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Book review

Viroids and Satellites, Ahmed Hadidi, Ricardo Flores, John W. Randles, Peter Palukaitis (eds). Academic Press (2017). 716 pp., Hardcover, ISBN: 9780128014981, ISBN: 9780128017029 (eBook). Price: US $119.

This well-conceived book describes viroid and satellite subviral pathogens associated with economically significant diseases in plants. The book was edited by Ahmed Hadidi, Richardo Flores, John W. Randles, and Peter Palukaitis, each a well-established scientist and internationally renowned expert on viroids and/or satellites. This is an up-to-date, comprehensive and dependable treatise with 107 prominent authors with expertise on viroids and satellites from 24 countries in Africa, Asia, Europe, the Middle East, North America, and Oceania. The editors melded the contributions of the authors into a cohesive set of highly informative chapters.

Viroids are the smallest infectious RNAs and have circular genomes ranging from 246 to 401 nucleotides in length that are capable of replicating autonomously (i.e. not dependent on another virus). On the other hand, satellite elements, either RNA or DNA with or without protein coding capacity, are dependent for replication on associated viruses. The first viroid was discovered by Theodor O. Diener in 1971, whereas the first satellite was discovered by Basil Kassanis in 1962 associated with tobacco necrosis virus. As noted by D. Škorić in Chapter 5, the subsequent discovery of circular RNAs in all domains of life showed that viroids are not the oddity they were initially thought to be. Even so, the discovery of viroids has challenged the central dogma of genetic inheritance because of their non-protein coding nature. Unlike viruses that are dependent on host translation, and in some cases transcription, viroids are completely dependent on host transcription because they lack any protein coding capacity.

The book begins with a brief Foreword by T.O. Diener describing the current taxonomic position of viroids followed by a Preface by the editors that provides the rationale behind the production of this volume, a brief history of the discovery of viroids and satellites and an overview of the organization of the book. These two sections are followed by a thoughtful Introduction by *J.S.* Semancik reflecting on discoveries of viruses, viroids and satellites as well as his own research experience on viroids.

Following the Introduction, the book is organized into two main sections each composed of well-written chapters by experienced and expert scientists. Section I focuses on Viroids and consists of seven parts with a total of 49 chapters most with multiple authors. These chapters present information on viroids of economic significance, viroid characteristics, diseases caused by viroids, viroid detection and identification methods, control measures, geographical distribution, transmission of viroids and special topics, which includes chapters on seed and pollen transmission and application of CRISPR-based technology for control of viroid and viroid diseases. In addition to descriptions of viroid diseases in different categories of agricultural plants, the section contains 19 chapters describing the properties of individual or closely related groups of viroids. The section on viroids is a timely update to the book entitled “Viroids” published in 2003 by CSIRO (Hadidi et al., 2003). It also expands a recent review of progress in viroid research since 2008 (Palukaitis, 2014).

Section II of this book is dedicated to Satellites and organized in five parts consisting of 14 chapters. The first chapter in this section provides historical background on discovery of satellite viruses and satellite nucleic acids and an overview of the chapters that follow. The succeeding parts provide key information on the economic impact of satellites, characteristics of satellites, types of satellites and application of satellites to control plant viruses.

Individual chapters throughout the book are concise and provide background as well as relevant up-to-date information on the subject areas covered. A number of chapters contain useful overview tables providing historical background. Additionally, the authors also identify future potential research. Illustrations and diagrams included are informative and relevant. Furthermore, the excellent reference list for each chapter provides a complete historical perspective and recent references that serve as a great starting point to a broad readership.

A possible shortcoming to the book is absence of an independent chapter on hepatitis delta virus (HDV), an important human pathogen that is associated with hepatitis B virus. HDV represents the only viroid-like pathogen reported to date infecting hosts outside of the plant kingdom. A review of HDV by Hughes et al. (2011) provides an overview of HDV starting with its discovery in the 1970s, which coincides with discovery of viroids. HDV was mentioned briefly in a few chapters, but studies on viroid replication illuminated subsequent research on replication of HDV. Even though HDV encodes a protein like a satellite virus and has a unique ribozyme structure, its circular RNA genome is replicated by host-encoded DNA-dependent RNA polymerase II similar to pospiviroids. As such, HDV has attributes of satellites and viroids (Flores et al., 2011). Regardless, a chapter on this subject would have been a matter of broad interest and may have expanded the readership.

In summary, this book is a welcome addition to the literature on viroids and satellites. This book constitutes a unique and most valuable source of information on viroids and satellites and will be useful to broad readership including researchers in applied and basic plant virology, agriculture, biological control, biotechnology, ecology, genetics, horticulture, microbiology, molecular biology, plant pathology, as well as diagnosticians, regulators, and others worldwide. Both those new to the field and familiar with the topics should find this book a valuable reference. Furthermore, it serves academics as a vital teaching resource and is a foundational source for information for students on viroids and satellites.

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