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Seeds of the future
Barley may be transformed to produce useful products

A pickup skids to a halt on the crest of a low ridge, kicking up puffs of dust that disappear quickly into the northern plains wind. The leather-faced driver climbs out and stands for a moment, squinting across waves of golden barley nearing harvest. "Looks like a fine crop of insulin," he says to the wind, and smiles.

Insulin?
Perhaps. But it might just as easily have been any one of dozens of other pharmaceuticals, enzymes or organic compounds. The point, says John C. Rogers, M.D., a researcher at Washington University, is that the notion of producing useful products from barley grain is more fact than fancy.

"Barley seeds have a unique capability," says Rogers, associate professor of both medicine and biology. "A part of the seed naturally secretes an extraordinary quantity of protein called alpha-amylase in a short period of time." By altering barley's genetic makeup, Rogers believes the seed could be induced to manufacture other compounds the same way it produces amylase. "Insulin is just one example," says Rogers, "of the types of useful compounds that may be possible."

Rogers may be the first to suggest that a higher plant, grown in a farmer's field, can be genetically transformed to harness its natural capabilities. But the science of discovery, he says, is far more important than potential applications.

"Practical applications are useful to illustrate the potential of scientific research," he says, "but the real basis for our work is to understand how these cells function and how their genetic machinery initiates and controls the phenomenal response we see." Rogers hopes the insights gained in his barley studies will help unravel the mysteries of genetic control processes in other organisms.

A grain of barley, he explains, is a miniature, organic factory with complex internal mechanisms that are marvels of production-line efficiency. When the dormant seed is turned on by moisture, the embryo — a yellowish nugget at the end of the seed — begins secreting a hormone called giberellic acid. This hormone migrates around the seed's outer shell where a layer of highly specialized cells, aleurone cells, have been built up around the seed's starch-filled interior.

When activated by the hormone, aleurone cells stop what they are doing and begin producing alpha-amylase, which breaks starches stored in the seed into sugar. "Under optimal conditions, a single barley seed will continue to produce amylase at that rate for 72 hours, up to 300 micrograms," he says. "In the world of biology, that is a tremendous amount of product."

"But the truly exciting thing about it," adds Bill Crosby, head of the department of molecular genetics at the Plant Biotechnology Institute in Saskatoon, Saskatchewan, "is that the amylase is EXCRETED from the cell in a functionality purified form." Pushing the protein outside the cell wall separates it from several hundred thousand polypeptides active inside the cell, Crosby explains.

In sophisticated laboratory research using recombinant DNA technology, Rogers isolated, sequenced and cloned barley's alpha-amylase genes. More importantly, he was the first to identify and isolate the regulatory region of DNA just "upstream" of the amylase genes that controls how amylase functions in the plant. This sequence includes the complex "on" and "off" mechanisms that start and stop production of the protein.

Experiments now are aimed at identifying exactly what parts of the DNA regulatory segment will result in the proper regulation of foreign material. "We need to know specifically what the DNA segments control so we don't end up with foreign material being expressed in the leaves instead of in the seed," Rogers observes.

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Barley seeds—continued from p. 1

The tough, fibrous aleurone layers can be easily stripped away and damped between vats in a process similar to that used in brewing beer. No complicated techniques or extra nutrients are needed for this high-tech version of barley soup, just a simple solution containing calcium and the right pH. Add the “on” hormone, which has been used widely by European brewers for better beer production, and watch the aleurone cells go to work. “After 72 hours, simply drain off the soup and isolate the final product,” says Rogers. “The combination of barley’s capability to be stored indefinitely and the existence of the industrial infrastructure already in place to process seeds — the barley malting industry — makes the idea of plant factories feasible,” Rogers says. “As our knowledge of plant engineering increases, the process of using barley as a vehicle for biotechnology could be applied to a virtually unlimited number of very useful products.”

Robert Brock

John C. Rogers, M.D., examines barley seeds in his laboratory at the medical school.

KWUR-FM holds pledge week

KWUR-FM (90.3) wants to increase its broadcast power by $10 per listener. They hope to increase our broadcasting power, enabling more students to tune in to KWUR’s alternative “smorgasbord” format, according to Robert Schwartz, general manager. KWUR, which features a variety of music ranging from classical to progressive rock, is located in the basement of the Women’s Building.

“The monies from pledge week will allow us to set up a trust fund to increase our broadcasting power,” says Schwartz, a junior in the business school. “In addition to more stupid — ‘a real Li’l Abner type.”

McMillan has been a supervising Magistrate for the Eastern District of Missouri; Judge Carol E. Jackson, U.S. District Court. The overall public, $10 to senior citizens and WU faculty and staff, and $7 for students. For more information, call the box office at 889-6543.

Desegregation probed, judges honored

In recognition of Black History Month, the Black Law Students Association of WU will sponsor a panel discussion on the St. Louis schools’ desegregation plan and host a reception honoring area black judges. Both events are free and open to the public.

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Philosophers to interact ‘face to face’

A Harvard and a Princeton philosopher will interact this weekend in a symposium called “Face to Face,” the second Richard Rudner Symposium in Philosophy at WU.

Hilary Putnam, professor of philosophy at Harvard University, and Bas van Fraassen, professor of philosophy at Princeton University, will discuss issues related to the nature of knowledge and the philosophy of science, on Friday, Feb. 21, and Saturday, Feb. 22, on campus. The sessions are free and open to the public.

The schedule is as follows:

Friday, 4 to 6 p.m. — Putnam addresses the question “Is Conceptual Relativity Incoherent?”; Van Fraassen comments.

Chaired by Carl P. Wellman, Ph.D., WU professor of philosophy.

Saturday, 4 to 10 p.m. — Informal discussion with Putnam in Hurst Lounge, Duncker Hall.

Richard Rudner, Ph.D., was a professor of philosophy at WU. He came to the University in 1962 as chairman of the philosophy department and retired from that position in 1979, continuing as professor until his death in July 1979.

The symposium is partially funded by a grant from the Franklin J. Mudd Foundation.

Italian guitarist to perform Feb. 28

Italian guitarist Oscar Ghiglia will make his third appearance in St. Louis at 8 p.m. Friday, Feb. 28, in Graham Chapel. Ghiglia’s appearance is co-sponsored by the Department of Music and the St. Louis Classical Guitar Society.

Ghiglia was born in Livorno, Italy. Ghiglia made his professional debut in 1982 at the Festival of Two Worlds in Spoleto, Italy. The following year, he won first prize at both the Internationale Guitar Competition in Paris and the Santiago de Compostela Competition in Spain. He has since toured Europe, North and South America, New Zealand and Australia.

His St. Louis program will include works by Ferdinand Sor, Joseph Tausig, Ture Housman and Heitor Villa-Lobos.

On Sunday, March 2, he will teach a master class from 1 to 4 p.m. in Blewett B-8. Admission to the master class is $5.

Tickets to the performance are $8 to the general public, $5 to students. Tickets are available at Ticketmaster outlets, by calling Dialix (421-1400) or at the door.

Faculty, staff and students are encouraged to attend the symposium and master class.

Program highlights:

Friday, Feb. 21

4 p.m. Dept. of Romance Languages and Literatures Lecture, “What Made Montaigne Modern,” Jules Brody, chairperson, dept. of literatures lecture.


1-5 p.m. Asian Art Society Symposium on Indian Arts.

Sunday, Feb. 23


Monday, Feb. 24


4 p.m. Dept. of Psychology Colloquium, "Pruning Developmental Psychopathology: In Search of a Meaningful Relationship with Research Methodology," Ron Roff, National Institute of Mental Health, Rockville, MD. 102 Eads.

4 p.m. Dept. of Biology Seminar, "Why Are There So Many Species of Neotropical Plants?" Alwyn Gentry, Missouri Botanical Garden. 322 Re stk.
CALENDAR

Feb. 20-March 1

EXHIBITIONS

Thursday, Feb. 20

"Photos by Number: Interplanetary Space Photography," images obtained through NASA's Regional Processing Lab at WU. Through March 9, Gallery of Art, lower gallery. 10 a.m.-5 p.m. weekdays, 1-5 p.m. weekends. For more info., call 889-4525.

"19th-century Art From the Permanent Collection." Through April 15, Gallery of Art, lower gallery. 10 a.m.-5 p.m. weekdays, 1-5 p.m. weekends. For more info., call 889-4525.

"Robert Cottingham: The Barrera-Rosa Series." Through March 2, Gallery of Art, lower gallery. 10 a.m.-5 p.m. weekdays, 1-5 p.m. weekends.

"Pierre de Ronsard (1524-1585): An Exhibit of Books and Papers Commemorating the 400th Anniversary of the Poet's Death." Through Feb. 28, Olin Library, Special Collections, level 5. 8:30 a.m.-5 p.m. weekdays.

"New York Art Directors Exhibit." March 1-16, Baby Ball, Baby Ball. 10 a.m.-4 p.m. weekdays, 1-5 p.m. weekends.

MISCELLANY

Thursday, Feb. 20


Saturday, Feb. 22

9 p.m: Student Interfaith Partnership Against Hunger Dance. Vinson House, a local rock band, will perform. Open to WU community. For more info., call 889-5156.

Sunday, Feb. 23

6:30 p.m. COSIMO International Club's International Dinner, Sneed House, 6670 Forsyth Blvd. Advance admission for general public and WU community, $5; 50 cents for students. $5. Tickets at the door cost 50 cents more.

Monday, Feb. 24

10 a.m.-3:30 p.m. Inter-Varsity Christian Fellowship presents a display "Ten Myths of Christianity" in the Mallinckrodt Center Gallery.

WU Filmboard Series, "Le Jour Se Leve." $2. Brown Hall. (Also Thurs., Feb. 27, same time, Brown.)

Friday, Feb. 28


Friday, Feb. 20

8 and 10 p.m. WU Filmboard Series, "Sixteen Candles." $2. Brown Hall. (Also Sat., March 1, same time, and Sun., March 2, at 7 p.m., Brown.)

Wednesday, Feb. 26

7 and 9:45 p.m. WU Filmboard Series, "Monty Python Live at the Hollywood Bowl." (Also Sat., Feb. 22, same time, and Sun., Feb. 23, at 7 p.m., Brown.)

Monday, Feb. 24

7 and 9:30 p.m. WU Filmboard Series, "Strange Love." $2. Brown Hall. (Also Thurs., Feb. 27, same time, Brown.)

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Saturday, Feb. 22

7:30 p.m. Men's Basketball, WU vs. Eureka College. Field House.

Wednesday, Feb. 26

11 a.m. Men's Tennis, WU vs. Central (Iowa) College. Too Tennis Center.

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