

---

---

## SHORT REPORTS

---

---

*J. Sci. Soc. Thailand*, 2 (1976), 76-80

**THE FEMALE SEX PHEROMONE GLAND OF THE ARTICHOKE PLUME MOTH,  
*PLATYPTILIA CARDUIDACTYLA* (RILEY) (LEPIDOPTERA : PTEROTOPRIDAE)**

SIRIWAT WONGSIRI

*Department of Biology, Faculty of Science, Chulalongkorn University, Bangkok.*

*(Received 30 March 1976)*

---

### Summary

*Female adults of *Platyptilia carduidactyla* (Riley) have a pair of sac-like structure of glandular epithelium situated dorsally between the 8th and 9th segments. It is likely that the female sex pheromone is produced by this gland because it is similar in structure and location to the gland in the spruce bud worm, *Choristoneura fumiferana* (Clem), which has been shown experimentally to be the source of the female sex pheromone. Using a scanning electron microscope, this gland was studied in relation to the mode of release of the sex pheromone.*

---

The sex pheromone gland of female Lepidoptera is typically situated dorsally or ventrally in the intersegmental membrane between abdominal segments 8 and 9 as described by Jefferson *et al.*<sup>1,2</sup>. The female sex pheromone gland of the pyralid moth, *Vitula edmandsae* (Packard), the bumble bee wax moth, is a ring-shaped structure formed by modification of the epidermal cells in the intersegmental membrane between the 8th and 9th abdominal segments<sup>3</sup>. When pressure is applied to the abdomen of a virgin female of the artichoke plume moth, a pair of sac-like structure is everted dorsally from the membrane between the 8th and 9th segments<sup>4</sup>.

A culture of the artichoke plume moth was reared in the laboratory on the semi-artificial medium modified from that of Coudriet<sup>5</sup>. The larval medium consisted of the following ingredients (% by weight): agar 9.83, water 72.84, vitamin solution\* 0.5, wheat germ 10.67, choline chloride 1.28, ascorbic acid 0.33, methyl hydroxybenzoate 1.49, tetracycline 0.027, propionic acid 0.33 and ground fresh artichoke 11.70. The moths were provided 10% sucrose solution as food. Sexes in this species can be easily recognised at pupal stage. Male pupae exhibit three ventral abdominal spines at

\* Niacinamide 1 gm, thiamine hydrochloride 0.025 gm, pyridoxine hydrochloride 0.25 gm, biotin 0.02 gm, calcium pantothenate 1 gm, riboflavin 0.5 gm, folic acid 0.25 gm, vitamin B12 0.002 gm, water 500 ml.

a caudal segment while female pupae show only two. Obviously, female pupae lack the middle ventral spine between the 8th and the 9th segments (see black arrow in Fig. 1). Thus virgin adults of both sexes can be collected and isolated in this manner.

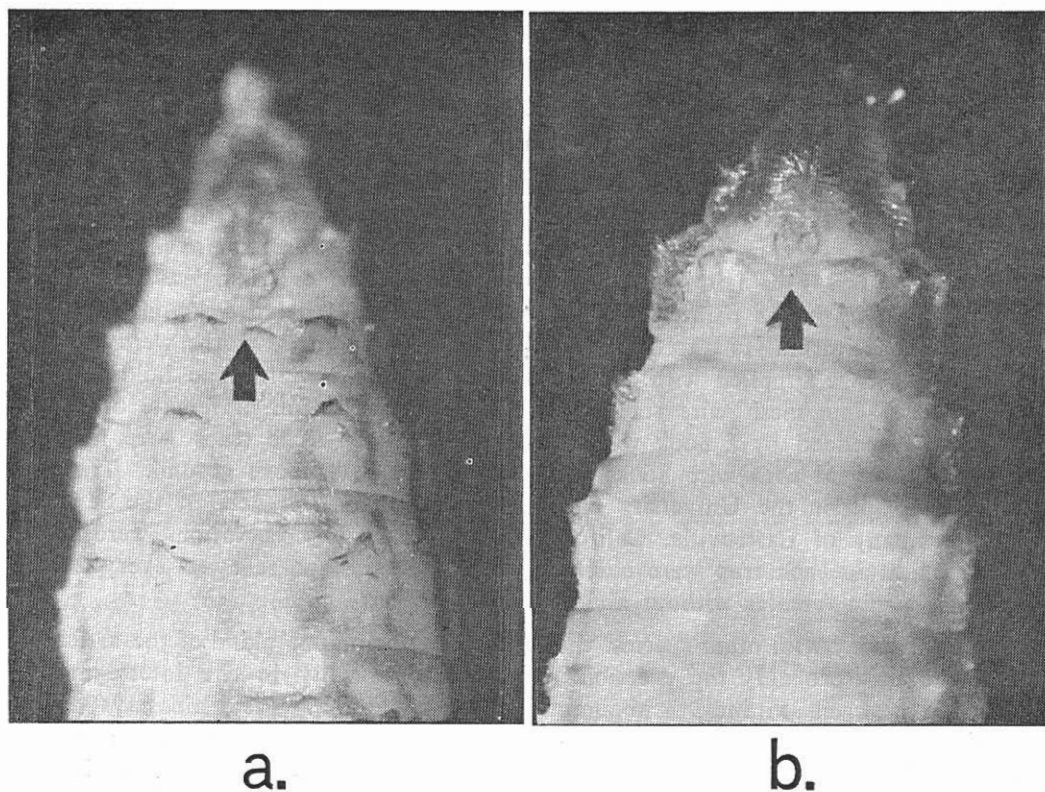
The pheromone-producing glands of the live moths, three days old, were extruded by applying pressure to the abdomen. The terminal abdominal segments were then excised and fixed in 4% glutaraldehyde for 2 h. The glands were prepared as follow: 1. Phosphate buffer (pH 7) was used to wash and clean specimens. 2. Specimens were transferred into 50% ethanol for 20 min, then into 75% ethanol for 12 h or overnight. 3. Specimens were kept in 95% ethanol for 20 min, then transferred into 100% ethanol for 20 min. 4. Absolute isopropanol was used to dehydrate the specimens for 30 min. The materials were stored in 100% amyl acetate until critical-point dried using CO<sub>2</sub> at 980 lb/sq. in. 5. The abdominal tips were affixed to a SEM specimen holder by conductive silver paint. The specimens were examined with an ETEC Autoscan U-1 scanning electron microscope.

Field bioassays were conducted with circular-type sticky traps using normal virgin females and without abdominal tips.<sup>6</sup> The traps were constructed of 11 × 21 cm circular ice cream cartons from which the lids were removed and with both ends of the traps left open to allow the free entrance of males. The inside surface of the traps was painted with Stickem special<sup>®</sup> (Michelan d Peton Company, Emeryville, California) to trap the attracted males. The female moths were confined in a holding cage supplied with 10% sucrose solution in a vial. The holding cages were made of fine mesh wire screen to allow free circulation of female attractant and were suspended by a hook within the trap cartons. The traps were hung in the artichoke field with wire hooks on wooden poles 3 ft above ground. Trapping was carried out on the University of California experimental field in the Sea Mist Farm Company of Castroville, California. A total of 30 observations were taken, moths caught in each trap were counted everyday and traps renewed every 2 days when the virgin females without abdominal tips died.

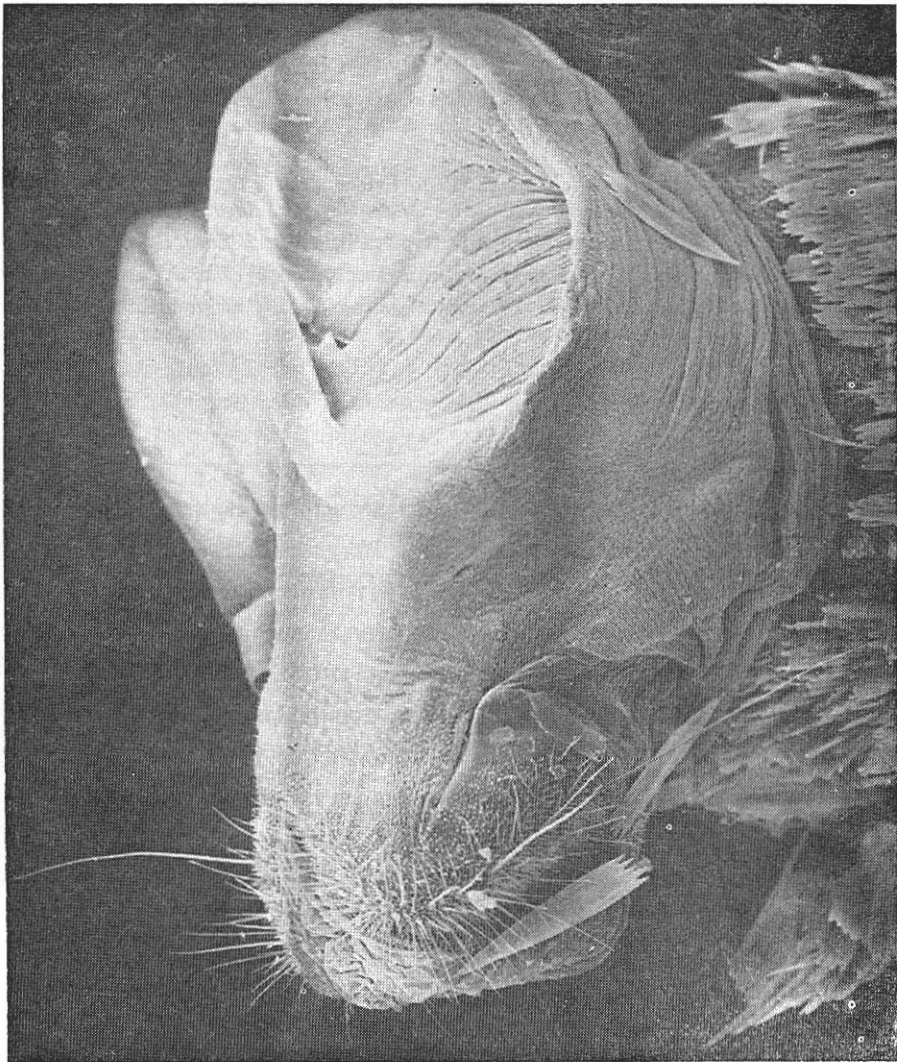
By analogy with other species, the female sex pheromone gland of the artichoke plume moth is probably the eversible sacs situated dorsally in the intersegmental membrane between 8th and 9th abdominal segments (Fig. 2). Field bioassays (Table I) strongly suggest that this structure is the pheromone gland. The surface area of the gland in the artichoke plume moth is similar to that of the spruce budworm, *Choristoneura fumiferana* (Clem) described by Weatherston and Percy<sup>7</sup>. Study of the gland using the transmission electron microscope is currently in progress is an effort to aid in the understanding of the mode of release of the pheromone.

TABLE I MEAN RESPONSES PER NIGHT OF MALE ARTICHOKE PLUME MOTHS.

Trap baited with 2 females	Number of observations	Mean responses
Virgin females	30	12
Virgin females without abdominal tips	30	0
Control without females	10	0



**Fig. 1.** Venter of caudal segments of the artichoke plume moth pupae. a, male, with distinguishing characteristic indicated by the arrow; b, female, lacking the dark middle spine characteristic of the male ( $\times 16$ ).



**Fig. 2.** Terminal portion of abdomen of a *P. Carduidactyla* female showing everted dorsal pheromone gland ( $\times 120$ ).

## References

1. Jefferson, R. N., Shorey, H.H., and Rubin, R.E. (1968) Sex pheromones of noctuid moths XVI. The morphology of the female sex pheromone glands of eight species. *Ann. Entomol. Soc. Am.* 61, 861-865.
2. Jefferson, R. N., Sower, L.L., and Rubin, R.E. (1971) The female sex pheromone gland of the pink boll worms, *Pectinophora gossypiella* (Lepidoptera : Gelechiidae) *Ann. Entomol. Soc. Am.* 64, 311-312.
3. Weatherston, J., and Percy, (J.E. (1968) Studies of physiologically active arthropod secretion. I. Evidence for a sex pheromone female *Vitula edmandsae* (Lepidoptera : Phycitidae). *Can. Entomol.* 100, 1065-1070%
4. Wongsiri, S. Lange, W.H. and Birch, M. C. (1975) Evidence for a sex pheromone in the artichoke plume moth, *Platyptilia carduidactyla*. *Ann. Meet. Entomol. Soc. Amer. Portland, Oregon*, 38-39.
5. Coudriet, D.L. (1970) Rearing the orange tortrix on a synthetic diet *J. Econ. Entomol.* 63, 1004-1005.
6. Wongsiri, S. (1973) Use of sex pheromone traps in insect survey. *Thai J. Agr. Sci.* 6, 321-328.
7. Weatherston, J., and Percy, J.E. (1970) Studies of physiologically active arthropod secretion. IV. Topography of the sex pheromone producing gland of the eastern spruce budworm, *Choristoneura fumiferana* (Clem) (Lepidoptera : Tortricidae). *Can. J. Zool.* 48, 569-571.

## บทคัดย่อ

เฟอโรโมนส์ คือสารสัญญาณทางเคมีชนิดหนึ่ง สารนี้ถูกกลั่นและสกัดออกมาจาก exocrine gland หรือ pheromone gland ในแมลงผีเสื้อกลางคืน *Platyptilia carduidactyla* (Riley) พบว่าตัวเมียมีต่อมภายนอกอยู่ที่ปลายท้อง (abdominal tip) ระหว่างปล้องที่ 8 และที่ 9 ด้านบนมีลักษณะคล้ายถุง (sac) อยู่สองถุง เมื่อบีบกันแมลงมันจะโป่งออกมาคล้ายลูกโป่งสองลูกเล็ก ๆ ข้างละลูกบนปลายท้องของแมลง จากการศึกษาจากภาพที่ได้จากกล้อง scanning electron microscope โดยเปรียบเทียบกับต่อม sex pheromone gland ในแมลงชนิดที่คล้าย ๆ กัน ซึ่งมีผู้ศึกษาเรื่อง sex pheromone gland มาแล้ว เราเข้าใจว่าต่อมที่พบใน *P. carduidactyla* นี้ คือต่อม sex pheromone gland ซึ่งสามารถผลิตสารสัญญาณทางเพศ sex pheromone ออกมาดึงดูดตัวผู้ให้เข้ามาผสมพันธุ์