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HYBRIDIZATION OF VARIETIES AND SAMPLES IN THE SHADE AND INHERITANCE OF VALUABLE ECONOMIC TRAITS AND CHARACTERISTICS IN SOYBEANS

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Abstract:

This article presents information on the selection of initial sources with high productivity and quality indicators, grouping, hybridization and inheritance of hybrid populations to create new soybean varieties.

Keywords: collection, variety, sample, parental forms, hybridization, inheritance

Introduction: As is known, obtaining high-quality and high yields from agricultural crops and fully satisfying the population's demand for agricultural products are the main tasks of specialists in this field. There are two main methods for this. First, developing the required agrotechnical measures for each crop variety; second, creating new high-yielding, adaptable varieties using selection methods. This complex task is performed by the science of selection. The main task of selection is to create new varieties (hybrids) of crops. To date, scientists of the Rice Research Institute have created a number of new varieties of soybean, which belong to leguminous crops, and are widely introduced into production.
The object of the study:272 varieties of soybeans brought from the International Scientific Centers and the Research Institute of Plant Genetic Resources were used.
Research methods. Phenological observation, field and laboratory analyzes in genetic-selection research "Method of the All-Russian Research Institute of Plant Science" (1984), and biometric analyzes "Method of conducting agrotechnical field experiments on oil crops" (2010), "Method of the State Commission for Testing Agricultural Crops" (1985, 1989), variational-statistical research results data processing was carried out based on the methods of O. Rebrova and B. Dospekhov, "Method for determination of grain and its processing products, protein" (GOST 108-91 2016), "Method for determining the moisture content of oilseeds" (GOST 10856, 2010) .
Research results. In the experiment, valuable morphological, phenological and biometric indicators of 272 varieties and samples of soybeans introduced from different countries of the world were determined and a database was formed and analyzed;
As a result of observations, a total of 272 varieties of soybeans in the collection were divided into 3 groups depending on the growth period. There were 130 samples of early variety (growing period up to 110 days), 78 samples of medium variety (growing period up to 125 days) and 64 samples of late variety (growing period -140 and above):
Hybridization of soybean varieties and samples and inheritance of valuable economic traits and characteristics.
Creation of new soybean varieties with high yield and grain quality based on hybridization. The main task of the breeder is to create new varieties with high yield and quality indicators compared to the varieties currently cultivated in crop production. To do this, first of all, it is necessary to correctly select the starting material. The starting material refers to the cultivated and wild plant species used in selection to create new varieties. The starting material for creating a new variety is created by finding various wild and cultivated crops and using their hybridization. As a result of hybridization, new forms that embody the traits and characteristics of the research objective were selected by individual selection and individual testing. This method was and remains the main and effective method in the selection of grain crops.
In studying valuable traits in hybrid generations, the following formula was used to determine the degree of dominance (hp) based on heritability indicators and yield elements.

$$hp = \frac{\mathrm{F1} - \mathrm{P}middle,}{\mathrm{P}good\ - \mathrm{P}middle}$$

where:
F1 - hybrid plants average;
P_{middle} - the arithmetic mean of the two parent forms;
P_{good} – arithmetic mean of good parent form,
hp<0 - negative dominance;
hp=0 - If so, dominance is not observed.;
hp>0-1 - if so, partial dominance;

hp>1 - high dominance is observed.

Dominant traits usually include traits that emerged earlier in the phylogeny of a species. For example, mid-ripening is phylogenetically formed earlier than mid-ripening and earlier than late-ripening. Therefore, when crossing early-ripening and mid-ripening forms, late-ripening traits are dominant, and when crossing mid-ripening and late-ripening forms, early-ripening traits are dominant.

When creating productive soybean varieties, it is important to ensure that the main elements determining productivity, namely the number of productive stems per unit area, plant height, number of pods per plant, grains, grain weight per plant, and 1000-grain grain weight, are within acceptable limits.

Plant height. One of the main features determines the suitability of this variety for fully mechanized cultivation from planting to harvest. The height of the soybean plant is from 20 cm to 155 cm, depending on the variety and growing conditions. It reaches up to 2-2.5 meters in the lying species. When studying the transmission of plant height from one generation to another, forms with high productivity and quality indicators are selected for hybridization. According to this sign, heterosis is observed, and even dominance (dominance) appears.

"Plant height varies depending on soil and climatic conditions, location, and cultivation techniques. According to research by T. Wilcox and T. Sedijama, every 10 cm increase in plant height provides an increase in yield by 1.12 c/ha. It is noted that the height of a soybean plant is mainly determined by the duration of the growing season. In late-ripening specimens, the main stem is usually higher, while in early-ripening specimens, on the contrary, the main stem is lower."[1]

Heritability and variability of plant height according to parental forms.

The height of the plant in the model variety was 150 cm. In the samples selected as a result of hybridization, the heredity and variability of plant height according to parental forms were analyzed and the following results were determined.

Table 1

№	Hybrid name	♀	♂	F_1	hp	F_2	hp
1	9177 x 9601 (Tashkent)	152	155	158	3,0	155	1,0
2	614551 x Tomaris	149	146	147	-0,3	145	-1,7
3	6806 x Flight	140	152	155	1,5	146	0,0
4	A-42 x 0512	150	145	145	-1,0	143	-1,8
5	2606 x 3103347	144	157	155	0,7	152	0,2
6	Я-3111 x К-52615	148	152	154	2,0	151	0,5
7	6405 x Nafis	149	155	154	0,7	152	0,0
8	588280 x 537071	151	147	150	0,5	148	-0,5
9	4896 x Friendship	142	150	146	0,0	145	-0,3
10	Universal x Sultan	142	145	147	2,3	145	1,0

If the Uzbekskaya-2 variety has a plant height of 150 cm, then, according to the results of the study, the plant height of the F1 generation hybrids was 140-158 cm, respectively. The level of dominance was high in the 6806 x Parvoz, Ya-3111 x K-52615, Universal x Sultan hybrids, while the level of dominance was low in the 614521 x Tomaris, A-42 x 0512 hybrids. The highest level of dominance was observed in the 9177 x 9601 (Tashkent) hybrid.

Low pod height. The height of the plant to the bottom pod is also one of the main indicators. The suitability of a variety for mechanized harvesting is determined mainly by the height of the bottom pod, which is associated with crop loss. "The location of the bottom pod is influenced by the geographical latitude of the area where the crop is grown, the forage area, etc. Analysis of data on changes in the height of the bottom pod in different soybean varieties shows that the height of the bottom pod increases with the length of the growing season. Thus, the height of the bottom pod varies." If the bottom pod is low, it can cause the pod to fall to the ground during harvesting, which leads to a decrease in yield. If the bottom pod is located at 12-16 cm, it is possible to obtain high yields. In the experiments conducted, the average lower pod height in the Uzbekskaya-2 variety was 11.0 cm. The following results were found in hybrid generations:

Table 2
Inheritance of the location of the lower leg in hybrids

№	Hybrid name	♀	♂	F_1	hp	F_2	hp
1	9177 x 9601 (Tashkent)	13,6	15,2	15,8	1,8	15	0,8

[1] Wilcox, J.R., Sediyama, T. Interrelationships among height, lodging and yield in determinate and indeterminate soybeans. Euphytica 30, 323–326 (1981).

2	614551 x Tomaris	10,8	12,7	11,8	0,1	11,3	-0,5
3	6806 x Flight	13,8	15,3	15,5	1,3	14,7	0,2
4	A-42 x 0512	12,2	13,7	12,5	-0,6	12	-1,3
5	2606 x 3103347	11,0	14,0	13,9	0,9	12,7	0,1
6	Я-3111 x К-52615	10,5	12,1	11,6	0,4	11,1	-0,3
7	6405 x Nafis	11,5	14,5	15,3	1,5	14,0	0,7
8	588280 x 537071	11,1	12,8	12,3	0,4	11,5	-0,5
9	4896 x Friendship	10,0	13,2	13,0	0,9	12,2	0,4
10	Universal x Sultan	13,0	14,2	14,1	0,8	13,8	0,3

The results of the study showed that the lower pod height in the Uzbekskaya-2 variety was 11.0 cm. In the F1 generation, the lower pod height was 15.3 and 14.1 cm, respectively. The F1 588280 x 537071, F1 4896 x Dustlik, F1 2606 x 3103347, F12606 x 3103347, F1 9177 x 9601 (Tashkent) hybrids had a high level of dominance, while the F1 A-42 x 0512, F1 614551 x Tomaris hybrids had a low level of dominance.

Number of pods per plant. The number of pods per plant is one of the main indicators determining the potential for high yield in legume crops; the higher the number of pods per plant, the higher the yield. In high varieties, the higher the yield is determined by the branching of productive stems and the higher the number of pods per plant.

In the Template Uzbekskaya-2 variety, the average number of pods per plant is 84. When analyzing the inheritance of the number of pods per plant in the experiment, it was found that the F1 6806 x Parvoz, F1 6405 x Nafis, F1 Universal x Sultan, F1 4896 x Dustlik, 2606 x 3103347, F1 9177 x 9601 (Tashkent) hybrids had a high level of dominance, while the F1 Ya-3111 x K-52615, F1 A-42 x 0512 hybrids had a low level of dominance. The highest indicator was observed in the F1 9177 x 9601 (Tashkent) hybrid (hp=2.0). The number of pods and grain weight per plant is also a relative indicator to describe its productivity, and is used within samples with the same grain size, because the weight of 1000 grains and the number of pods per plant and the number of grains in the pod have variability.

Table 3
Inheritance of the number of pods in one plant in hybrid generations

№	Hybrid name	♀	♂	F_1	hp	F_2	hp
1	9177 x 9601 (Tashkent)	138	142	144	2,0	141	0,5
2	614551 x Tomaris	125	140	139	0,9	135	0,3
3	6806 x Flight	144	151	154	1,9	150	0,7
4	A-42 x 0512	110	129	124	0,5	112	-0,8
5	2606 x 3103347	130	145	151	1,8	145	1,0
6	Я-3111 x К-52615	118	131	121	-0,5	115	-1,5
7	6405 x Nafis	135	145	147	1,4	143	0,6
8	588280 x 537071	128	133	131	0,2	129	-0,6
9	4896 x Friendship	118	129	130	1,2	125	0,3
10	Universal x Sultan	121	127	129	1,7	127	1,0

Therefore, in all cases, when determining the productivity of a plant, the indicator of grain weight from one plant is used. Grain weight per plant is a complex trait that depends mainly on weather and agro-ecological conditions.

Table 4
Inheritance of 1000 grain weight in soybean hybrids

№	Hybrid name	♀	♂	F_1	hp	F_2	hp
1	9177 x 9601 (Tashkent)	160,3	179,1	177,0	0,8	175,4	0,6
2	614551 x Tomaris	156,4	168,4	169,0	1,1	166,4	0,7
3	6806 x Flight	142,4	169,8	179,5	1,7	171,4	1,1
4	A-42 x 0512	152,4	156,0	152,3	-1,1	150,7	-1,9
5	2606 x 3103347	144,8	175,1	185,0	1,7	169,0	0,6
6	Я-3111 x К-52615	148,0	167,6	150,8	-0,7	148,6	-0,9

7	6405 x Nafis	165,2	174,4	187,4	3,8	174,5	1,0
8	588280 x 537071	156,6	170,2	162,0	-0,2	159,7	-0,5
9	4896 x Friendship	146,9	162,7	163,4	1,1	160,8	0,8
10	Universal x Sultan	136,2	155,2	168,9	2,4	161,6	1,7

1000-grain weight. The 1000-grain weight of a grain is one of the main factors determining the yield index in grain crops. When determining yield, the productive pod, the number of grains in the pod, and the 1000-grain weight of the grain are studied, and on this basis the yield potential of the plant is determined. In soybean, the weight of 1000 grains is very large (weight 221-250 g), large (191-220 g), medium (131-160, 161-190 g), small (71-100, 101-130 g), very small (less than 41-70 g). The external environment has a significant influence on the variability of 1000-grain weight, but it largely depends on the characteristics of the variety being grown.

In the conducted experiments, when determining the weight of 1000 grains of the plant, the average was 168.8 grams in the Uzbekskaya-2 variety. In terms of the degree of heritability of 1000 grains in hybrid generations, the average indicator in F1 generation hybrids was 150.0-177.0 g. It was noted that the heritability of 1000 grain weight was high by 1.7% in the F1 6806 x Parvoz hybrid, 1.1% in the F1 4896 x Dostlik hybrid, 1.7% in the F1 2606 x 3103347 hybrid, and 1.1% in the F1 614551 x Tomaris hybrid. Low dominance was observed in the F1 588280 x 537071, F1 Ya-3111 x K-52615 and F1 A-42 x 0512 hybrids. High dominance (hp=0.8) was also detected in the F1 9177x 9601 (Tashkent) hybrid.

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