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A handbook of leafhopper and planthopper vectors of plant disease

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Abstract

A new Handbook to leafhopper and planthopper vectors of plant disease will be produced, funded by The Leverhulme Trust. A background to the project is given.

Key words: Auchenorryncha, Phytoplasma, vector, leafhopper, planthopper, handbook.

Introduction

Leafhoppers and planthoppers (Hemiptera = Rhynchota: Auchenorrhyncha) are among the most abundant groups of insects. Around 20,000 leafhopper (Cicadellidae) species have been described but estimates suggest 100,000 species may exist (Dietrich, 2005). In addition there may be around 10,000 planthopper species of which the most significant pest species occur within the family Delphacidae. Around 200 vectors of phytoplasma are already known but many more are likely to be recognized because there are many more phytoplasma diseases characterised than there are known vectors of the diseases. Most the disease vectors will be found among leafhoppers and delphacid planthoppers. Recent papers by Redak *et al*. (2004) and by Weintraub and Beanland (2006) have highlighted the importance of the plant diseases and their vectors.

Most leafhoppers and planthoppers feed only from a narrow range of plants and may develop on only a few of these. Many of the crops most affected by planthopper and leafhopper-borne diseases are those which significantly impact subsistence farmers in the developing world, including coconut, rice, potato, sweet potato, maize and sugarcane. But not only crop plants are important. A recently identified phytoplasma disease of napier grass in East Africa (Jones *et al*., 2004) seriously threatens the use of this grass, the main forage used to feed livestock in order to raise living standards for small farmers. No insect vectors have yet been identified.

However, few comprehensive identification keys are available and details of pest species are mostly widely scattered in the specialist literature.

An account of the "Leafhopper vectors of phytopathogenic viruses" was published in 1968 (Nielson, 1968). While this volume remains a work of reference, it is largely for specialists only – there are no whole insect figures or photographs, only some morphological drawings to assist in identification. However, in the past 40 years there have been many taxonomic changes in the status of the insect names (e.g. Knight and Webb, 1993). Also Nielson's volume only covered leafhoppers (Cicadellidae) and no work has been produced for the planthopper vectors (which are considered less numerous at present).

As well as changes in insect taxonomy perhaps a more confusing problem in using Nielson's 1968 work is that phytoplasma and virus diseases were poorly understood so "virus vectors" and "phytoplasma vectors" are confused. Nielson (1979) discussed and listed the known insect vector species.

Objectives

This project, funded by The Leverhulme Trust will provide a comprehensive and accessible guide to the leafhopper and planthopper vectors of phytoplasma, bacteria and virus diseases. Datasheets will be developed that will include high quality digital images of adult insects (and nymphs where available), taxonomic drawings of morphological features, and text on the biology and pest status of each species. Each species datasheet will include details of taxonomy, identification, similar species, biology, host plants, distribution, and diseases and bibliography. Datasheets will be aimed at both professional use as well as by workers in developing countries seeking to find accurate information on identification.

The starting point of the project will be to compile a database of known plant diseases and their vectors from the various sources available. A preliminary list of leafhopper and planthopper genera and species that are known vectors of virus and phytoplasma disease has already been compiled.

This work will directly assist in identification of known vector species but should also lead to more rapid progress in discovering further vector species.

This project will bring together knowledge of both phytoplasma and virus diseases with taxonomic and biological details of the insect vectors and will be available to both plant pathologists and entomologists. The approach taken of web-based and published handbook will make dissemination easy, flexible and inexpensive.

As well as information on known vector species it will be important that introductory material will be provided. The guide will serve as an introductory

guide to the groups generally as well as placing emphasis on those that contain pest species.

It is not proposed to include aphids and whiteflies, which are known as vectors of many plant viruses. Guides to the identification of aphids and whiteflies are already available.

How will results be published and disseminated?

This project will bring together knowledge of both phytoplasma and virus disease with taxonomic details of the insect vectors and will be available to both plant pathologists and entomologists. The approach taken of web-based and published handbook should make dissemination easy and inexpensive.

It is intended that the data sheets and photographs of each species will be added to the website: http://www.ipwg.org/phytoplasma/ .

References

DIETRICH C. H., 2005.- Keys to the families of Cicadomorpha and subfamilies and tribes of Cicadellidae (Hemiptera: Auchenorrhyncha).- *Florida Entomologist,* 88: 502-517.

JONES P., DEVONSHIRE B. J., HOLMAN T. J., AJANGA S., 2004.- Napier grass stunt: a new disease associated with a 16SrXI group phytoplasma in Kenya.- *Plant Pathology,* 53: 519.

KNIGHT W. J., WEBB M. D., 1993.- The phylogenetic relationships between virus vector and other genera of macrosteline leafhoppers, including description of new taxa (Homoptera: Cicadellidae: Deltocephalinae).- *Systematic Entomology,* 18: 11-55.

NIELSON M. W., 1968.- The leafhopper vectors of phytopathogenic viruses (Homoptera, Cicadellidae): taxonomy, biology, and virus transmission.- *U.S.D.A. Technical Bullettin*, 1382: 1-386.

NIELSON M. W., 1979.- Taxonomic relationships of leafhopper vectors of plant pathogens, pp. 3-27. In: *Leafhopper Vectors as Plant Disease Agents* (MARAMOROSCH K., HARRIS K., Eds).- Academic Press, New York, USA.

REDAK R. A., PURCELL A. H., LOPES J. R. S., BLUA M. J, MIZELL R. F., ANDERSEN P. C., 2004.- The biology of xylem fluid-feeding insect vectors of *Xylella fastidiosa* and their relation to disease epidemiology.- *Annual Review of Entomology,* 49: 243-270.

WEINTRAUB P. G., BEANLAND L., 2006.- Insect vectors of phytoplasmas.- *Annual Review of Entomology*, 51: 91-111.

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