

Preface

These are extraordinary times to be a biologist. The advent of new DNA and RNA sequencing technologies that allow massive amounts of sequence to be generated at a very low cost means that the opportunities offered by application of genomics tools are now available to researchers working with almost any organism. This is in stark contrast to the situation just a few years ago where almost the only genome sequences that were available were those of a few carefully chosen model organisms. With so much data available, the best way to drive biological discovery forward and ensure that practical developments emerge is to work in teams rather as individuals.

The potential benefits of closer co-operation between researchers seeking to exploit this new genome information were recognised by COST who, in 2006, approved funding for COST Action 872 “Exploiting genomics to understand plant-nematode interactions”. The aim of this Action (as lifted from the original proposal) was “to develop a co-ordinated approach to exploitation of genomics information that is appearing for plant parasitic nematodes and host crops”.

Plant parasitic nematodes cause economic losses to crops throughout the world. The need for new control strategies for plant nematodes has become more pressing in recent years as many of the most effective nematicides have been withdrawn from use, or scheduled for withdrawal, on environmental grounds. In addition, increased international trade and movement of materials means pressure on quarantine organizations to keep new pests and diseases out of new areas. The difficulties faced by workers in this sector are reflected by the introduction and apparent establishment since 1999 of the pine wilt nematode, *Bursaphelenchus xylophilus* into the EU.

Although they are damaging pests, many plant parasitic nematodes have fascinating interactions with their hosts. Plant nematodes can be ectoparasites, browsing on cells at the root surface, or can be endoparasites that invade the host plant and migrate through host tissues. The most complex interactions are those between the sedentary endoparasites and their hosts, including the most economically important nematodes—the root knot and cyst forming nematodes. These induce feeding structures (giant cells or syncytia) which are kept alive for several weeks in order to supply the nematodes with the nutrients they need to reach maturity. This is a degree of biotrophy that is almost unparalleled by any plant pathogen. In order to induce the formation of the feeding site the nematodes induce huge changes in plant gene

expression including changes in the cell cycle and other fundamentally important developmental processes. Uncovering the mechanisms behind feeding site induction and suppression of host defences offers huge scientific opportunities.

Nematodes, of course, do not have it all their own way. Natural resistance against many nematode species is available and there is much work ongoing aimed at understanding resistance mechanisms and identifying resistance genes. One of the immediate outputs of genomics programmes is a full list of potential targets for new control strategies against nematodes using chemical or GM approaches. Much progress has been made—particularly in the latter area.

The purpose of this book is to showcase the developments in plant-nematode interactions over the last few years and to summarise the impact that genomics has had on our field. We have also tried to include sufficient background information in Part I to make the book accessible to relative newcomers to the field. We hope that this will make it useful to new students and postdocs entering this area for the first time as well as to more established researchers.

We would like to acknowledge the impact that COST funding has had on plant nematology in Europe over the last four years. Funds from COST have allowed researchers to meet each year and forge new partnerships that will tackle important areas in this field. Funding has been made available to early career stage researchers to attend these meetings, undertake exchange visits and attend training events. COST funding has therefore had an impact on the skill development of many young plant nematologists.

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