SUBSTRATE PREFERENCE OF SIMULIIDAE LARVAE IN THE FIELD IN INDIA

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In vector control programs, it is essential to ascertain relative or absolute densities of the population before and after the insecticide treatment (Pegel and Ruhm 1982). Black fly control is mainly based on attacking the larvae by applying insecticide to stream or river water. Unlike mosquitoes, the simuliid larvae remain submerged and attached to the substratum during most of their development. They are substrate specific and concentrate only in selected microhabitats (Laird 1981).

The search for a suitable substrate to study larval bionomics is a long standing requirement of simuliid workers. Substrates, e.g., polyethylene tapes, metal cones, ceramic tiles, natural rocks, polyethylene strips, polystyrene foam balls and tiles, were used earlier for sampling of simuliid larvae (Williams and Obeng 1962, Lewis and Bennett 1974, Pegel and Ruhm 1976, Boobar and Garnett 1978, Walsh et al. 1981). In the present study, polyethylene (= polythene) strips, banana leaves, cloth tapes, asbestos sheets and stones were evaluated in different habitats of Nagaland, Manipur and Arunachal Pradesh of India.

Ten microhabitats, biased for maximum density of simuliid larvae, were selected in each stream. Each of the five substrates was placed in one spot. Asbestos sheets (15 × 15 cm) and stones (almost round and approximately of the same surface area) were placed at a depth of 10–12 cm. Asbestos sheets were kept slanting towards the water current with the help of stones. Wooden pegs were fixed in the stream bed to tie the strips of polyethylene, banana and cloth (each 1 × 25 cm) with nylon thread and to keep them floating just below the water surface. Observations were taken every 24 hr, and the number of larvae attached to the substrates were counted. Mature larvae were brought to the laboratory for species identification. Substrates were cleaned and placed again for five successive observations. Trials were conducted in 10 different streams with 250 replicates in each (10 replicates × 5 substrates × 5 days).

Altogether 10 species were encountered. *Simulium himalayense* Puri was dominant in Arunachal Pradesh while *S. indicum* Breacher prevailed in Nagaland and Manipur. Other species encountered were *S. barraudi* Puri, *S. metatarsale* Bran, *S. praelargum* Dutta, *S. striatum* Brunetti, *S. rufibasis* Brunetti, *S. varicorne* Edwards, *S. aureohirtum* Bran and *S. nitidithorax* Puri. Results obtained are in Table 1.

Larval attachment was highest on polyethylene strips followed by banana, cloth, asbestos and stone. On the basis of a two-way analysis of variance (F values are given in Table 1), polyethylene strips and banana leaves were found to be significantly better than other substrates. Earlier, Pegel and Ruhm (1976, 1985) also noticed narrow and rough polyethylene strips were superior to broader and smooth ones. Lewis and Bennett (1974) advocated ceramic tiles for quantitative estimation of larvae even though they quickly became fouled with sediments and algae. Laird (1981) stated that no single, standardized method for trapping larval black flies will prove

Table 1. Number of Simuliidae larvae attached to different substrates.

Substrate	Number of larvae/100 cm^2		
	Nagaland stream	Manipur stream	Arunachal Pradesh stream
Polyethylene	134* (60–204)**	150* (80–256)	428* (136–720)
Banana	86* (40–152)	46* (24–92)	210* (32–400)
Cloth	6 (0–16)	0 (0–16)	60 (16–208)
Asbestos	6 (2–16)	2 (0–3)	4 (0–12)
Stone	4 (0–14)	1 (0–6)	2 (0–6)
Least significant difference (LSD)	18.88	19.24	75.73
F value	56.741	62.848	32.785

* Significant at 0.01 probability level.

** Range of larval attachment is shown in parentheses.

universally applicable. In the present trial, however, we did not obtain encouraging results with asbestos tiles. Furthermore, asbestos tiles are more prone to pilferage from stream beds, except for ceramic tiles.

It may be concluded that the polyethylene strip is undoubtedly a superior substrate for quantitative estimation of larval density in our simuliid control program. Moreover, it is cheap, durable, free-floating and is less subject to fouling even when evaluated in the subtropical environment of this region.

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