Follicular (Œstrus) Hormone and Plant Tumours

A FEW years ago I observed that female rats and mice, given subcutaneous injections of a watery suspension of *B. tumefaciens*, or subcutaneous implantations of the crown gall tumours of pelargoniums, appeared to reach sexual maturity before control animals did. Harde[1], Yano[2], Dodds[3], and others, have given experimental proof of the possibility of a carcinogenic sensitisation of animals through administration of sexual—especially the follicular—hormones.

In previous experiments[4] it was clearly shown that the œstrus hormone had marked effects upon certain plants, and it was also observed that, when introduced in toxic doses through a petiolar stump into tomato plants, this hormone manifested its effects upwards along the stem, above the point of introduction.

In the present experiments, a similar introduction of an aqueous solution of a hormone was made into tomato plants, which were afterwards inoculated above and below the petiole with *B. tumefaciens*. Commercial crystalline œstrus hormones ('Glandubolin' of Richter, and 'Hogival' of Chinoin), prepared from urine of pregnant mares, were used; the average total dose absorbed was 434·3 mouse units per plant during the period June 8–21, 1935. In spite of the high dosage, toxic effects were almost negligible in comparison with those seen on tomato plants similarly treated in winter[4].

Thirty-one plants were treated with hormone, and a similar number served as controls; all were inoculated with *B. tumefaciens*, but twenty-one received distilled water, and ten received a deproteinised, hormone-free extract of animal tissue—in all cases via the petioles.

At the first sign of necrosis of the tumours they were cut off and weighed. The average weights of the tumours per plant were as follows:

Treatment	Position of tumours in relation to petiolar stump	
	Above	Below
Œstrus hormone	0·554 gm.	0·303 gm.
Controls:		
Distilled water	0·452 gm.	0·427 gm.
Special extract	0·407 gm.	0·423 gm.

These results indicate that though the weights of the tumours on the control plants were not significantly a function of their position, the mean weight of the uppermost tumours on the plants treated with œstrus hormone was about 80 per cent greater than the mean weight of tumours below the petiole.

The final interpretation of these observations must depend upon further work to decide whether the direction of migration of the hormone in the plant is constant, or whether it is different with physiological and toxic doses.

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[1] Harde, E., *C.R. Soc. Biol. Paris*, **116**, 999; 1934.
[2] Yano, J., *Acta Dermat.* Kyoto, **23**, 20; 1934.
[3] Dodds, E. C., *Vehr. l. Intern. Kongr. Kampf Krebs*, **2**, 181; 1933.
[4] Havas, L., and Caldwell, J., *Ann. Bot.*, in the press.

Effect of Vitamin C (Ascorbic Acid) on the Growth of Plants

THE effect of vitamin C on plants was studied with sterile plant cultures. 40 mgm. of crystalline ascorbic acid was added to the liquid medium. It was found that the dry weight of the treated plants was about 35–75 per cent higher than that of the controls. The differences were greatest during flowering. The treated plants also showed a much higher content of vitamin C, particularly at the early stages. These results are illustrated by the table below. It is pointed out that the observed increase of growth is specifically due to ascorbic acid, and not merely to an addition of organic material to the inorganic medium, since a similar addition of glucose effected no increase in the growth of the plants.

'Torstai'-peas in sterile Hiltner's solution ($Ca(NO_3)_2$); initial *p*H 5·5.

Time of growth, in days	Stage of growth	Dry weight of 2 plants, in grams		Increase of crop per cent	Vitamin C per 1 gm. dry matter (ml. of indicator solution)	
		Treated	Controls		Treated	Controls
20	Before flowering	1·774	1·261	40·7	44	20
23	,, ,,	2·204	1·652	33·4	40	19
29	,, ,,	2·682	1·851	44·9	37	22
34	Start of flowering	4·641	2·666	74·1	35	24
39	Full bloom	5·692	3·835	48·4	36	30
44	Small pods	6·647	4·794	38·7	32	29
47	Full pods	7·119	4·343	63·9	25	26
50	,, ,,	7·906	5·550	42·5	24	25
52	,, ,,	8·122	5·820	39·6	23	24
55	,, ,,	8·423	6·117	37·7	21	24

Note added to proof. With regard to a communication by László Havas in NATURE of September 14, p. 435, concerning the effect of ascorbic acid on the growth of seedlings, I wish to point out that a report by me on the effect of vitamin C on plant growth[1] was published on May 8, 1935. Mr. László Havas has apparently not known of this earlier paper.

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[1] Synnöve v. Hausen, *Suomen Kemistilehti* B, **5-6**; 1935.

Mycorrhizal Habit in the Genus *Citrus*

IN a communication to NATURE, written when visiting the Citrus Experimental Station, University of California, I directed attention to the mycorrhizal habit in species of *Citrus* used as stocks for orange in Southern California, and to the possible relation of this habit with observed inconsistencies of response to the application of nitrogenous fertilisers[1]. The matter is one of considerable practical interest in view of the prevalent use of such fertilisers and the heavy cost of manuring in Californian orchards.

An investigation followed, the recently published results[2] of which justify the views expressed in my original note. Intensive study of the cytological changes in the roots of plants from experimental plots receiving different manurial treatments leads the authors to emphasise "the importance of the mycorrhizal association as a factor in the metabolism of *Citrus* root cells", and to conclude that: "the relations between the root cell and the endophytic fungus contribute to an understanding of the responses