Tea in China

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ABSTRACT: Tea drinking in China could be traced back to the Shengnong period, around 4000 years ago. Some associated aspects such as the history of tea, spread of tea to other countries, development of tea industry since 1950, tea production, tea export, types of tea and tea cultivars in China have been discussed in this paper. Five major features China tea industry were introduced in recent years: no-pollution tea production, promotion of sanitary (clean) production, development of premium teas, development of deep processing value add. products in tea industry as well as the intensification of scientific technical support to the tea growers.

Keywords: China tea; tea production; premium tea, tea deep processing

History

Tea is second only to water as a world beverage. Tea drinking can be traced back to around four thousand years, i.e. during the Shengnong period. However, it was only after the period (475–221 BC) "Warring States" that the earliest record of "tea" appeared in the ancient books. The spread of tea from China to other countries started during the Tang Dynasty (815 AD).[5] Japan was the first country where tea was introduced from China. The introduction of tea from China to Korea was recorded in 828 AD, slightly later than Japan. The spread of tea from China to Europe occured more than 800 years later than its introduction to Japan.

Tea has been linked with health from the very begining. When tea spread from China to other countries, it was mainly described from the viewpoint of medical effectiveness. The first tea reached Europe around 1607 AD via Dutch ships from Macao to Holland. As early as 1641 AD, a Dutch doctor Nikolas Dirk stated that tea was the medicine which is able to cure many human disorders. So, during that time, the tea was sold in medicine shops instead of food shops.

In England, the first solid evidence on selling of tea was a newspaper advertisement for the coffee house "Thomas Garway" in London in 1658 AD. The first tea reached Russia in 1618, through the Chinese Ambassador as a gift to Czar Alexis. India, the second largest tea-producing country in the world nowadays, received tea through English merchants after tea was popularized in Europe in around 1780, about 100 years later than it was introduced to England.

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The large scale cultivation of tea in China appeared during the Tang dynasty (618–907 AD).[5] Further expansion and development for its cultivation, manufacture and drinking took place during the Song dynasty (960–1279 AD).[5] The large scale cultivation in India was also introduced by the British merchants in the early 19th century. Since then, tea cultivation has been introduced to various parts in the world. It is estimated that presently the tea plant is grown in more than 60 countries and people from around 117 countries consume tea. Tea has become one of the three most important beverages with coffee and cocoa in the modern society.

Tea Areas in China

Tea areas in China are distributed in more than 1000 counties in 20 provinces. It is mainly cultivated in the southern part of Qin Ridges and Huaihe River including the Zhejiang, Hunan, Anhui, Sichuan, Chongqing, Fujian, Yunnan, Guizhou, Guandong, Guanxi, Hubei, Jiangxi, Jiangsu, Shanxi, Henan, Hainan, Sandong and Taiwan provinces (autonomous region).[3,5] It is also cultivated in small areas in Xizang autonomous region and Gansu province.

The tea areas of China are located between 94°–122° east longitude and 18°–37° north latitude. Tea extends across six climatic zones. According to the geographical positioning and historical evolution of tea, the tea production areas of China are divided into the following areas: South China tea area, Southwest China tea area, South Yangtze River tea area and North Yangtze River tea area. The South China Tea Area includes the Fujian province, middle-south part of Guandong province, south part of Yunnan province and Guanxi autonomous region, Hainan and Taiwan province. The Southwest China Tea Area includes the middle and north part of Yunnan

province, most part of Sichuan, Chongqing and Guizhou provinces, the south part of Xizang autonomous region. The South Yangtze River Tea Area includes the north part of Guandong and Guanxi province (autonomous region), most part of Fujian province, Hunan province, Jiangxi province and Zhejiang province, the south part of Henan, Anhui and Jiangsu provinces.[2,3,5] The North Yangtze River Tea Area includes the part of Ganshu, Shanxi, Hubei, Anhui, Jiangshu and Henan provinces and the part of Shandong province. The divison of China tea areas is illustrated in Figure 3 in colored plates.

Tea Industry since 1950

Since the founding of New China in 1949, especially since the reform and opening up in 1980s, tea industry has been greatly developed. Nowadays, there are 20 tea-producing provinces, autonomous regions and cities in China. Tea industry has become an important pillar of economy and the preponderant export and foreign currency earning industry. It has made great contributions to the promotion of agricultural practices, increasing farmers' income and job opportunities.

During the period just before the founding of the People's Republic of China, the amount of tea production was greatly reduced due to the Second World War and the Civil War. The toal area of tea plantation was only 169,500 ha and the total tea production was 62,000 tons in 1950.[3] However, after 1950, there has been rapid development of tea in China.

Tea Acreage

China is the largest tea planting country in the world. In 2007, the Chinese tea acreage was around 1.53 million hectares, occupying 47.23% of the world total tea acreage, and nine times higher than that in 1950, which was 6.9% higher than that in 2006. The plucking acerage in 2007 was around 1.04 million hectares.[3] The largest province with tea acerage is Yunnan province, which has about 16.1% of the total tea acreage in China. Updates figures for 2011 are given later in the Tea Production.

Tea Cultivars

Tea plant originated in China. The history of tea cultivation can be traced back to several thousand years ago. There is a vast rservoir of tea germplasm in China. According to the records of the Tea Reserach Institute, Chinese Academy of Agricultural Sciences, around 2665 accessions of tea germplasm were preserved in the China National Germplasm Hangzhou Tea Repository (CNGHTR).[4]

In China, the cultivated tea plant can be divided into two sub-species: the large-leaf tea plant (*Camellia sinensis* ssp. *assamica*) and the small-leaf tea plant (*Camellia sinensis* ssp. *sinensis*). The former sub-species is mainly distributed in the southern part of China (Guangtong, Guangxi, Hainan, Yunnan and Taiwan) and the latter sub-species is distributed in the northern tea-producing provinces in China. More than 1000 accessions were systematically evaluated and appraised in recent years. Seventy-six tea clones, including 22 black tea clones, 42 green tea clones and 12 Oolong tea clones have been successfully bred.[4] According to a survey in the major tea-producting provinces, the clones whose cultivated acerage was more than 60,000 ha including the following 11 local cultivars: Yunnan Daye, Qimen, Jiukang, Fuding Dabai, Tie Guanyin, Fuding Dahao, Fuan Dabai, Maixie, Shuixian, Wuniuzao (Jiaming No. 1), Anjie Baicha, and the following 8 clones: Fuyun 6, Yunkang 10, Longjing 43, Yinshuang, Mingshan 131, Baihaozao, Lingtou Dancong and Fuxuan No. 9).[3,4] In the early period, the local jat varities were grown dominantly; later, these varities were gradually replaced by the clone cultivars, especially by those new bred clone cultivars, which played an important contribution to the China tea industry.

Tea Production

In 2011, the total production in China was around 1,557,000 tons, 24 times higher than that in 1950 and 6.2% higher than that in 2009, and the largest tea-producing country occupying 31% of the total tea production in the world.[3] The per unit area yield in China was around 706.9 kg/ha,[3] which is nearly double than 366.9 kg/ha in 1950. The value of raw tea totalled 72.8 billion Yuan RMB in 2011, 18.9% higher than that in 2010. Among the tea-producing provinces, the Fujian province has the highest tea production. After the reforms in 1980, it is now mainly produced by smallholder farmers and collective tea farms, which occupy 90% of the total tea production in China. The production from the State tea farms occupies around less than 10% of the total.[2,3]

Tea Exports

China exported 322,000 tons of tea in 2011, which is 1.1% higher than that in 2010,[3] and is the second largest tea exporter in the world. At present, tea exports account for 20.6% of the total production of China. The export

value grew by 1.78 times, which increased from US $347 million in 2000 to US $965 million in 2010.[3]

The acreage, production and exports of China from 1950 to 2011 are listed in Table 1.

Table 1. China tea acreage, production and export[3,5]

Year	Acreage (× 10,000 ha)	Production (× 10,000 tons)	Total value of Production (billion RMB Yuan)	Exports Amounts (× 10,000 tons)
1950	16.94	6.22	—	1.87
1960	37.20	13.58	—	4.26
1970	48.73	13.60	—	4.17
1980	104.07	30.37	—	10.79
1990	106.13	52.50	4.6	19.55
2000	198.90	68.33	9.0	22.77
2002	118.00	74.53	12.5	25.22
2004	126.23	83.52	35.0	28.02
2006	143.17	102.80	55.0	28.66
2011	234.39	155.70	72.88	32.20

Kinds of Tea

There are various processing methods for the Chinese tea. Generally speaking, China tea comprises six kinds of tea: green tea, black tea, oolong tea, yellow tea, white tea, dark tea, and reprocessed tea, including scented tea and compressed tea. Since the 1980s, the production pattern of Chinese tea has changed fundamentally. The structure of products is optimized and regulated by the domestic market and export requirements, which also shows a balanced situation between the six kinds of tea. Table 2 shows the changing trends of various kinds of tea in China during the past 50 years. It can be seen from Table 2, the ratio of production of green tea, black tea and oolong tea was 58.6% : 23.4% : 2.9% in 1980; to 61.6% : 20.3% : 6.2% in 1990, to 72.9% : 6.92 : 9.9% in 2000; and to 64.7%: 3.3% : 10.3% in 2006, respectively.[3] This shows a steady increasing trend of the green tea. While Oolong tea also showed an increasing trend, but the black tea showed a declining trend during the last 25 years, from 23.4% of the total production in 1980 to 3.3% of the total in 2006.

In China, green tea is mainly consumed in central and eastern areas of China, and the scented tea in North China. Before the 1990s, Jasmine tea accounted for 95% of the total consumption in the North China, particularly in Beijing, including the north, northeast, northwest and other areas. At present, it has been reduced to less than 60% during recent years. Oolong tea is mainly consumed in South China areas, especially in Fujian province and part of Guandong province. Generally speaking, the consumption of green tea has been increasing gradually year by year. In 2007, the consumption of green tea reached 464,000 tons, which accounted for 70% of the total domestic tea consumption in China. Scented tea and Oolong tea were close to each other with the consumption of about 80,000 tons for each, accounting for 12% of the domestic tea consumption. The consumption of black tea in China is around 15,000 tons, accounting for 2% of the total. Other kinds of tea, including compressed tea, Pu'er tea, white tea, yellow tea, with a total consumption of about 100,000 tons, accounting for 15% of the total domestic tea consumption. The production of Pu'er tea has increased rapidly in China since 2002. It reached 52,000 tons in 2005, increased by 160% compared with that in 2004. However, the growth rates in 2006 and 2007 declined to 50% and 25%, respectively.[3] White tea and Yellow tea are light fermented teas, mainly produced in Fujian province. Its consumption in China is only 1–2% of the total.

Table 2. Types of tea and their output in China

	1980		1990		2000		2006	
	Tons	%	Tons	%	Tons	%	Tons	%
Total output	303,700	100	540,070	100	683,324	100	1,020,000	100
Black tea	71,000	23.38	109,680	20.31	47,294	6.92	34,000	3.33
Green tea	178,000	58.61	332,502	61.57	498,057	72.89	660,000	64.70
Oolong tea	8,850	2.91	33,411	6.19	67,608	9.89	105,000	10.29
Compressed tea	5,800	1.91	25,026	4.63	22,558	3.30	100,000	9.81
Other teas	40,050	13.19	39,451	7.30	47,808	7.00	121,000	11.87

Major Activities in China Tea Industry

China tea industry has had a significant development since reforms in 1980 and particularly after the turn of the new century. In recent years, this development has been closely related to the following important activities.

Development of Non-Polluting Tea Production

The Chinese Government pays more attention on quality and safety of tea products. The Ministry of Agriculture of China put forward the system of "non-polluting tea production" since 1999. The system contains three kinds of standards on tea quality based on production conditions: Non-polluting tea, Green Food-tea and Organic tea. Non-polluting tea products should not contain any polluted matters or if it has a little content of polluted matters, then it should be less than that of the national standard. Green food is a general designation for all kinds of non-polluting and top quality tea, which has been processed in China since 1990.

The quality of Green Food-tea contains two grades: one is 'A' grade and the second is the 'AA' grade. 'A' grade tea production allows the use of chemical fertilizers and pesticides but the residues should conform to the MRL of China National Standard. 'AA' grade tea production and organic tea production do not allow the use of any synthetic pesticides, chemical fertilizers and growth regulation agents. Any kind of residue is not to be detected in the products. 'AA' grade and organic tea products have their own trace back systems to secure quality and safety. Certificate of Green Food-tea is issued by the Ministry of Agriculture of China. Green Food Managing Office which is under the leadership of of the Ministry of Agriculture and is set up in each province of China, is responsible for examination of the application of green food products that are put forward by an enterprise.

Certificate of Green Food is valid for three years. Certificate of organic tea is issued by the institution, which is authorized by IFOAM. Department of Organic Food Developing Center of the China National Environment Protection Bureau is the department responsible for organic food management. Certificate of Organic Food (including organic tea) is valid only for one year, and in the next year, all the items have to pass through the examination and re-issue of the certificate. Up to now, the total organic tea area in China has reached 23,000 ha, with an annual output of 15,000 tons. Implementation of Green Food-tea and Organic tea has pushed forward the pace of quality safety in Chinese tea industry.

Promotion of Hygienic Production

In June 2002, Standing Committee of the National People's Congress of China issued "Law of Sanitary (Clean) Production", which became a milestone for the Chinese industrial and agricultural production to enter into a new era. During the five years since late 2002, Chinese tea industry has made great advances in hygienic production of tea products. Presently, a large number of tea enterprises set up in different tea-producing provinces of China meet the demands for hygienic production. Management of these tea enterprises has reached a high level.

However, at the national level, hygienic tea production and management remains to be further improved. This covers environment of tea gardens, tea planting, tea processing, tea packing, tea storing and tea marketing.[3] Tea planting and processing are the two most important sectors in the whole course of hygienic production.

In planting management, it is advocated to minimize the application of pesticide and chemical fertilizers and promote "Good Agricultural Practice" (GAP). In tea process management, it encourages tea factories to carry out technical reforms, especially on hygienic conditions of tea factory and the adoption of HACCP system for promotion of continuous production line. Technical reform focuses on the following aspects: clean fuel, which is the first step to realize the goal of hygienic production. It is shown that when coal is used as fuel, it sends out smoke and dust to pollute tea leaves. Oil gas, diesel oil and electricity are recommended as clean fuels for the operation of machines. Metal parts of tea machines should not cause lead pollution in processed tea leaves. Lubricants used in tea machinery should be the same as those used in food processing machinery. It is recommended that tea leaves should not touch the surface of ground during the whole course of tea processing.

Development of Premium Tea

Premium tea is the one that is manufactured by using tender tea shoots (mainly using one bud and one leaf shoot or one bud) during spring season as the raw material is of high quality as well as it is captivating and graceful in shape. The premium tea has developed rapidly in China

since 1990. It has also played a vital role in the development of Chinese tea industry since 1990, especially, in the green tea producing areas. In 2011, the production of premium tea was 676,047 tons, and it occupied 43.4% of the total tea production in China. But, in terms of its value, it is nearly 80% of the total.[1,3] The development of premium tea in China tea industry since given 1990 is in Table 3.

Table 3. Evolution of premium tea in China since 1990[3]

Year	Production (× 10,000 tons)	Value (billion RMB Yuan)	% of total value in Tea industry
1990	1.7	4.3	9.3
1995	6.9	23	39.7
2000	14.4	55	64.0
2002	18.0	64	—
2004	21.8	89	—
2006	39.1	186	—
2011	67.6	560	78.6

Development of "Deep Processing" in Tea Industry

The development of "Deep Processing" in China tea industry was initiated in the middle of the 1980s. It plays an important role in improving value-addition and supporting sustainability development of the tea industry. The development of ready-to-drink tea in China tea industry has made a great progress. At the beginning of the 1990s, the tea beverage in China started to industrialize, which witnessed a fast growth at the end of the 1990s. In recent years, the annual output of ready-to-drink tea beverage has reached 5 million tons. Since 1997, ready-to-drink tea had an accelerated development. The production of ready-to-drink tea was around 5,000,000 tons in 2007, which was was more than 25 times higher that in 1997.[3] The raw material used was only 3–4% of the total tea production in China, however, its value was around one-fourth to one-third value of the total tea production in China (Table 4). The development of ready-to-drink tea in China played an important role in raising the productive value of Chinese tea industry.

Table 4. Development of ready-to-drink tea in China

Year	Production (× 10,000 tons)
1997	20
1998	40
1999	80
2000	185
2001	210
2003	320
2005	400
2006	450
2007	500

Besides, Chinese tea industry has also paid more attention to the comprehensive utilization of tea and its deep processing, especially in utilization of low grade tea. The products such as tea polyphenols, theaflavin and theanines are being produced for health-protection purposes.[5] The development of these products has also increased the product value of Chinese tea industry to a certain degree.

Scientific and Qualified Personnel

The development of Chinese tea industry has proved that the progress in tea production largely depended on the scientific innovation in tea science, and the latter is greatly depended on support and participation of qualified personnel. Since the founding of New China, a lot of professional tea research institutions and agricultural universities have been set up successively by the central and local governments. A technological research, development and training system of China tea industry comprising professional research institutions, universities as well as middle-level schools for training the scientific experts and technicians has been established.

Presently, there are two national level Tea Research Institutes, 11 provincial Tea Research Institutes and 8 county- (or city) level Tea Research Institutes.[5] There are 11 universities and 11 colleges in China, which have courses on tea specialty and train students at different levels, i.e. professionals with bachelor's degree, master's degree and with doctor's degree. A number of Postdoctoral centres have also been built. These are also engaged in tea research and provide technical services on a large scale. Each year several hundred students with different professional levels, graduate from the universities and professional schools, that are presently working in a large number of areas related to tea. These technical personnels are likely to play an important role in the future development of Chinese tea industry.

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Fig.1: Map of Tea Growing Areas in China

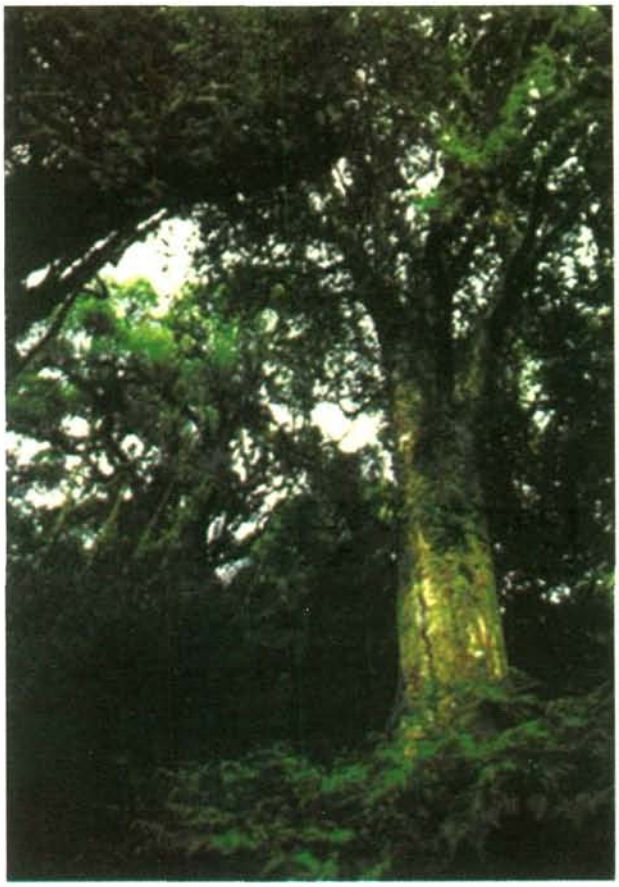


Fig.2: The oldest tree (aged 2700) that has ever been discovered grows in Qianjiazhai of Mt Ailao, Yunnan province

Fig.3: In the Tang dynasty, Mr. Lu Yu wrote the first tea book called "Cha Jing"

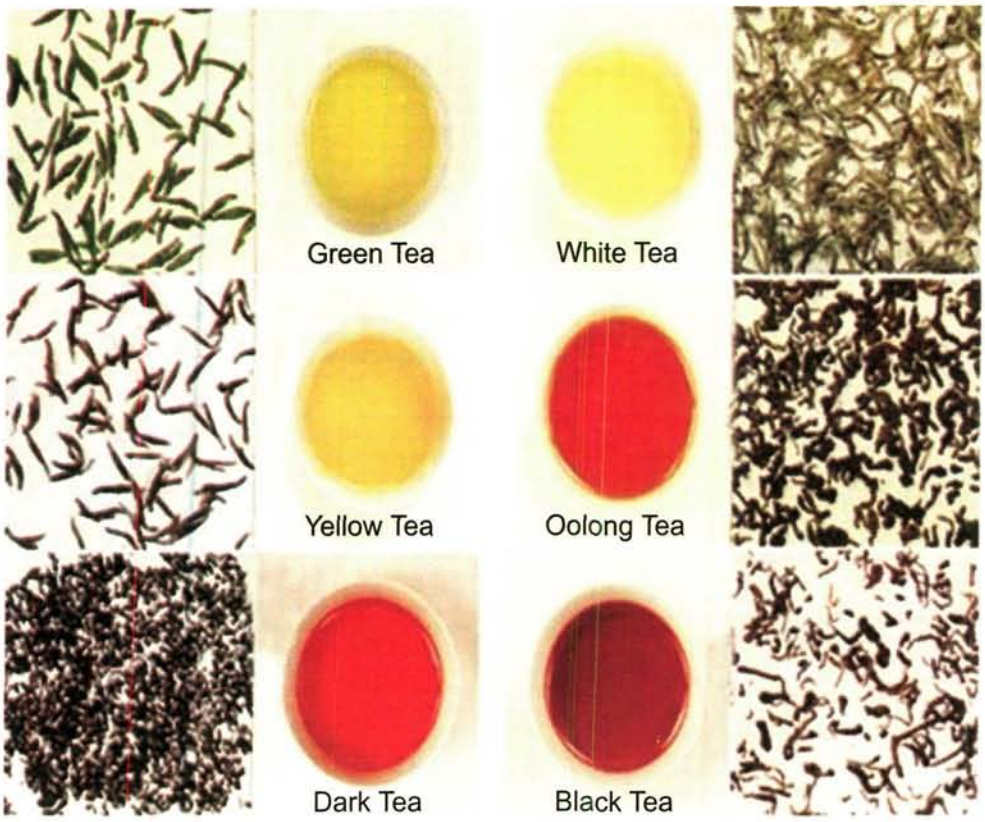


Fig.4: Six Kinds of Tea in China

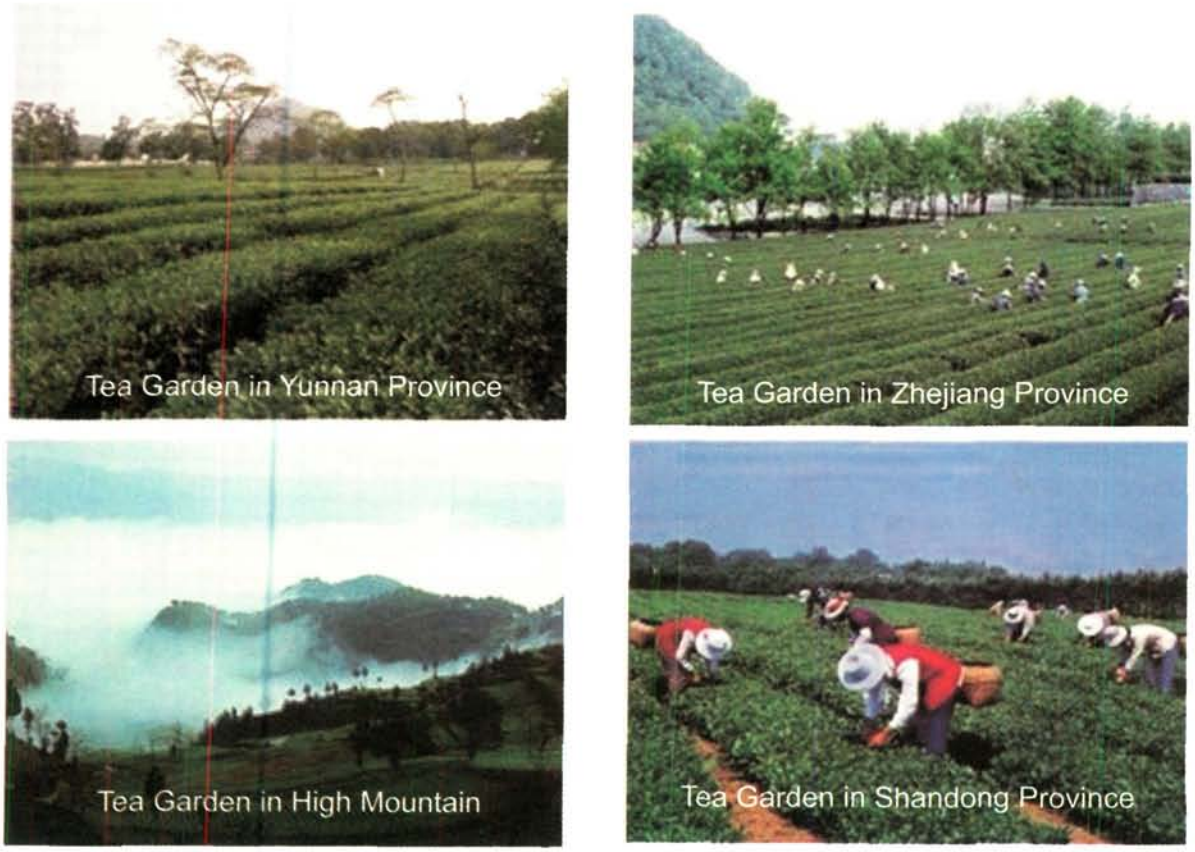


Fig.5: Tea Garden in Various Tea Areas of China

Fig.6: Tea Plant Species of Shi Gang

Fig.7: Raising Seedling of Production

Fig.8: Raising Seedlings in Green house

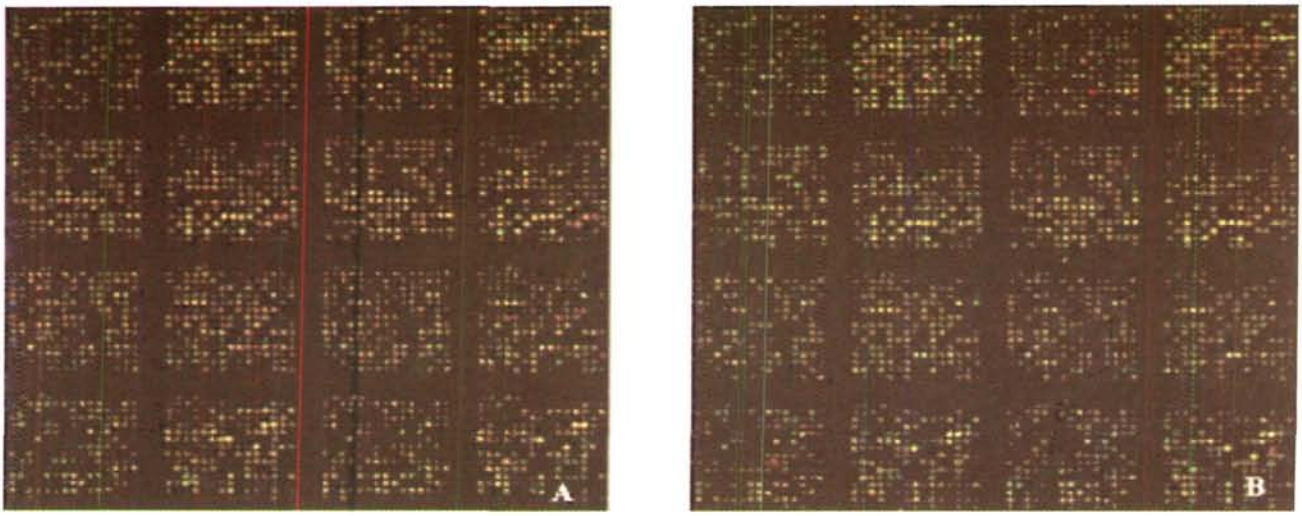


Fig.9: A Newly Developed Medium Density cDNA Microarray of Tea Plant

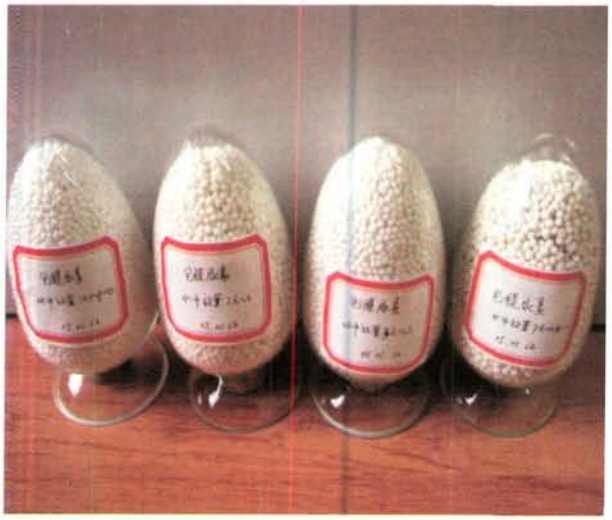


Fig.10a: Low-Releasing Nitrogen Fertilizer

Fig.10b: Complex Fertilizer Used in Tea Garden

Fig.11: Mechanized Plucking technology

Fig.12: Tea Plant diseases and insect pests

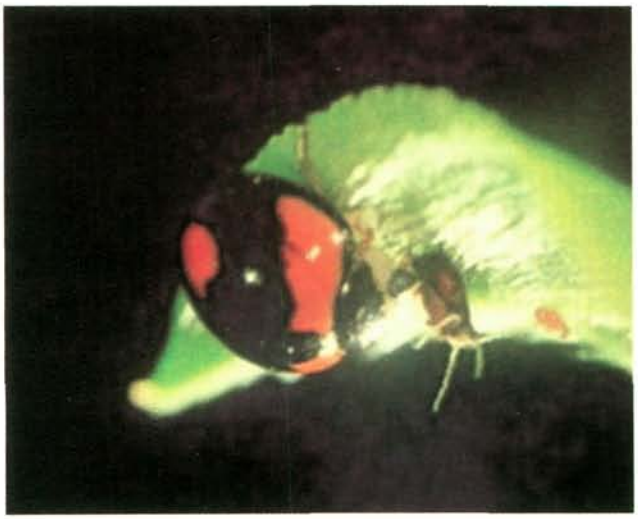


Fig.13: Natural Enemy of Pests in Tea Garden

Fig.14: Bio-Pesticides

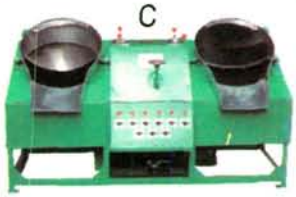
Fig.15: Research on the Chemical Communication Mechanism among Tea Plant-Pest-Natural Enemy

Fig.16: Trap Lamp Used in Tea Garden

A. Multi-Function Tea Machine
B. Flat-Shape Tea Machine
C. Curl-Shape Tea Machine

A

B



C

Fig.17: Traditional Tea Processing Technology

Fig.18: Tea Polyphenol Products

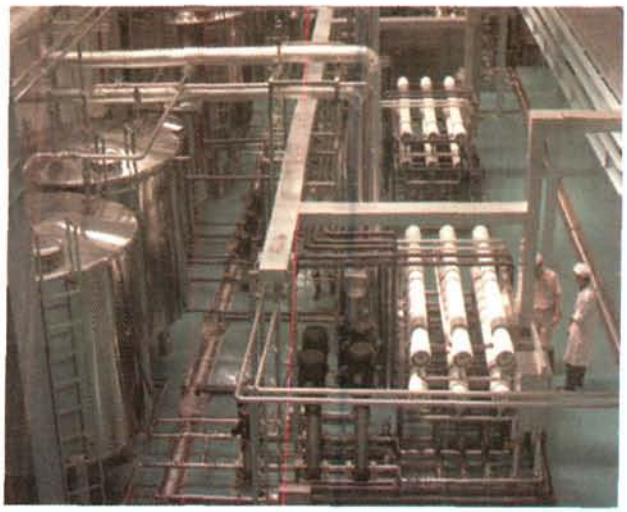


Fig.19: Extraction Technology of Tea Polyphenol

Fig.20: Extractive Technology of Tea Saponin

Fig.21: Ready-To-Drink Tea products

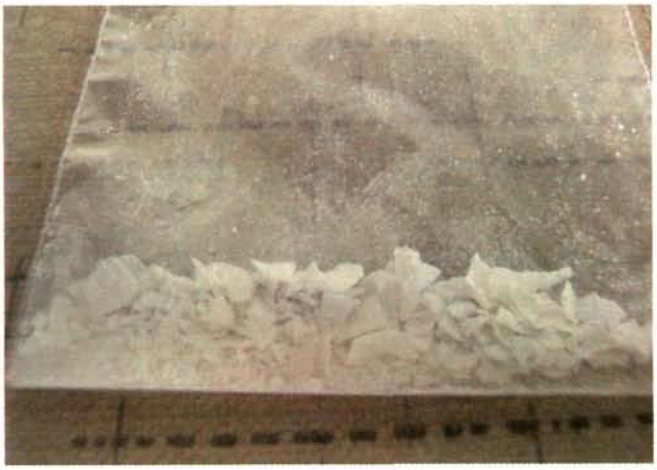


Fig.22: Theanine product

Fig.23: Theaflavins products

Fig.24: Tea Research Institute Chinese Academy of Agricultural Sciences