

**PYRAMIDING DIFFERENT ALIEN CHROMOSOME SEGMENTS IN DURUM WHEAT:
FEASIBILITY AND BREEDING POTENTIAL**

Gennaro, A.¹, Forte, P.¹, Carozza R.¹, Savo Sardaro¹, M.L., Ferri, D.¹, Bitti, A.¹, Borrelli, G.M.²,
D'Egidio, M.G.³, Ceoloni, C.^{1*}

¹Dept. of Agrobiology and Agrochemistry, University of Tuscia, 01100 Viterbo, Italy

²C.R.A.- Experimental Institute for Cereal Research, 71100 Foggia, Italy

³C.R.A.- Experimental Institute for Cereal Research, 00191 Rome, Italy

* Corresponding author: Carla Ceoloni

ABSTRACT

Wheat chromosome engineering, i.e. the transfer of alien chromosome segments from various Triticeae species into cultivated wheats, is greatly benefiting from the recent advancements in molecular genetics, cytogenetics and genomics. Powerful tools are currently available that make selection of desired genotypes far more precise and effective than in the past, thus giving this transfer strategy considerable potential for meaningful practical achievements. Such tools were successfully applied to engineer the durum wheat genome with small alien segments containing genes for disease resistance and quality traits, including *Lr19* (leaf rust resistance) and *Yp* (yellow endosperm pigmentation) from *Th. ponticum*, *Pm13* (powdery mildew resistance) from *Ae. longissima*, and the *Glu-D3* and *Glu-D1* glutenin subunit genes from *T. aestivum*. Targeted segments with such genes, all being of minimal size, were first separately incorporated into durum wheat by *ph1*-induced homoeologous recombination. The positive performance of selected recombinant lines from each transfer project encouraged attempts to develop multiple alien segment combinations. The results obtained with double and also triple recombinants indicate a good tolerance of the durum wheat genome even toward such complex manipulations, which thus appear to offer good prospects for simultaneously enriching durum wheat germplasm with several valuable traits from related Triticeae.

INTRODUCTION

CHROMOSOME ENGINEERING AT THE DURUM WHEAT LEVEL: AN OVERVIEW OF THE PERFORMANCE OF SINGLE ALIEN TRANSFERS

A STEP FORWARD IN MANIPULATING THE DURUM WHEAT GENOME: ALIEN CHROMOSOME SEGMENT PYRAMIDING

EVALUATION OF AGRONOMIC AND GRAIN QUALITY CHARACTERISTICS OF MULTIPLE RECOMBINANT LINES

Agronomic traits

Quality characteristics

CONCLUDING REMARKS