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Agriculture, Horticulture and Forestry

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Frank Kempken • Christian Jung
Editors

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Editors
Prof. Dr. Frank Kempken
Institute of Botany and Botanical Garden
Christian Albrechts University of Kiel
Olshausenstr. 40
24098 Kiel, Germany
fkempken@bot.uni-kiel.de

Prof. Dr. Christian Jung
Plant Breeding Institute
Christian Albrechts University of Kiel
Olshausenstr. 40
24098 Kiel, Germany
c.jung@plantbreeding.uni-kiel.de

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This book is dedicated to
Prof. Dr. Dr. h.c. mult. Gerhard Röbbelen
on the occasion of his 80th birthday for
his lifetime contribution to applied plant
genetics.

Preface

Today modern agriculture is facing new challenges. Total yields have to be increased due to the continuing population growth of mankind and due to changing food consumption. However, global climate creates new problems but also new opportunities for agriculture. For more than a decade the yearly yield increases of major food staples have been on the decline, which is due to optimized production systems like the application of mineral fertilizer and crop protection measures. But also the yield increases due to genetic improvement of crops have been stagnating. Obviously we are approaching yield barriers for a number of crops, which creates a need for innovation in breeding systems.

There is no doubt that further genetic improvement of crops will be a key for increasing yields in the future. Moreover, breeding must meet the demands for increasing biomass (bioenergy) and the production of industrial raw materials. The breeding of better-adapted and higher-yielding varieties relies crucially on the available genetic variation. Broad genetic variation is a fundamental prerequisite for successful breeding. Apart from other technologies like wide crosses, mutation breeding and somatic hybridization, genetically modified plants will play an increasingly important role in future breeding systems either because natural genetic variation has been largely exploited or because natural variation is completely lacking from the primary and secondary or even from the tertiary gene pool of a crop species.

It is commonly agreed within the scientific community that genetically modified plants will be important for future breeding. Adoption rates worldwide have been increasing in the past ten years in a breathtaking manner. In the year 2008 genetically modified plants were cultivated by about 13.3 mio farmers from 25 countries worldwide on a total acreage of about 125 mio ha (http://www.isaaa.org/). Numerous investigations have confirmed that cultivation of genetically modified plants is safe, as far as approved plants are concerned which have passed a step by step risk assessment procedure, as is commonly applied in most countries growing genetically modified organisms (GMO) today. Instead of this, there is still a big public debate on GM plants in a number of countries. Mainly in the European Union, the production of GM plants is almost completely avoided. Low consumer acceptance

is the only reason pointed out by politicians to establish legal restrictions for GMO production, in spite of numerous studies confirming their safety towards the environment or for food and feed use. Many scientists have been frustrated due to this debate which is ignoring scientific facts and which is mainly directed by pressure groups and non-governmental organizations.

This book was written with an intention to get back to the facts. In the past years a number of books focusing on GM plants have been published. Some of these cover all aspects, including minor crop species. So, why is there a need for a new book? Our book tries to address all aspects of GM plants, including their employment in a plant-breeding procedure, and their socioeconomic implications. We try to emphasize that GM plants among others are an important tool in plant breeding to broaden the genetic variation of crop species.

The book is structured into four parts. The first part deals with technical details of plant genetic engineering. The second part introduces characters of GM plants, while the third part presents applications in agricultural production systems. The last part deals with risk assessment and economic implications, which are important aspects of GM plants. The articles are written by scientists who have a long experience in their field of expertise. We thank the authors for their excellent contributions, which make this book, we think, a valuable resource for the different aspects of GM crops. We are aware of the fact that not all topics and some minor crops could not be included in this book. We regret that this was not possible due to size limitations. Finally we are indebted to the Springer publishing company for supporting this book.

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Frank Kempken and Christian Jung

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