# Bleach 'digests' weeds & stems into feed

PEORIA, Ill. — Peroxide, a common bleach, predigests weeds and stems of crop plants in laboratory studies here and frees the components for possible use as feed and chemical raw materials, says a U.S. Department of Agriculture biochemist.

Michael Gould says plant stems, stalks, straws, husks, hulls, cobs and wood contain more energy than seeds, but are little used for feed and chemical products because they are hard to digest. To free components that contain energy-yielding sugars, he treats plant parts 12 hours at room temperature with a solution of hydrogen peroxide that is about as alkaline as strong soap (pH 11.5). This peroxide is a common antiseptic as well as a bleach.

The treatment is like a tenderizing process. It frees components in the plant parts for digestion by animals and microorganisms and for chemical reactions. "Changes in composition are accompanied by dramatic changes in physical properties," Gould says. "During the wheat straw treatment, for instance, chopped straw disintegrated into highly absorbent fibers with a pulp-like consistency." He also treated corn stalks, husks and cobs, stems of soybeans and foxtail, a weed grass, kenaf stalks and oak wood shavings in the Agricultural Research Service studies.

"Chemical energy from the peroxide makes the reaction go at room temperature," Gould says. It saves the cost of fuel for heating. The treatment uses 1 part of hydrogen peroxide for about 4 parts of straw, a proportion that might be too costly in an industrial scale process, depending upon the value of the feed and industrial raw materials produced. "Furthermore," Gould says, "continuing studies may lead to ways to lower the peroxide requirement significantly."

This first study at the Northern Regional Research Center was designed not to develop an industrial process but to learn more about the plant components, cellulose, lignin and hemicellulose, and how to get them out of the plant materials. Gould says a process "may be years in the future and with many variations from the present treatment, depending upon what we learn in further research. Right now, for example, we are studying how the peroxide changes the plant materials. We think it may react primarily with lignin to yield oxygen and oxidized lignin fragments. These new products may have potential as chemical raw materials."

Feeding trials of treated crop residues have started in cooperation with George C. Fahey, Jr., animal scientist at the University of Illinois. In the first studies, cattle appear to digest almost all of a treated straw product, primarily cellulose, in 24 hours. They digest less than half of untreated straw even in 72 hours.

"Complete use of the cellulose, hemicellulose and lignin from agricultural residues to produce cattle feed, simple sugars, alcohol and feedstock chemicals," Gould says, "would be a positive factor in the overall economics of a commercial peroxide process."

A commercial process could aid soil conservation, he says. It could furnish a market for grass or other soil-protecting crops planted instead of row crops or cultivated crops on hillsides and strip-mined land.

Cellulose is a fibrous substance making up most of plant cell walls and plant products such as paper, cotton and linen. Gould says it is a source of the same glucose sugar obtained now from corn starch for making ethyl alcohol. If cellulose in crop residues can be made more digestible, it might be fed to cattle for producing meat and milk for people.

Hemicellulose is another component of plant cell walls. It is the source of another sugar, xylose, which can be converted to alcohol by the yeast, Pachysolen, in a process developed at the Northern Center.

Lignin cements cellulose and hemicellulose in and around plant cells like mortar and concrete in and around bricks in a wall. It is a source of many compounds that could be converted to new products such as plastics and other synthetics now made from petrochemicals, Gould says. Lignin gives strength to plant stems and protects the cellulose

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