

Chromosomes of *Ageniaspis fuscicollis* (Dalman, 1820) (Hymenoptera: Encyrtidae)

Хромосомы *Ageniaspis fuscicollis* (Dalman, 1820) (Hymenoptera: Encyrtidae)

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КЛЮЧЕВЫЕ СЛОВА: хромосомы, кариотип, Hymenoptera, Encyrtidae, *Ageniaspis fuscicollis*.

ABSTRACT: $n = 10$ and $2n = 20$ are found in *Ageniaspis fuscicollis*. The karyotype of this species contains a pair of large metacentrics; the other chromosomes are acrocentric and much shorter than those of the first pair. Each bivalent has the only chiasma except for the first one bearing two chiasmata.

РЕЗЮМЕ: У *Ageniaspis fuscicollis* обнаружено $n = 10$ и $2n = 20$. Кариотип этого вида содержит пару крупных метацентриков; остальные хромосомы являются акроцентрическими и гораздо короче хромосом первой пары. Каждый бивалент имеет только одну хиазму, за исключением первого, несущего две хиазмы.

Ageniaspis fuscicollis (Dalman, 1820) is a well-known parasite of various ermine moths (Yponomeutidae) [Trjapitzin et al., 1982], including a significant pest of the apple-tree, the apple ermine moth *Yponomeuta malinellus* (Zeller, 1838). The taxonomy and biology of this parasitic wasp species are thoroughly studied due to its high potential to control *Y. malinellus* [Trjapitzin, 1989; Kuhlmann et al., 1998]. Chromosomes of *A. fuscicollis* were first examined at the beginning of the 20th century [Silvestri, 1908; Martin, 1914]. However, neither reliable chromosome counts nor detailed pictures of chromosomes were given. We have studied both mitotic and meiotic karyotypes of *A. fuscicollis*. The results of this work are given below.

Materials and methods

Females of *A. fuscicollis* were reared from parasitized larvae of *Y. malinellus* collected from apple-trees at the Botanical Garden, Moscow State University, Moscow, in July 2003. Chromosome preparations were obtained from ovaries of adults according to the standard technique for studying chromosomes in adult females of parasitic wasps [Gokhman, Quicke, 1995]. Cell divisions were studied and photographed using the optic microscope Zeiss Axioskop 40 FL fitted with

the digital camera AxioCam MRc. The resulting images were processed with the image analysis program AxioVision version 3.1. Voucher specimens are deposited in the Zoological Museum, Moscow State University, Moscow.

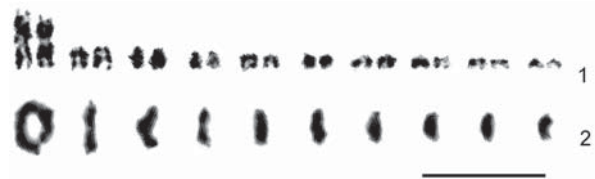
Results

The diploid chromosome number ($2n$) of *A. fuscicollis* is 20 (Fig. 1). All chromosomes gradually decrease in size except for the first chromosome pair which is about 2.5 times longer than the second one. The largest chromosome pair is metacentric, whereas all other chromosomes appear to be acrocentric; therefore the arm number (NF) in this species is 22.

Ten bivalents were found in diakinesis of the first meiotic division in *A. fuscicollis* ($n = 10$; Fig. 2). Each bivalent has the only chiasma, except for the first one bearing two chiasmata.

Discussion

The haploid chromosome number found in *A. fuscicollis*, $n = 10$, agrees with the previous approximate counts for this species done by Silvestri [1908] (“about ten”) and Martin [1914] (“eight to ten”). However, none of the authors seemed to recognize those numbers as



Figs 1–2. Karyograms of *Ageniaspis fuscicollis*: 1 — mitotic chromosomes, 2 — meiotic chromosomes in diakinesis. Scale bar indicates 10 μm .

Рис. 1–2. Кариограммы *Ageniaspis fuscicollis*: 1 — митотические хромосомы, 2 — мейотические хромосомы на стадии диакинеза. Масштаб 10 μm .

haploid ones. Moreover, no diploid chromosome numbers were previously known for *A. fuscicollis*.

The karyotype of *A. fuscicollis* differs from those of all studied Encyrtidae in having the very large first pair of metacentrics. Chromosomes of other members of the family more or less gradually decrease in size, being mostly acrocentric or subtelocentric [Hunter, Bartlett, 1975; Strand, Ode, 1990; Gokhman, 2003]. Since $2n = 20$ and 22 are the most frequent chromosome numbers in the Encyrtidae [Gokhman, 2003], the karyotype of *A. fuscicollis* probably originated from that having $2n = 22$ by chromosomal fusion¹.

The karyotypic study of *A. fuscicollis* has some potential taxonomic implications. Specifically, chromosomal analysis has already revealed obvious differences between populations of another parasitic wasp belonging to the family Encyrtidae, namely, *Copidosoma floridanum* (Ashmead, 1900) (see [Gokhman, 2002] for review). Moreover, molecular studies suggest that at least some species of the genus *Ageniaspis* Dahlbom, 1857 (including *A. fuscicollis*) actually represent complexes of sibling species, both sympatric and allopatric [Alvarez, Hoy, 2002; Unruh et al., 2002]. An extensive karyotypic study of various populations of *A. fuscicollis* is therefore badly needed.

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¹ $2n = 22$ was recently found in *Ageniaspis citricola* Logvinovskaya, 1983 [Andrade-Souza et al., 2002].