

IV. WALNUT

Level and Distribution of Production

Walnut, an important oil bearing and timber producing tree, is widely distributed throughout the dry valleys of the Hengduan Mountains in the east to Jilong area, Tibet in the west, and from mountains of medium height in the south to the southern edge of the northern Tibetan Plateau in the north. At present, over 700,000 walnut trees have been planted, and 1,000 tons of walnut is produced annually.

The counties of Jiacha and Nangxian are the areas where walnut trees are most widely distributed. The quantity sold annually was 75 tons in the 1970s. Next comes Bomi, Markam and Zogang in Qamdo area with yearly sales amounting to 60 tons. In Lhasa area, the annual quantity sold is less than 30 tons, with Nyingchi and Mainling as the main distribution places.

Geomorphologically walnut trees are widely planted at elevations of 1500-4000m, with the highest going up to 4300m, which has surpassed the upper limit for walnut growing not only in the northern temperate zone, but also in eastern areas with the same latitude. For example, the upper limit for walnut distribution is 1000m in China's mountains, 2000-3000m in Yunnan and Sichuan provinces in the same latitude. The height of the vertical distribution relates mainly to landform and climate, especially the thermal conditions. According to the record, at the upper boundary of walnut distribution, the average annual temperature is 2-4°C, the average temperature in January -7°C, and the minimum temperature -16°C. It has been observed that when anti-cold measures are taken, walnut trees can survive winters with the minimum temperature at -25°C.

The water regime for walnut cultivation is flexible. The trees can grow in semi-arid and sub-humid areas with an annual precipitation of over 400mm, and a relative moisture of 40-60 per cent. They are also widely adaptable to soil, e.g., provided the climate is suitable, yellow-brown soil, steppe soil, as well as meadow soil with pH value around 7.0, will be acceptable and mountain as well as valley locations. However, deep well-drained, sandy soil on sunny slopes is the most favourable.

The varieties of walnut in Tibet are varied, with thin-carpodermis, and thick-carpodermis being common of which Jiamian walnut is the most widely distributed. Table 8 shows their growth properties, revealing the good quality of the Tibetan walnut's kernel-producing percentage and oil-bearing ratio. Walnut samples from the Markam area showed that 45 per cent or even over 50 per cent of the kernels produce 65 per cent or even 72 per cent oil.

Table 8 Growth Properties of the Tibetan Walnut

Variety	Diameter Length (mm)	Size Width (mm)	Fruit weight (g)	Kernel weight (g)	Shell thickness (mm)	Kernel producing ratio percent	Oil bearing percent	Protein content percent
Kernel-Naked	4.0	3.0	6.90	3.70	0.6	53.6	61.6	-
thin-carpodermis	3.3-3.9	3.0-3.5	10-12	4-6	1-15	40-53	65	15-20
Jiamian walnut	3.4-4.1	2.9-3.5	10-14	4.2-6.1	1.5-2.0	35-40	60-68	15-19
thick-carpodermis	3.5-4.2	2.7-3.5	7.5-12	3-5	2-2.6	30-37	60-62	20-25

When the walnut ripens, the involucre turn from dark green to light yellow, some of which split or even detach from the kernel. This is a suitable period for harvesting. If this harvesting period is missed, the walnut quality will be affected adversely.

Post-harvest Processing

Post-harvest processing also influences walnut quality. If half the involucre have splinted, they become easily detached from the walnut after several day's lying about in houses. Frequently, turning over is necessary to prevent the involucre from becoming rotten and then polluting the walnut. After the involucre are detached the wet walnut should be bleached with water every three hours, otherwise, the conducting bundles on the base of walnut will contract, allowing the bleaching water to penetrate and make the kernel discoloured or even rotten.

Generally, walnuts are not further processed in Tibet. Traditionally, Tibetan people do not like walnut oil. Therefore, after primitive processing, the walnuts will be sold to the government or kept for guests.

Insect Pests and Plant Diseases

Insect pests and plant diseases rarely existed in the wild walnut trees of the Himalayas, but they often occur in introduced varieties. Some of these are very harmful. The two most common pests are described below:

Lebeda nobilis Walker

This pest is very harmful to walnut cultivation. It eats the leaves which affects the growth of the

plant. Usually, this pest occurs in trees which were introduced from Xinjiang Uygur Autonomous Region, in the counties of Bomi and Yigong.

Control measures: to kill the ova or pupa in winter and autumn; to lure the pest use of light traps; spraying 6 per cent wettable benzene hexachloride suspension (1:400) before July is often helpful.

Batocera horfieldi Hope

This is a kind of large moth and mainly harms the introduced walnut planted in or near oak forests. Among the affected trees, 20 per cent of them die due to withering.

Control measures: The affected dead wood should be removed. Spraying with 50 per cent phosphamidon or 50 per cent fenitrothion (1:40) is effective for the control of the pest.

Recommendations for Development

Walnut cultivation is not well developed in Tibet. Before 1956, walnut production was practically left to its natural state without man's intervention. Since the 1970s, increasing attention has been paid. Some walnut cultivars were introduced from Xinjiang, and have been cultivated successfully in Tibet.

At present, however, many problems remain unsolved. The most serious is the lack of proper management. Walnut orchards have not been formed and production is low and increases only slowly. In some places, the walnut trees have even been cut down for crop planting.

To develop the walnut production in Tibet, attention should focus on the following problems:

- Making the significance of walnut development known to the local Tibetan population and at the same time, strengthening guidance and planning. Walnut production is more labour-saving and money-saving than any other kind of cultivation. For example one walnut tree can produce 40 kg walnut, going up to 75 kg, and as much oil as rape but with only 5-7 man days. This is particular important for the middle, southern and eastern parts of Tibet, where there are vast mountainous areas but very little manpower. As shown from the statistics for Yunnan province, in the total agricultural production, walnut accounts for 0.7 per cent of the investment, 5.4 per cent of the labour power, while it is as high as 30.9 per cent of the total Gross Agricultural Production. Moreover, walnut trees are also an important factor in soil and water conservation.
- In the development of walnut production, both good local and improved imported varieties should be promoted. Scientific study should focus more on local varieties which are best suited to the local environment, more resistant and continuously productive. Acclimatization and study are needed for imported varieties, because the environment is different from the original habitat. The experiments conducted on imported Xinjiang walnuts in Lhasa and Xigaze showed that it can grow normally although some young shoots may wither in the first two years, it blossoms and bears fruit after only 4-5 years, which is a very good sign that it is productive. In Yunnan Province it was found that the introduced Xinjiang walnut grew slowly with small size nut and low production. This must be taken into consideration in Tibet.
- The study of walnut cultivation should be strengthened. Due to unique landform, walnut trees are commonly planted at elevations of over 1300m, where cold winter and dry spring may cause young trees to be damaged. Study should be carried out to identify the best conditions for walnut trees to survive the cold winter and to discover the best measures to prevent damage from frost and excessive cold.

- Walnut processing should be developed, which includes the adoption of proper methods for walnut detaching and desiccation, and methods to further process the kernels.
- In Tibet there are many old walnut trees. Measures should be taken, such as the cutting down of old branches to permit new ones to develop, as the local people do. The walnut tree will then recover and bear several years' later.
- Walnut orchards should be developed where conditions permit. Intensive management will raise the quality and commercial value of walnut production.