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Genomics of the Spruce Budworm and its Viral Pathogens

Status	Past
Competition	II
Sector	Forestry
Genome Centre	Ontario Genomics Institute
Project Leader	Basil Arif and Arthur Retnakaran

Project Description

Canada is a custodian of approximately 10% of the world's total forests. Occupying nearly 35% of our land mass, they are an enormous renewable resource of importance for recreation, the environment and the economy. Forests contribute approximately \$30 billion dollars annually to Canada; about 10% of all the jobs in Canada are forestry-related. We contribute to the health of Canada's forests by using genomics to study one of the most devastating forest-insect pests, the spruce budworm. The aim is to develop environmentally safe biological control agents – viruses and bacteria that control spruce budworm infestations but do not affect any other forest organisms or humans.

We carried out genomic studies of the spruce budworm and its viruses, and the molecular basis of their interactions. Through these studies we have developed the following: a large body of knowledge about the genomics of spruce budworm and many of its naturally occurring viruses; environmentally friendly methods that use insect viruses to control spruce budworm; a way to produce large amounts of viral proteins that can be used for further development by the pharmaceutical industry, and veterinary and agricultural agencies.

In our work on the spruce budworm we produced a large set of DNA molecules that allowed us to study budworm genes that affect molting, development and resistance to viruses. We developed an efficient way to make proteins in the test tube. For the viruses that infect spruce budworm we determined the entire gene sequence of the most important ones. This information is the basis for further genetic characterization of the viruses, the creation of virus gene-mutations and studies of viral gene expression. We modified viruses to make them more effective than normal ones against the spruce budworm.

Fast Facts

Highlighted outcome: Creation of genomic tools and knowledge leading to control of the spruce budworm, one of Canada's most devastating pests. The developed technologies can be applied to other forest and agricultural insect pests.

Number of research personnel employed by the project: 19

Number of peer reviewed publications published: 47 + 9 book chapters

Number of patents in process or obtained: 1

Co-funders: Canadian Biotechnology Strategy, Canadian Forest Service, Agriculture and Agri-Food Canada