

Natural Fibres in China

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China's farmers produce almost all kinds of natural fibres for processing industries mainly represented by textile industry. Natural fibres are widely and deeply associated with farmers and agriculture. The capacity of the overall textile industry in China is huge. Although China produces an enormous amount of natural fibres, China's textile industry still needs to import great quantities of cotton, wool and flax. Therefore, natural fibres are important with thousands textile workers as well as farmers outside of China who produce different natural fibres.

This paper presents the general situation of natural fibres production and industrial processing. Then I will give our view of a specific fibrous crop, hemp, which we believe can contribute a lot to improve farmers' lives and food security in China and will also help textile industries to produce many more green and functional products to market places and to help consumer demand, the environment and the earth---our common homestead.

The paper is in 3 parts:

1. General
2. R&D in hemp fibres processing
3. Hemp agriculture, hemp industries and their contribution to food security

GENERAL

In China, we have almost all raw natural fibres for the textile industry.

TEXTILE PEOPLE

In China not only produce fabrics of natural fibres but also blend different natural fibres, as well as blend natural fibres with manmade fibres to produce textiles with different performances.

Cotton

Since early last century, cotton has been the most welcome textile material to make fabrics for underwear, shirts, and bed linen as it is soft to handle, warm and so comfortable on your skin. Denim for jeans has been a fabric for fashion since the cowboy era.

Thanks to the rapid development of the textile industry in the last 30 years, the cotton textile industry of China now takes the first position in the world by its volume and production capacity. The following data shows agricultural production and textile production as well as importation of cotton in China.

Cotton

- Planted area: 5,666,666ha (2006);
- Lint production: 6,646,000 tons(2006);
- About 40,000,000 farmers involved in cotton growing;
- 20,000,000 textile workers involved in cotton textile industry;
- Cotton importation: 2,560,000 tons to 3,640,000 tons in the past 3 years.

Figure.1 Cotton spinning spindles in China

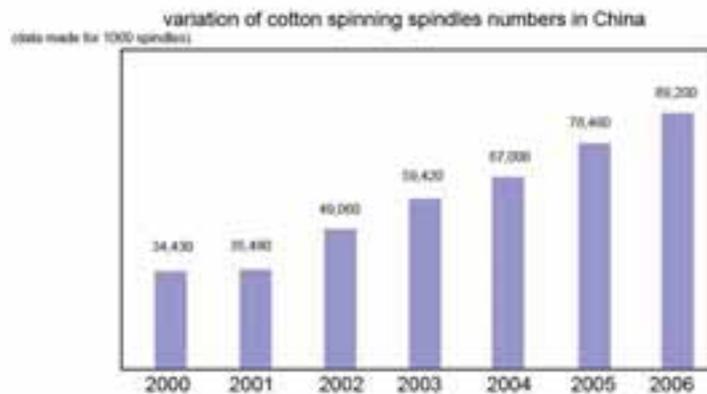
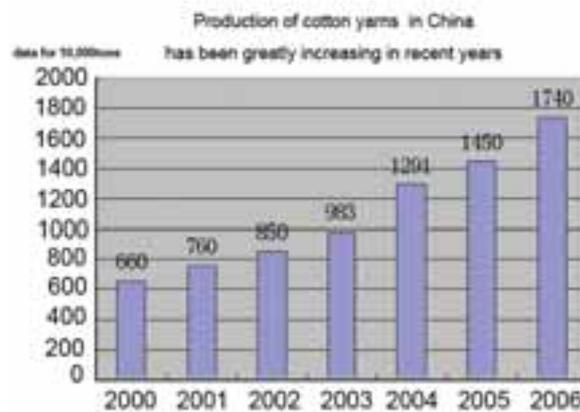


Figure 2 Production of cotton yarns in China



With 110 million cotton spinning spindles (according to information at beginning of 2008), we have a very clear picture of the capacity of Chinese cotton textile industry. Production of cotton yarns in China has been greatly increasing in recent years and its average increase has been about 18% since 2000

Bast fibres

Chinese farmers produce different kinds of bast fibres crops such as ramie, flax, hemp and kenaf, while textile processing capacity of bast fibres in general is doubtless also the number one of the world. Textiles made of flax and hemp are always present in top fashion design circles. But China still needs to import a lot of flax. The following data shows the general picture of agricultural and textile production, as well as importation of bast fibres in China.

The above data show the processing capacity of flax is larger, but agricultural production of flax in China can only supply 40% raw materials to factories.

Wool, silk, cashmere

In the last 20 years, China has had the largest wool textile industry, and about 76% of its wool has been imported from countries such as Australia, New Zealand, Uruguay, and

Figure 3 Bast fibres production and processing in China

Type Bast Fibres	Production in China (tonnes)	Processing amount (tonnes)
Ramie (refined)	113 500	110 000
Flax (scutched)	103 000	258 600
Hemp (refined)	4 000	4 000
Kenaf (retted)	158 000	158 000
Jute (retted)	0	29 000

Argentina Almost all silk textiles and cashmere textiles are made in China because Chinese farmers and goatherds supply the majority of these raw materials. The following data shows the production and textile processing of these animal fibres in China.

The above data shows that China can only supply 24 percent of the wool required by its factories and the rest (76%) has to be imported.

Figure 4 Wool, cashmere, raw silk production and processing in China

Type Bast Fibres	Production in China (tonnes)	Processing amount (tonnes)
Wool (scoured)	83 000	359 700
Cashmere	8 900	6 100
Raw silk	141 500	109 000

Both natural fibres and manmade fibres make an indispensable contribution to the quality of textiles. But it is very important to make consumers understand that using more natural fibres in clothing means not only more comfort but also a great contribution to mother nature.

R&D IN HEMP FIBRES PROCESSING TECHNOLOGIES

The birthplace of hemp is China. Archaeological discoveries show that we can backdate its self-sown growing to between 6,000 to 9,000 years ago. Archaeological specimens also show that, about 4,000 years ago, the Chinese people started widely growing the crop for food and clothing. Chemical analysis shows no THC in these specimens. About 3,000 years ago, hemp was introduced to India and then some mutative varieties of the plant appeared which have high content of THC and of course the variety with high THC content has other names as hashish or marijuana. In China, the growing of hemp is under the control of the Narcotics Control Bureau of the Ministry of Public Security. In recent years, China has developed Yunma 1 and Yunma 2 as varieties of very low THC content meeting the international standard for hemp.

Hemp and flax textile processing technologies are very similar, because the textile properties of hemp are very close to those of flax. Without a DNA check, even the most experienced textile expert can not tell the difference between flax fabric and hemp fabric. Pure hemp fashion fabric is made for niche markets with high value, but the quantity of the fibres used in this sector is limited. China's textile processing capacity in general is enormous and especially for cotton. So we believe that developing hemp fibre processing technologies will blaze a new path and this will become a wide road that will facilitate the integration of hemp fibres into the cotton textile system, wool textile system, silk textile system, cashmere textile system and also for blending hemp fibres with manmade fibres. We believe this idea is correct in China because it will bring a brighter future for using hemp in textiles.

Cottonisation of hemp fibres

We cottonise traditional hard fibres from hemp into quite fine, soft and workable textile fibres nearly like cotton. One kilogram of textile fibres can be produced from 2 kgs of hemp bark.

Hemp viscose fibre

We also successfully make viscose fibres (both filament yarn and staple fibres) from hemp core hurd (shiv). Hemp rayon staple is ideal for cotton textiles. A very interesting point is that hemp viscose fibre has very strong anti-bacterial properties just like natural hemp fibres. This has been established both by our laboratory and by the laboratory of the Japanese company Asahi Kasei.

One kilogram of viscose fibres can be produced from 3 kgs of hemp core hurd.

Characters of hemp fibres

The inherent and special performance properties of hemp are very important in the market because they are attractive selling points of hemp textiles to consumers. Following are the major functional qualities of hemp fibres.

In Contrast with cotton, hemp has the best quality of moisture (sweating) absorption and dispersion. Very high adsorbability to toxic gases of hemp is an excellent attraction for household textiles.

How to cottonise hemp fibres

By a group of degumming technologies, we cottonise hemp fibres. We developed some new technologies and machines to process hemp into fibres for the cotton system as well

Figure 5 Hemp fibre

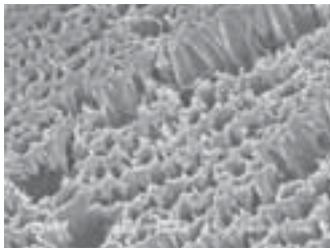


Figure 6 Properties of hemp fibre

Specifications	Unit	Hemp	Cotton
Fiber length	mm	20-25	25-31
Fineness	tex	0.22-0.38	0.12-0.20
Tenacity	N.tex	>0.48	0.22
Breaking elongation	%	2.2-3.2	7.12
Young's modul	N.tex	16-21	6.00-8.20
Heat resistance	Deg centigrade	370	190
Moisture absorption	Mg/min	2.18	1.33
Moisture dissipation	Mg/min	4.4	2.37

Natural Anti-bacterial Quality of hemp

Figure 7 Test results show that hemp fibres repress Nosocomial germs

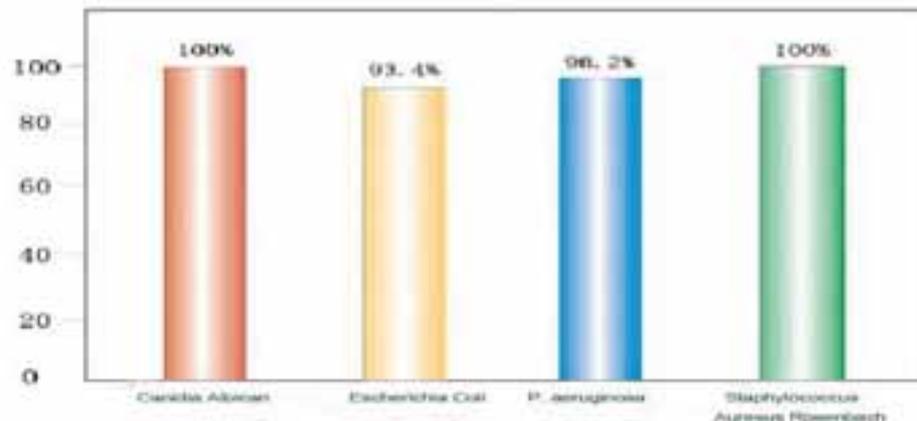
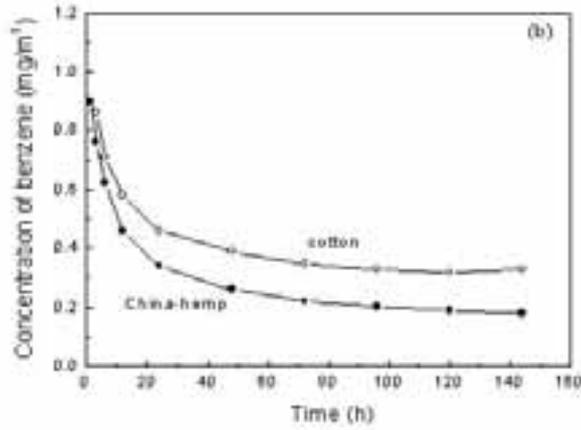


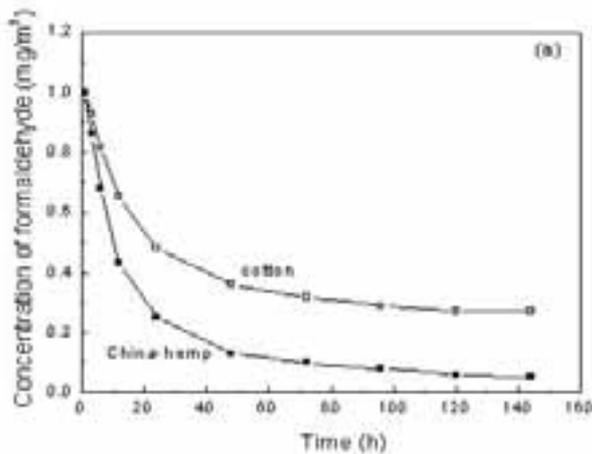
Figure 8 Adsorbability to formaldehyde of hemp and cotton



Unique adsorbability

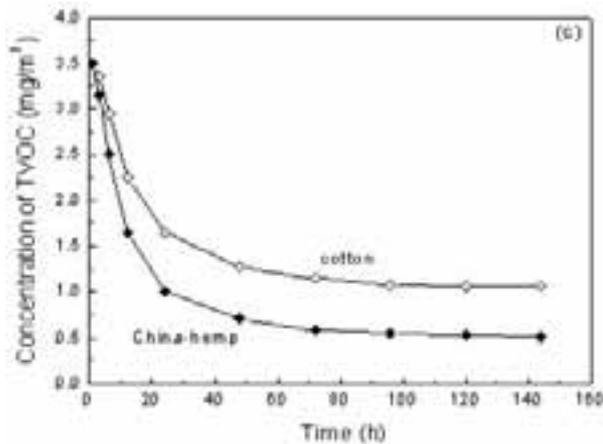
Formaldehyde adsorbing capacity of hemp is 9-10 times higher than that of cotton

Figure 9 Adsorbability to benzene of hemp contrasted to cotton



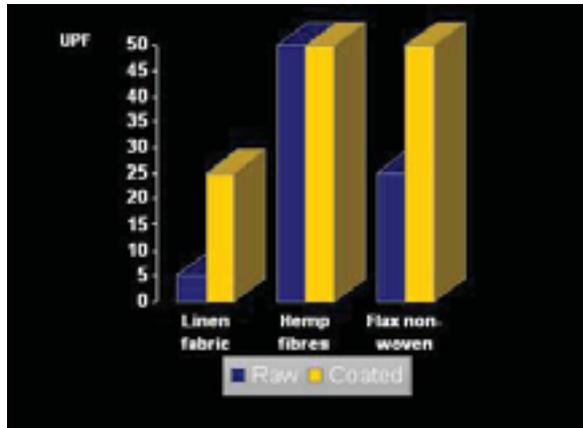
Benzene adsorbability of hemp is 6-7 times higher than that of cotton

Figure 10 TVOC adsorbability of hemp contrasted to cotton



TVOC adsorbability of hemp is 6-7 times higher than that of cotton.

Figure 11 UV Resistance of hemp



UV Resistance of Hemp is excellent

as for the wool system and for blending with man-made fibres. The following photos show some machines we developed.

Why we make hemp viscose fibres

Viscose fibre made from hemp hurd (shiv) is a special type of functional viscose fibre. And it makes economic sense to use this non-food crop as raw material for industry.

The usual raw material for producing viscose fibre in China is linters. But we can successfully make viscose from hemp core hurd. By using hemp for viscose production:

1. The shortage of supply of linters in China can be overcome;
2. The cost of viscose can be decreased;
3. Also farmers benefit more

Hemp viscose fibre has also very good resistance to UV; therefore fabrics made by hemp viscose will have much stronger UV resistance than viscose made from linters.

Our test shows that hemp viscose has anti-bacterial character similar to the fibres extracted from hemp bark

Figure 12 Cottonisation of hemp fibres

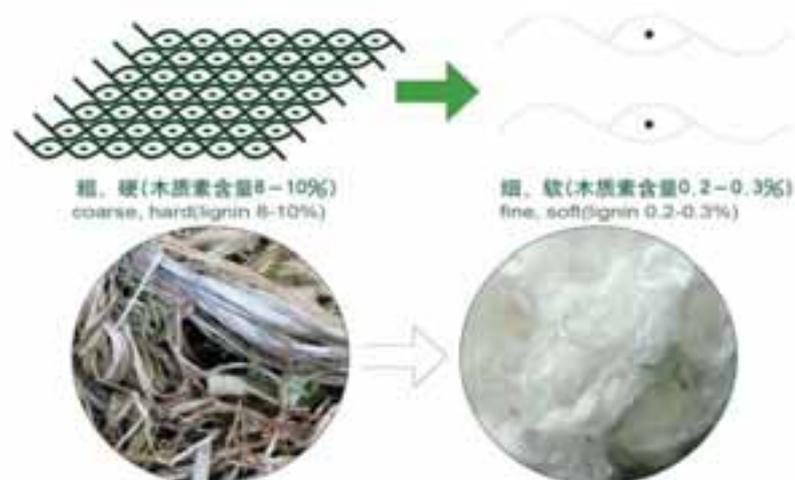


Figure 13 machines that have been developed



Figure 14 machines that have been developed



Figure 15 machines that have been developed



HEMP AGRICULTURE AND HEMP INDUSTRIES CONTRIBUTE TO FOOD SECURITY

Hemp agriculture: benefits for Food Security

Hemp is the greenest crop that requires only very poor soil. In China growing hemp is possible in almost all places. We have summarized the following benefits and these make a strong argument for improving food security in China.

Figure 16 specification of viscose staple fibers made by hemp core hurd

Item	Spec	Origin	Colour	Dry denacity cN/dtex	Wet tenacity cN/dtex	Dry elongation %	Luster
1.5d x 38	1.67 x 38	China	White	2.49	1.53	22.31	Bright
3d x 62	3.34 x 62	China	White	2.44	1.41	25.72	Bright

Cotton growing needs correct soil conditions and a great amount of pesticide must be used

Hemp can be grown in much poorer soil and requires much less pesticide, which is a contribution to the protection of soil and environment.

If 1,333,333 ha. of hemp is grown, China can reduce its area of cotton by the same amount, which means this 1,333,333 ha. can be used for growing food crops!

Our great plan is to grow 1,333,333 ha. of hemp to produce 2,000,000 tons of fibres for China textile industry

The main crops in the plains of northern China are soybean and wheat; hemp is the best choice for rotation crops - farmers make better use of their lands and make more money at the same time.

The map in fig 17 shows that major cotton growing regions are also the same regions where major food crops such as rice and wheat grow.

In the map of Fig 18, the green coloured parts are the regions where we plan to grow 1,333,333 ha. of hemp. Hemp will not displace food in the regions, because in some cases they are not major food growing areas, and in others hemp will be ideal as rotation crop.

Figure 17 cotton growing regions in China



Full use is made of the hemp plant

Not only fibres are used from the hemp plant, but full use is made of all parts of this crop for different industries and applications.

Fig.18 hemp growing regions in China



- Hemp core hurd(shiv) is used for wood plastic composite and activated carbon
- Hemp seed is used for edible oil, healthcare oil, cosmetics & lotions
- Hemp leaves and flowers are used to produce medicines
- Hemp roots will not be thrown away but used as combustibles

Fig 19 shows the hemp wood plastic product used

as outdoor flooring boards in 2008 Olympic Park

CONCLUSION:

As we can see from above description, hemp is indeed an ideal non-food crop for China, because both agricultural production and industrial production benefit a lot from this crop, and it contributes so much to improvement of the environment and the food security of our nation. We can summarize following major points as the conclusion.

Figure19 Application of hemp WPC boards



- Farmers living on hills and uplands as well as semi-arid, and poor soil places will profit from growing hemp
- Our country will have more places to grow food crops and environment

will be also improved

- Industries will also have benefits in developing eco-friendly products with more useful functions