Effect of population density on the performance of opaque-2 maize and their normal analogues — It is known that the homozygous opaque-2 (high lysine) mutants of maize commonly give a 10 to 15% lower yield than their normal analogues. Maize well adapted for Martonvásár is commonly planted to a density of 40,000 plants per hectare (80 x 30 cm area per plant). An attempt was made to study the effect of doubled population density (80 x 15 cm) on the performance of 15 opaque-2 single-cross hybrids, their six parental inbred lines and their normal analogues in an experiment conducted during the year 1972 in a split-split plot design with three replications.

Mean observations for a number of characters are presented in Table 1 for the o2 and normal endosperm types. The population density was found to have a statis-

Table 1. Effect of population density (80,000 expressed as % of 40,000) on various characters of o2 and normal maize.

Character	o2	Normal
% moisture	100.00	101.44
Days to 50% pollen-shed	100.98	100.43
Days to 50% silking	102.29	101.21
Total leaves	99.00	99.49
% lodging	118.72	117.74
% Ustilago infection	106.25	50.00
% Helminthosporium infection	140.00	38.09
% frit fly infection	80.60	75.00
Grain yield per plot	155.05	162.56
Raw ear yield per plot	153.70	163.28
Ears per plant	91.26	92.93
Plant height	100.00	100.52
Ear height	102.02	101.09
Ear leaf area	91.74	94.91
Leaves above the ear	98.27	100.00
Tillers per plant	35.62	41.18
Ear length	91.72	91.38
Ear diameter	97.37	94.87
Kernel rows	97.39	97.42
Kernels per row	94.75	92.66
Kernels per ear	91.84	90.57
Drying percentage	100.00	98.64
Shelling percentage	99.17	101.24
Rachis weight	80.00	80.77
Rachis diameter	95.83	95.83
1000-grain weight	97.74	95.59
Kernel density	97.62	97.70
Kernel length	95.83	97.26
Kernel width	100.00	98.63
% water imbibition	103.50	97.28

tically significant effect on the days to 50% silking, grain yield, raw ear yield, ears per plant, ear height, ear leaf area, tillers per plant, ear length, ear

diameter, kernel rows, kernels per row, kernels per ear, rachis weight, rachis diameter and kernel length (Gupta and Kovács, Theoret. Appl. Genetics 45: 64-71, 1974 and Proc. VII Maize Sorghum Sec. EUCARPIA, 1973, in press).

It can be seen from the data in Table 1 that increasing the population density delayed female flowering time more for the o2 types than for their normal analogues and increased lodging, ear height, grain yield and raw ear yield; the increased density reduced the number of ears per plant, ear leaf area, tillers per plant, ear length, ear diameter, kernel rows, kernels per row, kernels per ear, rachis weight, rachis diameter and kernel length. However, grain yield, raw ear yield, ear length, ear diameter, kernels per row and kernels per ear are apparently less affected by density in homozygous opaque-2 populations. Increased density seems to have reduced infections due to Ustilago maydis and Helminthosporium turcicum in normal plants and increased them in opaque-2 types, and the frit fly infection was reduced less in the o2 types than in their normal analogues.

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Additive genetic variance in opaque-2 and analogous normal triallels —All possible three-way cross-hybrids were made among six o2-converted inbred lines of maize (WF9 o2, R61 o2, N6 o2, HMv850-2 o2, C103 o2 and W187 o2) and their normal analogues. Observations on a number of characters were made on these hybrids in four replicate split-plot trials conducted during the years 1973 and 1974. Data obtained were analysed genetically using the procedure outlined by Rawlings and Cockerham (Crop Sci. 2: 228-231, 1962), and the expectations of eight components of genetic and environmental variance calculated for the o2 and normal hybrids for each year.

Variance attributable to additive and additive epistatic gene effects was expressed as a percentage of the total variance and combined over the 2 years (Table 1). It can be seen that 80.53% of the total variation observed for grain yield in the o2 hybrids was attributable to additive and additive epistatic gene effects, compared with 87.28% in the analogous normal triallel; the o2 hybrids have nearly 7% more non-additive gene effects than their normal analogues for the trait grain yield. It can further be seen that a number of characters had more variation attributable to additive and additive epistatic gene effects in the o2 forms than in their normal analogues. Thus, the days to 50% pollen-shed, days to 50% silking, total number of leaves, leaf area index, leaves above the ear, ear height, tillers per plant and yield components like drying percentage and shelling percentage had a greater proportion of their variance attributable to additive and additive epistatic gene effects if the o2 gene was present in recessive homozygous condition than if it was absent. However, plant height, water imbibition and such