An *in vivo* Comparison of the Effects of Picloram and Trifluralin on Cell Elongation and Plastid Development in *Tradescantia* and *Vicia*

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The authors previously reported (Sawamura and Jackson 1968) that treatment of *Vicia* leaf cells with low concentrations of 4-amino-3, 5, 6-trichloropicolinic acid (picloram) caused a marked increase in final cells length and the cells were wavy in appearance due to unbalanced growth. There was also a decrease in size of chloroplasts in these cells. They also stated that α, α, α -trifluoro-2, 6-dinitro-N, N-dipropyl-p-toluidine (trifluralin) caused a significant increase in cell length in *Tradescantia* and that chloroplasts were developing by the second day following treatment and that the cells survived for at least 14-days. In the present investigation, these secondary effects of picloram and trifluralin have been investigated in more detail by using the same methods and essentially the same materials described earlier.

Results and discussion

The earlier finding of Sawamura and Jackson (1968) that cells from

Figs. 1-3. Effects of picloram on cell elongation in *Vicia* leaf segments and in *Tradescantia* hair cells. ca. $\times 50$. 1, appearance of *Vicia* leaf segment 8 days after treatment with 12 ppm picloram. 2, leaf segment 7 days after treatment with 6 ppm picloram. 3, *Tradescantia* hair cells 6 days after treatment with 20 ppm picloram. Cells that were elongating at time of treatment reached final lengths significantly greater than controls. Neither very young nor mature cells elongated significantly, but there was an increase in number of plastids in these cells.

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excised segments of *Vicia* leaves treated with 5 or 6 ppm picloram elongated more than control cells was confirmed. The cells were then subjected to a range of concentrations of picloram from 5 to 20 ppm and changes in cell length and chloroplast development followed *in vivo*. The cells attained their maximum length on the ninth or tenth day following treatment. By this time, all chloroplasts and granules large enough to be seen in the light microscope had disappeared. The tissue segment surface became wrinkled and cupped around the edges due to unbalanced or wavy growth of cells and the cell walls seemed to be significantly thinner than normal (Figs. 1-2). The cells

Figs. 4-5. Contrast in pattern of elongation of cells of young *Vicia* petals when subjected to picloram or trifluralin. ca. $\times 50$. 4, petal on the tenth day of treatment with 1.6 ppm trifluralin. 5, petal on the thirteenth day of treatment with 6 ppm picloram.

Note appearance of cells indicated by arrow.

survived for at least fifteen days under these conditions. In leaf segment subjected to 30 to 50 ppm picloram, cell elongation was evident within 5 days in some cells; in others only chloroplast development could be observed. In regions of leaf segments in which cell division was still occurring, cell elongation was not stimulated, but the number of chloroplasts per cell did increase.

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hair cells, both those elongating and those dividing, were treated with 10 to 20 ppm

picloram. Although most cells that were elongating at time of treatment continued to grow, by the sixth day of treatment there had been an increase in plastid number but very little growth of some cells (Fig. 3). Neither development of plastids nor cell elongation was pronounced in the young hair cells. Thus, it is concluded that picloram can increase the final cell length of both *Vicia* and *Tradescantia* cells that are elongating at time of treatment, but the final shape of cells treated with picloram is distorted, whereas trifluralin

causes straight growth only.

Sawamura and Jackson (1968) reported that treatment of *Vicia* leaf segments with trifluralin did not result in increased cell elongation, but that the same treatment, 1.6 ppb trifluralin, caused marked elongation of *Tradescantia* hair cells. In the present study, the effects of trifluralin on elongation of cells in young petals of *Vicia* were determined. Petals separated at the basal portion were sealed in an agar plate containing 4.4% sucrose and 1.6 ppb trifluralin. Petals began to elongate rapidly within three days after initiation of treatment and reached their maximum length on about the tenth day (Fig. 4). It should be noted that individual cells elongated uniformly and did not have the wrinkled appearance induced by picloram in *Vicia*.

Treatment of petals with 6 ppm picloram resulted in an increase in number of chloroplasts per cell, but also gradually began to cause cells to elongate to lengths significantly greater than in controls. Cell elongation was pronounced by the fourteenth day (Fig. 5). Picloram increased cell elongation along the entire length of the petal; not merely at the tip. As is apparent in Fig. 5, cells near the margins of the leaf attained greater lengths than cells near the midvein, thereby becoming wavy or curved in appearance. The cells became highly vacuolate during their development, but survived for at least 18 days.

Excised petal tips subjected to 1.6 ppb trifluralin did not elongate, but chloroplast did develop. Treatment of excised petal tips with 10 ppm picloram again resulted in marked elongation and distortion of cells.

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