Next Generation Biocomposite Materials: How the science of genomics can revolutionise the automotive sector.

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Abstract

A project just under way in Western Canada will soon deliver fully renewable biocomposite materials to the Canadian industry based on fibre from flax germplasm with traits genetically optimized for use in advanced composite materials. The project, performed with partners from the University of British Columbia, the University of Manitoba, Westward Industries, the Composites Innovation Centre and Genome Prairie, is using semi-structural components of a prototype bio-vehicle developed with two industrial partners in Manitoba as proof-of-concept of the approach. Current practices for manufacturing biocomposites material depend on mixing percentages of natural fibre with fiberglass in appropriate laminate structures and using petroleum-based resins as a binding matrix. However, fibre feedstocks from flax and other crops have not been phenotypically screened and catalogued for their use in specific biocomposite applications. Issues of the greatest industrial relevance are: i) the lack of uniformity of fibres leading to inconsistency of product performance; ii) poor adhesion of fibres to petroleum-based resin (binding matrix) leading to poor material strength; & iii) the absence of natural resins that provide the required optimum binding capacity, thermostability, and biodegradability (related to ii). The project will also incorporate the use of microbial polymer/resins synthesized by a novel bacterium, *Pseudomonas putida* strain LS46. Growth of this bacterium on different carbon sources results in polymers with different monomer composition. Characterization of the physical and thermal properties of the different polymers will identify those that exhibit complementary physical and chemical properties required for binding to the optimised flax fibres in the biocomposite materials. This project, therefore, will develop a new generation of genetically optimised biocomposites for industrial applications.