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MEIOTIC STUDIES IN THREE POPULATIONS OF *Lantana Camara* Linn.

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Key words : *Lantana camara*, Meiosis, Chiasma frequency

Three populations of *Lantana camara* were studied meiotically from three different places of Gaya town. The gametic number in all the populations was reported as n = 11. Some anomalies like multivalents, univalents at metaphase-I and chromosomal bridge and unequal separation of chromosomes at anaphase-I were common. Chiasma frequency and half chiasma per chromosome differed in the populations. On this basis, it was concluded that every locality favours its own form of individuals.

INTRODUCTION

Lantana camara Linn which belongs to the family Verbenaceae, is commonly known as red sage or wild sage. In Bihar it is popular by the name 'Puttus'. Lantana camara was introduced in India in 1809 as an ornamental plant due to its beautiful flower. In the beginning it was confined largely as hedge but now a days, it has become one of the most dominant weed throughout the country. Regarding weeds, there is a general belief that they possess diverse genetic system and they can tolerate adverse environmental conditions, therefore, weeds are said to contain 'general purpose genotype' (Sinha, 2018).

In the present investigation three populations of *Lantana camara* collected from three different places of Gaya town have been studied meiotically in detail. A critical examination of meiosis of three populations of the taken weed will throw light on its chromosome behaviour. With this aim, the present investigation has been undertaken.

MATERIALS AND METHODS

Flower buds of *Lantana camara* were collected from three different populations growing around Gaya town. Details have been given in Table-I. Meiotic studies were carried by anther squash preparation. The time for obtaining suitable buds varied from 10:30 am to 11:15 am. Fixation of flower buds and staining was done in 1: 3 aceto-alcohol and 2% acetocarmine respectively. Microphotographs were taken from prepared temporary slides.

OBSERVATIONS

Table-I

	Populations	Locality	Period of collection
Lantana Camara Linn	Lc0316	Cotton mill, Gaya	3rd March 20 16
	Lc0516	Loco field, Gaya	5th May 2016
	Lc0517	Rasalpur, Gaya	8th May 2017

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Table-II

Nature and frequency of Chromosome association at metaphase-I

Populations	Chromosomal association						Frequency of PMCs
	VI	V	IV	III	II	I	
Lc0316	1	0	1	1	4	1	23
	2	0	1	0	3	0	13
	0	0	0	0	11	0	9
	0	1	0	1	7	0	5
Lc0516	0	0	0	0	11	0	24
	0	1	2	1	3	0	18
	1	0	1	0	6	0	5
	0	1	0	2	3	3	3
Lc0517	0	2	0	2	2	2	27
	0	0	2	1	4	3	15
	0	0	0	0	22	0	6
	0	0	2	0	7	0	2

Table-III

Chromosome pairing and chiasma frequency at Metaphase-I

Population	No. Of PMCs Studied	No. Of bivalents per PMC				Total	Chiasmata Per PMC		Terminalized chiasmata		½ chiasma per chromosome	Terminal!/ ation Co-efficient
		Ring		Rod			Range	Mean	Range	Mean		
		Range	Mean	Range	Mean							
Lc0316	50	7-8	8.5	1-4	2.5	11	16-21	18.5	13-18	15.5	0.84	0.83
Lc0516	50	5-8	6.5	3-6	4.5	11	12-22	17	12-19	15.5	0.77	0.91
Lc0517	50	6-10	8	1-5	3	11	15-23	19	14-18	16.0	0.81	0.94

Table-IV

Population	No. of Pollen studied	No. of normal pollen	No. of sterile pollen	% of sterile pollen
Lc0316	1000	920	80	8.0
Lc0516	1000	814	186	18.6
Lc0517	1000	914	86	8.6

Population: - Lc0316

This population consisted of five plants. Some other weeds like *Calotropis procera* and *Datura metel* were growing along with *Lantana camara*.

Detailed meiotic investigation showed the gametic number as n = 11. The division was found to be highly non-synchronized as all the stages right from prophase-I to tetrad formation was found in one anther. At 'pachytene stage, chromosomes were intermingled and nucleolus was found attached with one of the chromosome. Eleven bivalents along with nucleolus were found in a few pollen mother cells at diakinesis (Fig no-1). In most of the pollen mother cells at eleven bivalents were found at metaphase-I (Fig no-2). Some anomalies were also recorded. Clumping of chromosomes and formation of multivalents besides univalents were observed in some of the pollen mother cells. Details of chromosomal association and chiasma frequency have been summarized in Table nos-II and III respectively.

Anaphase-I was found to be normal in most of the pollen mother cells (Fig no-3). Later stages were more or less normal. However, a few pollen triads were recorded. Pollen grains were of one size and the sterility was calculated to be 8 percent (Table no-IV).

Population: - Lc0516

Plants of this population were growing in a barren land of Gaya town. This population consisted of seven plants and was exposed to sunlight. In this case also, the gametic number was found to be n = 11. Earlier stages like pachytene and diplotene (Fig no-4) stages were observed in which counting of chromosome number was difficult. Eleven bivalents were reported at metaphase-I (Fig no-5). Meiotic anomalies in this population included formation of multivalents and univalents at metaphase-I besides clumping of chromosomes and precocious separation of chromosomes. Details of chromosomal association and chiasma frequency have been summarized in Table nos-II and III respectively.

At anaphase-II clumping of chromosomes was reported at four poles (Fig no-6). A few pentads were also reported. Pollen sterility was recorded as 18.6 percent (Table no-IV).

Population: - Lc0517

The flower buds for meiosis were collected from the plants growing in rocky areas of Gaya town. This population consisted of six plants. Some of the weeds like *Argemone mexicana* and *Euphorbia hirta* were growing along with *Lantana camara*.

Meiotic preparations confirmed the chromosome number as n = 11 (Fig no-7). Among anomalies multivalent formation univalents, clumping of chromosomes and precocious separation of chromosomes were found in some of the pollen mother cells. In a few pollen mother cells, interlocking of chromosomes was seen (Fig no-8) Details of chromosomal association and chiasma frequency have been summarized in Table nos-II and III respectively.

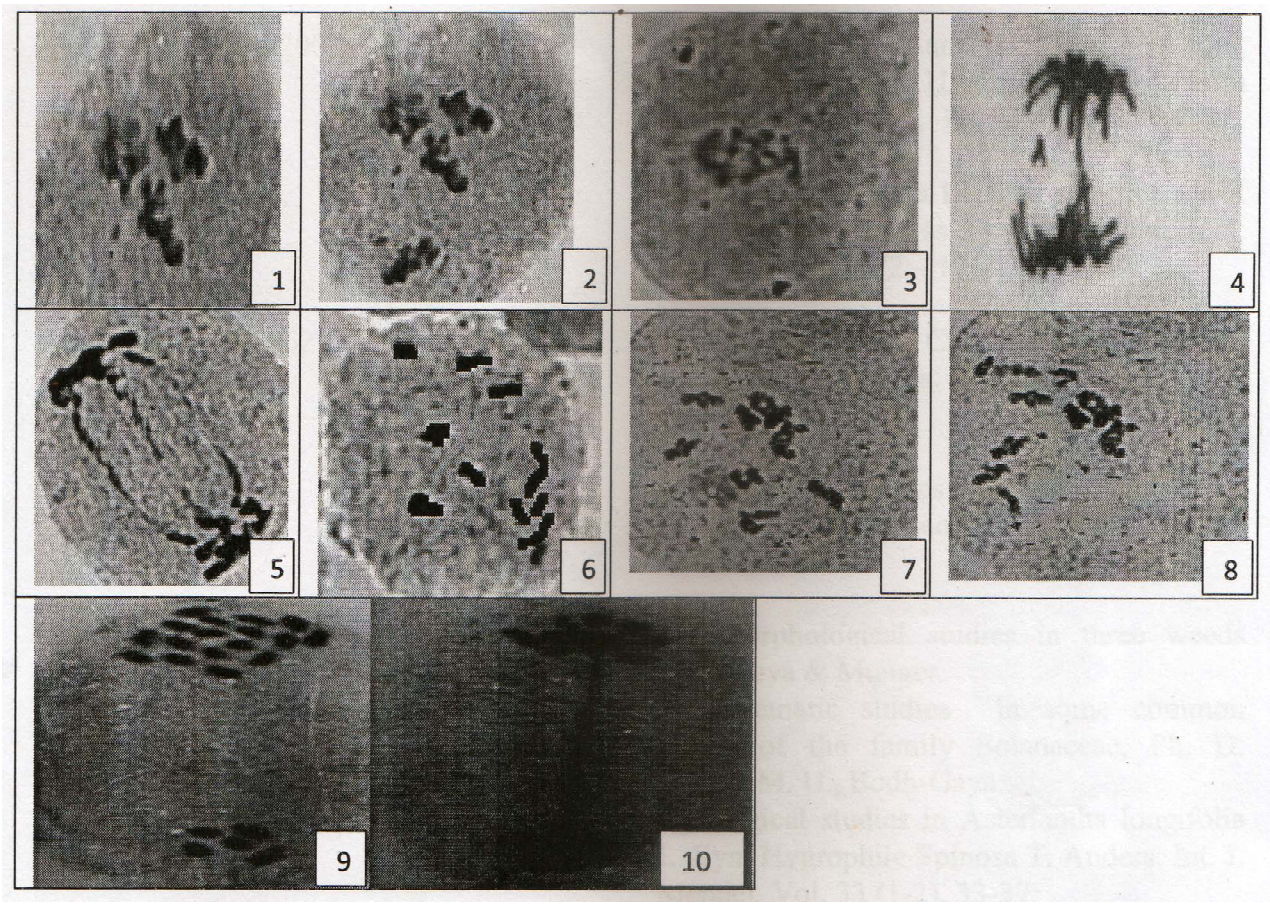
Besides normal anaphase-I, abnormalities like unequal segregation of chromosome, chromosomal bridges and clumping of chromosomes (Fig nos-9 & 10) were prominent. Equal distribution of chromosomes at four poles at anaphase-II was recorded in most of the pollen mother cells. Spore triad and pentads were also recorded besides normal spore tetrad. Pollen sterility was found to be 8.6 percent (Table no-IV).

DISCUSSION

The different population of *Lantana camara* studied from different places of Gaya town showed gametic number as n= 11. The meiotic division in all the populations was highly non-synchronized. Abnormalities reported included multivalents and univalents, clumping of chromosomes, precocious separation of chromosome at metaphase-I and unequal separation of chromosomes, chromosomal bridges and laggards at anaphase-I. Among multivalents, trivalents, quadrivalents, pentavalents and hexavalents were reported; however, quadrivalent formation was most common. The half chiasma per chromosome varied from 0.77 to 0.84 (Table no-III). The percentage of pollen strelity was found to vary from 8 percent to 13.6 percent (Table no-IV). The difference in chiasma frequency and half chiasma per chromosome provide important clues to know about the nature of structural heterozygosity.

According to Garber (1958), chiasma formation is controlled by gene and the frequency and pattern of chiasma formation are specific for the population of a species. On this basis it is suggested that chiasmata per chromosome is used as cyto-taxonomical tool in drawing phylogenetic conclusion. According to some other workers, chaisma formation may be affected by the fluctuation of the tempreture (Henderson,1962). In the present investigation, on the basis of differences in chiasma frequency,

it can be said that the same variety studied meiotically from different localities favour its own from of individuals and all such individuals growing in that area are adapted to that locality. Even within one locality, different populations growing in different seasons have often being found to differ (Sharan, 989; Kumar, 1994, Srivastava, 1998, Sinha, 2001; Agrawal, 2005, Kumari, 2012, Sharan, *et al.,* 2016 Sinha, 2017 and Sinha, 2018).



Lantana camara Linn, n = 11

Lc0316

Fig. 1 PMC at Prophase-I showing Late Diakinesis stage.

Fig.2 PMC at Metaphase-I showing 1 Ibivalents.

Fig.3 PMC at Anaphase-I showing chromosomes at two poles.

Lc0516

Fig.4 PMC at Prophase-I showing Diplotene stage.

Fig.5 PMC at Metaphase-I showing 11 bivalents.

Fig.6 PMC at Anaphase-II showing clumped chromosomes at four poles.

Lc0517

Fig.7 PMC at late Diakinesis showing disappearing nucleolus.

Fig.8 PMC at Metaphase-I showing multivalents and interlocking patterns of chromosomes.

Fig 9 PMC at Anaphase-I showing unequal distribution of chromosomes at two poles.

Fig. 10 PMC at Anaphase-I showing simple chromosomal bridge.

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