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OPTIMUM DENSITY AND STAND UNIFORMITY AS DETERMINANT PARAMETERS OF CROP YIELD POTENTIAL AND PRODUCTIVITY IN MAIZE HYBRIDS

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SUMMARY

A generally held view is that maize yield per unit area responds to density changes in a curvilinear pattern. Non-uniform stand in the field has also been reported to be negatively associated with productivity. Optimum plant density for maximum grain yield per unit area may differ from hybrid to hybrid on account of significant interactions between hybrids and densities (Fasoula, V.A. and D.A. Fasoula, 2002; Tokatlidis and Koutroubas, 2004). Objective of the study was to assess how hybrids' yield respond to density changes, as well as to estimate their optimum density for maximum grain yield per unit area. Moreover, the density impact on stand uniformity was evaluated. Seven single-cross hybrids were grown under the densities of 2.5, 4.2 and 8.3 plants/m^2 at the Agricultural Research Station, Turda, Romania. Experimental design was split-plot RCB with density as main plot and the hybrids as subplots. Each block was replicated three times. One hybrid except, maximum yield per hectare was obtained under the middle density of 4.2 plants/m^2. However, optimum density was found to be 4.7 plants/m^2 in four out of the seven hybrids, and 4.2, 4.8 and 5.0 plants/m^2 for the other three hybrids. Additionally, optimum density was found too narrow, excepted one hybrid whose yield loss at the lower and the higher density was considerably lower compared to the rest hybrids. CV values for three agronomic traits (yield per plant, ear length, and ear kernel row number) considerably increased as density increased. The aforementioned impacts highlight the following. Regarding breeding, selection of superior genotypes is expected to be more effective under lower densities where lower CV values reflect lower environmental impact on phenotypic expression. Comparative evaluation of different hybrids under a single density to estimate crop yield potential may lead to biased judgment, due to strong hybrid by density interaction. Alternative models to predict crop yield potential are needed and these preliminary data constitute part of such a project being under way. Maize breeding should aim to hybrids that are affected the less possible by density changes (i.e., density-independent hybrids) to avoid adverse effects of high densities on stand uniformity. As far corn cultivation in the field is concerned, producers should take the necessary measures to achieve both optimum density for the hybrid they choose and the most possible uniform stand.

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