Extra DNA causes Mendel's peas to pucker

Genetic research has added a new wrinkle on an old pea. More than a century after Gregor Mendel crossed his round and wrinkled peas, British geneticists have cloned the enzyme-encoding gene that ultimately determines the shapes so painstakingly recorded by the Austrian monk. In pinpointing the gene's chromosomal location, or locus, they have discovered that the wrinkling trait stems from an extra piece of DNA, which prevents the gene from directing proper starch synthesis.

The new work, conducted at the John Innes Institute in Norwich, confirms that the chromosomal locus *r* houses the gene coding for the production of starch-branching enzyme 1 (SBE1). This enzyme, found in all plants, converts amylose, a simple starch of linear construction, into a "branched" starch called amylopectin.

Scientists have known for some time that the ratio of these starches in peas and other plants influences other elements of their composition, says Alison M. Smith, who coauthored the report in the Jan. 12 CELL. Round seeds (*RR* or *Rr*) contain a much higher ratio of amylopectin to amylose than do wrinkled seeds (*rr*), suggesting the enzyme doesn't function properly in wrinkled peas. When a plant's starch conversion is impaired, sucrose and water build up in the young seeds. Maturing seeds lose much of this water, and the shrinkage leaves them wrinkled.

When the researchers cloned the gene, they found it was always larger in wrinkled seeds than in round seeds. This, says Smith, indicates that wrinkled seeds carry a gene with an extra insertion of DNA that leaves the plants without an efficient means of starch conversion. The insertion occurs in the part of the gene that codes for the SBE1, thus garbling the DNA message for SBE1 production.

Now that scientists understand how the *r* locus influences starch production, they hope to modify the chemical structure of plant starches to improve the quality of prepackaged vegetables. Frozen-food packagers often add starch to maintain a vegetable's structure, Smith notes, but the food tends to lose water as it thaws, leaving consumers with a drippy mess. – C. Decker

The expression "as alike as two peas in a pod" doesn't always hold water. Geneticists have now traced the wrinkles to a DNA insertion that leads to water loss.

Droopy plants drop hints of enzyme's role

Even at its death knell, after the last traces of chlorophyll and other vital chemicals have vanished, a withering plant keeps producing one compound – a red-pigmented enzyme called peroxidase. Since the turn of the century, scientists have studied this intriguing and easily detectable enzyme, which assists plants in wound healing, oxidation and cell elongation. But because a plant may contain up to 35 different types of peroxidase, each reacting with several plant compounds, researchers have been frustrated in their attempts to pin down the enzyme's fundamental role in plant development.

Now, with a bit of genetic sleight-of-hand, investigators have uncovered hints that the enzyme may play a part in plant aging and fertility.

In 1987, molecular biologist L. Mark Lagrimini of Ohio State University in Columbus cloned the gene that codes for one type of peroxidase found in tobacco plants. He and his colleagues at Ohio State and the University of Guelph in Ontario went on to combine a peroxidase gene with fragments of cauliflower mosaic virus, which stimulates overproduction of peroxidase. They inserted this gene-virus combination into two species of tobacco plants, which began producing up to 10 times the normal amount of peroxidase. Genetically altered plants containing at least twice the usual enzyme levels were outwardly identical to their normal relatives until flower buds appeared. Then the plants began to droop in sunlight, at first recovering during the night, but after several weeks wilting permanently.

Wilting and the stunted growth associated with it were more severe in plants with larger amounts of peroxidase, Lagrimini and his collaborators report in the January PLANT CELL. None of the altered plants died prematurely, and all the leaves remained green, unlike those that droop from drought. But the wilting, combined with peroxidase's well-known ability to thrive in dying plants, suggests a link between peroxidase and plant aging, Lagrimini says.

More recent observations, he told SCIENCE NEWS, indicate peroxidase action may concentrate in the roots. Genetically altered tobacco stems grafted onto normal roots no longer drooped, although normal stems grafted onto roots containing the altered gene still wilted.

But these observations fill in only one piece of the peroxidase puzzle. Other research by the same group suggests another role for the enzyme: regulating fertility. Tobacco plants altered to produce unusually low peroxidase levels grew normally but yielded about one-hundredth as much seed as unaltered controls. Lagrimini, who is now extending his peroxidase pursuit to tomato plants and sweet gum trees, says the enzyme's primary function remains unclear.

"Even after [publication of] three to four thousand papers on plant peroxidase, we're still ignorant about what it does," says Fred B. Abeles, a plant physiologist at the USDA's Appalachian Fruit Research Station in Kearneysville, W. Va. "But [Lagrimini's] work is a new strategy" for narrowing the possibilities, he says. – R. Cowen

If not cold fusion, try fracto-fusion?

Whatever its finale, the cold fusion story that began last March will color the history of science. Most of the drama has subsided, but a few researchers have carried on the investigations, continuing to observe phenomena they cannot explain (SN: 12/23&30/89, p.406). Several of these scientists are now exploring a theoretical concept dubbed fracto-fusion to explain at least some of the mystery observations.

Fracto-fusion describes what might happen when microcracks develop in metals containing deuterium or tritium. In this scenario, electrical charges along the cracks speed up deuterium nuclei within the voids, increasing the chances of the nuclei fusing together.

The latest indication that fracto-fusion may occur in some deuterium-loaded solids comes from scientists at Washington State University in Pullman and the Los Alamos (N.M.) National Laboratory. "We suggest that crack growth results in charge separation on the newly formed crack surfaces, which act like a miniature 'linear accelerator,'" the team writes in the January JOURNAL OF MATERIALS RESEARCH.

Although the researchers report no direct evidence of fusion in their samples, University of Washington physicist J.

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