

## Ethnobotanical research on origin, cultivation, distribution and utilization of hemp (*Cannabis sativa* L.) in China

Fei-Hu Liu\*, Hua-Ran Hu, Guang-Hui Du, Gang Deng & Yang Yang

Laboratory of Plant Improvement and Utilization, School of Agriculture, Yunnan University,  
2# North Cuihu Lake Road, Kunming 650091, China  
E-mail: dmzpynu@126.com

Received 05 September 2016, revised 28 October 2016

Hemp (*Cannabis sativa* L.) is a dioecious and annual herbaceous plant in family Cannabinaceae, with more than 30 local names in China such as *flame hemp*, *string hemp*, *cold hemp*, *dew hemp* and *yellow hemp*, etc. China is one of the native habitats of hemp and is the oldest country cultivating and utilizing hemp, with a history over 10,000 to 12,000 years. Hemp widely distributes in China, was mainly used for textiles, foods, paper and medicine from very early time, and became a very important crop of the ancient China. Based on a number of archaeological discoveries, ancient Chinese literatures and records, this paper summarized the knowledge about the origin, geographical distribution, cultivation and utilization of hemp in the ancient China, and concluded that China is the most conceivable origin center of hemp.

**Keywords:** Hemp (*Cannabis sativa* L.), Distribution, Folk customs, Fabrics, Medicine

**IPC Int. Cl.<sup>8</sup>:** A01, A61K 36/00

Hemp (*Cannabis sativa* L.), a dioecious species of aromatic herbaceous plant with palmate leaves, loose clusters of male flowers, and spikes of dense cones of female flowers, belongs to family Cannabaceae. Hemp had become a very important economic crop for clothing and textile in the world since the ancient time<sup>1</sup> and is getting more and more popular all over the world, but the origin of hemp is worth discussing, due to lack of adequate historical records and archeological data, although hemp had distributed in the Eurasia since very early time. The hemp varieties with tetrahydrocannabinol (THC) content less than 0.3 % is classified as industrial hemp, otherwise, as marijuana or hashish<sup>2</sup>. Small (2015) discussed the evolution and classification of *Cannabis sativa* L. in relation to human utilization<sup>3</sup>. Hemp had been mainly used as fiber and food crop in China since the far ancient time, although the usage differed in different parts of the world. This paper helps readers to understand the origin, cultivation, distribution and utilization of hemp in China.

### Methodology

Ancient literatures relating to hemp in China has been investigated. In total over 90 copies of available

books, archives, handwritten documents and records were checked carefully. The most likely hemp-associated literatures were double-checked, including *Ben Cao Gang Mu (Compendium of Materia Medica)*<sup>4</sup>, *Shen Nong Ben Cao Jing (or She`n Nung Pe`n Ts`ao Ching)*<sup>5</sup>, *Zhi Wu Ming Shi Tu Kao Chang Bian*<sup>6</sup>, *Ben Cao Yan Yi (or Pen Ts`ao Yen I)*<sup>7</sup>, *Si Min Yue Ling (or Monthly Instructions for the Farmers)*<sup>8</sup>, *Qi Min Yao Shu*<sup>9</sup>, *Nong Shu*<sup>10</sup>, *Lv Shi Chun Qiu*<sup>11</sup> and others. Moreover, the searchable modern literatures, mainly journal articles, were checked carefully to discover the origin of Chinese cultivated hemp and the distribution of *Cannabis sativa* in China. We conducted field surveys in the hemp growing areas to investigate the traditional uses of hemp. These areas cover northeast China, northern China, north west China, central China and south west China as well. The ethnic groups we visited included *Han, Miao, Tujia, Yao, Yi, Hui, Korean, Uigur, Dong, Buyi, Dai* and others. Questionnaires, semi-structured interviews involving status of hemp distribution, hemp usage and legends of hemp, etc., and ethnobotanical approaches including ethnic literature search and face-to-face talk, were used to collect the information of traditional uses of hemp by different ethnic groups. Furthermore, when the investigators got the grant for this study they were approved to carry out all investigations necessary for

\*Corresponding author

the study including interviewing with the ethnic groups.

## Results and discussion

### Evidences for the origin of hemp in China

Although the origin of hemp is still not determined and the original areas at least involve (a) the central Asia, i.e., the intermediate region among Central Asia, Himalayas and Siberia, the South Caucasus and the southern region of Caspian Sea<sup>12,13</sup>; (b) Asia or the Near East<sup>14</sup>; (c) the Himalayas or Iran and China<sup>15</sup>; (d) Sikkim, Bhutan, India and the Central Asia<sup>16</sup>; (e) India and Persia (Iran)<sup>17</sup>; (f) China<sup>18</sup>. The origin center of hemp unequivocally covers Asia, the East Asia, the Central Asia, the South Asia, the West Asia and the Near East. The specific regions involve China, India, and Iran and so on. The common ideas support that hemp originated in Asia, while China has been supposed as the most conceivable origin center of hemp, based on the following evidences.

### Archaeological discoveries

The Neolithic relics of hemp are undoubtedly valuable materials for surveying the origin of hemp. The earliest-known hemp relic was found in existence in Taiwan back to about 10,000 BC, and the earliest known cloth fabric back to 8 000 BC in China is woven from hemp<sup>19</sup>. The unearthed relics from Yin Ruins (about 1300 BC) at Anyang, Henan Province, China included hemp seeds and some hieroglyphs of “Si” (silk) and “Ma” (bast fiber, hemp) in the Oracles (the inscriptions on bones or tortoise shells)<sup>20</sup>. In Dongxiang County, Gansu Province, the hemp seeds unearthed in the Lin’s site were from over 4000 years ago<sup>21</sup>. In addition, archeologists found hemp fiber dating back to 4,000 yrs ago in the tombs located at the downstream of Kongque River in Xinjiang Autonomous Region<sup>22</sup>.

Hemp fabrics and seeds were also found from a little bit later ruins of Shang Dynasty, such as the hemp fabrics from Taixi site in Gaocheng County, Hebei Province. The fabrics (hemp seeds as well) were confirmed made of hemp fiber by projection diagram analysis<sup>23</sup>. At the end of 1971, archaeologists found lots of hemp fabrics dating back to 3,000 yrs ago in the graves of early (Western) Zhou Dynasty in Gaojiapu (Fortress Gaojia), Jingyang County, Shaanxi Province, showing the advanced textile technique at that time<sup>24</sup>. Up to early (Western) Han Dynasty, the technology of hemp textile had been further improved greatly. Archeologists found a piece of hemp fabric in

Mawangdui Han Tomb No.1 near Changsha, China. Analysis of longitudinal projection and cross-sectional slices revealed that the fiber diameter was 21.83  $\mu\text{m}$ , the average fiber length was 12 mm, the cross-sectional area of single fiber was 153  $\mu\text{m}^2$ , and the turning of fiber helix angle was counterclockwise<sup>25</sup>. All these parameters were similar to the characteristics of modern hemp fiber. High compactness of the fabric, demonstrated the highly developed textile technique at that time. In early Han Dynasty, China exported hemp textiles to the Middle East, the Mediterranean, European countries, and then to different regions of the world via the “Silk Road”.

### Written records

There were a large number of written records about hemp early in China, but it was not confirmed whether “ma” (hemp) appeared in the earliest Chinese characters on the Oracles or not. However, character “ma” (just like 𦉳) was affirmed in the inscriptions on bronze in Shang and Zhou dynasties<sup>26</sup>. The font style was basically not different from “ma” (just like 麻) in *Shuo Wen Jie Zi* (or *Origin of Chinese Characters*)<sup>27</sup> written by Xu Shen in Han Dynasty, and is similar to the modern Chinese character “ma” (just like 麻). This implied that hemp cultivation had been relatively popular in Shang and Zhou dynasties, and the character “ma” was therefore, specially created to indicate hemp. The earliest literature in it hemp was clearly recorded was *Shi Jing* (or *The Book of Songs*, A book about the social life in early (Western) Zhou Dynasty)<sup>28</sup>. Words about hemp were seen in this book, such as millet, hemp, beans and wheat in chapter *Bin Feng · Qi Yue*, hemp growing on the hills in chapter *Wang Feng · Qiu Zhong You Ma*, the pond near the east gate could be used to ret hemp in chapter *Chen Feng · Dong Men Zhi Chi*, the market is not prosperous without hemp products in chapter *Chen Feng · Dong Men Zhi Fen*, and hemp cultivation techniques could be valued by the cultivation area in chapter *Qi Feng · Nan Shan*. From these records, people can imagine the popular hemp cultivation and the developed techniques during early (Western) Zhou Dynasty. The above literatures demonstrated a very long history of hemp cultivation and utilization in China.

### Wild hemp in China

The wild species (types) provides a strong evidence to discuss the origin of a crop, since the cultivated plants were domesticated from the wild plants. Lots of

wild hemp grows at different places in the Yellow River and Yangtze River Basins, China, wild hemp was often documented in Chinese ancient books as well. For example, “The wild hemp in the mountains is similar to cultivated hemp” said the book *Er Ya · Shi Cao Di Shi San* (3rd century BC)<sup>29</sup> and the wild hemp growing on Taishan Mount described in *Shang Shu · Yu Gong* (4<sup>th</sup> century BC?)<sup>30</sup>. Sun<sup>31</sup> suggested that the district wild hemp growing mentioned in *Er Ya · Shi Cao Di Shi San* was exactly in the surrounding areas of Taishan Mount that located at the Yellow River Basin. He in 1981 found plenty of wild hemp along the way from the piedmont to the South Gate of Taishan Mount. Furthermore, wild hemp was also found in some forest areas, where traffic inconvenient, untraversed and remote, in Yunnan, Tibet, Xinjiang and the North and the North east of China<sup>32-34</sup>. Wild hemp had shorter and slender stem, less branches, smaller and easy shattering seeds of longer dormant duration, which evidently differed from the cultivated hemp<sup>35</sup>.

#### *Folk customs associated with hemp*

Hemp, wheat, millet, broomcorn and bean were recorded as the most common cereals in an ancient Chinese book *Lv Shi Chun Qiu* (about 239 BC)<sup>11</sup> that implied Chinese people widely used hemp seed as food at latest from the late Warring States period. Hemp carvings were verified on a Square Bronze Dou (bucket), collected in the Palace Museum of China, from the beginning year of New Mang Dynasty (AD 9)<sup>36</sup>. The famous poet Bai Juyi in Tang Dynasty in his *Qi Yue Yi Ri Zuo* portrayed the scenery that people satisfy themselves by eating a bowl of hemp seed porridge when hungry<sup>37</sup>. Today, people in some areas of Xinjiang Autonomous Region often eat Tsampa mixed with hemp seed<sup>38</sup>. Owing to the outstanding quality, hemp fabrics were often presented as tributes to the emperor in ancient China. As recorded in *Shang Shu · Yu Gong*<sup>30</sup>, two states Qing (now Shandong Province) and Yu (now Henan Province) in the Warring States period were the main producers of hemp tributes to the emperor. The records said in *Xin Tang Shu · Bei Di Zhuan*<sup>39</sup> that Xian State (now Sumi Town, Huadian City, Jilin Province) produced the costly hemp fabrics that were used only by the aristocracies. Hemp was widely cultivated in the northeast region of China in Tang Dynasty. Furthermore, Sima Qian also mentioned in his book *Shi Ji*<sup>40</sup> that mulberry and hemp were popular in Qi and Lu States (now Shandong Province). In addition,

the Miao and Yi nationalities in Yunnan Province retained the custom of hemp cultivation, fiber for fabrics and seed for food from a long time ago. The above records and facts verified that hemp became an important part of Chinese food and dress cultures for all ethnic groups from the ancient time.

#### **Distribution of hemp in ancient China**

In ancient China, bast fiber crops mainly included hemp (*Cannabis sativa* L.), ramie (*Boehmeria nivea* L.), piemaker (*Abutilon theophrasti* Medic), jute (*Corchorus capsularis* L.) and flax (*Linum usitatissimum* L.). Of them, hemp had a large proportion of cultivation area and usage<sup>41</sup>. During the long period before Qin Dynasty (before 221 BC), hemp mainly distributed in the middle and lower reaches of the Yellow River, the northern part of China, later expanded to Jing and Chu states, the South areas of Yangtze River (now Hunan, Hubei, Anhui and so on). However, the written records about hemp production in southern part of China were seen until the Warring States period, such as “break hemp branches entrust the parting thoughts” in *Jiu Ge* (or *Nine Odes*) written by Qu Yuan (3rd century BC)<sup>42</sup>. In Northern Wei Dynasty (A.D. 386-534), according to the *Wei Shu · Shi Huo Zhi*<sup>43</sup>, people paid hemp fabrics instead of money or cereals as taxes to the Government in Gansu, Shaanxi, Hebei, Henan, Shandong, Shanxi and other places in Yangtze-Huaihe Region. When the monarch carried out the policy of Land Equalization, a man could get ten more acres of farmland for hemp plantation and a woman five more acres. Therefore, the middle and lower reaches of the Yellow River was the production center of hemp in China from the ancient time. Up to Han Dynasty, as the culture of Central Plains expanded to remote areas in China, hemp cultivation gradually extended to the southern China and the ethnic minority districts in the South western part of China. Hemp production therefore developed very quickly and hemp became one of the most important economic crops. Until Tang Dynasty, hemp cultivation expanded rapidly in the Yangtze River basin where became another important hemp-producing region<sup>44</sup>. In addition, hemp was also cultivated in Yunnan district, mainly in the southern Qujing district and the west bank of Dianchi Lake as recorded in *Man Shu* (a book recorded the history and geography of South western China)<sup>45</sup>. However, the situation changed in Yuan Dynasty along with the decline of hemp production in the region South of

Yangtze River, because of the quick expansion of cotton from the southern border areas to northern areas from late (Southern) Song Dynasty to early Yuan Dynasty. Yuan monarch encouraged farmers to grow cotton that led quick reduction of hemp production in China by the thirteenth century<sup>46</sup>, although there were indeed small-scale hemp production that was used for coarse ropes and mourning dresses in different districts. However, hemp production regained its importance once again in Ming Dynasty, because hemp products were the requisites for ritual and conventional dresses of average people that could not be replaced by cotton or silk. The book *Min Shi · Shi Huo Zhi* published in 1739 recorded that Emperor Zhu Yuanzhang, conforming to the public requirements at the beginning of his dynasty, issued an order saying farmer with 5-10 acres of farmland ought to plant mulberry, hemp and kapok half acre for each; this should be doubled if the farmer has more than ten acres of farmland<sup>47</sup>. The hemp production thereby was greatly promoted in Ming Dynasty.

#### Hemp cultivation in ancient China

China is one of the oldest countries in the world to cultivate and utilize hemp. The history of hemp utilization in China could be traced back to 10000 to 12000 yrs ago<sup>13,19</sup>. At the beginning, farmers accumulated great amount of experiences from the practices of hemp cultivation that were passed orally from one generation to another. The earliest known book that documented the techniques of hemp cultivation was *Si Sheng Zhi Shu* (or *Si Sheng-Chih Shu*, the earliest known agricultural book in China)<sup>48</sup>. This book described a series of techniques for hemp cultivation involving sowing, fertilization, irrigation, harvesting and so on. For sowing, the best time is from the last ten days of March to the first ten days of April. Hemp should be sown immediately before or after raining, and inter-tillage should be done in the seedling stage. Hemp sown ahead of time would develop very hard stalk, thick bast and more internodes, while hemp sown delayed decreases the strength of bast. However, predated sowing is better than delayed sowing. Hemp can be fertilized with silkworm excrement or animal manure when it grows to a height of 33 cm, but silkworm excrement is better. For the water management, it is better to irrigate hemp using river or stream water when needed. The well water should be warmed under sunshine if river water is not available. However,

hemp needs no irrigation when the soil is humid; and the irrigation should not be done frequently. When the most of the male plants is flowering, hemp can be harvested; stalks are retted in water for twenty days from late summer to early autumn. The produced fiber is as good as silky. Moreover, seed hemp is harvested after the first frost by cutting off the stalks to get seeds. Another famous agricultural book in ancient China, *Qi Min Yao Shu* comprehensively recorded the techniques of hemp cultivation<sup>9</sup>; covering from seed selection, seed soaking through to harvest. According to the book, the white hemp seed is good for planting and the density should be higher in fertile lands than in infertile lands. Rainwater is better than well water for soaking hemp seeds, but too much water is not conducive to germination. The detail operations for forced germination were described that was the earliest records about seed soaking and germination for the field crops in China. Hemp can be sown after seed soaking and germination if the soil moisture is high enough, otherwise sown only after seed soaking. Continuous cropping is harmful to hemp because of increasing risk of diseases that causes decline of the fiber quality. Hemp can be planted in rotation system with millet, wheat, beans, etc. The book *Qi Min Yao Shu* also recorded many experiences about row intercropping, relay intercropping and mixed cropping, such as hemp-turnip intercropping and hemp-millet mixed cropping. In addition, hemp can be grown together with pagoda (*Sophora japonica* L.) trees, which benefits the hemp growth, but soybean-hemp intercropping is not good to the growth of both plants. The book also suggested that the right time of removing the male plants is after flowering, otherwise if the male plants are removed too early, the female plants would seed very poor. Moreover, the chapter *Zhong Zhi* (planting) in the book *Tai Ping Yu Lan* also documented the techniques of hemp cultivation, covering sowing time, soil preparation, inter-tillage, weeding and fertilizing<sup>49</sup>. All the above techniques contributed very much to the later generations. When the time comes to Tang Dynasty, hemp was planted almost throughout China. The famous poet Du Fu wrote in his poem *Xi Qing* that "I'm too old to grow proso millet, but do tea and hemp"<sup>50</sup>. Bai Juyi, another poet said in his poem *Qin Zhong Yin · Chong Fu* that "Fertile land for planting mulberry and hemp in order to reduce the burden of people"<sup>37</sup>. Poet Xu Hun wrote, "At the South end of the village, that was the first family, the house was surrounded by hemp and

mulberry” in his poetry *Ding Mou Ji*<sup>51</sup>. All these works fully reflected the widespread hemp cultivation in China in Tang Dynasty. Moreover, some important books of agriculture and plant science in the later dynasties, such as *Tu Jing Ben Cao* in Song Dynasty<sup>52</sup>, *Nong Shu*<sup>10</sup> and *Nong Sang Yi Shi Cuo Yao*<sup>53</sup> in Yuan Dynasty, *Ben Cao Gang Mu (Compendium of Materia Medica)* in Ming Dynasty<sup>4</sup> and *Zhi Wu Ming Shi Tu Kao Chang Bian* in Qing Dynasty<sup>6</sup>, expounded the production technology, medicinal properties and name determination of hemp in detail.

The above ancient books not only recorded the cultivation techniques of hemp, covering soil preparation, sowing, inter-tillage, fertilizing, irrigation, harvesting and retting, but also showed sceneries of hemp production and utilization in ancient China. All these were both the valuable experiences of hemp production summarized from the practices of ancient Chinese over thousands of years, and the important symbols of highly advanced technology of hemp production in ancient China, which were the important foundation of hemp production for the modern generations.

#### Uses of hemp in China

The book *Er Ya Yi* in Song Dynasty said that hemp has many benefits, seeds provide nutrition to the human and fiber could be made into cloth<sup>54</sup>. The ancient Chinese clearly understood the dioecious nature of hemp and its usage. Chapter *Sang Fu* in the book *Yi Li* (or *Ceremonial Etiquette*) recorded that *Xima*, the male hemp, is mainly for fiber to spin and weave<sup>55</sup>. The chapter *Cao Feng · Fu You* in *Shi Jing*<sup>28</sup> also said that *Xima* produces better fiber that can be used for high quality cloth. Then the chapter *Bin Feng · Qi Yue* said that *Juma* (the female hemp) produces edible seeds that can be harvested around October. Another book, *Yi Wen Lei Ju* had further described the scene of people eating hemp seeds at that time<sup>56</sup>. *Juma* produces coarse fiber that is used for coarse dress and mourning cloth, evidenced by the book *Zhuang Zi · Rang Wang*<sup>57</sup>. The usages of hemp in ancient China including foods, fabrics, papermaking and medicines were summarized as follows.

#### Foods

Ancient Chinese named hemp seeds as one of the “five grains”, hempseed, broomcorn millet (*Panicum miliaceum*), millet (*Panicum miliaceum* L.), wheat (*Triticum aestivum* L.) and soy bean (*Glycine max*)<sup>58</sup>.

In the late (Eastern) Han Dynasty, hemp seed was used as a kind of high-grade food according to *Shen Nong Ben Cao Jing*<sup>5</sup>, ranking between linseed and wheat. Some other famous ancient books, such as *Ben Cao Gang Mu (Compendium of Materia Medica)*<sup>4</sup> and *Zhi Wu Min Shi Tu Kao Chang Bian*<sup>6</sup>, also recorded the important food hemp seed. Summarizing the historical records, there were four ways of eating hemp seed in ancient China. Firstly, hemp seed was eaten as a snack, but mainly by the middle and lower classes. The book *Lie Zi · Yang Zhu* told a story that a few poor people made fun of a rich man who did not know how to eat hemp seed<sup>59</sup>. Up to now, people in some regions of South western and northern China still keep the custom of eating hemp seed. Secondly, hemp seed was made into porridge. A story said that Queen Chen, who was short of breast milk for child, produced sufficient milk when she ate hemp seed porridge for days<sup>60</sup>. Thirdly, hemp seed oil was used with food. Ancient Chinese used hemp oil for stir-fries or frying foods. Modern Chinese in the northern parts of Shaanxi and Shanxi provinces still maintain the habit of eating hemp seed oil. Song also pointed out in his book *Tian Gong Kai Wu* (or *Exploitation of the Works of Nature*) that only hemp seed and linseed could be used as edible oil resources from the bast fiber crops<sup>61</sup>. Fourthly, the smashed hemp seed was used as seasoning for foods. The chapter *Yue Ling* in *Li Ji* (or *The Book of Rites*)<sup>62</sup> recorded that animal meat was stewed, adding mashed hemp seed as seasoning functioned the same as sesame oil for meliorating the taste. Besides, local Chinese people also used hemp oil for the cold dishes, cakes or pastry<sup>63</sup>. Until around the 10th century, before other high-yielding grains were cultivated widely, hemp seed was an important part of the diet for Chinese people<sup>64,65</sup>.

#### Fabrics

The Chinese may have been the first people to make use of hemp’s fiber<sup>19,66</sup>. By knowing the excellent flexibility of hemp fiber, ancient Chinese cultivated hemp as raw material of textile. Before the introduction of cotton into China, hemp fabrics had all along been the main dress material of ancient Chinese, which was confirmed by many archaeological discoveries<sup>21, 22, 24, 25, 64, 65</sup>. For example, the hat for the aristocrat was made of hemp fiber during early (Western) Zhou Dynasty (1046 B.C. -771 BC). The coarse hemp fabrics were used to make mourning dress or shroud<sup>64</sup>, such as the hemp shroud

unearthed from an early Han Dynasty tomb in Gansu Province. In addition, hemp fiber was often made into shoes, bags and other daily necessities in ancient China<sup>67</sup>.

#### **Papermaking**

Paper making is another important use of hemp, because Chinese mastered the technique of making hemp fiber into paper very long time ago. Based on the records in the book *Hou Han Shu · Cai Lun Zhuan*<sup>68</sup>, Cai Lun (AD 61-121) used tree bark, worn-out hemp fabrics and fishnet to make paper. However, it was much earlier in the fact to make paper using hemp as raw material and hemp paper appeared around 100 BC<sup>69</sup>. In 1957, archaeologists found a piece of paper residue made from hemp fiber, approximately 10 cm<sup>2</sup>, from an early tomb of early (Western) Han Dynasty at Baqiao, Xi'an, Shaanxi Province that was believed as the oldest paper residue ever seen in the world<sup>70</sup>.

An ancient book *Tang Hui Yao* mentioned that the emperor ordered placeman use hemp paper to write appointment notification for new officials<sup>71</sup>, which implied the popularity of hemp paper at that time. In addition, the most common paper rolls in Dunhuang Grottoes, Gansu Province was made of hemp paper<sup>72</sup>.

#### **Medicines**

There were too many records about the medicinal uses of hemp in the ancient Chinese literatures to be summarized in short words. The earliest records about hemp as medicine is seen in *Huang Di Nei Jing* (or *Inner Canon of Huangdi*) that was the earliest writing of traditional Chinese medicine theory<sup>73</sup>. Hemp was used to cure disease in China, India and the Middle East from thousands of years ago. Chinese hemp, with less content of addictive substances, was not narcotic drugs or hallucinogens, but an important agricultural or medicinal crop. Hemp seed has been one of the commonly used Chinese herbal medicine since the ancient time, but other parts of hemp plant was also of special medicinal values.

#### **Hemp as single herb**

*Shen Nong Ben Cao Jing* (one of the earliest known Chinese medicinal book edited ca. the Qin and Han dynasties) said that *Mafen*, the male flowers of hemp, could cure general debility, benefits the five internal organs and made people feel bright and breezy, and eating hemp seed make people healthier and stronger and enjoy a long life<sup>5</sup>. *Min Yi Bie Lu*<sup>74</sup> pointed out that *Mafen* was noxious and mainly used

for diminishing inflammation, but the hemp seed was innocuous, neutral-natured. Li recorded the medicinal qualities of hemp in detail in his book *Ben Cao Gang Mu (Compendium of Materia Medica)*<sup>4</sup> and suggested the male hemp flower was pungent, warm-natured and innocuous, but hemp seed with hull was pungent, mild-natured and nocuous. Moreover, Ni mentioned in his book *Ben Cao Hui Yan* that hemp leaves had a good curative effect on ascariasis and malaria<sup>75</sup>. Hemp stem or its bast<sup>76</sup>, as well as hemp roots<sup>77</sup> were used to cure the traumatic injuries with satisfied effect in the ancient China.

#### **Hemp as ingredient of prescriptions**

Ancient Chinese knew hemp of different parts had different medicinal effect for disease therapy. Hemp seed mixed with other herbs had the function of lubricating the bowel and eliminating dryness of the body. The famous ancient Chinese doctor Zhang Zhongjing in late (Eastern) Han Dynasty used “*Maren pill*” (the main ingredient is mashed hemp seed without hull) to cure frequent urination and hard stool<sup>78,79</sup>. His medicinal book *Shang Han Lun* (or *Treatise on Febrile Diseases*) documented in detail the efficacy and theory of “*Maren pill*” to the related symptoms<sup>78</sup>, and suggested that broiled *Licorice* root soup was mainly used for the treatment of consumptive lung asthenia, deficiency of Yin blood or insufficiency of Yang, and physically weak. In the prescription, *Maren* mixed with donkey-hide gelatin and radix ophiopogon (*Ophiopogon japonicus* (L.f.) Ker-Gawl) could achieve the desired effect of nourishing Yin and tonifying Yang. There was a similar prescription recorded in *Wen Bin Tiao Bian* (or *Item Differentiation of Warm Febrile Diseases*) for the patients showing symptoms of pathogenic heat lingering, Yin deficiency of body fluid, hot red face, mouth parched and tongue scorched, empty high pulse etc. at the later stage of febrile disease<sup>80</sup>. Besides, there were quite a few prescriptions involving hemp seed in *Ben Cao Gang Mu (Compendium of Materia Medica)*, such as mixing hemp seed with peach kernel to treat absence of menses, hemp flower and radix *Aconiti Kusnezoffii* to treat numbness of limb caused by wind disease, and male hemp flower and *Typhae* pollen (pollen of *Typha angustifoliae* L.) to treat incised wound and numbness<sup>4</sup>.

#### **Conclusion**

From ancient time *Cannabis sativa* L. (hemp) was called in China as “*flame hemp, string hemp, cold hemp, dew hemp and yellow hemp*”. China is the

oldest country who has utilized hemp for more than 10 000 yrs and cultivated hemp at least for 6 000 yrs according to archaeological discoveries and written sources. From books and local peoples, hemp was mainly used as food, fiber, medicine and edible oil in ancient China. The common ideas support that hemp originated in Asia, while China has been supposed as the most conceivable origin center of hemp, based on the archaeological discoveries, written records, wild hemp distribution and Chinese folk customs associated with hemp.

### Acknowledgment

This research was supported by the National Natural Science Foundation of China (31371678), China Agriculture Research System for Bast and Leaf Fiber Plants (CARS-19). The authors present heartfelt thanks to Dr. KP Singh for his kind help in compiling and modification of this paper.

### References

- Liu Y, From commoner to noble: Historical evolution of Chinese hemp, *Young Writers*, (7) (2009) 79-83.
- He JF, Chen TP, Lu RR, Liu G, Chen M, *et al.*, Study on the comprehensive utilization and industrialization of hempseed (*Fructus Cannabis*), *J Chinese Inst Food Sci Technol*, 10 (3) (2010) 98-112.
- Small E, Evolution and Classification of *Cannabis sativa* (Marijuana, Hemp) in Relation to Human Utilization, *The Bot Rev*, 81 (3) (2015) 189-294.
- Li SZ, *Reprint of Ben Cao Gang Mu (1590) [Compendium of Materia Medica]*, (People's Medical Publishing House, Beijing), 1999.
- Gu GG, *Reprint of Shen Nong Ben Cao Jing (1844)*, (Lanzhou University Press, Lanzhou, China), 2009.
- Wu QJ, *Reprint of Zhi Wu Min Shi Tu Kao Chang Bian (or Chih Wu Ming Shi T'u K'ao Ch'ang Pien) (1848)*, (Zhonghua Book Company, Beijing), 1963.
- K'o F-s, ed. *Ben Cao Yan Yi [Augmented Materia Medica](Kou ZS 1116)* Wuchang), 1905.
- Shi SH, ed. *Si Min Yue Ling (Monthly instructions for the farmers) (Cui S 2<sup>nd</sup> Century)*, (Zhonghua Book Company, Beijing), 1965.
- Shi SH, ed. *Annotation of Qi Min Yao Shu (Jia S X A.D. 544)*, (Science Press, Beijing), 1957.
- Wang Z, *Reprint of Nong Shu (1313)*, (Zhonghua Book Company, Beijing), 1956.
- Xia WY, ed. *Annotation of Lv Shi Chun Qiu (Lv BW about 239 B.C.)*, (Zhonghua Book Company, Beijing), 1958.
- Li JX, Yang SR & Zhou KR, eds. *Crop Cultivation Science*, (Higher Education Press, Beijing), 1959.
- Schultes RE, Klein WM, Plowman T & Lockwood TE, *Cannabis: an example of taxonomic neglect*, *Bot Museum Leaflets Harvard Univer*, 23 (9) (1974) 337-367.
- Chen QB & Yang M, Discussion about the origins of marijuana, *Agric Archaeol*, 1 (1996) 215-217.
- Li ZD, *The Theory and Technology of Fiber Crops*, (Shanghai Science and Technology Press, Shanghai), 1980.
- Editorial Committee of FoC, ed. *Flora of China (Vol. 23)*, (Science Press, Beijing), 1998.
- Chopra RN & Chopra IC, *Indigenous Drugs of India*, (Academic Publishers, Kolkata, India), 2006.
- De Candolle A, *Origin of Cultivated Plants*, (Kessinger Publishing, 2006).
- Hemphasis.net, Chronology of hemp throughout history [EB/OL], <http://www.hemphasis.net/History/history.htm>.
- Tong PY, Ramie in ancient China, *China's Fiber Crops*, 2 (1) (1980) 25-28.
- Chen WH, *Archaeological Illustrated Catalog of China Agriculture*, (Jiangxi Science and Technology Press, Nanchang, China), 1995.
- Chen WH, The origin and development of Chinese primitive agriculture, *Agric Archaeol*, (1) (2005) 8-15.
- Gao HY, Wang ZC & Chen YC, Unearthed textiles of Shang Dynasty in Taixi Village, Gaocheng County, Hebei Province, *Cultural Relics*, (6) (1979) 44-49.
- Ge J, Excavation of early Zhou Dynasty tombs in Gaojiabu, Jingyang County, Shaanxi Province, China, *Cultural Relics*, 7 (1972) 5-9.
- Shanghai Institute of Textiles & Heritage Research Group of SSI, *Study of the Unearthed Textile from Han Tomb No. 1 at Mawangdui, Changsha*. (Cultural Relics Publishing House, Beijing), 1980.
- Jiang ZF & Huang CY, *Brief Explanation of Chinese Bronze Inscriptions*, (Zhejiang People's Publishing House, Hangzhou, China), 2006.
- Xu C, *Reprint of Shuo Wen Jie Zi (A.D. 121)*, (Jiangsu Ancient Books Publishing House, Nanjing, China), 2001.
- Tang YR, ed. *Annotation of Shi Jing (Anonymity 6th century B.C.)*, (Sichuan Publishing House, Chengdu, China), 1998.
- Chen TM, ed. *Annotation of the Thirteen Classics—Er Ya (Anonymity 3<sup>rd</sup> century BC)*, (Sanqin Press, Xi'an, China), 2004.
- Li M & Wang J, eds. *Annotation of Shang Shu (Anonymity 4th century B.C.?)*, (Shanghai Ancient Books Publishing House, Shanghai), 2004.
- Sun AG, China is the origin of hemp, *China's Fiber Crops*, 5 (3) (1983) 45-48.
- Yang YH & Cheng JR, A preliminary systematic study on *Cannabis sativa* L., *China's Fiber and Products*, 26 (4) (2004) 164-169.
- Liu YT, Investigation report of wild hemp, *Xinjiang Agric Sci*, 6 (1963) 241.
- Sun AG, Chen XH, Jiang GX & Guo RP, Study of Chinese hemp variety resources, *China's Fiber Crops*, 14 (3) (1992) 17-21.
- Yang M, Brief contrast of wild hemp and cultivation hemp, *China's Fiber Crops*, 14 (3) (1992) 44.
- Luo FY & Tang L, Copper square bucket from Xinmang Dynasty the first year, *Palace Museum J*, 1 (1958) 50-51.
- Zhu JC, ed. *Revision of the Poetry of Bai Juyi (Bai JY AD 9<sup>th</sup> century)*, (Shanghai Ancient Books Publishing House, Shanghai), 1988.
- Hu YY, Inspection of bast fiber plants in Changdu, Tibet, *Crop Germplasm Resour*, (2) (1984) 21-22.
- Ou YX & Song Q, *Reprint of Xin Tang Shu (1060)*, (Zhonghua Book Company, Beijing), 1975.
- Wang LQ, ed. *Annotation of Shi Ji (Sima Q 104 B.C.)*, (Sanqin Press, Xi'an, China), 1988.

- 41 Song ZQ, History and techniques of fiber plant cultivation in ancient China, *China's Fiber Crops*, 9 (2) (1987) 44-48.
- 42 Wen HS, ed. *Translation and Annotation of Jiu Ge (Qu Y 3rd century B.C.)*. (Baihua Literature and Art Publishing House, Tianjin), 2005.
- 43 Wang ZC, Chen ZX & Xiang ZL, eds. *Interpretation of Wei Shu (Wei S A.D. 554)*, (Jiangxi People's Publishing House, Nanchang, China), 1986.
- 44 Xu XH, The varieties of bast fiber plants in the Dynasties of Tang, Five Generations and Early Song, *Dunhuang Research*, 2 (2004) 87-91.
- 45 Xiang D, ed. *Annotation of Man Shu (Fan C A.D. 862)*, (Zhonghua Book Company, Beijing), 1962.
- 46 Song ZQ, Hemp production in ancient China, *Agric Hist China*, 2 (1982) 48-57.
- 47 Li X, ed. *Annotation of Ming Shi-Shi Huo Zhi (Zhang TY 1739)*. (Zhonghua Book Company, Beijing), 1982.
- 48 Wan GD, ed. *Recompile and Interpretation of Si Sheng Zhi Shu (Si Sheng-Chih Shu, Si Shengzhi late Early Han Dynasty?)*. (China Agriculture Press, Beijing), 1980.
- 49 Li F, Li M & Xu X, *Reprint of Tai Ping Yu Lan (A.D. 983)*, (Zhonghua Book Company, Beijing), 1960.
- 50 Yang WK, *A Dictionary for Appreciation and Lookup of Poem Rhesis in Tang Dynasty*, (Commercial Press, Beijing), 2007.
- 51 Luo SJ, ed. *Revision of Ding Mou Ji (Xu H A.D. 850)*, (Jiangxi People's Publishing House, Nanchang, China), 1998.
- 52 Hu NC & Wang ZP, *Tu Jing Ben Cao (Su S 1061)*, (Fujian Science and Technology Press, Fuzhou, China), 1988.
- 53 Wang LH, ed. *Revision of Nong Sang Yi Shi Cuo Yao (Lu MS 1314)*, (China Agriculture Press, Beijing), 1962.
- 54 Luo Y, *Reprint of Er Ya Yi (1174)*, (Huangshan Press, Hefei, China), 1991.
- 55 Peng L, ed. *Annotation of Yi Li (Confucius 4<sup>th</sup> century B.C.)*, (Yuelu Bookstore Press, Changsha, China), 2001.
- 56 Ou YX, *Reprint of Yi Wen Lei Ju (A.D. 624)*, (Shanghai Chinese Classics Publishing House, Shanghai), 1965.
- 57 Zhuang Z, *Reprint of Zhuang Zi (369 B.C. ~ 286 B.C.)*, (Jilin Literature and History Press, Changchun, China), 2004.
- 58 Chen TM, ed. *Annotation of the Thirteen Classics—Zhou Li (Ji D 11<sup>th</sup> century B.C.)*, (Sanqin Press, Xi'an, China), 2004.
- 59 Jia EQ, Dai QY & Tu XM, eds. *Annotation of Lie Zi . Wen zi (Lie Z 450 B.C.?)*, (Liaoning Education Press, Changchun, China), 1998.
- 60 Xiao ZX, *Reprint of Nan Qi Shu (A.D. 519)*, (Jilin People's Publishing House, Changchun, China), 1995.
- 61 Song YX, *Reprint of Tian Gong Kai Wu (1637)*, (Commercial Press, Shanghai), 1933.
- 62 Chen H, ed. *Annotation of Li Ji (Dai D, Dai S 1st century B.C.)*, (Shanghai Chinese Classics Publishing House, Shanghai), 1987.
- 63 Chen YQ, Improvidence of eat way of hemp seed in ancient China, *Ancient Modern Agric*, (2) (1998) 40-41.
- 64 Li Y, Discrimination on *Cannabis sativa*, *J Beijing For Unver (Social Sciences)*, 4 (2) (2005) 86-89.
- 65 Liang JM, *History of China Agricultural Science and Technology*, (China Agriculture Press, Beijing), 1989.
- 66 Barnard D, *All about the hemp plant 10,000 years of history*. (Hemp, Inc., www.hempinc.com) 2015.
- 67 Hemplife.com.cn, Hemp Used as a Fiber Crop in Ancient China [EB/OL], [http://www.hemplife.com.cn/news.asp?a\\_id=41](http://www.hemplife.com.cn/news.asp?a_id=41).
- 68 Li GX, ed. *Annotation of Hou Han Shu (Fan Y A.D. 445)*, (Bashu Press, Chengdu, China), 1990.
- 69 Zhang JC, *Comprehensive Utilization Technology of Hemp*, (Great Wall Press, Beijing), 2006.
- 70 Pan JX, Is the Baqiao paper not plant fiber paper of Western Han Dynasty?, *Stud Hist Nat Sci*, 8 (4) (1989) 361-377.
- 71 Wang F, *Reprint of Tang Hui Yao (A.D. 961)*, (Zhonghua Book Company, Beijing), 1955.
- 72 Qian CX, Paper and Printing, In: *History of Science and Technology of China (Vol 5, No 1)*, edited by Li YS. (Science Press, Beijing), 1990.
- 73 Niu BZ, Chen ZQ & Xu SN, eds. *Annotation of Huang Di Nei Jing (Anonymity 1st century B.C.)*, (Hebei Science and Technology Press, Shijiazhuang, China), 1994.
- 74 Shang ZJ, ed. *Revision of Min Yi Bie Lu (Notes of Famous Doctors) (Anonymity A.D. 3rd century)*, (People's Health Publishing House, Beijing), 1986.
- 75 Dai S, Chen RS & Yu S, eds. *Annotation and Revision of Ben Cao Hui Yan (Ni ZM 1624)*, (Shanghai Science and Technology Press, Shanghai), 2005.
- 76 Wu GZ, ed. *Annotation and Revision of Ben Jing Shu Zheng (Zou S 1832)*, (Hainan Press, Haikou, China), 2009.
- 77 Dong ZH & Yang Z, eds. *Annotation of Jin Kui Yao Lue (Zhang ZJ 3rd century)*, (Sanqin Press, Xi'an, China), 2001.
- 78 Zhang ZJ, *Reprint of Shang Han Lun (A.D. 205?)*, (Academy Press, Beijing), 2007.
- 79 Zhou ZX & Zou ZM, *Pharmacology of Zhang Zhongjing*, (China Medical Science and Technology Press, Beijing ), 2005.
- 80 Liu YQ, Sun SC & Li CQ, eds. *Annotation of Wen Bin Tiao Bian (Wu T 1798)*, (Sanqin press, Xi'an, China), 2001.