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BOOK REVIEW

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Book review: *Edible insects in sustainable food systems*

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This recently published book on edible insects and sustainable systems is a nice addition to other recent books on insect production and utilisation (Dossey et al., 2016; Van Huis and Tomberlin, 2017), which every person, dealing with insects for food or feed, should have. Having a complicated task of highlighting the most recent developments in science and technology, the authors and editors of the book were able to compile a volume of almost 500 pages divided into 8 parts and 30 chapters. The book starts with an optimistic introduction on the potential of insects to fill a viable niche in future food production, specifically pointing out the ability of insects to provide more efficient animal-sourced food for developing and emerging economies. The introduction identifies the need for a deep understanding and assessment of insects' role for future generations. The production and consumption of insects is set in the context of sustainable food systems dealing with a wide range of topics, which are aimed to cover social, environmental, economic and cultural aspects of sustainable development. The introduction closes with a call to explore and develop insect production in local and global food systems.

The first part of the book consists of a single chapter, which presents a short analysis on basic biological features of insects (exoskeleton structure, insect life cycle, insect gut morphology, rearing and colony establishment). The general overview of main biological characteristics results in the

conclusion on the importance of the knowledge on insect biology, potential diseases, insect interactions with other organisms and the environment in order to realise the full potential of insects to be used for food and feed.

The second part of the book, devoted to the role of insects in culture, includes three chapters, which cover historical and modern evidences of insect consumption in the Arctic, India and North America. They present historic indications on influences of insect consumption on traditions of Inuits, on the myths and folklore of the Adi tribe, and indigenous customs of North American populations. The chapters also reveal the modern attitude towards insects resulting in the search for the new applications for Arctic tribes, potential risks of overexploitation of resources in the environment of Aidi tribes, and commercialisation of insect production in North America.

The third part of the book touches on the nutritional properties of insects and the impact of those on human health. It includes a brief overview of the nutritional composition of insects with highlights on the quality of vitamins, minerals, proteins and fats. Further it proceeds with a detailed analysis of macro- and micronutrients of insects in East Africa in relation to health benefits and cultural traditions (connection to the previous part of the book). It sums up with an analysis of potential biological and chemical hazards related to insect consumption.

Part IV concentrates on the challenges and potential of insect application in gastronomy. It starts with a limited survey of future chefs with results indicating their general willingness to experiment with insects in future. Next, it deals with *casu marzu* as an example of insect application in food production and processing in Mediterranean countries. In the final chapter a few examples of successful modern culinary applications are presented in relation to the South Korean market.

The fifth part covers a range of issues related to environmental impacts of insect production and consumption, need for their conservation, future market opportunities and ethical challenges. Environmental impacts of insect production are introduced as more beneficial in comparison to traditional livestock production, however, limitations on the knowledge available are indicated. The second chapter concentrates on the need to preserve natural habitats for the conservation of biodiversity and ability of sub-Saharan indigenous people for traditional insect harvesting from nature. It further proceeds with a conceptual indication of sustainability and insect proteins depending on ethical values and shifts of perception. The final part indicates the challenges for the insect marketing as 'sustainable superfood' via the comparative analysis with other 'superfoods'.

In the next part insects are analysed as a potential feed for animals. The first chapter deals with comparative analysis of small scale production of *Musca domestica* and *Hermetia illucens*. The next chapter addresses the potential and limitations of insect-based feed application for aquaculture, with specific attention to the need to be able to rapidly upscale insect production. Insights on the DESIRABLE project and potential scenarios for *Tenebrio molitor* upscaling for feed production are presented in detail in the following chapter. Next, quite an overlapping chapter indicates the potential of insects for feed applications. It identifies a decision-making framework and some of the parameters important for the establishment of the new production. The final chapter returns attention to the mealworms and their production not only for feed but also for food in the scope of a few European and national funded projects. A need for more research towards efficient feed development is highlighted.

The importance of consumer acceptance and preferences is highlighted in part VII of the book. A few chapters introduce 'a deep dive' into the historic-genetic, physiological, psychological, sensorial, socio-cultural and ethnographic conditions as a basis for consumption of insects. Other chapters enrich the set framework with examples of the consumer attitude towards insects in Europe, the USA and Kenya.

The last part deals with issues of legislation for the use of insects for food and feed. It starts with a chapter on the PROteINSECT project as a nice example of research on the application of insects for feed, but legislation is dealt with in a very limited manner. Further chapters fulfil the gap by providing a nice review on the limitations and opportunities set by the legislation for insect harvesting, growing and processing in Thailand, the Global South and South Africa. It concludes with a chapter on the role of insect producer associations for the lobbying of legislation changes in Europe.

In summary, it is necessary to mention that there is an overlap between the chapters and that not all the information has been introduced in the appropriate place. Readers may be puzzled by the repetition of material and the position of some chapters. Overall this book is a valuable and timely addition to the previous books on the topic of insects as food and feed, and is interesting for the professionals in the field of food and feed science, students, human and animal nutritionists and entrepreneurs.

References

- Dossey, A.T., Morales-Ramos, J.A. and Rojas, M.G., 2016. Insects as sustainable food ingredients: production, processing and food applications. Academic Press, London, UK.
- Van Huis, A. and Tomberlin, J.K., 2017. Insects as food and feed: from production to consumption. Wageningen Academic Publishers, Wageningen, the Netherlands.