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Field and laboratory observations on parasitization rates of *Glossina* puparia by *Syntomosphyrum* species in Nigeria

Short communication

J. A. Onyiah, K. Riordan

In Nigeria, field studies on *Glossina* species have rarely revealed parasites which are effectively involved in the reduction of natural population levels. Suggestions have been made for introduction of such controlling agents from areas in and outside Africa (Laird, 1977). There is a worldwide outcry against the blanket use of persistent insecticide formulations for control of *Glossina* species in the field. The introduction of biocontrol methods thus demands attention.

Syntomosphyrum species (Order, Hymenoptera; family, Eulophidae) have been tested as biocontrol agents of tsetse populations in Malawi (Lamborn, 1925), Tanzania (Nash, 1933) and Nigeria (Lloyd et al., 1927). In the third area *Syntomosphyrum albiclavus* (Kerrich), bred from materials obtained from England, was introduced in Sherifuri (near Azare, Bauchi State) to control *Glossina morsitans submorsitans* (Newstead) and *G. tachinoides* (Westwood). No parasitized field puparium was recovered. *S. glossinae* (Waterston) is incapable of penetrating sandy soils far enough to reach the tsetse puparia (Nash, 1933).

S. glossinae was first recorded in West Africa by Nash (1947) as a parasite of field-collected *G. palpalis* (R.-D.) puparia in the N.I.T.R. laboratories in Kaduna, Nigeria. Nash (1955) also reported the parasitization of *Periplaneta americana* (L.) oothecae by the same species within the same insectary. This report was later refuted by Jordan (1956). From the scanty information available, Laird (1977) summarized the life history of *Syntomosphyrum* spp. Three-day-old females drill a hole in the puparial case and oviposit about 40–50 eggs into the subpuparial space. A wide variety of dipteran puparia including *Glossina* spp. can be used. Hatching occurs within 48 h and the 3rd instar larva is attained 24 h later. The 4th instar has a 5-day duration. The prepupal and pupal stages last 2 and 10 days respectively. After eclosion, adults bite a small hole in the host puparium, through which they escape. Copulation then takes place

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Table 1. Parasitization-rate of field-collected *G. palpalis* puparia by *Syntomosphyrum* species in Nigeria

Year	Number of puparia examined	Number parasitized	%
1972	16,877	10	0.059
1973	21,890	11	0.057
1974	20,367	18	0.088
Totals	59,134	39	0.066

almost immediately. Females are capable of reproducing parthenogenetically, all offspring being males.

The low rates of parasitization (0.04%–2.4% of puparia examined) of *Glossina* spp. in nature in East Africa are given by Laird (1977). In Nigeria the incidence of parasitization recorded for *G. palpalis* puparia collected over a period of 3 years, is given in Table 1. The parasitized puparia were collected at Kaffin-Koro, Kwakuti, Kuje, Akerri, Guni and Bwari in Niger State of Nigeria. The overall rates of incidence varied little from locality to locality or from year to year, excepting Kuje (total rate for the 3 years, 0.133%) where the incidence was about twice the average.

At N.I.T.R., an attempt was made in January 1977 to raise laboratory colonies of *G. palpalis* and *G. tachinoides* in the insectary. 44,250 and 11,160 field-collected puparia of the two species respectively from the above collecting localities were used. Onyiah (1977) described the routine maintenance methods for adults and puparia. In May, a large number of *Syntomosphyrum* spp. was observed in the tsetse emergence cages. Cages were covered with fine-mesh netting, which ensured separation of the field- and laboratory-bred puparia within the insectary. All unemerged puparia were then examined for the tell-tale emergent holes. Those without holes were dissected for evidence of infection. The dissection indicated that parasitization could become established in well developed pharate flies in the puparium. The remains of tsetse flies (heads, probosces and legs) were seen in some cases. Once, 22 adults were observed crawling out from the emergence hole of a *Glossina* puparium. The summary of observations is given in Table 2. The parasitization rate amongst laboratory-bred puparia (of both *Glossina* spp.) was twice that amongst puparia from the field. Unlike the field-collected puparia (Table 1), parasitization was significantly higher amongst puparia kept in the insectary.

S. glossinae occurs naturally in Nigeria; the presence of *S. albiclavus* is not definitely confirmed. Reliable separation of the two species is only by a cross-breeding technique. No specimen of *Syntomosphyrum* has ever been taken during field studies in Nigeria. This indicates that in nature the hymenopterous parasite of various dipteran puparia occurs in very low densities. *Glossina*

Table 2. Rate of parasitization by *Syntomosphyrum* species of both field-collected and laboratory-bred *G. palpalis* kept in the Kaduna tsetse breeding laboratory

Field-collected puparia	Laboratory-bred puparia	Total No. unemerged	No. parasitized	No. found parasitized on dissection	Total parasitized	% of parasitization amongst unemerged puparia
G. palpalis						
44,450	–	7,524	666	19	685	9.1
–	5437	1,433	290	38	328	22.9
G. tachinoides						
11,160	–	2,095	785	–	785	37.5
–	413	209	145	–	145	69.4
Totals		11,261	1,886	57	1,943	17.3

larvae rarely pupariate on the soil surface. Therefore, few are exposed to infection since the hymenopterous parasites are unable to dig deeply into the sandy soil. This restricting factor is probably responsible for the very low parasitization rates amongst field-collected puparia. The barrier constitutes a major disadvantage in the use of the parasite in biocontrol of *Glossina* populations. Conversely, the parasite is highly effective in the destruction of *Glossina* puparia in an insectary; where puparia are exposed and readily available to ovipositing females. The higher infection rates amongst laboratory-bred puparia suggest that younger puparia are easier to infect than field-collected ones of older ages.

There is no evidence that exposed *Glossina* larvae, are infected before pupariation in the soil. This needs further investigation, as releases of the parasites can therefore be made in the dry season localized larviposition sites in the field. Laboratory experiences emphasize the care necessary to prevent the presence of the parasite in an insectary.

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