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### **Using Dried Distillers' Grains to Make Bioadhesive**

LANSING, MICH. – As the “green” economy began to expand in Michigan and our state’s ethanol production increased, the Corn Marketing Program of Michigan (CMPM) began looking at research projects that would provide novel products and new markets to utilize the influx of Distillers’ Dried Grains with Solubles (DDGS) and add an additional revenue stream for our state’s five ethanol plants.

Many starch adhesives are readily available in today’s marketplace. These adhesives, typically used to make corrugated boards and boxes, are easy to apply from water dispersion at a relatively low cost. However, starch adhesives have one large drawback – they fail when exposed to moisture. As a result, new alternatives are being researched to find replacements for these starch adhesives that are not as sensitive to water. These alternatives have the capability of being utilized for moisture sensitive applications and often garner an increased price. Therefore, a low cost adhesive, with improved water resistance is highly desirable.

The CMPM has been working with Dr. Rafael Auras, a professor in the School of Packaging at Michigan State University, to look at a DDGS-based adhesive and whether it could provide a similar performance to conventional starch based adhesives at the same cost or less, and have a higher resistance to performance loss when exposed to water or moisture.

In order to establish the market feasibility of creating a commercially viable DDGS-based adhesive, Dr. Auras looked at several factors to determine how the DDGS-based adhesive would compare to traditional starch adhesives. To be marketable and competitive, the resulting product would need increased lap shear strength. To identify if this quality was present, Dr. Auras looked at the effect varying heating temperatures and cooking time had on the production and strength of the DDGS-based adhesive.

“Our research showed that the production of DDGS adhesive is directly influenced by the heating time and heating temperature,” said Dr. Auras. “Varying levels of hydroxide solution is an important factor which influences the production and the lap shear strength of the DDGS adhesives. An increase in the solution can boost both the output and the lap shear strength of the adhesive. Using DDGS in the preparation of adhesives can provide a new approach for effective use of ethanol co-products.”

Lap shear strength affects the strength of the commercially-made joint and often indicates the ability of a joint to withstand rough handling without failure. One of the important factors affecting lap shear strength of bio-adhesives is the relative humidity and the sensitivity of the bio-adhesive to water. When compared with the starch based adhesive, the lap shear strength (psi) of the DDGS adhesive at 50 percent relative humidity was slightly lower. The lap shear strength at 25 and 75 percent relative humidity was significantly lower for DDGS adhesive than the starch adhesives. Values for the water resistant starch adhesive were higher than the regular starch adhesive at 50 and 75 percent relative humidity, and were much higher than the DDGS adhesive at all relative humidities tested. Although the first results were encouraging, additional research is necessary to determine if a more stable and increased water resistance formulation can be obtained utilizing DDGS.

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“As we look toward the future, it is exciting to be part of an organization on the cutting edge of technology,” said Clark Gerstacker, CMPM president and a corn grower from Midland. “Corn is such a versatile crop and can be used to replace almost any petroleum-based product. As corn farmers continue to grow record-setting crops, Michigan is in an excellent position to continue meeting the needs of not only our livestock industry, but also the need for feed, fuel, and now adhesives.” Gerstacker also serves as a member of the National Corn Growers Association Corn Board.

Headquartered in Lansing, the CMPM is a legislatively-established statewide program that utilizes one-cent per bushel of Michigan corn sold. Investments are made in the areas of research, education, market development, and new uses in an effort to enhance the economic position of Michigan corn farmers. The CMPM works cooperatively with the Michigan Corn Growers Association (MCGA), a grassroots-membership association representing the state’s corn grower’s political interests since the 1970’s. Michigan’s corn industry adds more than one billion dollars to the state’s economy annually and in 2009, Michigan’s corn farmers harvested a record setting crop of more than 309 million bushels. For more information, visit the website of the MCGA and the CMPM at [www.micorn.org](http://www.micorn.org).

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