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Rev. Elev. Méd. vét. Pays trop., 1984, 37 (N° spécial) : 192-197

A simple method to breed tsetse flies under field conditions

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Résumé

POLITZAR (H.), BOUCHON (D.). Méthode simple d'élevage des glossines sur le terrain. Rev. Elev. Méd. vét. Pays trop., 1984, 37 (N° spécial) : 192-197

Les auteurs ont utilisé une technique qui leur a permis de maintenir en vie des glossines sauvages sur les lieux même de capture. Le système d'étagères sur lesquelles reposent les cages permettant de conserver plus de 6 000 femelles reproductrices est décrit.

L'adaptation aux changements saisonniers de température et d'humidité ambiantes a permis d'élever pendant une année entière les mouches capturées et de maintenir en laboratoire une colonie de Glossina morsitans submorsitans provenant de ces mouches sauvages. Cette méthode a été employée car il n'est pas possible d'utiliser dans cette région la technique habituelle consistant à récolter un grand nombre de pupes pour établir une colonie.

Les performances des mouches sauvages sur le terrain (poids des pupes, productivité, mortalité...) sont indiquées ainsi que celles de la première génération en laboratoire. Cette méthode s'est révélée pratique pour établir en laboratoire des colonies de différentes espèces de mouches tsé-tsé sans risquer une extension possible de la trypanosomose transmise par des mouches sauvages introduites dans l'insectarium.

Mots clés : Mouches tsé-tsé - Glossina morsitans submorsitans - Elevage sur le terrain.

Summary

POLITZAR (H.), BOUCHON (D.). A simple method to breed tsetse flies under field conditions. Rev. Elev. Méd. vét. Pays trop., 1984, 37 (N° spécial) : 192-197

A method to breed wild tsetse flies in the field is described and the construction details for a breeding rack that can contain up to 6 000 producing females are given. Adaptation to the seasonal changes of the outside temperature and humidity permitted to breed captured tsetse flies during the whole year and to initiate a laboratory colony of Glossina morsitans submorsitans originating from these wild flies. The generally used method of collecting large numbers of pupae to start a colony proved impossible in our area. Details of the performance of the wild flies in

the field (mortality, productivity, pupae weight etc.) are presented as well as of the performance of the first generation in the laboratory. This method proved in the meantime practical to initiate laboratory colonies of several species of tsetse flies without running the risk of a possible spread of trypanosomiasis by captured wild flies brought into an insectarium.

Key words : Tsetse flies - Glossina m. submorsitans - Breeding under field conditions.

INTRODUCTION

To constitute a laboratory colony of Glossina morsitans submorsitans, it was at first tried to collect pupae as is usually done for other species. This proved not successful because of the too low densities in the widely dispersed pupal sites.

Therefore it was tried to collect wild females and to bring them to the laboratory, what was not successful either. Many flies did not adapt to the controlled and stable conditions of the insectarium and died before reproducing. Moreover 60 000 females had to be discarded after accidental trypanosome infection of our breeding colony of G. palpalis gambiensis with T. brucei. Severe losses occurred in the host animals. However satisfactory production of pupae of G. m. submorsitans was achieved by breeding wild flies in their capture location and then transferring these pupae to the Bobo-Dioulasso insectariums.

Though wild flies have been kept before under natural conditions in the field (2, 1) this is the first time that this was successfully tried for the large scale production of pupae to start a laboratory colony.

MATERIAL AND METHODS

A rectangular rack with seven inclinated floors of corrugated iron vas constructed to contrain the captured flies under the necessary climatic conditions. Fly cages are placed on these superimposed sloping sheets leading at their lower end to a pupae collecting tray (fig. 1). The whole rack is covered with two layers of canvas separated with a 1 cm layer of cotton. Flaps of this material mounted on iron frames give access to each of the seven levels individually. The rack is made rain proof by a roof of corrugated iron. The feet of the rack are built as detergent reservoirs to protect the colony against predators. The canvas covers are soaked in water as required to maintain the desired humidity or to lower the temperature by evaporation. The climatic conditions in the rack are registered by a thermohygrograph and can be further controlled by opening or closing the flaps. The structure is always kept in the shade of a gallery forest.

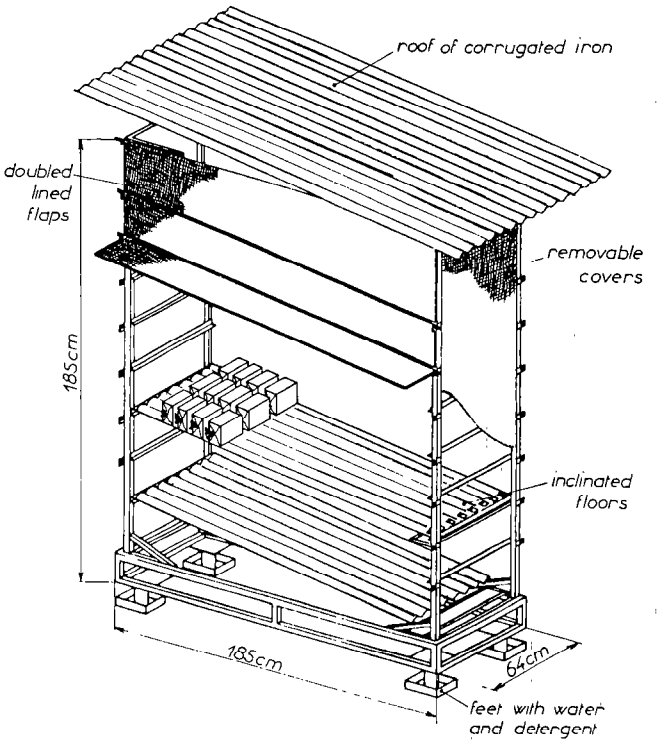

Fig.1: Rack to maintain a field colony of 4-6000 producing females

ADAPTATIONS TO SEASONAL CHANGES

The climatic conditions in Burkina vary considerably. During the rainy season, the optimal values of 25°C and 70-75 p.100 relative humidity are obtained by opening the flaps in the morning and closing them, as well as intensely humidifying the structure, during the hos afternoon. In the hot and humid season following the rains wetting the flaps several times a day is essential to lower the temperature and it is preferable to put the colony in a breeze. In the cold and dry season, the colony is placed under cover in a 3 x 4 m wide and 3 m high construction. This is conveniently achieved with an old lorry skip. The wetting of the flaps further decreases the already low temperature in the night (8-10°C) therefore an electric heater, running on a 1 km Honda portable generator is used to keep the temperature at a minimum of 16°C.

HOST ANIMALS AND FEEDING

The flies were fed every day for ten minutes of dwarf goats from nearby villages. Each goat fed 1 000 to 2 000 flies every third day. Berenil treatment (3,5 mg/kg) was given to the goats every two weeks. The main cause of death of the goats was pneumonia, not trypanosomiasis.

RESULTS

A colony of 4 000 - 6 000 producing G. m.submorsitans females was maintained under the described condition from the 15th September 1981. Three capture periods at different localities extended over a whole year, meeting all climatic conditions of Burkina (Table 1). It was relatively easy to maintain acceptable relative humidity but variations in temperature could not be completely controlled during extreme conditions. Temperature exceeding 25°C had an adverse effect and daily mortality raised to 6 p.100 at 27° C. This calculation was based on theoretical mean numbers of flies during two week periods. There were no statistically significant differences in mortality and productivity during the three capture periods.

TABLE I : Performance of the field colony of *G. m. submorsitans*

Periods	Females	Mortality	Number of producing females*	Theoretical mean number**	Pupae	Pupae/ female/ day	Daily mortality (p.100)	Pupal weight (mg)
16.09 - 01.10.81	4 660	985	3 675	1 838	645	0.023	3.57	22.25
01.10 - 15.10.81	3 070	2 045	4 700	4 188	2 209	0.035	3.26	21.39
16.10 - 31.10.81	3 711	3 452	4 960	4 830	2 533	0.033	4.47	21.49
01.11 - 15.11.81	3 788	3 107	5 641	5 301	1 853	0.023	3.91	22.16
16.11 - 30.11.81	4 595	3 309	6 927	6 284	1 812	0.019	3.51	22.14
01.12 - 15.12.81	2 650	3 446	6 131	6 529	1 859	0.019	3.52	22.25
	22 474	16 344		4 828	10 911	m=0.0253	m=3.62	m=21.95
						s=0.0070	s=0.429	s=0.396
20.03 - 31.03.82	3 819	490	3 329	1 665	375	0.019	2.45	23.84
01.04 - 15.04.82	3 900	1 548	5 681	4 505	2 204	0.033	2.29	23.37
16.04 - 30.04.82	1 940	1 414	6 154	5 918	2 187	0.025	1.59	24.66
01.05 - 15.05.82	1 580	4 034	3 700	4 927	1 456	0.020	5.46	23.93
16.05 - 28.05.82	970	1 870	2 800	3 250	978	0.023	4.43	23.09
	12 209	9 356		4 053	7 200	m=0.0240	m=3.24	m=23.78
						s=0.0056	s=1.627	s=0.601
11.08 - 31.08.82	2 620	703	3 917	959	606	0.030	3.71	21.85
01.09 - 15.09.82	2 970	1 708	3 179	2 548	1 061	0.028	4.47	22.98
16.09 - 30.09.82	3 220	2 121	4 278	3 729	1 281	0.023	3.79	22.49
01.10 - 15.10.82	4 220	4 028	4 470	4 374	1 522	0.023	6.14	22.38
16.10 - 31.10.82	4 310	3 638	5 142	4 806	1 014	0.013	4.73	22.02
01.11 - 19.11.82	5 040	5 606	4 576	4 859	1 285	0.014	4.56	21.50
	22 380	17 804		3 546	6 769	m=0.0218	m=4.57	m= 22.20
						s=0.0070	s=0.877	s=0.523
T o t a l	57 063			4 148	24 880	m=0.024	m=3.84	m=22.58
						s=0.0064	s=1 134	s=0.937

* : at the end of the period. ** : theoretical mean number = (number of producing females at the end of the period + number of produc. fem. at the beginning) /2.

Though fig. 2 seems to indicate a correlation between mortality and temperature for the third period of capture, during which climatic data were collected, it was statistically not significant (Test of Fisher and Yates for small numbers ; t-test non significant).

The first pupae produced after capture were usually of lower weight which could be explained as near abortions after the stress of capture. Due to the high mortality rates the percentage of recently caught females in the rack was always

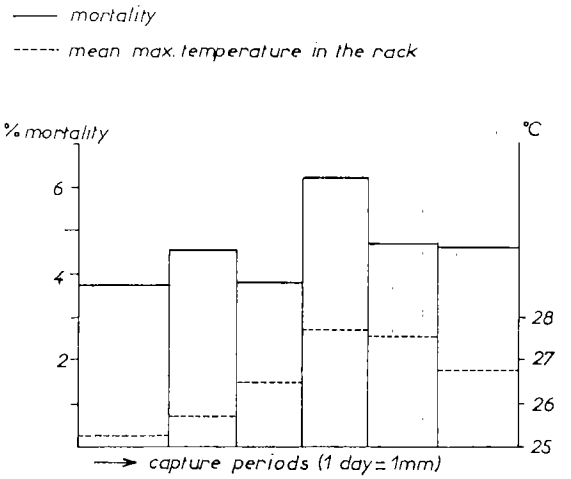

Fig 2: Correlation of mortality and mean maximal temperatures

TABLE N° II - Colony performance of females emerged from pupae of the first capture period (16.9 - 15.12.1981)

Period	Females emerged/ day	Mortality before mating	Mean number of ♀/day	Mortality after mating	Pupae/ day	Pupae/ ♀/day	Mean pupal weight (mg)	Total of ♀	Daily mortality (p.100)
13.10 - 16.10	23			3				23	
17.10 - 23.10	303	129	130	3				195	9.67
24.10 - 30.10	271	229	218	1	0.28	-	31.20	238	13.80
31.10 - 06.11	211	118	282	13	11.40	0.0405	27.53	318	5.88
07.11 - 13.11	256	129	451	12	10.14	0.0482	29.34	557	3.61
14.11 - 20.11	270	90	646	14	16.60	0.0800	28.96	721	2.06
21.11 - 27.11	317	61	324	21	22.70	0.0700	30.03	951	1.23
28.11 - 04.12	340	77	564	36	37.00	0.0653	29.38	1 178	1.37
05.12 - 11.12	316	165	905	53	58.00	0.0697	30.03	1 276	2.44
						m : 0.0623 σ : 0.0149	m : 29.496 σ : 1.130		m : 5.01 σ : 4.544

high and this resulted in a low average pupal weight. Table 2 gives the performance of the females in the laboratory which emerged from pupae of the first capture period. A high mortality before mating was found in the females emerging from the small pupae. Such females were found too weak to feed and died within a few days. Females that were able to feed showed only a slightly increased mortality compared to an adapted laboratory colony, but an excellent productivity later on; the pupal weight being normal. The performances improved at each generation and allowed, for the first time, to build up a large colony of this species which is difficult to raise. After 15 months it had reached 45 000 producing females for the implementation of a sterile male release project against this species.

CONCLUSIONS

The materials and methods described have proven to be practical to initiate laboratory colonies from adult wild flies during all seasons in Burkina. Since the attempt described here, G. tachinoides, G. p. gambiensis and even G. medicorum have been colonized using the same method. The mortality was too high, nevertheless, to maintain a self supporting colony in the field and daily captures were needed to maintain a constant number of females. Glossina appear to stand considerable fluctuations in relative humidity and temperature which should however be kept below 27°C.

The main advantages of the method are the lack of possible trypanosomiasis spred by captured wild flies brought into an insectarium and the short adaptation period needed by the flies arising from pupae that have been transferred shortly after production to the stable conditions of the insectarium.

Resumen

POLITZAR (H.), BOUCHON (D.). Método simple de cría de glosinas en el campo. Rev. Elev.Méd. vét. Pays trop. 1984, 37 (N° spécial) : 192-197

Los autores utilizaron una técnica para mantener glosinas salvajes sobre los sitios de captura. Se describe el sistema de anaqueles sobre los cuales estan las jaulas permitiendo la conservación de más de 6 000 hembras reproductoras.

La adaptación a las modificaciones estacionales de temperatura y de humedad exteriores permitió criar las moscas capturadas durante un año y de mantener en laboratorio una población de Glossina morsitans submorsitans proviniendo de estas moscas salvajes.

Se empleó dicho método por que no se pudo utilizar, en la zona de esta experiencia, el método usual de recogida de un gran número de pupas para establecer una población.

Se indican las características de las moscas salvajes en el campo (peso de las pupas, productividad, mortalidad...) asi como las de la primera generación en laboratorio. Dicho método es práctico para establecer en laboratorio populaciones de diferentes especies de moscas tse-tsé sin riesgar una extensión posible de la tripanosomosis transmitida por moscas salvajes introducidas en el insectario.

Palabras claves : Moscas tse-tsé - Glossina morsitans submorsitans - Criá en el campo.

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