

Review

Sustainable Pest Management in Date Palm Ecosystems: Unveiling the Ecological Dynamics of Red Palm Weevil (Coleoptera: Curculionidae) Infestations

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Simple Summary: This summary explores strategies to protect date palm trees from harmful insects like the red palm weevil. The emphasis is on employing intelligent and eco-friendly methods that do not harm the environment. The goal is to understand the impact of these insects on trees and identify effective measures to prevent their infestation. Ultimately, the objective is to ensure the long-term health and vitality of date palm trees.

Abstract: The red palm weevil (RPW) poses a significant threat to date palm ecosystems, highlighting the necessity of sustainable pest management strategies that carefully consider the delicate ecological balance within these environments. This comprehensive review delves into innovative approaches to sustainable pest management, specifically focusing on date palm, and seeks to unravel the intricate ecological dynamics underlying RPW infestations. We thoroughly analyze biocontrol methods, eco-friendly chemical interventions, and integrated pest management (IPM) strategies, aiming to minimize the ecological impact while effectively addressing RPW infestations. By emphasizing the interplay of both living organisms (biotic) and environmental factors (abiotic) in shaping RPW dynamics, we advocate for a holistic and sustainable management approach that ensures the long-term resilience of date palm ecosystems. This review aims to contribute to an ecologically sound framework for pest management, promoting the sustainability and vitality of date palm ecosystems amidst the challenges posed by the RPW.

Keywords: date palm; insect activity; pest ecology; biology; integrated pest management; environment



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1. Introduction

The RPW, scientifically known as *Rhynchophorus ferrugineus* (Olivier, 1790), is a persistent pest that originated in Southeast Asia and Melanesia. Through accidental introduction, it has become a global threat, affecting regions such as the USA, the Caribbean, the Mediterranean basin, and the Middle East. The RPW has been observed in numerous regions, spanning 28 countries in Asia, 6 in Africa, 1 in North America, 2 in Central America and the Caribbean, 14 in Europe, and 5 in Oceania [1,2]. The RPW exhibits the widest global distribution among the *Rhynchophorus* weevil genus and is notorious for causing extensive damage to cultivated date palm farms. Its existence has resulted in notable challenges concerning the cultivation of palm and coconut trees and their use in ornamental settings [3,4]. This invasive species has targeted about 40 different species of palm trees globally [5], resulting in its classification on the A2 list along with a few other destructive pest species, including *Bemisia tabaci*, *Drosophila suzukii*, *Helicoverpa armigera*, *Spodoptera*

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Sustainable Pest Management in Date Palm: Current Status and Emerging Challenges Waqas Wakil, Jose Romeno Faleiro, Thomas A. Miller, 2015-12-21 Date palm *Phoenix dactylifera* L. Arecales Arecaceae is an important palm species cultivated in the arid regions of the world since pre historic times and traditionally associated with the life and culture of the people in the Middle East and North Africa which are the pre dominant date palm growing regions worldwide. The Food and Agriculture Organization of the UN estimates that there are over 100 million date palms with an annual production of over 7.5 million tonnes. A recent report on the arthropod fauna of date palm enlists 112 species of insects and mites associated with date palm worldwide including 22 species attacking stored dates. Enhanced monoculture of date palm in several date palm growing countries coupled with climate change unrestrained use of chemical insecticides and extensive international trade is likely to impact the pest complex and the related natural enemies in the date agro ecosystems. In view of the importance of date palm as an emerging crop of the future and the need to develop and deploy ecologically sound and socially acceptable IPM techniques, this book aims to comprehensively address issues related to the biology and sustainable management of major insect and mite pests of date palm by assessing the current IPM strategies available besides addressing emerging challenges and future research priorities. The issues pertaining to the role of semiochemicals in date palm IPM involving new strategies revolving around attract and kill and push pull technologies, phytoplasmas and their insect vectors with implications for date palm innovative methods for managing storage pests of dates and knowledge gaps in devising sustainable strategies for the management of red palm weevil *Rhynchophorus ferrugineus* Olivier are also addressed.

Sustainable Pest Management in Date Palm: Current Status and Emerging Challenges Waqas Wakil, Jose Romeno Faleiro, Thomas A. Miller, 2015 Date palm *Phoenix dactylifera* L. Arecales Arecaceae is an important palm species cultivated since pre historic times in the arid regions of the world and traditionally associated with the life and culture of the people in the Middle East and North Africa which are the pre dominant date palm growing regions worldwide. The crop is currently cultivated in nearly 30 countries in the Asian, African, American and Australasian continents. The Food and Agriculture Organization of the UN estimates that there are over 100 million date palms world wide with an annual production of over 7.5 million tonnes. Date palm is attacked by a wide range of insect pests mainly from the orders Coleoptera, Lepidoptera and Hemiptera besides phytophagous mites several of which cause substantial loss in yield and even mortality of palms. During the last two decades there has been a significant increase in date palm cultivation worldwide especially in the Middle East and North Africa where the area has increased over 50% mostly in vast stretches of monoculture plantations offering a conducive macro and micro habitat for existing and emerging insect pests of date palm. Global warming together with rapid large scale movement of palm species for farming and ornamental gardening has compounded the threat of insect pests to date palm. Indiscriminate use of insecticides to control these pests as the first line of defense is of major concern in the date

growing countries due to the inherent disadvantages of insecticidal residues in dates affecting exports development of resistance to insecticides in the target species and resurgence of minor pest to major insect pest associated with chemical control The book provides an overview on the biology life cycle damage losses geographical distribution host range and management monitoring action thresholds biological control chemical control mechanical control use of semiochemicals and biopesticides of major arthropod pests of date palm from the orders Coleoptera red palm weevil long horn beetle rhinoceros beetle frond borer sap beetles Hemiptera dubas bug issid bug scale insects mealy bug and Lepidoptera lesser date moth carob moth raisin moth and mites The issues pertaining to the role of semiochemicals in date pest management and innovative methods for managing storage pests of dates are also addressed The book on date palm IPM will serve as a document for farmers students researchers and administrators involved in the date palm industry

Artificial Intelligence and Society 5.0 Vikas Khullar,Vrajesh Sharma,Mohit Angurala,Nipun Chhabra,2024-01-22 The artificial intelligence based framework algorithms and applications presented in this book take the perspective of Society 5.0 a social order supported by innovation in data information and knowledge It showcases current case studies of Society 5.0 in diverse areas such as healthcare smart cities and infrastructure Key Features Elaborates on the use of big data cyber physical systems robotics augmented virtual reality and cybersecurity as pillars for Society 5.0 Showcases the use of artificial intelligence architecture frameworks and distributed and federated learning structures in Society 5.0 Discusses speech recognition image classification robotic process automation natural language generation and decision support automation Elucidates the application of machine learning deep learning fuzzy based systems and natural language processing Includes case studies on the application of Society 5.0 aspects in educational medical infrastructure and smart cities The book is intended especially for graduate and postgraduate students and academic researchers in the fields of computer science and engineering electrical engineering and information technology

Integrated Pest Management of Date Palm Sulioiman Al-Rehiayani,Mohamed Al-Doghairi,Khaled A. Osman,2003* *Sustainable Agriculture Reviews* 34 Mu. Naushad,Eric Lichtfouse,2019-04-17 This book is the result of remarkable contribution from the experts of interdisciplinary fields of Science with comprehensive in depth and up to date research and reviews It describes the applications of date palm for food medicine and the environmental sectors Date palm is one of the oldest cultivated trees and its fruit has been a dietary staple around the world for many centuries Date pulps contain dietary fibers and easily digestible sugars 70% mainly glucose sucrose and fructose They also contain vitamins like biotin thiamine riboflavin ascorbic and folic acid that are important for our body The date palm fruit has been used in folk remedies for the treatment of various infectious diseases cancer and immuno modulatory activity Date stones and date palm leaves are freely and abundantly available biomass Therefore the renovation of agricultural biomass wastes into activated carbons for drinking water purification wastewater treatment treatment of dyes and metal ions from aqueous solution would add value to agricultural commodities which offer a solution to

environmental problems as well as reduce the cost of waste disposal *Integrated pest management in sustainable palm oil production* Edgar Clive Turner,2018 *Red Palm Weevil: Guidelines on management practices* Food and Agriculture Organization of the United Nations,2020-02-12 Since gaining a foothold on date palm in the Near East during the mid 1980s the red palm weevil RPW *Rhynchophorus ferrugineus* Olivier has spread rapidly over the last three decades and is now a major pest of palms in a diverse range of agroecosystems worldwide In most of the countries affected failure to manage RPW can be attributed to a lack of awareness about this pest and to lack of systematic and coordinated control actions or management strategies that involve all stakeholders These guidelines have been developed by FAO to support all those involved in the day to day management of RPW in the field including farmers and pest management professionals researchers and the decision makers and administrative stakeholders who support the implementation of integrated pest management IPM strategies for RPW Written by internationally recognized RPW experts the guidelines describe the biology and host range of RPW and address all aspects of RPW IPM including surveillance phytosanitary measures early detection pheromone trapping protocols preventive and curative chemical treatments removal and safe disposal of severely infested palms and best agricultural practices to mitigate attacks by this lethal pest of palms Handbook of Major Palm Pests Victoria Soroker,Stefano Colazza,2017-01-11 Handbook of Major Palm Pests Biology and Management contains the most comprehensive and up to date information on the red palm weevil and the palm borer moth two newly emergent invasive palm pests which are adversely affecting palm trees around the world It provides state of the art scientific information on the ecology biology and management of palm pests from a global group of experts in the field An essential compendium for anyone working with or studying palms it is dedicated to the detection eradication and containment of these invasive species which threaten the health and very existence of global palm crops DATE PALM PLANTATION Cultivation And Management Trey Samir,2024-03-14 Discover the Sweet Secrets of Success Date Palm Plantation Unveiled Sow Seeds of Wealth with Date Palm Plantation Your Gateway to Prosperity Transforming Dreams into Reality Date Palm Plantation and Your Path to Abundance Unlock the Mysteries of Date Palm Plantation Your Key to Financial Freedom Grow Your Future with Date Palm Plantation Planting Seeds of Wealth Today Taste the Sweetness of Success Date Palm Plantation Your Recipe for Riches Harvest Happiness with Date Palm Plantation Cultivate Wealth Reap Joy Planting the Seeds of Prosperity Date Palm Plantation Your Ultimate Investment From Sand to Gold Date Palm Plantation s Promise of Prosperity Empower Your Wealth with Nature s Bounty Date Palm Plantation Holds the Key ABOUT THIS BOOK Date Palm Plantation functions as an all encompassing manual that caters to the interests of agricultural enthusiasts agronomists and novice and seasoned farmers who are intrigued by the cultivation of date palms This book explores multiple critical aspects of effective date palm cultivation commencing with an introductory section that establishes the context for comprehending the agricultural significance of date palm plantations This book emphasizes the significance of date palm plantations using in depth analyses

that clarify their economic cultural and ecological worth The significance of date palms in arid and semi arid regions across the globe is underscored as they contribute to livelihoods environmental protection and sustenance A comprehensive comprehension of climate and soil prerequisites is critical for achieving the ideal growth of date palms This book thoroughly examines these facets guiding readers on the process of selecting appropriate varieties and adjusting cultivation methods to accommodate diverse environmental conditions This book provides invaluable insights into the critical phases of establishing a successful date palm plantation namely Site Selection and Preparation It aids in the identification of suitable sites and the execution of preparatory measures that maximize plant growth and productivity This book provides an in depth analysis of propagation methods and planting techniques encompassing both conventional and contemporary approaches to effectively establish and propagate date palm trees The implementation of watering and irrigation strategies is of the utmost importance in maintaining date palm plantations particularly in arid regions This book explores a range of irrigation techniques and scheduling practices that guarantee sufficient moisture provision for maximum growth and crop production A comprehensive analysis is provided on fertilization pruning and thinning with an emphasis on optimal strategies to improve tree well being fruit excellence and overall yield The exhaustive coverage of disease and pest management weed control harvesting and post harvest handling provides readers with the necessary information and approaches to minimize risks and optimize yields In the realm of date palm cultivation yield and economic considerations in conjunction with marketing strategies offer significant insights that can be utilized to enhance profitability and market competitiveness Additionally this book stresses the significance of date palm plantations implementing sustainable practices to prevent environmental degradation and ensure their long term viability Difficulties and Resolutions are investigated providing pragmatic strategies to surmount barriers that are frequently encountered in the cultivation of date palms In conclusion Future Trends in Date Palm Plantation provides insights into emerging technologies market dynamics and research avenues thereby assisting stakeholders in remaining informed about the ever changing industry environments and potential opportunities

The Date Palm Sandu Samuel Stoica, 2024-11-30 The Date Palm History Cultivation and Sustainability offers a detailed examination of the date palm *Phoenix dactylifera* covering its historical significance agricultural practices and ecological role The book begins with an in depth discussion on the taxonomy and classification of the species followed by a thorough exploration of its anatomy physiology and reproductive biology providing essential foundational knowledge for those interested in date palm cultivation It offers practical insights into the best practices for planting propagation irrigation and fertilization while also addressing techniques for pruning and maintaining healthy date palms A key focus of the text is on pest and disease management with strategies for ensuring the longevity and productivity of these trees The historical significance of the date palm is explored highlighting its cultural and economic importance in ancient civilizations and its continued relevance in modern economies Additionally the book examines the nutritional and medicinal benefits of dates as well as the ecological role of date palms in

their native ecosystems The final chapters address important topics of sustainability and conservation considering how date palm cultivation can be adapted to meet future environmental challenges With its balanced approach The Date Palm History Cultivation and Sustainability is a valuable resource for researchers farmers and anyone interested in the cultivation and preservation of this important plant Pests and Diseases of the Date Palm John B. Carpenter,H. S. Elmer,1978 Pests and Diseases of the Date Palm J. B. Carpenter,H. S. Elmer,1978 Mites Insects Fumigation and packinhouse pest control Root knot nematodes Diseases *Insect Pests of Date Palm and Their Control* Eltayb A. El Hag,Mohamed Al-Doghairi,R. Helal,2000 **Date Palm Pests and Their Control** Mohamed Abdel-Raheem,Laila Ali M. Al-Shuraym,Lamya Ahmed Al-keridis,2016-11-12 **Date Palm and Insect Pests** Mohamed Abdel-Raheem,Nada Abdulameer Obeid,2024-11-11 Date palm *Phoenix dactylifera* L family Arecaceae is one of the oldest fruit crops grown in the arid regions of the Arabian Peninsula North Africa and the Middle East The most probable area of origin of the date palm was in or near what is now the country of Iraq but date cultivation spread to many countries starting in ancient times Dates are a major food source and income source for local populations in the Middle East and North Africa and play significant roles in the economy society and environment in these areas In addition to serving directly as a food source dates are packed and processed in a number of ways and other parts of the tree are used for various purposes The date palm is a diploid perennial dioecious and monocotyledonous plant adapted to arid environments It has unique biological and developmental characteristics that necessitate special propagation culture and management techniques Thousands of date palm cultivars and selections exist in different date growing countries Different genetic marker systems have been used to study genetic relationships among date palm cultivars *Pests and Diseases of the Date Palm* J. B. Carpenter,John M. McMillen,Eugene M. Wengert,H. S. Elmer,1978 Set includes revised editions of some issues Pests and Diseases of the Date Palm J. B. Carpenter,Harold Stout Elmer,1976 **The Development of a Sustainable Integrated Pest Management Scheme for Oil Palm in Papua New Guinea** R. W. Caudwell,1996 A number of biological control agents including Strepsipteran parasites hymenopteran egg parasitoids and fungal pathogens have potential for use in an integrated pest management system for Sexava Agronomic practices directed towards developing biodiversity within the oil palm cropping system to maximise the presence of naturally occurring parasites and pathogens of the pest species will be another component of this IPM system Improved pest monitoring and surveying using both ground level technology and satellite imagery will also be used Authors abstract

PESTS AND DISEASES OF THE DATE PALM. United States. Department of Agriculture,1978

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