

The Present Situation of Study and Producing of Industrial Hemp in China

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1.The Present Situation of Producing

- The history of hemp cultivation is about 4000-5000 years in China by unearthed relics. some person guess that hemp was planted before 6500 years ago.



1.1 The plant area

- There are more than 20 provinces planted hemp in 1960's-1970's in China. And the hemp area were more than 7000ha in 6 provinces , they are Heilongjiang, Jilin, Shandong, Inner Mongolia, Hebei, and Shanxi.

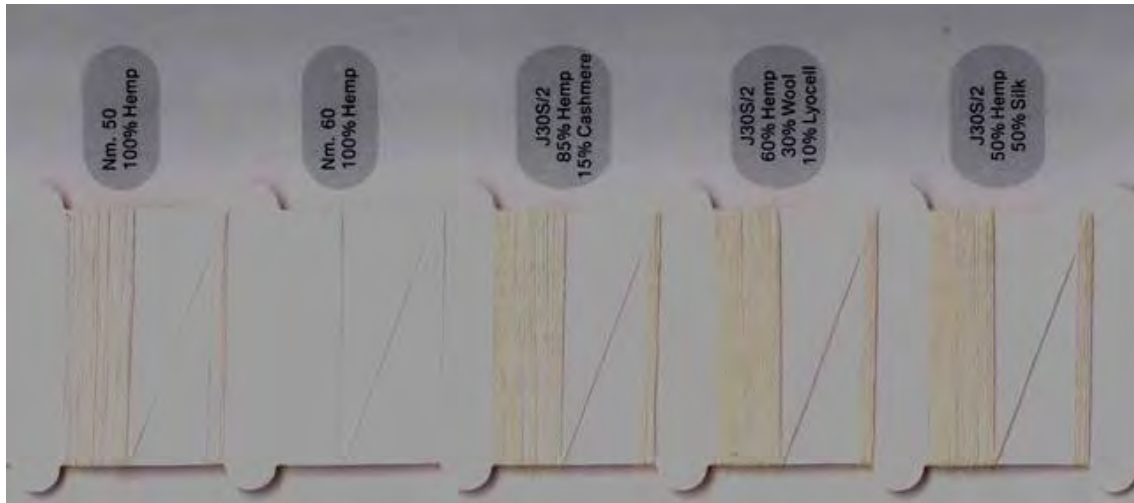


Hemp in 1960's-1970's

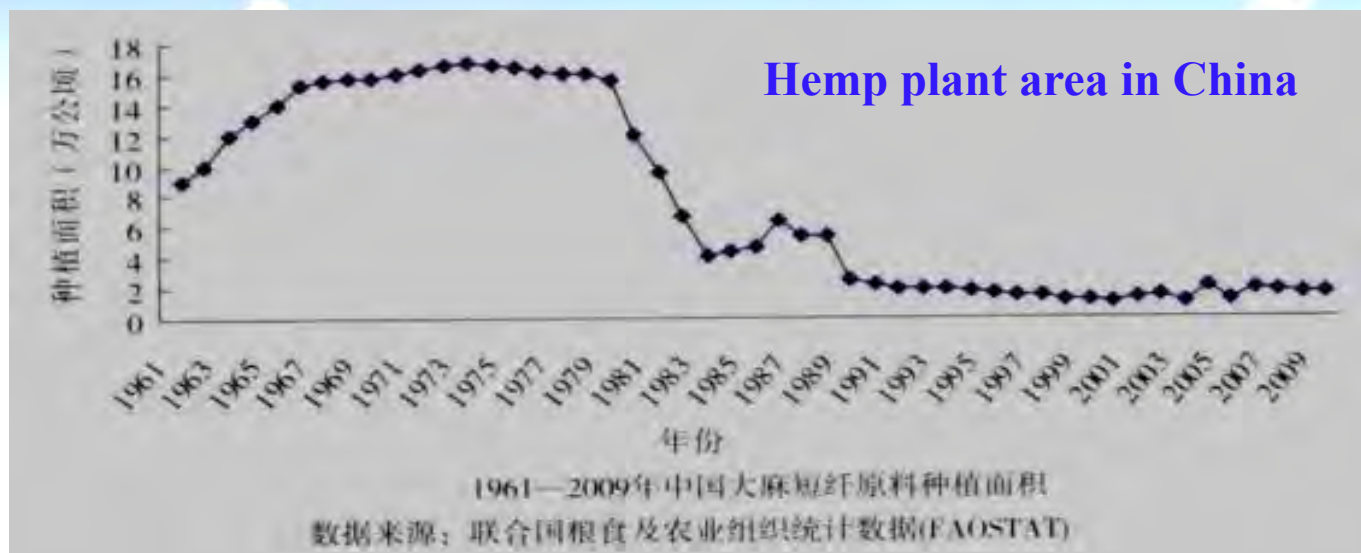
The highest plant area was 167,000 ha. But in the end of 1980's, the hemp area was decreased quickly. The reason is that its function of rope was instead by chemical fiber. In the 2000 year it was decreased to 9700 ha.



- After 2000, hemp fibre begin to be used to textil.



the area started enlarge after 2000



Year	area (ha)	yield (t)	kg/ha
2010	5100	10900	2130
2011	5713	15800	2766
2012	5280	14500	2753
2013	6553	18700	2862
2014	7680	32400	4214

Origin: The crop farming information internet of China.It is official date.

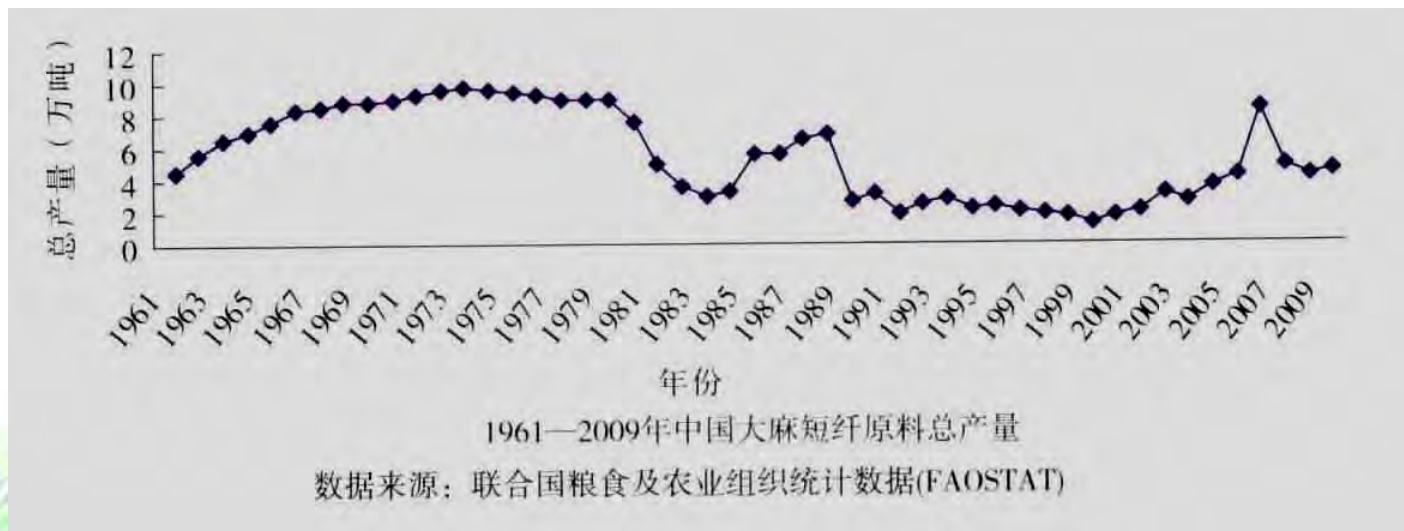
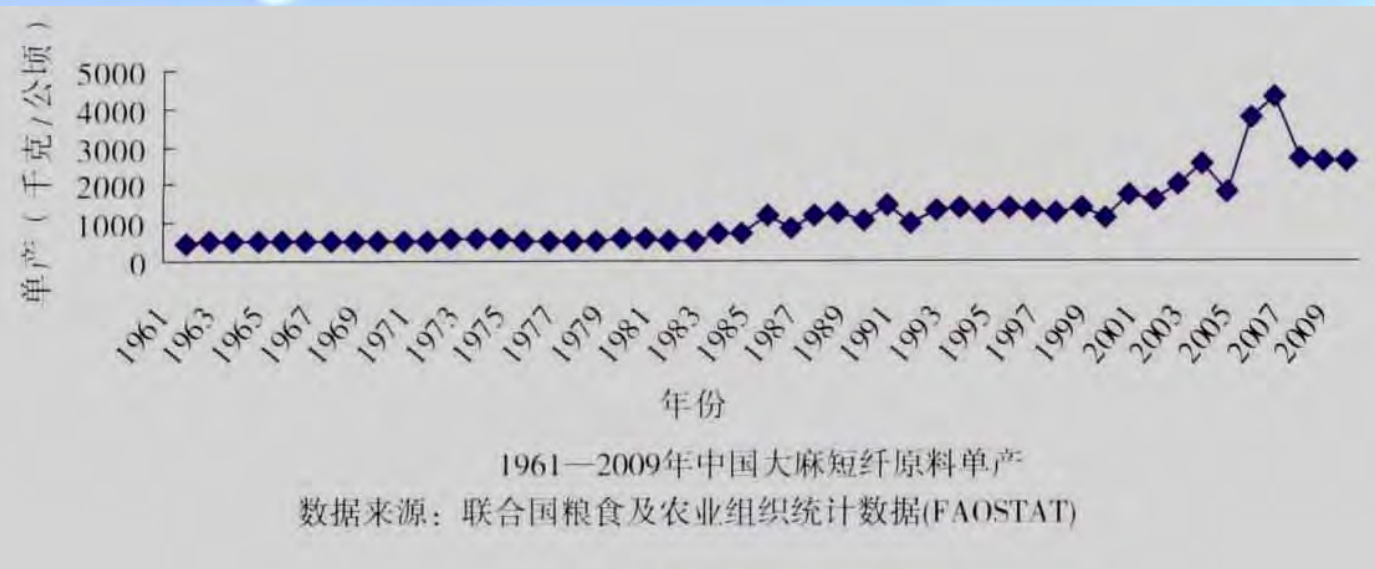
But maybe some plant area were omitted .

Maybe there are about **40,000ha** hemp in 2014 and 2015 in China (including seed hemp and fiber hemp)

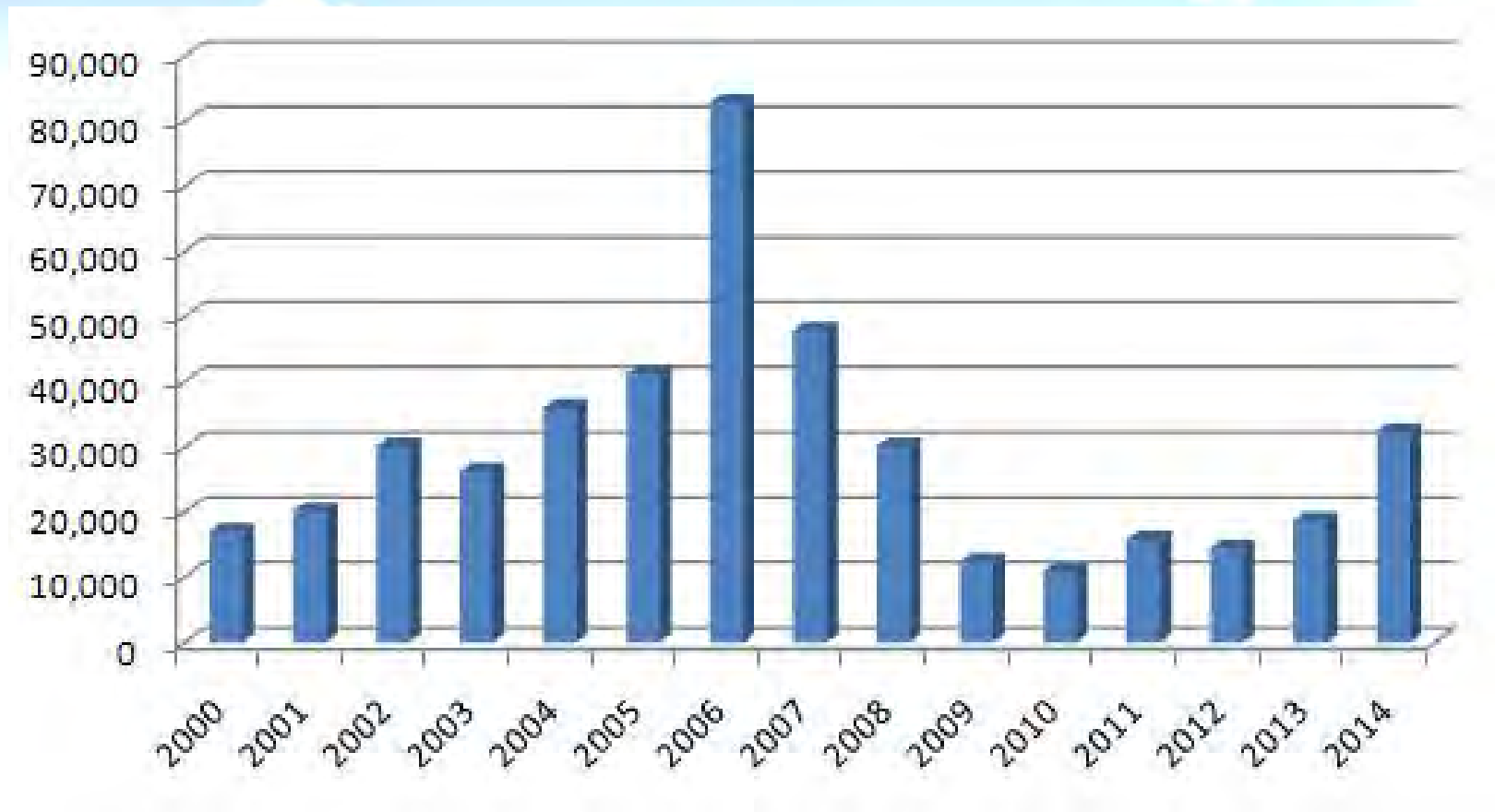
Main Hemp plant place recent years



1.2 hemp fiber yield of China

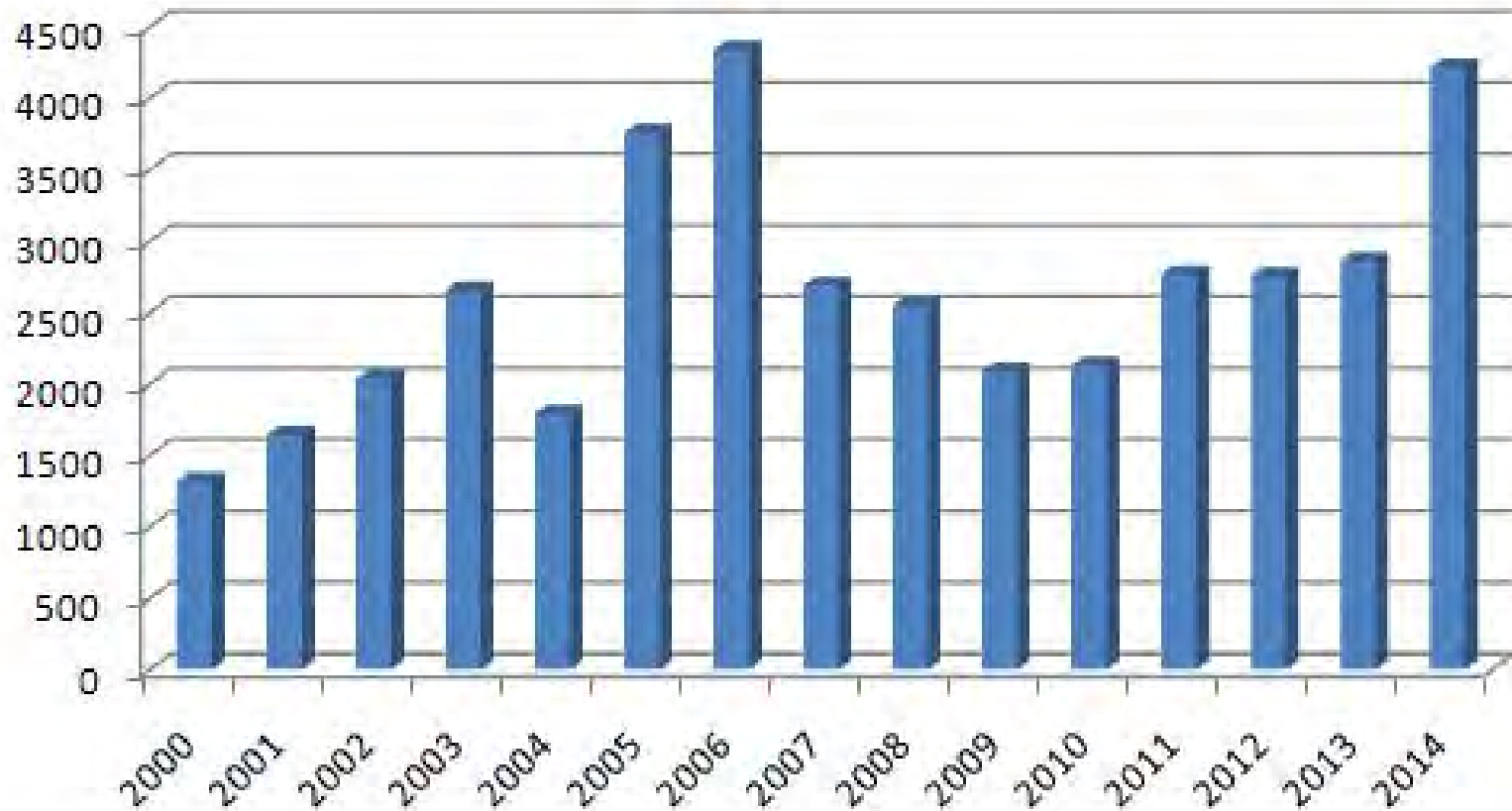


The total hemp fiber yield in China (t)



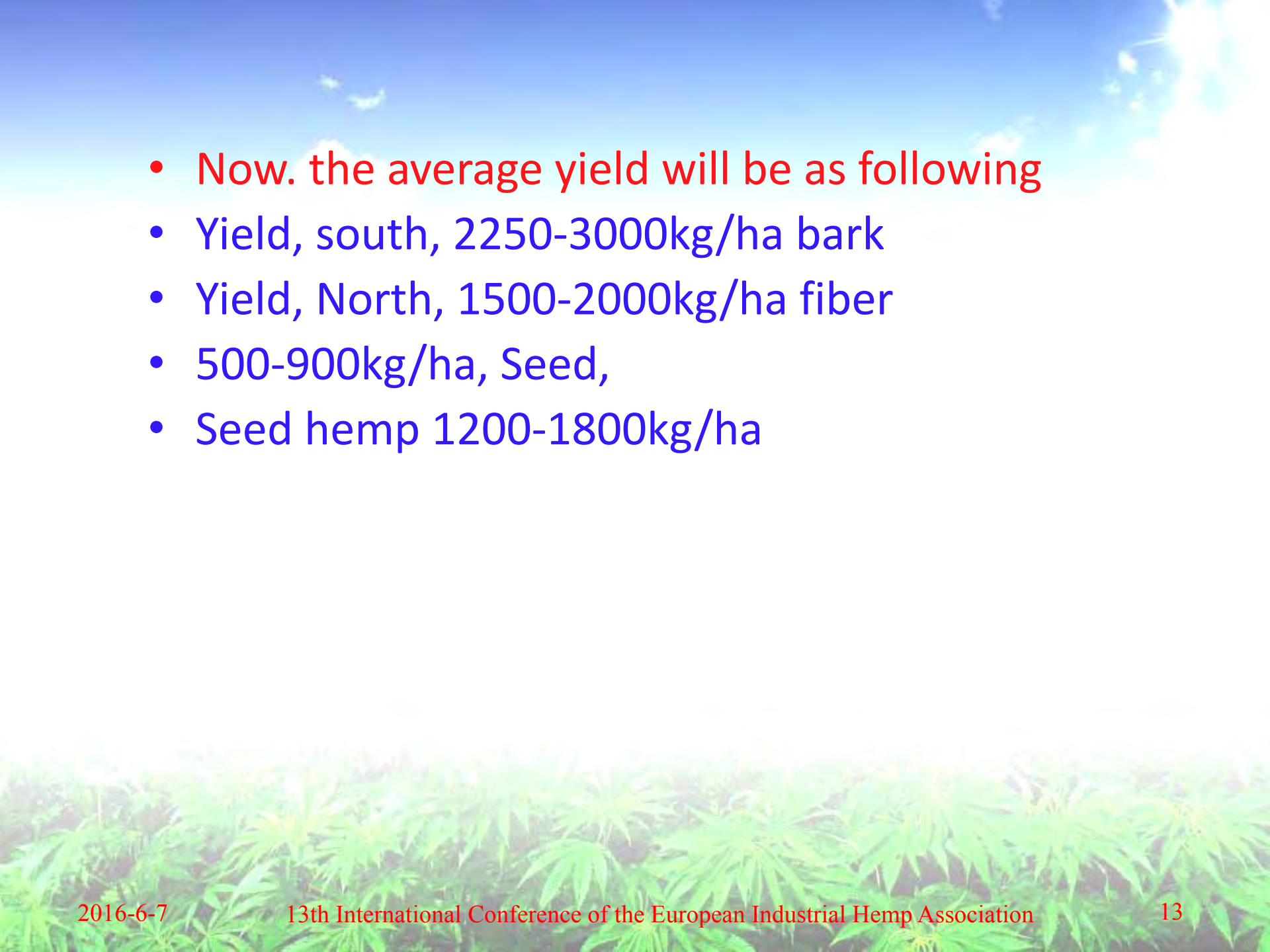
Origin: The crop farming information internet of China

The hemp yield of per ha in China (kg/ha)



Origin: The crop farming information internet of China

year	Hemp fiber total yield(t)	Unit area yield (kg/ha)
2000	17,000	1318
2001	20,200	1641
2002	30,100	2034
2003	26,300	2652
2004	36,000	1791
2005	41,300	3759
2006	82,900	4341
2007	47,900	2689
2008	30,100	2551
2009	12,400	2088
2010	10,900	2130
2011	15,800	2766
2012	14,500	2753
2013	18,700	2862
2014	32,400	4214

- 
- Now. the average yield will be as following
 - Yield, south, 2250-3000kg/ha bark
 - Yield, North, 1500-2000kg/ha fiber
 - 500-900kg/ha, Seed,
 - Seed hemp 1200-1800kg/ha

1.3 hemp sowing and harvest







South China







North China





1.4 The purpose of hemp in China

First is textile



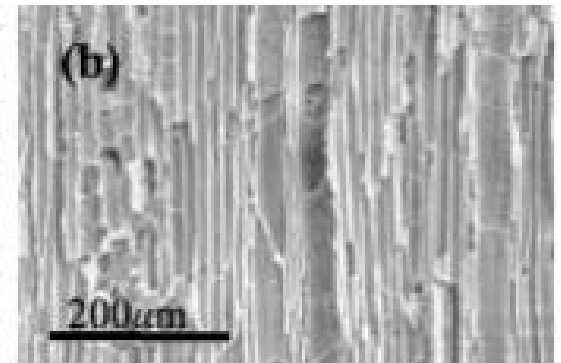
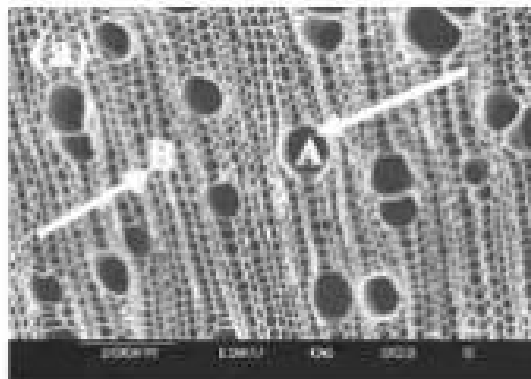
Second is food



Third is oil



Fourth is charcoal



(a) The transect images of hemp straw charcoal ; (b) the vertical images of the of hemp straw charcoal.
Fig. 1 SEM micrographs of carbonized hemp straw obtained at 500°C for 2h.



Other purpose: medicine, paper, composite and so on.



composite



paper



medicine



云南汉木森生物科技有限责任公司昭通市年
产1.5吨大麻二酚项目

1.5 The patents related to hemp in China

- There are about 500 patents related to hemp. Including: planting, processing, textile, food, oil, paper making, medicine and so on. they are belong to Chinese companies and individuals.
- There are many other parents belong to foreign companies.

item	textile	food	medicine	drink	deguming	oil	machine	multipurpose
number	183	65	52	44	36	30	24	23
item	composit e	cultivation	paper	test	charcoal	cosmetics	Brake material	total
number	19	17	14	13	6	3	1	530

1.6 The trade of hemp

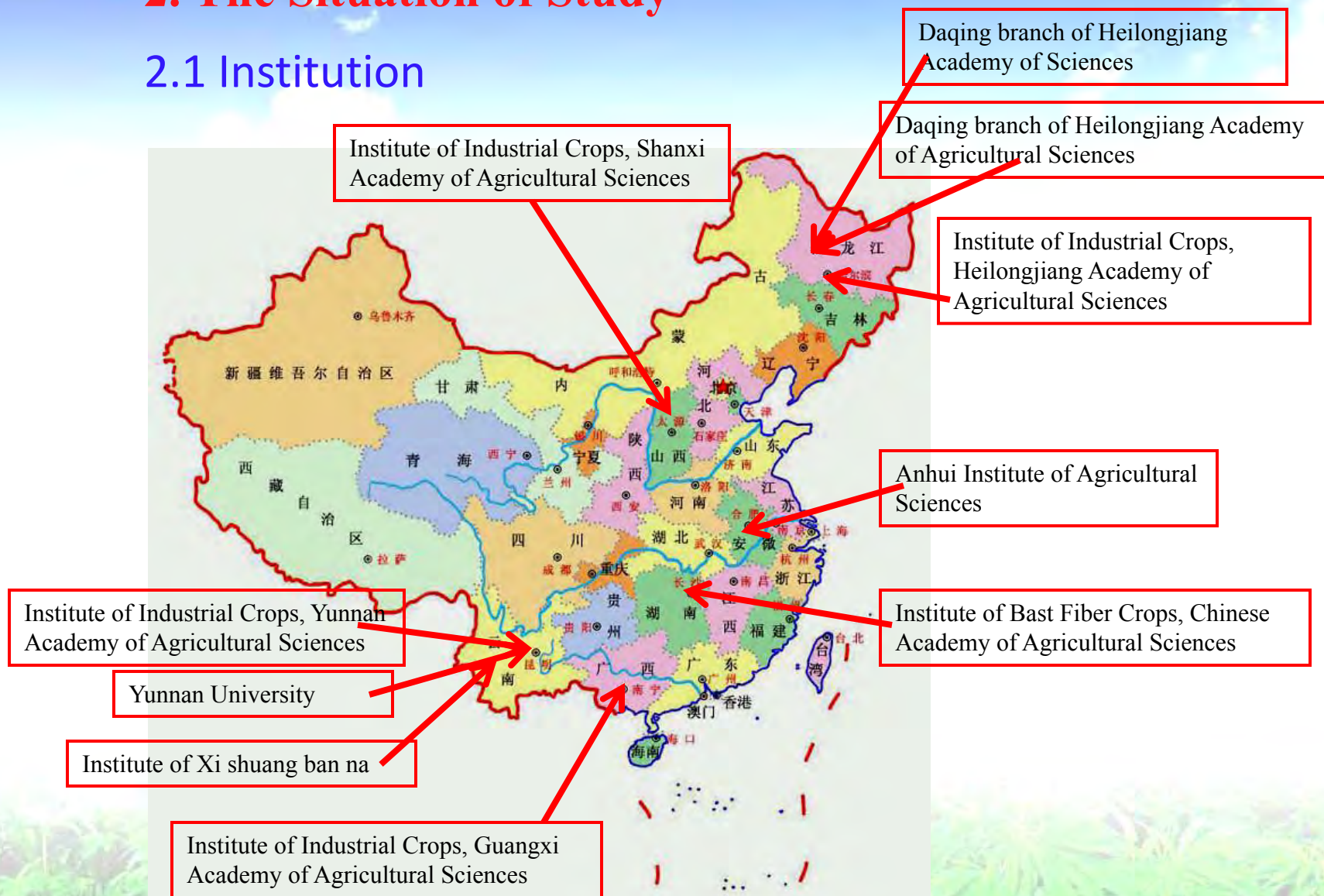
import hemp products									
	fiber and tow			yarn			textile		
year	amount (kg)	sum money (\$)	unit price \$	amount (kg)	sum money (\$)	unit price \$	sum money (m)	sum money (\$)	unit price \$
2010	1968	58313	29.63	4471	51579	11.54	62223	73772	1.19
2011	15605	118302	7.95	2265	39402	17.4	1635	22610	13.83
2012	17300	35747	2.07	1791	28871	16.12	16768	88718	5.29
2013	34573	62159	1.8	1161	28951	24.94	490	11670	23.82
2014	2814	24482	8.69	978	27088	27.7	11205	105823	9.44
2015	15920	13595	0.85	521	15815	30.36	31614	217032	6.87
export hemp products									
	fiber and tow			yarn			textile		
year	amount (kg)	sum money (\$)	unit price \$	amount (kg)	sum money (\$)	unit price \$	sum money (m)	sum money (\$)	unit price \$
2010	110442	954966	8.65	614054	22540330	36.71	1603712	5495063	3.43
2011	171415	669759	3.91	616262	19754435	32.06	4782082	22371899	4.68
2012	70177	688236	9.81	311359	6584729	21.15	1226631	7189120	5.86
2013	46969	652326	13.89	609023	12083519	19.84	928072	5743777	6.19
2014	33570	861358	25.66	127621	1237517	9.7	1789899	11674221	6.52
2015	50785	1029464	20.7	152063	1312117	8.63	2044247	12407284	6.07

Data from Chinese Customs

Volume of trade of hemp products			
Year	Export sum money(\$)	Import sum money(\$)	Export-Import \$
2010	28990359	183664	28806695
2011	42796093	180314	42615779
2012	14462085	153336	14308749
2013	18479622	102780	18376842
2014	13773096	157393	13615703
2015	14748865	246442	14502423

2. The Situation of Study

2.1 Institution



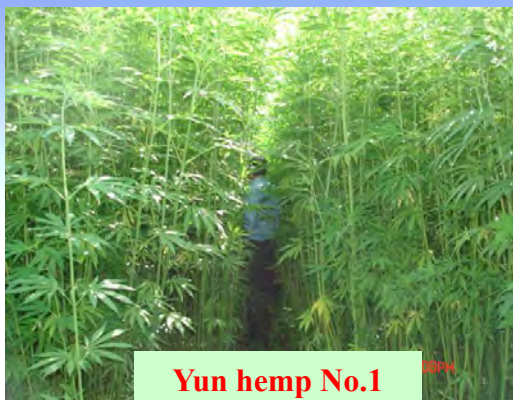
2.2 Breeding

- The main breeding is cross breeding. About 15 hemp varieties were registered in China until now.



The seeds of different varieties





Yun hemp No.1

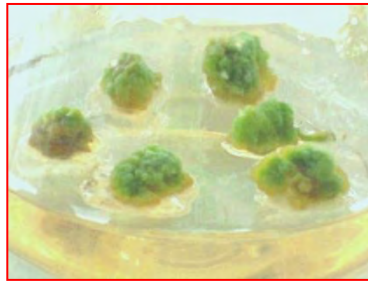
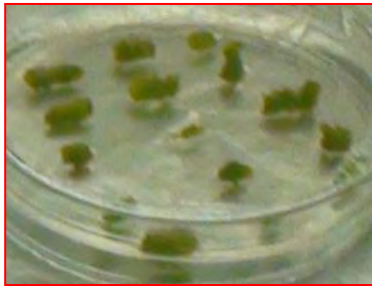


Wan hemp No.1

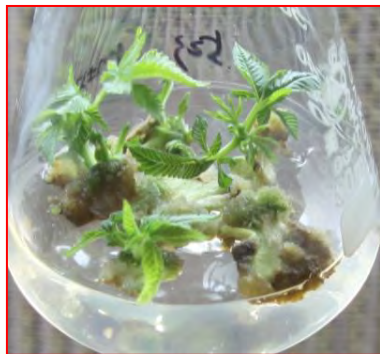




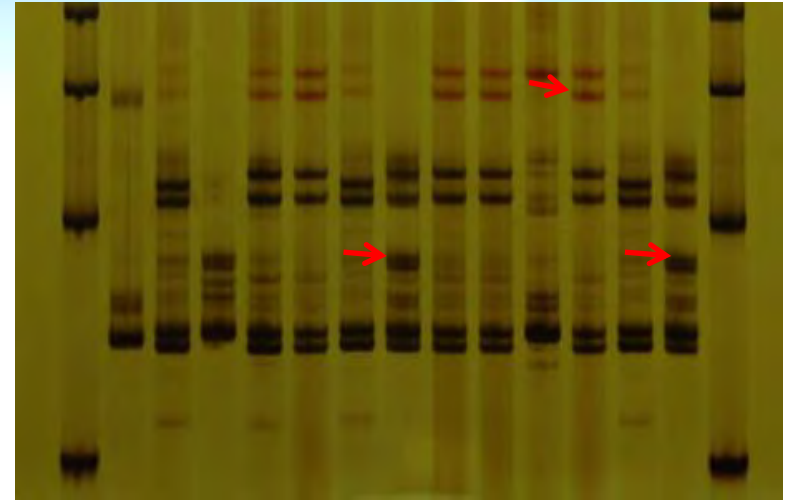
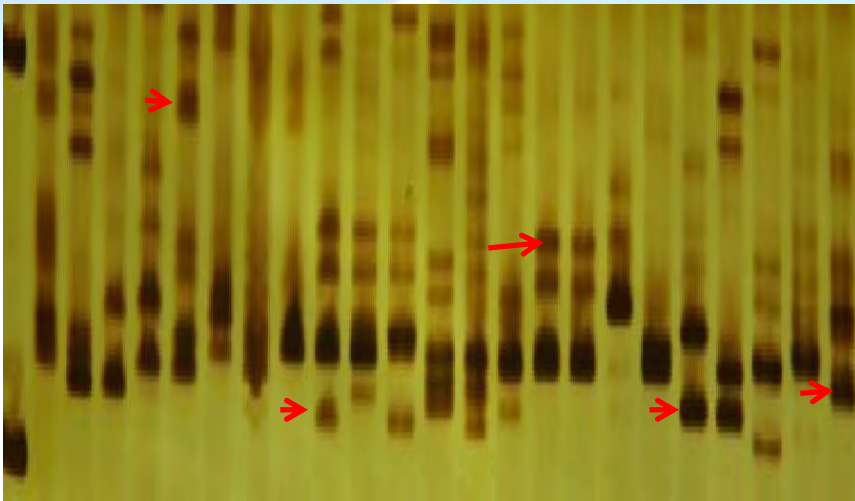
Regeneration system of hemp: The hypocotyls were used as explants for tissue culture. The induction rate of callus was 91. 67%, the differentiation rate of bud was 76. 67%, the rooting rate was 75%.



Transformation system of hemp was been established too: The cotyledons were used as explants for transgene.



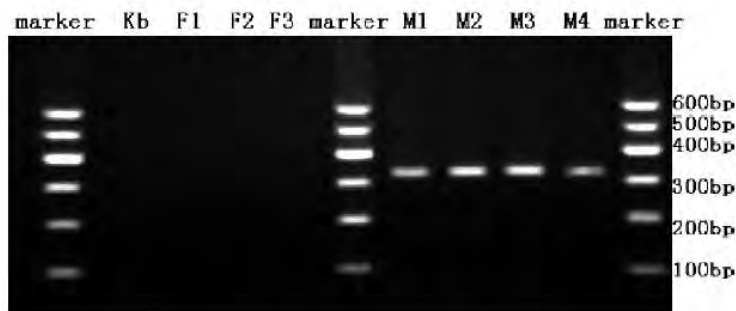
THC-linked SSR marker to Cannabis sativa L.



Molecular marker: 3 THC SSR markers

- (1) CAN0435: TCCTCACTGTAGCCTCCTTC, TTCCCATCCATGTCAGAGT;
- (2) CAN0698 : AAGTCAACGAGAGTTGGGAG , TGGGAGTATCAAGCCCTAAG;
- (3) CAN0123: AAT AAC TCC CAT ATC CAA GCA, AGG ACT CGC ATG ATT AGT TT.

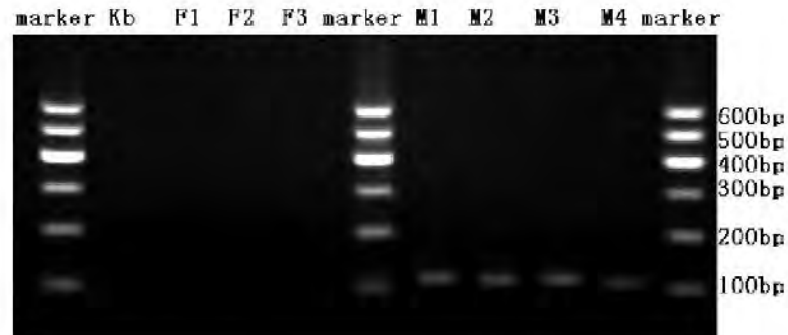
sex-linked SCAR marker to *Cannabis sativa* L.



Kb:空白 (blank) ;F1 ~ 3:雌性 (male) ;M1 ~ 4:雄性 (female)

图1 SCAR323 引物检测结果

Fig 1 The detection results of SCAR323



Kb:空白 (blank) ;F1 ~ 3:雌性 (male) ;M1 ~ 4:雄性 (female)

图2 SCAR119 引物检测结果

Fig 2 The detection results of SCAR119

2.3 Cultivation

- Sowing methods



2.3 Cultivation

- Sowing density 0.5, 1, 1.5, 2, 2.5 million/ha



South 0.5-1 m/ha



North 1.5-2 m/ha

Fertilizer:

Application of N, P, K Fertilizers on Accumulation and Distribution of Dry Matter and Nutrients in Industrial Hemp. Nitrogen was the main factor determining the growth and yield. Fertilizers affect are $N > P > K$.



2.4 Harvest



2.5 phytoremediation of contaminated soil

- Cd could be strongly absorbed and accumulated by hemp. low concentrations of Pb, Zn(<500mg/kg) and Cd (<50mg/kg) could increase the plant height and dry weight of hemp, and high concentrations of Pb, Zn and Cd restrained the growth of hemp.
- Cd was mainly concentrated in root, stem, leaf and fiber. The distribution of Cd: root > stem. In the stem, under part > middle part > upper part.
- The concentration coefficient were very high (> 1). In some experiment it is more than 2. So, hemp is very good for phytoremediation of contaminated soil by heavy metals.



Thanks !

再见！

