

KARYOLOGICAL ANALYSES OF TWO WOLF SPIDER (ARANEAE: LYCOSIDAE) FROM TURKEY

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ABSTRACT: In this study, the karyotype analysis of two wolf spider, *Alopecosa pulverulenta* (Clerck, 1757) and *Alopecosa accentuata* (Latreille, 1817) were made based on the samples from Turkey. The chromosome diploid number (2n) and the sex chromosome system in males of both species were found in the same, 2n= 28 (26 + X₁X₂). Two species have telocentric chromosomes.

KEY WORDS: Araneae, Lycosidae, Karyotype, sex chromosome, Turkey.

Lycosidae is one of the big spider families, which contains worldwide 2399 species from 120 (Platnick, 2015). However, only 85 species belonging to 15 genera are listed in Turkey (Topçu et al., 2005; Bayram et al., 2015). Many lycosids are diurnal and very active and therefore easy to find and observe. As the females carry the egg sacs attached to the spinnerets, these are easily collected during the reproductive season (Jocque, Alderweireldt, 2005). Although wolf spiders are one of the best explored families of entelegyne spiders, cytogenetic studies with them are scarce. Most of the analyzed species have only telocentric or acrocentric chromosomes; the sex chromosome system X₁X₂σ/X₁X₁X₂X₂♀ occurs in 94% of lycosids (Chemisquy et al., 2008).

In the present study, we have reported the results on the karyotypes of two wolf spider species in Lycosidae.

MATERIALS AND METHODS

Adult males of *A. pulverulenta* (Clerck, 1757) and *A. accentuata* (Latreille, 1817) were collected by hand in Central Anatolia of Turkey. All the individuals were collected between April and June in 2013. The specimens were deposited in NUAM (Niğde University Arachnology Museum).

It is selected the most suitable subadult and/or adult males for this type of analysis. Chromosome preparations were made according to the procedure described by TRAUT (1976), with some modifications. Testes were dissected out in a hypotonic solution (0.075 M KCl) and then transferred into a new hypotonic solution, and they were hypotonized for 20 min in total. Tissues were moved in 2 changes of freshly prepared Carnoy fixative (ethanol, chloroform, and glacial acetic acid, 6:3:1) for 35 min in total. A piece of tissue was suspended in a drop of 60% acetic acid on a slide using a pair of tungsten needles. The slide was dried on a histological plate (surface temperature 42 °C) and stained with a 5% Giemsa solution in Sørensen phosphate buffer (pH 6.8) for 27 min. The cells were investigated under an Olympus CX31 microscope and the best metaphase figures were photographed with an Olympus DP 25 digital camera and the DP2-BSW program (Olympus). Karyotypes of *A. pulverulenta* (Clerck, 1757) and *A. accentuata* (Latreille, 1817) were constructed by arranging chromosomes in pairs according to size using images of spermatogonial metaphases. Relative

chromosome lengths (RCLs) of each chromosome pair were calculated from 10 metaphase plates obtained from each species. Chromosome morphology was classified according to the method of Levan et al. (1964).

RESULTS

Alopecosa pulverulenta (Clerck, 1757)

The male karyotype consisted of 28 chromosomes (Figure 1). All autosome pairs were telocentric. Autosome pairs gradually decreased in size. Relative lengths of autosome pairs ranged from 5.06% to 3.01% (Table 1). The sex chromosome system was of the $X_1X_2\sigma$ type. The X_1 and X_2 sex chromosomes were telocentric and their relative lengths were 3.38% and 2.70%, respectively.

Alopecosa accentuata (Latreille, 1817)

The male karyotype consisted of 28 chromosomes (Figure 2). All autosome pairs were telocentric. Autosome pairs gradually decreased in size. Relative lengths of autosome pairs ranged from 5.34% to 2.81% (Table 1). The sex chromosome system was of the $X_1X_2\sigma$ type. The X_1 and X_2 sex chromosomes were telocentric and their relative lengths were 4.66% and 3.20%, respectively.

DISCUSSION

Despite the high diversity of lycosids (120 genera, 2399 species), they are poorly known from the cytogenetic point of view. As of today, 100 species have been examined. Diploid chromosome numbers in these species ranges varied from 18 to 30 and $2n\sigma = 28$ in 48% of all studied species (Kumbıçak et al., 2009).

Cytogenetic studies on the majority of males of lycosids have similar characteristics: acrocentric or telocentric chromosomes, sex chromosome system in male $X_1X_2\sigma$. Until now, only three species belonging to the genus *Alopecosa* has been studied cytogenetically (Table 2).

As a result, in this study we are studied on two *Alopecosa* species. First species, *A. accentuata* was investigated for the first time as by examining karyological characters, and other species *A. pulverulenta* was studied previously, the karyotypes consist of acrocentric chromosomes and the sex chromosome system is $X_1X_2\sigma$ (Hackman, 1948; Kumbıçak et al., 2009). Telocentric chromosome form of this species was found for the first time in this study.

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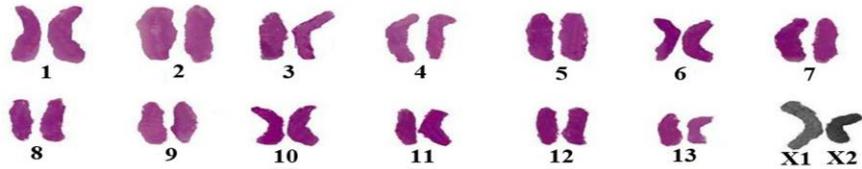
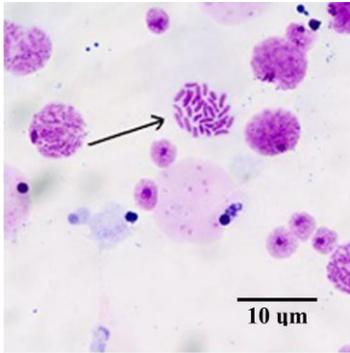


Figure 1. Male karyotype of *Alopecosa pulverulenta* ($2n = 28, X_1X_2\sigma$) (scale = 10 μm).

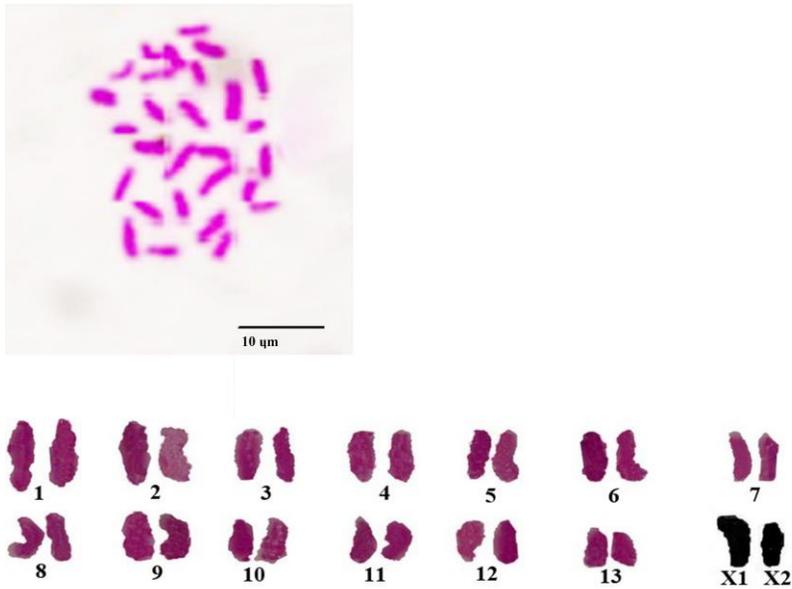


Figure 2. Male karyotype of *Alopecosa accentuata* ($2n = 28, X_1X_2\sigma$) (scale = 10 μm).

Table 1. Relative length of chromosome pairs (RCL) and chromosome morphology (CM) of *Alopecosa pulverulenta* and *A. Accentuata* based on spermatogonial metaphase cells (t: telocentric).

<i>Alopecosa pulverulenta</i>			<i>Alopecosa accentuata</i>		
Pair no.	RCL%	CM	Pair no.	RCL%	CM
1	5.06	t	1	5.34	t
2	4.76	t	2	4.49	t
3	4.57	t	3	4.29	t
4	4.29	t	4	3.99	t
5	3.97	t	5	3.99	t
6	3.83	t	6	3.95	t
7	3.81	t	7	3.85	t
8	3.75	t	8	3.80	t
9	3.60	t	9	3.56	t
10	3.12	t	10	3.48	t
11	3.10	t	11	3.26	t
12	3.00	t	12	3.11	t
13	3.01	t	13	2.81	t
X1	3.38	t	X1	4.66	t
X2	2.70	t	X2	3.20	t

Table 2. List of karyotyped species of the genera *Alopecosa*.

Species	2n	Haploid (σ)	References
<i>A. pulverulenta</i>	28	13+X ₁ X ₂	Hackman, 1948; Kumbıçak et. al., 2009; In this study
<i>A. albofasciata</i>	28	13+X ₁ X ₂	Gorlova et. al., 1997
<i>A. aculeata</i>	28	13+X ₁ X ₂	Hackman, 1948
<i>A. accentuata</i>	28	13+X ₁ X ₂	In this study