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Reproductive performance of field-caught *Glossina pallidipes* maintained on different host bloods

DAVIES-COLE (J.O.A.), OLUBAYO (R.O.), MIHOK (S.), MWAMISI (P.). Performances de reproduction de *Glossina pallidipes* capturées dans la nature et alimentées avec différents sangs. *Revue Élev. Méd. vét. Pays trop.*, 1994, 47 (1) : 77-79

Les auteurs ont étudié en laboratoire les performances de reproduction de femelles de *Glossina pallidipes* capturées dans la nature et maintenues durant 41 jours sur du sang frais défibriné de lapin, de buffle, d'éland, de cob des marais ou de chèvre. Le poids moyen des pupes était le plus élevé (37,2 mg) chez les glossines nourries sur sang de lapin et le plus faible (30,8 mg) chez celles nourries sur sang de cob. Les poids moyens des pupes nourries sur sang de lapin, d'éland, ou de buffle étaient significativement différents de ceux des glossines nourries sur sang de chèvre ou de cob. Le nombre le plus élevé de pupes produites par 90 femelles était celui des glossines nourries sur sang de lapin (83), tandis que le nombre le plus faible était celui des glossines nourries sur sang de chèvre (60). La mortalité était élevée (84-99 p. 100) quel que soit le groupe.

Mots-clés : *Glossina pallidipes* - Performance de reproduction - Sang - Hôte - Kenya.

INTRODUCTION

Though successful colonization of the tsetse fly, *Glossina pallidipes* has been reported (10, 15, 17, 19, 21), most populations have been reared with difficulty. For example, LANGLEY (15) was unsuccessful in rearing a Zimbabwe strain of *G. pallidipes*. Similarly, the colony of *G. pallidipes* maintained by the ICIPE that originated from the Lambwe Valley eventually died out from viral infection. Most of these colonies have been maintained on rabbits, rather than on more preferred natural hosts. CURTIS and JORDAN (3) found that goat-fed *Glossina austeni* survived slightly better than rabbit-fed flies, however, the fertility of rabbit-fed flies was consistently higher. A very high fertility was also reported by ITARD *et al.* (8) for *Glossina tachinoides* fed on rabbit blood.

Many species of animals are rarely fed on by the tsetse, for example zebra, wildbeest, waterbuck, impala, etc. (11). In the wild, *G. pallidipes* feeds mainly on bushbuck, buffalo, warthog and bushpig (11). It is not clear whether *G. pallidipes* can be raised successfully on preferred host bloods. The objective of the study was to compare the reproductive performance of field-caught *G. pallidipes* maintained on various host bloods.

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Reçu le 13.5.1993, accepté le 9.2.1994.

MATERIALS AND METHODS

G. pallidipes was trapped at Aitong near the Maasai Mara reserve in Kenya. Non-teneral females were selected and fed once on rabbits in the field at capture (males were discarded). Males were not used in this study since the females were assumed to have mated in the wild and therefore inseminated. Previous studies in Kenya show that most non-teneral females were already mated when caught in traps (2). Female flies were held in PCV cages (21 x 16 x 18 cm) with black nylon netting, and transported by air to Nairobi within 48 h, where they were maintained at 25 ± 1 °C, with a light/dark cycle of 12/12 h and 70-80 % relative humidity. They were allowed 5 days to stabilize while being fed on their respective host bloods. For each of the five host bloods, there were 6 cages, each containing 15 flies. Each group was membrane-fed on fresh defibrinated blood (9) of either rabbit, buffalo, goat, eland or waterbuck on alternate days for 41 days. MADUBUNYI (18) showed that daily feeding had no advantage over feeding on alternate days. Daily mortality, puparia production, weight of puparia and number of abortions were recorded. Any fly which died during the experiment was immediately dissected in order to determine its mating status. All flies were dissected at the end of the experiment.

RESULTS

Mortality was very high (84-99 %) at the end of the study period, irrespective of the group (fig. 1). Buffalo-fed flies had a high early mortality (30 and 77 % after one and two weeks, respectively); rabbit-fed flies survived best to the end of the study. Abortions were rare after the flies had stabilized in the laboratory for 5 days (<11 per group, table I). Rabbit-fed flies produced the highest number of pupae (83). For statistical analysis (χ^2 tests), expected pupal production was calculated from the cumulative number of days females survived divided by the average expected cycle length (10 days). There was a significant heterogeneity ($p < 0.05$) in the pupal output among host bloods, with rabbit blood still being best even after weighting for mortality (table I). The number of puparia per female reproductive cycle was about 1/2 of the expected output based on a 10-day reproductive cycle.

Mean puparial weights were above 30 mg in all groups (table II). However, mean puparial weight for flies fed on rabbit blood was higher ($37.2 \text{ mg} \pm 0.85 \text{ SE}$) than for flies fed on buffalo, waterbuck, eland or goat blood. Mean puparial weights differed significantly ($p < 0.05$) between rabbit, eland and buffalo-fed flies, versus goat and waterbuck-fed flies.

DISCUSSION

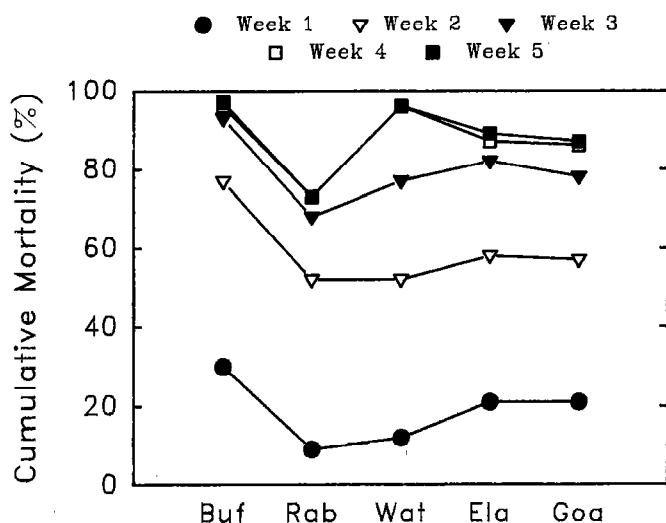


Figure 1 : Percent cumulative weekly mortality of female *Glossina pallidipes* fed on various host bloods. (Buf = buffalo ; Rab : rabbit ; Wat = waterbuck ; Ela = eland ; Goa = goat).

TABLE I Reproductive performance by day 41 of female *Glossina pallidipes* fed on various host bloods (N = 90 initial females per group).

	Host Blood				
	Buffalo	Rabbit	Waterbuck	Eland	Goat
Abortions	10	9	8	10	7
Observed puparia	61	83	63	78	60
Expected puparia given a 10-day cycle	138	96	117	118	115
No. of puparia per female	0.68	0.92	0.70	0.87	0.67

TABLE II Mean puparial weight (mg ± SE) of female *Glossina pallidipes* maintained on various host blood for 41 days.

Hostblood	Puparial weight (mg) (Mean ± SE)
Rabbit	37.2 ± 0.85 ^a
Eland	35.4 ± 0.95 ^a
Buffalo	35.2 ± 0.96 ^a
Goat	33.1 ± 0.96 ^b
Watrebuck	30.8 ± 0.92 ^b

Values with the same letters are not significantly different at the 5% level (LSD means compared).

Although tsetse are selective in their choice of hosts (except for the palpalis group) (11), the present study shows that they can be maintained on less preferred hosts. This is in agreement with BUXTON (1), MOLOO *et al.* (20) and LANGLEY (14). It is now well known that *Glossina morsitans morsitans*, *Glossina palpalis*, *Glossina tachinoides*, etc. can be reared easily on less preferred hosts and as such very little importance was given to them in this study.

Mortality of field-caught *G. pallidipes* brought to the laboratory for this study was uniformly high. This high mortality was probably due to the flies either rejecting captivity or adapting to a different feeding regime rather than infection picked up from the blood meal (blood meals were uninfected). ITARD and BAUER (9) stated that tsetse are adapted to feeding on certain host animals and would not necessarily change this habit unless a period of adaptation is provided. This fact was clearly demonstrated by FILLEDIER and BAUER (5) who successfully reared *Glossina morsitans submorsitans* in the laboratory after an initial period of difficulty. In this study, rabbit-fed flies survived best. Thus, failure to maintain certain populations of *G. pallidipes* successfully on rabbits in the laboratory is not due to a deficiency in the quality of the blood.

The authors also found that flies maintained on rabbit blood tended to have heavier puparia. This may be a reflection of the nutritional quality of rabbit blood. KABAYO and LANGLEY (13) found that dietary lipids play a vital role in supporting reproduction in the tsetse, e.g., serum albumin and lipoproteins are vital for ovarian growth. LANGLEY and PIMLEY (16) also found that a cow blood diet reduced the extent to which the lipids were utilized for larval growth, thus causing an altered secretory activity in the female uterine gland. There may therefore be some disadvantages of feeding on certain host bloods. For example, tsetse allowed to feed on crocodile produced 5 larvae but those on goat, 141 (1). WETZEL and LUGER (23) also obtained better results with porcine blood than equine or bovine blood. Similar results were reported by WILLET (24) and FOSTER (6).

The number of puparia produced by flies fed on rabbit blood was also higher than flies fed on any other host blood. These results for *G. pallidipes* contrast with those for *G. m. morsitans*, where MOLOO *et al.* (20) found only marginal differences among flies fed on various host bloods. LANGLEY (14), also working on *G. m. morsitans*, reported that impala blood (a very rare host) is as digestible as that of preferred hosts. The so-called preferred hosts may be those that the flies have adapted to feed on because they are present in the flies' locality. However, if these hosts are removed, it may lead to a disappearance of tsetse from the area (4, 7, 11). This was also the case in Nagupande, ex Rhodesia, an area well populated with game of many species, where *G. morsitans* was practically eliminated by removal of the preferred hosts only (22).

ACKNOWLEDGEMENTS

The valuable contributions and suggestions by Drs L.H. OTIENO and L.C. MADUBUNYI are greatly acknowledged. This work received financial support from the UNDP, for which we are very grateful.

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- DAVIES-COLE (J.O.A.), OLUBAYO (R.O.), MIHOK (S.), MWA-MISI (P.).** Rendimientos de reproducción de *Glossina pallidipes* capturadas sobre terreno y alimentadas sobre diferentes sangres hospedadores. *Revue Élev. Méd. vét. Pays trop.*, 1994, **47** (1) : 77-79
- Se examinaron los rendimientos de reproducción de hembras de *Glossina pallidipes* capturadas sobre terreno y mantenidas durante 41 días sobre sangre fresco defibrinado de conejo, de búfalo, de anta, de cob o de cabra. El peso medio de las larvas era más elevado (37,2 mg) en las glosinas alimentadas sobre sangre de conejo y más reducido (30,8 mg) en las alimentadas sobre sangre de cob. Los pesos medios de las larvas de glosinas alimentadas sobre sangre de conejo, de anta, o de búfalo eran significativamente diferentes de los de glosinas alimentadas sobre sangre de cabra o de cob. Se encontraba el número más elevado de larvas producidas por 90 hembras en las glosinas alimentadas sobre sangre de conejo (83), mientras que se observaba el número más reducido en las glosinas alimentadas sobre sangre de cabra (60). Era elevada (84-99 p. 100) la mortalidad en todos los grupos.

Key words : *Glossina pallidipes* - Reproductive performance - Blood - Host - Kenya.

Palabras clave : *Glossina pallidipes* - Reproductividad - Sangre - Huesped - Kenia.