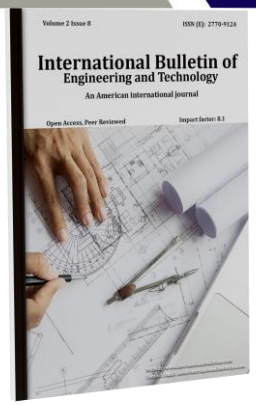


# PRIMARY SOURCE FOR SOYBEAN IN THE IRRIGATED CONDITIONS OF UZBEKISTAN

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**Annotation.** In this article, the research results of 236 samples of soybean varieties brought from different soybean-growing countries and international scientific centers on valuable economic characteristics are highlighted. Also, crossbreeding was done between plants selected for favorable traits and characteristics, and the laws of inheritance and variation of characters were studied in $F_1$-$F_4$ generations.

**Keywords.** Soybean, cultivar, selection, initial source, seed, disease, pest, heat, drought, dormancy, yield, grain quality

**Introduction.** Globally, problems related to global warming are leading to a decrease in the yield of agricultural crops. In particular, the drop in daily average air temperature from +21°C and rise from +32°C in the soybean crop disrupts the pollination process and causes shedding of mother flowers, resulting in a decrease in productivity. Breeding and seed production is focused on research activities in countries with a developed soybean industry, such as Brazil, the USA, Argentina, Canada, China, India and Russia in order to create varieties with high yields, early maturity, resistance to lodging, diseases and pests, and the seeds contain a lot of oil and protein.

One of the topical issues of our time is the creation of new soybean varieties that are productive for sowing in the regions of our republic, have high technological indicators of grain quality, do not spoil, are intended for harvesting using mechanization, and are resistant to diseases and pests, and organize their primary seed production.

**Research methods.** For phenological observation, field and laboratory analysis, "Method of the All-Russian Research Institute of Plant Science" (1984), and for biometric analysis "Method of conducting agrotechnical field experiments on oil crops" (2010), "Method of the State Commission for Testing Agricultural Crops" ( 1985, 1989), methods of O.Rebrova and B.Dospekhov for the processing of variational statistical data of the research results, the large-smallness of the dominance level (hp) indicator was implemented based on the formulas given in the work of G.Beil and R.Atkins.

The main tasks of soybean selection are to create varieties with high yield, quick ripening, resistance to dormancy, diseases, and pests, and high oil and protein content in its seeds.

Previous works dedicated to establishing some laws of character variability, heredity, and transmission from generation to generation related to identifying new soybean varieties essential for future production are analyzed in depth.

**Primary source**. In the research, 236 samples of soybean varieties from the world collection of the Research Institute of Plant Genetic Resources and the international scientific centers SIMMYT and ICARDA were studied. Among the studied samples, the most are 78 from North America (USA, Canada), 47 from East Asia (China), 37 from Eastern Europe (Russia, Ukraine). Also, the least of the studied varieties and samples belonged to the Australia.

**Geographical origin of the variety and samples studied in the research results**

| № | Geographical origin | Name of countries | The number of variety and samples |
|---|---|---|---|
| 1. | Eastern Europe | Ukraine, Russia | **37** |
| 2. | Western Europe | France | **16** |
| 3. | Central Asia | Kazakhstan, Uzbekistan | **34** |
| 4. | Front Asia | Iran, Turkey (CIMMYT, ICARDA) | **17** |
| 5. | East Asia | China | **47** |
| 6. | Australia | Australia | **5** |
| 7. | North America | Canada, USA | **78** |
| | **Total** | | **236** |

Varieties in the catalog of Soybean samples at the Research Institute of Plant Science are divided into nine groups (from 80 days to 170 and more days) depending on the duration of the vegetation period, depending on the main valuable agronomical traits and characteristics; depending on the weight of 1000 seeds - nine groups (from 40 grams to 250 and more grams); divided into nine groups (from 6 to 33 grams and more) according to the yield of one plant.

Among the samples of soybean gene pool belonging to different eco-geographical groups, 147 samples according to the location of lower pods, 81 samples according to the weight of 1000 grains and 87 samples according to the number of pods per plant were selected as the initial source for the selection process.

**Plant height**. Plant height ranges from 15 cm to 1.7 m and depends on variety and growing conditions. It reaches up to 2.5-3 m in the reclining types. The stem is straight, thick or thin, some are curly.

Depending on the characteristics of the stem, the forms of the soybean are divided into two groups:

- indeterminate form - the bud at their end is vegetative, and under favorable conditions, the growth of the stem and the formation of new generative organs last a long time;

- determinant form - the stem ends with a flower shingle, the growth of the stem ends with the formation of the upper shingle, they grow stronger and produce more than the first ones, and the shade of this shape is considered to be an early ripening.

In the world selection, efforts are being made to transfer the existing soybean varieties to the determinant form.

Plant height is one of the main soybean characteristics that determine the suitability of this variety for fully mechanized cultivation from planting to harvesting. The height of the plant varies depending on soil-climatic conditions, location and agrotechnics of cultivation. According to the morphological indicator, the height of the plant is between 14-150 cm in upright forms, and 250 cm and higher in creeping and ground-growing forms.

**Table 2**

**Inheritance of plant height in $F_1$-$F_4$ generations of soybean hybrids.**

| № | The name of the combinations | ♀ | ♂ | M±m | σ | V% | hp |
|---|---|---|---|---|---|---|---|
| 1. | $F_1$ K-16 x Nafis | 135,0±2,31 | 140,5±2,43 | 151,5±3,07 | 9,5 | 6,3 | 5,01 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2. | $F_1$ К-14 x 8852 | 115,0±2,42 | 125,0±2,19 | 132,0±2,79 | 8,6 | 6,5 | -2,4 |
| 3. | $F_1$ 2308 x 9206 | 120,0±2,23 | 105,0± 2,32 | 123,7±2,77 | 8,6 | 7,0 | -1,5 |
| 4. | $F_1$ К-11 x 5613 | 135,0±2,61 | 110,0±2,45 | 132,7±3,05 | 9,4 | 7,1 | - 0,78 |
| 5. | $F_1$ К-4 x 9177 | 100,0±2,33 | 140,0±2,17 | 132,0±3,26 | 10,1 | 7,6 | 0,6 |
| 6. | $F_1$ Nafis x У-300-3347 | 140,5±1,99 | 137,0±2,12 | 152,6±3,21 | 9,9 | 6,5 | 7,93 |
| 7. | $F_1$ 7469 x 0-128790 | 115,0±2,08 | 130,0±1,87 | 134,7±3,65 | 11,3 | 8,4 | - 1,63 |
| 8. | $F_1$ 464170 x 464132 | 130,0±2,02 | 95,0±1,96 | 123,7±2,80 | 8,7 | 7,0 | 0,64 |
| 9. | $F_1$ 6806 x К-24 | 145,0±2,31 | 144,0±2,16 | 147,3±4,75 | 14,7 | 10,0 | 5,78 |
| 10. | $F_1$ К-15 x 6310 | 152,0±2,21 | 155,0±2,44 | 162,7±2,62 | 8,1 | 5,0 | 6,14 |
| 11. | $F_2$ К-16 x Nafis | | | 148,7±4,24 | 13,1 | 8,8 | |
| 12. | $F_2$ К-14 x 8852 | | | 129,6±3,57 | 11,1 | 8,5 | |
| 13. | $F_2$ 2308 x 9206 | | | 121,5±3,51 | 10,9 | 8,9 | |
| 14. | $F_2$ К-11 x 5613 | | | 132,3±4,14 | 12,8 | 9,7 | |
| 15. | $F_2$ К-4 x 9177 | | | 129,6±4,20 | 13,0 | 10,1 | |
| 16. | $F_2$ Nafis x У-300-3347 | | | 149,8±4,32 | 13,4 | 8,9 | |
| 17. | $F_2$ 7469 x 0-128790 | | | 128,6±4,35 | 13,5 | 10,5 | |
| 18. | $F_2$ 464170 x 464132 | | | 114,7±4,18 | 13,0 | 11,3 | |
| 19. | $F_2$ 6806 x К-24 | | | 156,0±4,53 | 14,0 | 9,0 | |
| 20. | $F_2$ К-15 x 6310 | | | 161,1±3,59 | 11,1 | 6,9 | |
| 21. | $F_3$ К-16 x Nafis | | | 146,0±5,35 | 16,6 | 11,4 | |
| 22. | $F_3$ К-14 x 8852 | | | 127,2±4,41 | 13,7 | 10,8 | |
| 23. | $F_3$ 2308 x 9206 | | | 119,2±4,48 | 13,9 | 11,7 | |
| 24. | $F_3$ К-11 x 5613 | | | 129,8±5,11 | 15,8 | 12,2 | |
| 25. | $F_3$ К-4 x 9177 | | | 127,2±4,81 | 14,9 | 11,7 | |
| 26. | $F_3$ Nafis x У-300-3347 | | | 147,0±5,16 | 16,0 | 10,9 | |
| 27. | $F_3$ 7469 x 0-128790 | | | 129,8±5,11 | 15,8 | 12,2 | |
| 28. | $F_3$ 464170 x 464132 | | | 119,2±5,63 | 17,5 | 14,7 | |
| 29. | $F_3$ 6806 x К-24 | | | 145,9±7,67 | 23,8 | 16,3 | |
| 30. | $F_3$ К-15 x 6310 | | | 158,1±5,30 | 16,4 | 10,4 | |
| | **$LSD_{05}$=** | | | **3,7** | | | |
| 31. | $F_4$ К-16 x Nafis | | | 143,2±4,13 | 15,2 | 12,4 | |
| 32. | $F_4$ К-14 x 8852 | | | 124,8±3,97 | 14,6 | 11,3 | |
| 33. | $F_4$ 2308 x 9206 | | | 117,0±4,41 | 14,7 | 12,7 | |
| 34. | $F_4$ К-11 x 5613 | | | 127,4±4,67 | 16,1 | 13,2 | |
| 35. | $F_4$ К-4 x 9177 | | | 124,8±4,65 | 15,4 | 13,6 | |
| 36. | $F_4$ Nafis x У-300-3347 | | | 144,3±5,21 | 15,6 | 12,2 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 37. | $F_4$ 7469 x 0-128790 | | | 127,4±5,31 | 16,7 | 13,7 | |
| 38. | $F_4$ 464170 x 464132 | | | 117,0±6,21 | 17,1 | 14,6 | |
| 39. | $F_4$ 6806 x К-24 | | | 145,2±7,14 | 19,7 | 15,7 | |
| 40. | $F_4$ К-15 x 6310 | | | 155,0±6,0 | 17,3 | 14,5 | |
| | **LSD $_{05}$=** | | | **3,6** | | | |

According to the researches of T. Wilcox, T. Sedijama, each 10 cm increase in plant height ensures an increase in productivity by 1.12 t/ha. It is noted that the height of the soybean plant is mainly determined by the length of the growing season. In late-ripening samples, the main stem is usually higher, in early-ripening samples, on the contrary, the main stem is lower.[1]

In our research, the plant height of $F_1$ generation hybrid combinations of soybean had an average of 114.7-162.7 cm. The highest indicator was achieved by the combination $F_1$ K-15 x 6310 (162.7 cm). The coefficient of variation was found to range from 5.0 to 10.0% for $F_1$ hybrid combinations, 6.9 to 11.3% for $F_2$ hybrid combinations, 10.4 to 16.3% for $F_3$ hybrid combinations, and 11.3 to 15.7% for the $F_4$ generation. Plant height inheritance high dominance in $F_1$ K-16 x Nafis, $F_1$ Nafis x U-300-3347, $F_1$ 6806 x K-24 and $F_1$ K-15 x 6310 combinations, intermediate dominance in $F_1$ K-4 x 9177, $F_1$ 464170 x 464132 combinations and $F_1$ K-14 x 8852, $F_1$ 2308 x 9206, $F_1$ K-11 x 5613, $F_1$ 7469 x 0-128790 hybrids were observed negative dominance condition. The $F_1$ hybrid between Nafis and U-300-3347 demonstrated the highest dominance (hp=7.93).

The inheritance of plant height in the studied soybean hybrids is presented in Table 2.

**The location of the lower pod**. The suitability of the variety for mechanized harvesting is mainly determined by the location height of the lower pod, which depends on the decreasing of the yield. The location of the lower legume is affected by the geographical expance of the area where the crop is grown, the area of fodder, etc. In addition, only 28% of character variability is determined by genetic factors.

**Table 3**

**Inheritance of lower pod location in $F_1$-$F_4$ generations of soybean hybrids.**

| № | The name of the combinations | ♀ | ♂ | M±m | σ | V% | hp |
|---|---|---|---|---|---|---|---|
| 1. | $F_1$ К-16 x Nafis | 18,0±0,45 | 16,0±0,53 | 18,4±0,53 | 1,6 | 8,9 | 1,36 |
| 2. | $F_1$ К-14 x 8852 | 12,0±0,41 | 14,0±0,41 | 13,5±0,56 | 1,7 | 12,8 | 0,52 |
| 3. | $F_1$ 2308 x 9206 | 15,0±0,50 | 12,0±0,44 | 13,8±0,54 | 1,7 | 12,1 | -0,18 |
| 4. | $F_1$ К-11 x 5613 | 18,0±0,53 | 12,0±0,49 | 15,5±0,79 | 2,4 | 15,8 | -0,15 |
| 5. | $F_1$ К-4 x 9177 | 10,0±0,44 | 18,0±0,51 | 14,3±0,57 | 1,8 | 12,3 | -0,07 |
| 6. | $F_1$ Nafis x У-300-3347 | 16,0±0,51 | 20,0±0,55 | 19,8±0,41 | 1,3 | 6,5 | 0,90 |
| 7. | $F_1$ 7469 x 0-128790 | 18,0±0,52 | 20,0±0,52 | 19,6±0,48 | 1,5 | 7,6 | 0,57 |
| 8. | $F_1$ 464170 x 464132 | 15,0±0,51 | 12,0±0,42 | 13,8±0,49 | 1,5 | 10,9 | 0,18 |
| 9. | $F_1$ 6806 x К-24 | 20,0±0,49 | 15,0±0,49 | 17,9±0,51 | 1,6 | 8,7 | -0,14 |
| 10. | $F_1$ К-15 x 6310 | 17,0±0,47 | 11,0±0,42 | 15,2±0,54 | 1,7 | 11,0 | 0,40 |
| 11. | $F_2$ К-16 x Nafis | | | 18,0±0,64 | 2,0 | 11,0 | |
| 12. | $F_2$ К-14 x 8852 | | | 13,3±0,67 | 2,1 | 15,6 | |

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

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13. | $F_2$ 2308 x 9206 | | | 13,7±0,64 | 2,0 | 14,5 | |
| 14. | $F_2$ К-11 x 5613 | | | 15,3±0,86 | 2,7 | 17,5 | |
| 15. | $F_2$ К-4 x 9177 | | | 14,2±0,67 | 2,1 | 14,5 | |
| 16. | $F_2$ Nafis x У-300-3347 | | | 19,4±0,63 | 2,0 | 10,1 | |
| 17. | $F_2$ 7469 x 0-128790 | | | 19,4±0,66 | 2,0 | 10,6 | |
| 18. | $F_2$ 464170 x 464132 | | | 14,6±0,61 | 1,9 | 12,9 | |
| 19. | $F_2$ 6806 x К-24 | | | 17,8±0,62 | 1,9 | 10,7 | |
| 20. | $F_2$ К-15 x 6310 | | | 15,1±0,63 | 2,0 | 13,0 | |
| 21. | $F_3$ К-16 x Nafis | | | 17,7±0,69 | 2,1 | 12,0 | |
| 22. | $F_3$ К-14 x 8852 | | | 13,1±0,69 | 2,3 | 16,9 | |
| 23. | $F_3$ 2308 x 9206 | | | 13,6±0,74 | 2,1 | 14,3 | |
| 24. | $F_3$ К-11 x 5613 | | | 15,2±0,68 | 2,0 | 15,2 | |
| 25. | $F_3$ К-4 x 9177 | | | 14,1±0,72 | 2,0 | 16,0 | |
| 26. | $F_3$ Nafis x У-300-3347 | | | 19,1±0,72 | 2,1 | 14,9 | |
| 27. | $F_3$ 7469 x 0-128790 | | | 19,2±0,70 | 2,1 | 15,8 | |
| 28. | $F_3$ 464170 x 464132 | | | 14,3±0,69 | 2,1 | 16,4 | |
| 29. | $F_3$ 6806 x К-24 | | | 17,7±0,73 | 2,1 | 16,2 | |
| 30. | $F_3$ К-15 x 6310 | | | 14,8±0,71 | 2,2 | 15,1 | |
| | **LSD $_{05}$=** | | | **3,6** | | | |
| 31. | $F_4$ К-16 x Nafis | | | 17,5±0,72 | 2,2 | 13,2 | |
| 32. | $F_4$ К-14 x 8852 | | | 13,0±0,69 | 2,1 | 15,7 | |
| 33. | $F_4$ 2308 x 9206 | | | 13,6±0,77 | 2,4 | 15,4 | |
| 34. | $F_4$ К-11 x 5613 | | | 15,1±0,81 | 2,3 | 16,2 | |
| 35. | $F_4$ К-4 x 9177 | | | 14,1±0,69 | 2,5 | 17,1 | |
| 36. | $F_4$ Nafis x У-300-3347 | | | 18,7±0,71 | 2,4 | 16,2 | |
| 37. | $F_4$ 7469 x 0-128790 | | | 19,1±0,72 | 2,2 | 15,5 | |
| 38. | $F_4$ 464170 x 464132 | | | 14,0±0,81 | 2,3 | 16,7 | |
| 39. | $F_4$ 6806 x К-24 | | | 17,6±0,79 | 2,1 | 15,1 | |
| 40. | $F_4$ К-15 x 6310 | | | 14,6±0,69 | 2,2 | 13,4 | |
| | **LSD $_{05}$=** | | | **3,6** | | | |

The analysis of the data on the change in the height of the pod location in different soybean varieties shows that the height of the pod location increases with the duration of the growing season. Thus, the height of the lower pod is different[2].

**Table 4**

**Inheritance of 1000 grain weight in $F_1$-$F_4$ generations of soybean hybrids.**

| № | **The name of the combinations** | ♀ | ♂ | **M±m** | **σ** | **V%** | **hp** |
|---|---|---|---|---|---|---|---|
| 1. | $F_1$ К-16 x Nafis | 150,8±1,26 | 180,1±1,33 | 182,0±2,08 | 6,4 | 3,5 | 1,13 |
| 2. | $F_1$ К-14 x 8852 | 163,0±1,39 | 154,8±1,52 | 166,8±2,95 | 9,1 | 5,5 | 1,94 |
| 3. | $F_1$ 2308 x 9206 | 159,0±1,44 | 144,8±1,44 | 156,4±3,79 | 11,7 | 7,5 | -0,64 |

[2] http://agro-archive.ru/soya/1239

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4. | $F_1$ К-11 x 5613 | 159,2±1,37 | 163,5±1,58 | 164,5±2,94 | 9,1 | 5,5 | 1,5 |
| 5. | $F_1$ К-4 x 9177 | 163,2±1,42 | 170,4±1,61 | 171,8±2,65 | 8,2 | 4,8 | 1,39 |
| 6. | $F_1$ Nafis x У-300-3347 | 180,1±1,39 | 156,4±1,47 | 193,4±2,33 | 7,2 | 3,7 | 2,13 |
| 7. | $F_1$ 7469 x 0-128790 | 142,0±1,55 | 153,6±1,51 | 156,6±2,65 | 8,2 | 5,2 | 1,53 |
| 8. | $F_1$ 464170 x 464132 | 133,4±1,60 | 179,2±1,46 | 165,6±2,48 | 7,7 | 4,6 | -0,41 |
| 9. | $F_1$ 6806 x К-24 | 208,0±1,28 | 167,6±1,45 | 199,0±1,75 | 5,4 | 2,7 | -0,56 |
| 10. | $F_1$ К-15 x 6310 | 167,2±1,47 | 172,2±1,38 | 174,7±2,53 | 7,8 | 4,5 | 2,04 |
| 11. | $F_2$ К-16 x Nafis | | | 178,6±2,90 | 9,0 | 5,0 | |
| 12. | $F_2$ К-14 x 8852 | | | 163,6±3,23 | 10,0 | 6,1 | |
| 13. | $F_2$ 2308 x 9206 | | | 154,9±3,93 | 12,2 | 7,9 | |
| 14. | $F_2$ К-11 x 5613 | | | 163,7±3,35 | 10,4 | 6,3 | |
| 15. | $F_2$ К-4 x 9177 | | | 170,1±3,29 | 10,2 | 6,0 | |
| 16. | $F_2$ Nafis x У-300-3347 | | | 181,7±4,62 | 14,3 | 7,9 | |
| 17. | $F_2$ 7469 x 0-128790 | | | 153,7±3,47 | 10,8 | 7,0 | |
| 18. | $F_2$ 464170 x 464132 | | | 162,5±3,04 | 9,4 | 5,8 | |
| 19. | $F_2$ 6806 x К-24 | | | 195,3±2,41 | 7,5 | 3,8 | |
| 20. | $F_2$ К-15 x 6310 | | | 172,2±3,22 | 10,0 | 5,8 | |
| 21. | $F_3$ К-16 x Nafis | | | 175,3±6,20 | 12,4 | 11,1 | |
| 22. | $F_3$ К-14 x 8852 | | | 162,0±5,81 | 13,6 | 12,2 | |
| 23. | $F_3$ 2308 x 9206 | | | 154,1±5,63 | 14,1 | 17,9 | |
| 24. | $F_3$ К-11 x 5613 | | | 162,9±6,13 | 15,3 | 15,4 | |
| 25. | $F_3$ К-4 x 9177 | | | 169,3±5,68 | 13,6 | 17,4 | |
| 26. | $F_3$ Nafis x У-300-3347 | | | 178,3±5,72 | 15,2 | 16,5 | |
| 27. | $F_3$ 7469 x 0-128790 | | | 150,7±6,01 | 12,9 | 15,4 | |
| 28. | $F_3$ 464170 x 464132 | | | 159,4±5,43 | 13,7 | 14,9 | |
| 29. | $F_3$ 6806 x К-24 | | | 191,5±6,38 | 14,7 | 16,2 | |
| 30. | $F_3$ К-15 x 6310 | | | 171,4±5,41 | 18,1 | 18,1 | |
| | **LSD $_{05}$=** | | | **3,7** | | | |
| 31. | $F_4$ К-16 x Nafis | | | 172,0±5,69 | 11,6 | 13,2 | |
| 32. | $F_4$ К-14 x 8852 | | | 160,4±6,23 | 14,2 | 11,9 | |
| 33. | $F_4$ 2308 x 9206 | | | 153,4±6,19 | 13,6 | 16,5 | |
| 34. | $F_4$ К-11 x 5613 | | | 162,1±6,42 | 12,9 | 16,2 | |
| 35. | $F_4$ К-4 x 9177 | | | 168,4±6,37 | 13,3 | 15,8 | |
| 36. | $F_4$ Nafis x У-300-3347 | | | 174,9±5,92 | 13,8 | 15,2 | |
| 37. | $F_4$ 7469 x 0-128790 | | | 149,2±6,19 | 14,6 | 14,4 | |
| 38. | $F_4$ 464170 x 464132 | | | 157,8±6,42 | 14,4 | 13,9 | |
| 39. | $F_4$ 6806 x К-24 | | | 189,6±6,37 | 15,8 | 14,2 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 40. | $F_4$ K-15 x 6310 | | | 170,5±6,35 | 16,3 | 13,6 | |
| | **LSD $_{05}$=** | | | **3,8** | | | |

The $F_1$ generation hybrid combinations with lower pod location had an average of 13.8-19.8 cm. The combination $F_1$ Nafis x U-300-3347 (19.8 cm) had the highest rate. The coefficient of variation was found to range from 6.5 to 15.8% for $F_1$ generation hybrid combinations, from 10.1 to 17.5% for $F_2$ generation hybrid combinations, to 12.0 to 16.9% for $F_3$ generation hybrid combinations, and from 13.2 to 17.1% for $F_4$ generation hybrid combinations.

High dominance was found in the $F_1$ K-16 x Nafis combination, intermediate dominance was shown in the $F_1$ K-14 x 8852, $F_1$ Nafis x U-300-3347, $F_1$ 7469 x 0-128790, $F_1$ 464170 x 464132, $F_1$ K-15 x 6310 combinations, and negative dominance was seen in the $F_1$ 2308 x 9206, $F_1$ K-11 x 5613, $F_1$ K-4. The highest dominance was observed in $F_1$ K-16 x Nafis hybrid hp=1.36 (Table 3).

**1000 grain weight**. The weight of 1000 grains in soybean is very big (weight 310-1000 g), big (200-309 g), medium (150-199 g), small (100-149 g), and very small (less than 40-99 g ). The influence of the external environment on the variability of the weight of 1000 grains is large, but largely depends on the characteristics of the cultivated variety.

$F_1$ generation hybrid combinations had an average value of 156.4-199.0 g per 1000 grain weight. In $F_1$ generation hybrid combinations, the coefficient of variation is 2.7-7.5%, in $F_2$ generation hybrid combinations 3.8-7.9%, in $F_3$ generation hybrid combinations 11.1-18.1%, and in $F_4$ generation hybrid combinations 11.9-16.5%.

Heritability of 1000 grain weight was high dominance in combinations of $F_1$ K-16 x Nafis, $F_1$ K-14 x 8852, $F_1$ K-11 x 5613, $F_1$ K-4 x 9177, $F_1$ Nafis x U-300-3347, $F_1$ 7469 x 0-128790 and $F_1$ K-15 x 6310, negative dominance condition was observed in $F_1$ 2308 x 9206, $F_1$ 464170 x 464132 and 6806 x K-24 combinations. The highest dominance was observed in $F_1$ Nafis x U-300-3347 hybrid (hp=2.13). Inheritance of 1000 grain weight in studied soybean hybrids are presented in Tables 4.

**Grain weight per plant**. Seed productivity is determined by the weight of one plant grain, thus this indicator is the most important economical trait. The number of pods per plant is also a relative indicator to describe its productivity, and is used within samples of the same grain size, because the weight of 1000 grains and the number of grains in the pod have variability. 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. The importance of the external factor in the formation of this trait is 71-78% compared to 19-77% of the characteristics of the variety.

In terms of grain weight per plant, hybrid combinations of the $F_1$ generation had an average of 22.5-31.6 g.

In $F_1$ generation hybrid combinations, the coefficient of variation was 6.0-10.3%; in $F_2$ generation hybrid combinations, 6.4-10.2%; in $F_3$ generation hybrid combinations, 9.4-14.6%; and in $F_4$ generation hybrid combinations, 10.9-14.1%.

**Table 5**

**Inheritance of grain weight per plant in $F_1$-$F_4$ generations of soybean hybrids.**

| № | **The name of the combinations** | ♀ | ♂ | **M±m** | **σ** | **V%** | **hp** |
|---|---|---|---|---|---|---|---|
| 1. | $F_1$ K-16 x Nafis | 24,2±0,45 | 29,4±0,55 | 30,2±0,64 | 2,0 | 6,6 | 1,34 |
| 2. | $F_1$ K-14 x 8852 | 24,8±0,37 | 24,5±0,48 | 24,9±0,75 | 2,3 | 9,3 | 1,64 |
| 3. | $F_1$ 2308 x 9206 | 32,0±0,41 | 21,8±0,39 | 29,3±0,79 | 2,4 | 8,3 | -0,47 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4. | $F_1$ К-11 x 5613 | 26,5±0,39 | 27,6±0,41 | 27,5±0,92 | 2,8 | 10,3 | 0,98 |
| 5. | $F_1$ К-4 x 9177 | 24,3±0,44 | 16,6±0,42 | 22,5±0,52 | 1,6 | 7,2 | -0,53 |
| 6. | $F_1$ Nafis x У-300-3347 | 29,4±0,42 | 23,9±0,51 | 31,1±0,66 | 2,0 | 6,6 | 1,65 |
| 7. | $F_1$ 7469 x 0-128790 | 33,7±0,51 | 23,9±0,47 | 31,6±0,61 | 1,9 | 6,0 | -0,59 |
| 8. | $F_1$ 464170 x 464132 | 24,3±0,38 | 25,3±0,46 | 25,3±0,69 | 2,1 | 8,5 | 0,99 |
| 9. | $F_1$ 6806 x К-24 | 21,8±0,36 | 30,4±0,49 | 28,7±0,75 | 2,3 | 8,1 | 0,61 |
| 10. | $F_1$ К-15 x 6310 | 23,0±0,44 | 24,2±0,47 | 24,3±0,60 | 1,9 | 7,7 | 1,18 |
| 11. | $F_2$ К-16 x Nafis | | | 28,9±0,70 | 2,2 | 7,6 | |
| 12. | $F_2$ К-14 x 8852 | | | 24,7±0,72 | 2,2 | 9,0 | |
| 13. | $F_2$ 2308 x 9206 | | | 28,7±0,75 | 2,3 | 8,1 | |
| 14. | $F_2$ К-11 x 5613 | | | 27,4±0,90 | 2,8 | 10,1 | |
| 15. | $F_2$ К-4 x 9177 | | | 22,0±0,64 | 2,0 | 9,0 | |
| 16. | $F_2$ Nafis x У-300-3347 | | | 29,8±0,81 | 2,5 | 8,5 | |
| 17. | $F_2$ 7469 x 0-128790 | | | 31,1±0,64 | 2,0 | 6,4 | |
| 18. | $F_2$ 464170 x 464132 | | | 25,0±0,82 | 2,6 | 10,2 | |
| 19. | $F_2$ 6806 x К-24 | | | 28,1±0,79 | 2,4 | 8,7 | |
| 20. | $F_2$ К-15 x 6310 | | | 24,0±0,65 | 2,0 | 8,4 | |
| 21. | $F_3$ К-16 x Nafis | | | 28,4±1,14 | 2,7 | 9,4 | |
| 22. | $F_3$ К-14 x 8852 | | | 24,7±2,34 | 2,9 | 11,1 | |
| 23. | $F_3$ 2308 x 9206 | | | 28,2±1,26 | 2,8 | 12,3 | |
| 24. | $F_3$ К-11 x 5613 | | | 27,3±2,28 | 3,1 | 12,7 | |
| 25. | $F_3$ К-4 x 9177 | | | 21,6±1,41 | 2,7 | 11,8 | |
| 26. | $F_3$ Nafis x У-300-3347 | | | 29,3±2,51 | 2,9 | 12,4 | |
| 27. | $F_3$ 7469 x 0-128790 | | | 30,5±2,29 | 2,8 | 10,8 | |
| 28. | $F_3$ 464170 x 464132 | | | 24,9±1,62 | 3,1 | 13,4 | |
| 29. | $F_3$ 6806 x К-24 | | | 27,6±1,69 | 2,9 | 14,6 | |
| 30. | $F_3$ К-15 x 6310 | | | 23,8±2,23 | 3,0 | 13,9 | |
| | **LSD $_{05}$=** | | | **3,9** | | | |
| 31. | $F_4$ К-16 x Nafis | | | 27,8±3,4 | 2,6 | 12,3 | |
| 32. | $F_4$ К-14 x 8852 | | | 24,6±3,12 | 2,8 | 10,9 | |
| 33. | $F_4$ 2308 x 9206 | | | 27,4±2,91 | 2,6 | 12,2 | |
| 34. | $F_4$ К-11 x 5613 | | | 27,1±2,99 | 2,7 | 13,1 | |
| 35. | $F_4$ К-4 x 9177 | | | 21,2±2,79 | 2,1 | 12,4 | |
| 36. | $F_4$ Nafis x У-300-3347 | | | 28,5±3,01 | 3,1 | 13,1 | |
| 37. | $F_4$ 7469 x 0-128790 | | | 29,9±3,12 | 3,0 | 11,8 | |
| 38. | $F_4$ 464170 x 464132 | | | 24,8±2,91 | 2,9 | 14,1 | |
| 39. | $F_4$ 6806 x К-24 | | | 27,1±2,89 | 2,8 | 13,6 | |
| 40. | $F_4$ К-15 x 6310 | | | 23,7±3,06 | 2,8 | 12,9 | |
| | **LSD $_{05}$=** | | | **3,9** | | | |

According to the heritability of grain weight per plant high dominance was shown in $F_1$ K-16 x Nafis, $F_1$ K-14 x 8852, $F_1$ Nafis x U-300-3347, $F_1$ K-15 x 6310, combinations, intermediate dominance was found in combinations $F_1$ 6806 x K-24, $F_1$ K-11 x 5613, $F_1$ 464170 x 464132 and

negative dominance was observed in combinations $F_1$ 2308 x 9206, $F_1$ K-4 x 9177, $F_1$ 7469 x 0-128790. The highest dominance was observed in $F_1$ K-14 x 8852 hybrid (hp=1.64). The heritability of grain weight per plant in studied soybean hybrids is presented in Table 5.

According to many authors, the productivity of plants depends on the presence of favorable factors during the "seedling - flowering" period, the area of feed, the weight of 1000 grains, the number of seeds in the pod, the height of plants, leaves.

**CONCLUSIONS**

1. Among the samples of soybean gene pool belonging to different eco-geographical groups, 147 samples according to the location of lower pods, 81 samples according to the weight of 1000 grains and 87 samples according to the number of pods per plant were selected as the initial source for the selection process.
2. In the hybrids created by crossing ecologically and geographically distant samples of soybean within the species, the level of heredity was determined in the generations according to the plant height, the location of the pods, 1000 grains and the weight of grains per plant.
3. In the inheritance of characters, high dominance was observed for plant height in $F_1$ K-16 x Nafis, $F_1$ Nafis x U-300-3347, $F_1$ 6806 x K-24 and $F_1$ K-15 x 6310 hybrids, for location of the lower pod in $F_1$ K-16 x Nafis hybrid, for weight of 1000 grains in $F_1$ K-16 x Nafis, $F_1$ K-14 x 8852, $F_1$ K-11 x 5613, $F_1$ K-4 x 9177, $F_1$ Nafis x U-300-3347, $F_1$ 7469 x 0-128790 and $F_1$ K-15 x 6310 hybrids, for grain weight per plant in $F_1$ K-16 x Nafis, $F_1$ K-14 x 8852, $F_1$ Nafis x U-300-3347 and $F_1$ K-15 x 6310 hybrids.
4. Negative dominance in plant height in hybrids $F_1$ K-14 x 8852, $F_1$ 2308 x 9206, $F_1$ K-11 x 5613 and $F_1$ 7469 x 0-128790, the location of the lower pod in hybrids $F_1$ 2308 x 9206, $F_1$ K-11 x 5613, $F_1$ K-4 x 9177, $F_1$ 6806 x K -24, the weight of 1000 grains in hybrids $F_1$ 2308 x 9206, $F_1$ 464170 x 464132 and $F_1$ 6806 x K-24, the weight of grains per plant in $F_1$ 2308 x 9206, $F_1$ K-4 hybrids 9177 and $F_1$ 7469 x 0-128790 was determined by.
5. The highest rate of 1000 grain weight was observed in $F_3$ - $F_4$ generation hybrids of 6806 x K-24, Nafis x U-300-3347, K-16 x Nafis combinations, it was 191.5 178.3; 175.3; 189.6 174.9; and 172.0 gramms respectively.
6. It was found that the $F_3$ - $F_4$ generation hybrids had a high indicator of grain weight per plant in combinations 7469 x 0-128790, Nafis x U-300-3347 and it was 30.5, 29.3; 29.9 and 28.5 grams respectively.
7. The highest level of protein content was found in Madad variety (41.4%), the lowest level was seen in Nafis variety (40.2%), the highest level of oil content was shown in Sevinch variety (25.0%) and the lowest level was observed in Madad variety (22.0%).
8. By cultivating soybean varieties "Nafis", "Sevinch" and "Madad" in irrigated areas, an additional yield of 6.2-6.7 t/ha was created and 29.2-38.2 percent profitability was achieved.
9. The newly created "Nafis", "Sevinch" and "Madad" varieties were superior to the cultivated varieties in terms of their main economic value characteristics.

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