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Lower Aliphatic Amines as Chemical Attractants for *Milichiella lacteipennis* (Diptera: Milichiidae)[1]

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ABSTRACT

Fifteen lower aliphatic amines at several concentrations between 10% and 0.0001% were tested as chemical attractants for *Milichiella lacteipennis* (Loew) in the CES olfactometer. At the concentrations tested ethylamine, n-propylamine, and isopropylamine were the best attractant chemicals found, but most of the other amines tested showed some attractancy also.

Most of the literature on *Milichiella* is concerned with taxonomy and not much seems to be known about the biology of these insects. It is known that the genus is widespread geographically (Melander 1913) and that *M. lacteipennis* (Loew) is commonly found near excrements or other decaying organic matter (Grandi 1951). But *Milichiella* species do not seem to be important to economic and medical entomology.

We have been involved for some time in isolation studies on the chemical attractants contained in decaying protein against the eye gnat, *Hippelates collusor* (Townsend). Since the CES olfactometer (Mulla et al. 1960a) used in these studies is constructed in such a fashion that *Milichiella* can gain access to the traps and since *Milichiella* is attracted by decaying organic matter, it was not surprising that these little black flies were occasionally caught during such tests (Mulla et al. 1960b). It was of interest to note, however, that they were also attracted by lower aliphatic amines.

In spring of 1959 an unusually heavy population of *Milichiella lacteipennis* (Loew)[3] existed at one attractant test station in the Coachella Valley, California: a catch of 50 or 60 per trap with egg bait or ethylamine was not uncommon. A systematic study of the attractancy of lower aliphatic amines to *Milichiella* was then undertaken. However, the insect population started to decline soon and remained low ever since. Consequently, it was not possible to complete all the tests deemed desirable.

EXPERIMENTAL

Aqueous solutions of a number of aliphatic amines of 10, 1, 0.1, and 0.01 percent (weight per volume) were prepared. The limited solubility of di-n-propylamine and triethyamine did not permit testing of these

Table 1.—Relative attractancy of lower aliphatic amines to *Milichiella lacteipennis* (Loew).[a]

Substance	Concentration 10%	1%	0.1%	0.01%	0.001%	0.0001%
methylamine	0 (0)	0 (0)	0 (0)	6 (3)	22 (21)	26 (25)
ethylamine	27 (7)	100	52 (181)	31 (5)	—	—
n-propylamine	9 (9)	14 (5)	107 (35)	55 (18)	—	—
isopropylamine	3 (3)	17 (16)	113 (110)	58 (56)	—	—
n-butylamine	0 (0)	1 (3)	17 (37)	4 (9)	—	—
isobutylamine	1 (3)	0 (1)	0 (1)	0 (1)	—	—
sec. butylamine	0 (0)	0 (0)	1 (3)	0 (1)	—	—
tert. butylamine	0 (0)	2 (9)	2 (10)	7 (30)	17 (16)	20 (19)
n-amylamine	0 (0)	0 (0)	0 (0)	0 (0)	—	—
isoamylamine	0 (0)	8 (2)	0 (0)	0 (0)	—	—
dimethylamine	6 (2)	9 (3)	20 (94)	4 (17)	—	—
diethylamine	0 (1)	0 (0)	0 (0)	1 (3)	—	—
di-n-propylamine	—	2 (7)	2 (7)	0 (2)	—	—
trimethylamine	12 (8)	6 (4)	28 (19)	12 (8)	—	—
triethylamine	—	2 (2)	5 (4)	20 (17)	16 (14)	—

[a] Standard: 1% ethylamine. Each sample run in eight replicates. The numbers in parentheses indicate the actual number of *Milichiella* caught in each case.

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[3] Determined by C. W. Sabrosky, Entomology Research Division, USDA, Washington, D. C.

amines at the highest concentration. All the attractancy tests were carried out in the CES olfactometer (Mulla et al. 1960a) designed for testing *Hippelates* attractants. To place all the attractancies on a common basis 1 percent ethylamine was run as a standard with all the tests. The catch due to the other amines was then recorded as a percentage of the catch of this standard (=relative attractancy). Eight replicate samples were run of each amine at each concentration.

The results of our tests are recorded in table 1. Among the substances and concentrations tested 1% ethylamine, 0.1% n-propylamine, and 0.1% isopropylamine showed the greatest attractancy. Since the attractancy of methylamine and tert. butylamine was increasing with decreasing concentrations, tests with these amines at 0.001% and 0.0001% were conducted. Clearly, however, experiments with even lower concentrations of these amines will have to be undertaken when testing conditions become favorable again. Most of the other amines tested showed only low-grade attractancy.

A number of other amino compounds such as ammonia, lysine, ornithine, 2,4-diamino-butyric acid, spermidine, 1,1,7,7-tetraethyl diethylenetriamine, and N,N-di-n-butyl-1,3-propanediamine showed attractant properties but no quantitative data are available at this time. Possibly, the only strict structural requirement for the attractancy of a chemical to *Milichiella* is the presence of an amino group in the molecule.

When experiments were designed to compare the attractancies of ethylamine and egg bait, sometimes egg proved much more attractant than ethylamine and sometimes the reverse was true. This is not surprising since the optimum conditions for the preparation of egg bait as an attractant for *Milichiella* have not been studied. Neither has the optimum pH for *Milichiella* attractant testing been worked out.

No *Hippelates collusor* were attracted by the lower aliphatic amines tested and only a smaller number of *H. dorsalis* were attracted by trimethylamine.

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The Comparative External Morphology of *Trichobius corynorhini*, *T. major*, and *T. sphaeronotus* (Diptera, Streblidae)

Part II. The Thorax[1]

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ABSTRACT

A comparative, detailed discussion of the external morphology of the thorax and its appendages is given for each of these species. Variations within each species and within populations of the same species were studied intensively. All three species showed variations in the number of scutellar bristles, and several wing-vein anomalies were found in each. Data are presented to show the frequency of these variations in 2,238 specimens of *T. major* Coquillett, 292 *T. corynorhini* Cockerell, and 1,064 *T. sphaeronotus* Jobling, collected from bat caves in northwestern Oklahoma. Comparable numbers of individuals showing the same variations in two populations of *T. major* suggest gene flow between gene pools of the populations. No sexual dimorphism was noted in the thorax of any of the three species.

The first paper in this series (Zeve and Howell 1962) dealt with the head and its appendages in *Trichobius corynorhini* Cockerell, *T. major* Coquillett, and *T. sphaeronotus* Jobling, whose adults were collected from several bat caves in northwestern Oklahoma. The present paper deals with the thorax and its appendages in these three species of *Trichobius*.

Little information has been published on the structure of the thorax of the Streblidae. In a brief discussion, Jobling (1939) described the thorax of *Ascodipteron africanum* Jobling, an Old-World streblid, but its thoracic region is quite unlike that of *Trichobius*. Though studies on the external anatomy of the Streblidae are so scanty, several publications warrant mention here that served as excellent references. The publications of Bonhag (1949), Bequaert (1953), Crampton (1942), and Snodgrass (1935) were found to be extremely useful when drawing analogies and homologies in areas of great complexity. The terminology of Bonhag has been used wherever it was found applicable.

OBSERVATIONS AND COMPARISONS

In dorsal view the thorax (figs. 1, 2, 3) appears approximately circular in outline in all three species.

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