

Plant breeding for organic and sustainable, low-input agriculture: dealing with genotype–environment interactions

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In Europe, agriculture is increasingly moving towards organic and sustainable, low-input farming systems. These agricultural practices, however, have various constraints that still need to be solved. One of the major constraints of organic farmers is that they largely depend on crop varieties produced for conventional farming systems with high inputs of artificial, mineral fertilizers and chemicals for crop defense. Therefore, the organic sector urgently requires breeding programmes for robust varieties, which are better adapted to low-input conditions, with traits such as improved rooting systems, stronger interspecific competition ability for weed suppression and yield stability. An important aspect in the breeding for such varieties is the choice for an appropriate selection environment or a combination of environments: organic versus conventional and high- versus low-input conditions.

Recognising the above mentioned constraints and the need to explore alternative strategies to overcome these constraints, hereby also using insight and knowledge from agronomic fields working at a higher aggregation level (i.e. system level), the first EUCARPIA meeting of the Section Organic plant breeding and low-input agriculture was organised in Wageningen, the Netherlands, from 7 to 9 November 2007. This symposium was organised in close cooperation with COST860 SUSVAR, the European Consortium for Organic Plant breeding (ECO-PB), ISOFAR section Plant Breeding and Seed Production, the C.T. de Wit Graduate School for Production Ecology and Resource Conservation (PE&RC) and the Chair Organic Plant Breeding of Wageningen University. Some 130 participants representing 28 countries attended the symposium, including students, researchers and other professionals from universities, institutes and breeding companies.

The programme featured 17 oral and 47 poster presentations, covering the topic areas of genotype–environment interaction, breeding strategies, selection criteria and methods, and participatory breeding approaches. A book of abstracts was available at the symposium including abstracts of all the presentations, see www.eucarpia.org. A selection of presentations were regarded as representing the four topic areas and are combined as full papers in this special issue of Euphytica, the international plant breeders' journal. We are grateful to the editor-in-chief professor Dr. Richard Visser, for supporting the publication

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of this special issue. The first paper gives an overview of the issues involved in plant breeding for organic cereal production and is an introduction to future plant breeding for organic agriculture, followed by papers that give an overview of organic breeding activities and research carried out worldwide.

Although the organic market may still be of limited size, many seed companies regard the organic sector

as an interesting niche market, which can have a spin-off for more environmentally friendly seed production and breeding for sustainable, low-input farming systems. We hope therefore that this special issue will be of relevance for both organic and conventional agriculture searching for improvements of sustainable, low-input farming systems.