HETEROSIS MODELS OF MAIZE HYBRIDS

Konovalov V. O., postgraduate
Marchenko T. Y., c-e of a-l s.
Tyshchenko A. V., c-e of a-l s.
The Institute of Irrigated Agriculture of the NAAS

Accelerated production of new varieties and hybrids, which are characterized by high and stable yields with improved grain quality, is the observance of a specific model of agricultural crop in the process of creating and selecting appropriate genotypes.

The variety model includes both signs of productivity and signs that indicate the relationship of the plant organism with the elements of the environment. The development of the agromodel requires information about the parameters of quantitative signs of productivity and their dependence on morphological, physiological, specific adaptability, combination ability of the baseline and the use of appropriate heterosis plasmas.

The aim of the research was to develop heterosis models of maize hybrids and to create FAO 150–600 maize hybrids on their basis for conditions of sufficient natural moisture and artificial irrigation with grain yield of 11.0–17.0 t/ha.

Materials and methods. During 2007–2017, heterosis models of maize hybrids were developed for irrigation conditions: early-ripening group of hybrids (FAO 150–200), middle-early group of hybrids (FAO 200–290), medium-ripening group of hybrids (FAO 300–390), medium-ripening group of hybrids 400–490), a late-maturing group of hybrids (FAO 500–600). 350–400 hybrids of different maturity groups were studied annually. The estimated area of one section of the control nursery is 9.8 m^2 (two-row section, 7 m long, 0.7 m row spacing), three repetitions.

An important factor in effective selection is the development of a heterosis model using modern embryonic plasma. The creation of fundamentally new adaptive maize hybrids requires the use of traditional heterosis models and the creation of new elite lines based on mixed germplasms formed on the basis of new industrial hybrids. Analysis of the use of basic embryonic plasmas in recent years has shown that, along with traditional heterosis groups, the share of lines created on the basis of new commercial hybrids, the so-called "mixed plasma", is increasing. It should be noted that the main germplasms are preserved today in the working collections in a fairly modified state, and sometimes it is possible to obtain hybrids with a sufficiently high level of competitive heterosis and within one source plasma.

The most commonly used lines of different FAO groups used in the experimental hybrid combinations of the Institute of Irrigated Agriculture of NAAS and the Institute of Cereals of NAAS. These lines have undergone a significant improvement in the direction of increasing the combination ability, resistance to certain adverse biotic and abiotic factors, reducing the duration of the ripening period, accelerating the moisture release of grain during ripening.

Hybrids of medium-late (FAO 400–490) and late (FAO 500–600) maize have the highest productivity potential. However, this group of maturity until recently did not always meet the requirements of modern cultivation technologies associated with the harvesting of grain by direct threshing combines and the required harvest moisture of grain at the level of 13–16%. Models of such high-yielding hybrids have been developed and self-pollinated parental lines have been created that meet the requirements for the manufacturability of corn grain under irrigation.

Analysis of the use of FAO 400-600 basic embryonic plasmas in recent years has shown that, along with traditional heterosis groups, the share of lines created on the basis of new synthetic populations is increasing (mixed plasma) (Table 3). Plasma lines Reid (SSS) and Lancaster (C103) have undergone significant breeding work mainly in the direction of accelerating moisture loss during maturation.

This is especially true for the FAO group of lines over 500. Thus, if the base lines X18, B73, X18-1, X902 (parental forms of hybrids Perekop, Borisfen 600) and provided the level of grain yield of hybrids up to 15 t/ha, however, the grain moisture in they were at the level of 25–30%, which is unacceptable for modern technologies of corn cultivation. In addition, hybrids with FAO 500–600 are very sensitive to technological conditions of cultivation and the slightest violation of technological regulations leads to a sharp drop in yields, which eliminates their potential and leads to economic losses. That is why the selection of FAO 500–600 hybrids under irrigation conditions in the south of Ukraine is not very promising today and is carried out to a limited extent.

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It is characteristic that among the linear material of FAO 400-490 there is a rather wide range of source elite material which provides to receive hybrid combinations with the programmed level of productivity, however, elite source material of group FAO 500-600 is very limited. This is due to the fact that the selection of FAO hybrids over 500 is carried out to a limited extent in the main breeding institutions of Ukraine and Europe, which is primarily due to the high cost of drying grain.

The formation of the maximum yield of the hybrid depends on a number of factors, one of which is the growing area, where the resources of the environment correspond to the biological optimum of the genotype. For each region there are optimal models of new maize hybrids and in accordance with this, selection work is carried out. Based on the developed models, in cooperation with the Institute of Irrigated Agriculture of NAAS and the Institute of Grain Crops of NAAS, new maize hybrids were created that have adaptability to irrigation conditions, different irrigation regimes, adequate predictable response to technological support and high productivity potential.