

Preliminary Study on the Oil Sunflower Hybrid

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Summary

Xinjiang is one of the most important oil sunflower production base in China. It is also the largest hybrid cultivation province. 80% of its total oil sunflower are hybrid. Since the oil sunflower hybridity study begins very late here, local hybrid has some differences with the foreign ones. Comparing it with five Yugoslavian and three American hybrids, the oil yield of American hybrid DK4030 is 30.50% higher than that of the local Xinkuiza No.4, and the other characters are also better. We plan to do more trials, then introduce and spread it.

Keywords: hybrid; oil sunflower

Xinjiang Autonomous Region is one of the most important oil sunflower production base in China. Since 1980s, its cultivation area has always been more than 80 thousand ha. In 1994, it was up to 131 thousand ha. Because hybrid cultivation area accounts more than 80% of the total oil sunflower production area, Xinjiang is the largest hybrid oil sunflower planting province in China also.

The study on oil sunflower hybrid in Xinjiang begins very late. the local hybrid has some differences with the foreign ones. By doing some trials, comparing the seeds yield, oil content percentage and oil yield of several foreign hybrids, analyzing the main commercial characters and adaptability, foreign hybrids which can adapt to the condition of Xinjiang are chosen for introduction and extension.

1. Materials and Methods

1.1 Materials

Five Yugoslavian hybrids: NS-II-111, NS-H-17, NS-II-RM, NS-II-420, NS-II-43, and three American hybrids: DK3790, DK4030, G101 are compared with the local hybrid Xinkuiza No.4.

1.2 Methods

June 12th, 1995, materials were spotted sowing in the middle fertility sandy soils of Aningqu Experiment Station of Xinjiang Academy of Agriculture Sciences, where former plant was tomato. The seedlings emerged on June 19th and fixed on June 22th. After that, they were intertilled and weeded twice. On July 20th, dug ditches and irrigation. Four times irrigation during the whole growth period. 150 kg (NH₄)₂HPO₄ per ha was used as the basic fertilizer, and 300kg urea per ha was used with the first water.

The trial blocks were randomized design and three times replicated. Each block was 5m×2.6m, having four rows, with 65cm spacing between rows and 25cm apart in the row, Its total area was 13m². When harvest, only the middle two rows which had 40 plants were taken into calculation. The real harvest area was only 6.5m².

2 Results and Analysis

2.1 Seeds yield

The yield of seven foreign hybrids are higher than that of the Xinkuiza No.4 (See Table 1) .they are DK4030, NS-H-17, NS-H-RM, G101, DK3790, NS-H-43 and NS-H-111. Their average yield for each block are 3.73, 3.40, 3.18, 3.15, 3.12, 3.10 and 3.07, which are 26.8%, 15.65%, 8.16%, 7.14%, 6.12%, 5.44% and 4.42% higher Xinkuiza No.4 respectively. The yield of NS-H-420 is 2.67kg, which is 9.18% lower than that of the Xinkuiza No.4. With F test, the average yield of each hybrid block has no significant differences with each other.

Table.1 Block Yield of Different Hybrids (kg/6.5m²)

Hybrids Group	NS-H-111	NS-H-17	NS-H-RM	NS-H-420	NS-H-43	DK3790	DK4030	G101	Xinkuiza No.4
I	3.60	3.75	3.45	2.60	3.40	3.00	4.15	3.25	2.71
II	2.60	3.45	3.45	2.45	3.40	3.15	3.30	3.06	2.80
III	3.00	3.00	2.85	2.95	2.50	3.20	3.75	3.15	3.30
Total	9.20	10.20	9.75	8.00	9.30	9.35	11.20	9.46	8.81
Average	3.07	3.40	3.18	2.67	3.10	3.12	3.73	3.15	2.94
yield per ha	4723.10	5230.80	4892.33	4107.71	4769.25	4800.02	5738.49	4846.18	4523.10

2.2 Oil content percentage

The oil content percentage of DK3790, NS-H-420 and DK4030 are 51.21%, 49.83% and 49.41% respectively (See Table 2), which is 6.87%, 3.99% and 3.11% higher than that of the Xinkuiza No.4. The differences are significant (See Table 3). The differences of oil content percentage between NS-H-17, NS-H-111 and NS-H-RM with that of the Xinkuiza No.4 are not significant. The oil content percentage of G101 and NS-H-43 are 2.46% and 14.4% lower than that of the Xinkuiza No. 4.

Table 2. the oil content percentage of the hybrids (%)

Hybrids Groups	NS-H-111	NS-H-17	NS-H-RM	NS-H-420	NS-H-43	DK3790	DK4030	G101	Xinkuiza No.4
I	46.79	48.83	46.52	49.96	41.11	50.88	48.82	47.17	47.88
II	46.91	49.21	47.16	49.42	40.86	51.33	49.29	46.02	47.68
III	49.75	48.42	47.03	50.11	41.09	51.42	50.12	47.03	48.21
Average	47.82	48.83	46.93	49.83	41.02	51.21	49.41	46.74	47.92

Table 3. The significance test of the oil content percentage of the hybrids

Hybrid	Oil Content Percentage (%)	Difference Significance 0.05
DK3790	51.21	a
NS-H-420	49.83	b
DK4030	49.41	b
NS-H-17	48.83	bc
Xinkuiza NO.4	47.92	cd
NS-H-111	47.82	cde
NS-H-RM	46.93	de
G101	46.74	e
NS-H-43	41.02	f

2.3 Oil Yield of the Blocks

The block oil yield of six hybrids showed higher than that of the Xinkuiza No.4. They are DK4030, NS-H-17, DK3790, NS-H-RM, G101 and NS-H-111, which is 1.84, 1.66, 1.60, 1.49, 1.47 and 1.46 respectively (See Table 4). Among them, the DK4030 and NS-H-17 are 30.50% and 17.73% higher than the Xinkuiza No. 4, and the difference is significant (See Table 5). The block oil yield of NS-H-420 and NS-H-43 are 5.6% and 9.93% lower than that of the Xinkuiza No. 4. The differences are not significant.

Table 4. The block oil yield of the hybrids (kg)

Hybrids Groups	NS-H-111	NS-H-17	NS-H-RM	NS-H-120	NS-H-43	DK3790	DK4030	G101	Xinkuiza No. 4
I	1.68	1.83	1.60	1.30	1.40	1.53	2.03	1.53	1.30
II	1.23	1.70	1.63	1.21	1.39	1.62	1.63	1.40	1.31
III	1.49	1.45	1.25	1.48	1.03	1.65	1.88	1.48	1.69
Total	4.40	4.98	4.48	3.99	3.82	4.80	5.54	4.41	4.23
Average	1.46	1.66	1.49	1.33	1.27	1.60	1.81	1.47	1.41
Oil yield per ha	2246.17	2553.86	2292.32	2046.16	1953.86	2461.55	2830.78	2261.55	2169.24

Table 5. The significance test of the block oil yield differences of the hybrids

Hybrids	block oil yield	difference significance F _{0.05}
DK4030	1.84	a
NS-H-17	1.66	ab
DK3790	1.60	abc
NS-H-RM	1.49	bc
G101	1.47	bc
NS-H-111	1.46	bc
Xinkuiza No. 4	1.41	bc
NS-H-420	1.33	bc
NS-H-43	1.27	c

2.4 The main commercial and biological characters of the hybrids
(See Table 6)

2.4.1 Seeds weight of the individual plant:

That of the DK4030 is 93.25g, which is the highest, and that of the NS-II-420 is the lowest. Except the NS-II-420, other seeds weight of the individual plant are all higher than that of the local Xinkuiza No.4.

2.4.2 Seeds emergence percentage

That of the DK4030 is 79.84%, which is the highest, and that of the NS-II-43 is 72.73%, which is the lowest. The others are between them.

4.2.3 plant height

The plant height of NS-H-17 is 205cm, which is not adapted to be planted in Xinjiang. When the plant height is between 136-178cm, it is suitable to being planted in Xinjiang.

2.4.4 growth period

The growth period of all the hybrids is between 89-97 days, which are adapted to be planted at spring in Xinjiang.

Table 6. The main commercial and biological characters of the hybrids

Hybrid	seed weight per plant (g)	thousand seeds weight (g)	seed emergence percentage (%)	shell percentage (%)	plant height (cm)	growth period (days)
NS-H-111	76.75	78.0	79.49	20.51	178	92
NS-II-17	85.00	65.0	76.92	23.08	205	92
NS-H-RM	79.50	56.0	75.00	25.00	170	93
NS-H-420	66.75	66.0	78.79	21.21	170	92
NS-H-43	77.50	55.3	72.73	27.27	136	86
DK3790	78.00	57.3	79.51	20.49	157	89
DK4030	93.35	61.2	79.84	20.16	168	97
G101	78.75	71.5	76.32	23.68	172	95
Xinkuiza No.4.	73.50	74.8	75.00	25.00	162	94

3 Problems and Discussion

3.1 the oil yield of American sunflower hybrid DK4030 is 2830.78kg/ha, which is 661.54kg/ha or 30.5% higher than that of the Xinkuiza No.4. The difference is significant. Meanwhile its plant height is 188cm and growth period is 97 days. With other better commercial characters, it is adapted to be spreaded in Xinjiang.

3.2 The oil yield of NS-H-17, which is the second largest, is 2553.8 6kg/ha, and 384.62kg/ha or 17.73% higher than that of the Xinkuiza No.4. Since its height is 205cm, it is too high to be planted in Xinjiang.

3.3 The oil yield of the other hybrids are almost similar to that of the Xinkuiza No.4. Further study will be done on their resistance to sclerotinose for introduction.

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