Inheritance, variability and formation of crop productivity elements

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Abstract. In the article, acclimatization of South Korean varieties of soybeans to the soil-climate conditions of the Republic of Uzbekistan and cross-breeding between them has a positive effect. According to our experiments, the combinations F1CH11(-018) x CH30(-969) and F1CH27(-266) x CH30(-969) were observed in F1 hybrids from the main elements of productivity in terms of inheritance of the number of pods per plant. In addition, F1CH11(-018) x CH30(-969) and F1CH27(-266) x CH30(-969) combinations for seed weight per plant showed positive heterosis in all but 3 combinations for lower pod location characters, positive complete and incomplete dominance was observed. Character superiority in the number of seeds per plant in CH30(-969), CH7(-014), CH28(-268) and CH28(-268), F1CH11(-018) x CH30(-969), F1KO20 x CH30 In (-969) combinations, a high index of 1000 seed weight was found in CH7(-014) and K09(339) variety samples. In combinations F1K09(339) x CH30(-969), F1US-25(-622) x CH30(-969), F1CH11(-018) x CH30(-969), F1US-25(-622) x CH30(-969), the phenomenon of heterosis was observed in F1CH11(-018) x CH30(-969), F1US-44 (-641) x CH30(-969) and F1KO20 x CH30(-969) combinations. It has been highlighted that the continuation of research on the above-studied variety samples and hybrid combinations will be highly effective in increasing productivity.
Keywords. Soybean, cultivar samples, hybridization, yield, number of pods, number of seeds, seed weight, 1000 seed weight, lower pod location, formation.

1 Introduction

The United States (36.3%) is the leading producer of soybeans in the world. In 2020-2021, the production of soybean grain in the world is USA-125.1 million tons, Brazil-115.3 million tons, Argentina-54.2 million tons, China-16 million tons, India-12.5 million tons, Paraguay-10, 4 million tons, Canada - 7.5 million tons, Russia - 4.63 million tons, Ukraine - 4.01 million tons, and EU countries - 3.29 million tons [1].

Year by year, the soybean plant is occupying large areas in the world. In addition to being considered the main oil-yielding crop, this plant contains the highest amount of protein in its seeds, i.e. up to 40-45% [2]. Nowadays, various products are obtained from

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soybean, and the demand for this product is increasing. These characteristics encourage soybean scientists to study the chemical composition of the grain and conduct research. Increasing the economic efficiency of the soybean plant from leguminous grain crops is important in providing livestock with nutritious food and people with protein and oil. Today, soybean is one of the crops with high economic efficiency, and its cultivated areas are continuously increasing [3].

One of the important problems in soybean breeding is the creation and wide use of early and mid-ripening varieties with high yield, high protein and oil content. Due to the increase in the number of people on the earth and the reduction of irrigated arable land, it is important to get a high-quality harvest suitable for different soil and climate regions without expanding the arable land in the agriculture of the countries of the world [4].

Global climate change in the world indicates the need to create new varieties of soybeans that are resistant to drought, not wilting, and resistant to mechanization [5]. This problem can be solved by attracting new donors with unique characteristics to the selection work.

Extensive measures are being taken to create competitive, high-yielding new soybean varieties in our republic. Today, the creation of productive soybean varieties suitable for different soil and climate regions in Uzbekistan is urgent, and a number of studies are required in this regard.

The purpose of this work is to create drought-resistant, high-protein and oil-free, mechanizable, high-yielding, eco-friendly breeding materials and a new variety using samples of introduced varieties of soybean.

2 Literature review

The heredity, variability and formation of fertility elements are of great importance in soybean. Soybean crop yield is provided by the following indicators: the number of plants per unit area, the number of pods per plant, the number of grains and the weight of 1000 grains, that is, the yield of the variety depends on the productivity of plants (average yield of one plant) and the thickness of the crop (seedling) in the field [1].

To obtain a high yield from the soybean plant, proper organization of variety characteristics, soil-climatic conditions and agro-technological activities is of special importance. Also, when choosing varieties suitable for a certain region, it is advisable to take into account the quality of seeds, the fact that the pods do not rot, that the crop is not damaged during harvesting, and the location of the lower pods [6, 7].

Whether the seed is large or small depends on the characteristics of the variety and soil-climate conditions. The weight of 1000 seeds is 70-350 grams in cultivated varieties. Large seeds do not always determine productivity, that is, productivity depends not only on seed size, but also on the number of seeds per plant. It is worth saying that small and medium-sized seeds are technologically superior when they are crushed by machines, and are less damaged during cleaning and sorting. Large seeds have a high protein content [8, 9], and one plant has 10-15 to 300-400 pods [6]. The main yield structure elements of soybean are: the number of stems per unit area, the number of side branches, the number of joints, the number of pods and seeds per 1 plant, the weight of 1000 seeds and the weight of seeds per 1 plant [10, 11].

Productivity of plants depends on availability of favorable factors during "germination-flowering" period, feeding area, mass of 1000 seeds, number of seeds in a pod, plant height, foliage. According to the weight of the seeds in one plant, the collection variety samples are divided into several groups: very high yielding (more than 44.0 g), very high yielding (30.0-43.0 g), high yielding (26.0-29.9 g), productive (22.0-25.9 g), above average productivity (18.0-21.9 g), average productivity (14.0-17.9 g), low productivity (less than 14 g) [12].

Seed productivity is determined by the number of pods in one plant and the mass of seeds, so these indicators are one of the most important economic indicators. The mass of 1000 seeds indicates the amount of substance they contain. A large seed will have a higher weight of 1000 grains. The weight of 1000 seeds is an important indicator in determining the quality of seeds. Produces vigorous and productive plants from large seeds. The weight of 1000 seeds in varieties is very large (more than 310 g), very large (260-309 g), large (200-259 g), medium (150-199 g), small (100-149 g), very small (40-99 g). The influence of external factors on the variability of the weight of 1000 seeds is significant, but largely depends on the characteristics of the variety [13].

The suitability of the variety for mechanization is determined by the location of the lower pod. The location of the lower pod is affected by geographical latitude, soil and air humidity, feeding area and other factors. The location of the lower pods should be at least 10 cm above the root part. It is noted that Eldorado, Dina and Zolotistaya variety samples showed a good indicator, the maximum location of the lower pods was 11 cm. In this case, when the location of the lower pods is 11 cm, it is easily cut with a jack, and all the grain harvest falls directly into the hopper [14].

3 Materials and methods

Samples belonging to the Korean selection introduced as the object of the study - CH27(-266), CH28(-268), CH3(-008), CH7(-014), CH11(-018), CH30(-969), US-25 (-622), US-14(-382), US-44 (-641), US-80 (-699), US-82(-701), K09(339), KO20, KO3(-214), KO21(RR-1), KO18; Varieties belonging to KraCHodar selection - Avanta, Arleta, Sparta, Selekta 201, Selekta 302; Dostlik, Uzbekskaya 2, Orzu, Ukrainian selection Izumrud, Medea varieties, and their hybrids, families, and lines were used.

The subject of the study is the heredity of the valuable economic traits of the introduced F1-F4 hybrids, the level of variability, correlative dependence, analysis of the characteristics of formation in families and lines.

Crossbreeding, single selection and the study of the inheritance of characters from generation to generation, analyzes of laboratory and field experiments were considered acceptable methods. The obtained results were subjected to statistical analysis according to the Dospekhov method.

In our experiment, elements of yield structure (number of pods per plant, number of seeds, weight of seeds, weight of 1000 seeds, location of lower pods) of soybean collection variety samples were studied using Korsakov's method [11].

4 Results and discussion

The task of the breeder is to increase the productivity of the variety. Therefore, individual selection aimed at productivity in heterogeneous populations should be carried out according to indicators with strong genetic transfer ability and low (low) possibility of modification variation from generation to generation.

These indicators are: plant height, length of internodes, number of joints in the main (head) stem, number of seeds in a pod, weight of 1000 seeds and yield index.

For selection, it is necessary to form the initial forms, select and create new varieties in uniform growing conditions. In hybridization, a highly differentiated indicator in one of the parent forms should be supplemented by an average development of this indicator in the other.

It is necessary to evaluate the selection material according to the set of signs, because the maximum manifestation of one indicator usually coincides with the minimum manifestation of the other.

Selection based on productivity should be carried out together with the location of the lower pods at an optimal height (15-17 cm) and resistance to cracking. This in turn greatly reduced crop spillage during harvesting.

In our study, the heritability of the number of pods per plant was studied in F1 hybrids obtained on the basis of samples of the introduced Korean variety (Table 1). CH30(-969) showed a high number of pods in one plant compared to other forms, i.e. 128.3, and was involved in crossbreeding as a parent variety. CH7(-014), CH28(-268) and CH27(-266) samples showed relatively higher indicators of this character and made up 117.3 units, 114.4 units and 107.8 units, respectively. Somewhat lower indicators were recorded in KO21(RR-1) (63.9 units) and K09(339) (63.8 units).

In this research, 16 introduced Korean variety samples were involved in crossbreeding. The number of pods per plant of F1 plants ranged from 73.9 (F1US-25(-622) x CH30(-969)) to 133.3 (F1CH11(-018) x CH30(-969)). Genetic analysis of the number of pods per plant of F1CH28(-268) x CH30(-969), F1KO20 x CH30(-969), F1US-44 (-641) x CH30(-969) and F1KO18 x CH30(-969)F1 plants showed that showed positive heterosis in F1CH27(-266) x CH30(-969) (hp=1.2) and F1CH11(-018) x CH30(-969) (hp=1.1) combinations, F1KO20 x CH30(-969) and the combination of F1KO18 x CH30(-969) showed incomplete dominance. F1CH7(-014) x CH30(-969) (hp=-4.3) and F1US-82 (-701) x CH30(-969) (hp=-1.2) combinations showed negative heterosis, F1US-25(-622) x CH30(-969) (hp=-1.0) showed complete negative dominance, while the remaining hybrid combinations showed negative incomplete dominance.

Table 1. Inheritance of number of pods per plant in F1 hybrids

#	Parental forms and hybrids	Number of pods per plant			
		M±m	**σ**	**V%**	**hp**
1	CH27(-266)	107.8±0.28	0.58	0.53	-
2	CH28(-268)	114.4±0.88	1.77	1.55	-
3	CH3(-008)	80.1±1.10	2.21	2.76	-
4	CH7(-014)	117.3±1.78	3.57	3.04	-
5	CH11(-018)	88.0±2.16	4.33	4.92	-
6	**CH30(-969)**	128.3±0.70	1.40	1.09	-
7	US-25(-622)	73.6±1.78	3.58	4.86	-
8	US-14(-382)	83.1±2.11	4.23	5.08	-
9	US-44 (-641)	105.0±2.79	5.60	5.32	-
10	US-80 (-699)	95.6±4.56	9.13	9.55	-
11	US-82 (-701)	82.5±2.95	5.90	7.15	-
12	K 09 (339)	63.8±3.90	7.81	12.24	-
13	KO20	76.6±2.78	5.56	7.27	-
14	KO3(-214)	77.0±3.10	6.22	8.07	-
15	KO21(RR-1)	63.9±3.40	6.80	10.63	-
16	KO18	75.4±4.02	8.05	10.67	-
17	CH27(-266) x	129.5±0.77	1.54	1.19	1.1

	CH30(-969)				
18	CH28(-268) x CH30(-969)	120.0±2.01	4.03	3.36	-0.2
19	CH3(-008) x CH30(-969)	89.4±2.62	5.26	5.88	-0.6
20	CH7(-014) x CH30(-969)	98.9±2.55	5.10	5.16	-4.3
21	CH11(-018) x CH30(-969)	133.3±2.82	5.64	4.23	1.2
22	US-25(-622) x CH30(-969)	73.9±3.24	6.48	8.77	-1.0
23	US-14(-382) x CH30(-969)	84.9±3.12	6.25	7.36	-0.9
24	US-44 (-641) x CH30(-969)	111.2±4.07	8.14	7.32	-0.5
25	US-80 (-699) x CH30(-969)	97.5±4.57	9.15	9.38	-0.9
26	US-82 (-701) x CH30(-969)	78.9±4.76	9.53	12.06	-1.2
27	K 09 (339) x CH30(-969)	89.9±3.67	7.36	8.18	-0.2
28	KO20 x CH30 (-969)	114.5±4.46	8.93	7.80	0.5
29	KO3 (-214) x CH30(-969)	80.6±4.66	9.33	11.56	-0.9
30	KO21(RR-1) x CH30(-969)	83.4±4.29	8.59	10.30	-0.4
31	KO18 x CH30 (-969)	110.4±4.88	9.77	8.85	0.3

Therefore, F1CH11(-018) x CH30(-969) and F1CH27(-266) x CH30(-969) combinations are dominant in F1 hybrids in terms of inheritance of the number of pods per plant.

The next main yield factor was seed weight, which ranged from 12.4 g (CH3(-008) to 44.5 g (CH7(-014)) in parental forms (Table 2). CH28(-268) (35 g) and CH30(-969) (30 g) were recorded in combination.

Among F1 plants, F1KO18 x CH30(-969), F1US-44 (-641) x CH30(-969) and F1CH11(-018) x CH30(-969) combinations showed superiority in seed weight (respectively 29.1 g, 28.1 g, 27 g). Incomplete dominance event F1KO18 x CH30(-969) (hp=0.8), F1US-44 (-641) x CH30(-969) (hp=0.6) and F1CH27(-266) x CH30(-969) (hp=0.1) was recorded in combinations. F1KO21(RR-1) x CH30(-969) does not have dominance, which means hp is 0. F1CH3(-008) x CH30(-969), F1CH11(-018) x CH30(-969) and F1US-25(-622) x CH30(-969) combinations showed negative underdominance with hp index of -0, respectively, 0.5, -0.3 and -0.2. In the remaining combinations, a phenomenon of negative heterosis occurred. Therefore, the combinations F1KO18 x CH30(-969), F1CH27(-266) x CH30(-969) and F1US-44 (-641) x CH30(-969) are superior according to heritability.

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Table 2. Inheritance of seed weight in F1 plants.

#	Parental forms and hybrids	Seed weight, g			
		M±m	σ	V%	hp
1	CH27(-266)	14.3±0.25	0.50	3.52	-
2	CH28(-268)	35±0.52	1.04	2.97	-
3	CH3(-008)	12.4±0.26	0.53	4.29	-
4	CH7(-014)	44.5±0.38	0.77	1.74	-
5	CH11(-018)	25.2±0.66	1.35	5.31	-
6	**CH30(-969)**	30.0±0.91	1.83	6.11	-
7	US-25(-622)	21.1±0.58	1.16	5.50	-
8	US-14(-382)	25.3±0.61	1.23	4.88	-
9	US-44 (-641)	19.9±0.50	1.01	5.07	-
10	US-80 (-699)	27.5±0.45	0.91	3.32	-
11	US-82 (-701)	25.2±0.36	0.73	2.89	-
12	K 09 (339)	21.8±0.47	0.95	4.37	-
13	KO20	21.9±0.56	1.13	5.18	-
14	KO3 (-214)	24.8±0.43	0.86	3.48	-
15	KO21(RR-1)	19.5±0.41	0.83	4.27	-
16	KO18	21.6±0.40	0.81	3.76	-
17	CH27(-266) x CH30 (-969)	23.1±0.65	1.30	5.63	0.1
18	CH28(-268) x CH30 (-969)	24.9±0.46	0.93	3.75	-3.0
19	CH3(-008) x CH30 (-969)	16.8±0.40	0.81	4.85	-0.5
20	CH7(-014) x CH30 (-969)	17.4±0.38	0.77	4.40	-2.7
21	CH11(-018) x CH30 (-969)	27.0±0.36	0.72	2.67	-0.3
22	US-25(-622) x CH30(-969)	24.6±0.35	0.71	2.87	-0.2
23	US-14(-382) x CH30(-969)	24.7±0.26	0.54	2.17	-1.3
24	US-44 (-641) x CH30(-969)	28.1±0.29	0.58	2.06	0.6
25	US-80 (-699) x CH30(-969)	23.1±0.26	0.53	2.31	-4.5
26	US-82 (-701) x CH30(-969)	24.9±0.32	0.66	2.64	-1.1
27	K 09 (339) x CH30 (-969)	19.8±0.46	0.93	4.67	-1.5
28	KO20 x CH30(-969)	17.4±0.40	0.81	4.67	-2.1
29	KO3 (-214) x CH30 (-969)	23.6±0.35	0.70	2.98	-1.5
30	KO21(RR-1) x CH30(-969)	24.7±0.30	0.60	2.44	0.0
31	KO18 x CH30(-969)	29.1±0.32	0.65	2.25	0.8

According to Table 3, parental forms ranged from 10.1 cm (CH3(-008)) to 14 cm (CH7(-014)). In the F1 plants, the lower pod location was superior to F1CH7(-014) x CH30(-969) and 15.3 cm F1CH3(-008) x CH30(-969) F1CH11(-018) x CH30(-969) F1US -82 (-701) x CH30(-969) F1US-44 (-641) x CH30(-969) combinations were 14.3 cm, 14.3 cm, 14.2 cm, 14.41 cm.

Table 3. Inheritance of lower pod location in F1 plants.

#	Parental forms and hybrids	Llocation of lower pods, cm			
		M±m	σ	V%	hp
1	CH27(-266)	12.1±0.29	0.59	4.90	-
2	CH28(-268)	13.6±0.27	0.54	3.99	-
3	CH3(-008)	10.1±0.19	0.39	3.89	-
4	CH7(-014)	14.0±0.27	0.54	3.86	-
5	CH11(-018)	12.1±0.26	0.53	4.38	-
6	**CH30(-969)**	13.5±0.24	0.49	3.60	-
7	US-25(-622)	12.1±0.16	0.33	2.71	-
8	US-14(-382)	12.1±0.21	0.43	3.54	-
9	US-44 (-641)	12.3±0.17	0.35	2.88	-
10	US-80 (-699)	12.6±0.23	0.47	3.74	-
11	US-82 (-701)	13.7±0.27	0.56	4.06	-
12	K 09 (339)	13.8±0.23	0.46	3.34	-
13	KO20	13.9±0.30	0.61	4.38	-
14	KO3(-214)	12.1±0.12	0.25	2.09	-
15	KO21(RR-1)	13.9±0.19	0.39	2.82	-
16	KO18	13.6±0.29	0.58	4.28	-
17	CH27(-266) x CH30 (-969)	13.5±0.24	0.48	3.55	1.0
18	CH28(-268) x CH30 (-969)	12.9±0.30	0.60	4.64	-13.0
19	CH3(-008) x CH30 (-969)	14.3±0.25	0.51	3.54	1.5
20	CH7(-014) x CH30 (-969)	15.3±0.20	0.41	2.68	6.2
21	CH11(-018) x CH30 (-969)	14.3±0.25	0.51	3.59	2.1
22	US-25(-622) x CH30(-969)	12.9±0.22	0.45	3.49	0.1
23	US-14(-382) x CH30(-969)	13.4±0.26	0.52	3.89	0.9
24	US-44 (-641) x CH30(-969)	14.1±0.22	0.44	3.14	2.0
25	US-80 (-699) x CH30(-969)	13.5±0.20	0.41	3.01	1.0
26	US-82 (-701) x CH30(-969)	14.2±0.15	0.32	2.24	6.0
27	K 09 (339) x CH30	13.7±0.31	0.64	4.63	0.3

	(-969)				
28	KO20 x CH30(-969)	13.6±0.24	0.48	3.53	-0.5
29	KO3 (-214) x CH30 (-969)	13.7±0.25	0.51	3.73	1.3
30	KO21(RR-1) x CH30(-969)	13.5±0.28	0.56	4.18	-1.0
31	KO18 x CH30(-969)	13.6±0.22	0.44	3.24	1.0

F1CH7(-014) x CH30(-969) (hp=6.2), F1US-82 (-701) x CH30(-969) (hp=6.0), F1CH11(-018) x CH30(-969) (hp=2.1), positive in combinations F1US-44 (-641) x CH30(-969) (hp=2.0) and F1KO3 (-214) x CH30(-969) (hp=1.3) heterosis, F1CH27(-266) x CH30(-969) (hp=1.0), F1US-80 (-699) x CH30(-969) (hp=1.0) and F1KO18 x CH30(-969) (hp=1.0) complete dominance in combinations F1US-14(-382) x CH30(-969) (hp=0.9), F1K 09 (339) x CH30(-969) (hp=0.3) and F1US Incomplete dominance was observed in combinations -25(-622) x CH30(-969) (hp=0.1). F1CH28(-268) x CH30(-969) negative heterosis (hp=-13.0), negative dominance in F1KO21(RR-1) x CH30(-969) (hp=-1.0), F1KO20 x CH30(-969) (hp=-0.5) showed negative incomplete dominance phenomenon. Therefore, positive heterosis, positive complete and incomplete dominance was observed in all but 3 combinations according to the location of the lower pods, and the dominance of heredity was noted.

The results of analysis of 1000 seed weight in F1 plants of soybean introduced variety samples are presented in Table 4. Among the parental forms, the highest result was observed in samples of varieties CH7(-014) and K09(339), 210.5 g and 190.6 g, respectively, relatively high results were observed in KO3(-214) (179.6 g), CH28(-268) (170.6 g), US-14(-382) (170.5 g), KO21(RR-1) (170.4 g) and US-82(-701) (169.7 g) formed

F1US-25(-622) x CH30(-969) (hp=2.4), F1CH11(-018) x CH30(-969) (hp=2.1), F1US-44 (-641) x CH30(-969) (hp=1.7) and F1KO20 x CH30(-969) (hp=1.4) heterosis event, F1CH28(-268) x CH30(-969), F1US-14(-382) x CH30 (-969) underdominance in F1US-82 (-701) x CH30(-969), F1K09(339) x CH30(-969) combinations (respectively hp=0.8, hp=0.5, hp=0, 4, hp=0.4) event was recorded. F1CH3(-008) x CH30(-969) has hp=0 and no dominance, while F1US-80 (-699) x CH30(-969) has negative heterosis and F1 CH7(-014) x CH30 In the combination (-969) the phenomenon of incomplete dominance of the negative level was shown.

Table 4. Inheritance of 1000 seed weight in F1 plants.

#	**Parental forms and hybrids**	**Weight of 1000 seeds, g**			
		M±m	**σ**	**V, %**	**hp**
1	CH27(-266)	70.4±3.22	6.45	9.16	-
2	CH28(-268)	170.6±1.68	3.38	1.98	-
3	CH3(-008)	80.3±1.88	3.77	4.69	-
4	CH7(-014)	210.5±1.82	3.66	1.74	-
5	CH11(-018)	159.9±1.68	3.37	2.11	-
6	**CH30(-969)**	140.0±3.23	6.47	4.62	-
7	US-25(-622)	160.0±2.57	5.14	3.21	-
8	US-14(-382)	170.5±2.50	5.02	2.94	-

9	US-44 (-641)	110.1±2.20	4.40	4.00	-
10	US-80(-699)	160±2.44	4.89	3.05	-
11	US-82(-701)	169.7±1.86	3.73	2.19	-
12	K09(339)	190.6±2.71	5.43	2.85	-
13	KO20	159.4±2.71	5.43	3.41	-
14	KO3(-214)	179.6±2.39	4.78	2.66	-
15	KO21(RR-1)	170.4±1.87	3.76	2.21	-
16	KO18	159.9±1.81	3.62	2.26	-
17	CH27(-266) x CH30 (-969)	161.1±2.59	5.19	3.22	1.6
18	CH28(-268) x CH30 (-969)	152.6±2.08	4.17	2.73	0.8
19	CH3(-008) x CH30(-969)	110.5±2.24	4.49	4.06	0.0
20	CH7(-014) x CH30(-969)	162.7±1.73	3.46	2.13	-0.4
21	CH11(-018) x CH30 (-969)	170.7±1.96	3.93	2.30	2.1
22	US-25(-622) x CH30 (-969)	174.3±1.91	3.82	2.19	2.4
23	US-14(-382) x CH30 (-969)	162.2±1.67	3.35	2.07	0.5
24	US-44 (-641) x CH30 (-969)	150.6±1.80	3.61	2.39	1.7
25	US-80 (-699) x CH30 (-969)	110.4±1.54	3.10	2.80	-4.0
26	US-82 (-701) x CH30 (-969)	160.5±1.94	3.88	2.42	0.4
27	K 09 (339) x CH30(-969)	174.4±2.01	4.03	2.31	0.4
28	KO20 x CH30(-969)	163.1±1.73	3.46	2.12	1.4
29	KO3 (-214) x CH30(-969)	150.6±1.32	2.64	1.75	-0.5
30	KO21(RR-1) x CH30 (-969)	162.5±1.70	3.40	2.09	0.5
31	KO18 x CH30(-969)	70.4±3.22	6.45	9.16	-8.0

Relatively high indicators of 1000 seed weight were observed in combinations F1K09(339) x CH30(-969), F1US-25(-622) x CH30(-969), F1CH11(-018) x CH30(-969), respectively 174 ,4 g, 174.3 g, was 170.7 grams. Slightly higher results were F1KO20 x CH30(-969), F1KO21(RR-1) x CH30(-969), F1 US-14(-382) x CH30(-969) and F1US-14(-382) x CH30(-969) were observed in combinations, and the results of 163.1 g, 162.5 g, 162.7 g, 162.2 g were recorded. A relatively low figure for the character was seen in the F1KO18 x CH30(-969) combination, which was 70.4 g.

Thus, parental forms CH7(-014) and K09(339) that showed high results for the character, F1K09(339) x CH30(-969), F1US-25(-622) x CH30(-969), F1CH11(-018) x CH30(-969) combinations, by heterosis event F1US-25(-622) x CH30(-969) (hp=2.4), F1CH11(-018) x CH30(-969) (hp=2.1), F1US-44 (-641) x CH30(-969) (hp=1.7) and F1KO20 x CH30(-969) (hp=1.4) combinations were isolated.

According to Table 5, the inheritance of seed number in parental forms and F1 plants was analyzed. Among the parental forms, the highest indicator of the character was observed in the variety sample CH30(-969) and it was noted that it was 231.2 units. It was also relatively high in CH7(-014), CH28(-268) and CH28(-268) samples, and the number of seeds was 211.1, 205.4 and 204.2, respectively. In the F1CH11(-018) x CH30(-969) combination, the index for the character was 243.3 units, which in turn equaled hp=1.3, and positive heterosis was noted. F1KO20 x CH30(-969) had a seed number of 195.0 at hp=0.2, an incomplete dominance event, and F1US-82(-701) x CH30(-969) had a seed number of 189.6. unit is equal to hp=0, it is noted that there is no dominance. In the remaining combinations, the dominance index changed from -0.1 to -6.6.

Table 5. Inheritance of seed number in F1 plants.

#	Parental forms and hybrids	Number of seeds			
		M±m	σ	V, %	hp
1	CH27(-266)	204.2±5.88	5.76	1.76	-
2	CH28(-268)	205.4±4.70	9.58	4.40	-
3	CH3(-008)	154.4±2.64	5.29	3.42	-
4	CH7(-014)	211.1±2.37	2.25	4.75	-
5	CH11(-018)	158.3±2.05	2.60	4.11	-
6	**CH30(-969)**	231.2±3.21	2.78	6.43	-
7	US-25(-622)	132.5±3.30	4.99	6.61	-
8	US-14(-382)	149.3±2.57	3.45	5.15	-
9	US-44 (-641)	189.0±4.26	4.51	8.52	-
10	US-80 (-699)	172.0±3.21	3.74	6.44	-
11	US-82 (-701)	148.6±3.28	4.41	6.56	-
12	K 09 (339)	114.9±4.03	7.02	8.07	-
13	KO20	137.8±3.94	5.73	7.90	-
14	KO3 (-214)	138.5±4.19	6.06	8.40	-
15	KO21(RR-1)	115±1.94	3.39	3.90	-
16	KO18	135.7±3.65	5.39	7.31	-
17	CH27(-266) x CH30 (-969)	195.0±4.04	4.15	8.09	-1.7
18	CH28(-268) x CH30 (-969)	184.6±4.83	5.23	9.66	-2.6
19	CH3(-008) x CH30 (-969)	165.8±4.48	5.41	8.97	-0.7
20	CH7(-014) x CH30 (-969)	154.8±3.86	4.98	7.72	-6.6
21	CH11(-018) x CH30 (-969)	243.3±5.06	4.16	10.12	1.3
22	US-25(-622) x CH30 (-969)	149.6±3.42	4.58	6.86	-0.7
23	US-14(-382) x CH30 (-969)	129.7±3.92	6.05	7.84	-1.5
24	US-44 (-641) x CH30 (-969)	145.9±3.95	5.42	7.90	-3.0
25	US-80 (-699) x CH30 (-969)	121.6±3.52	5.79	7.05	-2.7
26	US-82 (-701) x CH30 (-969)	189.6±3.91	4.13	7.83	0.0
27	K 09 (339) x CH30	149.9±4.02	5.37	8.06	-0.4

	(-969)				
28	KO20 x CH30(-969)	195±3.75	3.85	7.51	0.2
29	KO3 (-214) x CH30 (-969)	183.6±3.12	3.40	6.24	0.0
30	KO21(RR-1) x CH30 (-969)	165.9±3.93	4.74	7.86	-0.1
31	KO18 x CH30(-969)	154.8±3.80	4.92	7.61	-0.6

5 Conclusions

In conclusion, it should be noted that acclimatization of South Korean varieties of soybeans to the soil and climate conditions of the Republic of Uzbekistan and crossbreeding between them will have a positive effect. According to our experiments, F1CH11(-018) x CH30(-969) and F1CH27(-266) x CH30(-969) combinations in F1 hybrids for the number of pods per plant, and F1CH11(-018) for seed weight per plant x CH30(-969) and F1CH27(-266) x CH30(-969) combinations, positive heterosis in all but 3 combinations for lower pod location character, positive complete and incomplete dominance, CH30(-969) for number of seeds per plant , CH7(-014), CH28(-268) and CH28(-268) cultivars are dominant by character, F1CH11(-018) x CH30(-969), F1KO20 x CH30(-969) combinations, 1000 seed weight index high index in CH7(-014) and K09(339) variety samples, F1K09(339) x CH30(-969), F1US-25(-622) x CH30(-969), F1CH11(-018) x CH30(- 969) combinations, F1US-25(-622) x CH30(-969), F1CH11(-018) x CH30(-969), F1US-44 (-641) x CH30(-969) and F1KO20 x CH30(-969) the phenomenon of heterosis was observed in combinations. The continuation of research on the above-studied variety samples and hybrid combinations will be highly effective in increasing productivity.

References

1. Abdukarimov D.T. Private selection, Tashkent: FAN Press.-2007. - 409 p.
2. Abdukarimov D.T. Selection and breeding of field crops, Samarkand: Nature Press, 2012. - 172 p.
3. Abzalov M.F., Kilichiva O.B., Baratova N.R., Zhumaev F.Kh. Soybean gene pool of the Institute of Genetics and Experimental Plant Biology of the Academy of Sciences of Uzbekistan / Gene pool of agricultural crops, selection, seed breeding and modern technologies: Rep. science and practice. conf. August 18-19, 2010. - Tashkent, 2010. - 6-7 p.
4. Atabaeva H.N., Umarova N.S. Soybean Biology. Tashkent: FAN Press, 2020.-227 p.
5. Baranov V.F., Dovydenko O.G., Kochegura A.V. High-protein soybean technologies. - Krasnodar: Nauka Press 2005. - 110 p.
6. Bezler N.V., Shcheglov D.I. Plant growing. Voronezh, 2011. - 52 p.
7. Vlasova E.V. Evaluation of early maturing soybean samples from the VIR collection by the ability to ripen in central Russia / E.V. Vlasova, Yu.V. Gorbunova // Feed production. 2016. No. 6. pp. 36-39.
8. Ivanenko A.S. The structure of the harvest of early maturing soybean varieties in the Tyumen region / A.S. Ivanenko, A.N. Sozonova // Bulletin of the State Agrarian University of the Northern Trans-Urals. 2017. No. 2. pp. 90-94.
9. Taranukho V.G. and other Cereal legumes: a workshop. - Gorki: BSHA Press, 2014. - 56 p.

10. Sozonova A. N. Economic-biological and breeding value of early-ripening soybean varieties in the forest-steppe zone of the Trans-Urals: dis. – Tyumen, 2019.188 p.
11. Kholmurodova G.R., Tangirova G.N., Zhuraev S.T. Soybean breeding and seed production. Tutorial. Tashkent, Lesson Press. 2022 88 pages
12. Kholmurodova G.R., Tangirova G.N., Yuldasheva R.A., Rakhmankulov M.S. Analsis of protein and oil content in seeds of soybeen collection varieties. 3 rd International Conference on Energetics, Civil and Agricultural Engineering 2022 (ICECAE 2022) 1142(1) 02146
13. Kholmurodova G.R.Khabibullaev X.A. Khabibullaeva M.A., Razzokova G.A. The significance of soya types. International Journal of Research 575(4) 13-19. https://pen2print.org/index.php/ijr/
14. Tangirova G.N., Kholmurodova G.R. The study of introgressive soybean varieties when creating the source material for breeding. - Actual problems of modern science, 2020. 2(19) 111-114-p.