Super Dwarf Wheat for Growth in Confined Spaces

Lyndon B. Johnson Space Center, Houston, Texas

USU-Perigee is a dwarf red spring wheat that is a hybrid of a high-yield early tall wheat (USU-Apogee) and a low-yield, extremely short wheat that has poor agronomic characteristics. USU-Perigee was selected for its extremely short height (≈0.3 m) and high yield — characteristics that make it suitable for growth in confined spaces in controlled environments. Other desirable characteristics include rapid development and resistance to a leaf-tip necrosis, associated with calcium deficiency, that occurs in other wheat cultivars under rapid-growth conditions (particularly, continuous light).

Heads emerge after only 21 days of growth in continuous light at a constant temperature of 25 °C. In tests, USU-Perigee was found to outyield other full dwarf (defined as <0.4 m tall) wheat cultivars: The yield advantage at a constant temperature of 23 °C was found to be about 30 percent. Originally intended as a candidate food crop to be grown aboard spacecraft on long missions, this cultivar could also be grown in terrestrial growth chambers and could be useful for plant-physiology and -pathology studies.

This work was done by Bruce Bugbee of Utah State University for Johnson Space Center. For more information, see www.usu.edu/cpl/Progression.pdf. GSC-15830-1

Fine Guidance Sensing for Coronagraphic Observatories

NASA's Jet Propulsion Laboratory, Pasadena, California

Three options have been developed for Fine Guidance Sensing (FGS) for coronagraphic observatories using a Fine Guidance Camera within a coronagraphic instrument. Coronagraphic observatories require very fine precision pointing in order to image faint objects at very small distances from a target star. The Fine Guidance Camera measures the direction to the target star.

The first option, referred to as Spot, was to collect all of the light reflected from a coronagraph occulter onto a focal plane, producing an Airy-type point spread function (PSF). This would allow almost all of the starlight from the central star to be used for centroiding. The second approach, referred to as Punctured Disk, collects the light that bypasses a central obscuration, producing a PSF with a punctured central disk. The final approach, referred to as Lyot, collects light after passing through the occulter at the Lyot stop.

The study includes generation of representative images for each option by the science team, followed by an engineering evaluation of a centroiding or a photometric algorithm for each option. After the alignment of the coronagraph to the fine guidance sys-