Int. J. Mendel, Vol. 35(1-2), 2018 & 36(1-2), 2019 65-69 ISSN0970-9649

Meiotic studies in three populations of *Ipomoea carnea* Jacq

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Key words : *Ipomoea carnea*, Meiosis, Meiotic anomalies, Chiasma frequency

Meiotic studies in three populations have been studied in *Ipomoea carnea* from three different places of Gaya town. Common meiotic anomalies like multivalents, univalents, clumping of chromosomes at metaphase-I and chromosomal bridges and laggards at anaphase-I have been reported. Chiasma frequency and pollen sterility were found to differ in the populations. On the basis of findings, it was concluded that each locality favours its own form of individuals.

INTRODUCTION

Ipomoea Carnea Jacq, belonging to the family Convolvulaceae, is commonly called as bush morning glory. The plant is well established as weed in many parts of India and has spread in hydrophytic and mesophytic habitats. The literal meaning of weed is that it is a herbaceous plant not valued for use and beauty, growing wild and regarded as cumbering the ground or hindering the superior vegetation (King, 1973). The plant contains many chemical constituents and show many properties which have positive effects on human life. *Ipomoea carnea* has been used in traditional medicine for its sedative and hypnotic property. In the present investigation, three populations of *Ipomoea carnea* have been studied meiotically from different places of Gaya town. Populations are the gene pool base of the genetic system in plants. The genetic system refers to all the intrinsic genetic processes that affect genetic recombination in population or species. The major components of the genetic system are the chromosomal organization, their behaviour in meiosis and the breeding system.

MATERIALS AND METHODS

In the present investigation, three populations of the plant from different places of Gaya town have been studied meiotically. Details have been given in Table-1. Meiotic behaviour of chromosomes was studied from anther squash preparation. Slides were prepared in 2% acetocarmine and microphotographs were taken. The slides were made permanent according to the method of Celariar (1956) and mounted in euparol.

Table-1

Populations of *Ipomoea carnea* Jacq. with locality and date of collection

Name of the species	Populations	Locality	Date of collection
Ipomoea carnea Jacq	Ic 0916	Ramshilla Hills Patna road. Gaya	19 Sept. 2016
	Ic 0917	Khatka Chak, Gaya	18 Sept. 2017
	Ic 1017	Bhusunda Mela Ground, Gaya	27 Oct. 2017

OBSERVATIONS:

Population: Ic 0916

The population was large one, consisting of 18 plants. The plants were growing in hydrophytic condition and were directly exposed to sunlight.

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The gametic number n = 15 was recorded during the meiotic studies. At diakinesis intermingled chromosomes were observed in few pollen mother cells. In some pollen mother cells the bivalents were seen attached with the disappearing nucleolus (fig-1). Beside observing normal metaphase-I, this stage was characterised by the presence of multivalents(Fig-2), univalent, clumping of chromosomes and two groups of bivalents scattered in a few pollen mother cells. Details of chromosomes association (Table-2) and chiasma frequency have been summarized in Tables-2 and 3 respectively.

Anaphase- I was characterized by equal distribution of chromosomes at both poles (Fig-3). However, simple chromosomal bridges (Fig-4) and clumping of chromosomes were recorded in few pollen mother cells. Subsequent stages were found to be normal. Pollen sterility was found to be 8% (Table-4).

Population - Ic 0917

This was also a large population consisting of twenty one plants growing on barren land. All the plants were exposed to the sunlight.

Here also the gametic chromosome number of n = 15 was recorded. At diakinesis and metaphase- I stages fifteen bivalents were observed in most of the pollen mother cells (Fig-5 and 6). At metaphase I stage the common anomalies were formation of univalent, trivalents and other multivalents. The number of univalents varied from one to three. The nature and frequency of chromosome association and chiasma frequency at metaphase- I have been summarized in Tables 2 and 3 respectively.

Anaphase I stage showed 15:15 chromosomes at both the poles (fig-7). The common anomalies observed were chromosomal laggard and clumping of chromosomes. Anaphase II stage was found to be almost normal. Pollen sterility was recorded as 3.5%, (Table-4).

Population:- Ic 1017

The plants were growing in mesophytic condition exposed to sunlight. Some other weeds like Parthenium hysterophorus and *Euphorbia hirta* were also growing along with this weed.

The pollen mother cells showed non-synchronised type of division. Fifteen bivalents n = 15 were recorded at metaphase I stage (Fig- 8 & 9). Some of the meiocytes showed anomalies during metaphase-I stage, having clumping of chromosomes, univalent and multivalent (Fig-10) and precocious separation of chromosomes. The details of chromosome association and chiasma frequency have been recorded in Tables-2 and 3 respectively.

At Anaphase- I stage the cell showed equal distribution of chromosomes at opposite poles. In some of the pollen mother cells chromosomal bridges and laggards (Fig-11) were seen. Anaphase-II showed normal alignment of chromosomes. Dyad stage was also reported (Fig-12).Pollen sterility was recorded to be 9 % (Table- 4).

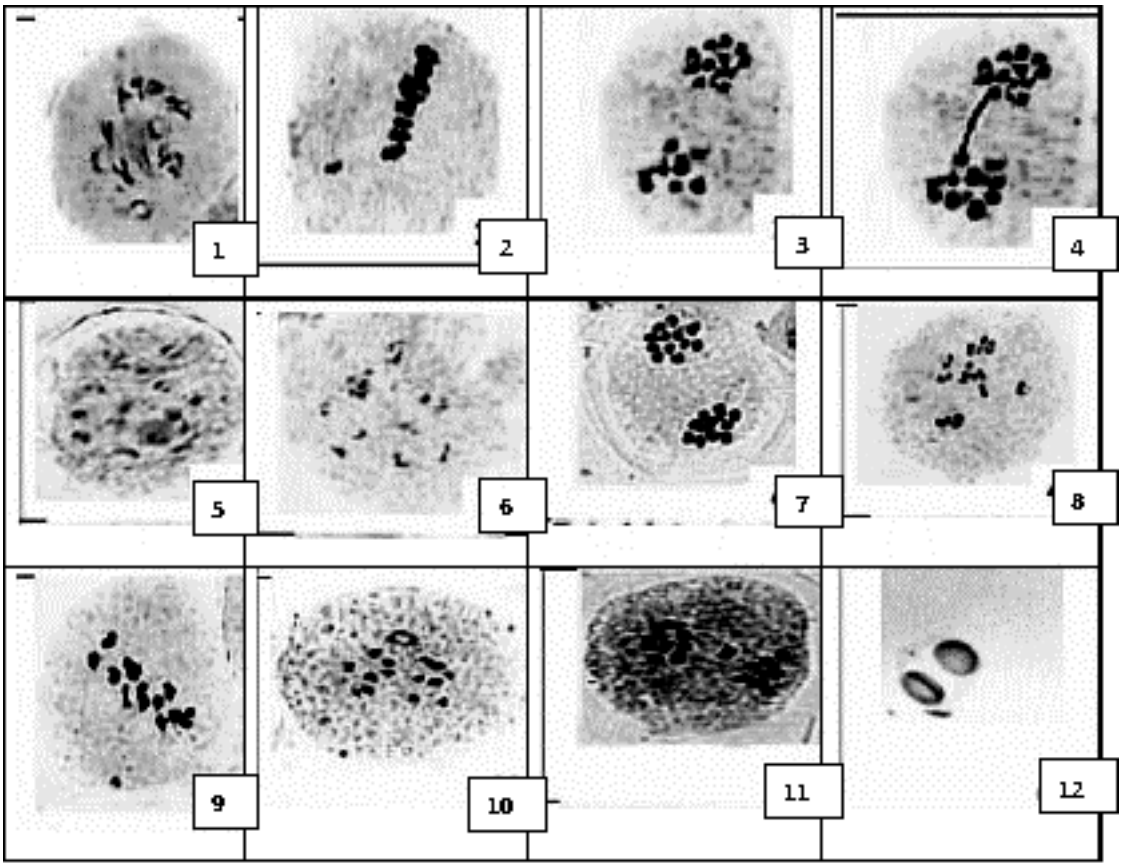

Fig-1 PMC at dikinesis showing disapperaning nucleolus.

Fig-2 Metaphase-I showing multivalents.

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

Fig-4 PMC at anaphase-I showing chromosomal bridge.

Fig-5 PMC at diakenesis showing bivalents and disappearing nucleolus..

Fig-6 PMC at late diakinesis showing bivalents.

Fig-7 PMC at anaphase-I showing chromosomes at two poles.

Fig-8 PMC at metaphase-I showing 15 bivalents.

Fig-9 PMC at metaphase-I showing bivalents at equatorial plate.

Fig-10 PMC at metaphase-I showing univalents and multivalents.

Fig-11 PMC at anaphase-I showing chromosomal laggard.

Fig-12 Dyad stage.

Table-2

Chromosome association in three populations of *Impomea carnea*

Chromosome association						Frequency of PMCs	Populations
VI	V	IV	III	II	I		
0	0	0	0	15	0	23	
0	0	1	0	12	2	14	**Ic 0916**
0	0	2	0	10	2	8	
0	0	0	0	14	2	5	
0	0	0	0	15	0	24	
0	0	1	0	13	0	14	**Ic 0917**
0	0	1	1	11	1	8	
0	0	0	1	13	1	4	
0	0	0	0	15	0	24	
0	1	0	0	12	1	14	**Ic 1017**
0	0	2	0	10	2	8	
0	1	0	1	11	0	4	

Table-3

Chiasma frequency in three populations of *Ipomoea carnea*

Population	No.of PMCs Studied	No. of bivalents per PMC				Total	Chaismata per PMC		Terminalised Chiasmata		½ chiasma per chromosome	Terminalization co-efficient
		Ring		Rod								
		Range	Mean	Range	Mean		Range	Mean	Range	Mean		
Ic 0916	50	15-12	13.5	0-3	1.5	15	26-30	28	23-28	25.5	0.93	0.91
Ic 0917	50	14-11	12.5	4-1	2.5	15	26-29	27.5	24-27	25.5	0.91	0.92
Ic 1017	50	14-11	12.5	6-1	3.5	15	26-28	27	22-25	23.5	0.9	0.87

Tabel -4

Study of pollen fertility in three populations of *Ipomoea carnea*

Population	No.of pollen studied	No of normal pollen	No of sterile pollen	Percentage of Sterile pollen
Ic 0916	1000	920	80	8%
Ic 0917	1000	965	35	3.50%
Ic 1017	1000	910	90	9%

DISCUSSION

The meiotic studies provide general information related to phylogenetic importance. A critical examination of chromosome behaviors at meiosis may bring about clear cut and decisive picture of chromosome homology than a comparative study of a karyotype. Two chromosomes from the two different populations may look alike in their karyotype but may differ in their genetic content. In all the studied populations the gametic number was reported as n=15. The same chromosome number was also observed by many cytologists like Rao (1947), King and Bamford (1937) and Jones (1964). Meiotic divisions were found to be of non-synchronized type. The meiotic anomalies reported at metaphase-I were multivalent, univalents and clumping of chromosomes. At anaphase-I simple chromosomal bridges and chromosomal laggards were common anomalies. Pollen sterility was found to vary from 3.5% to 9% (Table-4). However, it was interesting to find that Ic 0917 showed 3.5% pollen sterility while the outer two populations showed 8% & 9% sterility. It was also interesting to observe that three populations showed mean number of rod bivalents to vary from 1.5 to 3.5. These differences may be attributed to the linear arrangements of genes on the same chromosomes (Sharma & Chatterjee, 1957). The difference in chiasma frequency provides information regarding nature of structural hetrozygosity. According to Sharma and Dutta (1958), chiasma formation is controlled by genes and specific frequency pattern of chiasma formation. They therefore, suggested that chiasma per chromosome can be used as a cyto-taxonomical tool in drawing phylogenetic conclusions. In the present study it has been concluded that certain genes might have been controlling chiasma formation. Besides this it was also seen that the meiotic anomalies were found to vary according to localities. Therefore it is quite reasonable to believe that each locality favours its own form of individuals in a population and they are adapted to that place (Sinha , 2018).

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