

Analyses of G-bands in Chromosomes of the *Melipona quadrifasciata anthidioides* Lepeletier (Hymenoptera, Apidae, Meliponinae)

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Melipona quadrifasciata anthidioides, commonly known as "mandacajá", is a social stingless bee. It is exclusively neotropical being found in the whole mid east of Brazil, spreading from the North and North-East of São Paulo State until the states of Rio de Janeiro, Espírito Santo, Minas Gerais and Bahia (Nogueira-Neto 1970). Only a few publications exist on the *Melipona* karyotype in general and particularly on that of *M. quadrifasciata anthidioides*. Kerr (1947) found 18 chromosomes in females and 9 in males in preparations from the nervous tissue of larvae. Classifications of these chromosomes were proposed by Tarelho (1973) and Tambasco (1975) on the material obtained through squash of the germinative tissue. The utilization of the recent methods for the band formation in chromosomes permit a correct classification of these elements. This paper presents the karyotype of *M. quadrifasciata anthidioides*, particularly on the G-banding pattern.

Material and methods

For this analyses were used young queen and worker pupae of *M. quadrifasciata anthidioides*. The bees proceeded from Pocinhos do Rio Verde, Minas Gerais, were maintained in the Apiary of the Genetic Department, Ribeirão Preto, University of São Paulo. The pupae were dissected in water and the ovary was removed, fixed in Carnoy's fluid and squashed in 45% acetic acid. The cover glasses were removed by the dry ice or liquid nitrogen method. For the production of G-bands through trypsin technique (Scheres 1972), the following steps were carried out:

- a) incubation of the slides in 0,1% trypsin (BDH) solution on a pH 6.8 Sørensen buffer for 4 minutes;
- b) staining in Giemsa solution (1:30) in the same buffer, for 5 minutes;
- c) rinsing on distilled water;
- d) mounting in Canada balsam.

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For the description of the G-bands, 10 metaphases from 5 different specimens were used. The bands were classified and described according to the Paris Conference Nomenclature (1971) for human karyotypes.

Results and conclusions

The chromosomes of *M. quadrifasciata anthidioides* showing G-bands, are presented in Fig. 1. A schematic presentation of G-bands is given in Fig. 2. The lengths and positions of the G-bands are presented approximately, since measurements for them has not been made. For the same reason, the size of the chromosomes and the positions of the centromeres are not accurate either.

Chromosome pair no. 1

(p)—The short arms of the chromosomes of this pair were divided into two regions, 1 and 2. Region 1 extends from the centromere to the positive band 1 p 1 2,

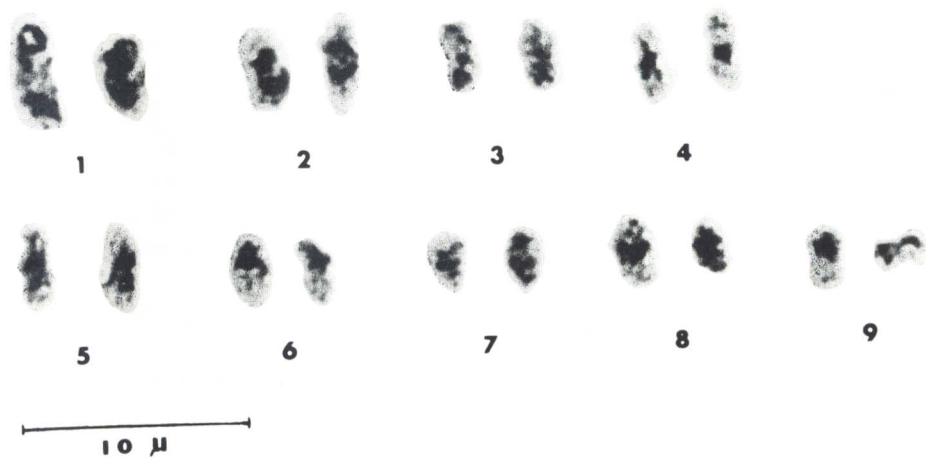


Fig. 1. Metaphasic chromosomes of *M. quadrifasciata anthidioides* workbee, showing G-bands.

and region 2 lies between this band and distal extremity of the chromosome arm.

The bands of region p 1

a) 1 p 1 1—negative, and occupying the region next to the centromere.

The bands of region p 2

a) 1 p 2 1—positive, well defined and long.

b) 1 p 2 2—negative, short and occupying the distal extremity of the chromosome arm.

(q)—The long arms of the chromosomes forming pair no. 1, were divided in two regions, 1 and 2. Region 1 is the area comprised by the centromere and the negative band 1 q 2 1, while region 2 stretches forth from this band to the distal extremity of the chromosome.

The bands of region q 1

a) 1 q 1 1—positive, well defined, long, situated near the centromere region

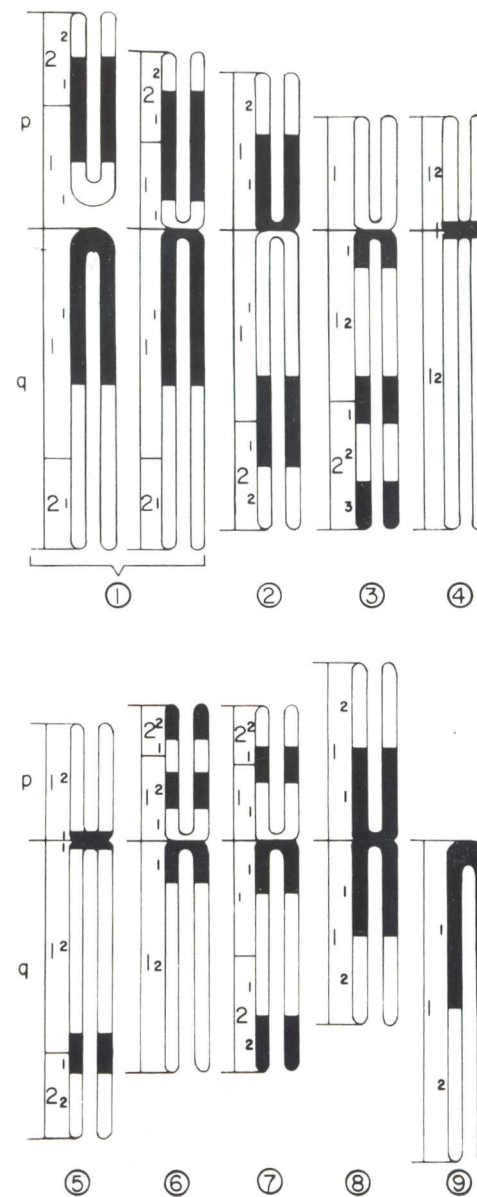


Fig. 2. Scheme of the G-band patterns of the chromosomes of *M. quadrifasciata anthidioides*. The symbols p and q designate, respectively, the short, and the long arms. (Chicago Conference, 1966).

The bands of region q 2

a) 1 q 2 1—negative, long and occupying the distal area of the chromosome arm.

Chromosome pair no. 2

(p)—The short arms of these chromosomes consist of a region which includes the area localized between the centromere and the distal extremity of the chromosome arm.

The bands of region p 1

a) 2 p 1 1—positive, well defined, long and occupying the region next to the centromere.

b) 2 p 1 2—negative, well defined and extending toward the distal extremity of the chromosome arm.

(q)—The long arms of the chromosomes of pair no. 2 were divided in two regions. Region 1 is the area comprised by the centromere and the positive band 2 q 2 1, while region 2 stretches forth from this band to the distal extremity of the chromosome.

The bands of region q 1

a) 2 q 1 1—negative, long and next to the centromere.

The bands of region q 2

a) 2 q 2 1—positive, well defined and localized near the extremity of the chromosome arm.

b) 2 q 2 2—negative, short and situated at the distal extremity of the chromosome.

Chromosome pair no. 3

(p)—The short arms of the chromosomes that form this pair consist of a region which stretches forth from the centromere until the final extremity of the chromosome.

The bands of region p 1

a) In this region no G-bands were formed.

(q)—The long arms of the chromosome of this pair were divided in two regions, 1 and 2. Region 1 extends from the centromere to the positive band 3 q 2 1, and region 2 lies between this band and distal extremity of the chromosome arm.

The bands of region q 1

a) 3 q 1 1—positive, short, occupying the area close to the centromere.
b) 3 q 1 2—negative, of medium length, occupying the nearly median part of the chromosome arm.

The bands of region q 2

a) 3 q 2 1—positive, well defined, situated in the middle part of the long arm.
b) 3 q 2 2—negative and short.
c) 3 q 2 3—positive, well defined and long, and situated at the distal extremity of the chromosome arm.

Chromosome pair no. 4

(p)—The short arms of the chromosomes contain only one region.

The bands of region p 1

a) 4 p 1 1—positive and occupying the centromere area.
b) 4 p 1 2—negative and stretching from the centromere to the distal extremities of the chromosome arms.

(q)—The long arms of this pair have only one region.

The bands of region q 1

a) 4 q 1 1—positive and localized in the centromere area.
b) 4 q 1 2—negative, and lies between the centromere and the distal extremity of the chromosome arm.

Chromosome pair no. 5

(p)—The short arms of the chromosomes of this pair contain a colourless region between the centromere and the distal extremity of the chromosome arms.

The bands of regions p 1

a) 5 p 1 1—positive, and near the centromere.
b) 5 p 1 2—negative and occupying the entire short arm of the chromosome.

(q)—The long arms of the chromosomes forming this pair were divided in two regions, 1 and 2. Region 1 extends from the centromere to the positive band 5^{*}q 2 1 and region 2 occupies the distal part of this arm.

The bands of region q 1

a) 5 q 1 1—positive, well defined and occupying the centromere area.
b) 5 q 1 2—negative, well defined and long.

The bands of region q 2

a) 5 q 2 1—positive, well defined and of medium length.
b) 5 q 2 2—negative, long and occupying the distal part of this arm.

Chromosome pair no. 6

(p)—The short arms of the chromosomes forming this pair, show two regions, 1 and 2. Region 1 lies between the centromere and the band 6 p 2 1, and region 2 is the area from this band to the extremity of the chromosome.

The bands of region p 1

a) 6 p 1 1—negative, short and next to the centromere.
b) 6 p 1 2—positive, well defined.

The bands of region p 2

a) 6 p 2 1—negative, short and not very distinct.
b) 6 p 2 2—positive, short and distinct, and situated near the distal extremity of the chromosome arm.

(q)—The long arms of the chromosomes of pair no. 6 have only one region.

The bands of region q 1

a) 6 q 1 1—positive, short and localized in the centromere area.
b) 6 q 1 2—negative, long and well defined, and extends from the region next to the centromere until the distal extremity of the chromosome arm.

Chromosome pair no. 7

(p)—The short arms of this pair were divided in two regions, 1 and 2. Region 1 lies between the centromere and the positive band 7 p 2 1, and region 2 goes from this band to the distal extremity of the chromosome.

The bands of region p 1

a) 7 p 1 1—negative, long and distinct and lies near the centromere.

The bands of region p 2

a) 7 p 2 1—positive and short, and situated in the middle of the chromosome arm.
b) 7 p 2 2—negative, of medium length and occupying the distal extremity of the chromosome arm.

(q)—The long arms of the chromosomes forming pair no. 7 were divided in two regions, 1 and 2. Region 1 is limited by the centromere and the negative band 7 q 2 1, and region 2 stretches from this band until the distal extremity of the chromosome.

The bands of region q 1

a) 7 q 1 1—positive, well defined and lies near the centromere.

The bands of region q 2

a) 7 q 2 1—negative, long and well defined.
b) 7 q 2 2—positive, short and occupying the final extremity of the chromosome.

Chromosome pair no. 8

(p)—The short arms of the chromosome of this pair have only one region.

The bands of region p 1

a) 8 p 1 1—positive, well defined and localizes in the area next to the centromere.
b) 8 p 1 2—negative, of medium length and well defined, and situated at the distal extremity of the chromosome arm.

(q)—The long arms of this pair show only one region.

The bands of region q 1

- a) 8 q 1 1—positive, well defined and localizes in the area next to the centromere.
- b) 8 q 1 2—negative, well defined and long, and extends until the final extremity of the chromosome.

Chromosome pair no. 9

(q)—The long arms of the chromosomes forming this pair show only one region.

The bands of region q 1

- a) 9 q 1 1—positive, well defined and long, occupying the centromere area.
- b) 9 q 1 2—negative, long and well defined, and situated at the distal extremity of the chromosome.

In Table 1, the number of regions, positive and negative bands, are presented.

Table 1. G-bands and regions of the chromosomes of *M. quadrifasciata anthidioides*

Chromosome number	Chromosome arms	Number of regions	Number of positive bands	Number of negative bands
1	short	2	1	2
	long	2	1	1
2	short	1	1	1
	long	2	1	2
3	short	1	indistinct	indistinct
	long	2	3	2
4	short	1	1	1
	long	1	1	1
5	short	1	1	1
	long	2	2	2
6	short	2	2	2
	long	1	1	1
7	short	2	1	2
	long	2	2	1
8	short	1	1	1
	long	1	1	1
9	long	1	1	1

Abstract

Chromosomes of *M. quadrifasciata anthidioides* pupae, obtained by squash preparations from ovaries, were analysed through proteolytic digestion with trypsin and subsequent staining with Giemsa. The G-bands were described according to the nomenclature proposed by the Paris Conference (1971) for human metaphasic chromosomes.

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