

## KARYOTYPE CHARACTERIZATION OF ALFALFA (*Medicago sativa* L.) COLLECTED FROM LAKE REGIONS OF TURKEY

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### Abstract

*Alfalfa (Medicago sativa L.) is the one of the important and economic forage legume crops in the world and Turkey. Alfalfa has 60 species which 30 annual and perennial species were distributed in different regions of Turkey. Cytogenetical research on alfalfa lagged far behind other crops mainly because alfalfa chromosomes are very small, the chromosomes are morphologically very similar, cultivated alfalfa has relatively high number of chromosomes and alfalfa is an autotetraploid. The Yeşilova-3 alfalfa population was collected from Lake Regions of Turkey as clone. Root tips meristems obtained from plants of similar age that originated by vegetative reproduction from a single parent from plants grown under greenhouse conditions, were pretreated with saturated solution of  $\alpha$ -bromonaphthalene and 0.002 M 8-Hydroxyquinolin before staining with aceto-iron-hematoxylin. The measured chromosomal parameters were; Short arm, Long arm, Total length of chromosomes, Arm Ratio and chromosome type. Within the chromosome complement, seven pairs of chromosomes were metacentric (chromosomes II, III, V and VI) and three numbers were submetacentric (chromosome I, IV and VIII). Karyotype analysis showed that Yeşilova accession was tetraploid ( $2n=4x=32$ ). The short arm, long arm and total length of chromosomes were ranged from 0.82-1.22, 1.17-1.80 and 2.21-2.85 micrometer, respectively.*

**Key words:** alfalfa, cytogenetic, chromosome, heteromorphic, karyotype.

### INTRODUCTION

*Medicago sativa* L. is one of the most important forage crops in the world. Cytogenetical research on alfalfa lagged far behind other crops mainly because: alfalfa chromosomes are very small, the chromosomes are morphologically very similar, cultivated alfalfa has relatively high number of chromosomes ( $2n=32$ ), and alfalfa is an autotetraploid (Bauchan et al., 1997). Although there are several cytogenetical reports in *Medicago* species/cultivars from different regions of the world (Mariani et al., 1996; Stanton et al., 1994; McCosoy et al., 1991; McCoy et al., 1991; McCoy, 1982), there are only few karyotypic reports from Turkey. The aim of the present study is to determine the chromosome morphologies of alfalfa.

### MATERIALS AND METHODS

Alfalfa (*Medicago sativa* L.) (Yeşilova-3 genotypes, collected from Isparta, Turkey as

clonally) root tips meristems obtained from plants of similar age that originated by vegetative reproduction from a single parent from plants grown under greenhouse conditions, were pretreated with saturated solution of  $\alpha$ -bromonaphthalene and 0.002 M 8-Hydroxyquinolin before staining with aceto-iron-hematoxylin (Agayew et al., 2010). The measured chromosomal parameters were; Short arm, Long arm, Total length of chromosomes and Arm Ratio.

### RESULTS AND DISCUSSIONS

Collected from Yeşilova-3 region of Turkey alfalfa (*Medicago sativa* L.) genotype had  $2n=4x=32$  chromosome (Figure 3). The smallest chromosome was  $2.21\pm 0.08 \mu\text{m}$  and The longest chromosome was  $2.85\pm 0.12 \mu\text{m}$  and had four satellite (Figure 1 and 2). Chromosome 1 and 8 were submetacentric and the others metacentric. Mean chromosome length was  $2.56\pm 0.04 \mu\text{m}$  (Table 1).

Chromosome I had  $2.85 \pm 0.11$   $\mu\text{m}$  length and  $1.71 \pm 0.06$   $\mu\text{m}$  arm ratio. Chromosome 1 was submetacentric. Chromosome II had  $2.71 \pm 0.10$   $\mu\text{m}$  length and  $1.23 \pm 0.04$  arm tation. It was metacentric. Chromosome III had  $2.60 \pm 0.11$   $\mu\text{m}$  length and  $1.27 \pm 0.06$  arm ration. It was metacentric. Chromosome IV had  $2.52 \pm 0.07$   $\mu\text{m}$  length and  $1.62 \pm 0.05$  arm ration. It was submetacentric or submetacentric. Chromosome V had  $2.41 \pm 0.06$

$\mu\text{m}$  length and  $1.23 \pm 0.07$  arm ration. It was metacentric. Chromosome IV had  $2.32 \pm 0.07$   $\mu\text{m}$  length and  $1.21 \pm 0.05$  arm ration. It was metacentric. Chromosome IIV had  $2.21 \pm 0.08$   $\mu\text{m}$  length and  $1.13 \pm 0.03$  arm ration. It was metacentric. Chromosome IIIV had  $2.85 \pm 0.12$   $\mu\text{m}$  length and  $1.66 \pm 0.06$  arm ration. It was submetacentric. Our results confirm the findings of Bauchan and Campbell (1994) and Bauchan and Hossain (2001).

Table 1. The chromosomes of the Yeşilova-3 genotype of alfalfa

Chromosome	Total (L+S) $\mu\text{m}$	Long arm(L) $\mu\text{m}$	Short arm (S) $\mu\text{m}$	Sat	Arm ratio (AR=L/S)	Type
I	$2.85 \pm 0.11$	$1.80 \pm 0.08$	$1.05 \pm 0.03$	-	$1.71 \pm 0.06$	sm
II	$2.71 \pm 0.10$	$1.49 \pm 0.06$	$1.22 \pm 0.05$	-	$1.23 \pm 0.04$	m
III	$2.60 \pm 0.11$	$1.45 \pm 0.08$	$1.15 \pm 0.04$	-	$1.27 \pm 0.06$	m
IV	$2.52 \pm 0.07$	$1.56 \pm 0.05$	$0.97 \pm 0.03$	-	$1.62 \pm 0.05$	sm
V	$2.41 \pm 0.06$	$1.31 \pm 0.02$	$1.10 \pm 0.05$	-	$1.23 \pm 0.07$	m
VI	$2.32 \pm 0.07$	$1.26 \pm 0.04$	$1.06 \pm 0.04$	-	$1.21 \pm 0.05$	m
VII	$2.21 \pm 0.08$	$1.17 \pm 0.05$	$1.04 \pm 0.04$	-	$1.13 \pm 0.03$	m
VIII	$2.85 \pm 0.12$	$1.34 \pm 0.05$	$0.82 \pm 0.05$	-	$1.66 \pm 0.06$	sm
Mean	$2.56 \pm 0.04$	$1.42 \pm 0.03$	$1.05 \pm 0.02$	0.82	$1.38 \pm 0.03$	

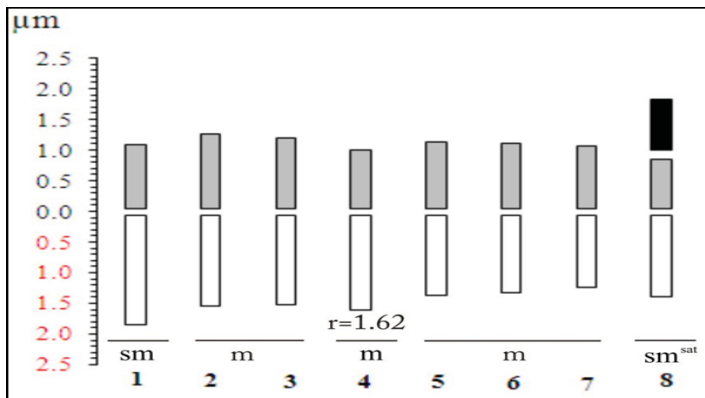


Figure 1. Haploid idiogram of alfalfa ( $2n=4x=32$ ), m: Metacentric, sm: Submetacentric

## CONCLUSIONS

Within the chromosome complement, seven pairs of chromosomes were metacentric (chromosomes II, III, V and VI) and three number were submetacentric (chromosome I, IV and VIII). Karyotype analysis showed that Yeşilova accession was tetraploid ( $2n=4x=32$ ). The short arm, long arm and total length of chromosomes were ranged from 0.82-1.22, 1.17-1.80 and 2.21-2.85 micrometer, respectively.

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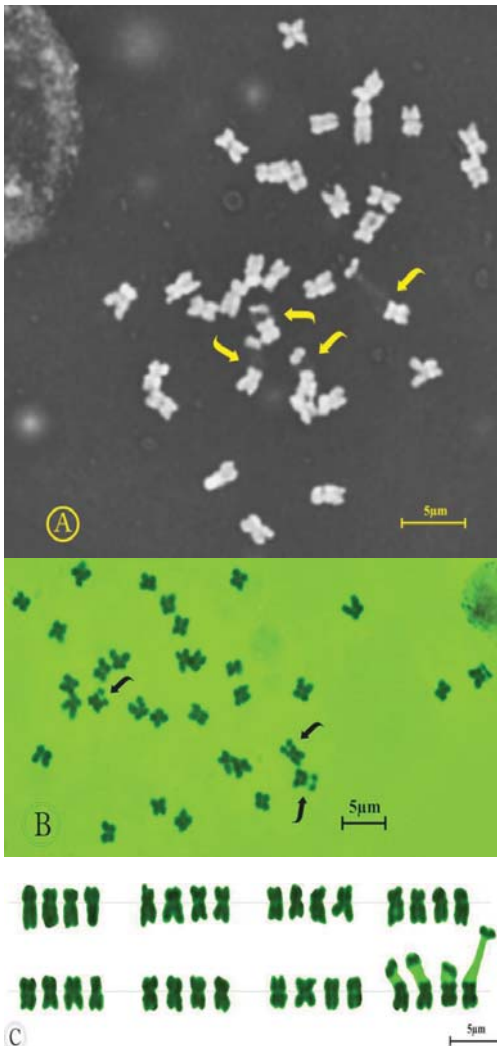


Figure 2. A, B: View of the alfalfa chromosome at mitotic metaphase, C: Caryogramme, Four satellite chromosomes were showed by arrow at all metaphase

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