

SUCCESS STORY

DENETER PROJECT: NETS WITH ADSORBENT PROPERTIES: COMBINING EXCLUSION WITH PEST CONTROL, CONFUSION, AND REPULSION

Pesticide-free production remains difficult, if not impossible, for certain fruit and vegetable crops in Canada due to the large number of insect species and diseases. These have a direct impact on the widespread use of pesticides, which can limit the emergence of alternatives and restrict opportunities to develop a sufficient supply of environmentally friendly products. Production using exclusion nets helps reduce pest-related damages to an acceptable level, but not all pests are excluded under current technologies. The nets that are currently available on the market act strictly as passive mechanical barriers against pest intrusion.

This project, led by Professor Jason Robert Tavares of Polytechnique Montréal, in collaboration with Professor Marie-Josée Dumont of Université Laval, Mikaël Larose and Catherine Pouchet of the IRDA, along with Dubois Agrinovation and MDB Texinov, sought to design exclusion nets with enhanced phytosanitary properties that could be loaded with bioactive compounds. The project's results are divided into three stages:

- 1) Texturing polymer candidates to ensure effective impregnation with active compounds;
- 2) Characterizing sorption, desorption, and resorption cycles of these active compounds;
- 3) Assessing entomological effects under laboratory and field conditions.

*« Our collaboration with Professor Jason Tavares and his team was incredibly satisfying. With support from PRIMA Québec, the project fell directly in line with our industrial needs and values. **It helped us create an innovative product that will meet our customers' needs. It also provided us with new insights into the use of pheromones and the hydrophobic properties of nets.** These two improvements will help pave the way to new technologies that will improve the performance of nets under various weather conditions while controlling certain insects. »*

- Éric Ménard,
Business Development Manager,
Dubois Agrinovation

*« We are pleased with the momentum that was initiated and sustained by Professor Tavares and his teams throughout this venture. The technology that was developed is currently at the laboratory stage. The consortium launched a new project, also supported by PRIMA Québec. **This new project focuses on solutions that can balance the environmental impact with industrial realities.** »*

- Bruno Mougin
R&D Manager,
MDB Texinov

SUCCESS STORY (CONTINUATION)

The polymer texturing was conducted using the dip-dip-dry (DDD) solvent dipping method. The team adapted this method to ensure its effectiveness on the commercial substrates supplied by its partners, Dubois Agrinovation and MDB Texinov. Thus, the companies designed their polymer threads with increased crystallinity (for better mechanical properties). A heated ethylene glycol dipping stage was introduced to adapt the method and allow for this texturing process. The treatment process was also developed as a continuous (roll-to-roll) operation, which helped the academic team understand the impact of the tension applied to the treatment. The textured nets and threads were characterized through laboratory tests and predictive modelling to assess their ability to absorb and release the molecules of interest, notably the aphid alarm pheromone E-beta-farnesene (EBF). Finally, the impregnated nets were field-tested under conditions that approximate real-world agricultural conditions, demonstrating their repellent effect on aphids. Interesting and surprising secondary results were also obtained in the project's final year: UVC radiation, normally used for disinfection, can reverse the wettability of the treated nets, thereby facilitating their end-of-life management.

Furthermore, the DDD technology platform developed and optimized by the academic team can be applied to other projects (notably those involving hydrogels). The platform also helped develop a method to capture non-polar molecules in water, which is currently being commercialized by Axelys. The nets designed to leach bioactive molecules represent an improvement over the products that are currently being marketed jointly by Dubois Agrinovation and MDB Texinov. The net and thread modification process using DDD is likely to be deployed at MDB Texinov after a few specific milestones (primarily involving occupational health and safety (OHS)) have been validated at laboratory scale via the DeNETer 2.0 project, which is currently underway. The project helped train 16 students, one postdoctoral student, two doctoral students, two master's students, and 12 interns.



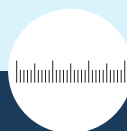
SECTORS

Agriculture,
Environment,
Textiles



APPLICATIONS

Pest-control nets
with phytosanitary
properties for use in
agriculture



TRL

Start 2, end 4



DURATION

54 months
(2020-2025)