

Space Wheat - To Boldly Grow Where No One has Grown Before

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The Salt Lake City Tribune; April 15, 1996

In order to fulfill his dream, Bruce Bugbee first had to find some really short wheat stalks.

Then he spent the better part of 10 years getting the diminutive grain to grow quickly, devour elevated levels of carbon dioxide and develop smaller leaves.

Now Bugbee, a crop physiologist at Utah State University in Logan, and NASA are ready to unveil the stubby stalks -- and blast them into space where they will grow in hydroponic gardens.

USU-Apogee, the first food designed to be grown in space, will be unveiled today during a news conference in Houston.

But Bugbee, despite the decade he's invested in tailoring wheat for sowing and harvest during flight in the space station, says he is not space happy. "A lot of people in this business are in it because they want to be astronauts," he explained. "But I just like plants."

He got started in the unusual field when he came to USU in 1981 after completing his doctorate at Penn State. "I started working on a brand new project to study growing food in space, then I took over the project a few years later. I immediately realized none of the existing varieties of wheat -- or of anything else for that matter -- was suited for space."

So after three fruitless years of testing all kinds of wheat, Bugbee went hunting for grain stalks in Mexico where the Rockefeller Foundation underwrites a worldwide breeding center, CIMMYT. "I walked into the fields looking for a unique wheat. We were looking for very, very short wheat. And we found some -- one we later called Super Dwarf."

This 8-inch-tall variety was only a beginning; the yields were bad and it did not grow well.

"We brought it back and cross-pollinated it with a tall variety of wheat which displays small leaves [large leaves deny light to weeds growing in between plants]. We don't have weeds in space, so we did not need big leaves," Bugbee said.

Then came year after year of cross-pollinating and growing and tossing out hybrids with unwanted qualities. "We selected for one or two heads on a plant -- because wheat makes branches called tillers which are not productive but do help block light from weeds. It took five or six years until we had pure breeding lines. Then we started comparing it from best lines in field and doing more refining. . . . About one year ago we started releasing test packets to NASA. They really liked it," said Bugbee.

Did he get discouraged while he was twiddling with the variety? Yes, Bugbee admits; in fact, he almost quit. "There was one point where I was ready to give it up. After all, the stuff [grown commercially] in the fields was developed over hundreds of years by hundreds of growers. I was one scientist."

But he was intrigued again by the process of plant breeding and where it was taking his space wheat, so he kept on. "You make a hybrid cross and get a variety. But 99 percent of the crosses are junk, so you keep the 1 percent. And do the whole thing over again."

All this work was done in hydroponic form -- where water laced with chemicals takes the place of soil. Bugbee also elevated carbon dioxide levels in the greenhouse to simulate conditions on the space station.

All this science brought forth the USU-Apogee strain which grows in 60 days, or about half the time of wheat in the field, under growing lights running 24 hours a day, seven days a week.

But Bugbee is not satisfied yet. He's working on getting the stalks even shorter. "This wheat will be grown in tanks suspended from shelves attached to walls of the space station. If we can get four shelves of wheat growing in a space where three of USU-Apogee can grow, then we have increased our food production."

And made the air in the space station cleaner, too. "A very big reason plants are up there [in space] in the first place is to get the carbon dioxide out of the atmosphere -- otherwise [we would] have to scrub it out chemically."

And carbon dioxide builds up quickly in space vehicles, Bugbee explains. "On Earth, carbon dioxide is about 0.03 percent of the makeup of the atmosphere. In space, it's likely to be 10 times that high."

The wheat Bugbee developed may be bred on the space station scheduled to be completed in 2002, but probably will never be grown on terra firma. It's so short it's difficult to harvest and has trouble competing with weeds.

But apparently it's tasty. Some mice that resided temporarily one fall in the greenhouse preferred the USU-Apogee seed to all others.

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