

**Biochemical taxonomy :
analysis of electromobility
of distinct proteinic fractions
of the male and female
of *Linognathus oviformis*
Rudow, 1869
(Anoplura : Insecta)**

S. MUÑOZ-PARRA ⁽¹⁾, M. D. SOLER-CRUZ ⁽²⁾,
R. BENÍTEZ-RODRÍGUEZ ⁽³⁾, I. RUIZ-MARTÍNEZ ⁽¹⁾,
J. M. PÉREZ-JIMÉNEZ ⁽¹⁾, M. DÍAZ-LÓPEZ ⁽¹⁾

Summary

Characterization of the total proteins of the male and female of *Linognathus oviformis* through SDS-PAGE has been carried out. The values of the R (mb), Rx and Rf of each one of the bands in particular are supplied. A study of the number of protein bands is done parallelly in function of their Pm. It is the first time that this study has been carried out in the order Anoplura.

Key words : Biochemical taxonomy — Anoplura — *Linognathus oviformis*.

Résumé

TAXONOMIE BIOCHIMIQUE : ÉLECTROMOBILITÉ DES DIFFÉRENTES FRACTIONS PROTÉIQUES DES MÂLES ET DES FEMELLES DE (*LINOGNATHUS OVIFORMIS* RUDOW, 1869 (ANOPLURA : INSECTA)). La caractérisation des protéines totales des mâles et des femelles de *Linognathus oviformis* a été établie par SDS-PAGE. Nous avons obtenu les valeurs du R (mb), Rx et Rf de chacune des bandes. Une étude de chacune des bandes a été aussi faite en fonction de son Pm. Cette étude est la première de ce type réalisée dans l'ordre des Anoplura.

Mots-clés : Taxonomie biochimique — Anoplura — *Linognathus oviformis*.

1. Introduction

In the last few years many authors have applied the characterization and study of total proteins of organisms as complementary data to that obtained by optic

microscope in the identification and specific determination. Wittaker and West (1962), Warren and Breland (1969), Townson (1969) and Lunt (1979) among others, applied different electrophoretic techniques to the protein determination in distinct groups of arthropods. In

(1) Professeur collaborateur, Département de Parasitologie, Faculté de Pharmacie, Université de Grenade, Espagne.

(2) Professeur titulaire, même adresse.

(3) Professeur adjoint, même adresse.

TABLE II

Analysis of electromobility of distinct proteinic fractions in the female of *L. oviformis*; Rx** Taking as reference bovine albumin;
Rx* Taking as reference lysozyme

	R(mb)	% R(mb)	R-%R(mb)	Rx**	Rx*	Rf	Pm
1	4.0	4.2	1.0	0.16	0.04	0.04	←66,000
2	8.0	8.4	2.0	0.32	0.08	0.07	
3	10.5	11.0	2.6	0.42	0.10	0.10	
4	17.0	17.9	4.2	0.68	0.17	0.16	
5	18.5	19.5	4.6	0.74	0.18	0.17	
6	21.0	22.1	5.2	0.84	0.21	0.19	
7	24.0	25.2	6.0	0.96	0.24	0.22	
8	26.5	27.9	6.6	1.06	0.26	0.25	
9	28.5	30.0	7.1	1.14	0.28	0.26	←66,000-45,000
10	33.0	34.7	8.2	1.32	0.32	0.31	
11	35.5	37.3	8.9	1.42	0.35	0.33	
12	38.0	40.0	9.5	1.52	0.37	0.35	
13	42.0	44.2	10.5	1.68	0.41	0.39	←45,000-24,000
14	45.0	47.3	11.2	1.80	0.44	0.42	
15	49.0	51.6	12.2	1.96	0.48	0.45	
16	51.5	54.2	12.9	2.06	0.50	0.48	
17	56.0	58.9	14.0	2.24	0.55	0.52	
18	58.0	61.0	14.5	2.32	0.57	0.54	
19	61.5	64.7	15.4	2.46	0.60	0.57	
20	66.0	69.5	16.5	2.64	0.65	0.61	
21	70.0	73.7	17.5	2.80	0.69	0.65	←24,000-14,300
22	72.5	76.3	18.1	2.90	0.71	0.67	
23	76.5	80.5	19.1	3.06	0.75	0.71	
24	80.0	85.1	20.0	3.20	0.78	0.74	
25	83.0	87.4	20.7	3.32	0.81	0.77	
26	87.5	92.1	21.9	3.50	0.86	0.81	
27	91.0	95.8	22.7	3.64	0.89	0.84	
28	95.0	100.0	23.7	3.80	0.93	0.88	

TABLE III

Percentage and number of protein bands in function of Pm in male and female of *L. oviformis*

	MALE	FEMALE	Nr. total bands
Nr. of bands with Pm superior to 66,000 daltons	2 (15.4%)	6 (21.4%)	8
Nr. of bands with Pm include between 66,000-45,000 d.	4 (30.8%)	7 (25.0%)	11
Nr. of bands with Pm include between 45,000-24,000 d.	6 (46.1%)	9 (32.1%)	15
Nr. of bands with Pm include between 24,000-14,3000 d.	1 (7.7%)	6 (21.4%)	7
Nr. of bands with Pm inferior to 14,3000 d.	-	-	-
TOTAL	13	28	41

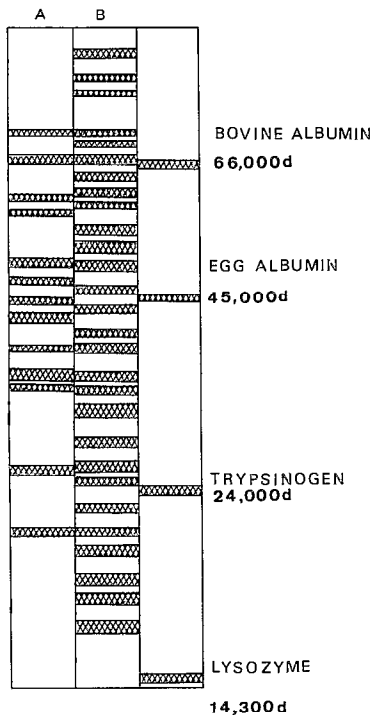


FIG. 1. — A : Males of *L. oviformis*. B : Females of *L. oviformis*.

Comparing the data obtained from *L. oviformis* with those from *Bovicola limbata* (Muñoz *et al.*, in the press a) and *B. caprae* (Muñoz *et al.*, in the press b) we observe that the number of bands from females (28, 22 and 14, respectively) is also superior to those obtained in males (13, 15 and 13, respectively).

Until now, no work about biochemical taxonomy of the genus *Linognathus* or order Anoplura has been carried out. The taxonomic value of the data obtained cannot be applied until a comparative study with other closely related species has been done.

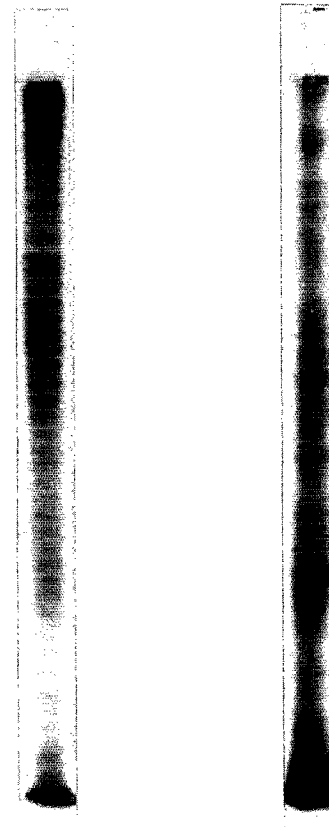


PHOTO 1 (on the left). — Electrophoretogram of the males of *L. oviformis*.

PHOTO 2 (on the right). — Electrophoretogram of the females of *L. oviformis*.

ACKNOWLEDGEMENTS

This work has been supported by a grant from the Comisión Asesora de Investigación Científica y Técnica (CAICYT, Proyecto nr. 3224/83).

Manuscrit accepté par le Comité de Rédaction le 18 janvier 1988.

REFERENCES

- AGUIRRE (J. M.) and GALLEGU (J.), 1983. — Contribución al conocimiento de los maléfagos parásitos de mamíferos domésticos en España. III Congr. Nac. Parasitol., Barcelona. Com. n° 19.
- BEDFORD (G. A. H.), 1919. — Anoplura from South African hosts. *Rep. vet. Res. Un. S. Afr.*, 5-6 : 709-731.
- BEDFORD (G. A. H.), 1920. — Anoplura from South African hosts. Part II. *Rep. vet. Res. Un. S. Afr.*, 7-8 : 708-734.
- HOPKINS (G. H. E.), 1949. — The host association of the lice of mammals. *Proc. zool. Soc. Lond.*, 119 : 387-604.
- LAEMLI (U. K.), 1970. — Cleavage of structural proteins during the assembly of the head of Bacteriophage T4. *Nature*, 227 : 680-685.
- LUNT (S. R.), 1979. — The use of electrophoresis in a taxonomic study of the *Aedes varipalpus* group and the *Ae. atropalpus* group. *Mosquito Syst.*, 11 : 278-279.

- MUÑOZ-PARA (S.), SOLER-CRUZ (M. D.), BENITEZ-RODRIGUEZ (R.), RUIZ-MARTINEZ (I), PEREZ-JIMENEZ (J. M.) and DIAZ-LOPEZ (M.), in the press a. — Analysis of electromobility of different proteinic fractions of the males and females of *Bovicola limbata* (Mallophaga : Insecta). *Angew. Parasitol.*
- MUÑOZ-PARA (S.), SOLER-CRUZ (M. D.), BENITEZ-RODRIGUEZ (R.), RUIZ-MARTINEZ (I), PEREZ-JIMENEZ (J. M.) and DIAZ-LOPEZ (M.), in the press b. — Biochemical study : Characterization of different proteinic fractions of males and females of *Bovicola caprae* (Mallophaga : Insecta). *Folia parasitol.*
- PEREZ (M. I), MASCARO (M. L.), MASCARO (C.) and OSUNA (A.), 1982. — La electroforesis como un medio para la identificación taxonómica de *Amebas limax* (Protozoa, Lobosea). *Rev. Ibér. Parasitol.*, 42 : 335-341.
- PORTUS (M.), GALLEGO (J.) and AGUIRRE (J.), 1977. — Sobre los anopluros parásitos de mamíferos domésticos y silvestres españoles. *Rev. Ibér. Parasitol.*, 37 : 345-354.
- TOWNSON (H.), 1969. — Electrophoretic identification of strains of *Aedes aegypti*. *Trans. R. Soc. trop. Med. Hyg.*, 63 : 19-20.
- WARREN (M. E.) and BRELAND (O. P.), 1969. — Electrophoretic patterns in mosquitoes. *Mosquito News*, 29 : 172-182.
- WHITTAKER (J. R.) and WEST (A. S.), 1962. — A starch gel electrophoretic study of insect hemolymph proteins. *Can. J. Zool.*, 40 : 655-671.
- ZLOTORZYCKA (J.), EICHLER (W.) and LUDWING (H. W.), 1974. — Taxonomie und Biologie der Mallophagen und Läuse mitteleuropäischer Haus- und Nutztiere. *Parasit. Schriften*, 22 : 1-160.