

SUPER SLURPER

Compound with a super thirst

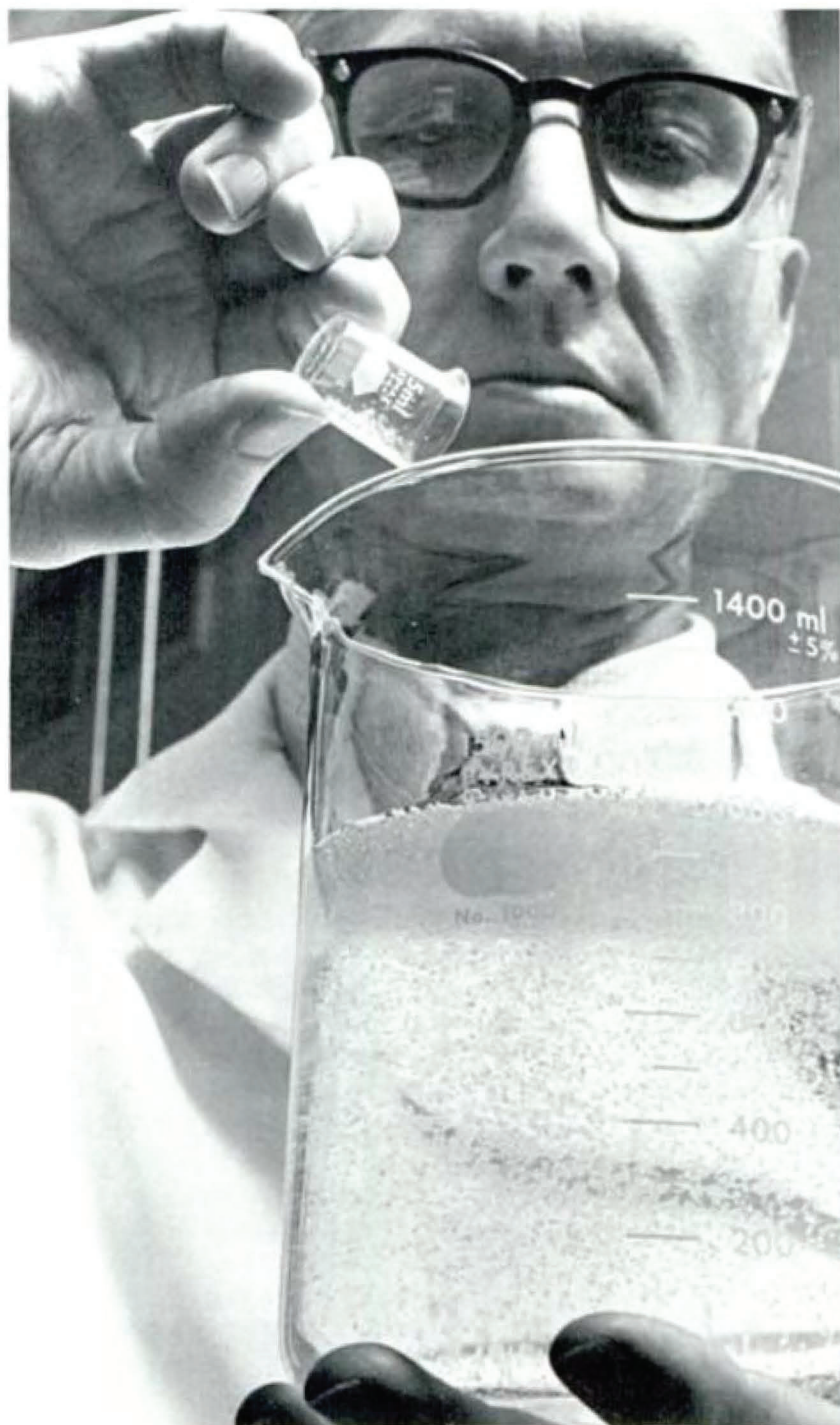
A NEW SUPER SLURPER is expected to intensify the interest of industry, agriculture, and science. Besides having a potentially useful "split personality," the new generation slurper can absorb 2,000 times its weight of distilled water.

The new slurper represents the third research generation of a family of water-laboratory starch products discovered at the Northern Regional Research Laboratory, Peoria, Ill.

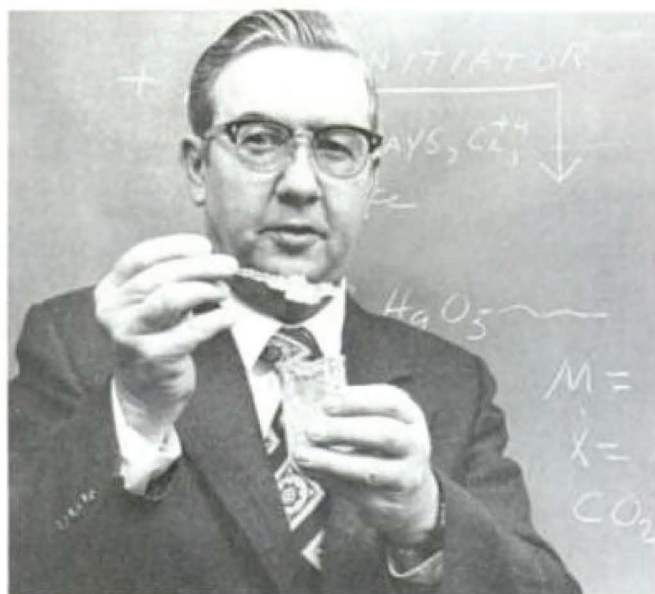
A first generation slurper earned the family name by absorbing 300 times its weight of water. A member of the second generation confirmed the family trait by absorbing 1,400 times its weight of water, half in 30 seconds and most of it in 10 minutes.

Super slurpers, chemically identified as hydrolyzed starch-polyacrylonitrile graft copolymers, are under study by ARS chemists M. Ollidene Weaver, George F. Fanta, Neil W. Taylor, and William M. Doane and engineer Edward B. Bagley, at the Northern Laboratory. With other scientists in ARS, State experiment stations and industry, they are studying slurpers as absorbents, thickening agents, and soil additives.

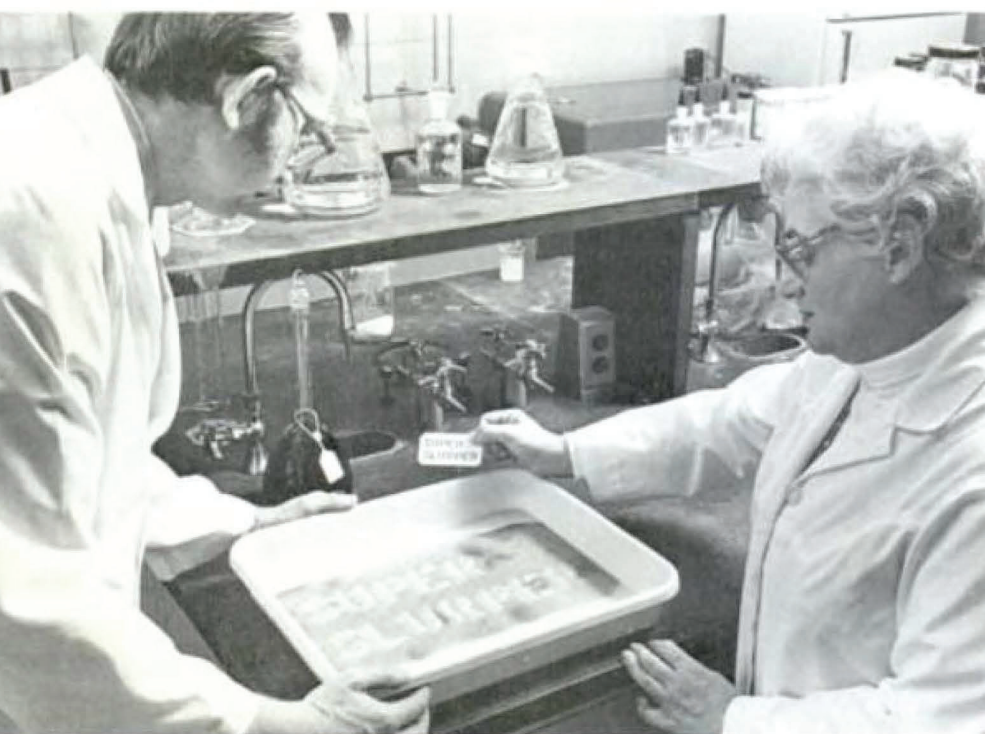
The researchers are providing information and samples in response to requests from Europe and Japan as well as all parts of the United States. Super slurper has caught the attention of manufacturers of products from disposable diapers and kitty litter to soil conditioners and seed coatings. More than 50 potential applications have surfaced in several hundred letters of inquiry that have been received by scientists at the Northern Laboratory.



Dr. Doane demonstrates that only 2 grams of super slurper will absorb 1,000 grams of water. In powder or flake form the absorbant congeals the water to the consistency of crushed ice. Later generations of the super slurpers can absorb up to 2,000 times their weight of distilled water (0375R222-15A).



Left: Dr. Russell, initiator of the starch grafting studies at the Northern Laboratory, holds a beaker of congealed water. He says that super slurpers demonstrate that components of annually renewable farm commodities can be used to extend and conserve limited petroleum resources and that those combinations of natural and synthetic materials can have useful properties that neither parent material alone has (0375R220-25A). **Above:** Glistening like crushed ice, but more solid at room temperature, a mixture of 998 parts water in 2 parts slurper surprises Miss Weaver by not flowing from a smooth, flat surface (0375R223-29).

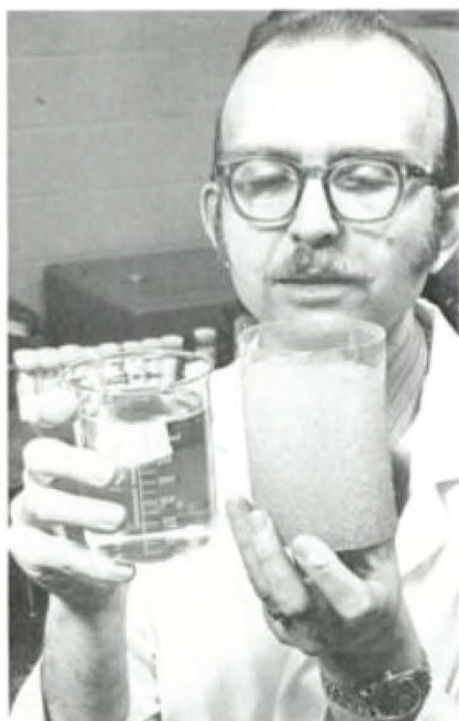


Super slurpers can also be produced in film forms as well as powdered. Dr. Fanta looks on as a film of the compound, originally the size of the stencil held by Miss Weaver, expands three-dimensionally when placed in water (0375R223-8).

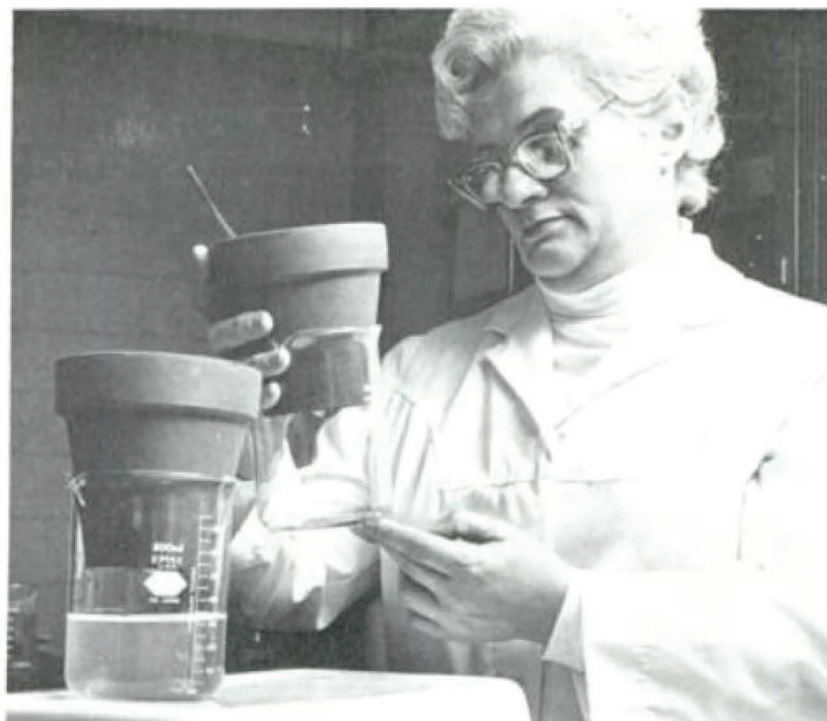
Super slurper III has a "split personality" built in by mechanical treatment. It is a laboratory specimen produced in test tube quantities by Dr. Bagley and Dr. Taylor in basic studies that have been aimed at learning what makes a slurper and how to control it.

Unlike earlier slurpers—which disperse in water to form gels that are difficult to pour—slurper III dissolves, and the solution pours like water. It easily penetrates such porous materials as cloth and sand. When the solution dries and is aged or heated, super slurper III reverts to the family behavior. It forms gel dispersions when water is added again. Slurper III studies show how to make a slurper with a selected capacity of up to 2,000 times its weight of water.

Filling requests for research samples, Miss Weaver and Dr. Fanta regularly make slurpers that absorb 700 to 800 times their weight of water or 55 times their weight of simulated urine. (Simulated urine contains urea, salt, magnesium sulfate and calcium chloride in water.) Against pressure 180 times that caused by gravity, these slurpers have almost 40 times the urine absorption capacity of cellulose fibers.



Dr. Fanta demonstrates that with the help of super slurper a screen wire "beaker" can hold water just as well as a glass beaker (0375R220-36A).



Miss Weaver does an experiment to show one of the potential uses of super slurpers—increase water retention of soils. Sand in the pot on the left held only 50 of 400 grams of water poured through it, while a 500 to 1 mixture of sand and super slurper in the other pot held all 400 grams of water (0375R221-26A).

Cellulose is the main absorbent used in disposable diapers, bed pads, bandages, and surgical sponges. Shortages and rising costs of cellulose are increasing the demand for absorbents that cost less, absorb more, and have less bulk. Bulky materials cause problems in sewage disposal.

What about costs? Estimating the cost of corn starch at 8 cents a pound, engineer Virgil E. Sohns estimates that super slurper could be made for less than 30 cents a pound in a plant with a capacity of 5 million pounds a year.

Dry super slurper can be made as films; thin, cushiony mats; flakes; or powder. When a film takes up water, it expands to a sheet of gel but retains its dry shape. Films of the original slurper, taking up 300 times their weight of water, expanded 33 times in surface area.

Gel sheets contract and become rubbery in dilute acid. They expand again in dilute alkali solution.

Coatings with these properties can be formed on sand grains, straw, wood shavings, all kinds of natural and syn-

thetic fibers, seeds, and other materials where water-absorbent properties would have value. Super slurper can be added in different proportions for different effects to a variety of porous materials like cloth or soil.

Only 1 percent of the slurper (dried in sand) is needed to bind sand firmly enough to be used for molds in metal castings, Dr. Bagley says. As little as 0.1 percent would hold sandy soil surfaces against wind erosion. In either situation, slurper and sand would absorb and hold more water than sand alone.

Super slurper increased water-holding capacity of sand and greatly enhanced the top growth of oats planted in it in greenhouse tests at Iowa State University, Ames. William D. Shrader, professor of soil management, compared the growth of oats in sand and in a mixture of 1 part slurper to 250 parts sand. He saturated and then drained both the sand and the mixture just before he seeded the oats.

The sand retained only 24 grams of water compared with 317 grams of water held by the sand-slurper mixture.

Oats in the sand died 14 days after seeding. The top growth weighed 0.03 gram. By contrast, oats in the slurper-treated sand lived 11 days longer, dying 25 days after seeding. The top growth weighed 0.32 gram.

Dr. Shrader is among more than 700 scientists in agriculture and other industries who have obtained research samples of super slurper from the Northern Laboratory. Other scientists are obtaining samples from General Mills Chemicals, Inc., Minneapolis. General Mills, one of five companies that have licensed a super slurper patent application (Serial No. 456,911), is the only supplier of developmental quantities of the absorbent.

Super slurpers are a branch of the family of starch graft copolymers on which Charles R. Russell, now chief of cereal products research, started research at the Northern Laboratory early in the 1960's. Grafts of acrylonitrile to starch were studied extensively by Dr. Russell, chemists Lewis A. Gugliemeli and Robert C. Burr, and Carl E. Rist, now retired, and others. □