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Insect-Plant Interactions *Arthropod-Plant Interactions* Plant-Animal Interactions **Plant-Pest Interactions: From Molecular Mechanisms to Chemical Ecology** Plant-Fire Interactions **Positive Interactions and Interdependence in Plant Communities Beneficial Plant-Bacterial Interactions** *The Ecophysiology of Plant-Phosphorus Interactions* Evolutionary Ecology of Plant-Herbivore Interaction Principles of Plant-Microbe Interactions Insect-Plant Interactions Plant-Plant Allelopathic Interactions Biochemical Interaction Between Plants and Insects *Plants on Plants – The Biology of Vascular Epiphytes* **Rhizosphere Biology: Interactions Between Microbes and Plants Plant-Microbe Interaction: An Approach to Sustainable Agriculture Individual-based Methods in Forest Ecology and Management Caterpillars in the Middle Plant Ecology Arthropod-Plant Interactions** Sulfur in Plants Ethnobotany of Mexico **Integrative Biological Control Root Ecology Baccharis** Salt Stress, Microbes, and Plant Interactions: Causes and Solution **Planthoppers** *Insect - Plant Interactions* Farming for Health Anticancer Plants: Mechanisms and Molecular Interactions *Insect-Plant Interactions* **Plant-Metal Interactions** *Plant Physiological Ecology Fungal-Plant Interactions* Assessment and Management of Plant Invasions **Plant, Soil and Microbes Plant and Soil Interfaces and Interactions** *Entomovectoring for Precision Biocontrol and Enhanced Pollination of Crops* Plant Biotic Interactions Caterpillars in the Middle

This book critically reviews advances in our understanding of the biology of vascular epiphytes since Andreas Schimper’s 1888 seminal work. It addresses all aspects of their biology, from anatomy and physiology to ecology and evolution, in the context of general biological principles. By comparing epiphytes with non-epiphytes throughout, it offers a valuable resource for researchers in plant sciences and related disciplines. A particular strength is the identification of research areas that have not received the attention they deserve, with conservation being a case in point. Scientists have tended to study pristine systems, but global developments call for information on epiphytes in human-disturbed systems and the response of epiphytes to global climate change. This book provides a straightforward and easy-to-understand overview of beneficial plant-bacterial interactions. It features a wealth of unique illustrations to clarify the text, and each chapter includes study questions that highlight the important points, as well as references to key experiments. Since the publication of the first edition of Beneficial Plant-Bacterial Interactions, in 2015, there has been an abundance of new discoveries in this area, and in recent years, scientists around the globe have begun to develop a relatively detailed understanding of many of the mechanisms used by bacteria that facilitate plant growth and development. This knowledge is gradually becoming an integral component of modern agricultural practice, with more and more plant growth-promoting bacterial strains being commercialized and used successfully in countries throughout the world. In addition, as the world’s population continues to grow, the pressure for increased food production will intensify, while at the same time, environmental concerns, mean that environmentally friendly methods of food production will need to replace many

traditional agricultural practices such as the use of potentially dangerous chemicals. The book, intended for students, explores the fundamentals of this new paradigm in agriculture, horticulture, and environmental cleanup. This book is the first to integrate biological control into a conceptual framework – ecostacking - uniting all aspects of biological control and ecosystem services. In 2018 the "First International Congress of Biological Control" was organised and held in Beijing, China. The chapters highlight some of the achievements presented at the congress, worldwide. Of particular significance are the numerous contributions by Chinese researchers illustrating the remarkable progress made on developing and adopting multiple biological control strategies over vast agricultural areas, largely replacing chemical pesticides for sustainable agricultural and horticultural production. In many parts of the world including Europe, fragmented research based on short-term funding has been unable to answer to the needs to develop sustainable long-term solutions to crop protection, while colleagues in China have been successful in implementing programs that exemplify the power of the ecostacking approach. Key contributions by European and US specialists combined with the expertise and experiences by the Chinese contributors comprise the building blocks for the integration of biological control approaches into the overall frame of ecostacking. This book will lead the way to a broader, integrated adoption of biological control techniques in sustainable pest, disease and weed management supporting also the functioning of other key ecosystem services. Chapter 2 of this book isavailable open access under a CC BY 4.0 license at link.springer.com Metal toxicity and deficiency are both common abiotic problems faced by plants. While metal contamination around the world is a critical issue, the bioavailability of some essential metals like zinc (Zn) and selenium (Se) can be seriously low in other locations. The list of metals spread in high concentrations in soil, water and air includes several toxic as well as essential elements, such as arsenic (As), cadmium (Cd), chromium (Cr), aluminum (Al), and selenium (Se). The problems for some metals are geographically confined, while for others, they are widespread. For instance, arsenic is an important toxic metalloid whose contamination in Southeast Asia and other parts of world is well documented. Its threats to human health via food consumption have generated immense interest in understanding plants' responses to arsenic stress. Metals constitute crucial components of key enzymes and proteins in plants. They are important for the proper growth and development of plants. In turn, plants serve as sources of essential elements for humans and animals. Studies of their physiological effects on plants metabolism have led to the identification of crucial genes and proteins controlling metal uptake and transport, as well as the sensing and signaling of metal stresses. Plant-Metal Interactions sheds light on the latest development and research in analytical biology with respect to plant physiology. More importantly, it showcases the positive and negative impacts of metals on crop plants growth and productivity. Plant-herbivore interactions are a central topic in evolutionary ecology. Historically, their study has been a cornerstone for coevolutionary theory. Starting from classic ecological studies at the phenotypic level, it has since expanded to molecular and genomic approaches. After a historical perspective, the book's subsequent chapters cover a wide range of topics: from populations to ecosystems; plant- and herbivore-focused studies; in natural and in man-modified ecosystems; and both micro- and macro-evolutionary levels. All chapters include valuable background information and empirical evidence. Given its scope, the book will be of interest to both students and researchers, and will hopefully stimulate further research in this exciting field of evolutionary biology. The book consists of multiple chapters by leading experts on the different aspects in the unique relationship between arthropods and plants, the underlying mechanisms, realized successes and failures

of interactions and application for IPM, and future lines of research and perspectives. Interesting is the availability of the current genomes of different insects, mites and nematodes and different important plants and agricultural crops to bring better insights in the cross talk mechanisms and interacting players. This book will be the first one that integrates all this fascinating and newest (from the last 5 years) information from different leading research laboratories in the world and with perspectives from academia, government and industry. Biological invasion of native plant communities is a high-priority problem in the field of environmental management. Resource managers, biologists, and all those involved in plant communities must consider ecological interactions when assessing both the effects of plant invasion and the long-term effects of management. Sections of the book cover human perceptions of invading plants, assessment of ecological interactions, direct management, and regulation and advocacy. It also includes an appendix with descriptive data for many of the worst weeds. Model-driven individual-based forest ecology and individual-based methods in forest management are of increasing importance in many parts of the world. For the first time this book integrates three main fields of forest ecology and management, i.e. tree/plant interactions, biometry of plant growth and human behaviour in forests. Individual-based forest ecology and management is an interdisciplinary research field with a focus on how the individual behaviour of plants contributes to the formation of spatial patterns that evolve through time. Key to this research is a strict bottom-up approach where the shaping and characteristics of plant communities are mostly the result of interactions between plants and between plants and humans. This book unites important methods of individual-based forest ecology and management from point process statistics, individual-based modelling, plant growth science and behavioural statistics. For ease of access, better understanding and transparency the methods are accompanied by R code and worked examples. Box 9E. 1 Continued FIGURE 2. The C–S–R triangle model (Grime 1979). The strategies at the three corners are C, competiti- winning species; S, stress-tolerating s- cies; R,ruderalspecies. Particular species can engage in any mixture of these three primary strategies, and the m- ture is described by their position within the triangle. comment briefly on some other dimensions that Grime's (1977) triangle (Fig. 2) (see also Sects. 6. 1 are not yet so well understood. and 6. 3 of Chapter 7 on growth and allocation) is a two-dimensional scheme. A C—S axis (Com- tition-winning species to Stress-tolerating spe- Leaf Economics Spectrum cies) reflects adaptation to favorable vs. unfavorable sites for plant growth, and an R- Five traits that are coordinated across species are axis (Ruderal species) reflects adaptation to leaf mass per area (LMA), leaf life-span, leaf N disturbance. concentration, and potential photosynthesis and dark respiration on a mass basis. In the five-trait Trait-Dimensions space,79%ofallvariation worldwideliesalonga single main axis (Fig. 33 of Chapter 2A on photo- A recent trend in plant strategy thinking has synthesis; Wright et al. 2004). Species with low been trait-dimensions, that is, spectra of varia- LMA tend to have short leaf life-spans, high leaf tion with respect to measurable traits. Compared nutrient concentrations, and high potential rates of mass-based photosynthesis. These species with category schemes, such as Raunkiaer's, trait occur at the ''quick-return'' end of the leaf e- dimensions have the merit of capturing cont- nomics spectrum. In an effort to implement conservation measures farmers have used a variety of production methods, including the use of reduced or zero tillage and cover crops. One benefit of these production methods has been early season weed control. The literature suggests that a variety of mechanisms may be involved, among them the allelopathic effects of phenolic acids. This retrospective analysis addresses the following: How likely are phenolic acid concentrations and environmental conditions in wheat no-till cropping systems for the inhibition of annual broadleaf weed emergence?

and Do phenolic acids have a dominant role or are they just one component of a larger promoter/modifier/inhibitor complex? The book covers allelopathic plant-plant interactions, laboratory and field experiments, and future research. It uses a journal format, provides justifications for procedures used, if-then hypotheses, and cons and pros so that readers can reach their own conclusions. Planthoppers include some of the most devastating pests of major agricultural crops throughout the world. One species, the rice brown planthopper, is among the most economically important pests in Asia. In past decades, government policies encouraged the control of rice planthoppers with synthetic pesticides, a tactic which promoted insecticide resistance and often led to the pesticide-induced resurgence of pest populations. To deter planthopper outbreaks, a more ecologically sound management strategy is being implemented, one based on a thorough investigation of population dynamics, natural enemies, and the genetics of host plant and insecticide adaptation. In the natural habitats of North America and Europe, scientists have also used planthoppers as model organisms to test ecological and evolutionary theory. The consequence of these diverse studies is an extremely scattered literature on planthoppers that has never been synthesized from an ecological perspective. This volume summarizes what is known about planthopper ecology and biological control. It takes a theoretical approach yet is deeply concerned with the application of theory to the practical problems of pest management. This book reviews the history, current state of knowledge, and different research approaches and techniques of studies on interactions between humans and plants in an important area of agriculture and ongoing plant domestication: Mesoamerica. Leading scholars and key research groups in Mexico discuss essential topics as well as contributions from international research groups that have conducted studies on ethnobotany and domestication of plants in the region. Such a convocation will produce an interesting discussion about future investigation and conservation of regional human cultures, genetic resources, and cultural and ecological processes that are critical for global sustainability. Farming for Health describes the use of farms, farm animals, plants and landscapes as a base for promoting human mental and physical health and social well-being. The book offers an overview of the development of ‘Farming for Health’ initiatives across Europe, resulting from changing paradigms in health care and the demand for new social and financial activities in agriculture and rural areas. The contributors are drawn from a range of countries and disciplines. This textbook provides the first overview of plant-animal interactions for twenty years focused on the needs of students and professors. It discusses a range of topics from the basic structures of plant-animal interactions to their evolutionary implications in producing and maintaining biodiversity. It also highlights innovative aspects of plant-animal interactions that can represent highly productive research avenues, making it a valuable resource for anyone interested in a future career in ecology. Written by leading experts, and employing a variety of didactic tools, the book is useful for students and teachers involved in advanced undergraduate and graduate courses addressing areas such as herbivory, trophic relationships, plant defense, pollination and biodiversity. This book presents the latest findings on how plants respond physiologically to sulfur in their environment. It combines an ecosystems approach with new insights at the molecular and biochemical level. Key areas are explored to assess the functions and implications of this essential plant nutrient in a range of natural, semi-natural and anthropogenic environments. The result is an important new reference on the relationships between plants and sulfur. Caterpillars are excellent model organisms for understanding how multiple selective forces shape the ecology and evolution of insects, and organisms in general. Recent research using the tools of modern molecular biology, genetics, metabolomics, microbial ecology, experiments conducted at a global level, network analysis, and statistical analyses of global

data sets, combined with basic natural history, are yielding exciting new insights into caterpillar adaptations and ecology. The best way to view these research advances is within a framework of tri-trophic interactions. This is a timely topic for research given the central role of caterpillars and plants in the ecology and trophic structure of terrestrial communities. This book is unique in that it contains chapters from a team of experts on a diversity of key topics within caterpillar-plant interactions. This volume brings together contributions by researchers from around the globe, working in both tropical and temperate habitats, and in human-managed and more natural habitats. It is a significant contribution to our understanding of insect biology, and the role that insects, as represented by caterpillars, play in a world increasingly dominated by humans and one in which threats to insect biodiversity are mounting. Chapter 11 is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com. The Natural History of Caterpillar-Ant Associations" is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com. The authoritative overviews in this volume provide a wealth of practical information on current approaches to the study of insect-plant interactions. Methods described include direct behavioral observation; assays of host finding, oviposition, and feeding behavior of insect herbivores; post-ingestion physiological effects; measurement of food quality and sensory responses of insects to plant stimuli; chemical isolation and identification of active phytochemicals; evaluation of plant resistance to insects; and the biochemistry of allelochemic interactions. This book focuses on entomovectoring, also known as apivectoring, the method used for managing pollinators to increase crop yields and employ strategies of biocontrol in greenhouses and open fields. It is written by experts working in academia and industry from the different continents of the world. Over the past 25 years Research and Development has successfully investigated the potential of pollinators to perform two tasks: dispersal of biological control agents (BCOs) and their pollination service. This book provides a basic overview of the current literature on the different aspects and factors of this novel technology. It explains and presents practical cases of enhancing pollination coupled with the suppression of plant pathogens and pests under various agricultural production practices from greenhouse to open field conditions and crops ranging from orchard fruits, to small and tender berries, vegetables and oil seeds This book offers an overview of salt stress, which has a devastating effect on the yields of various agricultural crops around the globe. Excessive salts in soil reduce the availability of water, inhibit metabolic processes, and affect nutrient composition, osmotic balance, and hydraulic conductivity. Plants have developed a number of tolerance mechanisms, such as various compatible solutes, polyamines, reactive oxygen species and antioxidant defense mechanisms, ion transport and compartmentalization of injurious ions. The exploitation of genetic variation, use of plant hormones, mineral nutrients, soil microbe interactions, and other mechanical practices are of prime importance in agriculture, and as such have been the subject of multidisciplinary research. Covering both theoretical and practical aspects, the book provides essential physiological, ecological, biochemical, environmental and molecular information as well as perspectives for future research. It is a valuable resource for students, teachers and researchers and anyone interested in agronomy, ecology, stress physiology, environmental science, crop science and molecular biology. The use of microbial plant protection products is growing and their importance will strongly increase due to political and public pressure. World population is growing and the amount of food needed by 2050 will be double of what is produced now whereas the area of agricultural land is decreasing. We must increase crop yield in a sustainable way. Chemical plant growth promoters must be replaced by microbiological products. Also

here, the use of microbial products is growing and their importance will strongly increase. A growing area of agricultural land is salinated. Global warming will increase this process. Plants growth is inhibited by salt or even made impossible and farmers tend to disuse the most salinated lands. Microbes have been very successfully used to alleviate salt stress of plants. Chemical pollution of land can make plant growth difficult and crops grown are often polluted and not suitable for consumption. Microbes have been used to degrade these chemical pollutants. Fungal-Plant Interactions is a synthesis of fungal physiology, plant pathology and biology for undergraduates and researchers. Interactions between higher plants and fungi at the cellular and biochemical level are covered together with their ecological importance and theories as to their evolution. This book highlights recent advances in the field of plant-biotic interactions and explores current serious issues in the crop production industry. It is intended to attract more attention to these important, but often overlooked areas, and to stimulate new ideas for future research. Plants are constantly under attack by pathogens, pests, and parasites, which can significantly impact worldwide food production and human health. While pathogens and pests attack and interconnect with their hosts in a variety of ways, plants have developed sophisticated immune systems to fight infections. In the field of plant-biotic interactions, most of the studies to date have focused on the function and signaling pathways of plant disease resistance proteins and pattern recognition receptors, as well as pathogen effector proteins. In contrast, this book presents new and emerging research areas, and introduces students, researchers, academics, and policy advisors to the latest trends in e.g. microbial technology, environmental microbiology, agricultural science, the health sciences, biological sciences and other related disciplines. This book summarizes the application of plant derived anticancer compounds as chemopreventives to treat several cancer types, focusing on the molecular mechanisms of action of phytocompounds and providing an overview of the basic processes at the cellular and molecular level that are involved in the progression of the cancer and can be employed in targeted preventive therapies. In addition, it highlights the development of novel anticancer drugs from plant sources using bioinformatics approaches. The compiled chapter data aids readers understanding of issues related to bioavailability, toxic effects and mechanisms of action of phytocompounds, and helps them identify the leads and utilize them against various cancer types effectively. Furthermore, it promotes the use of bioinformatics tools in medicinal plants to expedite their use in plant breeding programs to develop molecular markers to distinguish disease subtypes and predicting mutation, which in turn improves cancer diagnosis and prognosis, and to develop new lead compounds computationally. The book provides scientific verifications of plant compounds mechanisms of action against various cancers and offers useful information for students, teachers, and healthcare professionals involved in drug discovery, and clinical and therapeutic research. In the course of evolution, a great variety of root systems have learned to overcome the many physical, biochemical and biological problems brought about by soil. This development has made them a fascinating object of scientific study. This volume gives an overview of how roots have adapted to the soil environment and which roles they play in the soil ecosystem. The text describes the form and function of roots, their temporal and spatial distribution, and their turnover rate in various ecosystems. Subsequently, a physiological background is provided for basic functions, such as carbon acquisition, water and solute movement, and for their responses to three major abiotic stresses, i.e. hard soil structure, drought and flooding. The volume concludes with the interactions of roots with other organisms of the complex soil ecosystem, including symbiosis, competition, and the function of roots as a food source. This textbook covers Plant Ecology from the molecular to the global level. It covers the

following areas in unprecedented breadth and depth: - Molecular ecophysiology (stress physiology: light, temperature, oxygen deficiency, drought, salt, heavy metals, xenobiotica and biotic stress factors) - Autecology (whole plant ecology: thermal balance, water, nutrient, carbon relations) - Ecosystem ecology (plants as part of ecosystems, element cycles, biodiversity) - Synecology (development of vegetation in time and space, interactions between vegetation and the abiotic and biotic environment) - Global aspects of plant ecology (global change, global biogeochemical cycles, land use, international conventions, socio-economic interactions) The book is carefully structured and well written: complex issues are elegantly presented and easily understandable. It contains more than 500 photographs and drawings, mostly in colour, illustrating the fascinating subject. The book is primarily aimed at graduate students of biology but will also be of interest to post-graduate students and researchers in botany, geosciences and landscape ecology. Further, it provides a sound basis for those dealing with agriculture, forestry, land use, and landscape management. The interactions between the plant, soil and microbes are complex in nature. Events may be antagonistic, mutualistic or synergistic, depending upon the types of microorganisms and their association with the plant and soil in question. Multi-trophic tactics can therefore be employed to nourish plants in various habitats and growth conditions. Understanding the mechanisms of these interactions is thus highly desired in order to utilize the knowledge in an ecofriendly and sustainable way. This holistic approach to crop improvement may not only resolve the upcoming food security issues, but also make the environment greener by reducing the chemical inputs. Plant, soil and microbe, Volume 1: Implications in Crop Science, along with the forthcoming Volume 2: Mechanisms and Molecular Interactions, provide detailed accounts of the exquisite and delicate balance between the three critical components of agronomy. Specifically, these two titles focus on the basis of nutrient exchange between the microorganisms and the host plants, the mechanism of disease protection and the recent molecular details emerged from studying this multi-tropic interaction. Together they aim to provide a solid foundation for the students, teachers, and researchers interested in soil microbiology, plant pathology, ecology and agronomy. The book addresses current public concern about the adverse effect of agrochemicals and their effect on the agro-ecosystem. This book also aims to satisfy and contribute to the increasing interest in understanding the co-operative activities among microbial populations and their interaction with plants. It contains chapters on a variety of interrelated aspects of plant-microbe interactions with a single theme of stress management and sustainable agriculture. The book will be very useful for students, academicians, researcher working on plant-microbe interaction and also for policy makers involved in food security and sustainable agriculture. This book provides a unique exploration of the inter-relationships between the science of plant environmental responses and the understanding and management of forest fires. It bridges the gap between plant ecologists, interested in the functional and evolutionary consequences of fire in ecosystems, with foresters and fire managers, interested in effectively reducing fire hazard and damage. This innovation in this study lies in its focus on the physiological responses of plants that are of relevance for predicting forest fire risk, behaviour and management. It covers the evolutionary trade-offs in the resistance of plants to fire and drought, and its implications for predicting fuel moisture and fire risk; the importance of floristics and plant traits, in interaction with landform and atmospheric conditions, to successfully predict fire behaviour, and provides recommendations for pre- and post- fire management, in relation with the functional composition of the community. The book will be particularly focused on examples from Mediterranean environments, but the underlying principles will be of broader utility. Botanists and zoologists have recognized for

centuries the specificity of various insects for plants, and entomolo gists have long been aware that insects defend themselves from predators by emitting repulsive odors. Only recently have chemists and biologists established a joint endeavor for studying the chemical relationships between plants and insects. The present symposium volume of the Phytochemical Society of North America's RECENT ADVANCES IN PHYTOCHEMISTRY consists of eight papers dealing with phytochemical relation ships between plants and their insect herbivores. The fifteenth P.S.N.A. annual symposium and meeting was held in August, 1975, on the campus of The University of South Florida, Tampa. The chemical defenses of apparent and unapparent plants were contrasted by Feeny. Rodreguiz and Levin illustrated parallel defense mechanisms of plants and insects and then Hendry, Kostelc, Hindenlang, Wichmann, Fix and Koreniowski discussed chemical messengers for both plants and insects. Subsequently Beck and Reese reviewed plant contributions to insect nutrition and metabolism. Indepth studies for the monarch butterfly-milkweed interaction were presented by Roeske, Seiber, Brower, and Moffitt and for the cotton boll weevil-cotton plant relationship by Hedin, Thompson, and Gueldner. In the latter portion of the symposium Rhoades and Cates presented a general theory concerning the coevolu tion of insects and plant antiherbivore chemistry. Caterpillars are excellent model organisms for understanding how multiple selective forces shape the ecology and evolution of insects, and organisms in general. Recent research using the tools of modern molecular biology, genetics, metabolomics, microbial ecology, experiments conducted at a global level, network analysis, and statistical analyses of global data sets, combined with basic natural history, are yielding exciting new insights into caterpillar adaptations and ecology. The best way to view these research advances is within a framework of tri-trophic interactions. This is a timely topic for research given the central role of caterpillars and plants in the ecology and trophic structure of terrestrial communities. This book is unique in that it contains chapters from a team of experts on a diversity of key topics within caterpillar-plant interactions. This volume brings together contributions by researchers from around the globe, working in both tropical and temperate habitats, and in human-managed and more natural habitats. It is a significant contribution to our understanding of insect biology, and the role that insects, as represented by caterpillars, play in a world increasingly dominated by humans and one in which threats to insect biodiversity are mounting. Chapter 11 is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com. The Natural History of Caterpillar-Ant Associations" is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com. Forty years ago, when PLANT AND SOIL first appeared, Europe was still recovering from the devastating effects of World War II. During the war years, work in many centres of agricultural research had come to a virtual standstill. Buildings and equipment were destroyed, scientists were often forced to terminate their research and teaching activities and funds allocated to such work were diverted to other, at that time, more pressing needs. During the first post-war years reconstruction was undertaken with great zeal and in that light the founding of the new journal PLANT AND SOIL must be viewed. In the pre-war period most agricultural science journals were still primarily national ones and consequently many articles were published in languages mastered by only a limited number of potential readers. In small countries whose languages are not widely understood, the desire arose to publish research findings in one of the major languages. It is therefore understandable that in the early years of the journal's existence, large portions of PLANT AND SOIL were filled with articles from the Scandinavian countries and The Nether lands. Originally, rather frequent use was made of the opportunity to publish also in German and French, but with the advance of English as a major language of

communication, a decline was noticeable in the number of German and French manuscripts submitted. As a consequence the Edi torial Board has recently decided to terminate the publishing of articles in these languages. This book presents a detailed discussion on the direct interactions of plants and microorganisms in the rhizosphere environment. It includes fifteen chapters, each focusing on a specific component of plant-microbe interactions, such as the influence of plants on the root microbiome, and the downstream effects of rhizosphere microbial dynamics on carbon and nutrient fluxes in the surroundings. As such, the book helps readers gain a better understanding of diversity above the ground, and its effect on the microbiome and its functionality. As food producers, plants are constantly under attack by insects. Over the course of evolution, plants have not only developed a sophisticated defense apparatus but have also refined biochemical defense mechanisms to protect themselves, thereby maintaining the ecological balance. Plant-pest interactions induce an elaborate array of reactions involving the release of volatile compounds, effector and signaling molecules, trans-membrane proteins, and a variety of enzymes and hormones. This book offers a comprehensive guide to the strategies that plants employ against insects and other pests to ensure their continued survival. Addressing an important gap in the literature, it shares the latest findings in the field of plant–pest interactions for a broad audience. Providing an overview of the current state of knowledge on plant-pest interactions and their role in the genetic improvement of crops, it offers an essential guide for researchers and professionals in the fields of agriculture, plant pathology, entomology, cell biology, molecular biology and genetics. Phosphorus (P) is an essential macronutrient for plant growth. It is as phosphate that plants take up P from the soil solution. Since little phosphate is available to plants in most soils, plants have evolved a range of mechanisms to acquire and use P efficiently – including the development of symbiotic relationships that help them access sources of phosphorus beyond the plant’s own range. At the same time, in agricultural systems, applications of inorganic phosphate fertilizers aimed at overcoming phosphate limitation are unsustainable and can cause pollution. This latest volume in Springer’s Plant Ecophysiology series takes an in-depth look at these diverse plant-phosphorus interactions in natural and agricultural environments, presenting a series of critical reviews on the current status of research. In particular, the book presents a wealth of information on the genetic and phenotypic variation in natural plant ecosystems adapted to low P availability, which could be of particular relevance to developing new crop varieties with enhanced abilities to grow under P-limiting conditions. The book provides a valuable reference material for graduates and research scientists working in the field of plant-phosphorus interactions, as well as for those working in plant breeding and sustainable agricultural development. The book consists of multiple chapters by leading experts on the different aspects in the unique relationship between arthropods and plants, the underlying mechanisms, realized successes and failures of interactions and application for IPM, and future lines of research and perspectives. Interesting is the availability of the current genomes of different insects, mites and nematodes and different important plants and agricultural crops to bring better insights in the cross talk mechanisms and interacting players. This book will be the first one that integrates all this fascinating and newest (from the last 5 years) information from different leading research laboratories in the world and with perspectives from academia, government and industry. This book marshals ecological literature from the last century on facilitation to make the case against the widely accepted individualistic notion of community organization. It examines the idea that positive interactions are more prevalent in physically stressful conditions. Coverage also includes species specificity in facilitative interactions, indirect

facilitative interactions, and potential evolutionary aspects of positive interactions. This book has a broad scope and provides a comprehensive overview of the most up-to-date knowledge of the plant genus Baccharis. The book is organized into four major topics encompassing the evolution, ecology, chemistry, as well as environmental and medical applications of the genus. This publication is a major reference for an audience of practising researchers, academics, PhD students, and other scientists in a wide-ranging collection of fields, from Sociology to Medicine to bioeconomy. The authoritative overviews in this volume provide a wealth of practical information on current approaches to the study of insect-plant interactions. Methods described include direct behavioral observation; assays of host finding, oviposition, and feeding behavior of insect herbivores; post-ingestion physiological effects; measurement of food quality and sensory responses of insects to plant stimuli; chemical isolation and identification of active phytochemicals; evaluation of plant resistance to insects; and the biochemistry of allelochemic interactions.

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