String Trimmers for Curbing Weeds in Row Crops

With the whir of a string-operated weed whacker, corn and soybean farmers can take a big step to reduce herbicide use that has the potential to contaminate surface water near streams, wetlands, and wells.

"The only way to avoid surface water contamination is to reduce herbicide use, and that's where the string trimmer comes in," says Bill Donald. He is an agronomist in the ARS Cropping Systems and Water Quality Research Unit located at the University of Missouri in Columbia.

Donald designed a system to cut weeds between crop rows—using a lawn-type string trimmer—and reduce herbicide application by as much as 60 percent.

ARS studies in 1993 and 1994 evaluated the surface water quality at Goodwater Creek, an agricultural watershed established as an experimental site by USDA in 1971. The conclusion of those studies was that most herbicides end up in surface water, rather than in groundwater.

"If farmers banded herbicides in a small, narrow strip over the crop row and mowed or whacked the weeds between rows of corn and soybeans, they could get the same yield as if there were no weeds," says Donald. "Four years of field research in Missouri substantiate this finding.

"The same system could apply to growing sorghum and cotton, but at this time these crops haven't been tested," he says.

Banding uses less herbicide per acre by treating only the crop rows. And the weed stubble left between the rows after using the weed whacker has an added benefit: it helps prevent erosion by holding the soil in place.

Donald is currently developing a prototype string trimmer that can be used on four rows at a time.—By **Linda Cooke,** ARS.

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New Clues to Wheat Hardness

Scientists are a step closer to understanding the chemistry behind the hardness of wheat kernels, thanks to work at the Western Wheat Quality Laboratory in Pullman, Washington.

"Hardness is perhaps the single most important trait relating the grain to its end use," says ARS chemist Craig Morris, who heads the laboratory. "Many properties of wheat flour that are important to manufacturers, such as water absorption, depend on the initial hardness or softness of the grain."

Bakers use hard wheat for bread and soft wheat for cakes, cookies, and some noodles.

But the division between hard wheat and soft is not always clear cut, Morris says. Pacific Northwest growers, for example, produce soft white wheat that's popular in Asia. But some companies in the United States have said the same soft wheat is too hard.

To resolve such discrepancies, Morris says that researchers need to understand hardness on a fundamental level. Morris' latest discovery may help. He milled wheat into flour and separated the starch from gluten and other compounds.

Morris found that starch from soft wheat always contains polar lipids—a specific type of fat—attached to the surface of the starch molecules. Few or none of these lipids attach to hard wheat starch.

"This gives us a biochemical marker to identify soft and hard wheats. If the polar lipids are attached, the starch is from soft wheat," he says.

Polar lipids are the second such discovery. A team of researchers from the United Kingdom found in 1986 that a group of proteins called friabilins were also perfectly associated with soft but not hard wheat. Morris' research indicates that the two findings are related. The friabilin proteins seem to bind to the lipids rather than to the starch itself.

"When we determine what role these two compounds play in creating soft wheat, we should be better able to develop custom-tailored wheat," he says.—By **Kathryn Barry Stelljes**, ARS.

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