



Review article

Research and implementation of good agricultural practice for traditional Chinese medicinal materials in Jilin Province, China



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ABSTRACT

Jilin Province is one of the principal production bases of traditional Chinese medicine (TCM) in China with its typical preponderance in TCM resources, research and development power, and industrialization capacity. The province has 2,790 species of TCM materials in total. Over 20% of the TCM materials in common use are from Jilin Province. The province has established 36 good agricultural practice bases for 22 typical TCMs. The overall situation, in terms of collection, processing, and preparation, and the implementation of good agricultural practice of TCM materials in Jilin Province are summarized.

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1. Introduction

To strengthen the quality control of medicinal materials, the World Health Organization developed its guidelines for good agricultural and collection practices for medicinal plants in 2003, in which the quality standard of “quality, safety, and efficiency” was established [1]. In 1996, China worked out its plan for developing the modernization of traditional Chinese medicine (TCM) production based on standardization, internationalization, and technique updating with the policy of succession, innovation, and leap forward development [2]. Modernization of TCM production is an integrated development realized in the combination of the TCM knowledge with modern high technology. The key connotation of the modernization is assured efficiency, safety, and quality [3–5].

The patent Chinese medicine production takes the processing of medicinal materials as the first step in which material quality must be guaranteed. To standardize the production of TCM material, its quality is to be guaranteed, and facilitate the standardization of

TCMs and realize “safe, efficient, stable and controllable” quality standards, China developed its guidelines of Good Agricultural Practice (GAP) for TCM materials in 2002 and put it into force on June 1st of the same year [6].

2. General background for GAP implementation of TCM in Jilin Province

In China, there was an urgent need to deal with the over-exploitation of medicinal herbs. Due to the overexploitation, the reserves and output of wild medicinal plants were rapidly decreasing. According to world statistics, China received only a sales value of US\$600 million, only 3% in the international market. The loss in herbal products sales value has been attributed to the improper efforts given on quality control and standardization. In China, there are no uniform standardizations and specifications in the cultivation of herbs to ensure the herbal quality. GAP emerged as the best ways to protect the medicinal plant resource for

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sustainable development during herbs growth. GAP is of fundamental importance for the modernization of TCM. With the GAP to be carrying out perfectly, herbal products sales value increased with the improvement of the quality of herbs. Meanwhile, good manufacturing practice (GMP), good laboratory practice of drug (GLP), good clinical practice (GCP) became more meaningful.

Jilin Province, the geometric center of northeast Asia, lies in the central part of northeast China, neighboring the far east of Russia and Korean peninsula to its east and southeast and with Japan on the other side of the Sea of Japan. The overall features of Jilin Province can be summarized in three statistics of approximately 2%: 187,400 km² of territory (1.95% of the nation); 27 million of population (2.08% of the nation); and 295.8 billion of gross domestic product (1.81% of the nation).

Jilin Province is the principal TCM base of China with its typical preponderance in TCM resources, research and development power, and industrialized capacity. By the end of 2004, the submission of patent TCM of Jilin Province reached 10% of the total value of the whole nation. Both the profit and taxation of patent TCM rank the province the first place in China [7,8]. The Changbai Mountain, designated by the United Nations as a “human and biosphere” natural preservation land, has long been known as “land of ginseng” and “land of Sika deer”. This mountainous area is the gene pool of TCM in Northern China, and is abundant in organic and precious TCM materials. The volcanoes in this area erupted frequently in the past, and the dust and ashes from those eruptions fertilized the soil and nourished the forest coverage amounting 78% of the whole area. Tianchi (Paradise Lake) on top of its highest peak is the head of three famous rivers named Songhua, Tumen, and Yalu. The fine ecological environment has naturally endowed the area with abundant TCM materials. Here you can collect rare wild herbal medicinal materials such as ginseng (*Radix Ginseng*), gastrodia tubers (*Rhizoma Gastrodiabe*), Ganoderma (*Glossy Ganoderma*), and milk vetch roots (*Radix Astragali*), and can see living Sika, wood frogs, sables, and others, both domesticated and wild livestock.

Jilin Province has 2,790 species of TCM materials in total. In the key list from the national TCM resource investigation, there are 363 species among which 137 species are found in Jilin Province amounting to 37.7% [9]. More than 40 species of the TCM materials found in Jilin Province hold more than half of their natural storage of the whole nation. Over 20% of the TCM materials in common use are from Jilin Province. Ginseng, deer antler, and wood frog fat have long been sold to over 50 counties and regions for their superior quality, large quantity, and reputable origin (Table 1).

The GAP demonstrative areas for TCM were established in Jilin Province in 2000, and the technical supporting system and demonstrational system have been founded, resulting in the continuous development of GAP for TCM. The province has established 36 GAP bases for 22 typical TCM species, such as ginseng and magnolia vine fruits. The total demonstrative area reaches 16,000 ha, which accounts for 60% of the total area for TCM cultivation in the province. Six GAP bases for four species have been authenticated by the State Food and Drug Administration of China; it ranks Jilin Province in the first position in the GAP base for these species in China. The geographical distribution map of GAP bases is shown in Fig. 1.

3. Development of technical supporting system of GAP for TCM

The key idea of GAP for TCM is production guided by modern technologies. The rules and regulations concerning GAP were drafted in 2002 by the State Administration of Traditional Chinese Medicine of China, State Food and Drug Administration of China, and China National Group Corporation of Traditional and Herbal Medicine.

Table 1
Resources of traditional Chinese medicine (TCM) in Jilin province

Materials	Families	Species
Animals for TCM	264	822
Herbs for TCM	145	1,815
Fungi for TCM	34	153
Total	443	2,790

In recent years, the province has made considerable achievements in developments of techniques for environmental assessment of TCM cultivation area, variety selecting and breeding, pollution-free and standard cultivation, quality assurance system, and rational collecting and processing. This research and development work provided the GAP for TCM in the province with reliable technical supports. The GAP evaluation standards appeared strict and comprehensive, specialists in herbal medicine were whether they are suitable for China. The GAP evaluation standards contain 104 items for inspection, 19 of which are crucial; a single failure to reach the standard would mean disqualification of this batch of herbal products. But the other items of inspection, contents were vaguely defined and considered less important. Standards are obviously vague. It is further improved.

4. Suitable cultivation site selection and environmental assessment

4.1. Cultivation area delimiting

Scientifically delimiting a suitable cultivation area for TCM is very important. The quality of TCM is greatly related to its origin. In the nationwide delimiting of TCM cultivation area, Jilin Province is listed in the northeast mesothermal zone. According to the geographic condition and suitability for TCM cultivation, the province has been divided into three areas for TCM cultivation [10]. The mountainous area in the east part is mainly for cultivation and husbandry of ginseng (*Panax ginseng*), wild ginger (*Herba asari*), manyprickle acathopanax root (*Acanthopanax senticosi*), magnolia vine fruits (*Schisandra chinensis*), and wood frog. The hill land area in the central part is mainly for cultivation and husbandry of north thorowax root (*Bupleurum chinense*), balloon flower root (*Radix Platycodi*), primrose (*Primula vulgaris*), etc. The prairie in the west part is mainly for cultivation and husbandry of licorice root (*Radix Glycyrrhiza*), fangfeng (*Radix Sileris*), polygala root (*Radix Polygalae*), common anemarrhena rhizome (*Rhizoma Anemarrhenae*), wolf-berry fruit (*Fructus Lycii*), etc.

4.2. Environmental assessment

The environmental surveillance and assessment system has been established, and the monitoring and analyses on soil, atmosphere, and irrigating water have been done in the prime cultivation and husbandry area to keep the quality of the environment of those areas above grade 2 of the national standard. The monitoring and surveying work has covered over 100 cultivation bases in 32 counties or cities in the province.

5. Development of standard operating procedures

5.1. Variety selecting and breeding

A great deal of work has been done on variety selection and stock farm construction for more than 10 species, such as ginseng (*P. ginseng*), American ginseng (*Panax quinquefolius*), milk vetch

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