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Communication

Laboratory colonisation of *Glossina tachinoides* Westwood (*Diptera : Glossinidae*) in Nigeria

A.B. Ahmed [1]

J.A. Onyiah [1]

AHMED (A.B.), ONYIAH (J.A.). Élevage en laboratoire de *Glossina tachinoides* Westwood (*Diptera : Glossinidae*) au Nigeria. *Revue Élev. Méd. vét. Pays trop.*, 1992, **45** (2) : 163-166

Les auteurs décrivent un essai d'élevage en laboratoire de *Glossina tachinoides* Westwood à partir de pupes sauvages récoltées, en avril 1986, dans la réserve de gibier de Yankari. De précédentes tentatives infructueuses d'élevage de cette espèce ont montré que le maintien de conditions climatiques correctes était primordial et un nouvel insectarium a été aménagé au « Nigerian Institute of Trypanosomiasis Research » (NITR). Une durée d'accouplement de sept jours a joué un rôle majeur dans l'obtention d'un taux d'insémination des femelles optimum. L'élevage a montré une nette tendance à s'adapter aux conditions de laboratoire mais l'alimentation *in vivo* sur des lapins probablement nourris avec des aliments concentrés contenant des antibiotiques, a entraîné, en raison d'une baisse de fécondité des femelles, le déclin puis l'arrêt de cet élevage. *Mots clés : Glossina tachinoides* - Élevage d'insectes - Nigeria.

Introduction

Glossina tachinoides West. is an effective vector of human and animal trypanosomosis. Generally, the role of vectors as transmitters of diseases can best be studied through careful laboratory observations which permit the control of the many variables that affect their behaviour within their natural habitats. This was one of the reasons why tsetse laboratories colonies were established in different parts of the world (3, 5, 6, 9, 23). However, owing to the slow reproductive rate, laboratory rearing is often difficult (16) and a large number of flies should be used to ensure an excess output for research without interfering with the production level.

Although numerous reports are available on efforts at laboratory breeding of various tsetse species, emphasis should be given to ITARD *et al* (13) for being the pioneers in the breeding of *G. tachinoides* under European laboratory conditions. In spite of some initial difficulties their success represents an important contribution to advances in that field. Efforts to rear *G. tachinoides* in our laboratory had previously been made without any apparent success (17, 22). Factors attributed to the failures were mainly structural and instrumental. This paper presents a recent attempt initiated during 1986 at colonising the species using wild collected puparia.

Materials and methods

The colony was established at the newly reconstructed insectary of the Nigerian Institute of Trypanosomiasis Research in April 1986 with puparia collected from Yankari Game Reserve. Upon arrival at the laboratory a reasonable number of flies emerged and were used to start the colony.

Flies were maintained at 24 ± 1 °C and 75-85 % relative humidity with a 12-h photoperiod. They were initially fed on guinea-pigs for 15 min daily except on Sundays, but an outbreak of bacterial infestation decimated the animal hosts. Thereafter, the flies were fed on the ears of rabbits for 5-10 min daily. Routinely, females were mated on the third day of life with an equal number of males, at least 7 days old. Based on previous experience, the sexes were separated after 24 h using hand tubes after which 20 females were caged in either PCV plastic cages (18 x 8 x 4 cm) or aluminium framed Geigy cages (12.5 x 7.5 x 4 cm). Puparia were harvested 5 days per week and weighed singly before regrouping based on weight classes using a puparial mechanical sorting device originally designed by ZELGER and RUSS (24) and modified for screening puparia into five weight classes A, B, C, D and E.

Results

Out of the 4,025 puparia collected from the field, 69.0 % adults emerged to provide the first generation comprising 1,625 females and 1,425 males. A total of 1,494 females survived to mating age.

The mortality among pre-producing females was fairly high, exceeding 8.0 % during the first 4 months of colonisation. Reproductive rate of mated flies was generally low. This was confirmed through the dissection of 45 colony females selected at random which showed a 25 % insemination rate. The number of females dissected was low, because we could not afford to sacrifice a larger number. The result however suggested improper insemination.

Since the flies were experiencing laboratory conditions for the first time it was assumed that the poor insemination rate could be due to changing mating behaviour in the new habitat. We decided to investigate the effect of different mating lenght of the insemination rate (table I).

Analyses of variance (ANOVA) showed that the mating length most likely affected the fertility of the flies as there was a significant inter-group difference ($F = 2.982$, $P < 0.05$) between the mean values of puparia per initial female (PPF). The results suggest that optimal insemina-

1. Nigerian Institute for Trypanosomiasis Research (NITR), PMB 2077, Kaduna.

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TABLE I Effect of different mating duration on insemination rate in female **G. tachinoides.**

Mating duration (days)	Number of females	Total puparia produced	% survival by day + 60
2	25	25	72.0
5	25	38	56.0
7	25	57	64.0
Permanent mating	25	45	28.0

tion and better performance is obtained with 7-day long mating period with a good proportion of mated females remaining alive.

There was a steady increase in pupal production from an initial 250 in April to almost 2,000 by November, 1986 (fig. 1a). A brief period of shortage of feeding hosts and cages for housing adult flies resulted in a sharp decline in both fly number and fertility (point A, fig. 1b). There was a quick recovery in early 1987, but this was immediately arrested by a major accidental contamination of the holding room with petroleum products in April (Point B, fig. 1b) resulting in the gradual loss of the colony females. This affected mostly younger flies and by August 1987, there were only about 350 surviving females. Remarkable signs of recovery were noticed from September and by June/July 1988 there were more than 1,200 females with a monthly total puparia production of more than 2,000. AZEVEDO, COSTA PINHAO (1) and ITARD *et al.* (13) observed a similar pattern of decline and recovery with *G. morsitans* and *G. tachinoides* following insecticidal contamination. Except for a brief period from July to November 1988 when there was another shortage of feeding hosts, the mean mortality remained below 2.0 %. The numerous small-sized pupae reflect the frequent nutritional stresses experienced by the females with 60.0 % of the total number weighing between 0-17 mg (fig. 2).

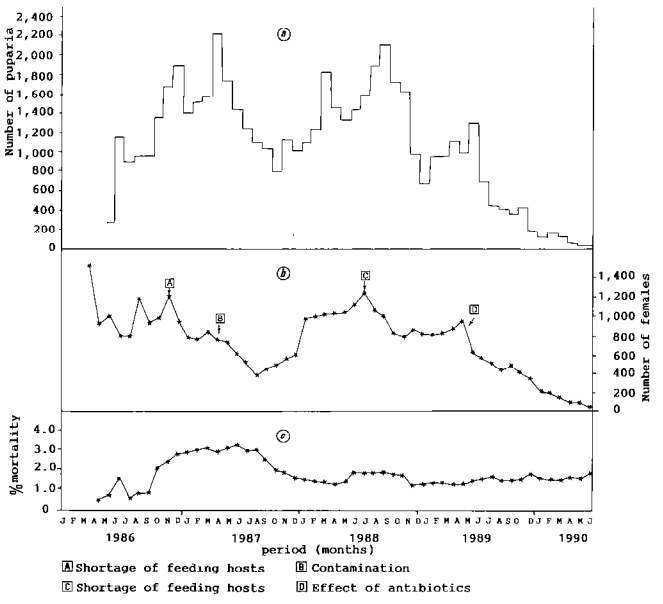

Fig. 1 : Monthly puparial production, female stock and mean feamel mortality from April 1986 to June 1990.

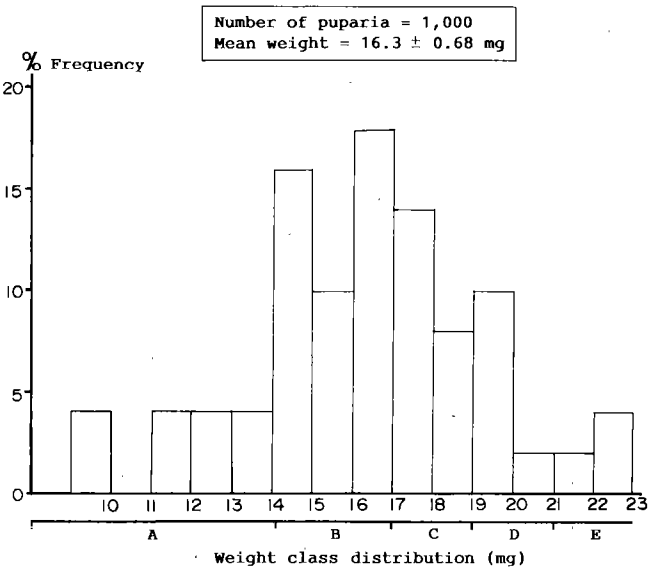

Fig. 2 : Dynamics of pupal weight frequency distribution and mean weight.

A new batch of purchased rabbit hosts was fed a commercial pelleted diet which unfortunately contained oxytetracycline and salinomycin antibiotics. The coumpounds did not affect the survival rate of the flies but reduced their fertility (fig. 1a, c). The colony did not recover from the effect of these coumpounds and finally collapsed in June, 1990.

Discussion

The main problem with colonisation of *Glossina* sp. is adequate feeding, on which depends puparia production (6, 23), and a stable climatic environment. Immediately after the failure of 1962 and 1977 attempts (18, 22), measures were taken to identify and correct the responsible factors. Having realised from previous experiments and from the conclusion of other workers the importance of the environment in which tsetse are reared (2, 7, 14, 18, 21) structural modifications were made involving the building a second wall to the old single wall of the insectary, leaving a space between both to reduce the influence of the weather. New climatic control gadgets were set up. The improvement in the stabilisation of the climatic condition played a major role in our initial success. A second contributing factor was the 7-day mating strategy adopted

to optimise insemination. ITARD (11) successfully established a colony of *G. tachinoides* using similar mating regime.

The inital high mortality among pre-producing females was probably because the flies were undergoing a climatic adaptation leading to the natural selection of those individuals that could withstand the laboratory condition. POLITZAR and BOUCHON (19) reported similar experience with *G. morsitans* emerging from wild puparia when females were too weak to feed and died within few days. Similarly, it took almost 2 years before a wild strain of *G. tachinoides* could adapt to laboratory conditions at CRTA, Burkina Faso (2).

The results of this work show the significance of continuity in all aspects of tsetse rearing. This could be seen from the improvement in the reproductive performance exhibited by the females during periods of adequate and timely feeding (graph 1a). The erratic growth rate and the relatively high mortality of the females was probably the consequence of a frequent interference with the feeding response that resulted in the production of numerous small-sized pupae with poor fat reserves. About 16.0 % of the puparia produced fell within the A class (0-14 mg) considered too light and unviable for colony growth (8). The mean pupal weight of 16 ± 0.68 mg obtained in this study did not differ much from that obtained by other workers (4, 10, 11). The best production figure so far obtained was 2.8 puparia per female and a hatching rate of 81.3 %. The emergence rate was considered below optimum (20) for *Glossina* species. The ability of the flies to recover from a nutritional stress and the threat of contamination was a clear indication of the viability and adaptative trends of the flies as well as the effectiveness of our rearing technique.

The collapse of the colony was suspected to have been caused by lowered fertility among the females following the detrimental effects of the antibiotics contained in the diet of the host on the reproductive performance of the female flies. It has been demonstrated (15) that flies which were fed on rabbits with antibiotics in their diet exhibited a markedly lower fertility than those which were fed on rabbits supplied additive-free diets, with a majority of females in the former group becoming sterile.

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The authors describe efforts at laboratory colonisation of *Glossina tachinoides* Westwood in April, 1986 from wild puparia collected from the Yankari Game Reserve. The climatic conditions that hitherto prevented previous attempts at breeding the species at the Nigerian Institute of Trypanosmiasis Research (NITR) were identified and corrected. A 7-day mating regime played a major role by ensuring optimal insemination of females. The colony exhibited adaptive trends towards laboratory condition. Antibiotics contained in the diet of the rabbit hosts probably affected the fertility of the female flies resulting in the decline and collapse of the colony. *Key words* : *Glossina tachinoides* - Insect rearing - Nigeria.

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