Combining ability and genetic diversity under low-temperature conditions at germination stage of maize (*Zea mays* L.)

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Abstract

Low temperatures are important for the production of spring maize in northern China. While the low-temperature tolerance of maize seeds can be improved by coating them, this can result in environmental pollution, high costs, and instability. Identifying new varieties of maize is the most effective method of improving the ability of maize crops to withstand low temperatures. In this experiment, four low-temperature tolerant maize inbred lines (DNF266, Zhong451, B73, Dan340) and four low-temperature sensitive maize inbred lines (Luyuan92, Ji853, Huangzaosi, Si144) were selected from the northern spring maize area. The Griffing double-row hybridization design method was used to prepare 28 hybrid combinations. After analysing the general combining ability and the special combining ability, we found that the indoor low-temperature index and low-temperature seedlings were extremely similar. The hybridization and parental inbred lines were subjected to low-temperature treatments both indoors and in the field. Several low-temperature indexes were assessed to identify what results could be produced from combining them. Under both treatments, the inbred line DNF266 had a higher general combining ability, and the Zhong451 × Dan340 hybrid combination had a higher special combining ability. These results provide technical support for breeding new low-temperature maize varieties.

Full Text

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Figures

Figure 1

Germination rate of hybrid line at low temperature. A Germination rate of P3 line at 6°C. B Germination rate of P1 line at 25°C. C Radicle length and seedling length of P1 line at 6°C and 25°C. D Radicle length and seedling length of the line P3 and P1 at 6°C.

Figure 2

Phenotypic correlation of low-temperature related traits between inbred lines and hybrids