The Present and Future of Rapeseed Production in China

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1. Developing of Rapeseed Production in China

Rapeseed production in China has been developing quickly since 1980s, especially in the 90s. Compared with the period 1950-60, the planting acreage has been raised 3-4 times, and the total yield has been increased more than 10 times (Table 1).

Table 1 Rapeseed Planting Acreage and Yield in Different Years

Years	Yearly acreage million hectares	Yearly average (Kg/ha)	Yearly total yield (million tones)
1950-59	1.936	463.5	0.8855
1960-69	1.731	478.9	0.83.32
1970-79	2.127	652.0	1.3865
1980-89	4.246	1153.7	4.899
1990-99	6.249	1331.5	8.321
2000	7.495	1518.5	11.381
2001	7.095	1596.8	11.3310
2002	7.143	1477.5	10.5522
2003	7.221	1581.0	11.4200

Why has the rapeseed industry a fast developing? We think that the following reasons might give the answer. Firstly, market demand. At the present, the edible oils consumption in China is about 12-13 million tons per year, but the total output is just 8.5-9.0 million tons. There is a shortage of 3-4 million tons. Secondly, the extension of some good varieties with high yield and nice quality. In order to get much better economic benefit, farmers would like to choose some good varieties, and improve the cultural technique to increase their yields. Finally, it is suitable for rapeseed growing, but not for wheat in the Yangtze River Basin, where it produced more than 80% rapeseed of China. Wheat was cultivated in the Yangtze River Basin, but the yield and

quality were not good. The farmers' income per hectare when they grew wheat was not higher than that of rapeseed as rapeseed variety improvement got some advance.

2. Rapeseed Variety Improvement in China

China is facing two reforms in rapeseed breeding. One is to replace double high cultivars with double low ones; the other is to extend hybrid varieties instead of open-pollinated (OP) cultivars.

With introducing of double low varieties Oro and Tower in 1970s, Chinese breeders promoted a quality breeding program in 1980, and registered some double low varieties, but the yield was less than that of double high varieties. This problem was solved by combined quality improvement with heterosis utilization in 1990s.

Table 2 Comparison between DL varieties and CK in yield in Hubei trials

Years	1992	1994	1998	2000	2004
OP varieties DL	-8.0%	-8.0%	+1.5%	+6.7%	+10%
Hybrid varieties DL	-	+7.05%	+10.18%	+16-19%	+20-25%

OP varieties have been increased 18% (-8.0%→10%) in yield compared with that of CK, Zhongyou821, from 1994 to 2004, and hybrid varieties have also been raised 18%(7%→25%). We got 1.8% advances in yield every year by breeding techniques. This result indicated there are the same achievements between OP and hybrid varieties. But the yield of hybrid varieties was more 10-15% than that of OP varieties.

From 2000 to 2004, there were 170 cultivars registered in China. Most of them were hybrids.

Table 3 The number of cultivars registered in China during 2000-2004

Total	OP cultivars	hybrids				
		CMS	GMS	CHA	EMS	Sub-total
170	41	87	35	4	3	129

According to Table 3, there were 170 cultivar registrationin China over the last 5

years. The ratio of hybrids was about 70%. Among 129 hybrids, there were 87 cultivars (about 67%) based on CMS system (most of them used pol and shan 2A CMS), and 35 hybrids based on GMS system. The utilization of GMS system was developing quickly. In addition, there were 4 hybrids by using CHA (chemical hybridizing agents), and 3 by EMS (ecotype male sterility).

Table 4 The planting Acreages of double low varieties and hybrid varieties

Years	Rapeseed planting acreage				
	Total acreage (million ha.)	DL varieties		Hybrid varieties	
		Acreage (million ha.)	Ratio %	Acreage (million ha.)	Ratio %
2000	7.495	3.584	47.8	2.933	39.6
2001	7.095	4.238	59.7	3.443	48.5
2002	7.143	4.572	64.0	3.549	49.6
2003	7.221	4.781	66.2	3.600	49.8

The DL variety planting area is enlarging at the present. It is about 66% of total rapeseed planting acreage and hybrid varieties accounted for 50% of the total area. However, there is no real double low seed to process in factories because the factories mix the seeds from different farmers' amounts.

3. The Future of Rapeseed Production in China

1. *To enlarge the planting area to answer the market demand*. The edible oils consumption will grow up to an average of 500 000 tons per year. The market demand is very high, but the total of vegetable oils in China cannot satisfy the market, and the input from other countries is about 3-4 million tons. We predict that rapeseed planting acreage will be increased to 7.5-8.0million hectares over the next 10 years.

2. *To develop some simple cultural techniques*. The transplanting acreage in the Yangtze River Basin will be decreased rapidly because of the transmission of farmers from countryside to city, meanwhile, several simple cultural methods will be extended, such as, tillage, direct sowing, and intercropping with rice and cotton. Those methods could affect the yield. All methods must utilize herbicides. This means that the transgenic rapeseed with the tolerance to herbicide will be permitted to use at first if the government open the GM rapeseed market.

3. *To utilize heterosis with good quality is the major breeding objection in the coming several years*. The hybrid planting area will reach 60-70% in the next 3-5 years. Besides cms system, GMS, EMS and CHAs will be used widely. The current used system is polima cms, it belongs to high temperature male sterile type, and which has very little pollen under the lower temperature, otherwise, no pollen under high temperature. There are two methods to solve the little pollens, one is to produce hybrid in spring planting area. It could increase the hybridization ratio by5-10%. The other is to utilize chemical hybridizing agents. Some agents can control small productions of pollen by spraying once.

4.*To raise the oil content and enhance the resistance above the utilizing of "double low + heterosis"*. The oil content will be raised by 1-3 percentages in the coming 3-5 years in the Yangtze River Basin. The advance in yellow seed *Brassica napus* has been quick. We predicate that the yellow seed *B.napus* will be extended in 3 years

5.*To develop a new cultural method of harvesting vegetable and rape seed*. This technique should have a good future because of its higher efficiency. When the plant grows up and reaches 40cm in height, the main stem is cut about 15-20cm as a kind of vegetable or dry. After cutting, some fertilization should be applied to develop more branches on the plant, so the seed yield would not be decreased, but sometimes, increased by about 3-5%, but the maturity sometimes, increased about 3-5%, but the maturity will be delayed about 3 days. In the Yangtze River Basin, especially the countryside around city, the technique will be more useful.

6. *To improve the processing technique and scales*. There are so many small factories with some old equipments to process oil seeds. They also take part in the market competition. With the establishment of new modern factories, they will be shifted out. The new modern factories will supply with some better rapeseed productions, and generate the consume market to have a fast development. For example, the procession to extract concentrated protein and phytic acid from rapeseed meal has been utilized by some factories. Those techniques accelerated the development of fine processing of rape seed.