EXPERIMENTAL EVIDENCE AGAINST THE OCCURRENCE OF AGAMOSPERMY IN THE BRITISH *CRATAEGI*

Where their ranges overlap in Britain *Crataegus laevigata* (Poiret) DC. and *C. monogyna* Jacq. readily form hybrids (Bradshaw 1953, 1971; Byatt 1975; Gosler 1981). Bradshaw (1971) has demonstrated that the two species are obligate outbreeders, are totally interfertile, and that hybrid pollen showed no reduction in fertility. However, Muniyamma & Phipps (1979) have shown that in *C. pruinosa* apomixis in the form of somatic apospory is common, and have suggested that this may be a widespread means of seed formation in North American *Crataegi*. This paper gives the results of an experiment to determine whether apospory was present in *Crataegus laevigata* or *C. monogyna*. The work was carried out as part of a larger survey of introgressive hybridization between the two species in the Thames Valley (Gosler 1981).

Flowering twigs were cut from each of four trees (two of each species) in Open Magdalen Wood, Oxford on 2 May 1981 and were supported in water in the laboratory. At least 100 unopened flowers were obtained of each species. The flowers of *Crataegus* are protogynous so that the anthers may be removed prior to anthesis. The following operations were carried out on flowers of each species:
(a) 50 flowers were emasculated prior to anthesis and bagged. Fruit production in this sample would suggest the presence of apospory.
(b) 25 flowers were emasculated prior to anthesis and then artificially cross-pollinated and bagged. Fruiting in this sample was used as a control for the effect of cutting and bagging.

All specimens were allowed to set fruit, and the percentage of flowers of each group (species and operation) that produced fruit was recorded. The fruiting success of the experimental and control groups was compared using χ^2.

Table 1 shows the results of the experiment. The difference in the number of fruits set between

TABLE 1. FRUIT-SET IN *CRATAEGUS LAEVIGATA* AND *C. MONOGYNA* FOLLOWING EMASCULATION ONLY, AND EMASCULATION THEN CROSS-POLLINATION

	Emasculation only		Cross-pollination	
Species	n[a]	no. fruit set	n[a]	no. fruit set
C. laevigata	50	0 (0%)	25	9 (36%)
C. monogyna	50	0 (0%)	25	11 (44%)

[a]n = no. flowers used.

emasculated and cross-pollinated treatments was highly significant: for *C. laevigata* $\chi^2_{(1)} = 20{\cdot}45$, $p \leq 0{\cdot}001$; for *C. monogyna* $\chi^2_{(1)} = 25{\cdot}78$, $p \leq 0{\cdot}001$. This indicates that the failure of flowers to form fruit in the experimental group was not due to their emasculation.

Assuming that there are no significant differences between trees, and that pseudogamy does not operate (although Muniyamma & Phipps (1979) inferred its occurrence in the triploid *C. pruinosa*), the results suggest that apospory is absent or occurs at a very low frequency (at most less than 1%).

Somatic apospory is likely to be more important in North American than in European *Crataegus* species. Longley (1924) found that of 100 North American species examined, some 75% were triploid, and Camp (1942) suggested that many of the 1100 New World species were dubious, having resulted from complex genetic interactions involving alloploidy and apomixis. This presents a rather different biosystematic situation from that observed in Europe where most species are sexually reproducing diploids, many of which form fertile hybrids, such as *C. laevigata* and *C. monogyna* (Franco 1968).

Although the present results suggest that aposory is probably absent from these species, it is impossible to say that it never occurs and further work is needed to determine whether pseudogamy is necessary for apomictic fruit formation.

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REFERENCES

BRADSHAW, A. D. (1953). Human influence on hybridization in *Crataegus*, in LOUSLEY, J. E., ed. *The changing flora of Britain*, pp. 181–183. Oxford.

BRADSHAW, A. D. (1971). The significance of Hawthorns, in *Hedges and local history*, pp. 20–29. London.

BYATT, J. I. (1975). Hybridization between *Crataegus monogyna* Jacq. and *C. laevigata* (Poiret) DC. in south-eastern England. *Watsonia* **10**: 253–264.

CAMP, W. H. (1942). The *Crataegus* problem. *Castanea* **7**: 51–55.

FRANCO, J. (1968). *Crataegus* L., in TUTIN, T. G. *et al.*, eds. *Flora Europaea* **2**: 73–77. Cambridge.

GOSLER, A. G. (1981). *Introgressive hybridization between* Crataegus laevigata *(Poiret) DC. and* C. monogyna *Jacq. in the Upper Thames Valley*. M.Sc thesis, University of Reading.

LONGLEY, A. E. (1924). Cytological studies in the genus *Crataegus*. *Amer. J. Bot.* **11**: 295–317.

MUNIYAMMA, M., & PHIPPS, J. B. (1979). Cytological proof of apomixis in *Crataegus* (Rosaceae). *Amer. J. Bot.* **66**: 149–155.

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