



Chemist Mila Hojilla-Evangelista tests the breaking point of plywood laminated with vegetable-based glues to determine the strength of the glue bond.

## CORN THE LATEST GLUE INGREDIENT?

**A**fter oil is extracted from it, corn germ meal is typically sold to farmers for use as a nutritious feed for poultry and other livestock.

But a surplus of corn germ could be looming on the horizon. That's if America's biorefineries can increase corn-ethanol production from the current 9 billion gallons (2008) to 15 billion gallons by 2015. But prescient researchers aren't waiting. Take, for example, Milagros P. Hojilla-Evangelista.

In studies begun in 2005 at ARS's National Center for Agricultural Utilization Research in Peoria, Illinois, the chemist determined that corn germ can be used as a protein extender for plywood glues, potentially opening a new, value-added market for the byproduct. Glue extenders reduce the amount of the main binder, or resin, that's used, thus lowering production costs. They also enhance adhesive action and impart textural properties to the glue.

The conventional extender for most

plywood glues is wheat flour. Hojilla-Evangelista has sought to expand the list of agricultural extenders to include not only corn germ protein, but also sorghum flour and soybean meal. The price and performance of industrial-grade wheat flour make it a dominant extender, but alternative sources are still important to consider.

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Technician Debra Stamm (right) feeds a sheet of wood into a glue spreader where it will receive an even coating of vegetable-based glue before being laminated to another sheet to form plywood. Mila Hojilla-Evangelista watches and waits to receive the piece as it exits.

"If something should happen—say, the price of wheat flour goes too high—glue manufacturers would like to be able to have something else they can use that's comparable," says Hojilla-Evangelista, who's in the ARS center's Plant Polymer Research Unit.

In earlier work there, she developed a soy-flour-based plywood glue formula for foam-extrusion applications. This process pumps out evenly spaced, pastalike, foamed strands of adhesive onto plywood veneers, which are then pressed together. The corn germ formula she's now testing is for sprayline coating, in which the liquid adhesive is applied by overhead nozzles to wood surfaces.

"I chose a sprayline formulation because it's more tolerant of nonprotein components such as oil, which is a defoamer," says Hojilla-Evangelista. "But since foaming isn't critical to sprayline applications, the presence of oil isn't an issue."

For tests, she applied the required amount of glue onto one side of 12-inch x 12-inch southern pine veneers, then hot-pressed them following industry-standard conditions to produce three-ply panels. She found the bonding strength of the corn germ-based glue to be the same as that of the wheat flour-based formula.

The corn germ glue's viscosity and mixing properties also compared well with the industry adhesive, notes Hojilla-Evangelista, who, in June 2008, presented her work at the Corn Utilization and Technology Conference in Kansas City, Missouri.

"Next, I plan to increase the amount of corn germ in the glue," she says. "If I can do that, I can reduce the amount of resin that's used, which cuts down on the costs of glue manufacturing."—By **Jan Suszkiw**, ARS.

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