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A SUSTAINABLE DURUM WHEAT CHAIN
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RE-EVOLUTION OF DURUM WHEAT BY RESTORING THE *HARDNESS* LOCUS

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Durum wheat is an important crop worldwide. In many areas, durum wheat appears to have competitive yield and biotic and abiotic advantages over bread wheat. What limits durum production? In one respect, the comparatively more limited processing and food functionality. Two traits directly relate to these limitations: kernel texture (hardness) and gluten strength. We have addressed both using Ph1-mediated translocations from bread wheat. For kernel texture, ca. 20 mb of chromosome 5DS replaced a similar amount of 5BS. SKCS hardness was reduced from ca. 80 to 20 as the puroindolines were expressed and softened the endosperm. Break flour yields increased from 17% to >40%. Straight-grade flour had low starch damage (2%), and a mean particle size of 75 μ m. Crosses with CIMMYT durums all produced soft kernel progeny and a high degree of genetic variance for milling and baking quality. Solvent Retention Capacities (SRC) and cookie diameters were similar to soft white hexaploid wheat, showing that soft durum can be considered a “tetraploid soft white spring wheat”. Regarding gluten strength, CIMMYT durums contributed a high genetic variance, with the “best” progeny exhibiting SDS sedimentation volume, lactic SRC and mixograph characteristics that were similar to medium hard red winter. The best loaf volume among these progeny was 846 cm³ at ca. 12.8% flour protein. To further address the issue of gluten strength, Soft Svevo was crossed with durum lines possessing Dx2+Dy12 and Dx5+Dy10. Bread baking showed that Dx5+Dy10 was overly strong, whereas Dx2+Dy12 significantly improved bread loaf volume. The best progeny produced a loaf volume of 1010 cm³ at 12.1% protein. As a comparison, the long-term in-house regression for loaf volume-flour protein for hard red ‘bread’ wheats is 926 cm³ at 12.1% protein. Obviously, from these results, excellent bread making potential has been achieved.

ABSTRACT