Gravenstein and Jonathan Apples produced with Gibberellic Acid

NORMAL-SIZED fruits of Sturmer Pippin apple were produced by Davison¹ using 1 per cent gibberellic acid (GA) in lanolin paste and of Strawberry Norman by spraying with gibberellic acid at 400 p.p.m. at the pink stage of blossoming; but as his Cox's Orange fruits produced with lanolin paste were only half the size of the seeded fruits, it was thought that an estimation of the cell numbers of such fruits might give an indication of the effectiveness of gibberellic acid in bringing about cell division and provide an explanation for the size differences in such fruits.

As none of the foregoing varieties was available at this Field Station, Gravenstein and Jonathan trees were used. Small flowering spurs were covered with 'Glassine' bags in 1961, but these proved unsatisfactory owing to condensation of moisture within the bags; hence in 1962 blossoms were not covered after treatment except for one series of Gravenstein blossoms which remained in bags over the blossoming period. At the 'balloon' stage, corresponding to 1-2 days before full bloom, the petals were cut away, anthers removed and styles decapitated. Gibberellic acid at a concentration of 400 p.p.m. was sprayed with a hand atomizer on to the receptacles in 1961 and again in 1962 with a further series of Jonathan receptacles sprayed at 800 p.p.m. The de-anthered blossoms remained uncovered. Fruit set, judged by a definite swelling of the receptacle, was estimated after 14 days in 1961 and after 28 days in 1962. At maturity fruits were gathered, weighed and sized, and sections prepared for estimation of cell size and number after the methods of Bain and Robertson². The long and short diameters of 30 Jonathan fruits from each treatment were measured with calipers to determine any change in shape of fruit.

A summary of the results obtained is given in Table 1. The fruit set with gibberellic acid compares favourably with that of open pollinated blossoms and with Jonathan in 1962 is considerably higher; a seasonal effect in fruit set may also be present. The Gravenstein fruits produced with gibberellic acid showed swollen areas at the calyx end in many instances and to this extent were different from normal fruits. In other respects as regards maturity, weight and cell number they were similar to the fruits produced by open pollination.

With Jonathan, however, the gibberellic-acid produced fruits were appreciably smaller, of less mean weight and with a corresponding lesser number of cells; the ratio of fruit-length to diameter indicated that these fruits were relatively elongated, the ratios for normal fruits being 0.84 as compared with 0.89 for gibberellic-acid produced fruits. Moreover, these fruits were less symmetrical than normal, showing a raised shoulder on one side in many cases. No seeds were found in gibberellic-acid treated fruits.

As cell volume appears to be similar within treatments for both varieties of apple, it is suggested that the differ-

ence in weight of the gibberellic-acid produced Jonathan fruits is due to the failure of the gibberellic acid stimulus to bring about the required number of cell divisions to produce full-sized apples, at the concentration used. The gibberellic-acid produced Jonathans are 79.9 per cent the weight of the open pollinated fruits, and approximately the same proportion of cells, namely, 81.7 per cent, were produced in these fruits as compared with seeded fruits.

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¹ Davison, R. M., *Nature*, **188**, 681 (1960).

² Bain, Joan M., and Robertson, R. N., *Austral. J. Sci. Res.*, **B**, **4**, 75 (1951).

Therapeutic Activity of a Streptothricin-like Antibiotic against Apple Mildew

THE streptothricin-like antibiotic complex, reference number A 4788, isolated and characterized by Lumb *et al.*¹ has high *in vivo* activity against a number of powdery mildew diseases including *Podosphaera leucotricha* on apple. Preliminary tests indicated that the mode of action of the antibiotic was essentially different from that of either dinocap or sulphur and investigations into the chemotherapeutic effects of the material were therefore undertaken.

MM.106 apple root-stocks were uniformly infected with mildew in an inoculation tower similar to that described by Kirby and Frick², and disease rating was estimated with the aid of matching diagrams as the mean percentage of the adaxial leaf surface area infected by apple mildew on the first five to seven fully expanded leaves of an extension shoot. Different treatments were replicated on at least five plants and assessments repeated two or three times at 5-7-day intervals. Spraying infected root-stocks with aqueous sprays containing 0.02 and 0.01 per cent A 4788 caused a reduction within a week of more than 80 per cent in the level of mildew compared with that on control plants receiving water sprays, but the maximum effect was not reached until a fortnight after the spraying date when a reduction of 95 per cent was recorded. On root-stocks, inoculated less than one day after spraying with concentrations of A 4788 in the range 0.01-0.08 per cent, protection increased with concentration, but when an ethoxylated octylphenol wetting agent was added, the degree of control at 0.01 per cent was of the same order as that obtained at 0.08 per cent without wetter (more than 90 per cent). Protectant activity declined as the interval between spraying and inoculation was increased although some measure of control was maintained when inoculation was delayed up to 11 days after spraying.

Gray³ has shown that streptothricin, applied to intermediate leaves of bean and tobacco plants at a concentration of 1 per cent, is translocated in high amounts both

Table 1

Variety	Treatment	No. blossoms treated	Per cent set	No. fruits in sample	Mean fresh wt. (g)	Mean cell vol. (mm ³)	Mean cell No. (millions)
Gravenstein 1961	GA at 400 p.p.m.	300	29.6	13	136.0	0.0055	22.5
	Open-pollinated	300	34.3	15	131.5	0.0056	21.1
	GA at 400 p.p.m.	100	39.0				
	Open-pollinated	100	48.0				
Gravenstein 1962	Control						
	de-anthered	100	0.0				
	Bagged entire blossom	100	0.0				
	Open-pollinated	185	42.2	20	86.2	0.0028	27.9
Jonathan 1961	GA at 400 p.p.m.	185	37.2	20	108.0	0.0029	34.2
	Open-pollinated	185	37.2				
	GA at 400 p.p.m.	100	79.0				
	Open-pollinated	100	98.0				
Jonathan 1962	Control						
	de-anthered	100	2.0				
	Open-pollinated	100	68.0				
	Open-pollinated	100	68.0				