Literature

Gerling, Dan (ed.) 1990: Whiteflies: their Bionomics, Pest Status and Management. Intercept Ltd, Andover, Hants, UK. 348 pp. ISBN 0-946707-16-2. Price GBP 40.

Whiteflies (Homoptera, Aleyrododea) are an important group of pest insects in warm regions. Investigations on whiteflies in applied entomology are scattered throughout the scientific literature, but no up-to-date handbook on the topic has been available. Based on this fact, Dan Gerling organized during the XVIII International Congress of Entomology in Canada in 1988 a symposium covering all recent knowledge on these insects. The present book is a summary of presentations during that symposium, to which 23 specialists from 9 countries contributed 13 papers, presented as separate chapters in the book. These chapters are, however, very thoroughly rewritten with extensive literature lists added (altogether about 1100 references); thus they can be used as an introduction to each topic.

The chapters are 1) "Whiteflies: diversity, biosystematics and evolutionary patterns" (R. M. Bink-Moenen & L. A. Mound, 12 pp.), 2) "The morphology of whiteflies" (R. J. Gill, 34 pp.), 3) "Whitefly-plant relationships: Behavioral and ecological aspects" (J. C. van Lenteren & L. P. J. J. Noldus, 44 pp.), 4) "Whitefly-plant relationships: Plant resistance" (O. M. B. De Ponti, L. R. Romanow & M. J. Berlinger, 16 pp.), 5) "Sampling and spatial patterns of whiteflies" (B. S. Ekbom & Xu Rumei, 16 pp.), 6) "Whitefly population dynamics and modelling" (J. Baumgärtner & E. Yano, 24 pp.), 7) "Natural enemies of whiteflies: predators and parasitoids" (D. Gerling, 40 pp.), 8) "Natural enemies of whiteflies: Fungi" (J. J. Fransen, 24 pp.), 9) "Epidemiology of whitefly-transmitted viruses" (S. Cohen, 16 pp.), 10) "Whiteflies in agricultural systems" (D. N. Byrne, T. S. Bellows Jr. & M. P. Parrella, 36 pp.), 11) "Chemical control and insecticide resistance of whiteflies" (V. Dittrich, S. Uk & G. H. Ernst, 24 pp.), 12) "The use of natural enemies for the biological control of whiteflies" (J. C. Onillon, 28 pp.) and 13) "Integrating biological control of whiteflies into crop management systems" (R. V. Dowell, 22 pp.).

In the first chapter, the systematics at both specific, generic and suprageneric levels are discussed. Most descriptions have been based on the fourth instar larvae ("puparium"), and only in the highest classification (subfamilies) has the adult stage been determinative. The authors express their doubts about the relevance of the present classification and point out that future taxonomic studies must include all stages of the whiteflies as well as studies on the host plant range.

All important characters of different stages potentially useful in the taxonomy and classification of whiteflies are described in the second chapter. The importance of some recently discovered characters of the adult stage in the taxonomy of whiteflies are also indicated.

The third chapter deals with host-selection in whiteflies, but basic behavioural and ecological information exists for only a few species. The whiteflies are attracted by yellow-green colour, but the selection of host plant occurs only after landing. For polyphagous species there is evidence for adaptation of local populations to new host plants. In general, moving after emergence of the adult is limited, and the resulting distributions aggregated. There are, however, some evidence for a dispersal phase in *Trialeurodes vaporariorum* (Westwood).

Plants resistance to the whiteflies is discussed in the fourth chapter. The whiteflies are known to be vectors of plant diseases (viruses) and thus are of economic importance. Some examples of resistance among economically important plants are given. However, it is a long-term task to develop resistant varieties of plants.

For monitoring of the whiteflies as pest insects, the method of sampling is essential. The fifth chapter deals with determination of the spatial distribution of whiteflies and sampling. It is stated that the whiteflies are highly aggregated on many levels. Aggregation occurs both per habitat, per plant and per leaf and may be different for different stages. The biology and behaviour of the whitefly are both important in determining sample unit and sample size.

In the next chapter dynamic simulation models for whitefly-systems are reviewed. Comparison is made between models of three different levels: whitefly population, the whitefly-hostplant system, and the whitefly-parasitoid system. More thorough information on the whiteflies is, however, needed to improve the models.

The natural enemies of whiteflies are discussed in the next two chapters. Their predators have been poorly studied, the most important groups being Coleoptera, Heteroptera, Neuroptera and some Acari. The parasitoids are better known: all belong to Hymenoptera and are usually highly specialized for their hosts. Long-range host-finding has not been determined, but host discrimination and some other features like superparasitism have been more thoroughly studied. Among pathogens, only fungi are known to infect whiteflies, the genus *Aschersonia* being especially important. The status of many other species belonging to other genera is unknown. The use of pathogens in integrated control of whiteflies is discussed.

In the ninth chapter, the epidemiology of viruses transmitted by *Bemisia tabaci* Gennadius is reviewed. This may be of some interest also for Finnish scientists because this whitefly has recently been recorded here.

The importance of whiteflies in agricultural systems is pronounced in the tropics. The authors of the 10th chapter state that only about 15 out of 1200 known species have a significant impact on crop yield, but the range of these species has been greatly enlarged unintentionally by man. They transmit more than 15 viruses among herbal crops and also cause direct damage to these plants. It seems clear as well that whiteflies are an increasing problem on a world-wide level.

In the last three chapters the control of whiteflies as pests is reviewed. Methods include chemical, biological and integrated control of whiteflies. Because the whiteflies are important pests also in green-houses these chapters are of some interest even for entomologists in northern regions. It is stated that direct use of chemicals causes a strong selection pressure on the whiteflies and results in some degree of resistance against the chemicals. For biological control there are certain examples of successful use of parasitoids. In general it seems valid that the greater the use of non-chemical controls, the better the long-term results in the integrated control of whiteflies.

This book will certainly furnish important inspiration for further research on whiteflies.

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