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Poster Abstract – A.11

RESPONSES TO DIVERGENT SELECTION FOR COB COLOUR IN A MAIZE POPULATION

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In a previous study, we carried out four cycles of recurrent selection for grain yield in the F_2 population of the maize single cross A632 (red cob) x Mu195 (white cob). Significant gains were achieved for grain yield and other agronomic traits; moreover, an increase of the frequency of the red cob allele was observed throughout the selection process, suggesting an association between grain yield and cob colour (determined by *P1* gene in chromosome 1). In a subsequent study, near-isogenic lines with red or white cob were developed by backcross to both recurrent parents A632 (using Mu195 as donor of the white allele) and Mu195 (using A632 as donor of the red allele). These near-isogenic lines were evaluated both *per se* and in hybrid combination and the lines with red cob (R) yielded more than the corresponding lines with white cob (W) in both A632 and Mu195 backgrounds, thus confirming the association between grain yield and cob colour. These findings prompted us to undertake a divergent selection for cob colour, i.e., for R or W, in the F_2 of A632 x Mu195 to evaluate the effect of this marker assisted selection on grain yield and other traits. About 200 random F_2 plants were selfed and the resulting F_3 seeds were bulked according to the cob colour of the ears. Forty seeds were bulked from each R ear to produce the selected F_3-R population; similarly, 40 seeds were bulked from each W ear to produce the selected F_3-W population. Moreover, 20 seeds were bulked from each ear (regardless of the cob colour) to produce the unselected F_3 population. The three populations were tested in two field trials. The F_3-R mean across the two trials was superior to the F_3-W mean for number of leaves per plant (19.2 vs. 18.0), days to flowering, whole leaf area, kernel moisture, number of kernels per plant and grain yield (3.44 vs. 3.05 Mg ha^{-1}). In contrast, the mean across the two selected populations was rather close to the mean of the unselected F_3 population for most traits, indicating a prevalence of symmetric responses to selection. In comparison with the unselected F_3 population, F_3-R population showed a superiority for grain yield of 0.22 Mg ha^{-1} corresponding to a gain of 7.7%, which is slightly higher than the average gain per cycle (7.3%) achieved in the laborious recurrent selection previously conducted. When differences between F_3-R and F_3-W populations were referred to the number of leaves per plant, either directly, as for leaf area (i.e., considering the average area per leaf), or indirectly, as for grain yield (considering the average grain yield per leaf area unit), the differences between F_3-R and F_3-W populations were not significant any more. These findings indicate that in the material herein investigated selection for cob colour can lead to an appreciable yield improvement, achieved at least partly by changes concerning the number of leaves per plant and associated traits. These findings could be accounted for by assuming that close to the *P1* gene there is a QTL controlling the number of leaves per plant and then date of flowering, whole leaf area, number of kernels per plant, kernel moisture and grain yield, following a sequence of causally related events. To gain a better insight into the genetic effects of this QTL and the frequency of recombination with *P1* gene, we are going to compare the selected F_3-R and F_3-W populations with the selected F_3-R and F_3-W populations obtained by selfing the plants derived by one cycle of random mating in the same source F_2.