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# Hybrids in Rice Breeding

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**Annotation:** In this article, the results of interbreeding father and mother forms in the creation of rice varieties are fully presented.

**Keywords:** Rice, variety, interbreeding.

Asia is the leader in world rice production and consumption. Asia accounts for 90% of the world's rice production and consumption, and the most interesting fact is that China and India alone account for 55% of this share. However, some factors caused significant negative changes in rice production. Various factors such as changes in water, soil composition and temperature, as well as air pollution and loss of biological diversity will prove our above statement. The Food and Agriculture Organization of the United Nations estimates that food production will need to increase by 70 percent by 2050 to meet the world's growing demand. the world population is expected to reach 9.7 billion.

Paddy rice is rich in nutrients, nutritious and easy to digest. One kilogram of rice contains 4000 calories. Rice husking yields an average of 54% rice, 10% ground grain, 13% residue, 3% flour and 20% bran. Food made from rice cooks very quickly, in the human body it is digested and assimilated faster than other cereals. The absorption coefficient of rice is the highest - 96%, the caloric content is 3594, and that of wheat is 3610. Flour is rarely made from rice, it does not contain a sticky substance (gluten).

When rice is processed, husks and rice scraps are obtained, which are used in the preparation of alcohol and sake vodka, beer, and preserves. Starch is extracted from rice bran and is used in medicine and in the preparation of rice flour.

Rice and its products contain protein, fat, starch, ash, fiber and phytin (Table 1).

**Table 1. Average chemical composition of rice and its products (in relation to initial dry weight,%)**

| Products | protein | fat | starch | ash | fiber | phytin |
|---|---|---|---|---|---|---|
| **Rice** | 7,88 | 2,76 | 65,85 | 2,26 | 9,57 | 5,72 |
| **Rice** | 8,62 | 0,48 | 87,72 | 0,62 | 0,19 | 2,07 |
| **Lame** | 8,98 | 0,79 | 88,22 | 0,73 | 0,25 | 1,23 |
| **Rice bran** | 13,86 | 16,80 | 39,84 | 9,22 | 12,88 | 7,39 |
| **Rice husk** | 3,07 | 0,68 | 26,48 | 20,34 | 49,19 | 0,24 |

**The purpose and objectives of the research work:** Creation of fertile initial sources and varieties of rice suitable for cultivation in different regions of our Republic, giving high quality rice.

To achieve this goal, the following tasks are performed:

1. Study of primary sources for selection;
2. Breeding of selected parent pairs;

3. Carrying out selections in crossbred hybrid populations;
4. Step-by-step testing of selected samples in nurseries (selection, control and variety selection test);
5. Submission of promising samples to the State Variety Testing Commission based on the test results.

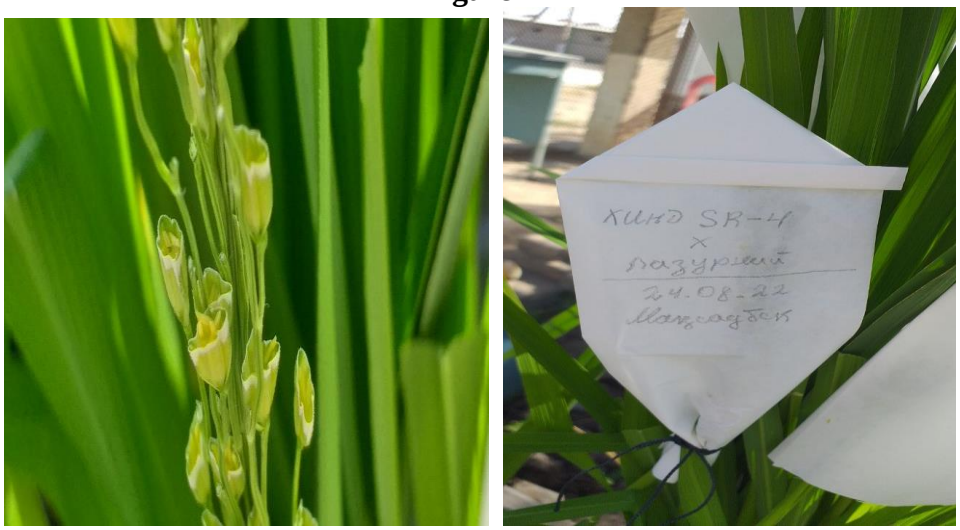
During the study, Eastern Europe (Ukraine, Russia), Western Europe (France, Italy), Central Asia (Kazakhstan), East Asia (Turkey, Iran) and Southeast Asia (Pakistan, India, China, Korea, Vietnam, Japan), international centers IRRI and WARDA, as well as 425 collections of local varieties were involved in the selection and crossbreeding of genotypes.

**Table 2. Geographical origin of variety specimens in the collection nursery**

| № | Geographical origin | Name of countries | The number of varieties, pcs |
|---|---|---|---|
| 1 | Eastern Europe | Ukraine, Russia | 21 |
| 2 | Western Europe | France, Italy | 33 |
| 3 | Central Asia | Kazakhstan, Uzbekistan | 262 |
| 4 | Ancient Asia | Iran, Turkey, India, Pakistan | 22 |
| 5 | Eastern Asia | IRRI, WARDA, Korea, China, Vietnam | 76 |
| 6 | South America | Brazil | 5 |
| 7 | Oceania | Australia | 4 |
| 8 | North America | Canada, Mexico | 2 |
| | **Total** | | **425** |

The flowering period of the parent components selected for cross-breeding should be compatible. In the breeding nursery, the best-developed parental forms of local and foreign samples with morphological, biological and valuable economic characteristics were selected from the collection nursery. The breeding process itself consists of preparing the mother plant's cuttings, removing the anthers and pollination of the flowers. 1/3 of the leaf blades were selected for breeding. They were opened and the flowering upper and immature lower spikes were removed, leaving 15–20 well-developed spikes and the rest were scraped off. The pollinated flowers were isolated with a paper bag and the label was hung.

**Figure 1**



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Interbreeding is a very laborious process, and some hybrids - combinations achieve 3-10% results in different years. After obtaining a hybrid (G'0), the breeder proceeds to breed and select the hybrid progeny.

**Results obtained:** During the research, a total of 62 combined hybridizations were carried out, of which hybrid seeds were obtained from 32 combinations. According to the crossbreeding results presented in the table, the highest indicators in terms of the number of flowers are Chokvang x Lazurniy 78, Hind SR-4 x Dongjin 75, TShD 16-1 x Kitake 72, Tursinboy x R-6-DV 72, Tolmos/Mar x K-353 67 pcs. was found to have organized. In the experiment, it was found that the number of cross-breeding combinations totaled 1298 pieces.

As for the amount of crossbred seeds, the obtained results were 10 pieces in the foreign and local variety samples Tolmos/Mar x K-353, and 6 pieces in the combination of Tolmos/Mar x Tursinboy. In this indicator, a total of 85 hybrid seeds were obtained, which was 6.55 percent of the total crossbreeding presented in the table. These obtained (G'0) hybrids will be planted again in field conditions in the future, and promising varieties will be created on the basis of individual selection.

**Table 3. Interbreeding results**

| № | Combination | | Number of furrow (pieces) | number of flowers | Number of obtained hybrids (units) |
|---|---|---|---|---|---|
| | ♀ | ♂ | | | |
| 1. | Chokvang | Lazurniy | 2 | 48 | 3 |
| 2. | Kitake | Lazurniy | 2 | 41 | 1 |
| 3. | Kitake | TSHD 16-1 | 1 | 19 | 1 |
| 4. | TSHD 16-1 | Kitake | 4 | 72 | 2 |
| 5. | Kitake | Lazurniy | 1 | 24 | 1 |
| 6. | Tolmos/Mar | Devzira | 2 | 45 | 3 |
| 7. | Chokvang | Lazurniy | 3 | 78 | 1 |
| 8. | K-341 | Kitake | 2 | 45 | 1 |
| 9. | 16-2 | Chokvang | 2 | 53 | 1 |
| 10. | Lazurniy | Chokvang | 2 | 49 | 2 |
| 11. | Lazurniy | Kitake | 1 | 16 | 1 |
| 12. | Hind SR-4 | Dongjin | 3 | 75 | 2 |
| 13. | K-341 | Lazurniy | 2 | 43 | 1 |
| 14. | K-341 | K-139 | 1 | 21 | 2 |
| 15. | K-92 | K-139 | 2 | 35 | 1 |
| 16. | Billur | Lazurniy | 2 | 41 | 6 |
| 17. | Billur | TSHD -8-14 | 2 | 39 | 5 |
| 18. | Qirg'iz-1 | Lazurniy | 2 | 43 | 4 |
| 19. | Hind SR-4 | Billur | 1 | 26 | 3 |
| 20. | Qirg'iz-2 | Billur | 2 | 43 | 1 |
| 21. | Tolmos/Mar | Chokvang | 3 | 65 | 2 |
| 22. | Tolmos/Mar | K-353 | 3 | 67 | 10 |
| 23. | K-341 | Qirg'iz-1 | 2 | 48 | 3 |
| 24. | K-341 | Chokvang | 1 | 23 | 4 |
| 25. | P-6-DV | Chokvang | 1 | 24 | 1 |
| 26. | Hind SR-3 | Chokvang | 1 | 22 | 1 |

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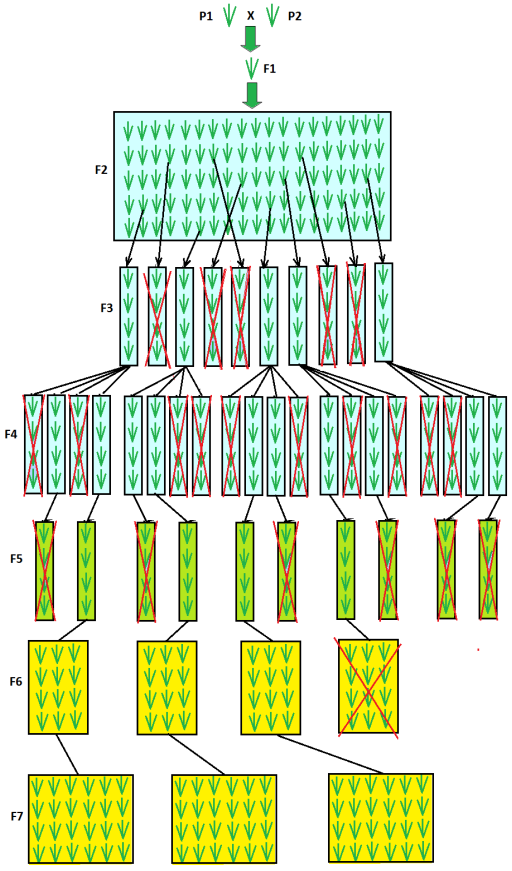
| № | Combination | | Number of furrow (pieces) | number of flowers | Number of obtained hybrids (units) |
|---|---|---|---|---|---|
| | ♀ | ♂ | | | |
| 27. | K-341 | P-6-ДВ | 1 | 27 | 4 |
| 28. | Tolmos/Mar | Tursinboy | 1 | 15 | 6 |
| 29. | Hind SR-4 | Tursinboy | 1 | 17 | 5 |
| 30. | TSHD 8-14-11 | P-6- DV | 2 | 44 | 1 |
| 31. | Tursinboy | P-6- DV | 4 | 72 | 4 |
| 32. | P-6- DV | Tursinboy | 1 | 18 | 2 |
| | **Жами** | | **102** | **1298** | **85** |

The method of pedigree of G'1 hybrids obtained during the research is to sow the seeds of each plant separately, each plant of the G'1 hybrid is crushed separately from others, stored in bags with numbers and planted separately next year. For example, if 100 hybrid seeds are obtained, next year they will be planted and 100 plants will be obtained, and their seeds will be saved separately and planted again. In this case, each hybrid can be studied joint-by-joint, so that at a certain joint (mostly G'3) invariable (characters and characteristics are stable) generations are formed. Then hybrid generations with similar characters and characteristics are united and can be used in further selection work. Although this method is complicated, it is a very accurate method.

**2-figure**



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The inheritance of plant height, furrow length and weight of 1000 grains in the studied F1 generation hybrid combinations was determined by the following formula:

$$hp = \frac{F - Mp}{P - Mp}$$

Here:

hp is the degree of dominance

F is the arithmetic mean of the hybrid

R is the arithmetic index of the paternal or maternal form with a higher index

Mr is the arithmetic mean of parent forms

**Table 4. Inheritance of plant height, furrow length and 1000 grain weight in F1 generation hybrids.**

| № | Name of combinations | Plant height, cm | | | | The length of the furrow | | | | Weight of 1000 grains, g | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ♀ | ♂ | $F_1$ | hp | ♀ | ♂ | $F_1$ | hp | ♀ | ♂ | $F_1$ | hp |
| **1** | Jinbu x Chongwang | 93,4 | 105,6 | 104,3 | 0,79 | 16,4 | 17,8 | 18,2 | 1,6 | 26,1 | 28,9 | 27,9 | 0,29 |
| **2** | TSHD 20-13 x TSHD 15-13 | 131,4 | 124,2 | 130,2 | 0,67 | 20,1 | 21,5 | 21,7 | 1,3 | 31,1 | 33 | 31,8 | 0,26 |
| **3** | Ситора x TSHD 20-13 | 132,2 | 131,4 | 132 | 0,50 | 22,5 | 20,1 | 21,6 | 0,3 | 34,4 | 31,1 | 34,8 | 1,24 |
| **4** | TSHD 15-13 x Sanam | 124,2 | 106,8 | 123,2 | 0,89 | 21,5 | 19,7 | 22,1 | 1,7 | 33 | 31,6 | 32,8 | 0,71 |
| **5** | Chongwang x TSHD 15-13 | 105,6 | 124,2 | 115,2 | 0,03 | 17,8 | 21,5 | 18,9 | -0,4 | 28,9 | 33 | 30,5 | -0,22 |
| **6** | Sitora x TSHD 15-13 | 132,2 | 124,2 | 130,9 | 0,68 | 22,5 | 21,5 | 22,9 | 1,8 | 34,4 | 33 | 34,1 | 0,57 |
| **7** | Sitora x Iskandar | 132,2 | 126,6 | 130,7 | 0,46 | 22,5 | 22,2 | 23,1 | 5,0 | 34,4 | 33,6 | 34,2 | 0,50 |
| **8** | Chongwang x 227-09 | 105,6 | 130,1 | 116,5 | -0,11 | 17,8 | 21,8 | 19,5 | -0,2 | 28,9 | 34,5 | 30,2 | -0,54 |
| **9** | ТШД 15-13 x Искандар | 124,2 | 126,6 | 127,4 | 1,67 | 21,5 | 22,2 | 23,1 | 3,6 | 33 | 33,6 | 33,4 | 0,33 |
| **10** | Polizesti x Iskandar | 122,5 | 126,6 | 123,1 | -0,71 | 19,8 | 22,2 | 21,8 | 0,7 | 32,9 | 33,6 | 33,0 | -0,71 |
| **11** | Nukus-2 x Iskandar | 98,1 | 126,6 | 125,5 | 0,92 | 17,5 | 22,2 | 22,8 | 1,3 | 28,6 | 33,6 | 33,5 | 0,96 |
| **12** | Sanam x Iskandar | 106,8 | 126,6 | 126,4 | 0,98 | 19,7 | 22,2 | 23,4 | 2,0 | 31,6 | 33,6 | 33,1 | 0,50 |
| **13** | TSHD 20-13 x Iskandar | 131,4 | 126,6 | 128,4 | 0,25 | 20,1 | 22,2 | 23 | 1,8 | 31,1 | 33,6 | 32,9 | 0,44 |

**Conclusion:** It is appropriate to use local and foreign varieties of India, Korea, Vietnam, and Kyrgyzstan in the crossbreeding of rice varieties.

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