



ACARICIDAL ACTIVITY OF MARINE ORGANISMS TO THE CATTLE TICK: *BOOPHILUS MICROPLUS*

Luc Olivier BRUN, C. MARCILLAUD, C. DEBITUS et D. DUHET

ORSTOM, BP A5, Nouméa, New Caledonia

Résumé : *Boophilus microplus* est responsable de diminution de poids, voire dans certains cas de la perte de bovidés, de même cet ectoparasite peut être vecteur de maladies. En Nouvelle-Calédonie comme dans la plupart des pays, le contrôle de *B. microplus* est assuré par des baignades régulières dans des bains acaricides. En Nouvelle-Calédonie le premier cas de résistance est apparu en 1981 (Brun et al. 1983).

Au cours des trois dernières années l'activité acaricide de 150 organismes marins a été évaluée dans le cadre du programme SMIB (Substances Naturelles d'Intérêt Biologique). Les échantillons ont été récoltés à l'intérieur du lagon et à l'extérieur, entre 300 et 700 mètres de profondeur.

Une méthode simple, dérivée de celle de Stone et Haydock (1962) a été utilisée pour tester l'activité acaricide des organismes lyophilisés sur de jeunes larves de tique du bétail. La plupart des produits actifs ont été trouvés parmi les éponges et les gorgones.

Abstract : *Boophilus microplus* is responsible for physical damage to livestock, sometimes leading to paralysis or death of animals, it can also transmit various serious disease. In New Caledonia as in most countries *B. microplus* is controlled by regular dipping of cattle in insecticides. This species has demonstrated the widest spectrum of resistance to acaricides in all continents and in New Caledonia the first case of resistance was experienced in 1981 (Brun et al. 1983).

As part of the SMIB programme (Substances Naturelles d'Intérêt Biologique) acaricidal activity of extracts made from 150 organisms was studied during the last three years. Samples were collected in the New Caledonian lagoon as well as in blue water, between 300 and 700 meters deep, mainly by draggings.

A simple method derived from Stone and Haydock (1962) was developed to screen biological activities of dried freeze organisms using larvae, the most susceptible cattle tick stage, for toxicity assessment. Most of the active compounds were found among sponges and gorgonians.

Introduction:

Boophilus microplus is the major pest of veterinary importance in New Caledonia. The cattle ticks are responsible for physical damage to livestock sometimes leading to loss of animals directly or through diseases transmitted. *B. microplus* has shown the widest spectrum of resistance to acaricides all over the world. In New Caledonia the first resistant strains were found on the East coast in 1983 (Brun et al.). This investigation aims to find new active molecules from marine organisms collected during SMIB (Substances Marines d'Intérêt Biologique) oceanographic campaigns.

Material and methods :

The method used to determine the activity of extract organisms is derived from the technique developed by Stone and Haydock (1962) where *B. microplus* larvae are confined in a pocket of impregnated filter paper.



Ticks : engorged female *B.microplus* collected on cattle were allowed to lay eggs in an incubator (27 +/-1°C and 85-95% r.h.). Eggs hatched after 4 weeks and unfed 2-3 week-old larvae were used for testing. An exposure period of three days was the best compromise between good expression of toxicity and low control mortality. Batches of 100-150 larvae were used in each impregnated filter paper packet.

Extracts : 160 marine organisms, deep water as well as shallow water, were collected during several oceanographic exploration trips carried out around New Caledonia.

Draggings were done between 300 and 700 meters deep leading to several samples of taxa only known as fossiles in different parts of the world. Most organisms belong to sponges and echinoderms. Deep or shallow water samples were freeze dried and then extracted in water (extract A), alcohol (extract B) or CH₂Cl₂ (extract C) for impregnation in filter paper.

Acaricidal activity of marine organisms :

Organisms	Number of species		Acaricidal extract
	studied	active	
Alcyonacea	3	2 ++	C
Alga (cyanophyceae)	2	2 +	C
Tunicates	17	2 ++	C
		3 +	C
Bryozoans	3	1 +	C
	82	4 +++	A, B, C
Sponges		3 +++	C
		1 ++	C
		4 +	C
Sea stars	5	1 +	C
Holothurians	2	1 +	A
Sea urchins	10	0	C
Crinoids	3	0	C
Ophiuroides	1	0	C
Gorgonians	10	2 +++	C
		1 +	
Hard corals	14	1 +	C
Molluscs	4	0	
Miscellaneous*	4	0	

* antipatharia, hydroids and zoanthids

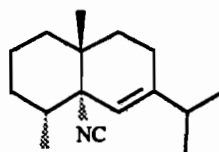
Conclusion

When the biological activity (++ or +++) was reliable (found on several collections of organism), the bioactive compounds were investigated.

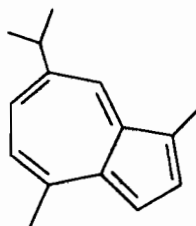
When the activity is spread in the 3 different extracts, it is very difficult to isolate the bioactive principles, thought they are usually very minor and very toxic compounds.

2 pure active compounds have been isolated:

- *Styllostelline*, a new isocyanide compound was identified from a deep water sponge *Stylotella sp.*,

**Stylotelline**

- **Guaiazulene**, an old antiinflammatory compound, has been isolated from a gorgonian *Euplexaura sp.*, and is responsible of the strong acaricidal activity of the chloromethanolic extract (C) from this invertebrate.

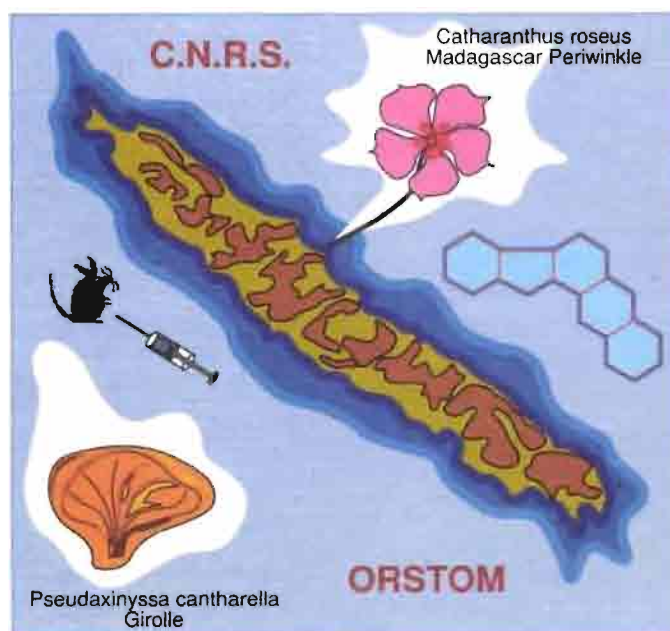
**Guaiazulene****References**

- Brun L.O., Wilson J.T. and Daynes P., *Trop. Pest Manage.* **29** (1) 16-22 (1983)
Fusetani N., Matsunaga S. and Konosu S., *Experientia* **37**, 680 (1981)
Pais M., Fontaine C., Laurent D., La Barre S. and Guittet E., *Tetrahedron Lett.* **28**(13), 1409-1412 (1987)
Stone B F. and Haydock K.P., *Bull. Entomol. Res.* **53**, 563-578 (1962)
The Mercks Index, 10th edition, p. 655.

Troisième Symposium sur les substances naturelles d'intérêt biologique de la région Pacifique-Asie

Nouméa, Nouvelle-Calédonie, 26-30 Août 1991

ACTES



Editeurs : Cécile DEBITUS, Philippe AMADE,
Dominique LAURENT, Jean-Pierre COSSON