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The latest findings in seed physiology—discussed as they relate to agricultural problems! Presenting the latest findings in the area of seed physiology as well as the practical applications of that knowledge in the field, the Handbook of Seed Physiology: Applications to Agriculture provides a comprehensive view of seed biology and its role in crop performance. Key topics include seed germination, crop emergence, crop establishment, dormancy, preharvest sprouting, plant hormones, abscisic and giberellic acids, weeds, grain quality, oil crops, and malting quality. Abundant case studies provide information of value to researchers, students, and professionals in the fields of seed science, field crop research, crop science, agronomy, and seed technology. The Handbook of Seed Physiology discusses vital topics which serve as the basis for the development of techniques and processes to improve seed performance and crop yield. In this text, you will explore: the effect of the soil physical environment on seed germination the roles of physiology, genetics, and environment in the inception, maintenance, and termination of dormancy the relationship between the termination of dormancy and the synthesis and signaling of gibberellins and abscisic acid mechanisms of orthodox seed deterioration and approaches for repair of seed damage characteristics, behavior, and mechanisms of desiccation tolerance in recalcitrant seeds the role of seed moisture in free radical assaults on seeds and the protective function of raffinose oligosaccharides the production of free radicals and their effect on lipids and lipid peroxidation components of grain quality in oil crops and factors influencing them structural components and genotypic and environmental factors affecting barley malting quality In addition to the latest scientific information in the area of seed physiology, this text provides insights into practical applications of that knowledge through the description of: screening protocols for germination tolerance to temperature and water stress methods for improving seed performance in the field techniques for controlling preharvest sprouting of cereals breeding and production strategies for improving grain quality population-based threshold models in the prediction of germination and emergence patterns modeling changes in dormancy to predict weed emergence Extensive reference sections accompanying each chapter include both foundation texts and current research. Principles and concepts discussed in the text are elaborated upon through equations, figures, and tables covering such topics as water and soil thermal regimes; seed water potential; temperature and water effects on germination; free radical attack; and molecular structures. Exploring concepts, techniques, and processes related to seed germination and crop establishment, this comprehensive, one-of-a-kind reference is an indispensable tool for seed scientists and agricultural professionals. Add it to your library today and put seed physiology research to work in establishing high-quality “next crops”! The formation, dispersal and germination of seeds are crucial stages in the life cycles of gymnosperm and angiosperm plants. The unique properties of seeds, particularly their tolerance to desiccation, their mobility, and their ability to schedule their germination to coincide with times when environmental conditions are favorable to their survival as seedlings, have no doubt contributed significantly to the success of seed-bearing plants. Humans are also dependent upon seeds, which constitute the majority of the world’s staple foods (e.g., cereals and legumes). Seeds are an excellent system for studying fundamental developmental processes in plant biology, as they develop from a single fertilized zygote into an embryo and endosperm, in association with the surrounding maternal tissues. As genetic and molecular approaches have become increasingly powerful tools for biological research, seeds have become an attractive system in which to study a wide array of metabolic processes and regulatory systems. Seed Development, Dormancy and Germination provides a comprehensive overview of seed biology from the point of view of the developmental and regulatory processes that are involved in the transition from a developing seed through dormancy and into germination and seedling growth. It examines the complexity of the environmental, physiological, molecular and genetic interactions that occur through the life cycle of seeds, along with the concepts and approaches used to analyze seed dormancy and germination behavior. It also identifies the current challenges and remaining questions for future research. The book is directed at plant developmental biologists, geneticists, plant breeders, seed biologists and graduate students. Seed development and germination; Phenotypic maternal effect of photoperiod on seed germination; Seed dormancy and germination; Seed vigor, stress and seed germination. The latest findings in seed physiology—discussed as they relate to agricultural problems! Presenting the latest findings in the area of seed physiology as well as the practical applications of that knowledge in the field, the Handbook of Seed Physiology: Applications to Agriculture provides a comprehensive view of seed biology and its role in crop performance. Key topics include seed germination, crop emergence, crop establishment, dormancy, preharvest sprouting, plant hormones, abscisic and giberellic acids, weeds, grain quality, oil crops, and malting quality. Abundant case studies provide information of value to researchers, students, and professionals in the fields of seed science, field crop research, crop science, agronomy, and seed technology. The Handbook of Seed Physiology discusses vital topics which serve as the basis for the development of techniques and processes to improve seed performance and crop yield. 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It integrates advances in the diverse and rapidly-expanding field of seed science, from ecological and demographic aspects of seed production, dispersal and germination, to the molecular biology of seed development. The book offers a broad, multidisciplinary approach that covers both theoretical and applied knowledge. Seed development and germination; Seed dormancy and germination; Seed vigor, stress and seed germination. Structural aspects of dormancy; Metabolic aspects of dormancy; Early events in germination; Mobilization of polysaccharide reserves from endosperm; Mobilization of nitrogen and phosphorus from endosperm; Mobilization of oil and wax reserves; Axix-cotyledon relationships during reserve mobilization. Introduction; The subject matter of this book; The seed; What is germination; How is germination measured; Some comments on our sources; Plant names; Some articles of general interest; The structure of seeds and their food reserves; The legacy of seed maturation; Imbibition, germination, and growth; Biochemistry of germination and growth; Mobilization of reserves; Control processes in the mobilization of stored reserves. Viability and longevity; Dormancy; The release from dormancy; The control of dormancy; Perspective on dormancy; Environmental control of germination. The data that will be given in the following paper have been collected from various experiments carried on by the writer during the school year of 1906-1907. They go to show the progress of the various tests, the results of which should be expected under similar methods and conditions, rather than a report of stated facts. Object In view: (1) to test the germinating power of various seeds, to determine whether large or small seeds produce the better plants for transplanting, whether the best seeds have a definite location in the plant; (2) to determine just what plants or seedlings seem to thrive better when more or less wilted prior to transplanting; (3) to determine what happens when plants are wilted, particularly those benefited by this process in transplanting. In response to enormous recent advances, particularly in molecular biology, the authors have revised their warmly received work. This new edition includes updates on seed development, gene expression, dormancy, and other subjects. It will serve as the field's standard textbook and reference source for many years to come. Seed Physiology, Volume 2, Germination and Reserve Mobilization, addresses some of the major unanswered questions about seed dormancy, germination, and post-germination development of the seedling. The book contains seven chapters and begins with two studies on dormancy—one on the structural constraints to germination and another on metabolic barriers preventing germination. These are followed by separate chapters on the physical and biochemical events following the imbibition of water by dry seeds; the mobilization of polysaccharide reserves from endosperm; the mobilization of nitrogen and phosphorus from external storage tissues; and the mobilization of lipid reserves in seed tissues. The final chapter reviews the subject of embryonic axis-cotyledon interaction, considering mainly those species where the cotyledons are adapted for the storage of reserves. Both this volume and its companion (Seed Physiology Volume 1. Development) will provide a valuable resource for advanced students, teachers, and researchers in plant physiology, biochemistry, agronomy, and related disciplines. 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 This updated and much revised third edition of Seeds: Physiology of Development, Germination and Dormancy provides a thorough overview of seed biology and incorporates much of the progress that has been made during the past fifteen years. With an emphasis on placing information in the context of the seed, this new edition includes recent advances in the areas of molecular biology of development and germination, as well as fresh insights into dormancy, ecophysiology, desiccation tolerance, and longevity. Authored by preeminent authorities in the field, this book is an invaluable resource for researchers, teachers, and students interested in the diverse aspects of seed biology. The germination of seeds is a magical event, in which a pinch of dust-like material may give rise to all the power and the beauty of the growing plant. The mechanisms of seed dormancy, of the breaking of seed dormancy and of germination itself continue to remain shrouded in mystery, despite the best efforts of plant scientists. Perhaps we are getting there, but very slowly. This book considers germination and dormancy from the point of view of plant physiology. Plant physiologists attempt to understand the relation ship between plant form and function and to explain, in physical and chemical terms, plant growth and development. The place of germination and dormancy in plant ecophysiology is taken into account with attempts to understand the seed in its ·environment, whether the environment be natural, semi-natural or wholly artificial. In due course plant scientists hope to develop a precise understanding of germination and dormancy in cellular and molecular terms, and therefore there is some biochemistry in this book. Biochemists who wish to learn something about seeds should find this book useful. The germination of seeds is a magical event, in which a pinch of dust-like material may give rise to all the power and the beauty of the growing plant. The mechanisms of seed dormancy, of the breaking of seed dormancy and of germination itself continue to remain shrouded in mystery, despite the best efforts of plant scientists. Perhaps we are getting there, but very slowly. This book considers germination and dormancy from the point of view of plant physiology. Plant physiologists attempt to understand the relation ship between plant form and function and to explain, in physical and chemical terms, plant growth and development. 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Since the publication of our monograph on seed physiology and biochemistry (The Physiology and Biochemistry of Seeds in Relation to Germination, Sprin ger-Verlag, 1978, 1982), it has been suggested to us that a text covering the same subject area would be appropriate. This book is our response. Unlike the previous volumes, however, this text is not intended to be either a critical or a comprehensive account. Instead it is a more generalized consideration of the essential aspects of seed physiology and biochemistry as we see them. It also includes a substantial amount of new and different material. In a work of this sort it is inevitable that some simplifications must be made, but we hope, never theless, that we have presented the most reasonable conspectus of areas of con troversy and uncertainty. In this respect, literature citations have been kept to a minimum and do not interrupt the text; they are placed at the end of each chapter and are intended to be used as a source for further references. We hope that this book will be of value to students and teachers in uni versities, colleges, and other institutes of higher learning whose courses include plant biology. Although it is particularly appropriate for studies of seed biol ogy, it should also find broader applications in general plant physiology, agri culture, and horticulture.

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