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Utah State University Develops Space Crop

NASA press release; April 15, 1996

The first crop developed specifically for growth in space has been developed at Utah State University, Logan, Utah.

USU-Apogee, a space-age wheat variety, produces the equivalent of almost 600 bushels of grain per acre-- three times the top yields from fields.

It took more than a decade to develop a wheat suitable for space farms, where the artificial sun always shines, carbon dioxide levels are high and space is at a premium. Apogee thrives under those conditions. Its heads emerge 23 days after germination, about a week sooner than some varieties grown in controlled environments. The wheat variety's development was funded by NASA's Office of Life and Microgravity Sciences and Applications and the Utah Agricultural Experiment Station.

As the duration and crew size of NASA space missions increase, the weight and volume required for consumable life support supplies also increases. The costs associated with the resupply of consumables will affect the agency's ability to conduct long-duration missions. On long-duration missions, it will be more economical to provide life support supplies by producing food, such as Apogee, potable water and breathable air by recycling metabolic and other wastes.

It's not known whether the new variety will make it to the moon or Mars, but it's likely to be grown on the International Space Station scheduled for completion in 2002.

"We're tickled to death with Apogee," said space scientist Doug Ming, with NASA's Johnson Space Center in Houston. "We're seeing much higher yields than the other varieties we've tried. It's also much shorter."

Bruce Bugbee, the USU crop physiologist who developed the variety, has worked with NASA for 15 years. He heads a NASA-supported university research facility to develop food crops for space in a complex consisting of 30 computer-controlled growth chambers of various sizes, in addition to several greenhouses.

Previously, the only wheat to be grown in space was Super Dwarf, a short (about 10 inches tall) line that Bugbee originally found in Mexico. Super Dwarf's short height is an attribute, but it grew poorly and produced low yields in the prototype space farms, known as regenerative life support systems.

Apogee, which is the term for the point in orbit farthest from Earth, is a dwarf hard red spring wheat, developed from thousands of segregating lines. It produces few tillers, or branches, which sap energy that can be used for grain production.

It fits the bill for space farming-- short (about 18 inches tall when mature), producing an unusually large number of seeds, and luxuriant greenleaves. Other wheat grown in controlled environments tended to develop yellow leaf tips characteristic of calcium deficiency, often killing 30 percent of the leaf.

"Super Dwarf required perfect conditions for growth. Apogee doesn't," Ming said.

To boost growth and yields, plants destined for space are always bathed in light, at a constant temperature and in air enriched with carbon dioxide, Bugbee said. Their roots never touch soil. All are grown hydroponically or in a crumbly substrate.

Apogee isn't likely to be as popular on Earth as other crop varieties. Its yields are comparable to taller field varieties, but its shortness hampers harvest and limits its ability to compete with weeds.

Apogee's baking characteristics are good, at least on Earth. Making bread in space is still uncharted territory.

Bugbee provides free samples of Apogee to research laboratories around the world and to schools.