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Book review

Alternatives to pesticides in stored-product IPM
Edited by Bhadriraju Subramanyam and David W. Hagstrum, Kluwer Academic Publishers, Boston, October 2000. ISBN: 0-7923-7976-4. Price: EUR 143,00/USD 125,00/GBP 88,00.

This book contains 15 chapters on topics ranging from crop varietal resistance to various physical, biological and other control methods, and pest detection. The authors have provided a good summary of the book in the Preface and each chapter finishes with sections on present usage, economics and future research needs which is useful and gives continuity to the book as a whole. There were three basic choices for organisation of material, grouping into biological, physical and novel chemical methods, grouping into raw, processed or finished products, or alphabetical by topic, but none of these were adopted and only the first two and the last chapters seem well placed. However, there is little difficulty in finding the relevant coverage of a topic of interest and all topics are discussed well in the chapters with only a limited amount of duplication.

Starting with a chapter on monitoring and decision support, the book moves on to consider physical control methods such as basic sanitation, exclusion by design and packaging, aeration in bulk commodities, use of temperature extremes and modified atmospheres, then on to insect growth regulators, varietal resistance and then some biological control methods, use of botanicals and some further physical control methods before concluding with a short chapter on integration. The inclusion of a botanicals chapter was on balance justified but presented a grey area with respect to alternatives to pesticides in that so many past pesticides have had a botanical origin, for example rotenone, nicotine and pyrethrum from which the modern pyrethroids have been derived. The chapter draws upon an earlier book by Prakash and Rao listing over 200 species of plant showing some activity against stored product pests.

The importance of estimating the size and location of an infestation is established in Chapter 1. The vulnerability of conventional sampling methods to unusual or uneven infestation distribution patterns is emphasised and the value of trapping as an alternative approach is strongly advocated. The problem of relating sampling and trap catches to economic action thresholds is then addressed with a description of the ongoing development of predictive expert and management systems in various segments of the food industry. The first step in pest control is good hygiene and the second chapter describes the legal safeguards in the US to counter pest problems. Cleaning, exclusion of pests by facility and machinery design, early detection of pests and contour mapping of results, removal of pests by sieves, impactors and screens, and use of insect-proof packaging, are described as components of a production system.

Aeration of bulk commodities is described in the third chapter, which gives details of the movement of cooling and drying fronts, effects on insects and the results of various modelling studies. The following chapter on temperature, shared somewhat surprisingly between four authors, follows on logically with a consideration of extreme temperature effects on insects, acclimation by target pests, and methods of providing heat or cold. It gives a comprehensive account of research and current usage of these technologies in North America.

The next chapter, on controlled atmospheres, describes the long history of hermetic storage, the effects of low oxygen or high carbon dioxide on insect pests, the situations in which the technique is used round the world, and methods for atmosphere provision and application. This latter topic area includes the sealing and pressure-testing of enclosures, the influence of commodity particle size on purging, and the use of pressure chambers for rapid treatments with carbon dioxide.

The next two chapters move from physical control to consider insect growth regulators and plant varietal resistance. Juvenile hormone mimics, moulting hormone agonists and chitin synthesis inhibitors are described in detail, including the botanical azadirachtin which acts to suppress prothoracicotropic hormone (PTTH). The importance of varietal resistance in history is described together with how to evaluate the resistance, the mechanisms which exist and the use of transgenics.

Chapters 8–10 deal with biological control methods based on pathogens, parasites and predators, and pheromones, respectively. All may provide a component for pest management programmes based primarily on good sanitation, but are recognised to be too specific to local conditions and pest type to play a major role in isolation. Use of pathogens and predators may encounter the regulatory need to cover concerns over safety towards non-target organisms and health. Pheromones have a far more significant role in the early detection of pest populations.

Following Chapter 11 on botanicals which has been covered earlier, the next three chapters preceding the conclusion on integration of the various IPM methods, return to physical control. Chapter 12 on inert dusts, the longest in the book, provides a full account of this important and recently revived pest control technique for bulk commodities, concentrating mainly on diatomaceous earths. Radiation is covered in Chapter 13, there now being evidence of an abatement of public resistance to the technique with the current emphasis being placed on non-ionising radiation (e.g. microwaves) and ionising radiation provided by electron accelerators rather than γ-ray-emitting isotopes. Chapter 14 deals with impaction devices used in the food processing industry in more detail than outlined in the second chapter. As the editors hoped in their introduction, the book should indeed be a useful text for researchers, trainers, trainees, students, consultants, regulators, pest controllers and food industry personnel alike.

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