

Book review

Herbicide Classes in Development: Mode of Action, Targets, Genetic Engineering, Chemistry

Peter Böger, Ko Wakabayashi, Kenji Hirai. Springer-Verlag Berlin, 2002. ISBN 3-540-43147-0. 364 pp. £97.50.

In these times where much of the developed world is obsessed with organic farming and is moving away from the intensive use of agrochemicals, it is important that the underlying science which has led to the development of many successful herbicides continues to be appraised and up-dated, as these compounds continue to have much to offer agriculture. In addition there is some excellent fundamental plant biochemistry here, which is particularly relevant to the readership of *Phytochemistry*, given the contribution herbicides have made to our understanding of plant metabolism and physiology.

The editors have organized the book logically and there is plenty to keep both the newcomer and experienced weed scientist and agrochemist occupied. The first eight chapters cover the modes of action of the major classes of herbicides in use today, namely the inhibitors of acetolactate synthase, carotenogenesis, aromatic amino acid biosynthesis, glutamine synthetase, acetylCoA carboxylase, very-long-chain fatty acid synthesis, cellulose biosynthesis and protoporphyrinogen oxidase respectively. In each case, the mode of action of the respective herbicides is considered, along with associated structure–activity relationships and an in depth examination of the biochemistry and molecular biology of the proteins targeted by each class of compound. It is in this latter respect that this book brings something particularly new to the literature, as it represents a very up to date review of how our understanding of herbicide action can facilitate the rational genetic engineering of plants to show resistance to these crop protection agents. There is also a consideration of using this molecular information to explain how herbicide resistance can evolve in weed populations in the field. For those involved in teaching crop protection at undergraduate or graduate level these first eight chapters will be a really useful reference source on herbicide action, offering a contemporary and holistic view of the subject.

The remaining five chapters are more appropriate for the specialist reader. Chapter nine details the technologies used to genetically transform plants. Personally, I think this might have read better if just a couple of case

histories on engineering herbicide resistance had been focused on in much greater detail. Chapter ten then examines how synthetic modifications of the core herbicide chemistries described in the first eight chapters has led to differing selective activities. The structural evolution of the chemical families of acetolactate synthase inhibitors is a particular triumph of the synthetic chemist's art and has allowed the diversification in the use of these highly active compounds in weed control in all the major crops. This is densely written stuff, but it has taken an enormous amount of effort and is a mine of information for agrochemists. Chapter eleven considers the differential activity of enantiomers of herbicides *in planta*, a topic which has received very little attention despite being a well recognized phenomenon in drug action in animals, while chapter twelve examines the determinants of herbicide uptake across the cuticle. These two chapters are very useful reviews of the literature and would not normally be found together in a single book on herbicide action. The final chapter describes some structure activity studies with inhibitors of very-long-chain fatty acid biosynthesis carried out by two of the editors and while a little indulgent, it demonstrates their enthusiasm and commitment to the basic science underpinning herbicide development.

In summary, this is a thoroughly contemporary account of how the major classes of herbicides work and how this knowledge can be used to modify their activity using either modifications to the plants through molecular genetics, or changes to their structure through synthetic chemistry. This would be a classic reference for final year undergraduate plant biochemists/chemists working on herbicides, or students taking graduate courses in crop protection. For specialists in weed science and the agroindustry there is also all the latest information on specialized aspects of herbicide action such as their uptake and detailed consideration of the relationship between chemical structure and activity. As such it would be a very useful book to purchase for the reference libraries of universities, companies and public institutions which offer training in, or are in the business of, crop protection.

Robert Edwards

School of Biological & Biomedical Sciences
University of Durham, Durham DH1 3LE, UK
E-mail address: robert.edwards@durham.ac.uk