

## **CRIS PROJECT REPORT CONTRIBUTION**

**YEAR 2008**

**PROJECT:** ND43500 - Canola-based Epoxy Resins for Bio-based Plastic Composites

Submitted by Dennis Wiesenborn, lead PI

### **OVERVIEW AND PROJECT IMPACT:**

Our long-term goal is development of high-quality, affordable composite materials using canola oil-based resins and the transfer of this technology to industry. Briefly, we developed a process in the first year to prepare canola resin and techniques for incorporating this resin into composites. Inclusion of up to 40% canola resin in a composite matrix was achieved in the second year of this project, also improved and scaled up procedures for producing and characterizing the resin. The performance of fiber glass-reinforced composites were tested using standard mechanical tests and found to be competitive with 100% synthetic resin/composites. Key goals for the coming year are further process scale-up to 1 kg batches, identification of industry needs and opportunities for canola resin, and development of composites targeted to specific industrial applications. A team of senior engineering students at NDSU is developing shields for the ASABE quarter-scale competition which incorporate the 40% canola resin; this is expected to combine excellent strength with light weight. This project is based on a unique partnership in composites research and is crucial to technical and commercial success of these types of materials.

### **OBJECTIVES:**

**Objective 1.** Identify and optimize procedures for production of epoxy resins from canola oil and alcohol esters of canola oil, and characterize those epoxy resins.

**Objective 2.** Characterize resins and plastic composites produced from those resins, using standard industry techniques.

**Objective 3.** Analyze economic feasibility of and identify steps to transfer technology for canola-based resins.

### **COOPERATING INVESTIGATORS:**

Judith Espinoza-Perez, Grad. Res. Assist., Agricultural & Biosystems Engineering  
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## **PRESENTATIONS & PUBLICATIONS**

Espinoza-Perez, J.D., D.P. Wiesenborn, D. Haagenson, C.A. Ulven. 2008. Study of the process parameters of the canola epoxidation, paper 081031036. ASABE Annual International Meeting, Providence, RI, June 29-July 2.

Kumar, M., J.D. Espinoza-Perez, D. Haagenson and D.P. Wiesenborn. 2008. Epoxidation of canola oil utilizing green solvents and recycled catalyst. ASABE/CSBE Intersectional Conference, Winnipeg, MAN, September 19-20.

Tatlari, M. 2008. Vegetable Oil-based Epoxy Resin for Structural Composite Material Manufacturing. M.S. Thesis under direction of C. Ulven, North Dakota State University, Fargo