FLOWER FORMATION IN THE PINEAPPLE PLANT AS CONTROLLED BY 2,4-D AND NAPHTHALENEACETIC ACID

THE flower-inducing power of appropriate growth-regulating substances in the pineapple plant may be ranked among the most spectacular effects of plant hormones. The treatments as given here in Puerto Rico resulted in flower formation with a precision and uniformity of response (Fig. 1) comparable to

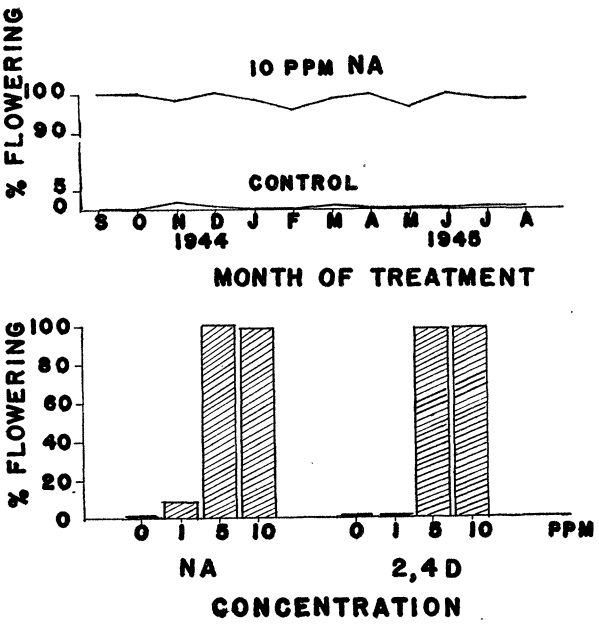

FIG. 1. (upper). Flower induction in pineapple plants throughout the year by a single treatment with naphthaleneacetic acid (NA; 10 ppm, 50 cc per plant). Fig. 2. (lower). Flower induction as a function of the concentration of NA and 2,4-D, applied by a single treatment in July, 1945, when the plants were 22 months old. Flowers were visible 6 to 8 weeks after treatment. The plants, of the Cabezona variety, were 16 months old in January, 1945. Each valve represents observations on from 40 to 50 plants.

that of the classical avena test for auxins. Flowers, which later produced perfect fruits,[1] were induced in plants which were not due to flower for another year or more. These results were somewhat surprising, since it had been shown previously in Hawaii[2] with the Cayenne variety and in Florida[3] with the Abachi variety, that naphthaleneacetic acid will induce flowering from 6 weeks[3] to 4 months[2] ahead of the natural flowering time. In addition it was shown that the plants in Florida did not respond during the summer. The investigations reported here, however, show that with the Cabezona variety growing in the dry Lajas Valley of Puerto Rico, growth-regulating substances will cause flower formation throughout the year (Fig. 1).

Although the main experiments were performed with naphthaleneacetic acid (NA), 2,4-dichlorophenoxyacetic acid (2,4-D) was also tested throughout the year. The results show that both substances are equally effective for the flower induction in pineapples. A concentration of 5 parts per million (50 cc per plant, applied in the center, equivalent to 0.25 mg per plant) is sufficient to cause a 100 per cent. response (Fig. 2).

The following conclusions may be drawn from these observations.[4]

(1) One ounce of either NA or 2,4-D is a sufficient amount for inducing flowering in 113,000 plants, which is equivalent to a pineapple plantation of 11 acres.

(2) One dollar's worth of chemical (2,4-D, at the current price of $7.50 per kg) will treat over one-half million of plants (536,000), the equivalent of 53 acres of pineapples.

It is also of interest to note that the same 2,4-D which is now being widely applied as a selective herbicide, is an equally effective flower-inducing agent for the pineapple when used in 100 times lower concentrations.

J. VAN OVERBEEK[5]

INSTITUTE OF TROPICAL AGRICULTURE,
MAYAGÜEZ, PUERTO RICO

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A NEW ABSORBABLE MATERIAL FOR USE IN NEUROLOGICAL AND GENERAL SURGERY

THERE have been reports in the recent literature on the properties and uses of readily absorbable materials in surgical procedures.[1, 2, 3] The substances described are human fibrin foam and oxidized cotton. Particular emphasis has been laid on the value of such agents in brain surgery, especially in the control

[1] The size of the fruit depends on the size of the plant; no effect of hormone treatment on the flavor of the fruit could be detected; J. van Overbeek *et al.*, Ann. Rept. Inst. Trop. Agric. Puerto Rico, 1944–45, in press. Here also the advantages of the "hormone method" over the "carbide method" have been pointed out.

[2] H. E. Clark and K. R. Kerns, SCIENCE, 95: 536–537, 1942.

[3] W. C. Cooper, *Proc. Am. Soc. Hort. Sci.*, 41: 93–98, 1942.

[4] A more detailed report will be published elsewhere.

[5] The author is indebted to Mr. Guillermo Dávila Olivo and Mrs. Elba Santiago de Váquez for their assistance, and also to Dr. A. Ortiz Romeu, who generously made available part of his plantation for experimental purposes.

[1] F. D. Ingraham, O. T. Bailey and F. E. Nulsen, *Jour. Neurosurg.*, 1: 171, 1944.

[2] V. K. Frantz, *Ann. Surg.*, 118: 116, 1943.

[3] T. J. Putnam, *Ann. Surg.*, 118: 127, 1943.

of bleeding. For this purpose, the absorbable material is soaked in a solution of thrombin and applied to the bleeding surface. The thrombin usually causes prompt clotting. The advantage of using one of the new substances, rather than a cotton pledget, lies in that fact that a pledget made of absorbable material need not be removed before closing the wound. This prevents the recurrence of bleeding which follows the removal of cotton. The field of usefulness of such substances in the realm of general surgery, too, is wide.

In considering various substances for use in absorbable sponges, batting, thread, etc., one of us (M. Z.) proposed casein fiber prepared from milk. Such fiber, from cows' milk, has been used commercially for some years in textiles under the trade name of "Aralac."[4] It is plentiful, inexpensive, extremely uniform chemically, and has physical properties which recommend it for the present purpose. It is readily spun into thread, forms an easily manipulated batting, and can be steam-sterilized repeatedly and stored indefinitely.

In preliminary experiments here reported, pledgets of Aralac batting (30–150 mg total dry weight) were inserted into the subcutaneous tissue, temporal muscle, subdural and subarachnoid spaces and the substance of the brain itself in a series of six cats. Each operation was performed aseptically under sodium pentobarbital anesthesia, and the animals were allowed to survive for 11, 11, 12, 23, 35 and 46 days, respectively. At the end of these periods, the animals were anesthetized and the brains removed along with other tissues that had been in contact with the batting. None of the animals showed any ill effects from the insertion of the casein fiber, and each was in good health at the termination of the experiment.

At post-mortem, no Aralac was visible grossly in any specimen. Microscopically small amounts of the fiber remained in the three animals that were examined after 11 and 12 days. A few of the fibers seen were bordered by giant cells. The principal tissue reaction consisted of the presence of macrophages or, in a few instances, polymorphonuclear leucocytes and lymphocytes on the one hand, and fibroblastic and endothelial cell proliferation on the other. In the three cats which were allowed to survive the longest, no trace of fibers remained. Giant cells were very rarely found in the sections from these animals. The tissue reaction consisted chiefly of fibrous tissue proliferation and the presence of macrophages at or near the site of implantation.

In two of the experiments (11 and 12 days), the casein fiber was implanted on the left side and the same operative procedure carried out on the right side without implantation of fiber. On comparing the microscopic sections from the two sides in these animals the tissue reaction appeared to be slightly greater on the side where the casein fiber had been implanted. There was no evidence in any section that either the casein fiber itself or its breakdown products were particularly toxic to the cortical cells.

It appears from these preliminary experiments that casein fiber (Aralac) is rapidly absorbed after septic implantation in the brain, muscle or subcutaneous tissue of the cat. The absorption is accompanied by a mild cellular reaction similar to that produced by implantation of fibrin foam[1] or oxidized cotton.[2]

More extensive studies on the absorbability of casein fiber of various types and of plasticized sheets of casein are in progress, with particular attention to the possibility of antibody formation in the tissues or blood of the experimental animal. If the material derived from the casein of cows' milk should prove to have undesirable antigenic properties, the latter might be avoided by using casein from human milk.

EUGENE B. SPITZ
DIVISION OF NEUROPSYCHIATRY,
MONTEFIORE HOSPITAL, NEW YORK, N. Y.

MORRIS ZIFF
DEPARTMENT OF CHEMISTRY,
NEW YORK UNIVERSITY

CHARLES BRENNER
DEPARTMENT OF NEUROLOGY,
COLUMBIA UNIVERSITY

CHARLES DAVISON
DIVISION OF NEUROPSYCHIATRY,
MONTEFIORE HOSPITAL, NEW YORK, N. Y.

[4] The Aralac used in these experiments was kindly furnished by Aralac, Inc.

DISCUSSION

A NOTE ON THE NATURAL OCCURRENCE OF FLUOROACETIC ACID, THE ACID OF THE NEW RODENTICIDE "1080"

IN a recent article[1] the discovery of the value of sodium fluoroacetate, referred to as compound "1080," as a highly successful rodenticide by the joint work of the Economic Investigations Laboratory and the Wildlife Research Laboratory of the Fish and Wildlife Service is described. Subsequent to this publication, the writer and his colleagues learned of the work

[1] E. R. Kalmbach, SCIENCE, 102: 232, 1945.