

Chemical defence reaction in *Pseudoophonus rufipes* (Coleoptera, Carabidae) and its impact on human skin

Zbyšek ŠUSTEK¹, Július RAJČÁNI²

¹Institute of Zoology, Slovak Academy of Sciences, Dúbravská cesta 9, 842 06 Bratislava, Slovakia

²Institute of Virology, Slovak Academy of Sciences, Dúbravská cesta 9, 842 46 Bratislava, Slovakia

ŠUSTEK, Z., RAJČÁNI, J. 2002. A note to chemical defence reaction in *Pseudoophonus rufipes* (Coleoptera, Carabidae) and their impact on human skin. *Entomol. Probl.* 32(2): 167–168. – In summer 1998 and 1999, during daily marking of 50–350 individual Carabids [mostly *Pseudoophonus rufipes* (DE GEER, 1774)], a sudden strong heating of the ventral body part followed by the secretion of an acidic defensive secretion was observed in some *P. rufipes* in the hot evenings (about 26–28 °C). This reaction resembled the defence reaction in the bombardier beetles, especially *Pheropsophus* spp. The repeated exposure of the fingertips to the secretion of *P. rufipes* provoked an erythema, followed by dotted hemorrhages, developing later to spongiotic edema and resulting in the formation of flat intraepidermal vesicles. Finally, the upper necrotized and keratinized layer sloughed off the bottom of former vesicles and, due to previous hemorrhages, it was occasionally coloured by dark brown spots with yellow edges. The lesions, resembling reactive spongiiform dermatitis, healed within 7–10 days by a transient hyperkeratotic response.

Key words: Carabidae, *Pseudoophonus rufipes*, chemical defence, human skin.

The carabids are known to use various modes of chemical defence if disturbed or attacked. Their defensive substances were analysed by SCHILDKNECHT et al. (1968, in THIELE 1977). According to him, the defensive secretion of *Pseudoophonus rufipes* (DE GEER, 1774) predominantly consists of formic acid and, like the secretions of most carabids, has no or only negligible effects on the human skin (ROSICKÝ et al. 1979). Its secretion is not known to be accompanied by a spectacular sensation, like in the Brachyninae or Paussinae.

During the daily marking of about 50–350 carabids flying on light or surviving in various covers in the centre of Bratislava (ŠUSTEK 1999), it was observed that a minor part of the marked *Pseudoophonus rufipes* (DE GEER, 1774) exhibited a much stronger defensive reaction than other individuals. This reaction was exhibited by about 15% on beetles, particularly females. It consisted of a considerable increase in temperature of their body, which was felt on the ventral side of the marked beetles contacted immediately with the fingertips. The temperature increase was followed by the secretion of an acidic secretion which was felt in the air. If the fingertips were already etched by the secretion of a larger number of beetles, the secretion also provoked a short, sharply burning sensation on the fingertips, which forced one to break the work for some time.

P. rufipes showed this reaction exclusively in the warm evenings (26–28 °C) at the turn of July and August in 1998 and 1999, when the flying activity of *P. rufipes* and other carabids culminated. In colder days, from mid-August to early November, when the flying activity was negligible or when only the beetles running along the wall bases were marked, this reaction was not observed. This reaction was not observed in other carabid species (mainly *Pseudo-*

ophonus calceatus DUFTSMIDT, 1812 and *Dolichus halensis* SCHALLER, 1783) marked in this locality, but this difference might be due to the considerably lower numbers of individuals of these species and the reduced probability of meeting individuals showing a similarly strong defensive reaction.

The increase in the temperature of the ventral part of body resembled the defensive reaction of the East Asian bombardier beetle, *Pheropsophus jessoensis* MORAVITZ, 1862. This species, when caught in the fingers, begins to move excitedly, the temperature of its body increasing



Fig. 1. Fingertips on the hands after sloughing the upper necrotized and keratinized layer off the bottom of former vesicles and the with dark brown spots with yellow edges caused by previous hemorrhages (photo M. Červeňanský).

rapidly and reaching a hardly supportable degree. Just at that time, after a noisy explosion, it produces a large cloud of yellow vapour getting stuck on the fingers and persisting there for 2–3 days. The explosions may be repeated several times within a short time (ŠUSTEK unpublished personal observation made in North Korea). This similarity suggests that a similar exothermic reaction, like that causing the explosions in *P. jessoensis*, may also serve to help eject the defensive secretions in *P. rufipes*.

The predominance of females among the individuals in which this reaction was observed, as well as its intensity, suggest that *P. rufipes* females unprepared for copulation may also use chemical defence against males, as KIRK & DUPRAZ (1972) observed in the American *Pterostichus lucublandus* SAY, 1823. However, this sex-correlated difference may be caused only by the larger bodies of most females of *P. rufipes* and, consequently, by their larger defensive glands.

Independent of the intensity of the defensive reaction in individual *P. rufipes*, the repeated exposure of the fingertip skin to small amounts of acidic secretion caused a visible etching of skin after marking about 150 individuals within one evening. This etching appeared as late on the next day, after washing the hands several times. As a consequence of the acidic secretion, the affected skin showed erythema, followed by dotted hemorrhages. Within 2–3 days, the area in question developed spongiotic edema with a moderate accumulation of intercellular fluid between the

upper and lower layers of the squamous epithelium, resulting in the formation of flat intraepidermal vesicles. As a consequence, the upper necrotized and keratinized layer sloughed off the bottom of former vesicles, which, due to previous hemorrhages, was occasionally coloured by dark brown spots with yellow edges. The spots were situated on opposing places of fingertips held together (Fig. 1). These places were most exposed coming in immediate contact with the body of beetles being marked. The lesions, resembling reactive spongiiform dermatitis, healed within 7–10 days by a transient hyperkeratotic response. No later than within a fortnight, the touched skin could not be distinguished from the surroundings and it was painless during healing.

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