

# Cultivation technology of high-yielding and high quality maintaining of double-low rapeseed Suyou No. 1

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## Abstract

The experiment was conducted to study the effects of planting density, nitrogen application rates, potassium application rates on seed yield and quality of Suyou No.1. Results showed that for higher yield and higher rate of oil content, the suitable density was 120,000 to 166,000plant/ha, the optimum amount of nitrogen was 190kg/ha, the optimum amount of potassium was from 150 to 200kg/ha. As the economic benefit concerned, the best combination was 120,000plant/ha, 270kg/ha of nitrogen, 190kg/ha of potassium, with a yield of more than 3000kg/ha or even 4000kg/ha.

**Key words:** double-low rapeseed, Suyou No.1, cultivation technology of high-yielding and high quality

## Introduction

A new cultivar Suyou No.1 (*Brassica napus* L.) with low erucic acid and low glucosinolate content, was bred from a cross combination by Agricultural Institute of Taihu District. It was bred by hybridization of low erucic acid cultivar Rongxuan and local double-low line 372. The variety possessed the characteristics of high- and stable yield, better increasing potential, high oil-content, double-low quality, moderate maturity, and extensive adaptability.

## Materials and Methods

Suyou No.1, with the erucic acid content of less than 1% and glucosinolate content of less than 30 $\mu$ mol/g (in meal) was sown on Sept.23-24 and transplanted on Oct.30 to Nov.2, 2005. Treatments were: (1)densities of 7.5\*10<sup>4</sup> plants/ha, 12\*10<sup>4</sup>plants/ha and 16.5\*10<sup>4</sup>plants/ha with 270 kg/ha of N (50% was applied before transplanting, 20% was applied at seedling stage and the rest applied at flowering), (2)N applications of 225kg/ha, 270kg/ha and 315kg/ha with 12\*10<sup>4</sup>plants/ha, (3)K applications of 81kg/ha, 135kg/ha, 189kg/ha and 243kg/ha with 12\*10<sup>4</sup> plants/ha and 270kg/ha of N, (4)combinations of density and N of the stated 3 levels respectively. The plots were arranged randomly, 20m<sup>2</sup> of each plot and 3 replications.

*Production Samples:* The test districts were separately located in Jinfeng town of Zhangjiagang, Nanfeng town, Yuexi town of Wuxian in Suzhou, Bache town of Wujiang and Shuofang town in Wuxi according to the results and better combinations by Agricultural Technology Extend Department, 87 ha area in all. The date of seeding and transplanting was the same as usual. Each site's density and N fertilizer application were 12\*10<sup>4</sup>plants/ha and 270-300 kg/ha separately and the match of P and K was 0.40-0.50, while other field managements were the same as usual.

*Test of yield and seed traits:* The oil content was mensurated by Soxhlet extractor method with the sample when it's mature, harvested, threshed, insolated and weighed. Oil content, erucic acid content and glucosinolate content would be tested by Quality Inspection and Test Center for Oilseeds Products (QITCOP), Agricultural Ministry of China, in each several years with the samples cultivated in this method.

## Results and analysis

### 1. Effects on yield and oil content of Suyou No.1 by density and N fertilizer application

Yield increased as the increase of density (table 1), with a significant difference between 16.5\*10<sup>4</sup> plants/ha, or 12\*10<sup>4</sup> plants/ha and 7.5\*10<sup>4</sup> plants/ha. N of 270 kg/ha had the highest yield of 2883.45 kg/ha, higher significantly than that of 225kg/ha had (table 2). Both of two tests outyielded the yield of 225 kg/ha N fertilizer application, 2750 kg/ha, by 4.85% and 3.04%, respectively. The differences were both very significant. (table 2)

Table 1 Effects of density on yield and oil content of Suyou No.1

Density (10 <sup>4</sup> plants/hm <sup>2</sup> )	Yield of pots (Kg/20m <sup>2</sup> )				Yield (Kg/hm <sup>2</sup> )	Significant of yield difference		Oil content (%)
	I	II	III	Average		5%	1%	
16.5	5.73	5.77	5.97	5.823	2911.50	a	A	41.47
12.0	5.73	5.73	5.70	5.72	2860.05	a	A	41.88
7.5	5.20	5.47	5.50	5.39	2695.05	b	B	41.17

**Table 2 Effects on yield and oil content of Suyou No.1 by N fertilizer application**

N fertilizer application (Kg/hm <sup>2</sup> )	Yield of pots (Kg/20m <sup>2</sup> )				Yield (Kg/hm <sup>2</sup> )	Significant of yield difference		Oil content (%)
	I	II	III	Average		5%	1%	
270	5.70	5.77	5.83	5.767	2883.45	a	A	41.64
315	5.60	5.70	5.70	5.667	2833.50	a	A	41.01
225	5.37	5.50	5.63	5.50	2750.00	b	B	41.68

Q-test of combination by density and N fertilizer application indicated that (table 3): the two higher yields were average 2911.50 kg/ha and 2860.05 kg/ha in densities of  $16.5 \times 10^4$  plants/ha and  $12 \times 10^4$  plants/ha, respectively. Compared to the yield of  $7.5 \times 10^4$  plants/ha, 2695.05 kg/ha, both of two tests outyielded it by 8.03% and 6.12%, respectively. The yield increases were both very significant. The two higher yields were 2885 kg/ha and 2835 kg/ha by N fertilizer application of 270 kg/ha and 315 kg/ha, respectively. Compared to the yield of 225 kg/hm<sup>2</sup>, 2750 kg/hm<sup>2</sup>, both of two tests outyielded it by 4.67% and 3.05%, respectively. Compared to each combination between the two factors, the highest yield was 3016.50 kg/hm<sup>2</sup> in density of  $16.5 \times 10^4$  plants/ha and N fertilizer application of 270 kg/ha. It outyielded other tests by 3.43%-16.02%, whose increase was significant or very significant.

The highest oil content was 41.88% in density of  $12 \times 10^4$  plants/ha, which was 0.61% and 0.41% higher than  $7.5 \times 10^4$  plants/ha and  $16.5 \times 10^4$  plants/ha, respectively. The two higher oil contents were 41.68% and 41.64%, respectively, by different N fertilizer applications of 225 kg/hm<sup>2</sup> and 270 kg/hm<sup>2</sup>. It was 0.6% higher than N fertilizer applications of 315 kg/hm<sup>2</sup>, 41.01% (table 3).

**Table 3 effects on yield and oil content of Suyou No.1 by combination of density and N fertilizer application**

Treatment		Yield of pots (Kg/20m <sup>2</sup> )				Yield (Kg/hm <sup>2</sup> )	Significant of yield difference		Oil content (%)
Density ( $10^4$ plants/hm <sup>2</sup> )	N application (Kg/hm <sup>2</sup> )	I	II	III	Average		5%	1%	
16.5	270	5.80	6.00	6.30	6.033	3016.50	a	A	41.69
12.0	315	5.80	6.00	5.70	5.833	2916.45	b	AB	41.10
16.5	315	5.90	5.60	5.80	5.767	2884.95	bc	AB	41.29
12.0	270	5.90	5.60	5.60	5.700	2850.00	bc	BC	42.03
16.5	225	5.50	5.70	5.80	5.667	2833.50	bc	BC	42.34
12.0	225	5.50	5.60	5.80	5.663	2816.55	bc	BC	41.51
7.50	270	5.40	5.70	5.60	5.567	2768.55	cd	BC	40.99
7.50	315	5.10	5.50	5.60	5.400	2700.00	d	CD	41.33
7.50	225	5.10	5.20	5.30	5.200	2599.95	e	D	41.20

Thus it can be seen,  $12 \times 10^4$  plants/ha and 270 kg/ha would be the best density and N fertilizer application of higher-yield technology and oil content of Suyou No.1. Under the density and N fertilizer application, we would get the highest yield and higher oil content.

### 2. Effects on yield and oil content of Suyou No.1 by K fertilizer application

Under the density of  $12 \times 10^4$  plants/ha and N fertilizer application of 270 kg/ha, the yield was the highest by K fertilizer application of 189 kg/ha, 2950.05 kg/ha. It outyielded the K fertilizer application of 135 kg/ha, 243 kg/ha and 81 kg/ha by 2.91%, 3.51% and 5.36%, significantly. The highest oil content was 42.34% by K fertilizer application of 189 kg/ha, 243 kg/ha secondly. The lowest oil content was only 40.82% (table 4).

**Table 4 Yield analysis of Suyou No.1 by match of K fertilizer application**

K application (Kg/hm <sup>2</sup> )	Yield of pots (Kg/20m <sup>2</sup> )				Yield (Kg/hm <sup>2</sup> )	Significant		Oil content (%)
	I	II	III	Average		5%	1%	
189	6.00	5.90	5.80	5.90	2950.05	a	A	42.34
135	5.80	5.70	5.70	5.733	2866.50	b	A	41.83
243	5.90	5.60	5.60	5.70	2850.00	b	A	42.11
81	5.50	5.70	5.60	5.60	2800.05	b	A	40.82

### 3. Results of production samples

According to the sample results, we combined the best cultivating factors and set a production demonstration in Jinfeng town, Nanfeng town, Yuexi town, Bache town in Suzhou city and Shuofang town in Wuxi city. It cumulated 87 hm<sup>2</sup>. The actual yield was average 3012.42 kg/ha in average density of  $11.69 \times 10^4$  plants/ha and N fertilizer application of 270–300 kg/hm<sup>2</sup>. Actual yield of three higher-yield fields arrived at 3978.35 kg/hm<sup>2</sup> in average density of  $11.38 \times 10^4$  plants/ha. Trait tests of samples showed that: average oil content was 39.0%-40.18%, erucic acid content was 1.14%-1.59%, gross glucosinolate content was 30.29-30.54  $\mu$  mol/g (table5).

**Table 5 Yield and traits of Suyou No.1 of higher-yield fields and production samples (2000-2002)**

Type	Spot (town)	Area	Density (10 <sup>4</sup> plants/hm <sup>2</sup> )	Yield (Kg/hm <sup>2</sup> )	Oil content (%)	Erucic acid (%)	Glucosinolate (μmol/g)
Higher-yield fields	Jinfeng	1080 m <sup>2</sup>	11.50	4203.00	39.00	1.59	30.29
	Nanfeng	1294 m <sup>2</sup>	11.10	3883.05			
	Guizhuang	1000 m <sup>2</sup>	11.55	3849.00			
Average			11.38	3978.35	39.00	1.59	30.29
Demonstration	Jinfeng. Nanfeng. Yuexi. Bache. Shuofang	87 hm <sup>2</sup>	11.69	3012.42	40.18	1.14	30.54
Production			11.18	2289.00			

## Discussion

Sample results and analysis of density, N fertilizer application, K fertilizer application and combination of single or multiple factors, density and N fertilizer application, indicated that the suitable density, N fertilizer application and K fertilizer application of Suyou No.1 was 12-16.5\*10<sup>4</sup> plants/ha, 270-315 kg/ha and 150-200 kg/ha, respectively. In this range, yield and oil content would be higher and the traits would be better. According to economic benefit, the best combination of density and fertilizer application were 12\*10<sup>4</sup> plants/ha, 270 kg/ha N fertilizer application and 190 kg/ha K fertilizer application.

In order to increase yield and improve double-low technology of Suyou No.1, we should strictly choose better quality seeds, and according to the normal measure of agriculture manage farm well.