

Foreword

Durum wheat for the future: challenges, research and prospects in the 21st Century

Pasta, made from durum wheat (*Triticum turgidum* L.), is a staple food product in many parts of the world. Durum wheat grain is characterised by high levels of protein and yellow pigment, is very hard (which is ideal for making semolina), has strong and stable dough ideal for the production of high quality pasta and other durum derived products. Globally, some 35–40 million tonnes of durum are produced annually. Most production is centred in the Mediterranean region, Canada, North America, Mexico, Maghreb countries, and India, with small amounts of highly valued durum being produced in Australia.

Durum wheat is typically grown under rain-fed conditions in the semi-arid regions of the world. Rainfall can vary dramatically in these regions, and consequently the quality of the grain can be variable. A range of pathogens, but primarily *Fusarium* species (and some rusts); also significantly affect durum production. The adverse impact of mineral deficiencies, disease and water stress on the plant have previously limited the ability of durum breeders to significantly increase yield, while also ensuring high grain quality, in new varieties. However, the complexities of these traits have not necessarily been explored to the same extent in durum wheat as for common (bread) wheat. Hence, research that addresses these challenges will be important for the future growth of the durum industry worldwide.

Papers presented in this Special Issue of *Crop and Pasture Science* demonstrate the broad array of research that is being conducted worldwide in an attempt to understand and address the barriers to high-yielding, high-quality durum wheat production. This Special Issue largely arose out of discussions between durum wheat researchers at two recent international symposia on the genetics and breeding of durum wheat (Adelaide, Australia, 2012 and Rome, Italy, 2013). Being a minor wheat crop, typically many research reports on durum become dispersed in the main literature on wheat and other crops therefore, a dedicated journal issue addressing this important crop is welcome amongst durum wheat

researchers. The papers have been chosen to indicate the importance of combining different approaches to address the various challenges to growing durum wheat. Papers presented cover grain quality improvements through breeding and cytogenetics, introgression of useful genes from bread wheat or alien species, agronomic practices, understanding plant–pathogen relationships and the application of new technologies such as molecular markers and mutagenesis approaches such as TILLING.

While there is a rich diversity of research presented in this Special Issue, it also highlights that there is much more to be explored with this crop. Two challenges that lie ahead globally include adapting durum to marginal growing areas currently considered unsuitable for production, and improving disease resistance to pathogens and insect pests that significantly impact on yield and grain quality. The rich pool of genes in the relatively unexploited germplasm within the *Triticeae* family could be used to overcome these hurdles through breeding. Add to this, the multitude of technological approaches now available to the scientific community, and our ability to address these challenges is considerably enhanced.

The future of durum wheat is therefore very bright and on that note we would like to thank the authors for their contributions, the funding agencies who support this valuable work (in particular the **Grains Research and Development Corporation**), and the many reviewers for taking the time to rigorously assess the research presented in this Special Issue.

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