A STUDY OF FLOWER INITIATION IN APPLE
WITH PARTICULAR REFERENCE TO THE ROLE OF LEAVES

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SUMMARY

Several factors correlated with flower initiation in apple were examined.

Dwarfing rootstock and root restriction reduced elongation growth and promoted flower initiation, the differences between rootstocks being reduced by root restriction. However, elongation growth was not invariably inversely correlated with flower initiation, suggesting the two processes may be independently controlled. It is proposed that elongation is regulated by the supply of factor(s) either from reserves or developing roots.

As fruit number increased on whole trees, branches or individual spurs, there was a corresponding reduction in leaf area and/or number, and flower initiation. Sporadic increases in flower initiation, in the presence of fruit, in response to injected organic nutrients suggested that the fruit effect may result from competition between fruit growth and leaf growth for nutritional factors in the first few weeks of the growth cycle. The possibility of hormonal control of nutrient utilization is not dismissed however.

A potent positive effect of leaves on flower initiation was confirmed and selected as the most direct influence for further investigation. The leaf effect on flower initiation very closely paralleled the inhibitory effect of leaves on leaf primordium development. An hypothesis was developed that the leaves subtending an apex promote flower initiation by inhibiting the development and expansion
of leaf primordia within the apex.

Culture of apple leaf tissue _in vitro_ was developed with the dual objective of examining the effect of chemicals on leaf growth and the bioassay of leaf extracts.

A search for endogenous regulators of leaf expansion revealed that conventional extraction and purification procedures produce artefacts from apple tissue rendering bioassay results meaningless.

By circumventing these problems, it was established that mature apple leaves contain one compound which opposes gibberellin-stimulated processes, including apple leaf expansion and the level of this compound correlates with the incidence of flower initiation.

The compound is tentatively identified as phloretic acid.

An explanation of flower initiation in apple is proposed which invokes the inhibition of leaf primordium development by a leaf-produced regulator of the type isolated, in the presence of continued meristematic activity of the apex. This proposal is discussed in relation to current concepts of the physiology of flowering in photo-period-sensitive plants.