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Induction of Flowering in Pineapple by Beta-Hydroxyethylhydrazine

Some years ago, Rodriguez demonstrated that ethylene could induce pineapple plants to flower (1). Subsequently, it was found that acetylene could also "force" differentiation of flower buds in the pineapple plant (2). With these exceptions, the chemical materials reported to induce flowering in the pineapple have had the chemical structure characteristic of plant growth regulators and have given positive results in the various tests for such properties (stimulation of cell elongation, initiation of roots, and so forth). Such flower-inducing materials as 2,4-dichlorophenoxyacetic acid, 1-naphthaleneacetic acid, and 2-naphthoxyacetic acid have a ring system nucleus, a double bond in the ring, a side chain containing a carboxyl group (or structure readily converted to it), and, presumably, the necessary spatial relationship between the ring and the carboxyl group (3). They are also active in the Went split-pea-stem test (4).

Beta-hydroxyethylhydrazine, $\text{H}_2\text{NN}-\text{HCH}_2\text{CH}_2\text{OH}$, gave no activity in the split-pea-stem test or in the *Avena* test and has none of the structures associated with plant-growth-regulator activity. However, it has induced early flowering

in two tests at different seasons in the pineapple, *Ananas comosus*, variety smooth Cayenne (5). The chemical was applied in water by sprinkling can to 20 plants at each treatment rate in each test. Plants of test 1 were planted in May 1953; they were treated 18 May 1954, and the buds were counted 23 July 1954. Plants of test 2 were planted in October 1953; they were treated 15 September 1954, and the buds were counted 15 November 1954 (Table 1).

It would be of interest to determine the effect of this chemical on long- or short-day plants undergoing inductive periods to ascertain whether it has the properties of an auxin antagonist.

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References and Notes

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5. We wish to express our appreciation to the Olin Mathieson Chemical Corporation for providing the beta-hydroxyethylhydrazine and to Martha J. Kent for the split-pea-stem and *Avena* assays. This report is published with the approval of the director of the Pineapple Research Institute of Hawaii as technical paper No. 236.

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Effect of Stress on an Extinguished Fear Response

Gellhorn (1) has reported a series of studies that were made to determine whether convulsions induced by Metrazol, electroshock, or insulin hypoglycemia would effect the acquisition and/or extinction of a simple conditioned avoidance response. By means of a two-compartment box, a barrier, and shock, rats were taught a jumping response that enabled them to escape shock in one of the compartments. A bell was generally used as the conditioning stimulus, although in some cases a light was used. A number of Gellhorn's findings are pertinent to the present study. Gellhorn found that a conditioned avoidance response, extinguished by lack of reinforcement, could be reinstated following three to five convulsions that were induced by electroshock or Metrazol. Reinstatement lasted 5 to 10 days, after which a gradual decrease in the frequency of the response occurred. Gellhorn reported that with the use of insulin, only in the case of production of a coma state was the extinguished avoidance response reinstated. In this case, the recovered response lasted as long as several months without reinforcement. Evidence was presented that

was interpreted as indicating that the coma state was the essential condition for reinstatement of the avoidance response.

The present study (2) reports the effect of stress induced by treadmill running on an extinguished conditioned fear response.

A modified Miller box (3) was used for the acquisition of a conditioned fear response. This apparatus consisted of a rectangular box, the over-all dimensions of which were 28 by 7½ by 11½ inches, that was divided into two equal chambers by a partition containing a manually operated vertical sliding door. One compartment, painted white, contained a charged grid floor and a lead weight that was suspended by a wire to the left of the intercompartment door. The second compartment was painted black; it contained no suspended weight and its grid floor was uncharged.

By means of standard conditioning procedure, ten male inbred albino rats were taught to escape shock in the white compartment by hitting the suspended weight with their forepaws. On performance of this act, the experimenter opened the sliding door and allowed the subject to escape to the black compartment. All animals were conditioned to hit the weight and escape to the black compartment immediately on placement in the white compartment, in the absence of shock.

After this habit had been acquired, the response was extinguished by lack of reinforcement. The subjects were then exposed to treadmill (4) running, with noninjurious shock as a motivator, for a 5-minute period daily for 1 week. Subsequently, the animals were replaced in the conditioning apparatus. Ten matched male albino rats used as controls were not subjected to the treadmill running.

We have previously reported (5) that some rats that were subjected to treadmill running became so highly agitated that they exhibited full pattern convulsions, including tonic, clonic, and comatose stages. In the present study, four of the ten experimental animals showed complete pattern fits on each exposure to the treadmill. The remaining six rats, although they were agitated, did not show seizures. It was found that after exposure to the treadmill running the extinguished fear response was reinstated in all experimental subjects. After a period of 1 week, the fear response of the six animals not showing the convulsions gradually disappeared; the fear response was not evidenced in any of these subjects 14 days following the treadmill experience. In the case of animals showing full pattern fits, the reinstated fear response continued to be manifested with regularity, and in the absence of reinforcement, for a period of 3 weeks following treadmill experience.

Table 1. Induction of flowering in the pineapple with beta-hydroxyethylhydrazine.

Material	Concn. (%)	Plants with flower buds (No.)
<i>Test 1</i>		
Beta-hydroxyethylhydrazine	0.001	0
	0.01	0
	0.06	18
	0.12	20
Untreated control		1
<i>Test 2</i>		
Beta-hydroxyethylhydrazine	0.01	0
	0.06	1
	0.12	13
	0.23	18
Untreated control		0