


**SCREENING OF RESTORER LINES OF A SOYBEAN STERILE  
LINE AND UTILIZATION OF ITS HETEROSIS**

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S0105, a soybean cytoplasmic-nuclear male sterile line, was used as the female parent to test a cross with 280 cultivars from home and abroad in different latitudes and ecological zones. When pollen fertility rates were over 90%, the plant was classified as fertile. Using fertility rates of both pollen and F1 plants, nine restorer lines (restoring rate  $\geq 97\%$ ) were selected. Crossed with the sterile line, superparents and superstandard heterosis appeared in all 9 crosses based on the F1 seed yield. Four crosses had heterosis  $>25\%$ . 

# **Screening of Restorer Lines of A Soybean Sterile Line and Utilization of Its Heterosis**

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# Introduction

Crop hybrids appear significant heterosis that generally increased by 20%-40% in yield. The heterosis of rice, corn, rapeseed, cotton and other crops have been widely used in production. Soybean hybrids also showed remarkable heterosis.

S0105, a soybean cytoplasmic-nuclear male sterile line, was used as the female parent in this study to evaluate the heterosis of hybrid soybean, and select new restorer lines and hybrid crosses with strong heterosis.

# Materials and methods

**Materials:** S0105, a soybean cytoplasmic-nuclear male sterile line, was used as female parent to test crossed with 280 cultivars from home and abroad in different latitudes, different ecological zones. According to the results of hybrid pollen fertility analysis, the restorer lines had been identified first, then those lines were crossed with S0105 to get the F1 generation.

**Methods:** Pollen fertility of F1 were identified by the result of I<sub>2</sub>-KI(potassium iodide) staining method , the stained ones were fertile, the others were sterile.

# Results and discussion

## Restorer lines identification

Pollen fertility of every F1 plant of each cross was identified under the microscope at flowering stage. Meanwhile the pods of each hybrid plant were also numbered during the period of pod filling. The results showed that , plants were 100% fertile when the pollen fertility rates over 90%, 89.5% fertile between 80-89.9% pollen fertility, 59.1% fertile between 70-79.9% pollen fertility, 29.9% fertile between 60-69.9% pollen fertility, 14.3% fertile between 50-59.9% pollen fertility.

**Table 1. The fertility of pollens and plants of the first generation of test cross**

Ratio of fertile pollens(%)	Total plants	Fertile plants	Sterile plants	Rate of fertile plants(%)
90-100	179	179	0	100
80-89.9	124	111	13	89.5
70-79.9	115	68	47	59.1
60-69.9	97	29	68	29.9
50-59.9	147	21	126	14.3
< 50	573	23	550	4

Note: Ratio of fertile pollens was the average fertilities of three flowers on each plant.

- ◆ The percentage of fertile plants was much lower when the pollen fertility ratio under 50% and it was not applicable to the restorers' screening. 9 restorer lines with over 97% restoring percentage were identified from 280 test crosses.

**Table 2 Fertilities of pollens and plants in the F<sub>1</sub> of the crosses that restoring ratio was over 97%**

Crosses	Ratio of fertile pollens/%	Total plants	Fertile plants	Sterile plants	Ratio of fertile plants/%
HS05009	96.8	128	126	2	98.4
HS05037	99.2	124	121	3	97.6
HS05060	100	141	141	0	100
HS05069	100	122	122	0	100
HS05088	95.7	136	135	1	99.3
HS06006	95.2	129	129	0	100
HS06027	100	146	146	0	100
HS06058	98.3	149	149	0	100
HS06132	90.7	143	139	4	97.2

Note: Ratio of fertile pollens was the average fertilities of each cross.



## Heterosis

The heterobeltiosis and standard heterosis of F1 of each combination crossed from the 9 screened restorer lines with the male sterile line (S0105) were detected by yield. All of them had both heterosis, the heterobeltiosis was ranged from 20.14% to 62.87%, standard heterosis from 3.79% to 40.71% .

The average value was 35.74% and 22.96%, respectively.

The four combinations, HS05009 、 HS05060 、 HS06027 、 HS06058, which both heterosis reached above 25%, were valuable in production, but HS05009, needs further verification before in use for its restoring percentage was only 98.4%.

**Table 3 Seed yield of crosses and its heterosis  
( kg.hm<sup>-2</sup> )**

Crosses	Yield of male parent ( kg/ha )	Yield of F1 ( kg/ha )	Yield of CK ( kg/ha )	Heterobeltiosis (%)	Standard heterosis %
HS05009	2454	3619.5	2649	47.49	36.64
HS05037	2127	3040.5	2649	42.95	14.78
HS05060	2665.5	3570	2649	33.93	34.77
HS05069	1963.5	3198	2649	62.87	20.72
HS05088	2494.5	2997	2649	20.14	13.14
HS06006	2371.5	3000	2649	26.50	13.25
HS06027	2730	3412.5	2649	25.00	28.82
HS06058	2880	3727.5	2649	29.43	40.71
HS06132	2062.5	2749.5	2649	33.31	3.79
Mean	2416.5	3256.5	2649	34.76	22.93

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