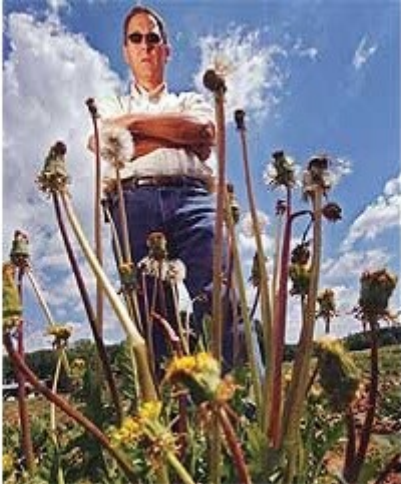


Roots to rubber

Ohio State scientists see Russian dandelion as a new, sustainable source of natural latex



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TOM DODGE

Matthew Kleinhenz, Ohio State University professor of horticulture and crop science, leads a team trying to create a stronger dandelion that can help meet a growing demand for rubber.

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WOOSTER, Ohio -- During World War II, the Soviet Union made tires for its military machine out of rubber extracted from a dandelion that grows in the mountains of Uzbekistan and Kazakhstan.

The United States, whose supply of rubber was cut off by Japan during the war, began to experiment with the Russian dandelion.

After the war, trade routes reopened and scientists began working on synthetic rubbers. Dandelion research was abandoned.

But a decline in rubber production and disappointment in synthetics has companies in the United States going back to the Russian plant.

At Ohio State University's Ohio Agricultural Research and Development Center, scientists are carefully breeding *Taraxacum kok-saghyz* to squeeze rubber from the weed.

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"In a nutshell, we're trying to create a crop that will serve as a new source of natural rubber," said Matthew Kleinhenz, a professor of horticulture and crop science.

Kleinhenz's team is working on its fourth generation of dandelion plants, carefully bred to increase the amount and quality of latex.

On a recent afternoon, researchers selected a few plants, cut their roots and caught a bit of latex that oozed onto their forefingers. Then they pinched the latex between finger and thumb for a minute.

The stickier, the better.

This rubber could one day become the main ingredient of tires made in the U.S., researchers say.

The rubber used in this country comes from tree plantations in Southeast Asia. Since 2002, the price of rubber has risen with energy and transportation costs.

And while demand for rubber is growing, supply is shrinking.

In Malaysia, once the world's largest rubber producer, rubber-tree plantations are being replanted with palm trees for palm oil, which is used to make biodiesel, said Fred Michel, a professor of biosystems engineering at the OSU research center.

These changes have not gone unnoticed by the U.S. government.

"The government sees this as strategically important," said Colleen McMahan, lead scientist for the domestic natural rubber program at the U.S. Department of Agriculture.

"If we're really serious, to have security of supply, we need more than one crop."

The agency has been working since the 1980s to help develop strains of guayule, a shrub found in the southwestern United States and Mexico, into a source of natural rubber. The plant is used to make allergy-free latex gloves that were approved for sale in April.

But McMahan and others at the USDA have more recently turned to working with dandelion researchers.

Growing the Russian dandelion in Ohio, where agriculture and tire manufacturing are huge, is a natural, said Bryan Kinnamon, president of Delta Plant Technologies, a group of Akron-area entrepreneurs.

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Kinnamon, a former Goodyear executive, brought the dandelion idea to the OSU research center. Other partners include Cooper Tire & Rubber and Bridgestone Firestone North American Tire.

The U.S. spends about \$3 billion annually on natural rubber from Asia. Kinnamon said that 3 million acres of dandelions could supply 30 percent of demand.

To put that in perspective, Ohio grew about 14 million acres of crops last year, including 3.85 million acres of corn and 4.15 million acres of soybeans, according to the state Department of Agriculture.

Kleinhenz said dandelions require little fertilizer and no irrigation. The cost of growing them would be about \$100 per acre, compared with the \$300 per acre for some flowers and food crops.

The Ohio Agricultural Research and Development Center is working with the University of Akron as well as Oregon State University.

Bob Seiple, manager of the University of Akron's Applied Polymer Research Center, said more than 2,000 plant species, including the common dandelion, make rubber.

But none seem to produce as much as the Russian dandelion or contain as strong a rubber.

Seiple said that a truck tire made with 1.5 pounds of rubber from Uzbekistan had "fairly similar properties" to a tire made with rubber-tree rubber.

McMahan said that the rubber from the rubber tree, guayule and the Russian dandelion are identical except for proteins, fatty acids and other materials.

To make comparable rubber, "we'll have to tweak the recipes for each," she said.

Michel said that when he has isolated rubber in the dandelion using chemical processes and heat, he has found that 10 percent to 20 percent of the root is rubber. He has drawn up plans to build a facility on campus where 20 tons of rubber could be extracted in a year.

The plans rely largely on a 1947 U.S. Department of Agriculture report that highlighted research performed under the Emergency Rubber Production Act. In the early 1940s, dandelions were grown in 40 states and a processing plant was built in New Jersey.

"These guys were pretty smart," Michel said.

Over time, plants at the OSU research center will be selected and bred for their resistance to disease and drought. McMahan said genetic manipulation in the lab probably will follow.

At the University of Nevada, biochemist David Shintani is identifying genes and proteins that promote rubber production in the Russian dandelion. In time, he said, the work could be used to engineer more productive plants.

Similar research is being conducted worldwide. For example, the European Union has funded a program to develop plant-derived raw materials from guayule, the Russian dandelion, goldenrod and others.

And this week, USDA researchers are with botanists from Russia and Kazakhstan in the Kazakh mountains, collecting dandelion seeds for study and hybridizing.

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From Russia with love

Researchers are looking at how to best extract rubber from the Russian dandelion, *Taraxacum kok-saghyz*. The plant, a cousin to the common dandelion, could be the answer to supply problems with the rubber tree.

Some facts about the plant:

- Russian dandelions can be nearly identical to common dandelions found here.
- Leaves come in three types: smooth spoon shape, sharp saw-tooth, rounded saw-tooth
- *Flower*: yellow, composite head
- *Reproduction*: sexual and asexual
- *Growing season*: about one year
- *Native range*: mountains of Kazakhstan and Uzbekistan

.Rubber content: About 10 percent to

20 percent of root

Source: Ohio Agricultural Research and Development Center