

**Evaluating populations derived from complex crosses
involving both bread wheat and durum wheat
parentage for partial resistance to crown rot**

By

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Abstract

Crown rot in durum, caused by *Fusarium pseudograminearum* and *Fusarium culmorum*, can reduce yields up to 90% in seasons characterised by limited spring rainfall. To decrease this potential loss, breeding of partially resistant cultivars could complement agronomic approaches. However, the limited variation in durum has meant that development of partially resistant lines is still a major objective to overcome. The aim of this study was to evaluate, through genotypic and phenotypic-based approaches, durum lines with partial resistance to crown rot. The germplasm under study consisted of 252 durum lines obtained by crossing durum parents with partially resistant bread wheat varieties. Phenotypic assessment of the symptoms, accomplished by visual assessment of the fungal necrosis of the stems, led to the identification of 120 partially resistant lines. Genotypic assessment, performed through a SNP array, identified associations between marker genotype and crown rot severity for the family originating from the parents EGA Bellaroi 38a and Sumai 3. Moreover, the frequency of QTL for crown rot partial resistance already published was investigated in the populations under study through the multiplex ready PCR technique. These findings confirm that bread wheat varieties can be exploited to reduce crown rot severity in durum.

Declaration

The presented thesis does not contain any material already accepted for the award of any other degree or diploma in any University or tertiary institution. To the best of my knowledge and belief, this work does not contain material already published, excepted for everything that is cited.

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Domenico Deserio

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Glossary of Abbreviations

Abbreviation	Full term
AGRF	Australian Genome Research Facility
ANOVA	Analysis of variance
ASOs	Allele-specific oligonucleotides
AUD	Australian Dollars
cDNA	Complementary deoxyribonucleic acid
CGIAR	Consultative Group for International Agricultural Research
CIMMYT	International Maize and Wheat Improvement Centre
CR	Crown rot
DArT	Diversity arrays technology
DNA	Deoxyribonucleic acid
EDTA	Ethylenediaminetetraacetic acid
EST	Expressed sequence tags
FHB	<i>Fusarium</i> Head Blight
GxE	Genotype by environment
I	Inoculated treatment
IARCs	International Agricultural Research Centre
ICARDA	International Centre for Agricultural Research in the Dry Areas
LOD	Logarithm of odds
LSD	Least significant difference
LSO	Locus specific oligonucleotide
MAS	Marker assisted selection
mRNA	messenger ribonucleic acid

Abbreviation	Full term
MRT	Multiplex Ready Technology
NI	Not inoculated treatment
PCNB	Pentachloronitrobenzene
PCR	Polymerase chain reaction
PDA	Potato Dextrose Agar
<i>Ph1</i>	Pairing homoeologous 1
QTL	Quantitative trait loci
R	Correlation coefficient
RCF	Rotation centrifugal force
RFLP	Restriction fragment length polymorphism
S	Susceptible line
SARDI	South Australian Research and Development Institute
SNP	Single nucleotide polymorphism
SSR	Simple sequence repeat