Finding rewrites the evolutionary history of the origin of potatoes

October 4 2005

Humans have cultivated potatoes for millennia, but there has been great controversy about the ubiquitous vegetable's origins. This week, writing in the Proceedings of the National Academies of Sciences, a team led by a USDA potato taxonomist stationed at UW-Madison has for the first time demonstrated a single origin in southern Peru for the cultivated potato.

The scientists analyzed DNA markers in 261 wild and 98 cultivated potato varieties to assess whether the domestic potato arose from a single wild progenitor or whether it arose multiple times - and the results were clear, says David Spooner, the USDA research scientist who led the study.

"In contrast to all prior hypotheses of multiple origins of the cultivated potato, we have identified a single origin from a broad area of southern Peru," says Spooner, who is also a UW-Madison professor of horticulture. "The multiple-origins theory was based in part on the broad distribution of potatoes from north to south across many different habitats, through morphological resemblance of different wild species to cultivated species, and through other data. Our DNA data, however, shows that in fact all cultivated potatoes can be traced back to a single origin in southern Peru."

The earliest archaeological evidence suggests that potatoes were domesticated from wild relatives by indigenous agriculturalists more than 7,000 years ago, says Spooner. Today, the potato - an international

dietary staple - is a major crop in both the United States and in Wisconsin, which is fourth in the nation for potato production.

Potato diseases such as late blight can cause significant economic damage to farmers in America and throughout the world.

"As a taxonomist, my job is to help determine what is a species and to classify those species into related groups," Spooner explains. "Other scientists use these results as a kind of roadmap to guide them in the use of these species based on prior knowledge of traits in other species." Spooner spends about two months each year trekking through the mountains of South America, collecting and identifying wild potatoes and researching them.

"When researchers discover an important trait - for example, that a certain species is resistant to disease - then everything related to that species becomes potentially useful," Spooner says. "We can screen samples to see if related germplasm has similar resistance, in which case we may be able to guide plant breeders to germplasm to use in breeding programs."

And beyond the agricultural benefits, Spooner's study has helped to rewrite a small but important chapter of evolutionary history.

"Books are written about questions of how crops originate," he says. "Sometimes statements are repeated so often that they are accepted as fact. This is a way to get people to reconsider long-held assumptions of the origin of the potato, and stimulate us to reconsider the origins of other crops using new methods."

Spooner's collaborators included colleagues from the Genome Dynamics Programme at the Scottish Crop Research Institute in Scotland. The work was supported financially by the USDA Agricultural Research

Service, by the USDA's Foreign Agricultural Service, and by the Scottish Executive Environment and Rural Affairs Department.

Source: UW-Madison