

Preface

Vorwort

The western corn rootworm *Diabrotica virgifera virgifera* is one of the most significant corn pests. Since it was introduced accidentally into Europe in 1992 near Belgrade in Serbia, it has spread and invaded many important corn growing areas in Europe. In Germany, mainly the federal states of Bavaria and Baden-Württemberg are affected. Hesse, North Rhine-Westphalia, Rhineland-Palatinate and Saxony have detected individual specimens but the beetle has not yet established there. Therefore, effective control measures are required to slow down the further spread of the beetle in Germany to protect corn production in the areas concerned in the long term. To achieve these aims, an extensive research programme was established in 2008 by the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) and the Bavarian State Ministry of Food, Agriculture and Forestry (StMELF) with the participation of the federal state of Baden-Württemberg. This programme aimed at gaining knowledge and enabling scientific recommendations regarding necessary measures for containing and controlling the western corn rootworm.

23 projects were sponsored within the research programme. They considered the most varied aspects, from the biology of the beetle, efficacy and environmental compatibility of different control measures for beetles and larvae to economic impacts. The *Diabrotica* website of the research programme (<http://diabrotica.jki.bund.de>) provides general information on the beetle, descriptions of the projects and a list of publications containing about 90 publications up to now which are a result of the research programme. Moreover, the website allows access to a simulation model for a crop-specific prediction of the beetle's population dynamics (the model is hosted by www.ISIP.de). The research programme was completed in 2012 and the results were presented at the International Conference on the German *Diabrotica* Research Program organised by BMELV at the Julius Kühn-Institut in Berlin. More than 80 participants from 10 European countries attended the event and several *Diabrotica* experts from different European countries contributed with scientific presentations. Almost all contributions are presented within this special issue of the Julius-Kühn-Archiv, either as short or extended abstracts or as full scientific papers.

The conference provided the most up to date knowledge and the basis for Germany to improve measures to contain and control this significant pest. Maintaining crop rotation is the most suitable and successful way of controlling the beetle and hindering its further spread. The replacement of maize with other crops is so successful because *Diabrotica* larval development on alternative host plants such as grasses and cereals is not possible or very limited. In addition to crop rotation, chemical control measures against *Diabrotica* using insecticides are effective and should therefore be made available as an additional option. Effects on honey bees were assessed and key factors for risk mitigation identified. Data to improve seed treatment and spray applications to reduce environmental effects were presented. Other methods such as controlling *Diabrotica* larvae with entomopathogenic nematodes proved to be very effective in many studies and should be optimised further to make biological methods available for practical control of *Diabrotica*. The basic principles and prototypes for forecasting models have been developed, which now have to be validated and improved. The economic impact of the beetle and of the official control measures proved to strongly depend of regional conditions and farming types. A consequent eradication of single small new *Diabrotica* outbreaks showed to be still economically very appropriate when considering the overall impact for Germany. The spread situation in Bavaria and Baden-Württemberg, however, could in the long term lead to *Diabrotica* becoming a "normal" pest that needs IPM control measures with threshold concepts.

Several remaining knowledge gaps were identified that need further studies to cope with *Diabrotica*. Though relevant environmental aspects of chemical seed treatment are now understood, still more research is needed to get such insecticides registered for control of *Diabrotica*. Resistant plants cultivars would support sustainable maize production, but such research still needs support. Practi-

cal application of entomopathogenic nematodes needs more improvement and should be accompanied by other biological alternatives like entomopathogenic fungi. When the newly developed models on population development and spread of *Diabrotica* will be validated with data already available from infested areas (e.g. Hungary, Romania, Austria), the federal states in Germany could plan their monitoring activities and control strategies much more efficiently. Results on egg density in the soil could be integrated as parameters into these models, making them more reliable and providing a first approach for infestation-damage relationships which still offer a large research potential for the future. In order to minimise income losses for farms in infested areas with crop rotation restrictions, regional studies on possible alternative plant species for crop rotation (e.g. for fodder or bioenergy) should be carried out.

For the future it is expected that most results will be of practical use for growers. Future research is needed to ensure an efficient and sustainable maize production for food, feed and energy in Germany despite the presence of *Diabrotica*.

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Januar 2013