BOOK REVIEW

Leaf Defence. Edward E. Farmer. Oxford, UK: Oxford University Press. 2014. viii + 216 pp. ISBN 978 0 19 967144 1. Hardback £35.
doi:10.1017/S0960428614000304

Fifty years ago, a simple observation became one of the most intriguing and controversial questions in the field of ecology: Why is most of the world green? Leaves are highly abundant but most do not fall prey to hungry herbivores. In *Leaf Defence*, plant molecular biologist Edward E. Farmer, from the University of Lausanne, addresses this question. In a very succinct yet comprehensive format, Farmer explores the remarkably diverse means by which leaves defend themselves against herbivores. The emphasis here is on how the evolutionary 'arms race' between plants and herbivores may have driven the suite of leaf defence traits that we observe today. Using this approach, Farmer takes us on a guided tour, introducing and discussing the different types of leaf defences, ranging from macroscopic to molecular level and from direct to indirect defences. As a guide, Farmer is engaging, authoritative and didactic. For example, concepts are interspersed with personal anecdotes and quotations which emphasise the main points, and provide a glimpse of how methods and experiments were designed in order to test the different hypotheses.

The introductory chapter presents a broad overview of the pressures exerted on leaves by herbivores, with a specific focus on the diversity and impact of folivory. This chapter addresses the notion that herbivory is as inconspicuous an event as it is important in shaping plant responses – and this concept shapes the basis of what is discussed in the succeeding chapters of *Leaf Defence*.

A difficult challenge exists in demonstrating the specific role of leaf defences against herbivory, as a range of biotic and abiotic factors exerts selective pressures on these features, while some features may also provide non-defensive functions. The book reiterates the fact that there are many types of herbivores to defend against, and there is no perfect form or structural or chemical strategy to combat all herbivores effectively. Chapters 2 to 4 focus on leaf colouration and form, and the structural and chemical defences which plants use to deter or escape from herbivory, spanning a range of strategies and utilising examples from a diversity of systems. The chapters collectively demonstrate the theory that plants have evolved leaf features and form as a first line of defence against herbivores, and structural and chemical defences provide an important second line of defence upon herbivore attack.

Chapter 5 offers a deep yet accessible exploration of inducible leaf defence mechanisms. Farmer is perhaps best known for his work on the jasmonate pathway and it is not surprising, then, that he explains wound signalling with clarity and verve. Similarly, Chapter 6 illustrates the remarkable partnerships between plants and members of the third trophic level to introduce the topic of indirect defences.

Farmer's choice of examples provides an opportunity for the exposition of the power of selective pressure and evolution. For example, ant–*Vachellia* associations are explained in detail together with the potential pressures that could lead initially to their evolution.

The categorisation of defences in different chapters and the order in which they are presented allow for an easy distinction between direct and indirect defences, and the interaction between them, and it also prepares the reader for the examination of evolutionary anachronisms in plant defences presented in Chapter 7. The last chapter, Chapter 8, is somewhat speculative. After several compelling hypotheses of the relationship between the defensive features in the endemic flora of the Indian Ocean island of Socotra and the existence of indigenous vertebrate leaf eaters have been presented, the reader may be disappointed to find that there is no evidence that such a herbivore has ever existed on the island or on the neighbouring archipelago. The book ends with a synthesis where applied aspects of plant defences are briefly mentioned, and a glossary.

Throughout the book, the roles of insect and vertebrate herbivores are discussed while leaf pathogens are absent, although this is acknowledged in the preface. Geographically, the breadth of coverage is wide with examples ranging across five continents and a diversity of ecosystems, illustrated by high quality images and graphics. At 216 pages in total, *Leaf Defence* provides a sufficient overview of the topic from which the reader can explore in further detail. Farmer's text is an enjoyable read for anyone interested in plant defences with an evolutionary perspective, accessible to a general audience from students studying ecological courses to interested biologists and biochemists.

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