



Insect tea, a wonderful work in the Chinese tea culture

Lijia Xu, Huimin Pan, Qifang Lei, Wei Xiao, Yong Peng, Peigen Xiao*

Institute of Medicinal Plant Development, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing 100093, China
Key Laboratory of Bioactive Substances and Resources Utilization of Chinese Herbal Medicine, Ministry of Education, Beijing 100193, China

ARTICLE INFO

Article history:

Received 27 August 2012
Received in revised form 28 December 2012
Accepted 5 January 2013

Keywords:

Insect tea
Tea culture
Traditional application
Chemical composition
Pharmacological activity

ABSTRACT

Insect tea, listed in the “Compendium of Materia Medica” by Li Shizhen, is not only a traditional drink for the ethnic minority in southwest China, but also one of China’s traditional export commodities. Insect tea is made of the feces of insects that feed on plants, and characterized by minimal dose, enjoyable tea flavor, few tea-residues, and superb transparency. Insect tea has been used to clear summer heat, protect the spleen and stomach, and facilitate digestion. Modern research has suggested that insect tea is safe and nutritional, and it has blood lipid lowering, antihypertensive and hypoglycemic effects. At present, due to the household production of insect tea, there are a variety of species of tea-producing insects and feeding plants. In the present review, we summarized the types, civilian applications, nutritional value, pharmacological activity and safety of insect tea, in an effort to provide scientific knowledge for future study.

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1. Introduction

In the past several thousand years, extensive knowledge has been accumulated in China on tea cultivation, production and consumption, which forms the unique Chinese tea culture. The tea culture was developed rapidly in the Tang Dynasty and has infiltrated the Chinese society deeply since then. The origin of tea is highly diverse as a result of the biological, ethnic and cultural diversity of China. Tea has been documented in Chinese ancient literature inconsistently. For instance, it is clearly indicated that tea was a sweet-tasting plant in the “Odes”, while tea was indicated as a bitter-tasting plant in the “Eyra”. Many herbs were used to prepare tea beverages locally in different regions of China according to *Camellia sinensis*. Examples of such herbs include vine tea (*Ampelopsis grossedentata*), Hawk tea (*Litsea coreana*) and bitter tea (*Ilex latifolia* Thunb, *Ligustrum robustum* (Roxb.) BL.) and so on. These herbs, so called non-*Camellia* tea varieties, constitute a sub-culture in the tea culture (He, Peng, & Xiao, 2010; Xiao et al., 2011a, 2011b). Insect tea is one of those varieties, and it is a wonderful natural work in the colorful Chinese tea culture.

Insect tea, a traditional drink for the ethnic minority in southwest China, is a native product of China, and it has a long history. As described in the “Compendium of Materia Medica” by Li Shizhen, insect tea is made of the feces of insects that feed on plants and is suggested to be effective for the treatment of otitis media (Li, 1982). In the scientific point of view, insect tea is not tea because it originates from

insect feces; however, it is called tea because the way to drink it and the color of the drink are analogous to tea. A tiny amount of insect tea particles in boiled water can make a cup of yellow-red tea without any residues, and its flavor is even better than that of other teas. Thus, it is also called a boutique tea. According to the drinking experience of local people, the insect tea has a variety of health protection benefits, including summer heat clearance, dampness dissipation, detoxification, spleen and stomach protection, digestion enhancement, and benefiting Qi (the terminology of traditional Chinese medicine which means vital energy or energy of life) to relieve superficies syndrome. And it is an important drink for people operating in high-temperatures in tropical and subtropical regions (Wang, 1980). Insect tea is also one of China’s traditional export commodities. Due to its advantages of minimal dose, strong tea flavor, few tea-leaves, and superb transparency, insect tea has been popular in Southeast Asia in places such as Singapore, Malaysia, and Nansha, and is regarded as a tea treasure.

2. Traditional application of insect tea

2.1. Types

Insect tea can be produced by a variety of insects such as *Aglossa dimidiata* Haworth, *Hydrillodes morose* Butler, and *Nodaria nippona* (Butler). The insects feeding plants include *Malus sieboldii* (Regel) Rehd, *Platycarya strobilacea* Sieb. et Zucc., *L. coreana*, *Ilex kudingcha* C.J. Tseng and so on (Hu, 1996; Li, 1998; Wen & Guo, 1997; Xiang & Ru, 1998; Zhang & Xu, 1990). A variety of insect teas are produced when different insect species feed on different plants. For instance, *A. dimidiata* Haworth fed *M. sieboldii* (Regel) Rehd (San-ye-hai-tang) produce Sanye insect tea; *H. morose* Butler fed *P. strobilacea* Sieb. et

* Corresponding author at: Institute of Medicinal Plant Development, Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing 100093, China. Tel./fax: +86 10 57833166.

E-mail address: xiaopg@public.bta.net.cn (P. Xiao).

Zucc. (Hua-xiang-shu) produce Hua-xiang insect tea; and *A. dimidiata* Haworth fed *L. coreana* (Lao-ying-cha) produce Hawk insect tea. The major types of insect tea produced by different insects that feed on different plants are listed in Table 1.

2.2. Production modes

The household production protocols of insect tea are very similar. For instance, to produce Chengbu Miao insect tea, the Miao people collect 'NiaoLiYa' (*M. sieboldii* (Regel) Rehd) in late spring and early summer. Some leaves are air-dried for daily drinking, and the rest of the leaves are boiled, air-dried, and sprayed with rice-washed water followed by placement into the ventilated and dry place of the Miao Diaojiao building. Then the rice-washed water is used to spray the leaves every half month to one month to attract insects until insect eggs are laid on the leaves. After the leaves are eaten up by the hatched larvae, the feces, which are the insect tea, are collected using a sieve. And the larvae will emerge into moths finally. Usually, it takes 10 kg of leaves and almost one year to produce 1 kg of insect tea. Because of the low production rate and long production time, household production and field collection have been the major production modes for insect tea. The raw product is sold at a price of \$25–35 per 500 g. After packaging, the price can rise to \$80 per 500 g, or even as high as \$270 per 500 g for some insect teas stored for years.

2.3. Local uses

The major production and application regions of insect tea are the ethnic minority mountainous areas in southwest China, such as the counties at the border of Hunan and Guangxi, including Chengbu, Tongdao, Longsheng, and Sanjiang (Table 1). Sanye insect tea is mainly produced in Chengbu County, Hunan Province, and this is also called Chengbu insect tea. The Chengbu Local Records in the Guangxu years of the Qing dynasty mentioned that after stored for years, the tea leaves will become insect teas, which can be stored for a very long time and can resolve phlegm and remove blood stasis (Chengbu Local Records (V) (Qing Dynasty) (1906)). As we investigated in Chengbu, the Miao people have formed a unique tea culture, and all the Miao families have been continuing with the habit of drinking and collecting insect tea. According to the local people, the insect tea is effective in relieving the symptoms of throat and

gastrointestinal discomforts, as well as cold. In the Hunan Tongdao Dong Autonomous County, insect tea was used as an agent to treat sores and unknown swelling. Hawk insect tea is famous for its production in Chishui, Guizhou, where the people of Miao, Tujia, Gelo and Buyi reside, and thus is also called Chishui insect tea or Guizhou white insect tea. In addition, Hawk insect tea has been long-term consumed by the minorities (mainly Gelo) on the Dalou Mountain and in the surrounding areas. Before 1949, it was a fashionable thing for businessmen in Chengdu, Chongqing and Wuhan drank and competed for Hawk tea and Hawk insect tea. The Hawk insect tea was produced using *MacLzilus chuanchienensis* S. Lee in Shuiyang County (Xiang & Ru, 1998). Hawk insect tea is also produced in the counties surrounding Yibin, and those produced in the Jinsha River Basin regions with an altitude of 800–1200 m (Pingshan, Mabian, and Muchuan) is better because of its higher quality including color, shape and taste (He, 2001). In addition, on the Emei Mountain in Sichuan, people used to collect Hawk insect tea in the field to treat children with dysentery. Huaxiang insect tea is mainly produced in Sanjiang County and Longsheng County (Dong and Miao region) in Guangxi. In Guangxi, people also produce Guilin insect tea, which is also called Longzhu tea, by mixing the insect teas, honey and tea leaves at a certain ratio, for the purpose of summer heat clearance, dampness dissipation, and liver and kidney protection.

3. Chemical composition of the insect tea

3.1. Amino acid

It has been suggested that insect tea contains all natural amino acids. The overall amino acid content of insect tea is similar to that of traditional teas. The content of 9 essential amino acids in insect tea is 0.722%, which is 3–12 times that of the traditional teas (Wen, Guo, Li, Yin, & Duan, 1996). Particularly, the contents of first and second limiting amino acids are much higher than in the traditional teas. Based on the contents of essential and limiting amino acids, Sanye insect tea is much more nutritional than traditional teas (Guo, Xu, Wen, Huang, & Wang, 2008; Guo, Zhou, & Jiang, 1991; Wen et al., 1996). Hawk insect tea has even higher amino acid content than Sanye insect tea, and the content of different amino acids varies among the teas produced in different regions. Although it was proposed to be related to the variations in plant and insect species, and the metabolic characteristics of the insects, the reasons underlying this discrepancy require further exploration (Yang, Yi, Qin, & Huang, 2011).

3.2. Minerals

Insect tea contains a variety of minerals, such as K, Mn, Mg, Ca, Zn and Na. Hawk insect tea has higher contents of Zn, Mn, Mg and Ca compared to the traditional Hawk tea (Xu, Mao, & Zhou, 1996), and Sanye insect tea also has higher contents of Zn, Mg and Ca than traditional teas (Guo et al., 2008). The high contents of trace elements might be involved in the functions of insect tea in digestion, trauma healing, and homeostasis. Therefore, insect tea is an ideal drink for humans to take more trace elements and is a new nutritious food resource (Ao, 2010b; Guo et al., 2008; Yang et al., 2011).

3.3. Fatty acids, volatile oils and others

Insect tea contains fatty acids and volatile oils. Guizhou insect tea contains five types of fatty acid, C_{14:0}, C_{16:0}, C_{18:1}, C_{18:2}, and C_{18:3}, of which the important C_{18:1} and C_{18:2} account for 74.09%. Sanye insect tea contains six types of fatty acid, and the saturated fatty acids account for 70.81% of the total fatty acids, and the polyunsaturated fatty acids account for 35.25%, especially for the oleic acid and human-required linoleic acid and linolenic acid. According to the references, the ratio of saturated fatty acids (S): monounsaturated fatty

Table 1
Main types of the insect teas in China.

Name	Tea-producing insect	Host plant	Distribution and application region (Li, 1998; Sun et al., 2010; Wen & Guo, 1997; Xiang & Ru, 1998; Xu, 2010; Zhu, Wen, Zhou, Chen, & Xu, 2009)
Sanye insect tea (Chengbu insect tea)	<i>Aglossa dimidiata</i> Haworth	<i>Malus sieboldii</i> (Regel) Rehd	The Chengbu Miao Autonomous Region and Tongdao Dong Autonomous Region of Hunan Province
Hawk insect tea (Guizhou white insect tea, Chishui insect tea)	<i>Aglossa dimidiata</i> Haworth	<i>Litsea coreana</i> ; <i>Actinodaphne cupularis</i> (Hemsl.) Gamble, <i>MacLzilus chuanchienensis</i> S. Lee	Mountainous area and minority region of Guizhou, Sichuan and Yunnan
Huaxiang insect tea (Longzhu tea, Huaxiang golden tea)	<i>Hydrillodes morose</i> Butler; <i>Nodaria nippona</i> (Butler)	<i>Platycarya strobilacea</i>	Longsheng County and Sanjiang County of Guangxi

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