Int. J. Mendel, Vol. 35(1-2), 2018 & 36(1-2), 2019 21-25 **ISSN0970-9649**

Karyomorphological studies in six populations of *Lantana camara* Linn.

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Key words : *Lantana camara,* Mitosis, Diploid & Tetraploid plants, Cytodeme

Six populations of *Lantana camara* were studied mitotically from four different zones of Gaya town. The somatic chromosome number in four populations was reported as 2n=22 (diploid) while in two other populations 2n=44 (tetraploid) chromosomes were reported. A comparative analysis of mitosis of all the diploid populations showed almost similar type of karyotype while the two tetraploid populations differed a bit from the diploid in total form percentage. On the basis of karyomorphological evaluation, diploid and teraploid populations have been recognised as different cytodemes.

INTRODUCTION

Lantana camara Linn. a native of America, belongs to the family Verbenaceae. This plant was introduced in India in 1801 as an ornamental plant due to its beautiful aromatic flower. In the beginning it was restricted largely as a hedge but now a days it has become one of the most dominant weeds throughout India. Cytogenetically the species is provided with a variety of characteristics. Cytological investigations on this weed have been carried out by some workers like Tandon and Bali (1955), Raghavan and Arora (1960), Ojha and Dayal (1992) and Sinha (2018).

The present study deals with a detailed karyotypic account of six populations of *Lantana camara* collected from different zones of Gaya town, a Buddhist city.

MATERIALS AND METHOD

Materials for the present investigation included six populations of the species *Lantana camara*, the details of their locality and period of collection have been given in Table-1.

For mitotic studies young and healthy root tips were treated with paradichlorobenzene at 4°C for 3.5 hrs and were fixed in 1:3 aceto-alcohol. Root tips were stained in 2% acetocarmine and squashed in 45% acetic acid. The detailed structure of chromosome was made out from enlarged photographs in temporary preparation. Total form value was calculated by the following formula as given by Huziwara (1962).

$$\text{T.F.} = \frac{\text{Sum of the short arm length}}{\text{Sum of the chromosome length}} \times 100$$

OBSERVATIONS

Lc0316:

Somatic chromosome number was found to be 2n=22 (Fig-1). Chromosomes varied from 1.32 to 3.88 µ in length. Five pairs of median chromosomes, four pairs of sub-median chromosomes and two pairs of sub-terminal chromosomes were reported. In one pair of chromosome secondary constriction was observed. Chromosome pairs have been represented in the idiogram (Fig-1A) and the detailed chromosome measurements are summarized in Table-2.

Lc0517:

In this population also somatic chromosome number was reported as 2n=22 (Fig-2). The chromosome length varied from 1.29 to 4.42 µ. Three pairs of median, seven pairs of sub-median and one pair of sub-terminal chromosomes were reported. Secondary constriction was reported in one pair of sub-median chromosome. Chromosome pairs have been represented in the idiogram (Fig-2A) and the chromosome measurements are given in Table-2.

Lc0317:

In this population, the chromosome length varied from 1.69 to 3.85µ, chromosome count remained the same (Fig-3). Karyotype showed four pairs of median chromosomes, six pairs of sub-median chromosomes and one pair of sub- terminal chromosome. One pair was reported with secondary constriction. The chromosome pairs have been represented in idiogram (Fig-3A) and detailed chromosome measurements are represented in Table-2.

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Lc'0317

In this population, the chromosome count was interestingly found to be 2n=44; the plant showed tetraploid number (Fig- 4). Karyotype showed a variation in the length of somatic chromosome from 1.02 to 4.43µ. Here the median chromosomes were seven pairs, sub- median chromosomes were thirteen pairs while sub- terminal chromosomes were only two pairs. One pair of sub-median chromosome showed secondary constriction. Chromosome pairs are represented in the idiogram (Fig-4A) and chromosome measurements have been summarized in Table-2.

Lc0417:

The population was a diploid one (2n=22) (Fig-5) and showed chromosome length from 1.22 to 4.50 µ. Median and sub-median chromosomes were five pair each while one sub-median chromosome showing secondary constriction was reported. One pair was sub- terminal chromosome. The chromosome pairs are represented in idiogram (Fig-5A) and chromosome measurements are given in Table-2.

Lc'0417

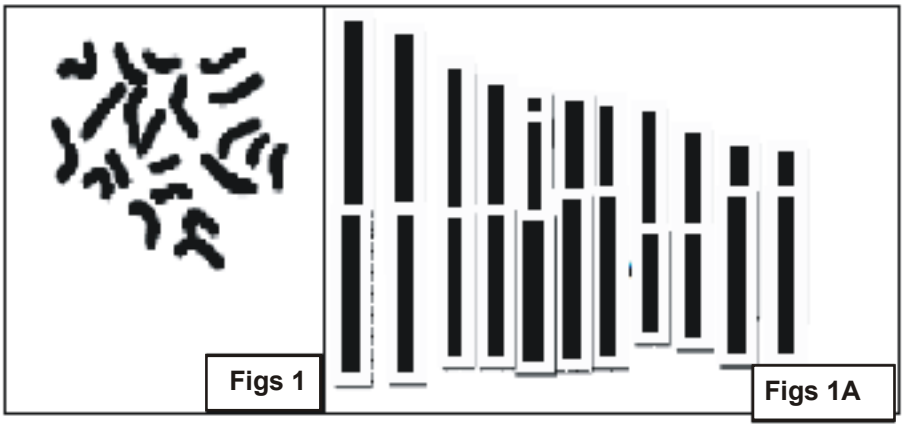
This population also showed tetraploid number (2n = 44) (Fig-6). The chromosome length ranged from 1.0 to 4.21µ. There were thirteen pairs of median chromosomes, seven pairs of sub-median chromosomes and two pairs of sub-terminal chromosomes. Secondary constriction was present in one pair of sub-median chromosome. Chromosome pairs are represented in idiogram (Fig-6A) and chromosome measurements are summarized in Table-2

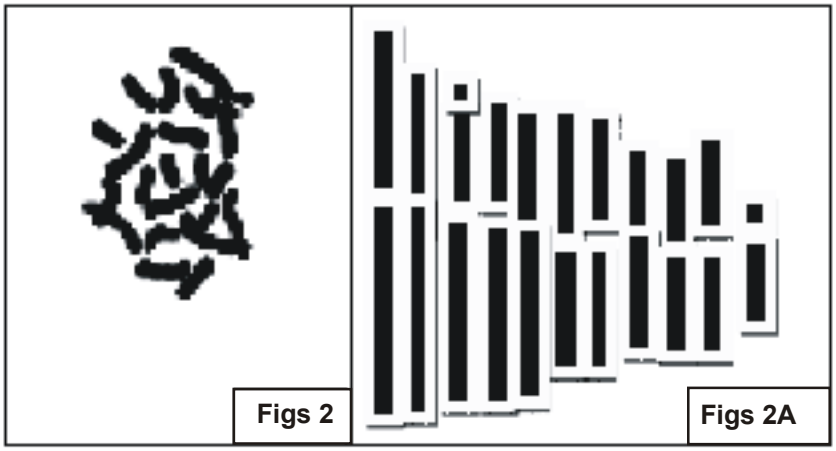
TABLE-1

Sl.No.	Population	Area of Collection	Period of collection	Temperature
1	Lc0316	North zone of Gaya Town	3rd March 2016	30^0C
2	Lc0517	East zone of Gaya Town	14th May 2017	43^0C
3	Lc0317	South zone of Gaya Town	30th March 2017	35^0C
4	Lc'0317	South zone of Gaya Town	30th March 2017	35^0C
5	Lc0417	West zone of Gaya Town	18th April 2017	40^0C
6	Lc'0417	West zone of Gaya Town	18th April 2017	40^0C

TABLE-2

Sl No.	Population	Somatic chromosome number	Range of chromosome length	Total chromosome length in µ	Chromosome pairs	TF%
1	Lc0316	2n=22	1.32 to 3.88µ	61.62µ	5M, 3SM, 1SM with SC 2ST	43
2	Lc0517	2n=22	1.29 to 4.42µ	71.1µ	3M, 6SM, 1SM with SC 1ST	43.5
3	Lc0317	2n=22	1.69 to 3.58µ	66.66 µ	4M ,5SM, 1SM with SC, 1ST	43.7
4	Lc'0317	2n=44	1.02 to 4.43µ	130.74µ	7M, 12SM, 1SM with SC, 2ST	44.4
5	Lc0417	2n=22	1.22 to 4.50µ	53.62µ	5M, 4SM, 1SM with SC, 1ST	43.8
6	Lc'0417	2n=44	1.0 to 4.21µ	107.96µ	13M, 6SM, 1SM with SC 2 ST	46.1





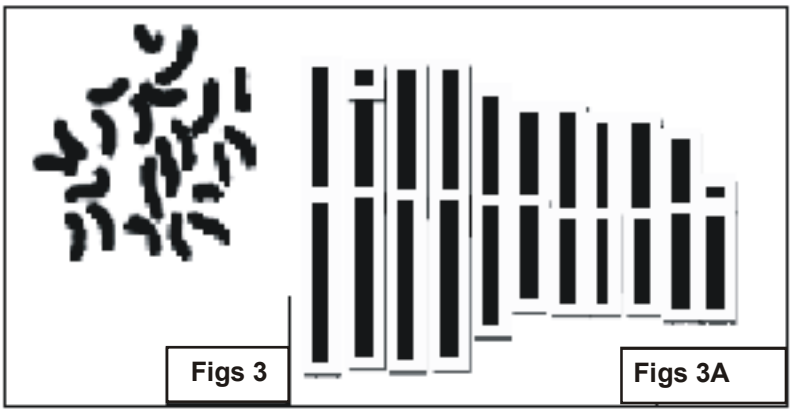
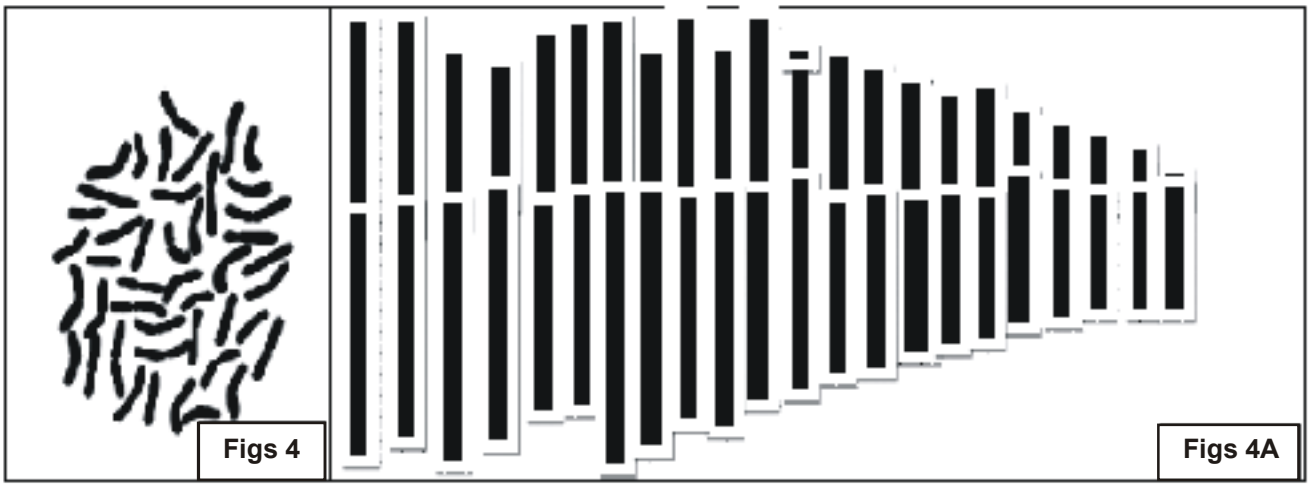
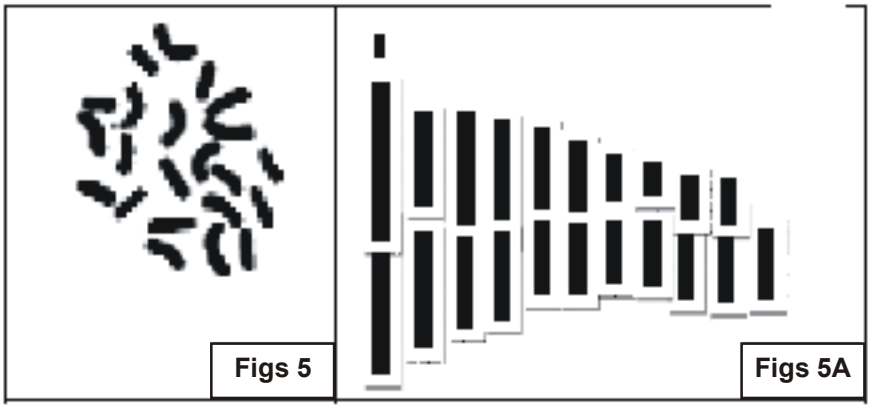


Fig. Showing somatic chromosomes and idiograms





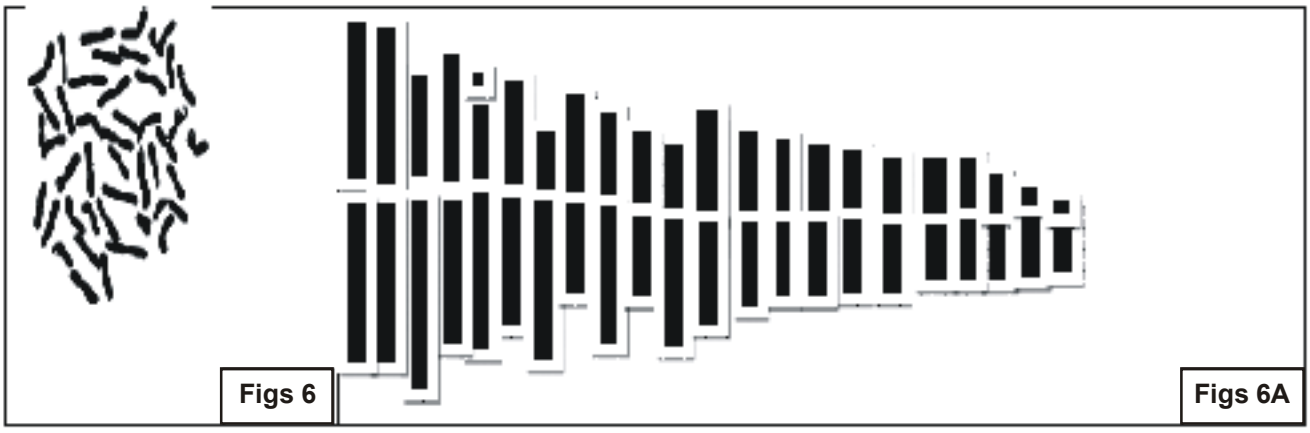


Fig. -Showing somatic chromosomes and idiograms

DISCUSSION:

A comparative analysis of mitosis of the four diploid populations collected from four different zones of Gaya town showed almost similar type of karyotype. The total form percentage was found to be 43.03% in Lc 0316, 43.54% in Lc 0517, 43.74% in Lc 0317 and 43.75% in Lc 0417. These data clearly show that as far as the chromosome morphology is concerned, all the populations resembled with each other. Interestingly in tetraploid plants the total form percentage was more than diploid and varied between two tetraploid populations. In the Lc'0317 the total form percentage was 44.42 % while it was 46.14% in Lc'0417. Therefore, the two tetraploid populations differed from each other as far as the chromosome morphology is concerned. Karyotypic studies made in *Nicotiana* (Goodspeed, 1954), *Oenothera* (Cleland, 1962), *Momordica* (Trivedi & Roy, 1972), *Solanum surattense* (Trivedi & Sinha, 1986) and *Lantana* (Dayal & Ojha, 1992) are classical works in this regard. It is also interesting to find that somatic chromosomes varied in their absolute as well as their relative size. Variation in chromosome size is generally correlated with climatic condition. Adaptation to cold and high altitude may result in reduction in chromosome size by the loss of inert chromatin from the karyotype (Stebbins, 1950). However, in the present investigation the materials have neither been collected from colder region nor high altitude region, so the above explanation does not fit here. According to Tobgy (1943), variation in the size of chromosomes might occur due to coiling of chromonemata and distribution of heterochromatin .This explanation seems a bit logical in the present investigation. It can also be said that a repatterning of chromosomes due to chromosomal aberration might have been occurring in the studied populations. According to Harlan & Dewet (1975), gene mutation is a potential source of variation in diploid plants where as in polyploids chromosomal changes are most important source of variation.

It will be worth while to mention here that different polyploidy levels have been reported in *Lantana camara*. Many workers have reported triploid, pentaploid and hexaploid, besides tetraploid plants (Spies., 1984 & Czarnecki *et al*., 2014). By observing these numbers it can be said that the base number of *Lantana camara* is x=11 and from this all the other numbers have been derived. Therefore it will be quite logical to conclude that the diploid and tetraploid populations of *Lantana camara* can be treated as different 'Cytodemes', as the population differences are in some distinctive cytological features only (Heslop-Harrison,1973; and Spies, 1984).

REFERENCES

Cleland, R. E., 1962, The cytogenetics of *Oenotheras* Adv. Genet. II : 147-237.

Czarnecki, D. M., Hershberger, A. J., Robacker, C.D., Clank, D. G & Deng, Z. 2014. Ploidy levels and pollen stainability of *Lantana camara* cultivars and Breeding Lines, Hortscience 49 (10) : 1271-1276.

Dayal, N and Ojha, B.M., 1992. Cytological Investigations in the Genus L*antana i*n India, Cytologia 57: 9-13.

Goodspeed, T. H., 1954. The Genus *Nicotiana*. Chronica Botanical Co. Waltham, U. S. A.

Harlan, J. R. and J. M. J. Dewet, 1975, The origin of polyploidy Bot. Rev. 41: 361-390.

Huziwara, T., 1962, Karyotype analysis in some genera of Compositae. VIII. Further studies on the chromosome of Aster. Amer. J. Bot. 49 : 110 - 119.

Heslop-Harrison, J. 1973, Lectures to Botany Department. The Botanica 23 : 87.

Raghwan, R.S and Arora,cm-1960, Morphological & cytological studies in the genus *Lantana* L. Bull. Bot. Sur India (2), 299-303.

Spies, J.J., 1984, A Cytotaxonomic study of *Lantana camara* (Verbenaceae) from South Africa, S.-Afr. Tydskr.Plantk., 3(4).

Stebbins, G. L., 1950, Variation and evolution in plants. Columbia University Press, New York.

Sinha,G.S., 2018, Biosystematic studies in *Lantana camara* Linn. a weed.

Tandon, S.L and Bali, P.N 1955, Morphology & Cytological studies of the diploid and naturally occuring triploid in *Lantana camara* L. Indian Jour.hort. 12 (2), 1-5.

Tobgy, H. A., 1943, A cytological study of *Crepis fulginosa*, C. neglecta and their F1 hybrids. J. Genet. 45 : 67-111.

Trivedi, R. N. and R. P. Roy, 1972.Cytological studies in some species of Momordica L. Genetica 43 : 282-291.

Trivedi, R. N. And A. K. Sinha, 1986, Karyomorphological studies in three populations of *Solanum surattense*, a weed. Cytologia 51 : 157-161.