Key to the species of *Decanematus*

1. Sawsheath in lateral view narrow and slender (Fig. 2). Japan ..... *longus* Takeuchi
   Sawsheath in lateral view broad and tapered (Fig. 1) 2
2. Hind femora black, antennae with 10 segments. Kamchatka ..... *longiserra* Malaise
   Hind femora reddish brown, antennae with 9 segments. Canada ..... *dulichus* sp. nov.

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References

Malaise, R. 1931. Entomologische Ergebnisse der schwedischen Kamchatka-Expedition 1920–1922. 35 Tenthredinidae. *Ark. Zool.* **23**A(8): 31–32.

Takeuchi, T. 1952. A generic classification of the Japanese Tenthredinidae (Hymenoptera: Symphyta). *Kyoto*: 66–68.

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EFFECT OF OVIPOSITION SITES ON EGG PRODUCTION AND LONGEVITY OF *TROGODERMA PARABILE* (COLEOPTERA: DERMESTIDAE)[1]

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Abstract *Can. Ent.* 100: 86–89 (1968)

Pairs of adults of *Trogoderma parabile* Beal were held in glass vials and provided with one of seven types of oviposition sites. Among the types of oviposition sites tested, the highest mean egg production was recorded on cotton balls and the lowest in empty glass vials. Egg production was not increased by adding food to vials that contained cotton balls. A suitable oviposition site, which provided crevices for insertion of the ovipositor, was more important than food in stimulating egg production. Non-ovipositing females lived longer than productive females on the various oviposition media. Adults fed, but did not require food to lay eggs. Mated females laid practically the same number of eggs during the oviposition period whether or not males were present.

Introduction

Reproductive rate is an important parameter determining the rate of increase in an insect population. Hence, factors such as availability of food, suitability of oviposition sites, and the presence of males, which may affect oviposition, should be investigated. Adults of some species of *Trogoderma* are thought not to feed (Burges 1961; Hadaway 1956), or require neither food nor water to lay eggs (Norris 1936). In the present study oviposition, longevity, and feeding of adults of *Trogoderma parabile* Beal on various media were investigated.

Methods

Insects were obtained from a laboratory culture, reared at 30±0.5°C and 70±5% relative humidity on a mixture of wheat, bran, brewer's yeast, and wheat germ (45:45:5:5 W/W). Adults were removed from the last larval skin within

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24 hours of emergence. A male and a female were placed in each of 154 vials, 5×2 cm, that contained the oviposition sites. The different oviposition sites tested were: a ball of black sterile cotton about 3 mm in diameter plus 25 mg food medium (ground to pass through an 80-mesh bolting cloth); a ball of black sterile cotton; a ball of black sterile cotton that was extracted with ether, washed with water, dried, and kept from contact with the hands; two exuviae from fifth instar larvae; two exuviae shredded into small flakes; a ball of glass wool; a plastic egg-laying block. The block, modified after Bond and Monro (1954), was made of two pieces of acrylic plastic 13 mm square and 3 mm thick. A piece of cardboard 0.24 mm thick and about 6 mm square was placed between the blocks, centered and fastened with bonding cement. The space between the two pieces of plastic provided the oviposition site. Twenty-two pairs of adults were used with each type of oviposition site and a comparable group was placed in empty vials. All insects were held in desiccators maintained at 30±0.5°C and 70±5% relative humidity. The number of eggs laid by each female was recorded daily. Female longevity was also noted.

To determine if adults consumed food, 50 newly-emerged adults (25 males and 25 females) were provided with finely-ground dog biscuit dyed with carmine. One lot of beetles was supplied with the dry meal whereas a second lot was provided with a paste made by adding water to the dyed ground meal. The production of fecal pellets was considered to be evidence of feeding.

A separate study was carried out to determine if the presence of males affected the rate of oviposition of mated females. A pair of newly-emerged adults was placed in each of 20 salve tins lined with scored blotting paper. The latter served as an oviposition site. The males were removed from 10 containers as soon as the females commenced to oviposit, while in the other containers the pairs remained together until the females died.

The results shown in Table I were analyzed by analysis of variance and multiple range tests (Duncan 1955; Kramer 1956).

Results and Discussion

Egg Production

Significantly more eggs were laid by females in vials that contained oviposition sites than in empty vials (Table I). The glass vial was not a suitable oviposition site probably because there was no crevice into which the ovipositor could be inserted. Eggs laid in vials that contained cotton balls or cotton balls plus food were inserted among the cotton fibers. Females laid almost as many eggs on substrates that had no nutritive value, such as glass wool and the egg-laying blocks, as on cotton balls plus food. These results indicate that *T. parabile* did not require cereal food to lay a normal number of eggs. However, adults did ingest cotton fibers and produced feces, which suggests that they may have derived nourishment from components or contaminants in the cotton. The fact that egg production on whole cast skins (ingested by adults and presumably of nutritive value) and on ether-extracted cotton was the same (Table I) suggests that feeding stimulants have no effect on oviposition.

Table I shows that only 59% of the females laid eggs on glass wool and ether-extracted cotton balls. Possibly the physical nature of glass wool restricted the movements of adults sufficiently to prevent some from mating. However, those females that laid eggs on glass wool were as productive as females ovipositing on cotton balls. The small percentage of females that oviposited on

TABLE I
Numbers of eggs laid by *Trogoderma parabile* on various oviposition sites

Oviposition site	No. of females	No. of ovipositing females	Mean number of eggs*
Cotton ball without food	20	18	89.0
Cotton ball plus food	20	20	82.7
Cast larval skins, shredded	22	17	78.2
Glass wool	22	13	72.9
Ether-extracted, water-washed cotton ball	22	13	67.9
Oviposition block	21	18	67.8
Cast larval skins, whole	19	19	64.8
Empty glass vial	19	19	21.5

*Any two mean values joined by the same line are not significantly different at the 5% level.

ether-extracted cotton cannot easily be explained. Adults were not impeded in their movements and should have been able to meet and mate. Females that oviposited on this medium produced normal numbers of eggs.

Longevity

Non-ovipositing females lived longer than ovipositing females on the various oviposition sites (Table II). Female longevity and egg production tended to be inversely related (Tables I and II) (Loschiavo 1967). Females in empty vials lived 3.5 to 7.6 days longer than did those provided with oviposition sites, and produced the fewest eggs ($P < 0.05$).

Adult Feeding

In the present investigation adults were observed to feed. Newly-emerged adults placed on a finely-ground mixture of dry dog biscuit and carmine produced a few dyed fecal pellets. On a dough-like paste made by adding water to the mixture adults produced copious quantities of feces. Furthermore, adults were frequently observed in the act of ingesting cotton fibers.

Effect of Presence of Male on Oviposition

The total egg production of 10 mated females reared with and without males was 768 and 773, respectively. These results indicate that *T. parabile* does not

TABLE II
Longevity of female adults of *Trogoderma parabile* on various oviposition sites

Oviposition site	Number of females		Mean days ± S.E. from emergence to death			
	Ovipositing	Non-ovipositing	Ovipositing females		Non-ovipositing females	
Cotton ball without food	18	2	10.3	0.21	23.0	2.00
Cotton ball plus food	20	0	9.9	0.47	—	
Cast larval skins, shredded	16*	5	13.0	0.57	21.2	1.39
Glass wool	13	7	10.7	0.43	19.4	0.37
Ether-extracted, water-washed cotton ball	12*	9	11.0	0.40	19.4	1.01
Oviposition block	17*	4	11.9	0.16	21.0	0.70
Cast larval skins, whole	19	0	11.9	0.48	—	
Empty glass vial	19	0	16.5	0.79	—	

*One female lost or damaged after oviposition was completed and therefore not included in longevity data.

require frequent copulations to lay a full complement of eggs. These observations agree with those made with *T. inclusum* (= *T. versicolor*) (Norris 1936). The continued presence of males was not an important factor affecting the potential increase and economic status of *T. parabile*. Optimal temperature for development and reproduction are of greater importance (Loschiavo 1960; Loschiavo, in press).

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References

Bond, E. J., and H. A. U. Monro. 1954. Rearing the cadelle *Tenebroides mauritanicus* (L.) (Coleoptera: Ostomidae) as a test insect for insecticidal research. *Can. Ent.* **86**: 402–408.

Burges, H. D. 1961. The effect of temperature, humidity and quantity of food on the development and diapause of *Trogoderma parabile* Beal. *Bull. ent. Res.* **51**: 685–696.

Duncan, D. B. 1955. Multiple range and multiple *F* tests. *Biometrics* **11**: 1–42.

Hadaway, A. B. 1956. The biology of the dermestid beetles, *Trogoderma granarium* Everts and *Trogoderma versicolor* (Creutz.). *Bull. ent. Res.* **46**: 781–796.

Kramer, C. Y. 1956. Extension of multiple range tests to group means with unequal numbers of replications. *Biometrics* **12**: 307–310.

Loschiavo, S. R. 1960. Life-history and behaviour of *Trogoderma parabile* Beal (Coleoptera: Dermestidae). *Can. Ent.* **92**: 611–618.

Loschiavo, S. R. Adult longevity and oviposition of *Trogoderma parabile* Beal (Coleoptera, Dermestidae) at different temperatures. *J. stored prod. Res.* **3**: 273–282.

Norris, M. J. 1936. Experiments on some factors affecting fertility in *Trogoderma versicolor* (Creutz.) (Coleoptera, Dermestidae). *J. Anim. Ecol.* **5**: 19–22.

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AN ENVIRONMENTAL CABINET WITH VARIABLE AIR VELOCITY FOR INSECT STUDIES[1]

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Abstract *Can. Ent.* 100: 89–93 (1968)

A controlled environment cabinet for the study of insects or plant–insect interactions which has a novel air velocity control mechanism is described. The useful working space is 0.56×0.84×1.83 m long and the temperature in this area can be selected from 18° to 35°C at air velocities ranging from 1.5 to 18.0 km/hr. Fluorescent lamps provide a light intensity of 32,300 lm/m², 0.32 m below the lamps.

Temperatures were controlled within ±0.67°C and the air velocity was uniform within 20% throughout the working area.

Description of Apparatus

The cabinet (Fig. 1A) is constructed of wood and mounted on casters. The 0.56×0.84×1.83 m long working section (D, Fig. 2) is at the top and is accessible via two 0.84-m square doors which contain observation windows. The machinery for the cabinet is installed below the working section and the electric controls (L) are externally mounted at one end (Fig. 2). The self-contained portable cabinet is 0.74×2.12×3.33 m long and it can operate wherever electric power and a water supply are available.

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