AGRICULTURE

Jack's Beanstalk Comes True

A powerful new chemical might mean a new world of agriculture. It causes certain plants to grow three times normal size, others to blossom in a week. Its name: gibberellic acid.

By HOWARD SIMONS

➤ A CHEMICAL that causes plants to develop like Jack's fabled beanstalk might very well re-shape the world's agriculture. It is called gibberellic acid—the beginning of the word is pronounced like the beginning of the word "gibberish"—and it promises to become a household and farmhold word.

The exact potential of the chemical is not as yet well known. In some cases, the scientists' studies of what gibberellic acid can do have far surpassed the scientists' dreams. In other cases, the scientists' dreams for gibberellic acid have far surpassed its capabilities.

Nevertheless, the chemical, which accelerates plant growth to two or three times what is normal, has also caused research on it to grow as rapidly and chemical manufacturers to market the drug at superspeed. Gibberellic acid has so far proven to be not only a plant growth promoter, but a research and industry promoter too.

Uses for the Chemical

What exactly can gibberellic acid do?

Most scientists agree with Dr. Paul C. Marth of the U. S. Department of Agriculture's plant industry station at Beltsville, Md., who says right off the chemical is not a cure-all. Dr. Marth points out that much more research will be needed before gibberellic acid can be used effectively by the nation's farmers. Even then, Dr. Marth cautions, the drug will have to be tailored for use, taking into consideration the crop, season, soil, climate and, above all, the intended goal.

But even with these restrictions, a score of research teams throughout the world are reporting fantastic results with the chemical and it looks as if the revolutionary growth promoter will live up to its advance notices.

Generally, gibberellic acid has been credited with not only stimulating plant growth, but causing earlier flowering, faster germination, speedier seed maturation and tailored dormancy.

Specifically, here are a few examples of what gibberellic acid has been found to do: increase the number of tobacco leaves; create stronger and longer cotton fibers; cause significant increases in both the fresh weight and dry matter in celery; cause earlier heading in broccoli; cause some tree seedlings to grow faster; and create giant poinsettias, geraniums, chrysanthemums and roses.

Greener Grass, Tamer Wild Oats

Some of the results have been direct, such as the stimulating of Kentucky bluegrass. This particular study, reported by Drs. Curt Leben of Eli Lilly and Company and Lela V. Barton, Boyce Thompson Institute for Plant Research, may mean green lawns in the winter—at least in the warmer climates. Bluegrass sprayed with the acid in October, its slow growth season, shot up with bright green leaves in four days.

Other results will mean a use of the chemical of indirect benefit for the farmer. E. A. Helgeson and John G. Green of the North Dakota Agricultural Experiment Station report, for example, that gibberellic acid is a new weapon against wild oats.

The dormancy of wild oat seeds, they explain, has been a hindrance to effective control of this annual weed. Dormancy, they report, affects the control of the weed in that seeds may germinate for several years following an initial infestation of cultivated soil. Now, however, gibberellic acid can break the dormancy of wild oat seeds. Using gibberellic acid, the North Dakota research team concludes, may mean effective control in the fall or early spring by stimulating the wild oat seeds to germinate.

A third example of gibberellic acid's work is a report on how the drug affects leaf shapes. Dr. Reed A. Gray, plant pathologist with Merck, Sharp & Dohme, reported treated tomato leaves looked more like potato leaves, tobacco and African violet leaves became longer and more pointed at the tip, and pepper leaves became rough instead of smooth.

Whatever gibberellic acid does, it does it in a powerful way, for it only takes one or two parts per million to work its wonders.

GIANT PLANT—Poinsettias make a point about the remarkable effects a revolutionary growth-promoting chemical may have on the world's agriculture. Dr. Paul C. Marth of the U. S. Department of Agriculture shows the untreated plants on the left in comparison with the one on the right that received a dose of gibberellic acid. Both were the same height to begin with.

As wonderful as the drug seems, however, scientists feel they cannot stress enough that much more work is needed. Overdosing, they point out, can cause undesirable effects in some plants such as death of the growing tips or fruit that is knocked off.

In addition, different experiments on the same plant have yielded different results. Treated tomato plants in one study, for instance, grew taller and produced twice as many tomatoes as untreated plants. Another study showed "fruit development not affected" in tomato plants.

More Research Needed

Drs. S. H. Wittwer and M. J. Bukovac of Michigan State University's department of horticulture sum up gibberellic acid research this way:

"While gibberellins produce many remarkable effects which can speed up production in a wide range of crops—and many more will be discovered—there is still much to be learned in their use. . . . Much laboratory, greenhouse and field testing is needed before the full power of the gibberellins will be realized. By that time, the farmer will be able to buy ample quantities from commercial sources. Because of cost, present uses will probably be with high-value greenhouse, nursery and garden crops as a fruit setting agent and in seed production."

History of Gibberellic Acid

The history of this revolutionary growth promoter involves military secrecy and a strange international barter that has resulted in the drug's expanded research in this country.

The story begins in Japan in the late 1920's. A fungus called *Gibberella fujikuroi,* which causes the disease known to rice farmers as "the foolish disease," was wreaking havoc with the rice crops by elongating the stems of rice plants. In the 1930's, Japanese scientists, looking for a control of the disease, had isolated several crystalline compounds from fermentation broths. (A relative of this fungal disease in this country attacks corn and is known as corn root rot.)

The Japanese named the crystalline compounds, which they found had growth-promoting capabilities, Gibberellin A and Gibberellin B.

Much excited about their find and the fact these compounds in only one part per million could cause abnormal plant development, the Japanese scientists published their reports in Japanese journals. At about this time, however, World War II broke out and Western scientists had only a vague knowledge of the Japanese discoveries. Some anguish was caused in this country with scientific rumors that the Japanese had a "secret weapon" for increasing food production.

At the same time, Army scientists were experimenting with the fungal disease itself as a possible weapon to be used against Japanese rice crops. Nothing came of this study and at the war's end the Army information on gibberellins was declassified.

British Research

But before American scientists became excited, British scientists had started an intensive study of the gibberellins and tried to make a synthetic compound. When American scientists became interested a few years ago, the drug was a rare item. The little available here, however, did enable Dr. Frank Stodola of the U. S. Department of Agriculture to study it and make the first American report on the microbiological synthesis of Gibberellins A and X.

Since then, American and British scientists have found a related compound with the same capabilities and it is known as gibberellic acid.

The drug was still in short supply when Dr. P. W. Brian of Akers Research Laboratories, England, was visiting the USDA Beltsville Station in 1955. Interested in a drug called Amo-1618, a chemical that regulates plant growth, Dr. Brian offered Dr. John Mitchell of the Beltsville Station five grams of gibberellic acid for a like amount of Amo-1618.

Thus, a rather strange barter was concluded in which British scientists received a chemical that stunts plants in exchange for a chemical that elongates plants, and which has resulted in a rapid research program in the United States that may end in a whole new world of agriculture.

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GEOPHYSICS

IGY Program Needs Volunteers

➤ AMATEUR skywatchers are needed to take a census of all possible meteors seen during the International Geophysical Year (IGY) that begins July 1.

The volunteer program is an excellent opportunity for amateurs throughout the world to get in on the world-wide activities of the IGY. No special equipment or instruments are needed.

The volunteer observers can work either singly or in groups but should plan to spend at least a full hour at a time watching for meteors. Shorter periods of observation would have little statistical significance, Dr. Peter M. Millman, of the National Research Council of Canada, reports in the astronomical journal *Sky and Telescope* (May).

Special forms and instructions will be supplied free of charge to all interested amateurs who request them from Meteor Centre, IGY, National Research Council, Ottawa, Ontario, Canada. On the forms, volunteers will note the number of meteors they see, their approximate brightness and other pertinent details. The data will then be placed on IBM punched cards for analysis along with data obtained from radar observations.

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