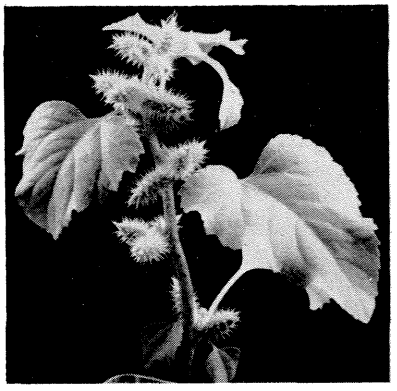

Plant Flowering

Scientists have been trying for more than half a century to isolate the hormone that induces plants to flower and bear fruit. Now James Bonner, professor of biology at Caltech, and Jan Zeevaart, research fellow, have evidence that this hormone which transmits the stimulus to flower could be a steroid – a fatty substance like the sex hormones in animals. The hormone has been given the name "florigen."

Caltech scientists are now making an intensive effort to isolate and chemically identify florigen. One reason why there is great interest in determining the composition of the hormone is the possibility of using a synthetic version of it to control crop production. This could have far-reaching effects on the world's food supply.

The U.S. Public Health Service has assigned Dr. Erich Heftmann, noted steroid chemist, to Caltech to help in this work.

A hormone is a substance that is synthesized in one part of an organism and produces an effect in another part. Hormones are vital metabolic regulators in plants as well as in animals. Thiamine and niacin, which are vitamins, are examples of plant hormones. In plants they regulate root growth. (Both, incidentally, were recognized as plant hormones by Dr. Bonner.)

In their research on florigen, Drs. Bonner and Zeevaart have been using two plants which can be made to flower easily, the cocklebur (above) and the Japanese morning glory. As studies in the Caltech plant physiology laboratories have shown, it is the length of the dark period, rather than the amount of light, that is vital to flowering. The cocklebur, a short-day plant, flowers only when it is exposed to nights that are more than 8½ hours long. If the dark period is cut down even 15 minutes, the flower bud will not form. Nor will it form if the plant is exposed to a single flash of light during the 8½ hours of darkness. Yet florigen is so potent that if just one leaf of the cocklebur is protected, and gets the required amount of darkness, it will synthesize enough florigen to induce the whole plant to flower.

Since biologists have been unable to isolate florigen by direct means, Bonner and Zeevaart tried attacking the problem indirectly. They removed all but one leaf from each of several cocklebur plants. Each single-leafed plant was then dipped into an anti-metabolite solution before it was given the proper dark period. Each of these solutions was designed to prevent the synthesis of a particular biological substance, such as protein or nucleic acid.

If a leaf were to be dunked in a protein anti-metabolite, for example, this solution would be absorbed into the leaf and would prevent the synthesis of florigen, provided florigen were a protein. If florigen were not a protein, this particular anti-metabolite would not affect its synthesis and the plant would flower.

The only solution that completely prevented flowering in the cocklebur was a steroid anti-metabolite compound, indicating that florigen may be a steroid. Biochemists know a lot about steroids and are able to synthesize many. Once isolated, florigen should be easy to synthesize.

Using synthetic anti-steroids and steroid sprays, growers could spread crops over longer seasons, producing them when needed. Anti-steroids, by preventing flowering, could accelerate growth of the edible parts of plants. Sugar cane plants, for instance, use ten percent of their energy in producing flowers. Suppressing the flowers might mean as much as a ten percent increase in the yield of sugar.

The work on florigen in Caltech's plant physiology laboratories is supported by the National Science Foundation and the Herman Frasch Foundation.