Preface

Global warming is affecting agriculture in a wide range of the climatic zones. In contrast to the extensive debate over the effects of global warming during summer growth, the impact of rising winter temperature on agricultural production has received considerably less attention. However, climate changes can certainly affect winter conditions, and small changes in winter climate can have even more drastic impacts in many regions of the world. The tendency of winter warming is most evident in the lower latitude winter transitional areas of cool temperate regions, which include major production areas of winter wheat and forage crops. In these areas, snow cover has the greatest impact on winter crop production in both positive and negative ways: snow cover beneficially protects plants from freezing injury while also providing optimal habitat for the major winter pathogens, known as snow molds, to prevail under snow cover. Climate change affects the depth, duration, and distribution of snow cover in the cool temperate regions, resulting in increased freezing damage of crops due to reduced snow cover in some areas, as well as increased snow mold damage due to prolonged snow cover in other areas. Changes in the flora and dynamics of snow mold fungi are also being reported. Fluctuations in snow cover also affect occurrence of soil frost and freeze-thaw cycles, which result in alteration of soil physical properties, ecosystem nutrient cycling and microbial activities. Overall, there are many emerging factors that can threaten the sustainability of agricultural production.

Plant and Microbe Adaptations to Cold (PMAC) is an interdisciplinary forum for research and extension scientists working in the fields of plant pathology, plant physiology, microbiology, and crop breeding, to advance our understanding of overwintering of crops and attempt to solve the problems associated with winter damage. The first PMAC conference was held in Sapporo, Japan in 1997 and the following meetings have been held every three years in different locations around the world. The PMAC conference came back to its place of origin after 15 years, and PMAC2012 was held June 24–28, 2012 at the Conference Hall of Hokkaido University, Sapporo, Japan. The PMAC2012 conference focused on global climate change, food security, and agriculture sustainability with the subtitle "Toward risk assessment and management of sustainable agriculture in the cool and cold regions," and the entire program was organized to reflect this theme. The sessions

covered a wide range of topics from soil physical properties and crop protection from frost and pathogens to current breeding strategies. In order to widen the scope of the conference and enhance interdisciplinary discussion, experts in meteorology, soil science and ecology were also invited to participate in the program. What was unique about PMAC2012 was having a special panel discussion session on global warming management. This was a great opportunity for the scientists to better understand the realities of impacts on producers and the questions that needed to be addressed through discussion with the invited panel members representing farmers, agricultural co-operators, and policy makers. PMAC2012 gathered over 100 participants from 14 countries and hosted 41 oral and 42 poster presentations.

This book is a collection of contributions from invited and selected speakers at the conference. Each contribution includes important and timely topics on plant and microbe adaptations to cold. These contributions span the topics discussed at the conference. Publication of this book has been partially suported by OECD-CRP. We also thank Hannah Smith, Melissa Higgs, and Kevin Wright of Springer for their assistance in production of this volume. Finally, we express our gratitude to all the authors and reviewers whose dedicated efforts made this publication possible.

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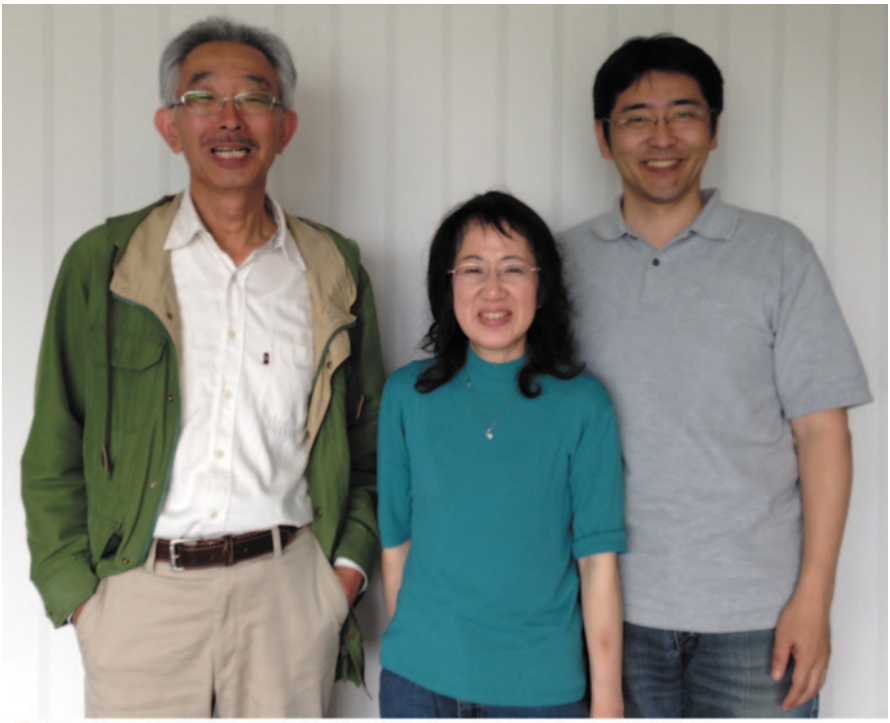

Editors; Naoyuki Matsumoto (left), Midori Yoshida (middle), Ryozo Imai (right).

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