BOOKS: PLANT ECOLOGY

To Emerge or Not to Emerge

Susan J. Mazer

We often regard the life cycle of seed plants as straightforward and continuous. They germinate from seeds, grow, flower, export and receive pollen, and produce new seeds. But an additional phase, seed dormancy, often lasts longer than the cumulative duration of all the other steps. This period, extending from seed maturity to germination, is the subject of Carol and Jerry Baskin's comprehensive overview, *Seeds*.

Seeds
Ecology, Biogeography, and Evolution of Dormancy and Germination
by Carol C. Baskin and Jerry M. Baskin
Academic, San Diego, 1998. 680 pp. $99.95. ISBN 0-12-080260-0.

Over the last three decades, the authors' names have become synonymous with detailed studies of seed germination and dormancy. *Seeds* stands out among the numerous volumes on germination because it is satisfyingly pervaded by the Baskins' understanding that, like any other trait, seed dormancy evolves. Recurring throughout the book is a clear evolutionary message: determining what makes seeds germinate (or not) requires knowledge of the ecological conditions that they normally encounter. By culling the results of thousands of studies covering over 3500 species, the Baskins show that the requirements for breaking dormancy and for germination can usually be unequivocally interpreted as adaptations that protect seedlings from exposure to the most predictable environmental hazards.

The authors begin by reviewing the basic components of successful and unambiguous germination experiments. They then offer detailed descriptions of the currently recognized classes of seed dormancy. (Researchers working on species whose seeds have no special germination requirements may be surprised to find that there are seven major classes of dormancy, the subdivisions within which yield a total of 18 more or less distinct behaviors.) Following this introduction, three chapters survey hundreds of studies on the environmental factors known to break each kind of dormancy. Filled with brief summaries of primary research, these chapters are very dense.

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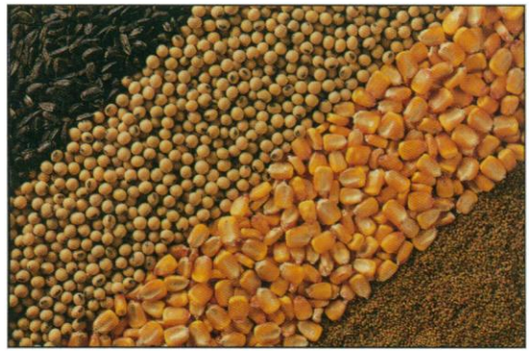
Subsequent chapters on seed banks and on the causes of intraspecific variation in germination behavior might ordinarily escape the attention of theoretical population biologists, but overlooking them would be perilous. Researchers have been slow to include parameters that reflect realistic seed bank behavior in mathematical models of plant population dynamics. This is not surprising given the levels of inter- and intraspecific variation in the conditions necessary for germination, the proportions of seeds germinating in response to particular environmental cues, and the number of times a seed may cycle between dormant and non-dormant states. Although the prospect of assigning values to such parameters is intimidating, realistic estimates are critical for accurate predictions of population trajectories. Even if the Baskins' volume will provide little comfort to those who develop or interpret population dynamic models of species with dormant seeds, it clearly identifies the parameters (and the ranges of their values) that must be considered.

Two well-organized chapters offering a geographical perspective document the tremendous variation in the germination ecology of sympatric species. These cover tropical, subtropical, temperate, and arctic zones. For each of the zones' major vegetation types, the Baskins discuss the germination requirements of the different plant life forms (trees, shrubs, vines, and herbaceous species). In a separate chapter, they offer similar digests of the dormancy characteristics of plants with specialized life cycles (including parasites, orchids, aquatic plants, and halophytes).



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The book's final chapter begins to provide the synthesis the authors, and probably most readers, seek. Here the Baskins use one of the volume's major contributions—the tables that collectively list hundreds of species, their dormancy types, and some aspects of their dormancy-breaking requirements. The authors' analyses of these tables reveal several intriguing patterns. For example, higher percentages of species with dormant seeds are found in plant communities that experience cyclical periods of cold or little precipitation. These and other patterns raise many tantalizing questions, but, curiously, no statistical analyses are reported to confirm their significance. Readers would have to return to the original tables to extract data for rigorous analysis; the data are ripe for such mining. In fact, multivariate analyses of the data in *Seeds* would help tease apart the associations between climate, vegetation type, life form, and dormancy type. I was sorry to find that that the volume lacks such analyses.

The results of the authors' examination of the evolutionary history of dormancy are largely inconclusive. Because there are no unambiguous morphological indicators of most kinds of dormancy, the brief summaries of paleoclimates and the fossil history of seed morphology provide little insight into the ecological factors involved in its evolutionary origin. It seems likely that most types of dormancy have evolved in multiple lineages, but determining the sequences and directions of dormancy evolution within seed plants will require detailed phylogenetic analyses that were beyond the scope of this volume.

Those considering *Seeds* as the focus of, say, a graduate course should note a few omissions. Perhaps the most glaring is the lack of summaries for all but the final chapter. The vast amount of information presented makes for dull reading when there are no overriding themes with which to glean its significance. A glossary would also have been helpful, especially given that the authors hope the volume will be used by newcomers to seed ecology. In fact, the authors hope to "(1) provide people who are just beginning to learn about seed germination a comprehensive overview of seed germination ecology, biogeography, and evolution and (2) give active researchers in the field a sense of what we know and do not know about these aspects of seed biology and thus what research needs to be done on them in the future." These aren't the usual goals of a reference volume, and I doubt that this book will be read cover-to-cover by even the most avid seed enthusiast. Nevertheless, it should be on the bookshelf of any ecologist, evolutionist, or theoretician who needs to know how seeds can be coaxed to get on with the *rest* of their life.