



PEST MANAGEMENT IN DRYLAND HORTICULTURAL CROPS

SHRAVAN M. HALDHAR • SUSHIL K. MAHESHWARI



Sustainable livelihood security of resource poor farmers is the top priority for the nation today. However, there is wide gap in productivity of various horticultural commodities among different eco-regions, dryland horticulture can play significant role particularly in arid and semi arid regions. Dryland horticultural crops are becoming popular for nutritional and health security point of view as they are excellent sources of minerals, vitamins, protein, antioxidants and photochemical. Among the dryland horticultural crops like ber (*Ziziphus mauritiana*), date palm (*Phoenix dactylifera*), lasoda (*Cordia myxa*), aonla (*Embllica officinalis*), bael (*Aegle marmelos*), jamun (*Syzygium cumini*), pomegranate (*Punica granatum*), khejri (*Prosopis cineraria*) and cucurbits are the major crops which can be grown easily in arid and semi-arid eco-system of the country. Arid and semi-arid region are marked by abiotic limitations such as high temperature, high potential evapo-transpiration, low erratic rainfall, low soil fertility, poor quality of ground water, etc., which lead to poor crop growth and yield. Apart from the climatic limitations, the biotic factors like insect pests are also one of the limiting factors for crop production in hot arid ecosystem.

In this book, several such interventions are given inform of various chapters which will be of immense use improving the productivity and profitability of arid and semi arid horticultural commodities through pests management. In this endeavour, useful information has been generated on identification, damage symptoms and management of the pests in different horticultural crops at various research institutions and SAUs of the country. Earnest efforts have therefore, been made to compile information on identification, damage symptoms and management of pests in a systematic manner, grouped in different chapters and presented in the form of a book entitled "Pests Management in Dryland Horticultural Crops". Correct identification of the pest, their damage and management is the prerequisites for effective control measures. This publication contains excellent colored photographs depicting salient identification characteristics of pest, their damage on plants under natural condition and management in field conditions so as to update the knowledge of extension agencies and farmers.

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– Editors –

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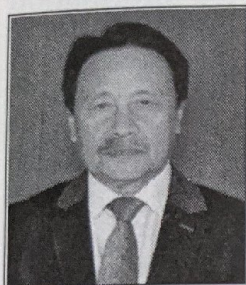


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Foreword

Sustainable livelihood security of resource poor farmers is the top priority for the nation today. However, there is wide gap in productivity of various horticultural commodities among different eco-regions and horticulture can play significant role particularly in arid and semi arid regions. Horticultural crops are becoming popular for nutritional and health security point of view as they are excellent sources of minerals, vitamins, proteins, antioxidants and phytochemicals. Among the horticultural crops like ber (*Ziziphus mauritiana*), date palm (*Phoenix dactylifera*), lasoda (*Cordia myxa*), aonla (*Emblia officinalis*), bael (*Aegle marmelos*), jamun (*Syzygium cumini*), pomegranate (*Punica granatum*), khejri (*Prosopis cineraria*) and cucurbits are the major crops which can be grown easily in arid and semi-arid eco-system of the country. Arid and semi-arid region are marked by abiotic limitations such as high temperature, high potential evapo-transpiration, low erratic rainfall, low soil fertility, poor quality of ground water, etc., which lead to poor crop growth and yield. Apart from the climatic limitations, the biotic factors like insect pests are also one of the limiting factors for crop production in hot arid ecosystem. Natural control of agricultural pests has been occurring since the beginning of evolutionary process of crop plants. It was shortly after the Second World War, the success of chemical pesticides such as DDT and 2, 4-D became known. The public eventually got interested in having better pesticides for effective control of various pests and diseases. Since then, synthetic pesticides development and their extensive use in agriculture went up. Later, since Earth Summit in 1992, Agenda 21 clearly defined the need for corrective measures to the use of pesticides for attaining sustainable agriculture and environmental safety.

Several pest management strategies have been scientifically examined and introduced by many countries. Information concerning progress in this discipline has, therefore, become very important both for the scientists and the farmers. It is also important for both the developed and developing countries to lay greater emphasis on large scale demonstrations of pest control methods as a part of an

integrated pest management (IPM) strategy. In this book, several such interventions are given in the form of various chapters which will be of immense use for improving the productivity and profitability of arid and semi arid horticultural commodities through pests management. In this endeavour, useful information has been generated on identification, damage symptoms and management of the pests in different horticultural crops at various research institutions and SAUs of the country. Earnest efforts have, therefore, been made to compile the information on identification, damage symptoms and management of pests in a systematic manner, grouped in different chapters and presented in the form of a book entitled **"Pest Management in Dryland Horticultural Crops"**. I congratulate to the editors for bringing out this book of Pest Management in time. This book will be useful to the extension functionaries and farmers in integrating various integrated pest management modules and thus increasing the income of the farmers in a sustainable way. I hope that the concerned readers would find this publication quite useful and interesting.



M. Premjit Singh

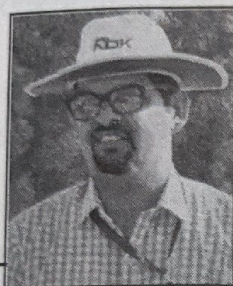


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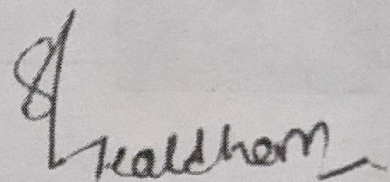
Preface

Horticultural crops are becoming popular for nutritional and health security point of view as they are excellent sources of minerals, vitamins, protein, antioxidants and photochemical. Among the horticultural crops like ber, date palm, lasoda, aonla, bael, jamun, pomegranate, khejri, cactus, mulberry, ker, phalsa, citrus, kinnow, karonda, pilu and cucurbits are the major crops which can be grown easily in arid and semi-arid eco-system of the country. Arid and semi-arid region are marked by abiotic limitations such as high temperature, high potential evapo-transpiration, low erratic rainfall, low soil fertility and poor quality of ground water which lead to poor crop growth and yield. Apart from the climatic limitations, the biotic factors like insect pests are also one of the limiting factors for crop production in hot arid ecosystem. Integrated pest management plays a pivotal role in agriculture production. During the last few decades, the science of crop production has developed rapidly resulting in many diverse techniques to manage a variety of pests, diseases and nematodes. Currently the prospects of chemical control do not appear good because of accidental and incidental trauma encountered in the field of chemical pesticides. Therefore, vigorous research efforts for exploring newer but pragmatic tools for the control of biotic agents have become imperative under climate change scenario. The crop losses estimate range from 15 to 100 per cent due to climate calamities coupled with damage by harmful pests and diseases. However, these pests are gradually becoming resistant to these agents, because the agents themselves are acting as selective factors making the pests better and better able to resist and persist. As a result, the use of integrated pest management is increasing.

Although integrated pest management is not a new issue to adopt in agriculture but technical literature focusing the pest management of arid and semi-arid horticultural crops are not available abundantly. Therefore, first and foremost, I am cordially thankful to Dr. T. Mohapatra, DG, ICAR and Secretary, DARE and Prof. M. Premjit Singh, VC, CAU, Imphal for encouraged and motivated me for publication.

I am also thankful to Director, ICAR-CIAH, Bikaner, who encouraged and provided valuable suggestions and ideas to improve the authenticity and quality of this book. I am also grateful to my Guru Prof. R. Swaminathan, Emeritus Professor, MPUAT, Udaipur for their constant inspiration, encouragement and valuable suggestion to bring out this publication. The dream seen so far has now been converted into reality due to very valuable efforts of all the contributors; therefore, my sincere thanks are recorded towards them. Bringing out this book in the existing shape has been possible due to rigorous and continuous efforts of all the scientific staff of ICAR-Central Institute for Arid Horticulture, Bikaner.

I am confident this publication will be an important source of pest management in horticultural crops information for the stakeholders and extension functionaries devoted to the service of farming communities.



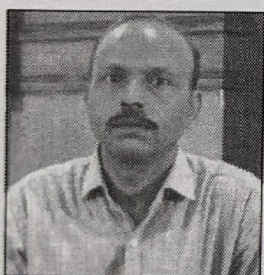
S.M. Haldhar

The Editors



Dr. Shravan M. Haldhar (MSc, PhD) joined January 2020 as Associate Professor (Entomology) in Department of Entomology, College of Agriculture, Central Agricultural University, Imphal, Manipur. He started his career as Scientist (Agril Entomology) in ICAR in 2009 at CIAH, Bikaner. He born on 13th October, 1979 in Jaipur (Rajasthan), obtained M.Sc. Agricultural Entomology (2004) from RAU, Bikaner and Ph.D. (2008) from MPUAT, Udaipur. He has collected and identified

around ninty five insect species of horticultural importance in arid and semi-arid region, of which eleven species occurred on new hosts. He also developed 05 varieties of ridge gourds (Thar Karni); long melon (Thar Seetal); sponge gourd (Thar Tapish); palak (Thar Hariparna) and ivy gourd (Thar Sundari) and registered two trait specific muskmelon genotype (AHM/BR-8) and watermelon genotype (AHW/BR-5) in NBPGR, New Delhi. He has published 12 international and 44 national research papers; 14 books/compendium; 06 technical bulletin, 02 technical folder; 21 book chapters; and delivered 50 lectures. He is fellow of 'The Entomological Society of India' and is the recipient of several awards and recognitions including Dr. B. Vasantharaj David Young Scientist Award 2019; Agriculture Today Young Scientist Award 2019; SAAER-Young Scientist Award 2016; AIASA-Scientist of the Year Award 2016 and IIFS-Rastriya Gaurava Award 2012. Dr. Haldhar has developed 31 technologies related to insect pests management strategies in arid horticulture crops and applied one patent on biopesticide "Thar Jaivik 41 EC" for insect pests management. Submitted 07 new DNA Bar-coding sequence data of arid horticulture crops insects to Gen Bank NCBI, USA. Guided 05 Ph. D. and M. Sc. scholar. He has participated international symposium (TAAO) at University Putra Malaysia in 2016. In a short career span of 13 years, this young researcher has established himself in the field of arid horticulture and holds a promising future.



Dr. Sushil K. Maheshwari (MSc, PhD), working as Principal Scientist (Plant Pathology) in Division of Crop Production, ICAR-Central Institute for Arid Horticulture, Bikaner. He had completed his M. Sc. (Ag.) in 1993 and Ph. D. (Plant Pathology) in 1997 from C. S. Azad University of Agriculture and Technology, Kanpur (U. P.). After completing his dissertation, he joined as Research Associate at RS, CTCRI, Bhubaneswar (Odisha). Since then he joined as Assistant Professor-cum Jr. Scientist in S. K. University of Agricultural Sciences and Technology-K,

Srinagar (J&K) in 2004. He selected as Senior Scientist (Plant Pathology) at ICAR- Central Institute for Arid Horticulture, Bikaner in ICAR system from 29th July, 2009. His major area of research is management of major diseases of pulses (lentil wilt, Alternaria leaf spot of moong) and cucurbits (Alternaria leaf blight, Cercospora leaf spot and powdery mildew of bottle gourd, Fusarium wilt of muskmelon, Alternaria leaf blight and mosaic disease of watermelon, mosaic disease of ridge gourd). He has also worked on fruit rot of ber and gummosis of lasoda. He has served as Member Secretary, Institute Research Committee and Nodal Officer, Project Information Management Committee. Besides this, he was associated in development and identification of ridge gourd variety 'Thar Karni' and longmelon variety 'Thar Sheetal'. He has published more than 55 research papers in National and International journals, more than 30 popular articles in Hindi or English magazines, 22 book chapters, more than 15 abstracts, 02 technical bulletins and 02 compendiums. He was nominated as member of editorial board of International Journal of Plant Protection and Current Horticulture in 2015. He is HAS Fellow-2014 and SPPS Fellow-2015 from Hind Agri- Horticultural Society, Muzaffarnagar (U.P.) and Society of Plant Protection Sciences.

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