BIOLOGY

Inhibition of Fruit-Bud Formation in Apple with Gibberellic Acid

Bradley and Crane[1] have reported inhibition of fruit bud formation by gibberellin in apricot, almond, cherry and plum; Hull and Lewis[2] in peach and Griggs and Iwakiri[3] in pears. Gibberellic acid also inhibits flower formation in *Fragaria* spp.[4] and *Kalanchoe blossfeldiana*[5]. No report of inhibition of fruit buds in apples has been found, although Hull and Lewis[2] obtained no effect on flowering or vegetative growth from a single application of a spray of 100 p.p.m. of gibberellin.

An experiment at Mylnefield has shown that gibberellic acid can cause inhibition of fruit-bud formation in apples without affecting bursting of buds in the following spring. In the summer of 1960 branches of six varieties of apples were selected, and treatments were allocated at random so that each treatment was applied to two branches on each variety. Drenching sprays of gibberellic acid (*YF* liquid formulation supplied by Plant Protection, Ltd.) at either 10 or 50 p.p.m. were applied to the leaves and stems of the branches at approximately weekly intervals from May 31 until August 29, making 14 applications in all. Control branches were not sprayed. Counts of buds were made in spring 1961 and the records are presented in Table 1. Some branches were broken in winter and this accounts for the missing data. Taking the six varieties and both levels of treatment together, the percentage of spurs bearing blossom clusters was reduced from 40 per cent on unsprayed branches to 14·7 per cent on sprayed branches. There was also a pronounced inhibition of fruit bud formation on the new wood of the variety Laxton's Superb.

Table 1. EFFECT OF GIBBERELLIC ACID (GA) ON FRUIT-BUD FORMATION IN APPLE

Variety	No GA		10 p.p.m. GA		50 p.p.m. GA	
	No. of fruiting spurs or buds	No. of vegetative spurs or buds	No. of fruiting spurs or buds	No. of vegetative spurs or buds	No. of fruiting spurs or buds	No. of vegetative spurs or buds
Benediction (spurs)	12	38	1	27	0	27
Delicious (spurs)	9	27	—	—	1	22
Madresfield Court (spurs)	13	8	7	8	0	11
McIntosh Red (spurs)	4	9	—	—	1	16
Lord Derby (spurs)	11	12	0	31	0	20
Laxton's Superb (spurs)	15	2	5	2	14	18
Laxton's Superb (buds on new wood)	42	1	4	57	0	47
Total (spurs and buds)	106	97	17	125	16	161
Per cent fruiting	52·2		12·0		9·8	

The same rates of application on plums caused either death (50 p.p.m.) or a severe delay in bud break (10 p.p.m.) as has been reported before[1].

Microscopic examination of buds of *Prunus* by Bradley and Crane[1] showed that growth of both fruit and vegetative buds was retarded by gibberellin. However, because growth of fruit buds was retarded at lower levels of gibberellin than were required to retard vegetative buds they suggested that gibberellins may be specifically blocking floral initiation as well as generally retarding cell division at higher concentrations.

Apple buds were not examined microscopically at Mylnefield, but the fact that there was no delay in bud break in spring suggests that any check to bud growth that there may have been during treatment was not severe. Nevertheless an indirect morphological effect rather than specific inhibition of flower induction remains possible, especially as Fulford[6] found that small differences in numbers of nodes in apple buds appeared to determine the presence or absence of flowers.

It is possible that sprays of gibberellic acid could be used to restrict flower bud formation in the non-fruiting year of biennial bearing apple trees.

The assistance of Mrs. R. N. Smith is gratefully acknowledged.

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A Species of *Tetrahymena* from the British Garden Slug *Milax budapestensis*

HISTOPHAGOUS species of the ubiquitous holotrich genus *Tetrahymena* (Ciliata: Hymenostomatida) have been reported from the body spaces and tissues of a variety of vertebrate and invertebrate organisms[1]. Slugs and snails have been named as hosts in a dozen widely scattered and usually very brief reports published during the past 30 years, the molluscs having been collected in South Africa, the Congo, Poland, Nova Scotia, and from sites in California, Oregon, Virginia, and Illinois in the U.S.A. In work by one of us (A. C. S.) on osmotic relations in gastropods, a small (about 40μ long) ciliated protozoon was detected in a blood sample withdrawn from one of the common British garden slugs, *Milax budapestensis* (Hazay, 1881), collected in the University of Exeter greenhouse. Subsequent examination of additional specimens of this species of keeled slug revealed similar infections; the ciliates were apparently present throughout the alimentary tract and in the liver, although not occurring in great numbers. Study of the protozoon by silver impregnation[2] and other techniques made possible its identification as a strain of *Tetrahymena limacis* (Warren, 1932) Kozloff, 1946, in agreement with the careful redescriptions of this species published by Kozloff[3–5].

The finding of *T. limacis* in British slugs extends its geographical host range, which one may now suspect is truly world-wide. Of more significance, however, is the relationship of this species of *Tetrahymena* to its host, especially in comparison with other tetrahymenid ciliates which also have been said to exhibit facultative parasitism. Of the 13 species of *Tetrahymena* described so far, 8 have been implicated in some degree of parasitic or commensalistic association with vertebrate or invertebrate hosts; only 5 have been found solely in free-living (fresh-water) habitats. In the total range, from a completely non-parasitic existence or merely occasional or accidental parasitism to incipient or possibly true obligate parasitism, *T. limacis* appears to fall near the latter extreme. The whole series has very recently been considered of possible evolutionary significance in the origin of the endoparasitic habit from a free-living ancestry[6].