Study points the way toward producing rubber from lettuce

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Prickly lettuce, the wild relative of cultivated lettuce, is a potential source for the production of natural rubber. Credit: Jim Kennedy, Flickr

Prickly lettuce, a common weed that has long vexed farmers, has potential as a new cash crop providing raw material for rubber production, according to Washington State University scientists.

Writing in the *Journal of Agricultural and Food Chemistry*, they describe regions in the plant's genetic code linked to rubber production. The findings open the way for breeding for desired traits and developing a new crop source for rubber in the Pacific Northwest.

"I think there's interest in developing a temperate-climate source of natural rubber," said Ian Burke, a weed scientist at WSU and a study author. "It would be really great if prickly lettuce could become one of those crops."

Potential for sustainable source

When the lettuce we eat and grow in our gardens bolts, a milky white sap bleeds from the stem. In prickly lettuce, the wild relative and ancestor of cultivated lettuce, this same substance could prove to be an economically viable source of natural rubber and help alleviate a worldwide threat to rubber production.

Natural rubber is the main ingredient for many everyday products, from boots to condoms to surgical gloves. Roughly 70 percent of the global supply of rubber is used in tires.

But more than half of rubber products are made from synthetic rubber derived from petrochemical sources. And the largest source of natural

rubber, the Brazilian rubber tree, is threatened by disease.

Burke has reviewed many studies of prickly lettuce and its cultivated cousins, but one in particular gave him an idea. A study published in 2006 found that the latex in prickly lettuce was very similar to the polymers found in natural rubber.

"It occurred to me that we could grow the heck out of prickly lettuce in eastern Washington," he said.

Genetic markers for desired traits

He knew that to develop a viable new crop for rubber production, he had to start by understanding the genetics of rubber production in the plant.

The milky sap, or latex, of prickly lettuce could be used to produce rubber. Credit: Jared Bell/Washington State University

Burke, doctoral student Jared Bell and molecular plant scientist Michael Neff began their studies with two distinct samples of prickly lettuce collected from eastern Washington. These differed in their rubber content, leaf shape and tendency to bolt. The scientists were able to identify genetic markers not only for rubber content but for the way the plants grow, including the number of stems produced and bolting.

Sought-after traits in cultivated lettuce - like abundant leaves, a single stem and delayed bolting - are the exact opposite of traits desired for rubber production. Early bolting plants with multiple stems would allow for multiple harvests over the season and potentially maximize rubber yields.

Burke said that selecting for other traits, like water use efficiency, could allow prickly lettuce to be grown with minimal rainfall, meaning it could be grown in rotation with other crops.

More information: Bell et al. (2015). Genetic and biochemical evaluation of natural rubber from Eastern Washington prickly lettuce (Lactuca serriola L.), *Journal of Agricultural and Food Chemistry* 2015, 63, 593-602.

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