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RESPONSE OF BLACKFLIES (DIPTERA : SIMULIIDAE) TO CERTAIN COLOURED LIGHT SOURCES

M. DATTA, D. K. CHOUDHURI* AND B. DASGUPTA**

Zoological Survey of India, Calcutta

ABSTRACT

The photophilic behaviour of six species of blackflies (Diptera : Simuliidae) of Darjeeling, *viz.*, *Simulium* (*Eusimulium*) *praelargum* Datta, *S.* (*E.*) *gracilis* Datta, *Simulium* (*Simulium*) *himalayense* Puri, *S.* (*S.*) *grisescens* Brunetti, *S.* (*S.*) *rufibasis* Brunetti and *Simulium* (*Gomphostilbia*) *tenuistylum* Datta, was tested with five different coloured lights. Blackflies appeared to be more attracted to snow-white light than to any other coloured light. The incidence percentage of a given species varied from colour to colour, and the sequence except in the case of *praelargum*, was as follows : snow white, chrome yellow, dark red, forest green and dark blue. *S.* (*E.*) *praelargum* was found to be least attracted to forest green light. The reason for decreasing incidence of different species of blackflies to different coloured lights is discussed.

INTRODUCTION

Blackflies are known to be positively phototropic insects (Williams and Davies, 1957 ; Datta, 1972 ; and others). Taking advantage of this behaviour a series of experiments were conducted at Darjeeling to study the relative attractiveness, if any, of six species of blackflies to different five coloured light sources (Datta, Dey and Paul, 1973), the photophilic behaviour being considered in terms of the co-efficient of apparent sensivity to different chromatic effects.

MATERIAL AND METHODS

The material consisted of six species of blackflies of Darjeeling, *viz.*, *Simulium* (*Eusimulium*) *praelargum* Datta, *S.* (*E.*) *gracilis* Datta, *Simulium* (*Simulium*) *himalayense* Puri, *S.* (*S.*) *grisescens* Brunetti, *S.* (*S.*) *rufibasis* Brunetti and *Simulium* (*Gomphostilbia*) *tenuistylum* Datta. These were collected by means of light traps. A Chinsura light trap (Banerjee and Basu, 1956) was operated simultaneously for the control experiment beside the usual light trap device (Datta and Dasgupta, 1972) meant for the treated experiments. A 200 watt lamp was used as the light source of each of the traps which were turned on daily at 7.00 P. M., and the trapping continued till 5.00 A. M. of the following day. The experiment was conducted at Darjeeling Government College campus

* *Burdwan University, Burdwan*

** *Darjeeling Government College, Darjeeling*

for 68 nights during March-October of 1968, 1969 and 1970. The light source of the treated trap was wrapped by transparent cellophane papers of desirable colour, while the control trap emitted ordinary white light as usual throughout the series of experiment. The incidence of blackflies taken in the treated series was compared with that of the control one in order to observe any possible colour preference of these insects.

Results

The incidence of six species of blackflies under investigation are given below (Tables I-V).

The incidence of blackflies in the control trap was slightly greater than that of the treated trap except the case of *gracilis* and *tenuistylum*. The former species taken in the treated trap showed a slightly higher incidence, while the latter occurred in equal proportions in both the traps (Table I).

The incidence of all the blackflies taken in the treated trap using dark red light was always lower (much below 50%) than that taken in the control trap. *S.* (*G*) *tenuistylum*, however, showed the incidence only above 30% level (Table II).

The incidence of blackflies except *prae-*

Table I. Blackflies taken in the treated trap with chrome yellow light source as against the control trap tested for 14 days.

Species	Number of specimens taken in the light trap		Percentage of incidence in chrome yellow light
	Control	Treated	
praelargum	14	12	46.1
gracilis	10	11	52.4
himalayense	20	16	44.4
grisescens	7	4	36.4
rufibasis	13	12	48.0
tenuistylum	5	5	50.0

Table II. Blackflies taken in the treated trap with dark red light source as against the control trap tested for 17 days.

Species	Number of specimens taken in the light trap		Percentage of incidence in dark red light
	Control	Treated	
praelargum	20	15	42.9
gracilis	12	9	42.9
himalayense	22	17	41.0
grisescens	10	7	41.2
rufibasis	11	9	45.0
tenuistylum	4	2	33.3

TABLE III. Blackflies taken in the treated trap with forest green light as against the control trap tested for 15 days.

Species	Number of specimens taken in the light trap		Percentage of incidence in forest green light
	Control	Treated	
praelargum	20	7	26.0
gracilis	14	6	30.0
himalayense	31	14	31.1
grisescens	15	7	31.8
rufibasis	18	8	30.8
tenuistylum	7	2	22.2

TABLE IV. Blackflies taken in the treated trap with dark blue light as against the control trap tested for 12 days.

Species	Number of specimens taken in the light trap		Percentage of incidence in dark blue light
	Control	Treated	
praelargum	17	7	29.2
gracilis	11	2	15.4
himalayense	24	9	27.3
grisescens	15	5	25.0
rufibasis	18	6	25.0
tenuistylum	7	1	12.5

TABLE V. Blackflies taken in the treated trap with snow white light as against the control trap tested for 10 days

Species	Number of specimens taken in the light trap		Percentage of incidence in snow white light
	Control	Treated	
praelargum	12	17	58.6
gracilis	8	14	63.6
himalayense	27	34	55.7
grisescens	9	12	57.1
rufibasis	15	16	51.6
tenuistylum	6	7	53.8

largum and *tenuistylum* taken in the treated trap with forest green light was found to be 30% or just above 30% level, while *praelarqum* and *tenuistylum* showed lower incidence below 30% level. In all cases, however, the appearance of females in the treated trap was scarce (Table III).

The incidence of blackflies taken in the treated trap using dark blue lamp was very poor. The two species *gracilis* and *tenuistylum* showed the incidence at 15.4% and 12.5% levels respectively, while the others registered this incidence between 25% and 30% levels. The most important feature of this experiment was that the treated trap captured only the female specimens instead of admixture of both the sexes as evidenced in other experiments (Table IV).

The incidence of blackflies taken in the trap with snow white light source was quite different in that all the species showed higher incidence in the treated trap than in the control one and the percentage of females captured was always above 50 (Table V).

The incidence percentage for all the species of blackflies taken in the treated series of experiments tried for five desirable colours with which the relative attractiveness of these insects was tested is given (Table VI).

Discussion

It was observed that blackflies were more attracted to snow white light than to any other coloured light. Vargas (1945) reported that blackflies were more attracted to blue than to yellow light. Further, Frost (1954) and, Grebelsky, Kovrov and Byaenkova (1963) found high incidence of female blackflies taken in ultra-violet light. It was probable that snow white light, like green (Doby, Bernard and David, 1956) and ultra-violet (Frost, 1954 ; Grebelsky et al., 1963) stimulated and concentrated the flies towards the light source and upon heat-shock the flies fell to the liquid medium of the trap showing the incidence. The colours used in the experiments apparently had little to do with spontaneous landing like purple, maroon, red and blue colours (Davies, 1971). However, the incidence percentage of a given species varied from colour to colour and the sequence of attractiveness for all but *praelargum* was as follows :—snow white, chrome yellow, dark red, forest green and dark blue. In contrast to other species, *praelargum* was least attracted to forest green light. The incidence of *tenuistylum* occurred in equal proportions taken in the control and in the treated traps with chrome yellow light source, probably because of the scanty population of

Table VI. Incidence-percentage of blackflies taken in the treated trap tried for 5-coloured light sources in 68 nights.

Species	Chrome yellow	Dark red	Forest green	Dark blue	Snow white
praelargum	46.1	42.9	26.0	29.2	58.6
gracilis	52.4	42.9	30.0	15.4	63.6
himalayense	44.4	41.0	31.1	27.3	55.7
grisescens	36.4	41.2	31.8	25.0	57.1
rufibasis	48.0	45.0	30.8	25.0	51.6
tenuistylum	50.0	33.3	22.2	12.5	53.8

the species, and this sort of variation in incidence was also reported by Kohler and Fox (1951) who experimented with *Culicoides* in Puerto Rico and demonstrated that the yellow trap made consistently higher catches than the forest green one, if the population was not extremely low.

The reason of decreasing incidence in the treated series might be correlated to the limited dispersion of light rays from the coloured envelope of the treated traps which were probably beyond the span of these insects' activity in nature in certain cases, if not to speak of the blackflies' natural sensivity to different chromatic lights. Moreover, two sexes of a species behaved in an opposite way and this was probably due to certain physiological factors (*cf.* Davies, 1971). Thus, as the incidence of a species began to decline with the above trend of attractiveness, more and more female specimens were to appear in the treated trap except in the case of green light. According to Davies and Williams (1962) two sexes of a given species or two species of a given population of blackflies might be attracted to light differentially. Davies (1951, 1961) held that females of *Simulium venustum* Say were attracted more to dark blue cloth than to other coloured ones. It might be possible that females of a species would be influenced by the excitement to one colour and not to another, which might be preferable or otherwise to the other sex, depending upon the physiological conditions of the individual insect.

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