

## New parboiling method saves water, improves nutrient content in rice

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Graduate student Annegret Jannasch, left, and Arkansas Agricultural Experiment Station food scientist Ya-Jane Wang, steam rice that has been parboiled using a new method Jannasch developed. It uses less water than conventional parboiling methods and also preserves more of the nutrients with which the rice is fortified. She is developing a scaled-up method that can be adapted for use by rice growers and processors in Burkina Faso. Credit: Fred Miller

Food scientists at the Arkansas Agricultural Experiment Station have developed a new parboiling process that reduces water use up to 75 percent and improves nutrient content in rice.

Annegret Jannasch, a food science graduate student in Dale Bumpers College of Agricultural, Food and Life Sciences at the U of A, developed the new parboiling method for her graduate thesis research. She works with Ya-Jane Wang, professor of food science for the experiment station and Bumpers College.

The Arkansas Agricultural Experiment Station is the research arm of the U of A System Division of Agriculture.

## **Lack of nutrition**

Rice is a staple food for billions of people around the world, Jannasch said. "Many people, especially in Africa and southeast Asia, depend on [rice](#) for up to 70 percent of their daily calorie intake.

"But a diet of only rice can result in hidden hunger," Jannasch said. Rice is deficient in many important micronutrients.

"Iron, calcium, [folic acid](#) and vitamin A play important roles in human health," Jannasch said. "Iron is a key component of hemoglobin, which carries oxygen around the body in the blood. Calcium helps fight osteoporosis, high blood pressure and colon cancer."

Jannasch added that inadequate intake of folic acid increases risks of birth defects, and vitamin A deficiency can weaken the immune system.

"Where rice is the primary food, micronutrient deficiency disorders are widespread," Wang said.

Rice can be fortified with inexpensive essential nutrients, Wang said, but current technologies—dusting the grains with a nutrient powder, adding a waxy coating of nutrients and extrusion of reconstituted grains—all have drawbacks, Wang said. Nutrients are lost during cooking and the fortification processes make the taste, color or texture of the rice less acceptable to consumers.

## **The solution**

Jannasch investigated parboiling as a method for fortifying rice. "It's estimated that 15 to 20 percent of the world's milled rice is consumed as parboiled rice," Jannasch said.

Parboiling offers higher nutrient retention rates than other methods and retains more favorable flavor and texture characteristics, Jannasch said. It's an easy, three-step process—soaking the rice in a nutrient-enriched bath, steaming the rice and then drying it.

"But existing parboiling methods also use excess [water](#) that can present an environmental hazard if discarded without treatment," she said. High volumes of water may also be unavailable in many arid regions.

Jannasch investigated a reduced-water parboiling process that places rice and a nutrient-enriched water bath in vacuum-sealed bags. The sealed bags are then soaked in a water bath to apply pressure that helps the nutrients migrate into the rice endosperm.

## **The benefits**

Jannasch and Wang analyzed the reduced water prepared rice for [nutrient content](#) and quality issues and compared it with fortified rice parboiled in the conventional, excess water method. They also compared

nutrient and soluble solids in wastewater.

The reduced-water parboiled rice compared favorably for nutrition and quality, Jannasch said. It also reduced [water use](#) by 75 percent and wastewater volume by up to 89 percent.

"This method was efficient for fortifying parboiled rice with essential micronutrients and had minimal effects on rice quality," Jannasch said.

## **Taking it the world**

Wang obtained funding from Oxfam International for Jannasch to scale up her limited water parboiling process to community scale for use in Burkina Faso, an African nation with limited water resources. She has developed a system of placing sealed vacuum bags of rice and enriched water baths in a 55-gallon drum for soaking in boiled water before steaming and drying.

The method can be used for producing nutrient-fortified parboiled rice in local communities with limited water resources. Not only does the process use less water than conventional parboiling, Jannasch said, but both the nutrient baths and the water in the soaking tanks can be reused to fortify and parboil more rice, to conserve even more water.

Provided by University of Arkansas

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