

# Sustainable Use of Genetic Diversity in Forage and Turf Breeding

Christian Huyghe  
Editor

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 Springer

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# Preface

Grassland produces feed for livestock, improves soil fertility and structure, protects water resources and may contribute to climate change mitigation through carbon storage and to biodiversity preservation. It simultaneously maintains sustainable economic outputs for farmers and provides ecosystem services. Turf similarly considerably contributes to our environment by adding beauty to our surroundings, providing a safe playing surface for sports and recreation.

The species diversity present in most grasslands and turfs is a functional diversity contributing to the previously mentioned agronomic and environmental benefits. The species belong to different functional groups and the adequate species composition may maximise the agronomic performance through a higher production and a better quality and the environmental benefits through symbiotic nitrogen fixation or sources of pollen and nectar to pollinators. In a given grassland or turf, the genetic diversity available in each variety contributes to this economic and environmental performance, but also to the stability of these performances including the stability of the resistance against pathogens and pests.

Natural grasslands share many species with the sown swards. They may be regarded as favourable sites for in situ preservation of genetic diversity as well as valuable sources of diversity for breeding.

Breeding programs in forages have resulted in large genetic improvements in forage yield, quality and disease resistance. Similarly, in turf, large improvements were achieved in aesthetic value and resistance to diseases. Registration criteria and systems play a key role to validate these improvements and to release them to the market for the benefit of the end-users.

Resources available for breeders become increasingly large, with more access to better characterised materials, rapid and accurate methods for phenotyping and genotyping, expanding molecular resources, bioinformatics and computational resources. This huge amount of resources requires to clearly defining breeding objectives and optimum variety structure and to integrating phenotyping and genotyping. These are prerequisite conditions for a sustainable use of genetic diversity in forage and turf breeding.

Previous conferences of the Eucarpia Fodder and Amenity species sections were held in Perugia, Italy, in 2006 and Copenhagen, Denmark, in 2007. On this occasion, the 27th meeting was held in La Rochelle, France in 2009. It was organised by

the French Association of Forage and Turf breeders (ACVF) in partnership with the National Institute of Agronomic Research (Inra), Poitou-Charentes Research Centre. Attendees included genebank curators, breeders, geneticists and molecular biologists of both public institutes and private breeding and seed companies from 40 countries. The program featured plenary addresses from leading international speakers, selected oral presentations, volunteered poster presentations, as well as tours of research centres, private breeding companies and cattle or dairy goat farms.

This book includes papers from the plenary lectures and offered papers presented either orally or as posters during the Conference. A wide variety of themes is included and offers a valuable overview of the present knowledge in forage and turf breeding. Five main sections will be found in the present book. After an introduction on the stakes for forage breeding, a section is dedicated to genetic resources with characterisation of the germplasm through various techniques and various innovative approaches such as biogeography. The second section investigates the changes which may occur in grassland swards. Population genetics and genetic ecology may be beneficial to question the paradigm of variety and sward stability.

The third section reviews the genetic improvements and the role of registration systems to stimulate and validate genetic progresses. The numerous achievements and findings in molecular biology are presented in the fourth section, while the fifth one will focus on new variety structures and prospects offered by interspecific hybridizations.

The 27th Conference of the Eucarpia Fodder and Turf Section and the publication of this book were supported by the Poitou-Charentes Regional Council, the Conseil Général de Charente-Maritime, the Xavier Bernard Foundation, GNIS, RAGT and Jouffray-Drillaud breeding companies, Agri-Obtentions, La Rochelle municipality.

The scientific program of the conference, the selection of the oral presentation among the numerous offered papers, and well as the critical reviewing of papers, sometimes leading to rejection, were made by the scientific committee which I had the pleasure to chair: Michael Abberton, Beat Boller, E. Charles Brummer, Jean-Louis Durand, Ulf Feuerstein, Marc Ghesquière, Marie-Christine Gras, Jean-Marie Prosperi, Isabel Roldan-Ruiz, Daniele Rosellini. They are sincerely thanked for their outstanding contribution to the success of the conference and to the quality of the present book.

The local organising committee made a great job to set a fruitful conference in a friendly atmosphere: Claude Tabel, head of R2n (RAGT breeding company), who chaired the committee, Nathalie Bonnet (Inra), Marc Lécivain (Sicasov), Antoine de la Soujeole (Sicasov), Jean-Paul Sampoux (Inra), Fabien Thierry (Sicasov). They are sincerely thanked for their valuable work.

We thank Jacco Flipsen and Noeline Gibson of Springer for their assistance and cooperation in the publication of this book. Finally, we express our gratitude to the participants for their contribution to discussion and to authors whose dedication, work and responsiveness made this book possible.

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