

The cultivation and use of hemp (*Cannabis sativa* L.) in ancient China

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Figure 1. Hemp (*Cannabis sativa*) was grown throughout eastern China by the year 200 BC.

Hemp in ancient Chinese literature

Hemp was one of the earliest crop plants of China. Through long term efforts, the ancient Chinese domesticated hemp from a wild plant into a cultivated crop. According to the Chinese historic records and archeological data, the history of Chinese hemp cultivation and use spans approx. 5,000 to 6,000 years. The archeological record shows that China was the earliest region to cultivate and use hemp. From the time of the earliest primitive societies (about 4,000 -5,000 years ago) to the Qin and Han dynasties (221 BC to 220 AD) ancient Chinese techniques of hemp sowing, cultivation, and processing developed rapidly and became fairly advanced.

The earliest Neolithic farming communities along the Wei and Yellow rivers cultivated hemp along with millet, wheat, beans, and rice. The oldest Chinese agricultural treatise is the *Xia Xiao Zheng* written circa the 16th century BC which names hemp as one of the main crops grown in ancient China (Yu 1987).

Remains of *Cannabis* fibers and seeds have been recovered from archeological sites especially near the Yellow and Yangtze rivers.

In the ancient Chinese works *The Book of Songs* (a book of culture and social customs) and *The Annals* (written by Bu-Wei Leu during the Warring States period (476 to 221 BC), there are records of six kinds of crops that the ancient Chinese generally planted. These crops were named "*he, su, dao, shu, ma, and ma'*". '*Ma*' is *Cannabis* hemp.

The *Book of Odes* or *Shih Ching*, written during the Western Zhou dynasty, describes the life of the Chinese people from the 11th to the 6th century BC and discusses hemp cultivation for both fiber and seed. The area whose description is encompassed by *The Book of Odes* lies south of present-day Beijing (Ho 1969).

There are also records about hemp cultivation and fertilization methods from the Zhou dynasty (1100 to 256 BC),

"Hoe up all the weeds in the field during the summer solstice (June 21), let them dry in the sun, and then burn them into ash. All these ashes will permeate into the soil after a heavy rain and the soil will be fertilized."

This is also one of the earliest mentions of using potash fertilizer in agriculture.

There are other ancient Chinese agriculture books such as the *Si Min Yue Ling* written by Cui Shi during the Eastern Han dynasty (25 to 220 AD), *Ji Sheng's Book* written by Ji Sheng during the Western Han dynasty (206 BC to 24 AD), and *Qi Min Yao Shu* written by Guo Shixian during the Northern Wei dynasty (386 to 534 AD). All of these books contain accounts of hemp cultivation.

Ancient Chinese hemp cultivation techniques of collecting seeds, sowing time, field controls, and their influence on hemp quality were also recorded in the *Essential Arts for the People* or *Qi Min Yao Shu* which is a precious legacy of ancient Chinese science written 1,400 years ago. The *Essential Arts for the People* systematically summarized the ancient Chinese techniques of hemp cultivation.

In the *Essential Arts for the People* there are accurate records about the relation between the male hemp plant scattering pollen and the female hemp plant bearing seed.

"If we pull out the male hemp before it scatters pollen, the female plant cannot make seed.

Otherwise, the female plant's seed production will be influenced by the male hemp plants scattering pollen and during this period of time, the fiber of the male hemp plant is the best."

This ancient Chinese discovery of the dioecious nature of hemp came at least 1,500 years earlier than any mention in European publications.

The Essential Arts for the People also recommends that adzuki beans (*Phaseolus angularis*) is the best green manure crop to follow hemp (Bray 1984). This is one of the earliest mentions of the use of green manures, cover crops, and rotational cropping.

The Record of Rites or *Li Chi* is an ancient Chinese book of classical Confucian works written by his followers during the Qin dynasty (221 to 207 BC) and contains many detailed references to hemp. The Record of Rites describes the uses of hemp as the cloth of the peasant masses. Hemp textiles were common items of early Chinese culture used for many purposes throughout life, then, from swaddling clothes to funerary shrouds.

The cultivation technique of hemp was increasingly perfected during the Qin (221 to 207 BC) and Han dynasties (206 BC to 220 AD) there are detailed descriptions in Ji Sheng's Book of hemp's cultivation techniques and quality control,

"Deep plow and fertilize the soil before sowing the seed. When spring comes, about February to March, select the dusk of 4 rainy day to sow seeds. Remove the hemp's big leaves when it is growing.

Then thin out seedlings according to the distance of 9 perch³. Fertilize the hemp with silkworm excrement when it has grown to one chi tall, and when it has grown to three chi tall, fertilize it with silkworm and pig excrement. Water the hemp frequently, and if there is much rain, the quantity of water should be decreased. The water from wells should be used where there is no river near the field and it should be warmed by the sun before using. By using all of these controls, the yield of dry stalks and leaves from each mu⁴ could be 50-100 shi⁵ and the lowest yield could be 30 shi. The quality of hemp fiber depends not only on the field controls, but also on the sowing time. If the sowing time is early, the fiber will be thick and strong and can be harvested early. Otherwise, the fiber will not be mature. So, it is better to sow hemp seed early instead of late."

We learn from these records that Han dynasty farmers not only knew to select the appropriate season to sow hemp, but also knew the principles of field controls, and selected the higher quality fibers from the male plants to spin textile yarn.

The *Si Min Yue Ling* is another ancient Chinese book which was written during the Eastern Han dynasty (25 to 220 AD). There are descriptions of hemp sowing and harvesting times in the book such as,

"Plow and fertilize in January. In February, sow the female hemp's seeds, and on a rainy day in May sow the male hemp's seeds. Then, harvest the hemp and spin it into cloth in October."

These records show that some of the hemp cultivation techniques used during the Han dynasty were quite different from the techniques used today. Perhaps the ancient Chinese sowed the seeds that were destined to be the seed plants early, so that they could reach a large size, before they were pollinated by the late sown male plants. This method could increase seed yield significantly.

The sowing methods written in the Essential Arts for the People are,

"First, soak the seed in water and sow them as soon as they germinate. Soak the seed in water for about the same time required to cook two shi of rice. Then spread the soaked seeds on the bamboo bed for about three to four cun⁶ in thickness. Stir the seed several times and after one night they will germinate. It is best for hemp to grow after a rain, when the rain has permeated into the soil. Second, in order to avoid plant diseases and insect pests, hemp should rotate with wheat, bean, and cereals. Third, different methods should be used with different soil moistures."

Field control methods are also described in the Essential Arts for the People.

"Disperse the sparrows for several days in order to protect the seeds that have just germinated from being eaten by them. When the seedlings have grown for some time, thin out weak ones so that there is some distance between two seedlings and good seedlings can grow well."

A simple method of distinguishing different sexes of hemp seeds was also presented in the Essential Arts for the People.

"Generally, male hemp seeds are white. There are two ways to examine the quality of the white seeds. The first is to bite a seed with the teeth, and if the inside of the seed is very dry, it should not be sown. Otherwise the seeds can be sown. The second method is to put the white seed in the mouth for some time. The seeds that do not turn black are good."

This passage indicates that ancient Chinese farmers already knew the methods for distinguishing the sex and quality of hemp seeds 1,800 years ago. Although the correctness of these methods is dubious, the innovative spirit of the ancient Chinese farmers is commendable.

The sowing time stated in this book is the same as that stated in the *Si Min Yue Ling*. A warning about late sowing is also included. The hemp sowing time is around the spring equinox.

"Sowing seeds ten days before the summer solstice is called late seeding. Late sown hemp will not grow vigorously and its fiber will be too thin and light to spin into yarn."

Hemp as a fiber crop in ancient China

The ancient Chinese used the hemp plant for many different purposes. The bast fiber of the male plant was used to spin yarn and weave cloth. From the time of the earliest Chinese societies, until cotton was introduced into China during the Northern Song dynasty (960 to 1127 AD), hemp textile was the main cloth worn by the ancient Chinese. Many of the accounts of hemp use for cordage and textiles contained in the ancient Chinese texts have been corroborated by archeological discoveries.

During the Western Zhou dynasty (1100 to 771 BC) the hats of nobles were made of hemp.

The fine diameter of the yarn in the cloth was equivalent to modern 70-80 count yarn. High-quality raw material, along with advanced cultivation and processing techniques were needed to produce such fine cloth. The Book of Songs was written during the Western Zhou dynasty into the Spring and Autumn period (1100 BC to 600 BC). In a poem named 'The Pool in Front of the Main Gate' (written about 900 BC) in the chapter entitled 'Culture of the Chen State' (in southeast Henan province) there is a reference to hemp;

"The pool in front of the east gate could be used to *Ou Ma*. The pool in front of the east gate could be used to *Ou Ning* . . .". The phrase 'Ou Ma' means 'to ret hemp' and the phrase 'Ou Ning' means 'to ret high-quality white hemp'.

The Classics of History or *Shu Ching*, the earliest Chinese history, mentions the value of hemp for fiber, and reported that hemp was grown in present day Hunan and Anhui provinces (Li 1974).

The *Er Ya*, the earliest Chinese dictionary with cultural, agricultural, and social contents, was written about 2,200 years ago during the Qin (221 to 207 BC) or Western Han (206 BC to 24 AD) dynasties. In this book, there is a sentence;

"Male hemp is called *xi ma*, female hemp is called *ju ma*". This quote shows that the important discovery of hemp's dioecious sexuality was first recorded at a very early date in China. There are more mentions of hemp in this book, such as,

"Ju ma grows tall and straight. Its fiber is very thick and strong, and its seed can be eaten. The fiber of xi ma is thin and soft, and can be used to spin cloth."

Several archeological discoveries have confirmed the accounts of the use of hemp textiles described in ancient Chinese books. Several pieces of pure hemp textiles were discovered in the ruins of the Shang dynasty period (1700 to 1100 BC) near Taixi village in Hebei province.

Imprints of hemp textiles and cordage adorn several fragments of pottery found amongst the ruins of Xi'an Banpo village in Shaanxi province. Through the C14 dating of these remains, they were confirmed as cultural relics of the Yangshao culture (4115 +/- 110 BC to 3535 +/-105 BC) (Xi'an Banpo Museum 1963). Although the imprints of textiles and cordage could have been made from fibers other than hemp, hemp remains the most likely choice. Archeological strata at Xi'an Banpo contained large amounts of pollen identified as belonging to the genus *Humulus*. *Humulus* is the closest relative of *Cannabis* and their pollen grains are very similar in appearance. Pollen grains of *Cannabis* could easily have been confused with, and incorrectly identified as, *Humulus* pollen (Li 1974). Pottery fragments bearing rope imprints, have also been recovered from a Lung-shan culture site at Hsichou in Hunan province dated at between 230 +/- 95 BC and 1170 +/- BC (Li 1974).

Hemp cloth has a long association with burial rites. Corpses were often shrouded in hemp cloth before interment. Hemp corpse covers were recovered from Western Han Dynasty (206 BC to 24 AD) tombs in Gansu province. According to Li (1974), the hemp cloth outer shroud covered silk dresses and were tied with hemp ropes.

A piece of hemp cloth was unearthed at a ruin named Ma Wang Dui No. 1 near Changsha in Hunan province. Careful analysis showed that the fiber diameter was 21.83 microns, and the fiber cross sectional area was 153.01 square microns. Both values are very close to those common for present day hemp varieties. The weave of the cloth is relatively tight, indicating that weaving techniques had become quite advanced by this time.

A piece of hemp textile with a silver-white design was unearthed from a tomb in a cliff near Guixi in Jiangxi province and dated to the Spring and Autumn (770 to 476 BC) or Warring States period (476 to 221 BC).

During the Tang dynasty (618 to 907 AD), China had close trade relations with central and west Asian countries and there are many traces of hemp along the Silk Road. Two pairs of hemp shoes and a piece of hemp cloth were found in a tomb dated to 721 A.D. near Turfan in Xinjiang province of western China.

These archeological data show that the ancient Chinese had already known how to cultivate hemp and use its fiber to weave cloth at a very early date.

The use of hemp for paper making in ancient China

Hemp fibers were also used long ago in ancient China to make paper. Pounded and disintegrated hemp fiber was used to make the world's oldest piece of paper, recovered from a tomb near Xi'an in Shaanxi province dating from 140-87 BC (Temple 1986). Ba Qiao paper which was made during the Western Han dynasty (206 BC to 24 AD) was unearthed near Xi'an in Shaanxi province and analysis showed that it was made from hemp fiber (Shaanxi Museum Xi'an). Scraps of hemp paper have also been recovered from Han dynasty tombs in Shanxi province. A piece of hemp paper bearing Chinese characters from the Analects of Confucius or Lun Yu was found near Turfan in Xinjiang province in a tomb dated to 1100 AD. White hemp paper shoes sewn with white hemp thread, and a piece of hemp fabric, were also recovered (Li 1974).

Hemp as a food crop in ancient China

Cannabis seed was used for food by the ancient Chinese. The Book of Songs has the following mention of the use of hemp seed for food,

"Farmers eat hemp seeds in September."

Hemp was commonly grown as a seed crop throughout the Spring and Autumn period (770 to 476 BC), Warring States period (476 to 221 BC), the Qin dynasty (221 to 207 BC), and the Han dynasty (206 BC to 220 AD).

The *Li Qi* places hemp among the "five grains" of ancient China which included barley, rice, wheat, and soybeans. Hemp seed remained a staple of the Chinese diet through the 10th century when other higher quality grain became more widespread (Li 1974).

There are hemp seeds and inscriptions of the characters ta ma on bones found amongst the relics unearthed from the Jin dynasty (265 to 420 AD) ruins in Henan province.

Among the sacrificial objects unearthed from the Han dynasty era Ma Wang Dui tomb near Changsha in Hunan province, hemp seeds were stored together with those of rice, millet, and wheat. Hemp seed remains were also found inside of earthenware grain storage jars recovered from a tomb at Shao-kou near the Han dynasty capital of Lo-yang in present day Hunan province (Yu 1977).

The use of hemp as medicine in ancient China

Chinese accounts of medical or euphoriant use appear very early. In Shanxi Province, jade stone 'oath documents' contain the archaic character ma for hemp, along with the connotation of negative that denotes the stupefying nature of *Cannabis* hemp. This is the earliest reference to the psychoactive and psychological effects of *Cannabis*. The ancient Chinese medical texts make a clear distinction between ma fen or toxic, and ma ze or nontoxic, *Cannabis* seeds. The first mention of the medical or euphoriant uses of *Cannabis* appear in the *Materia Medica Sutra* or *Pen Ts'ao* originally attributed to Emperor Shen Nung who lived around 2,000 BC. However, the original book of the *Materia Medica Sutra* is lost and the oldest version in existence dates back to the first or second century AD. The *Materia Medica Sutra* says that,

"*Ma fen* (*Cannabis* seed) . . . if taken in excess will produce hallucinations (literally 'seeing devils'). If taken over a long term, it makes one communicate with spirits and lightens one's body."

During the second century AD the famous Chinese surgeon Hua T'o successfully used an anesthetic made from *Cannabis* seeds and wine during complicated abdominal surgery (Li 1974). The *Ming'i Pieh'lu*, written by the famous physician T'ao Hung Ching in the 5th century AD, says that,

"*Ma fen* is not much used in prescriptions (now-a-days). Necromancers use it in combination with ginseng to set forward time in order to reveal future events."

From the description of the spicy taste and the psychoactive effects of the ma fer *Cannabis* seed, it seems likely that the *Materia Medica Sutra* and the *Ming'i Pieh'lu* were actually referring to the resinous bract that surrounds each seed, rather than the seed itself. The quantity of *Cannabis* used must have been fairly large to cause an anesthetic effect (Mechoulam 1986). The wine may have served to extract the active compounds from the *Cannabis* and concentrate them. Thus, these are the earliest Chinese written records acknowledging the euphoriant, psychoactive properties of *Cannabis*.

Conclusion

Hemp was one of the main crops in ancient China and it holds important status in China's long history of farming fiber crops for spinning yarn and weaving cloth, making paper, and formulating traditional medicines. All of the traditional uses of hemp were invented in China.

The earliest hemp cordage and textile remains, the earliest records of hemp seed use for food, the first paper, and the first medicinal use of hemp can all be traced back to ancient China. Although the medicinal value of *Cannabis* was recognized early on, the recreational value of *Cannabis* smoking and eating for its inebriating effects seems to have eluded the ancient Chinese. Since China has such an ancient cultural association with hemp, it makes sense that China is currently the world leader in hemp production.

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- ook het electoraat van de Volksraad klein bleef; nog in 1939 bestond dit uit slechts 2228 personen. Zie: M.C. Ricklefs, *A history of Modem Indonesia* (London /Basingstoke: MacMillan 1981) 153.

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3 One 'chi' equals about 1/3 meter or 13 inches.

4 One 'mu' equals about 660 square meters.

5 One 'shi' equals about 30 kilograms or 66 pounds.

6 One 'cun' equals about 2.5 centimeters or one inch.

[BACK](#) [HOME](#) [NEXT](#)

Keywords: *Cannabis sativa*, Hemp, Retting, Roman Iron Age, Sweden, Scandinavia Introduction *Cannabis* pollen are, on the contrary, good indicators Hemp (*Cannabis sativa* L.) is an important cultural for the local growing of hemp. They may indicate cul- plant used for a variety of products and purposes. In tivation near the sampling point or, if the pollen per- the past, hemp fibre was particularly valued for

its centages are high, they may reflect the retting of the strength and durability, being coarser than fibres stems. Cannabis Sativa Cannabis is marijuana or any other substance derived from the hemp plant. The plant has many different uses from Hemp products to medicinal purposes. This paper will talk about the plant as a whole and itâ€™s usefulness.Â Industrial Hemp is an ancient crop, which has a multitude of diverse uses. The earliest uses of Hemp can be traced back to the Sumerians and probably even earlier in manâ€™s unrecorded history. Industrial Hemp is not Marijuana though the two plants are of the same family and have passing resemblance to one another.Â This paper summarizes the history of hemp (*Cannabis sativa* L.) cultivationâ€¦| Show More. Proposal For Legalizing Industrial Hemp.

