**Bio-inspired Pest Control Technologies: A New Frontier in Biological Control**

Angharad M.R. Gatehouse1 Francesco Pennacchio2

School of Natural and Environmental Sciences, Newcastle University, Newcastle upon Tyne NE1 7RU, UK - [a.m.r.gatehouse@newcastle.ac.uk](mailto:a.m.r.gatehouse@newcastle.ac.uk)

Department of Agricultural Sciences, University of Napoli "Federico II" 80055 Portici, Italy - [f.pennacchio@unina.it](mailto:f.pennacchio@unina.it)

A paradigm shift in current practices is required in order to increase primary agricultural productivity to feed an additional 2.3 billion people by 2050. These practices will need to be both resilient and environmentally sustainable, posing negligible risks to non-target organisms, and in particular ecosystem service providers. Whilst biological control, defined as the reduction of pest populations by natural enemies, is a valuable component of any integrated pest management strategy, its efficacy is often very variable, dependent upon both the ecological context and prevailing environmental conditions, not always allowing stable economic control that is required in agricultural production systems. It is, therefore, highly desirable to complement biological control agents (BCAs) with sustainable control tools of natural origin, which themselves have low impact on the environment and non-target organisms. To achieve this objective, attention has turned to the exploitation of molecules and genes present within BCAs, finely ‘tuned’ by long co-evolutionary processes, which are used to kill the host or to disrupt its physiology and reproduction. Current research being carried out seeks to develop novel, highly specific biopesticides based on knowledge obtained from the understanding of the molecular mechanisms underlying associations between plants, insects and pathogens, and by mimicking the natural antagonistic strategies of the BCA and/or weakening the defence barriers of pest insects. Therefore, biocontrol agents can be used beyond the organism level, allowing the development of control strategies based on their virulence factors or on molecular technologies that reproduce their negative impact on insect pests. Examples of this approach based on exploiting molecules from insect antagonists that target either the central nervous system or immune system of the pest insect, or the use of RNAi to silence key genes in target insects, will be presented. Such molecules represent good candidates for biopesticide development.