unsaturated, those from the immature pastures contained a higher proportion of unsaturated acids than those from the mature pastures. There was also a higher proportion of fat in the immature pasture. The differences in properties of the butterfats from cows grazing on the two types of pasture were thus associated with differences in both the nature and the amount of lipids present. It would seem, therefore, that the composition of butterfat from pasture-fed cows is markedly influenced by the type of pasture consumed, and that the seasonal changes in the carotene content of the blood and in the composition and properties of the butterfat from cows grazing typical New Zealand pastures result from seasonal changes in the state of maturity of the ryegrass in the pasture.

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[1] Cox, G. A., and McDowall, F. H., *J. Dairy Res.*, **15**, 377 (1948).
[2] McDowell, A. K. R., and McDowall, F. H., *J. Dairy Res.*, **20**, 76 (1953).
[3] McGillivray, W. A., *J. Dairy Res.*, **24**, 95 (1957).
[4] Worker, N. G., and McGillivray, W. A., *J. Dairy Res.*, **24**, 85 (1957).

Intra-ovarian Pollination in *Eschscholzia californica* Cham., *Argemone mexicana* L. and *A. ochroleuca* Sweet

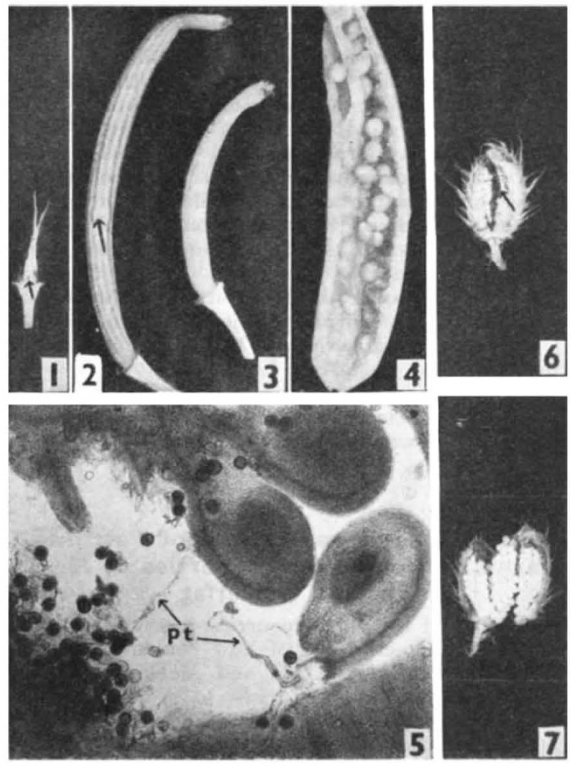
In an earlier communication one of us[1] described the results of intra-ovarian pollination in *Papaver rhoeas*. The present work deals with some observations of a similar nature on *Eschscholzia californica*, *Argemone mexicana* and *A. ochroleuca*.

The pollen suspensions were prepared in 0·5 c.c. of a boric acid solution—200 mgm./l. for *Eschscholzia* and 100 mgm./l. for *Argemone*. Each drop of the suspension contained 200–300 pollen grains.

Eschscholzia. The ovaries injected with pollen suspension grew normally (Figs. 1–3) although the size of the fruits was smaller than that of fruits from naturally pollinated ovaries.

The pollen grains germinated in the ovarian cavity (Fig. 5) and many pollen tubes entered the ovules. The growth of the fertilized ovules was slow in the beginning but the ultimate size (Fig. 4) attained by them was equal to that of ovules from naturally pollinated ovaries. The maturation of the ovaries and dehiscence of the capsules resulting from intra-ovarian pollination took almost the same time as in Nature (25–30 days). The seeds were viable and the embryos as large or larger than those which developed naturally. The seeds germinated and gave rise to normally flowering and fruiting plants.

Argemone. When a pollen suspension in 100 mgm./l. boric acid was injected the germination of the pollen grains inside the ovarian cavity was very low and scarcely more than 1 or 2 seeds were produced per fruit, or sometimes none at all. If a suspension of the pollen grains in double distilled water was used, seed setting was slightly improved (2–4 per fruit). However, when the pollen grains were introduced as such into the ovary through a vertical slit, they germinated profusely (50 per cent) and the seed set was very high. In *A. ochroleuca* about 60 seeds (Figs. 6, 7) and in *A. mexicana* as many as 140 seeds were produced per fruit; in Nature the number of seeds varies between 150 and 200 in the two species.



Figs. 1–5. *Eschscholzia californica*, ovaries injected with a suspension of pollen in 200 mgm./l. boric acid. Fig. 1. Ovary at the time of anthesis and injection of pollen grains; the arrow in this and in Fig. 2 indicates the place of injection of the pollen suspension (× ⅔). Figs. 2 and 3. 17 and 25 days after injection (× ⅔). Fig. 4. Same as Fig. 3, cut vertically to show the developing ovules (× 2·25). Fig. 5. Transverse section of ovary 72 hr. after injection; note the pollen tubes (*pt*) from the germinating pollen grains in the ovarian cavity (× 47). Fig. 6. *Argemone ochroleuca*, ovary 12 days after insertion of pollen through a vertical slit shown by an arrow (× ⅔). Fig. 7. Same as Fig. 6, split open to show developing ovules (× ⅔)

In *A. mexicana* the growth of treated ovaries was slow and the maximum size attained by them was only two-thirds of the normal. In *A. ochroleuca* the treated ovaries grew to less than one-half of their natural size. Nevertheless, in both the species the growth of the ovules and the differentiation of the embryo were almost similar in the treated as well as in the naturally pollinated ovaries. The capsules ripened and dehisced in the same period (27–30 days after anthesis) in both sets and the seeds obtained by intra-ovarian pollinations were fully viable.

A. mexicana is a diploid ($n = 14$) and *A. ochroleuca* a tetraploid ($n = 28$)[2,3]. Natural hybrids between the two are rare and usually sterile[2]. This incompatibility could possibly be overcome by intra-ovarian pollination and work in this direction is in progress. The technique of injecting pollen grains into the ovary may be of help in overcoming some types of incompatibilities.

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[1] Kanta, Kusum, *Nature*, **188**, 683 (1960).
[2] Malhotra, S. K., *Curr. Sci.*, **29**, 282 (1960).
[3] Venkatesh, C. S., *Proc. Indian Sci. Congr., Bombay*, **47**, 401 (1960).