

Meiotic studies in *Ipomoea carnea* Jacq.

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Abstract: Meiotic studies in three populations of *Ipomoea carnea* Jacq, were carried out in details from three different localities at Gaya town. Meiosis showed anomalies like univalents, bivalents and multivalents at metaphase-I. The meiotic division in all the three populations were highly non-synchronised and abnormalities like clumping of chromosomes, unequal distribution of chromosomes, simple chromosomal bridges and chromosomal laggards at anaphase-I were reported. Comparative analysis of the chiasma frequency mentioned in three populations indicates great deviation in half chiasma per chromosome in the all three populations studied from Gaya town.

(Key words: : *Ipomoea carnea* Jacq, chiasma, pollen sterility, Laggards, secondary constriction.)

Introduction

Ipomoea carnea(Morning glory) is belongs to the family Convolvulaceae, is commonly known as 'Besharam' due to highly adaptability and resistance towards adverse climatic condition. It is toxic plant found in abundance in Gaya town and all other areas of Bihar. It can be easily grown from seeds which are toxic and it can be hazardous to cattle. The stem of *Ipomoea carnea* can be used for making paper. It contains a component identical to masilin, a sedative and anticonvulsant. Meiotic studies have been carried from all the populations under study to know the chromosomal behaviour of the species carried. The pollen fertility studies were also carried out to know the reproductive behaviour of three weeds under different ecological conditions from three different localities of Gaya town.

Experimental

Materials and methods:

Materials for meiosis have been collected from populations: *Ic0309*(Gaya College Campus, Gaya), *IC'0409*(Mangla Gauri, Gaya) and *Ic''0509* (Police Line, Gaya) have been carried out.

Meiotic studies were done from anther squash preparation. The materials were fixed in 1:3 acetol-alcohol and stained in 2% acetocarmine. Meiotic slides were made permanent according to method given by Celarier¹ (1956). Photomicrographs were taken from temporary as well as permanent slides. Analysis of rods and rings, bivalents and chiasma frequency has been done from quite a good number of pollen mother cells. Studies of pollen grains as regards to fertility and sterility were made on the basis of stain ability in acetocarmine.

Observations:

Meiosis:

Ic0309

A chromosome count of $n=15$ was recorded from this population. Meiosis was of non-synchronised type. At diakinesis and metaphase-I stages, fifteen bivalents were recorded (fig.01).

Some important abnormalities were encountered at the metaphase-I stage. This included univalent, multivalent, clumping of chromosomes, scattered bivalents (fig.02) and precocious separation of chromosomes. Details of chromosomal association and chiasma

Table-01

Nature and frequency of chromosome association at metaphase-I of populations: Ic 0309, Ic'0409 and Ic''0509 from three different localities at Gaya town.

Chromosome association						FREQUENCY OF PMCs	Populations
VI	V	IV	III	II	I		
0	0	0	0	15	0	28	<u>Ic 0309</u>
0	0	0	0	12	6	12	
0	0	0	0	13	0	6	
0	0	0	0	12	2	4	
0	0	0	0	15	0	24	
0	0	0	0	13	4	10	<u>Ic '0409</u>
0	0	1	0	12	2	9	
0	1	0	0	12	1	7	
0	0	0	0	15	0	30	
0	0	0	1	12	3	10	<u>Ic''0509</u>
0	0	1	0	11	4	6	
0	1	0	1	10	2	4	

frequency have been summarised in Tables 1 and 2 respectively

Anaphase-I was characterised by equal distribution of chromosomes at two poles (fig.03). but anomalies like simple chromosomal bridges, chromosomal laggards and unequal distribution of chromosomes at two poles were noticed in some pollen mother cells. At anaphase-II also, some irregularly dividing pollen mother cells were observed. This consisted of clumping of chromosomes at four poles and multipolarity. Pollen sterility was found to be 9% (Table 3).

Ic'0409

This was a small population which comprised of only 8 plants. Flower buds were collected from plants growing near Mangla Gauri, Gaya in an isolated manner. All plants were directly exposed to sunlight.

The meiotic behaviour was found to be of non-synchronised type. The gametic number of $n=15$ was recorded in the present studies. At diakinesis, some of the pollen mother cells were

Table-02

Chromosome pairing and chiasma frequency at metaphase-I of different population of *Ipomoea carnea* studied from three different localities at Gaya town: Ic 0309, Ic'0409 and Ic''0509

Population s	No. of PM Cs stu die d	No. of Bivalents per PMCs				T O T A L	Chiasmata per PMC		Terminalized chiasmata		$\frac{1}{2}$ chiasmata per Chromosom e	Term. Co eff
		Ring		Rod			Ran ge	Me an	Range	Mean		
		Ran ge	Mea n	Ran ge	Mea n							
<u>Ic 0309</u>	50	10- 15	12.5	0-5	3.5	15	26-30	28	22-24	23.0	0.93	0.82
<u>Ic '0409</u>	50	10-12	11.10	3-5	3.0	15	22-24	23	20-22	21	0.78	0.91
<u>Ic''0509</u>	50	8-12	11.10	3-7	3.1	15	16-24	20	14-18	16.0	0.66	0.80

Table-03

Pollen analysis of population of *Ipomoea carnea* studied from three different localities Gaya town: Ic 0309, Ic'0409 and Ic''0509

Populations	No. of Pollen Studied	No. of Normal Pollen	No. of sterile Pollen	Percentage of sterile pollen
<u>Ic 0309</u>	1000	910	90	9
<u>Ic '0409</u>	1000	860	140	14
<u>Ic''0509</u>	1000	920	80	8

found to contain bivalents showing di-synapsis. At metaphase-I $n=15$ was observed in most of the pollen mother cells (fig.04). clumping of chromosomes, precocious separation of chromosomes and scattering of bivalents (fig.05) were recorded at this stage. Besides these anomalies, some of the pollen mother cells revealed different types of multivalent, univalent and a few showed translocations. Details of chromosomal association and chiasma frequency

have been summarised in Table 1 and 2 respectively. At anaphase-I, besides equal distribution of chromosomes at two poles, the abnormally dividing pollen mother cells were also recorded. The anomalies recorded were chromosomal bridges (fig.06), laggards and clumping of chromosomes. At anaphase-II some irregularly dividing pollen mother cells were observed. These consisted of clumping of chromosomes at four poles, tripolarity conditions

and chromosomal laggards. These cells formed micronuclei at the quartet stages. Pollen sterility was calculated to be 14% (Table 3).

Ic"0509

Materials for meiosis were collected from the plants growing in police line area, Gaya. This was a large population which consisted of more than 20 plants. Most of the plants were directly exposed to sunlight.

The gametic number of $n=15$ was recorded during the meiotic studies. At diakinesis, intermingled chromosomes were observed in a few pollen mothers' cells. In some other pollen mother cells, three bivalents were seen attached with the nucleus (fig.07). besides observing normal metaphase-I, this stage was characterised by the presence of multivalent (fig.08) univalent, clumping of chromosomes and two groups of bivalents scattered in a few pollen mothers' cells. Details of chromosomal association and chiasma frequency have been summarized in Table 1 and 2 respectively.

Anaphase-I was characterised by equal distribution of chromosomes at both the poles. However, simple chromosomal bridges and clumping of chromosomes were recorded in a few pollen mothers' cells. Pollen sterility was observed to be 8% (Table 03).

Ipomoea carnea Jacq, $n=15$

Ic 0309, $n=15$

Fig-01 PMC at metaphase-I showing 15 bivalents 1350x.

Fig-02 PMC at metaphase-I showing clumping of chromosomes.

Fig-03 PMC at anaphase-I showing equal distribution of chromosomes at two poles 1350x.

Ic'0409, $n=15$

Fig-04 PMC at metaphase-I showing 15 bivalents 1350x.

Fig-05 PMC at metaphase-I showing scattered bivalents 1350x.

Fig-06 PMC at anaphase-I showing simple

chromosomal bridge 1350x.

Ic"0509, $n=15$

Fig-07 PMC at diakinesis showing three bivalents attached with a nucleolus 1350x.

Fig-08 PMC at metaphase-I showing bivalents and multivalents 1350x.

Results and Discussion

Meiotic studies have been carried out in three populations of *Ipomoea carnea* from different places of Gaya town. Population has been defined as a group of individuals considered together at any time because of the feature they have in common (Davis and Heywood², 1963). According to Dobzhansky³ (1951), population is a reproductive community and sexual and cross-fertilizing individuals. Therefore, populations size may be reflection of genotype competition and the factor affecting this.

Populations are always subject to change in size, composition and area. Small populations may be succeeded in later years by large populations due to high reproductive capacity of the components (Singh⁴, 2010) the dynamic change in the populations take place gradually and continuously.

The mode of variation is generally determined by the reproductive system and is utilized in adaptive evolutionary by natural selection. This may even contain genetic variation which can be reproduced by random gene mutation. Such variations are carried from one generation to another by gene segregation and recombination (Roy⁵, 1977) Trivedi, 1985 Trivedi & Jha⁶ 1988 and Gupta and Shrivastava⁷, 2008)

A physical examination of chromosome behaviour at meiosis from the mention point would focus on the reproductive behaviour of the species in the population.

The meiotic division in all three populations were highly non synchronised

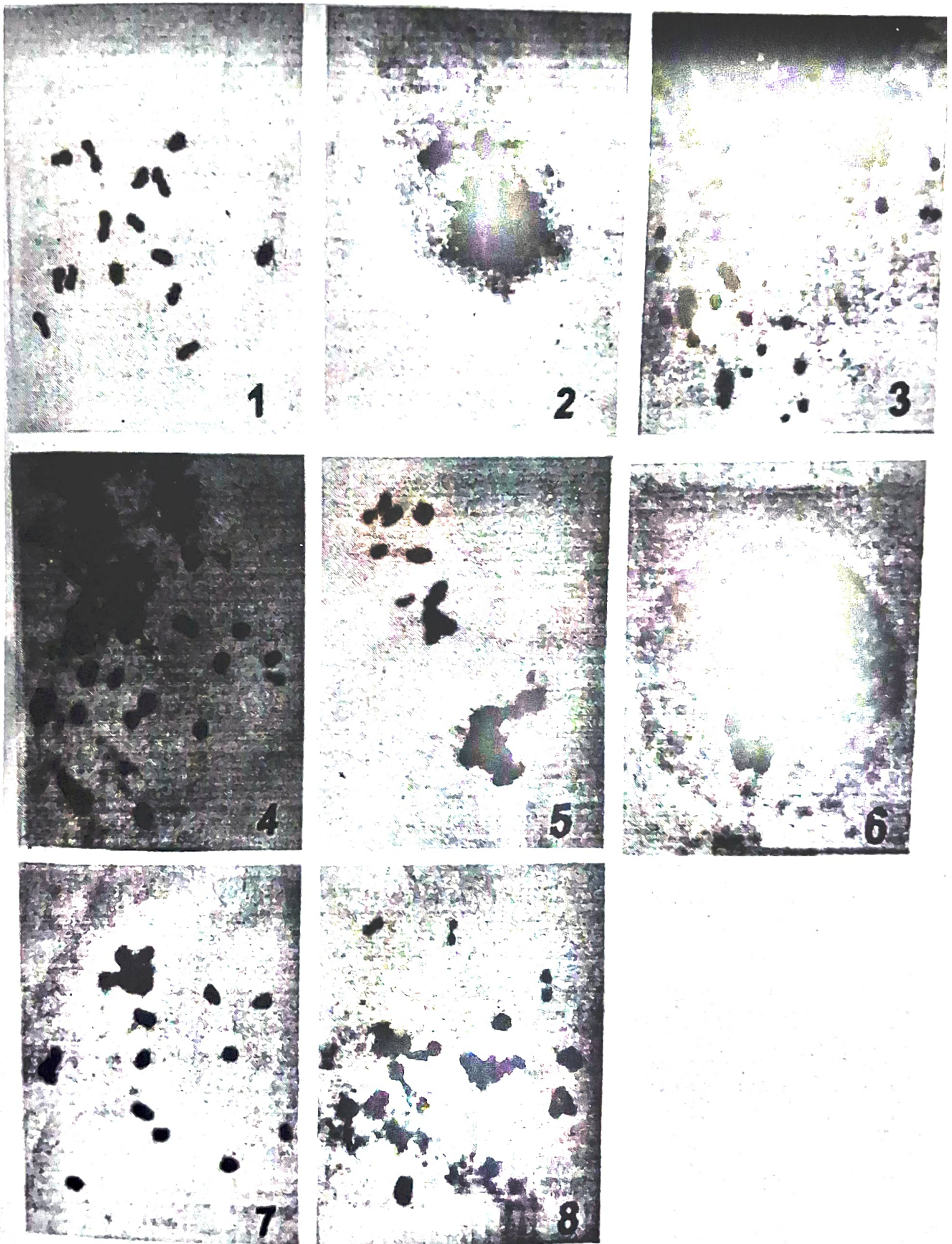


Fig-01-08

abnormalities like clumping of chromosomes, univalent and multivalent and diakinesis and metaphase-I stages and clumping of chromosomes, unequal distribution of chromosomes, simple chromosomal bridges and

chromosomal laggards at anaphase-I were reported. The half chiasma per chromosome in population *Ic 0309*, *Ic'0409* and *Ic''0509* were 0.93, 0.78 and 0.66 respectively.

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