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GENETIC VARIABILITY OF DROUGHT TOLERANCE IN DOUBLE HAPLOID BREEDING OF MAIZE

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Purpose. Our stepwise dihaploid (DH) selection procedure is designed to create recombinant lines from two parental maize lines (Rf7 and Ku123) with the goal of achieving superior productivity over both parents. Nine families of DH lines were obtained in four breeding cycles. Three of these families were tested during drought years, providing information on drought tolerance. Here, we will review the obtained data on the productivity of DH lines under drought conditions.

Materials and methods. Haploid seeds were obtained by the matroclinal method using the MHI inducer. In the families considered here, the maternal forms were F_1×rk-5, rk5×rk-239, and F_1×rk-433. Here, F_1 is a hybrid of Rf7×Ku123, while rk-5, rk-239, and rk-433 are DH lines selected from the first, second, and third breeding cycles due to their productivity, respectively. The genome of haploid plants was doubled using the Deimling method, and DH lines were obtained as a result of self-pollination. Three families were obtained from three maternal forms, named 2b (36 lines were tested in 2015), 3c (24 lines were tested in 2025), and 4a (44 lines were tested in 2024). The tests were carried out in a randomized block in three replicates, on a non-irrigated plot, with a density of 3 plants/m^2.

Results. The Rf7 line, which was constantly used as a control in the trials, served as an indicator of the year's conditions. In favorable years, its productivity ranged from 86 to 115 g/plant, with an average of 105 g/plant, but in 2015, it fell by half (52 g/plant). The lines of population 2b fared better in this year's conditions: compared to the favorable 2017, average productivity dropped by only 20%, from 93 to 72 g/plant. Average productivity was close to that predicted by the additive-dominant model: ¼Rf7 + ¼Ku123 + ½rk-5 = 52/4+76/4+84/2=74 g/plant, and genetic variability, measured by the standard deviation after subtracting random variation, was 20 g/plant.

We note the rk-206 line, which showed minimal sensitivity to the year's conditions. In 2015, 2016, 2017, and 2022, its productivity was 115, 135, 116, and 98 g/

plant, respectively. Rf7's productivity in the same years was 52, 121, 104, and 36 g/plant, respectively.

Populations 3c and 4a were tested only in unfavorable years. For these populations, we note only good agreement between the average productivity and that predicted by the additive-dominant model (77 versus 81 and 22 versus 26 g/plant) and relatively high genetic variability (17 and 15 g/plant).

Conclusions:

1. The average productivity of DH lines under dry conditions is satisfactorily predicted by the additive-dominant model.

2. The genetic variability in families of DH lines is sufficiently high for selection for drought resistance;

3. The DH line rk-206 has been obtained that exhibits productivity of about 100 g/plant or slightly higher in both favorable and dry conditions.

Keywords: Maize, drought tolerance, double haploids.

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