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Warming Up to *Cuphea*

Seeds get special treatment after cold storage

***Cuphea* in bloom.**

A natural source of capric, lauric, and myristic fatty acids, *Cuphea* oils can be used in thousands of products, from toothpastes and shampoos to wood preservatives and corrosion inhibitors. *Cuphea* is a genus of herbaceous annual plants that grow throughout the Western Hemisphere.

With their delicate blooms and oily seeds, these ornamental plants are both pretty and practical. Unfortunately, the medium-chain fatty acids that make *Cuphea* species so marketable also impede long-term cold storage of their seeds.

"Most seeds can survive freezing temperatures because they're dry," says Christina Walters, plant physiologist at the ARS Plant Germplasm Preservation Research Unit at Fort Collins, Colorado. "*Cuphea* seeds are different."

Candice Gardner, research leader of the ARS North Central Regional Plant Introduction Station at Ames, Iowa, first noted the difference. She alerted Walters when she observed that cold storage was damaging her *Cuphea* seeds.

"We couldn't have done this research without the station's help," Walters says. "They've been incredibly supportive, and they provided all the seeds we used in the research."

With plant physiologist Gayle Volk and support scientist Jennifer Crane, Walters examined the seeds' lipid composition, identified the species susceptible to damage, and developed a solution.

Because of the number of carbons in lauric acid and in myristic acid, the lipids within *Cuphea* seeds containing these acids will crystallize when stored at –18°C (about 0°F), the standard temperature for seed preservation. When returned to room temperature, the lipids stay crystallized, and the seeds won't germinate.

Volk's electron micrograph images show that the crystallized cells disintegrate if water contacts them. The researchers suspect that freezing disrupts the forces binding the contents of the seeds' cells, so the cells cannot reorganize properly when the seeds rehydrate.

Fortunately, the damage can be avoided by simply heating the seeds for 10 minutes at 45°C (113°F) before germination, Walters says. She compares it to mixing water and butter. If you sprinkle water on a cold stick of butter, it will bead on the butter's surface. But if you melt the butter first, the liquids will mix together. Similarly, water will not mix with *Cuphea* seeds during the crystallization stage. But they interact normally after the seed oils have been heated.

Electron micrograph images reveal that untreated seeds vary significantly from seeds that have been stored and reheated, but both are capable of germination. Walters hopes that future research will reveal the nature of this variation.

The researchers believe their findings can be used to improve long-term seed storage for other oil-rich tropical species, such as coffee, papaya, citrus, and oil palm. This will enable them to better preserve the genetic diversity of these species for breeding programs.—By **Laura McGinnis,** ARS.

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