Difference of Cuticular Surface between Diapause and Non-Diapause Pupae of *Pieris rapae* crucivora (Lepidoptera: Pieridae)\(^1\)

Adult development of *Pieris rapae* is triggered by the neurosecretion from the brain-corpus cardiacum system at the larval-pupal ecdisis in non-diapause individuals (Kono, 1973a). The white colour of the wing scales of developed adult becomes observable through the cuticle 4 days after pupation when incubated at 20°C (Kono, 1970). If the neurosecretion does not occur at the pupal ecdisis, pupae stop their adult development by the 2nd day after pupation and enter diapause (Kono, 1971). Therefore, the distinction between diapause and non-diapause pupae used to be made by noting whether the white colour appeared in the wing pads within 4 days after pupation or not. However, the author’s experience has been that the surface of pupal cuticle is somehow glossier in diapause pupae than in non-diapause ones. In the present paper, the surface of pupal cuticle was observed by a scanning electron microscope in order to recognize the difference in the cuticular surface between diapause and non-diapause pupae.

**MATERIALS AND METHODS**

When the larva of *Pieris rapae* are reared under 10L-14D photoperiod at 20°C, all the resulting pupae diapause, while under 10L-2D-2L-10D photoperiod at 20°C, all insects proceed to adult development. Therefore, insects reared under 10L-14D cycle and 10L-2D-2L-10D cycle are regarded as diapause and non-diapause pupae, respectively.

A square of cuticle (about 4×4 mm) was cut off from the first day pupal wing pad of both diapause and non-diapause pupae. It was coated with layers of evaporated carbon and gold, and then observed by a JSM-U3 scanning electron microscope.

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\(^1\) Appl. Ent. Zool. 8 (1): 50–52 (1973)
Fig. 1. a: Scanning electron micrograph of the cuticular surface of a non-diapause pupal wing pad. b: Enlargement of a. c: Scanning electron micrograph of the cuticular surface of a diapause pupal wing pad. d: Scanning electron micrograph of the negative replica of a non-diapause cuticular surface. w, wrinkle.

(CLARET, 1968; KONO, 1973b). In fact, fine structures of neurosecretory IV cells in the brain showed different appearances between the larvae under long day and the larvae under short day periods (KONO, 1973a). Therefore, pupal cuticle construction may also be regulated by the neurosecretory activity in the brain.

There have been few reports on morphological
differences between diapauses and non-diapauses pupae except in the rice leaf miner, *Agromyza orizae* (Kuwaya and Nishijima, 1947). But differences of cuticle construction between diapause and non-diapause pupae must be found in many insect species because the particular construction of cuticle would be necessary for suppressing water loss during the long duration of diapause.

REFERENCES


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Received December 7, 1973