Book Review

Leonard, K.J., Bushnell, W.R. 2003. *Fusarium* Head Blight of Wheat and Barley. APS Press – The American Phytopathological Society, St. Paul, Minnesota, USA, 512 pp. ISBN 0-89054-302-X.

This book concerns one of the most intractable plant diseases around the world. *Fusarium* blight not only reduces crop yield, but also destroys the quality of grain by contaminating it with mycotoxins.

The book contains 18 chapters arranged in 6 parts co-authored by 28 specialists from USA, China, Brazil, Hungary, Canada and Uruguay.

Part "History" contains only one chapter "History of *Fusarium* head blight with emphasis on North America" (p. 1–34) in which R.W. Stack provides detailed historical information on names of pathogens and diseases, their occurrence and importance, epidemiology, mycotoxins produced etc. It must be emphasized that this disease is caused by a complex of pathogens: *Fusarium culmorum, F. sporotrichoides, F. poae, F. graminearum, F. avenaceum, F.* nivale and by their perithecial stages known under generic name *Gibberella.*

Chapter 2 "Systematics of *Fusarium* species and allies associated with *Fusarium* head blight" (p. 35–43) by C.M. Liddell is a short but excellent review on *Fusarium graminearum* (*Gibberella zeae*) and ten other associated species.

Chapter 3 "Histology and physiology of *Fusarium* head blight" (p. 44–83) by W.R. Bushnell, B.E. Hazen and C. Pritsch discusses characteristics of *F. graminearum* (*Gibberella zeae*) and *F. culmorum*, infection of the floret including the role of trichotecene mycotoxins and caryopsis development. Of special scientific and practical interest is part concerning mechanisms of resistance.

Chapter 4 "Epidemiology of *Fusarium* head blight of small grain cereals in North America" (p. 84–119) by G. Shanner points that *Fusarium* head blight was described in the USA about 1890 and provides many interesting data on historical epidemics, survival of the fungus in soil and in residue of small grains, production of primary inoculum and needed research.

Chapter 5 "Population biology of *Fusarium* species causing head blight of grain crops" (p. 120–143) by L.R. Gale provides very interesting information on species composition of *Fusarium* isolates. In Minnesota and Dakota *F. graminearum* was the most prevalent – 75% and 68% respectively. An excellent review of advances in species determination is provided including phenotypic markers and molecular markers.

Part "Mycotoxins" contains two chapters:

Chapter 6 "Chemistry and detection of *Fusarium* mycotoxins" (p. 144–164) by C.J. Mirozha, W. Xie, and E. R. Filho reviews mycotoxins DON, IS-ADON, 3-ADON, NIV and others including mass spectral characteristics and analytical methods.

Chapter 7 "The role of DON in pathogenicity" (p. 165–183) by S. McCormick discusses biosynthesis mechanism, related genes mode of action of toxin and introducing of resistance to DON in wheat varieties.

Part 3 "Resistance" has 5 chapters.

Chapter 8 "Inoculation methods and evaluations of *Fusarium* head blight resistance in wheat" (p. 184–211) by R. Dill-Macky emphasizes that *Fusarium* head blight is caused by a complex of pathogens that also show broad pathogenic specialization. For this reason the chapter summarizes various approaches for inoculum production, protocols for the isolation of *Fusarium* strains, assessment of diseases symptoms and laboratory protocols for re-isolation and identification of *Fusarium*-infested kernels. Composition of five most useful media for isolation and culture of fungi causing *Fusarium* head blight is given.

Chapter 9 "Breeding wheat for *Fusarium* head blight resistance in Europe" (p. 211–240) by A. Mesterhazy provides information on breeding wheat for resistance to *F. graminearum* and *F. culmorum* in various European countries with special concern to Hungary. The author refers to various types of resistance, their sources and lists a number of tasks for the future research.

Chapter 10 "*Fusarium* head blight of barley: impact, epidemics, management and strategies for identifying and utilizing genetic resistance" (p. 241–295) by B.J. Steffenson reviews pertinent literature on head blight of barley, synthesizes the latest research results and assesses prospects for disease management. Barley is attacked by many *Fusarium* species, but mostly by *F. graminearum, F. culmorum, F. avenaceum, F. sporotrichoides*, and *F. poae*. Regions where head blight is present and has endemic or epidemic status are listed and factors contributing to epidemics are identified. Special attention is given to

screening and breeding barley for head blight resistance. Genetic and molecular mapping studies have shown that head blight resistance is controlled by a number of loci with relatively small effects.

Chapter 11 "Breeding for resistance to *Fusarium* head blight of wheat in China" (p. 296–317) by G.-H. Bai, L.-F. Chen and G. Shaner provides information on programme of wheat breeding for resistance in China, and lists wheat cultivars most frequently used in resistance/breeding programs and most commonly isolated *Fusarium* species.

Chapter 12 "Transgenic approaches to *Fusarium* head blight resistance" (p. 318–362) by G.J. Muehlbauer and W.R. Bushnell contains very interesting information on procedures and selectable marker and reporter genes used in wheat and barley transformation. Review of literature is provided on the following categories: genes for antifungal proteins, genes that induce SAR, genes for enzymes involved in metabolic pathways leading to resistance reactions, genes for factors acting against trichotecene toxins, and genes for reducing apoptosis. Also such topics as limitations to wheat and barley transformation, potential allergenic properties of AFP genes and use of transgenic wheat and barley in agriculture are covered.

Part 5 contains two chapters.

Chapter 13 "Control of *Fusarium* head blight of wheat by fungicides" (p. 363–380) by A. Mesterhazy reviews effectiveness of presently available fungicides and in several tables shows the effectiveness of various fungicides in control of head blight.

Chapter 14 "Biological control of *Fusarium graminearum*" (p. 381–394) by W. Corio de Luz, C.A. Stockwell, and G.C. Bergstrom reviews microorganisms with potential to control *F. graminearum* on wheat and barley. Among them are: (1) bacteria – *Bacillus subtilis*; (2) yeasts – *Sporobolomyces roseus*; (3) fungi – *Trichoderma* spp.

Part six contains 4 chapters.

Chapter 15 "Impact of *Fusarium* head blight on malting and brewing quality of barley" (p. 395–419) by P.B. Schwarz discusses general effects of disease on lowering quality of barley for beer production or its use as feed in animal husbandry. This chapter also discusses ways of utilization of barley grain with *Fusarium* head blight.

Chapter 16 "Safety assurance and quality assurance issues associated with *Fusarium* head blight in wheat" (p. 420–460) by J.E. Dexter and T.W. Nowicki reviews several topics e.g. relationship between level of *Fusarium* damage and potential safety hazards, as well as relationship between DON concetration and the extent of *Fusarium* infection is presented in many tables. Worldwide tolerance limits (ppb) for *Fusarium* trichothecenes and zearalenone in wheat is given.

Chapter 17 "Quantifying economic impacts of *Fusarium* head blight in wheat" (p. 461–483) by D.D. Johnson, G.K. Plaskerud, R.D. Taylor, V. Satyanarayana reviews methodology to estimate economic losses from *Fusarium* head blight and in several tables provides lost crop values from *Fusarium* in the USA and Canada.

Chapter 18 "Impacts of *Fusarium* head blight on the North American community: the power of one disease to catapult change" (p. 484–503) by M. McMullen reviews and lists unprecedented economic losses and other negative impacts that epidemics of *Fusarium* head blight of wheat and barley caused to grain producers and to rural communities in the USA and Canada during 1991–1998. Of special interest is also information concerning impacts of *Fusarium* on farming practices, cereal industry, educational and research responses, policy and politics. Although, most of these topics refer to the USA and Canada but they may be of use and interest in other countries.

It may be mentioned that in the USA the National *Fusarium* Head Blight Forum was organized to bring together researchers studying this serious grain disease.

No doubt this APS book makes a big contribution to the knowledge of worldwide important disease of wheat and barley.

Jerzy J. Lipa
Institute of Plant Protection, Poznań, Poland