

Spread the News:

Mustard Can Drive Away Pests

by Pam Sherwood

Across the Pacific Northwest, a movement is afoot to reduce synthetic chemical fumigants in the production of the region's massive potato crop. In a region where farmers once stockpiled barrels of toxic ethylene dibromide, farmers are now learning to fight pests with meadows of mustard. This year, it is estimated that nearly 40,000

acres of potato fields in Washington and Idaho will have switched from using dangerous synthetic fumigants like metam sodium to employing mustard as a less expensive, natural bio-fumigant.

It is an issue that is as close as the dinner table. Americans eat about 140 pounds of potatoes per-person per-year, according to U.S. Department of Agriculture's (USDA) Economic Research Service.

But there's no reason our appetite for potato salad and fries needs to be satisfied at the expense of the health of our environment.

How important is the Pacific Northwest potato crop? Well, it accounts for more than half of America's \$3 billion potato industry. Idaho and Washington are two of the nation's top producers and one of the biggest and most influential players in this region is the Fort Hall Indian Reservation.

The reservation extends over 520,000 acres of southeast Idaho. But it isn't just one of the richest potato growing areas in the Northwest—it is also one of the most fragile since its sandy soil is highly susceptible to erosion.

This coming season, an estimated 20,000 acres of Idaho potatoes will be cultivated in a program designed to limit chemical fumigant use by planting Pacific Gold and Caliente mustard. In an experiment funded through the USDA, these potato growers will plant mustard between wheat and potato crops. When the mustard is plowed into the soil, it acts as a natural bio-fumigant to foil soil



This spud's for you. And, thanks to the mustard, there's less chemical contamination.
Photo: Harry Morse

pests. This “green manure” also helps to counter erosion and nitrate losses.

Using mustard as a rotational crop costs less than chemical fumigation and is proving effective in curbing nematodes and early-die in potatoes. Chemical fumigation can cost more than \$100 per acre while bio-fumigation with mustard costs an average of \$60 per acre. The seeds are not your standard commercial mustard; they are imported from abroad and require an extra 10 inches of water over a six-week growth cycle.

Within two or three weeks of seeding in the fall, the fields spring to life with a carpet of green and gold. After six weeks, the mustard crop is beaten down, lightly plowed and incorporated back into the soil. As mustard greens decompose, they produce methyl isothiocyanate (MITC)—the same substance produced by the synthetic chemical fumigant metam sodium. MITC works to control hundreds of pests, including nematodes, the potato-growers’ nemesis.

Richard Rouch, Dean of the University of Melbourne’s Faculty of Land and Food Resources, cautions that mustard’s MITC is likely to produce ground-level ozone-forming chemicals. While lab studies have shown that MITC is “effectively removed from the atmosphere by sunlight” within a matter of hours,^{1,2} its breakdown produces other toxic chemicals.

Mustard’s advantage is that it slowly delivers a small, “targeted dose” of MITC deep within the soil. By contrast, applying metam sodium involves the release of huge amounts of the chemical, much of which escapes into the air.

The Shoshone-Bannock Tribes lease approximately 115,000 acres to area potato growers in three adjoining counties on the Fort Hall Reservation. This is about one-third of Idaho’s potato acreage.

The use of chemicals in potato production on such a vast scale is closely regulated. Groundwater pollution is a serious con-

cern—both on the reservation and among the private well owners around the reservation. While saving money is critical to the survival of potato growers leasing tribal lands, assuring water quality is vital to the survival of the entire region.

Ethylene dibromide (EDB) was used on the reservation’s potato crops until it was banned in the late 1970s. But years of constant use left chemicals slowly seeping into the groundwater. Excessive concentrations of nitrates have also been detected in the water and are being closely monitored.

In 1997, the U.S. EPA reviewed EDB levels in drinking water in wells adjacent to and on the Fort Hall Indian Reservation. Red flags were raised. The concentrations found posed

Spice Up Your Fuel Tank... With Mustard ■

In addition to serving as a natural Earth-born alternative to chemical pesticides, the mighty mustard plant soon could be filling your gas tank—if you drive a diesel-powered vehicle, that is.

The Department of Energy’s Mustard Project envisions fields of yellow flowers serving as both pest-suppressor and fuel-additive. Since mustard seeds contain up to 50 times more pest-busting ingredients than the roots, stems and leaves, this biomass can be harvested for use as a feedstock to generate alcohol for biodiesel production.

Meanwhile, Colorado-based Blue Sun sees mustard seed oil as a good bet to replace soybean oil as a biofuel. The oil content of soybeans is only 18% but mustard seeds are 40% oil. It takes less energy to process mustard seed oil into biofuel and the end-product offers better performance—a higher octane rating, better cold-weather starts and improved lubrication.

The Energy Department’s immediate goal is to produce six billion gallons of mustard oil biodiesel costing less than a dollar a gallon. A plant that fights both nematodes and global warming, mustard provides the kind of win-win solution you’ve just got to relish.

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unacceptable cancer risks. Families were told not to drink the water flowing from their taps.

Water began to arrive on the reservation by the tanker load. Adjacent landowners had their wells shut down.

Business as usual ceased. Farming practices and all pesticide and chemical use underwent critical review. Changes in chemical use were instituted as growers began searching for farming practices

that would keep chemical pollutants out of the groundwater.

All chemical use on the reservation is now tightly regulated and regularly reviewed, and a series of pilot projects using chemical-free

alternatives were started. Tribal officials are encouraging the switch to bio-fumigants and special demonstration projects are underway to establish the best approaches.

Last May, the USDA's Natural Resources Conservation Service (NRCS), the Shoshone-Bannock Tribal Business Council, Three Rivers Resources, Conservation & Development, the Shoshone-Bannock Land Use Commission and the Northwest Coalition for Alternatives to Pesticides joined together to develop an outreach and demonstration project on the reservation.

According to Tom Liddil, the Shoshone-Bannock Tribes' agricultural resources manager, "It's become a priority on the reservation to make sure that we maintain good soil health and reduce the amount of pesticides."



On a clear day, you can see fields of mustard as far as the horizon—more proof that it's possible to save the Earth and save money, too.

Changing farmers' attitudes and farming practices is not easy. Word-of-mouth is usually more persuasive than word-from-on-high. In this case, local growers began hearing stories from farmers in eastern Washington who were reporting that mustard rotation was cutting costs, enriching the soil, and discouraging pests at the same time. A Sustainable Agriculture and Research Education grant from the USDA allowed potato farmers in eastern Idaho to substitute mustard greens in place of fumigants on a 160-acre demonstration plot.

Like many farmers on and off the reservation, potato grower Dennis Wasia was looking for better ways to control nematodes and verticillium wilt, reduce costs and conserve soil and water quality. "I have seen some really nice spuds come off fields with the mustard rotation," says Wasia. "I planted about 40 acres in the mustard demonstration area last year and this year I am planting a whole pivot of about 120 acres."

Ed Smith Farms, which cultivates nearly 1,000 acres of potatoes on deeded and leased reservation land in Power County, has been using mustard to enhance yield and reduce chemical use. This year's crop was very good. Bill Meadows, a seed dealer in American Falls, believes the use of mustard seeds will continue to increase. Orders for mustard seed are up again this year.

Meanwhile, the USDA Vegetable and Forage Crops Production Research Unit in Prosser, Washington, is attempting to develop mustard seed varieties that require less water. Earth's changing climate is bringing longer, hotter days to the region. The Intergovernmental Panel on Climate Change predicts that the region could see temperatures rise 5°F by 2100. During drought years, the cost of using an extra ten inches of water in the fall could pose substantial financial problems.

Mustard use, coupled with other biological and conservation practices, promises to help solve some of Forth Hall's water pollution problems while saving potato growers money on the production costs.

Mustard as Green Manure

The Northwest Coalition for Alternatives to Pesticides reports that using mustard as a green manure chopped into winter soil before the spring planting of potatoes—helps stabilize the soil, increases water infiltration and reduces erosion. NCAP reports savings of as much as \$85 per acre when mustard was used to replace chemical fumigants. NCAP and the Shoshone-Bannock Tribes have been jointly exploring mustard green-manure cropping for pest control and improved soil health on the reservation since 2002.

NCAP, PO Box 1393, Eugene, OR 97440-1393, (541) 344-5044, www.pesticide.org.

The NRCS is working with farmers by providing cost-share money for planting mustard on reservation plots of 50 acres or less. "We want to help farmers get started in this program," says Kurt Cates, NRCS district conservationist for the Shoshone-Bannock Tribal Natural Resources Conservation District. "Any way we can utilize sustainable agriculture and decrease man-made chemicals to raise crops goes a long way to preventing further contamination of groundwater."

The future looks bright for the reservation's leafy green and yellow mustard crop. The tribe is behind it, private industry sees its value, and profit-potential and governmental agencies are supporting it.

Pam Sherwood is an Idaho-based freelance writer whose beats include cancer-causing chemicals in the environment.

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1. Alvarez, Ramón C. and Moore, C. Bradley, *Science*, Jan. 14, 1994. <http://www.sciencemag.org/cgi/content/abstract/263/5144/205>
2. Geddes, Jason D., et al., "Gas Phase Photolysis of Methyl Isothiocyanate," *Environmental Science & Technology*, Vol. 29, No 10, 1995.