



REVIEW ARTICLE

Emerging Insect Pests of Vegetable Crops under Changing Climate Scenario

Pratap A. Divekar^{*}, Jaydeep Halder, Kuldeep Srivastava and V. Sridhar[†]

Abstract

Crop losses in vegetables vary greatly depending on plant variety, cropping season, geographical location, and pest damage potential. Vegetable crops are heavily impacted by insect pests and diseases due to their softness, fragility and short duration in comparison to other crops. An emerging insect pest is one that has been observed in a specific crop-infested area and has progressively increased in population over time. Emerging insect pests have the potential to cause economic harm. In other words, an emerging insect pest is a pest insect whose position has shifted from minor to major or secondary to primary pest. The number of existing minor pests is increasing, as is the arrival of new ones, such as mealybugs, fruit flies, stem borers, diamondback moths among phytophagous insects and red spider mites among acarine. Recent infestations, such as South American tomato pinworm and chili black flower thrips, have caused serious damage to tomato and chili harvests. This review envisages on the variables that contribute to the establishment of new invasive pests, the persistence of main pests, general pest management practices, and integrated pest management to achieve sustainable vegetable production.

Keywords: Vegetables, emerging insects, invasive pests, integrated management.

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Introduction

Indian vegetables are recognized for their broad range of colors, shapes, and sizes. Globally, around 1097 different vegetables are grown for human consumption. These veggies are low-cost sources of vitamins and nutrients that provide farmers with both on- and off-farm revenue. Vegetables high in fibre enhance digestion, lower cholesterol, and reduce the risk factors for heart disease, diabetes, and obesity. Although India was second in vegetable output after China, the yield of numerous vegetables is still considerably below the global average. One of the primary factors for reaching this goal is biotic stresses like insect and acarine pests, diseases, nematodes and weeds. Insect pests alone cause crop losses on an average 25 to 30% yield loss in vegetables (Rai et al. 2014a). Apart from direct losses many of them also serve as many plant diseases which aggravate the problem further (Kodandaram et al., 2017b). The yield losses due to insect pest in different vegetables are listed as follows:

Sustainable vegetable production can be achieved through the management of insect pests in an eco-friendly way. The eco-friendly and sustainable pest management options like Cultural control (Halder et al., 2023), host plant resistance (HPR) (Divekar et al. 2019), plant secondary metabolites (Divekar et al. 2022), bio-control agents (Divekar P. 2023; Dukare et al. 2021), defense proteins (Divekar et al. 2022) and finally the chemical control (Kodandaram et

Emerging Scenario In Vegetable Research And Development

**Abhishek Bohra,Ashok Kumar
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Chandra**



Emerging Scenario In Vegetable Research And Development:

Emerging Scenario in Vegetable Research and Development Studium Press, 2001-01-01 Emerging Crop Pest Problems : Redefining Management Strategies P. Parvatha Reddy, 2018-12-01 The present book on Emerging Crop Pest Problems Redefining Management Strategies comprehensively deals with the rapid and accurate detection diagnosis and development of management recommendations for the emerging crop pests The book is divided into five sections The first section deals with an overview of emerging crop pest scenario including drivers of pest emergence impacts of emerging pests and management of emerging pests The emerging insect and mite pests on field fruit vegetable plantation tuber and forest crops and strategies for their management are dealt in section two The third section deals with emerging bacterial fungal and viral diseases of field fruit vegetable ornamental spice and tuber crops and their management The emerging nematode scenario on field fruit vegetable ornamental medicinal spice and tuber crops and strategies for their management are dealt in section four The final section deals with pests likely to become serious threats in future and potential impact and anticipated effect of climate change on emerging pests The possible technical and policy responses policy considerations and the road map ahead are also discussed in this section The book is extensively illustrated with excellent quality photographs enhancing the quality of publication The book is written in lucid style easy to understand language along with adoptable management recommendations involving eco friendly practices This book will be of immense value to scientific community involved in teaching research and extension activities related to emerging crop pest problems and their management strategies The material can be used for teaching post graduate courses The book can also serve as a very useful reference to policy makers and practicing farmers *Advances in Plant Breeding Strategies: Vegetable Crops* Jameel M. Al-Khayri, S. Mohan Jain, Dennis V. Johnson, 2021-08-25 This book examines the development of innovative modern methodologies towards augmenting conventional plant breeding in individual crops for the production of new crop varieties under the increasingly limiting environmental and cultivation factors to achieve sustainable agricultural production enhanced food security in addition to providing raw materials for innovative industrial products and pharmaceuticals This Volume 9 subtitled Vegetable Crops Fruits and Young Shoots consists of 12 chapters focusing on advances in breeding strategies using both traditional and modern approaches for the improvement of individual vegetable crops Chapters are arranged in 2 parts according to the edible vegetable parts Part I Fruits Bell Pepper *Capsicum annuum* L var *grossum* Sendt Chili pepper *Capsicum frutescens* L Bitter gourd *Momordica charantia* L Bottle gourd *Lagenaria siceraria* Molina Standl Eggplant *Solanum* spp Okra *Abelmoschus esculentus* L Plantain *Musa paradisiaca* L Sweet gourd *Cucurbita moschata* Duch ex Poir Melon *Cucumis melo* L Groups Dudaim and Flexuosus Tomato *Solanum lycopersicum* L and Zucchini *Cucurbita pepo* L and Part II Young shoots Asparagus *Asparagus officinalis* L The chapters were contributed by 43 internationally reputable scientists from 11 countries Each chapter comprehensively reviews the modern literature on the subject and reflects the authors own experience

Sustainable and Innovative Vegetable Production in times of Climate Change Zafar Iqbal, Muhammad Akbar Anjum, Sezai Ercisli, Saeed Rauf, 2025-07-22 This contributed book delves into the cutting edge techniques and sustainable practices essential for vegetable production in times of climate change. It offers a comprehensive exploration of topics such as CRISPR based gene tweaking, hydroponic systems, organic farming, edible landscaping, indoor vegetables production techniques, vegetable grafting, protected olriculture, value addition and postharvest management. The book covers insights into the nutritive and therapeutic value of vegetables, innovative nursery management and the latest trends in fresh cut vegetables. The chapters contributed by world renowned experts address critical questions about food security, environmental sustainability and advanced cultivation methods. This book is a must read for anyone looking to enhance their understanding of modern vegetable production. This book is an invaluable resource for agriculturists, horticulturists, food scientists, plant breeders, university scholars and industry professionals. It provides knowledge on improving practices through eco friendly techniques. Whether you are a researcher or an avid gardener, this book will equip you with the latest research and practical applications to thrive in the evolving field of olriculture.

Advances in Plant Physiology P. C. Trivedi, 2013-12-30 In the present scenario with the increasing pressure posed by a rapidly growing population and diminishing per capita arable land and sources of irrigation, the role of plant physiologists in increasing agricultural and horticultural production by economically viable means is significant. The present book incorporates articles covering latest information on the varied aspects of plant physiology like diagnosis and management of physiological disorders in fruit production, physiology of vegetable crops, breeding crops for dryland conditions, effect of sulphur dioxide on growth, photosynthesis, antioxidant enzyme activities and so on. Topics such as abiotic stress, macronutrient stress and stress caused by pollutants also form part of the book. Articles on the effect of herbicides, growth hormones, photoquality on germination and physiology of rice and groundnut provide useful information for improving crop yield. This book would serve as a useful reference for teachers, scientists and planners in the fields of Botany, Plant Physiology, Agriculture, Forestry and related fields.

Advances in Agriculture For Doubling Farmers' Income Dr Wajid Hasan, 2022-04-23 This book discusses the Advances in Agriculture to Doubling Farmers Income. The changing cropping pattern, monoculture, intensive cultivation of high yielding varieties, negligence of crop rotation, non adoption of summer ploughing and other cultural practices have aggravated pest problems, thus their management has become difficult. Then this book focuses on some farming methods which are being used and has a future for the better development of agriculture. Doubling Farmers are so crucial in the coming years. Many proven technologies and planting improvement practices promise to boost returns and reduce the cost of production. The chapters will clearly define the Advances in Agriculture and their impacts on agricultural productivity. We wish to express a deep sense of gratitude to those who helped us directly or indirectly during the preparation of the manuscript of this text. We hope that the book is valuable and exciting to readers, teachers and students and would urge them to know more about recent research related to

Smart Agriculture We are highly thankful to all authors who contribute their research ideas to enhance the book's utility

Dryland Technology, 2nd Ed. M.L. Jat, S.R. Bhakar, S.K. Sharma, A.K. Kothari, 2016-09-01 This book primarily designed to cater to the needs of undergraduate and post graduate students of Agricultural Engineering and Agriculture research scholars professionals and policy planners associated with dryland farming or rain fed farming covers major topics on land and water resources and their management aspects Entire content has been divided into 22 chapters with solved examples and case studies First 4 chapters are devoted mainly in explaining the basic dryland farming dryland engineering rainfall and water balance analysis and climate weather forecasting with solved examples and case studies 18 chapters on land and water resources management aspects implements used in different field operations and also on storage value addition of agricultural products livelihood security of dryland farmers with communication facilities and resources centre and alternate land use planning and Watershed Management A sincere attempt has been made to compile and present the text in quickly understandable form Well drawn diagrams understanding the Dryland Technology and livelihood aspects of dryland farmers This could be a good text book for undergraduate and post graduate students a reference tool for professional and good teaching material for teachers in the field of land and water resources management under dryland ecosystem and also for scientists working in the field of rain fed farming

Agroecological Innovations Norman Uphoff, 2013-06-17 The world's food supply needs to rise significantly yet both arable and water supplies per capita are decreasing Not only are modern agricultural methods beyond the reach of those suffering the greatest food insecurity but they are also ecologically damaging relying upon fossil energy and chemical inputs This volume offers a collection of innovative and diverse approaches to agricultural development Documented in 12 case studies these approaches are reliant upon greater knowledge skill and labour input rather than larger capital expenditure They are shown to increase yield substantially sometimes doubling or tripling output This volume presents the concepts and operational means for reorienting agricultural efforts towards these more environmentally friendly and socially desirable approaches in the developed as well as developing world

Plant Male Sterility Systems for Accelerating Crop Improvement Abhishek Bohra, Ashok Kumar Parihar, Satheesh Naik SJ, Anup Chandra, 2022-10-11 This book covers all aspects of hybrid breeding technologies applied for crop improvement in major field crops The different male sterility systems such as genetic male sterility GMS cytoplasmic male sterility CMS cytoplasmic and genetic male sterility CGMS and male sterility induced by the photoperiod PGMS temperature TGMS and chemicals are discussed in detail The different chapters in this book provide a timeline of the key breakthroughs witnessed in the field of plant male sterility technologies their application in hybrid breeding and the relevance to the current need for food security In depth insights into the genetic and regulatory mechanisms of plant male sterility have been presented This includes discussion on a variety of molecular players that induce male sterility and rescue male fertility in the hybrid plants To enhance this book's appeal more emphasis has been given on the modern emerging approaches such as construction of

heterotic pools that could boost hybrid breeding for enhanced crop performance amid climate change and growing population worldwide This book is a guide for growers and industries related to field and horticultural crops Further it is a useful reference for plant breeders researchers and extension workers and students The material can also be used for teaching undergraduate and postgraduate courses

Breeding And Protection Of Vegetables M. S. Rana, 2011-01-15

The book has been written in a very simple and easily understandable language The information given in this book is based on systematically and scientifically designed field and laboratory experiments conducted in various ecological zones It is believed that this book will serve the scientific society in a variety of ways Undergraduate and postgraduate students professors teachers scientists and researchers having their interests in different fields of specialization will certainly be benefited The book covers articles written by well known authorities in respective fields

The Science of Horticulture 01

K. V. Peter, 2011-01-01 The Science of Horticulture exposes all the stakeholders students scientists extension officers farmers policy planners to recent scientific research findings in horticulture Marketing of horticulture produces has assumed prime importance in a global market with establishment of World Trade Organisation WTO Many trade related agreements were signed among over 110 countries The Agreement on Trade Related Aspects of Intellectual Property Rights TRIPS Agreement specifically represents the resolve of all member countries to use intellectual property as one of the means of achieving economic balance and diminishing the trade barrier The legislative history elaborates the genesis of TRIPS agreement General Agreement on Tariffs and Trade GATT Madrid Agreement Chairman's draft Dunkel draft general protection under article 22 and certain aspects of TRIPS definition Malabar Pepper Alleppy Green Cardamom Assam Tea Darjeeling Tea Nilgiri Tea and Coorg Orange are a few horticultural crops which got registered under GI appellation The I is contributed by Latha S Nair Intellectual Property Firm Gurgaon

Integrated Nutrient Supply Management System N.P. Singh (ed.), 2002

Agriculture and Food Production, 2002-04-16 This volume of Applied Mycology and Biotechnology completes the set of two volumes dedicated to the coverage of recent developments on the theme Agriculture and Food Production The first volume provided overview on fungal physiology metabolism genetics and biotechnology and highlighted their connection with particular applications to food production The second volume examines various specific applications of mycology and fungal biotechnology to food production and processing In the second volume coverage on two remaining areas of the theme food crop production and applications in the foods and beverages sector is presented The interdisciplinary and complex nature of the subject area combined with the need to consider the sustainability of agri food practices its economics and industrial perspectives requires a certain focus and selectivity of subjects In this context the recent literature contained in this work will help readers arrive at comprehensive in depth information on the role of fungi in agricultural food and feed technology As a professional reference this book is targeted towards agri food producer research establishments government and academic units Teachers and students both in undergraduate and graduate studies in departments of food science food

technology food engineering microbiology applied molecular genetics and biotechnology will also find this work useful

Genetic Resources and Seed Enterprises Hari Har Ram, Rakesh Yadava, 2007-01-15 The Book entitled Genetic Resources and Seed Enterprises Management and Policies addresses the three core issues vital to modern crop improvement The first part is related to collection characterization conservation and evaluation of plant genetic resources with focus on biotechnology interventions The second part analyses in depth the principles of seed technology along with focus on seed industry which is expanding fast under private sector The third part deals with international agreements and national legislations related to biodiversity conservation seed policies and intellectual property rights The book shall be very handy to undergraduates and post graduate students across a wide spectrum of disciplines in agricultural universities and professionals dealing with plant genetic resources seed and policy framework

Advances in Research on Vegetable Production Under a Changing Climate Vol. 2 Shashank Shekhar Solankey, Meenakshi Kumari, 2023-01-01 This second volume on the topic will be extremely useful for the researchers and postgraduate students working on vegetable crops with a special focus on climate change Today the entire world is suffering from global warming and its consequent climate change This has emerged as the most prominent global environmental issue and there is an urgent need to mitigate its impact on agriculture Over the past 20 years South Asia has had a robust economic growth yet it is home to more than one fourth of the world's hunger and 40% of the world's malnourished children and women Persistent climatic variability which results in frequent drought and flood is among the major reasons for this phenomenon Vegetables are in general more succulent have 90% water and more sensitive to climatic vagaries and sudden changes in temperature as well as irregular precipitation at any phase of crop growing can affect the normal growth flowering pollination fruit setting fruit development and fruit ripening which eventually decreases the yield The irregular precipitation also causes the soil salinity and is a major challenge in many vegetable growing areas To mitigate the harmful impact of climatic change there is an urgent need to develop adequate adaptation strategies for adverse effect of climate change and preference should be given to the development of heat cold drought flood and salinity stress tolerant genotypes along with climate proofing through conventional and non conventional breeding techniques as well as exploiting the beneficial effects of CO₂ enhancement on crop growth and yield Available evidence shows that there is high probability of increase in the frequency and intensity of climate related natural hazards due to climate change and hence increase the potential threat due to climate change related natural disasters in the world At present protected cultivation and grafted seedlings are also popularizing among vegetable growers because of the huge scope as well as molecular breeding emerging insect pests diseases and postharvest quality of vegetables under this climate change scenario Moreover underexploited vegetables perennial vegetable and tuber crops have a more tolerant ability to climate vagaries compare to major vegetables which are also discussed in this book

Ecologically Based Integrated Pest Management D. P. Abrol, Uma Shankar, 2012 The availability of modern tools and transgenic crop

protection technology has opened new vistas in the vast field of pest management All these issues form the focus of the book where they have been discussed by eminent scientists who are authority in their respective fields The book describes the science and art of integrated pest management It contains 48 chapters grouped into six sections which include topics ranging from Impact on food security Breeding for resistance IPM in crops fruits vegetables Future strategies and policy issues IPR related issues It also gives detailed information on emerging strategies and problems such as the role of biotechnology and the implications of IPR issues The roles of IPM in sustaining food productivity contribution of IPM in meeting economic environmental and social costs have been elaborated The role of diagnostic tools weather forecasting transgenic plants biological control and new chemicals in future IPM programmes and strategies to meet the challenges of pest adaptation have been highlighted The need for improved information transfer implementation and application of IPM has been discussed Finally it is essential to know the status of IPM its future challenges and constraints which have been extensively elaborated in the last chapter of this book The book intends to fill the gap by providing the critical analysis of different management strategies having bearing on agriculture sustainability and environmental protection The compilation of this book is unique in the sense that it does not deal with the conventional way of discussing pest management with respect to particular crops or the regions It emphasizes on the other hand an overview of the management strategies with critical evaluation of each in the larger context of ecologically based pest management

Plant Genetic Resources B. S. Dhillon, 2005 The agricultural paradigm is already undergoing a shift in focus from food security towards nutritional quality Horticultural crops besides improving biological productivity and nutritional standards also have enormous export potential This group of crops comprising fruits vegetables root and tuber crops plantation crops medicinal and aromatic plants spices and condiments and ornamental crops would constitute core of any such agro economic strategy In addition to supplementing the economy and national food grid by providing fresh and processed fruits vegetable nuts etc horticultural crops also help to promote diversification Depletion of plant genetic resources in areas of diversity at a rapid pace is a matter of global concern This book profiles all scientific management aspects of the horticultural crop genetic resources including their diversity conservation and sustainable utilization It also addresses vital concerns regarding management of horticultural crop genetic resources from diverse perspectives and provides recommendations for action in certain areas of research that must be pursued with intensity The publication would serve as a valuable comprehensive scientific reference for breeders researchers teachers students and policy makers in biology and agriculture

Fifty Years of Indian Agriculture Ali Mohammad, Abdul Munir, Hifzur Rehman, 2007 Contributed papers presented at the conference organized by Dept of Geography Aligarh Muslim University *Horticultural Reviews* Jules Janick, 2010-07-13 Horticultural Reviews presents state of the art reviews on topics in horticultural science and technology covering both basic and applied research Topics covered include the horticulture of fruits vegetables nut crops and ornamentals These review articles written by world authorities bridge the gap

between the specialized researcher and the broader community of horticultural scientists and teachers *Plant Breeding Reviews, Volume 35* Jules Janick, 2011-10-07 Plant Breeding Reviews presents state of the art reviews on plant genetics and the breeding of all types of crops by both traditional means and molecular methods Many of the crops widely grown today stem from a very narrow genetic base understanding and preserving crop genetic resources is vital to the security of food systems worldwide The emphasis of the series is on methodology a fundamental understanding of crop genetics and applications to major crops The series is sponsored by the American Society for Horticultural Science and appears in the form of one or two volumes per year

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Table of Contents Emerging Scenario In Vegetable Research And Development

1. Understanding the eBook Emerging Scenario In Vegetable Research And Development
 - The Rise of Digital Reading Emerging Scenario In Vegetable Research And Development
 - Advantages of eBooks Over Traditional Books
2. Identifying Emerging Scenario In Vegetable Research And Development
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Emerging Scenario In Vegetable Research And Development
 - User-Friendly Interface
4. Exploring eBook Recommendations from Emerging Scenario In Vegetable Research And Development

- Personalized Recommendations
- Emerging Scenario In Vegetable Research And Development User Reviews and Ratings
- Emerging Scenario In Vegetable Research And Development and Bestseller Lists
- 5. Accessing Emerging Scenario In Vegetable Research And Development Free and Paid eBooks
 - Emerging Scenario In Vegetable Research And Development Public Domain eBooks
 - Emerging Scenario In Vegetable Research And Development eBook Subscription Services
 - Emerging Scenario In Vegetable Research And Development Budget-Friendly Options
- 6. Navigating Emerging Scenario In Vegetable Research And Development eBook Formats
 - ePub, PDF, MOBI, and More
 - Emerging Scenario In Vegetable Research And Development Compatibility with Devices
 - Emerging Scenario In Vegetable Research And Development Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Emerging Scenario In Vegetable Research And Development
 - Highlighting and Note-Taking Emerging Scenario In Vegetable Research And Development
 - Interactive Elements Emerging Scenario In Vegetable Research And Development
- 8. Staying Engaged with Emerging Scenario In Vegetable Research And Development
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Emerging Scenario In Vegetable Research And Development
- 9. Balancing eBooks and Physical Books Emerging Scenario In Vegetable Research And Development
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Emerging Scenario In Vegetable Research And Development
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Emerging Scenario In Vegetable Research And Development
 - Setting Reading Goals Emerging Scenario In Vegetable Research And Development
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Emerging Scenario In Vegetable Research And Development

- Fact-Checking eBook Content of Emerging Scenario In Vegetable Research And Development
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
- Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
- Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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