

KARYOTYPES AND HETEROCHROMATIN DISTRIBUTION (C-BAND PATTERNS) IN THREE SPECIES OF *Microstigmus* WASPS (HYMENOPTERA, SPHECIDAE, PEMPHREDONINAE)

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ABSTRACT

Cytogenetic studies of sphecid wasps are reported for the first time. Karyotype and C-band patterns are described for three species of the genus *Microstigmus*: *M. arlei* Richards ($n=3, 2n=6$), *M. brasiliensis* Melo ($n=5, 2n=10$), and *M. luederwaldti* Richards ($n=3, 2n=6$). Similarities between karyotypes of the species pertaining to different taxonomic groups are discussed.

INTRODUCTION

The family Sphecidae includes nearly 8000 species of predaceous wasps, belonging to 226 genera (Bohart and Menke, 1976). Although these wasps are widely distributed throughout the world, no previous investigations on their karyotypes have been reported.

Microstigmus wasps are restricted to the Neotropical region and include solitary and primitively social species, varying from 3 to 5 mm in size (Richards, 1972; West-Eberhard, 1977). Twenty-two species have been described (Richards, 1972; Antropov, 1992; Melo, 1992; Melo and Evans, 1993), but the genus contains a great number of undescribed species (West-Eberhard, 1977; Melo, unpublished results).

MATERIAL AND METHODS

The nests of *M. luederwaldti* were found beneath leaves of understory treelets, while that of *M. arlei* and *M. brasiliensis* were found under large roots in banks, inclined tree trunks, and lianas. *M. arlei* nests were also found under tree branches and beams of cabin roofs. All these species possess small nests with an average of three to four adults per nest.

Material from the following 19 nests were analysed: nine nests of *M. brasiliensis* and seven nests of *M. arlei*, all collected in Viçosa, MG, Brazil (20°45'S, 42°52'W), and three nests of *M. luederwaldti*, one collected in Viçosa, one in Araponga, MG (20°40'S, 42°30'W), and the third in Joinville, SC (26°21'S, 48°55'W). An average of two immatures per nest were at the proper stage for analysis.

Metaphase preparations were obtained from male and female cerebral ganglion cells and/or gonadal cells at the prepupal stage by the technique of Imai *et al.* (1988). C-band patterns were obtained by the technique of Sumner (1972), with slight modifications introduced by Pompolo and Takahashi (1990). A mean of ten metaphasic cells were analysed in each slide. Photomicrographs were taken using a Zeiss microscope and a AGFA COPEX PAN A.H.U. film. Karyotypes were mounted by arranging chromosomes in decreasing order of size.

RESULTS AND DISCUSSION

The diploid number of *M. arlei* and *M. luederwaldti* is six. The first and second chromosome pairs are submetacentric in both species, pair 2 is a little shorter than pair 1 (Figure 1, a and b). The third pair in *M. luederwaldti* is also submetacentric, whereas in *M. arlei*, it is telocentric. In all chromosomes of these two species, heterochromatin is restricted to the pericentromeric region and to the whole short arm of the third pair in *M. luederwaldti* (Figure 1, d and e).

Microstigma brasiliensis have a diploid number equal to ten, and its karyotype consists of five pairs of acrocentric chromosomes (Figure 1, c). The first pair differs from the others by its larger size. Pairs 2 and 3, and pairs 4 and 5 are very similar to each other, respectively. The C-band karyotype presents heterochromatin in the pericentromeric region and in the whole short arm of all chromosomes (Figure 1, f).

The three species pertain to the Collembola-hunting *Microstigma* group of Richards (1972). *M. arlei* and *M. luederwaldti* belong to the same species group (Melo, unpublished results), and their karyotypes are very similar, both in number and in chromosome morphology. The most evident distinction between these two species is found in the morphology of the third chromosome pair, submetacentric with a heterochromatic short arm in *M. luederwaldti*, telocentric in *M. arlei*. *M. brasiliensis*

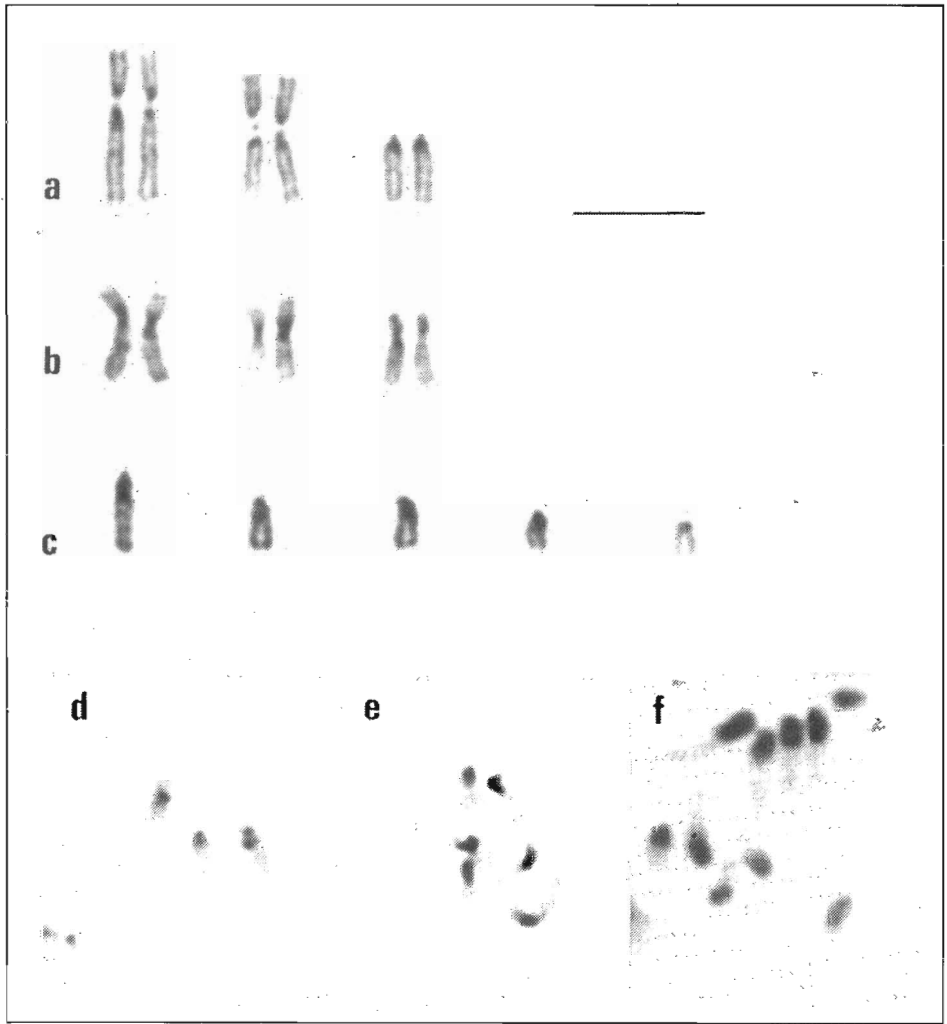


Figure 1 - Karyotype of (a) *Microstigmus arlei* female, ($2n=6$); (b) *M. luederwaldti* female, ($2n=6$); (c) *M. brasiliensis* male, ($n=5$). C. banded metaphases of (d) *M. arlei* male, ($n=3$); (e) *M. luederwaldti* female, ($2n=6$) and (f) *M. brasiliensis* female, ($2n=10$). Bar represents 10 μm .

belongs to a species group related to the *theridii* group (Melo, 1992), and its karyotype differs from that of the other two species in chromosome number, morphology and heterochromatin distribution. A detailed study of the karyotype evolution within the genus *Microstigmus*, involving the species reported here as well other species already analysed, is in progress by the authors.

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RESUMO

Neste trabalho são apresentados os primeiros dados citogenéticos na família Sphecidae. O cariótipo e padrões de banda C são descritos em três espécies do gênero *Microstigmus*: *Microstigmus arlei* Richards (n=3), *M. brasiliensis* Melo (n=5) e *M. luederwaldti* Richards (n=3). A similaridade entre cariótipos das espécies pertencentes a diferentes grupos taxonômicos é discutida.

REFERENCES

- Antropov, A.V. (1992). A new species of digger wasps of genus *Microstigmus* (Hymenoptera, Sphecidae, Pemphredoninae) from Brazil. *Byullet. Moscov. obshch. ispyt. priroedy otd. Biol.* 97: 53-55 (in Russian).
- Bohart, R.M. and Menke, A.S. (1976). *Sphecid Wasps of the world. A Generic Revision*. Univ. California Press, Berkeley.
- Imai, H.T., Taylor, R.W., Crosland, M.W.J. and Crozier, R.H. (1988). Modes of spontaneous chromosomal mutation and karyotype evolution in ants with reference to the minimum interaction hypothesis. *Jpn. J. Genet.* 63: 159-185.
- Melo, G.A.R. (1992). Duas novas espécies de *Microstigmus* Ducke, 1907 (Hymenoptera, Sphecidae). *Rev. Bras. ent.* 36: 663-670.
- Melo, G.A.R. and Evans, H.E. (1993). Two new *Microstigmus* species (Hymenoptera, Sphecidae), with the description of their parasite, *Goniozus microstigma* sp.n. (Hymenoptera, Bethyilidae). *Proc. Entomol. Soc. Wash.* 95: 258-263.
- Pompolo, S.G. and Takahashi, C.S. (1990). Chromosome numbers and C-banding in two species of the genus *Polistes* (Hymenoptera, Polistinae, Polistini). *Insectes Sociaux* 37: 251-257.
- Richards, O.W. (1972). The species of the South American wasps of the genus *Microstigmus* Ducke (Hymenoptera, Sphecoidea, Pemphredoninae). *Trans. R. Ent. Soc. Lond.* 124: 123-148.
- Sumner, A.T. (1972). A simple technique for demonstration of centromeric heterochromatin. *Exp. Cell Res.* 75: 304-306.
- West-Eberhard, M.J. (1977). Morphology and behavior in the taxonomy of *Microstigmus* wasps. *Proceedings of the 8th International Congress of the IUSSI*. The Netherlands, pp. 123-125.

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