Can observations of a hardy weed help feed the world?

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As the human population increases, so too do the demands and stresses on agriculture. In the January 2013 issue of *International Journal of Plant Sciences*, Penn State University Waller Professor of Plant Biology Dr. Sarah Assmann explores how the responses to environmental stresses by one small, genetically diverse plant species might illuminate possible approaches to addressing growing human demand for crop products amid decreasing resources.

In the article, Dr. Assmann describes how human population growth presents new challenges to twenty-first-century agriculture, especially since such abiotic stresses as climate change and poor-quality soils can disrupt the ability of many crops to flourish and provide sufficient calories, nutrients, and other resources. According to the U.N.'s Food and Agriculture Organization, the Earth's population will reach nine billion people by the year 2050. To meet the needs of this population, Dr. Assmann says, plant biologists must study how and why some plants are heartier and more capable than others of tolerating these stresses.

Dr. Assmann's focus is on a small flowering plant, a distant cousin of cabbage and canola that can be found growing wild across much of the globe. She explains that this species, *Arabidopsis thaliana* (also known as mouse-eared cress), is an ideal study system in part because it has not been domesticated. Unlike crops, which for millennia have been selectively refined to express certain traits, *Arabidopsis* has not been cultivated and thus has not suffered the same loss of genetic diversity. This robust genetic makeup contributes to the plant's tolerance of

stresses associated with climate change and rising temperatures: increased carbon dioxide concentrations, drought, salinity, and mineral limitation and toxicity. "Ideally, if we can understand better the genetic diversity of this species, we can begin to explore the possibility of related biotechnological manipulations within crop species," Dr. Assmann says. "Here we have a great opportunity to harness the genetic variation in *Arabidopsis* to inform crop improvement efforts and ameliorate the effects of climate change on crop yield."

More information: Sarah M. Assmann, "Natural Variation in Abiotic Stress and Climate Change Responses in Arabidopsis: Implications for Twenty-First Century Agriculture." International Journal of Plant Sciences 174:1 (January 2013). doi:10.1086/667798

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