



## DESCRIPTION OF KARYOTYPES OF PARENT SPECIES AND SUBSPECIES OF *MAGNIBRACTEOLATA* TOD. SECTION

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### ABSTRACT

*In this article, a cytogenetic analysis of the karyotypes of the *Magnibracteolata* Tod section was carried out. Karyotypic analysis gives us a set of features of a complete chromosomes set inherent in cells of this type of cotton, such as *G. hirsutum* L. (cultivated variety of AN-Bayaut-2 and *G. hirsutum* L. var. *morili*), *G. tomentosum*, *G. mustelinum*, *G. barbadense* L. ssp. *ruderales*. as well as the number, size and shape of the chromosomes and the idiogram of these species and subspecies. Based on the selection of the initial species and subspecies using karyological indicators, it is possible to determine the harmony of karyotypes when crossing the section *Magnibracteolata* Tod.*

**KEY WORDS:** *Chromosome, karyotype, species, subspecies, interspecific hybrid, cotton, forms, donor.*

### INTRODUCTION

Use of wild species of cotton when combined with experimental polyploidy in interspecific hybridization contributes to the creation of hereditarily new hybrid forms. One of the most important areas of genetic research is the study of the basics of cotton cytology during interspecific hybridization. This is of great practical importance in the creation of new donors and prospective varieties of cotton.

It is seen from the scientific literature that karyological studies of *Gossypium* L. species are not yet completed. There are many species, cotton subspecies whose karyotypes have not yet been studied. The data of karyological studies available in the literature is few [1, 4] and they were often controversial.

### MATERIALS AND METHODS

As a source of variety we used: *G. tomentosum*, *G. mustelinum*, *G. hirsutum* var. *morili*, *G. hirsutum* variety AN-Bayaut-2, *G. barbadense* ssp. *ruderales*, as well as *G. barbadense* ssp. *vitifolium* var. *brasiliense*. All the original variety of cotton belongs to the section *Magnibracteolata* Tod. of the genus *Gossypium* L. with  $2n = 4x = 52$  chromosome set.

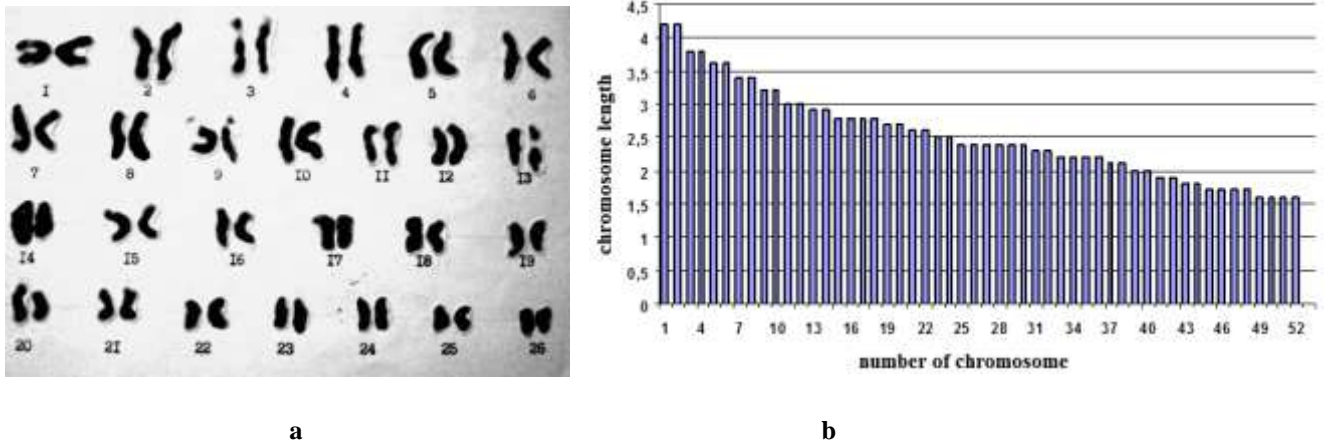
### RESULTS

We have studied the cytology and karyology of some species and hybrids of cotton. A comparative morphological study of plants was carried out, and some evaluation of the morphobiological parameters of the material obtained was carried out. As a material for morphostructural and cytological studies were used: some types of section *Magnibracteolata* Tod. such as: *G. hirsutum* L. (cultivated variety of AN-Bayaut-2 and *G. hirsutum* L. var. *morili*), *G. tomentosum*, *G. mustelinum*, *G. barbadense* L. ssp. *ruderales*.

To give a notion about those karyotypic transformations that occur during hybridization, experimental polyploidy, as well as during the stabilization-formation of new constant forms, cotton lines, and their karyotypes during subsequent generations, we first represent the karyotypes of the original parental species, subspecies, etc.

As a source diversity we used: *G. tomentosum*, *G. mustelinum*, *G. hirsutum* var. *morili*, *G. hirsutum* cultivar AN-Bayaut-2, *G. barbadense* ssp. *ruderales*, as well as ssp. *vitifolium* var. *brasiliense* (*G. barbadense*). All the original diversity of cotton belongs to the section *Magnibracteolata* Tod. of the genus *Gossypium* L.  $2n = 4x = 52$  chromosome set. The karyotypes of the original species presented below were presented by us, as well as from the work of M.B. Akhmedov [2, 3].

**Karyotype *G. mustelinum* (2n = 4x = 52)**



**Fig. 1 (a, b). a - idiogram, b - diagram (karyogram) of *G. mustelinum* chromosomes (2n = 4x = 52)**

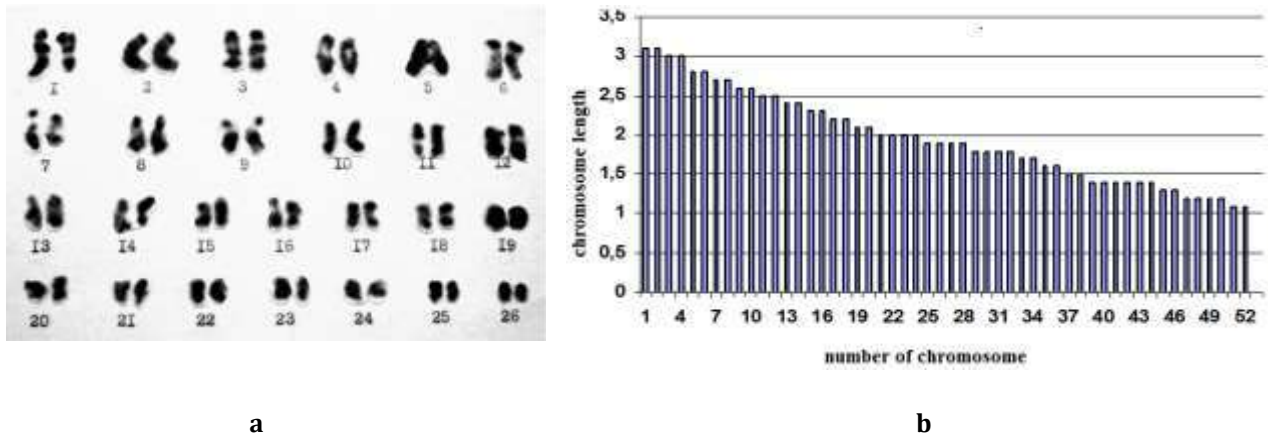
Karyotype *G. mustelinum* (Fig. 1) has 2n=4x=52 chromosomes. It includes 13 pairs of metacentric chromosomes (1, 6, 8-9, 11, 13-14, 17-19, 21, 25, and 26th pairs) and 13 pairs of submetacentric chromosomes - 2-5, 7, 10, 12, 15-16, 20,22, 23-24 pairs of chromosomes.

The 3rd pair contains large (0.5 μm) club-shaped satellites on long (0.6 μm) satellite thread; the 9th pair contains small, round satellites on long satellite thread. The 20th pair of chromosomes contains oval, medium-

sized (0.4 μm) satellites on very short satellite threads (0.1 μm). The 23rd pair of chromosomes has small, round, satellites on very short threads.

Boundary chromosomal length oscillation varies from 1.6 to 4.0 microns. The total length of all chromosomes 2 n = 4 x = 52 *G. mustelinum* is 132.8 ± 0.6 microns. The average length of one chromosome (*l avg*) is 2.55 microns.

***G. tomentosum* karyotype (2n = 4x = 52)**



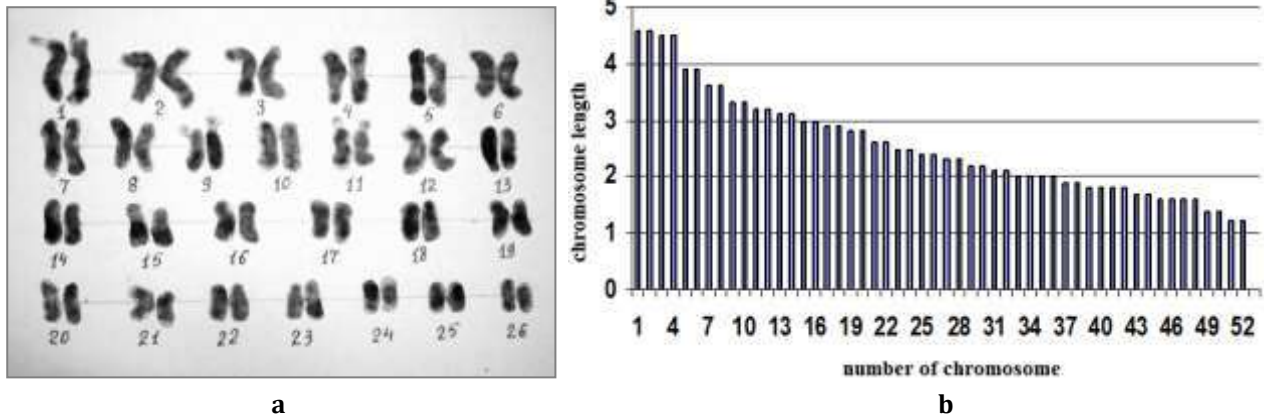
**Fig.2 (a, b). a - *G. tomentosum* chromosomes ideogram, b - idiogram - "karyogram" of this species (2 n = 4 x = 52)**

Karyotype *G. tomentosum* (Fig. 2) includes 15 metacentric pairs, 9 submetacentric pairs, and 2 acrocentric chromosome pairs. In the chromosomal set of this species, 5 pairs of satellite chromosomes were found: the 1st pair of acrocentrics and the 3rd pair of submetacentrics carry large (0.6 microns), oval satellites on short thread. The 6th and 9th pairs of submetacentric chromosomes carry oval, medium size (0.4 μm) satellites on short (0.3 μm) threads. The 7th pair of acrocentrics carry medium size (0.4 μm) circular

satellites on medium (0.4 μm) threads. Boundary chromosomal length oscillation of *G. tomentosum* varies from 1.2 to 3.1 microns. The total length of all chromosomes of the diploid set of this type is 101.6 ± 0.6 microns.

The average length of one chromosome (*l avg*) of this specie is 1.95 microns.

***G. barbadense ssp. vitifolium var. brasilense* karyotype (2n = 4 x = 52)**



**Fig. 3 (a, b). a - Idiogram of *G. barbadense ssp. vitifolium var. brasilense* chromosomes, b - karyogram of this type (2n = 4x = 52).**

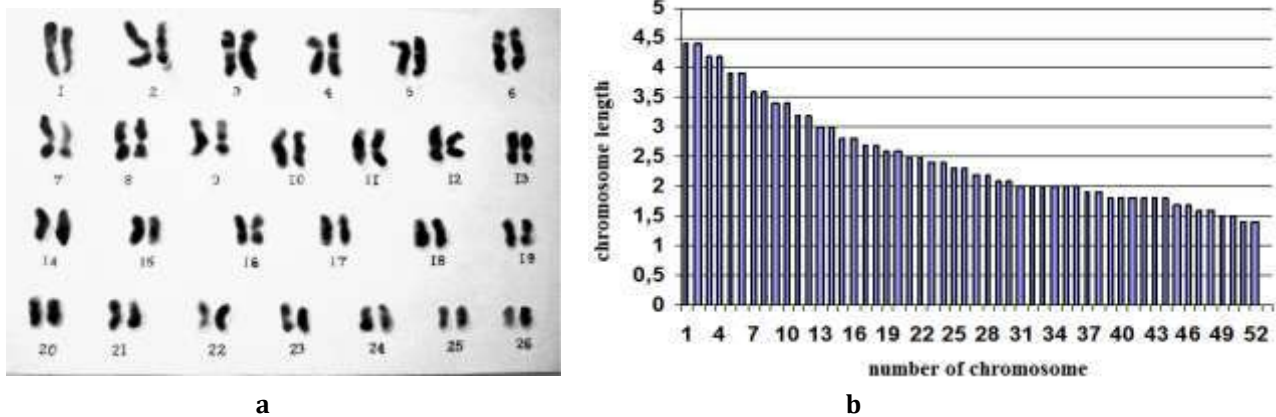
Karyotype *G. barbadense ssp. vitifolium var. brasilense* (2n = 4 x = 52) (Fig. 3) includes 16 metacentric (2.4–5, 10, 12, 14, 17–26) and 10 pairs (1, 3, 6–9, 11, 13, 15–16 pairs) submetacentric chromosomes.

The 1-pair submetacentric chromosomes have medium size (0.4 μm), oval satellites on short threads. The 3rd pair has slightly oval, almost round satellites on medium length (0.4 microns) threads. 7th pair of

submetacentric chromosomes carry large (0.5–0.6 μm) weakly oval, almost circular satellites.

The 11th pair of submetacentric chromosomes carries small satellites on short threads. Boundary chromosomal length oscillation varies from 1.2 to 4.4 microns. The total length of all chromosomes in the set is 130.2 ± 0.6 microns. The average length of one chromosome (*l avg*) is 2.5 microns.

**Karyotype of *G. barbadense ssp. ruderale* (2n = 4x = 52)**



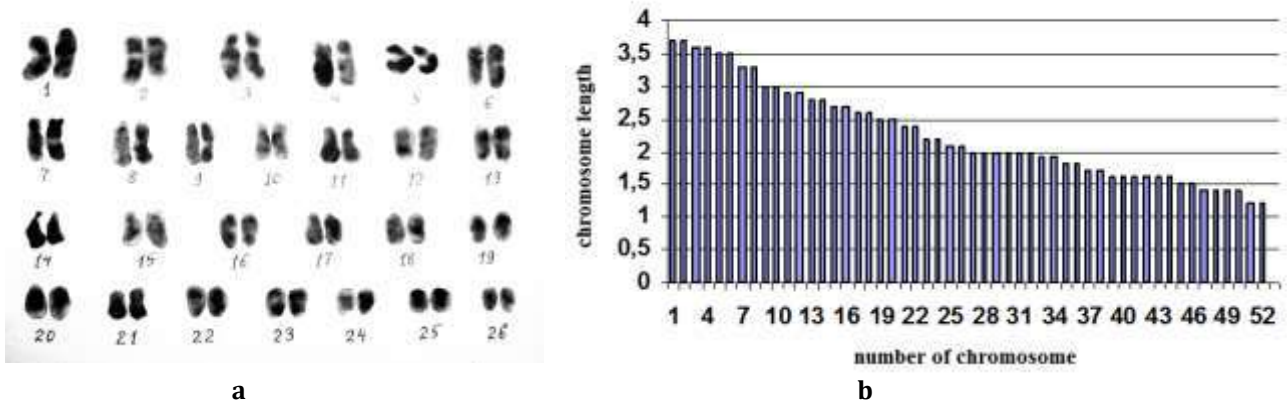
**Fig. 4 (a, b). a - ideogram, b - karyogram of *G. barbadense ssp. ruderale* chromosomes (2n = 4x = 52)**

Karyotype *G. barbadense ssp. ruderale* (2n = 4x = 52) (Fig. 4) includes 15 pairs (1, 10, 14–28) of metacentric and 11 pairs (2–9, 11–13th) of submetacentric chromosomes. Submetacentric (3rd pair) has medium-sized (0.4 microns) oval satellites on short threads. The 5th pair of submetacentric chromosomes has small (0.3 μm), round satellites on short (0.2 μm)

threads. The 11th pair of chromosomes has small (0.2 μm), round satellites on short (0.2 μm) threads. Boundary chromosomal length oscillation varies from 1.4 to 4.4 microns.

The total length of all (2 n = 4 x = 52) chromosomes is 129, 6 ± 0.6 microns. The average length of one chromosome (*l avg*) is 2.49 microns.

**Karyotype *G.hirsutum* var. *morili* (2n = 4x = 52)**

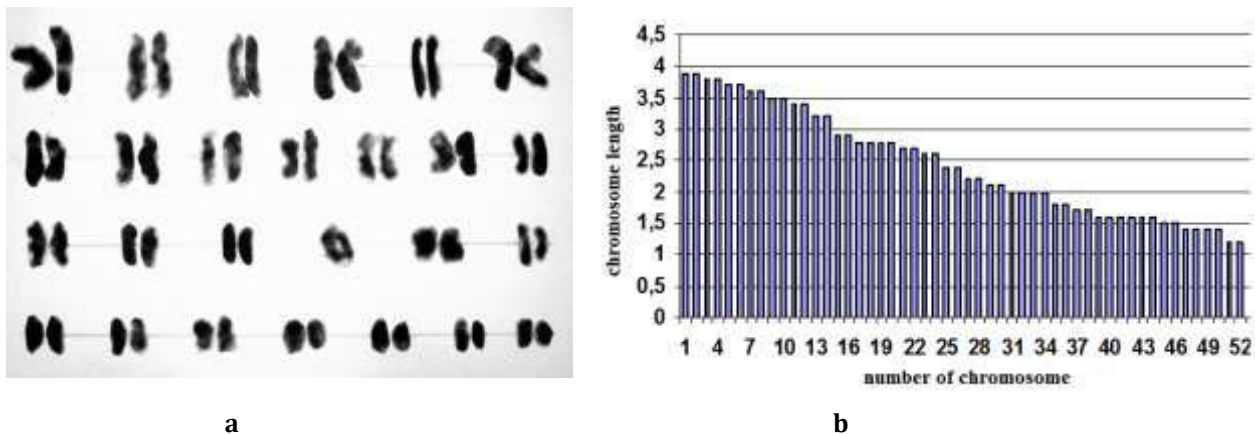


**Fig. 5 ( a , b ). a - idiogram, b-karyogram of *G. hirsutum* var. *morili* chromosomes.**

Karyotype of *G. hirsutum* var. *morili* (2n = 4x = 52) (Fig. 5) includes 18 pairs of metacentric, 6 pairs of submetacentric and 2 pairs of acrocentric chromosomes. 6th pair of long submetacentric chromosome, 20th pair of short acrocentric, as well as 22nd pair of short acrocentric chromosomes has satellites. The total length of all chromosomes 2n = 4x = 52 is 139.20 ± 2.80 microns.

The average length of one chromosome (*I* avg) is 2.68 ± 2.60 µm.

**AN-Bayaut-2 (*G hirsutum*.) variety karyotype (2n = 4x = 52)**



**Fig. 6 (a, b). a - Idiogram of AN-Bayaut-2 variety, b - diagram of AN-Bayaut-2 (*G.hirsutum* L) variety (2n = 4x = 52)**

The karyotype of AN-Bayaut-2 variety (2n = 4x = 52) (Fig. 6) includes 12 metacentric pairs, 13 submetacentric pairs, and 1 acrocentric chromosome pair.

The 2nd pair of long acrocentric chromosomes, the 6th pair of long submetacentric, the 10th pair of medium submetacentric and the 20 th pair of short submetacentric chromosomes carry satellites - total 4 pairs of satellite chromosomes.

Total length of all chromosomes of a diploid chromosome set of AN-Bayaut-2 variety is 138,84 ± 2.5 microns. The average length of one chromosome (*I* avg) is 2.67 microns.

Thus, we studied *G.tomentosum*, *G.mustelinum*, *G.hirsutum* var. *morili*, *G.hirsutum* L. cultivar Bayaut AN-2, *G.barbadense* ssp. *ruderales*, and *G.barbadense* ssp. *vitifolium* var. *brasilese* species and subspecies of

cotton in terms of the total length of all chromosomes (2n = 4x = 52) and the average length of one chromosome (*I* avg) differed. The largest total length of all chromosomes was found in *G.hirsutum* L var. *morili* (2n = 4x = 52) and in AN-Bayaut-2 varieties, whose figures were respectively 139.20 ± 2.80 µm and 138, 84 ± 2.5 µm, and the average length of one chromosome (*I* cp) was 2.68 microns and 2.67 microns. The average total length of all chromosomes is set in *G.mustelinum*, *G.barbadense* ssp. *vitifolium* var. *brasilese* and *G.barbadense* ssp. *ruderales* - the total length of all chromosomes was – 132.8 ± 0.6 µm and 130.2 ± 0.6, 129, 6 ± 0.6 µm, and the average length of one chromosome (*I* avg) was 25.5 and 25.0, 24.9 µm. The smallest total length of all chromosomes was observed in *G.tomentosum* -101.6 ± 0.6 µm with an average length of one chromosome (*I* avg) up to 1.95 µm.

## CONCLUSIONS

From the above stated we conclude that the rate of the total length of all chromosomes ( $2n = 4x = 52$ ) and the average length of one chromosome ( $l$  avg) differ significantly among the *species and subspecies* of cotton.

It was found that on the basis of selection of initial *species and subspecies* using karyological indicators, it is possible to determine the harmony of karyotypes when hybridizing the section *Magnibracteolata* Tod.

It was found out that using chromosomally-karyologic method, it is possible to pick a pair for crossbreeding, which can lead to the formation of new

forms - interesting for both scientific and practical appliances.

## REFERENCES

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