BOTANY

Fruit-Inducing Hormone

➤ THE POSSIBILITY of greater control over the world's agricultural production that could have far-reaching effects on the world's food supply is contained in a new discovery on the hormone that induces plants to flower and bear fruit.

Dr. James Bonner, professor of biology at the California Institute of Technology, reported in Pasadena evidence that the vital fruiting hormone, given the name of florigen, is a steroid in the same chemical class as sex hormones in animals. It is synthesized in the leaves of plants and this manufacture occurs only at night.

If a synthetic version of the natural hormone is developed, it could be used to modify and change the flowering and fruiting of plants.

So promising has been the work so far that the U.S. Public Health Service has assigned Dr. Erich Heftmann, steroid chemist and acting chief of the steroid section of the Institute of Arthritis and Metabolic Diseases, National Institutes of Health, to cooperate with Dr. Bonner and Dr. Jan Zeevaart, research fellow in biology, who has collaborated in the experiments so far.

Hormones are vital metabolic regulators in plants as well as in animals. A hormone is a substance that is synthesized in one part of an organism and produces an effect in another part. Examples of plant hormones are thiamine and niacin, which are vitamins that regulate root growth. They were identified as plant hormones by Dr. Bonner.

Florigen, which is elusive probably because such minute quantities are required in plants, is the first plant hormone that appears to be a steroid, which is one type of fatty substance. Drs. Zeevaart and Bonner believe it functions this way: after being synthesized in the leaves, it migrates via the plant's "pipe system" to the growing tips. There it activates the genes that make flowers. There is evidence, Dr. Bonner said, that the genes are activated during cell division, or mitosis.

Drs. Bonner and Zeevaart chose for their research two plants with which they can conveniently produce flowering. They are the cocklebur and Japanese morning glory. Both plants are photoperiodic, that is they are sensitive to the length of the light and dark periods to which they are subjected.

Contrary to popular notion, it is the length of darkness, rather than the amount of light, that is vital to flowering. In these two plants, florigen is synthesized only in darkness.

The cocklebur leaf requires at least eight and one-half hours of darkness to complete the complex chemistry involved in the synthesis of florigen. Fifteen minutes less than that is not enough. Likewise, a flash of light during the eight and one-half hours of darkness will prevent synthesis.

A mature cocklebur plant will flower two days after receiving an adequate dose of darkness. A plant pigment, phytochrome, that is sensitive to light is the master switch that turns on and off the florigen-making processes.

The photoperiodicity of cocklebur and other plants is related to the length of the night at the season of the year when they normally flower. Some plants are more sensitive to temperature than to light.

Looking into the future, Dr. Bonner explained that once florigen is isolated, it will be synthesized.

Armed with synthetic anti-steroids as well as with steroid sprays, growers could spread crops over longer seasons, could produce them when needed and could increase their yield.

Steroid sprays could increase "flowering" crops such as tree fruits and such vegetables as cauliflower and artichoke. Anti-steroids could be even more important economically. By the prevention of flowering, they could accelerate growth of the edible vegetative parts of such plants as potatoes, carrots, onions and sugar cane. For instance, sugar cane plants use ten per cent of their energy to produce flowers. Suppress the flowers and presumably there would be a ten per-cent increase in the yield of sugar. Flowers are needed for the breeding of new sugar cane varieties. These flowers would be chemically induced.

• Science News Letter, 82:367 December 8, 1962

U. S. Department of Agriculture

GAINES WINTER WHEAT—Dr. O. A. Vogel, agronomist for the U. S. Department of Agriculture, holds a sample of his recent creation, a semi-dwarf grain called Gaines (left). It is contrasted with Omar club wheat which he also developed. Gaines outyields Omar and other varieties raised in the Pacific Northwest and stands up against weather and disease better than most.

ENTOMOLOGY

10,000 Cockroaches Reveal Nocturnal Habits

➤ BABY SITTING 10,000 cockroaches and watching their courting behavior, mating and egg laying under red lights invisible to them keeps Dr. Frances Ann McKittrick, entomology research associate, N.Y. State College of Agriculture, awake night after night.

Her cockroach zoo is probably the largest assemblage of different species, 40 in all, of any one group in captivity.

She is using the insects for the study of evolution. Through comparative studies, differences in species are observed and clues are obtained to the relationship of animals in general.

Chemical secretion of hormones seems to hold these sub-social insects together in what Dr. McKittrick calls, "a very successful group of creatures." Some of the insects were collected on her cockroach observing travels to Pakistan, Texas, Arizona, Panama, Florida, and Hawaii.

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AGRICULTURE

Winter Wheat Hybrid Raises High Yield Hopes

➤ A NEW HARDY but fickle winter hybrid wheat, seed of which was released for commercial production this fall, raises hope of record yields for some growers in the Pacific Northwest.

Named Gaines in honor of the cerealist who bred the first smut resistant wheat for this area, the American-Japanese hybrid semi-dwarf wheat yielded anywhere from a barely satisfactory 30 bushels per acre to a top of 155 on fertile soil during four years of testing in Washington and two in Oregon and Idaho.

"Gaines yields are going to vary a lot more than other varieties," reported its breeder, Dr. O. A. Vogel, an agronomist for the U.S. Department of Agriculture at Washington State University in Pullman, Wash. Dr. Vogel also has bred several other varieties of winter wheat for growth there.

Management, particularly of fertilizer and available moisture, should prove to be the difference between yields from the Gaines, Dr. Vogel said. Gaines can outperform others if treated properly.

Gaines stands up well against the elements, adapts to a wide range of conditions and uses nutrients and moisture more efficiently than others, if ample moisture and 25 per cent more fertilizer than usual are administered. Over-fertilization, however, can be dangerous, opening the door to foot rot fungus.

Though resistant to most ailments common to winter wheats, Gaines is susceptible to stripe rusting in the seedling stage. In the spring, the Gaines plantings could give rise to an epidemic decimating yields of other varieties. That disease was notably injurious to the 1961 Northwest winter wheat crop.

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