tree, To solve the problem of insufficient supply of scion [17]. Chestnut tree prohibited the using of high toxic pesticides such as methamidophos [18]. Analysis on the input and output of chestnut orchard, think chestnut orchard profitable [19]. According to the present situation of Chinese chestnut, the breeding of varieties should be strengthened, breeding characteristic variety, meet different needs [20]. The team continue to strengthen the breeding research work of huaqiao chestnut clones, has made gratifying achievements [21]. Growth habit of new chestnut cultivar “Huaqiao 2” is described [22].

### 3. Future Development

In accordance with the requirement of the huaqiao 2 chestnut for fertilizer, the additive for inorganic and organic fertilizer, medium quantity elements and trace elements were added into the basic fertilizer with N, P, K as the key elements, based on the application technique of balanced and appropriate proportion of different elements. The multi element fertilizer special for huaqiao 2 chestnut will be developed. Grind, dry and press forming with model from shell of huaqiao 2 chestnut produce products of charcoal in shape and fixation which content of fixed charcoal can reach requirement of one-class broad-leave charcoal of the state standard with big density, no smoke and no taste during burning, which is a great measure to utilize wasted material in mountain area and

provide new energy for urban residents and broad countryside.

We will work on the “huaqiao 2” chestnut plant breeding and production with aids of embryogenesis and molecular markers. You may browse publications of “huaqiao 2” and learn the details. If there is anything you are interested in, we can discuss it further.

#### 4. Discussion

A new variety is an industry, which is rich in the resources of chestnut varieties, and is a good breeding material. Along with the acceleration of industrialization, Chinese chestnut industry has faced a series of problems such as difficulty of sales in domestic and international markets, malicious competition among many chestnut processing enterprises, etc. At present, the Chinese chestnut processing technology is not advanced, still in the primary stage, and is plagued by some major problems such as lower selling prices of fresh products and easy to decay. Planting chestnut trees is conducive to our environment and our society. We should strengthen the research of varieties, high yield technology, storage and processing and persist in innovation and breakthrough.

The following development prospects should be proposed: continuing to improve the cultivation and research varieties, and continuing to do well the new varieties promotion; increasing the storage and processing research; doing a good job in chestnut ball bract and male flowers resource reuse; doing well enterprise and brand; doing a good job in the application of national geographical indication product protection of huaqiao chestnut.

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