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MEIOTIC STUDIES IN THREE POPULATIONS OF *Evolvulus alsinoides*

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Key words : *Evolvulus alsinoides*, Meiosis, Chiasma frequency.

Meiotic studies have been carried in three populations of *Evolvulus alsinoides* of the family Convolvulaceae from Gaya town. In all the populations, the gametic number has been reported as n=13. Meiotic anomalies consisted of univalents and multivalent at metaphase-I and chromosomal bridges and laggards at anaphase-I. Pollen sterility was found to vary from 5.6 to 6.6 percent. On the basis of findings, it was concluded that *Evolvulus alsinoides* with the flexibility in its genetic system may possess evolution of developmental systems which are highly adaptable.

INTRODUCTION

Evolvulus alsinoides, a member of family Convolvulaceae, occurs as a common weed in Gaya town and other parts of the state. Weed has been defined as a plant which interferes with man's utilization of land for specific purpose (Moore, 1954). From cytological point of view, weeds are endowed with a variety of characteristics. It has been discovered that evolutionary development often involves significant cytological variations therefore, some important observations can be noticed by comparative meiotic studies of different populations.

The present paper gives s comprehensive picture of the meiotic characters of three populations namely Ea 0396, Ea' 0396 and Ea"0396 growing in Kharkhura area, near Gaya College and near J.J. College, Gaya respectively.

MATERIALS AND METHODS

Meiotic studies were carried from flower buds which were collected in between 10 am and 11:00 am. Flower buds were fixed in 1:3 aceto-alcohol and stained in 2% aceto-carmine. Permanent slides were prepared following Celarier's method (1956). Microphotographs were taken from temporary as well as permanent slides.

OBSERVATIONS

Ea 0396

This population was a small one and consisted of eight plants only. All the plants were directly exposed to sunlight. The plants were growing in the wasteland area of kharkhura, Gaya. Collection of flower bud was done from several plants on random basis for meiotic studies.

Meiotic study revealed the chromosome number as n=13. The division was found to be highly non-synchronised. At diakinesis, thirteen bivalents were observed in a number of pollen mother cells. One bivalent was found to be associated with nucleolus (Fig-1). At metaphase-I also, thirteen bivalents were reported (Fig-2). Abnormalities have also been recorded from some of the pollen mother cells. In a few pollen mother cells, bivalents were found to be clumped. Multivalents and univalents were also reported from some of the pollen mother cells. Details of chromosomal association and chiasma frequency have been given in Tables- 1 and 2 respectively.

At anaphase -I, 13:13 univalents were seen at both the poles. In a few pollen mother cells, clumping of chromosomes and simple chromosomal bridges (Fig-3) were reported. However, abnormal pollen mother cells were less. Subsequent stages were found to be normal. Pollen sterility was calculated to be 5.6 percent (Table-3) ie, pollen fertility (Fig-4) was maximum.

Ea' 0396

This population consisted of about thirty five plants which were growing in an area covering about two katha of land. All the plants were directly exposed to sunlight. The plants were growing in the waste land area near Gaya College, Gaya. Collection of flower bud was done from several plants on random basis for meiotic studies.

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In this population also, the gametic number was found to be n = 13. The division was found to be non-synchronised. At diakinesis and metaphase-I stages thirteen bivalents were observed in most of the pollen mother cells (Fig-5). In a few pollen mother cells, however, some abnormalities were reported. Abnormalities included were clumping of chromosomes, formation of multivalents and precocious separation of chromosomes. Details of chromosomal association and chiasma frequency are given in Tables-1 and 2 respectively.

At anaphase-I, equal number of chromosome were found at both the poles in most of the pollen mother cells. Abnormalities at anaphase-I included clumping of chromosomes at the poles, chromosomal laggard (Fig-6) and unequal segregation of chromosomes. At anaphase-II equal number of chromosomes was found to be present at four poles (Fig-7). No significant anomaly was reported at this stage. Pollen sterility was found to be 6.1 percent (Table-3). Pollen tetrad was also reported in this population (Fig-8).

Ea"0396

This population was comparatively small one and consisted of twenty five plants. The plants were growing in the vicinity of wasteland area near J.J. College, Gaya. Collection of flower bud was done from several plants on random basis for meiotic studies.

Meiotic studies confirmed the earlier findings as chromosome n = 13. At late diakinesis multivalent formation was found in a few pollen mother cells. This was also evident at metaphase-I (Figs-9 & 10). Clumping of chromosomes was also reported. Details of chromosomal association have been given in Table-1 and chiasma frequency has been recorded in Table-2.

The anaphase-I was marked by equal number of chromosomes at both the poles. The abnormalities were found at anaphase-I included unequal separation of chromosomes, chromosomal laggard and single and double bridges (Fig-11). Later stages were found to be more or less normal. At anaphase-II, equal number of chromosomes was recorded at four poles (Fig-12). Pollen sterility was found to be 6.6 percent (Table-3).

Table-1

Nature and frequency of chromosome association at Metaphase-I of different populations of Evolvulus alsinoides.

Chromosome association						Frequency of PMCs	Populations
VI	V	IV	III	II	I		
0	0	1	0	10	2	5	Ea 0396
0	0	0	1	8	7	3	
1	0	1	0	8	0	12	
0	0	0	0	13	0	30	
0	0	2	0	8	2	5	Ea’ 0396
1	0	0	0	9	2	2	
0	0	1	0	11	0	15	
0	0	0	0	13	0	28	
0	0	1	0	11	0	5	Ea”0396
1	0	0	0	9	2	4	
0	0	2	0	8	2	9	
0	0	0	0	13	0	32	

Table-2

Chromosome Pairing and Chiasma frequency at Metaphase-I of different populations of Evolvulus alsinoides

Populations	No. of PMCs Studied	No. of bivalents per PMCs				Total	Chiasmata Per PMC		Terminilised Chiasmata		½ Chiasma per chromosome	Term. Coeff.
		Ring		Rod								
		Range	Mean	Range	Mean		Range	Mean	Range	Mean		
Ea 096	50	09-10	9.5	03-04	3.5	13	19-23	21	19-21	20	0.807	0.952
Ea' 0396	50	09-10	10	02-04	3	13	20-23	21.5	20-22	21	0.826	0.976
Ea"0396	50	08-11	9.5	02-05	3.5	13	21-23	22	20-21	20.5	0.846	0.931

Table-3

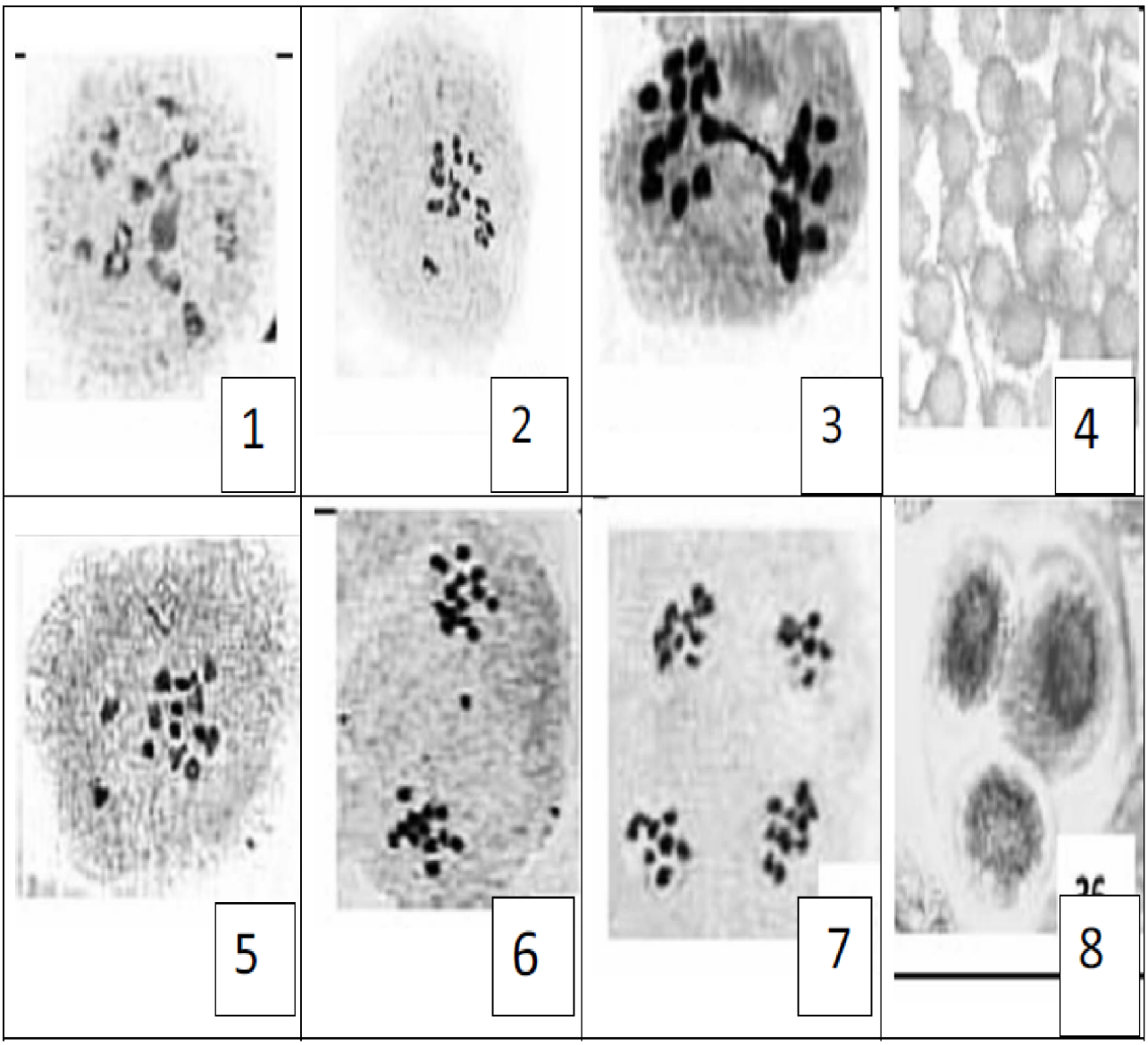
Pollen analysis of different populations of Evolvulus alsinoides

Populations	No. of studied	No. of Normal pollen	No. of Sterile Pollen	Percentage Sterile Pollen
Ea 0396	1000	944	56	5.6
Ea' 0396	1000	939	61	6.1
Ea"0396	1000	934	66	6.6

DISCUSSION

In all the populations of the studied plant, chromosome number as n=13 was reported. The abnormalities included clumping of chromosomes and formation of univalents and multivalents at metaphase-I and at anaphase-I, clumped chromosomes and simple chromosomal bridges were scored. Here half chiasma per chromosome was found to vary. It was 0.807 in Ea 0396, 0.826 in Ea' 0396 and 0.846 in Ea"0396. Pollen sterility was not very variable. It varied from 5.6 to 6.6 percent (Table-3). When we look to the meiotic behaviour of the mentioned populations, we do not find much difference, however, the univalents and multivalents were found in considerable number of pollen mother cells of different populations. Presence of multivalent in the population is indicative of real homology among several pairs of chromosomes of different individuals within the populations which have common parents. At the same time occurrence of univalent is the indication of the non-homology between certain complements. The variable chiasma frequency found in the populations of Evolvulus alsinoides may be supposed to occur due to the failure of chromosome to pair either because they are non-homologous or because the linearity of gene in them is altered by some means or other (Dayal, 1977 and Madhusoodanan *et al.,* 1981). Loose pairing may not denote partial homology of the chromosomes in gene structure but only difference between linear arrangements of genes on the chromosome. On this basis of points raised above, it can be said that the taxa growing under identical conditions and studied at the same time, their meiotic and chiasma differences be taken to indicate intrinsic differences in chromosome structure of a taxon concerned (Kumar, Binod 1999).

It is quite reasonable to believe that each locality favours its own form of individuals and the species can allow the environment to have a strong influence on an individual ontogeny (Waddington, 1965). This is possible only when the environmental modifications are towards selection for the particular environment Evolvulus alsinoides with flexibility in its genetic system may possess evolution of development systems which are highly adaptable.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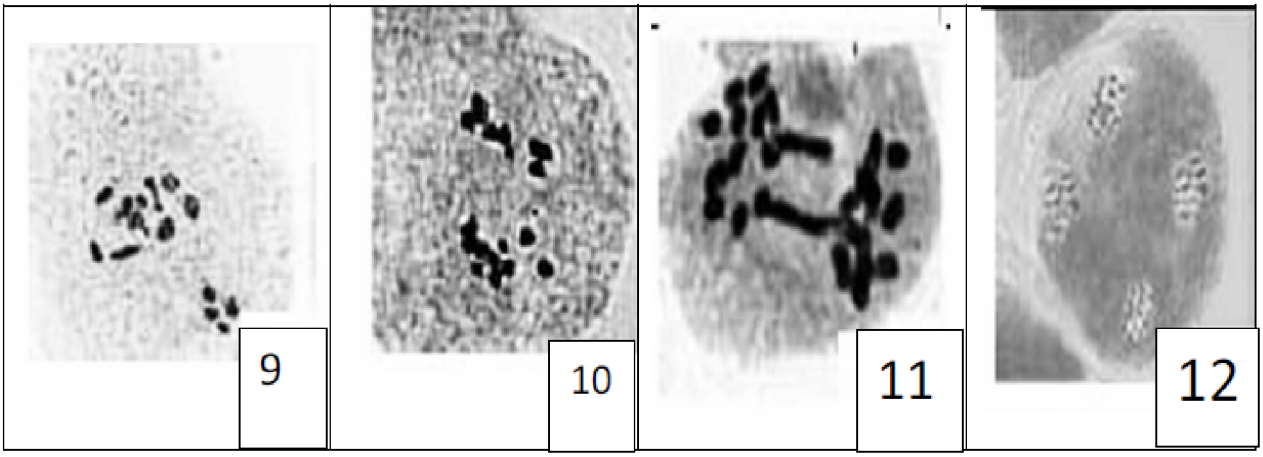

Fig-1- PMC showing bivalent associated with nucleolus

Fig-2- PMC showing metaphase-I with thirteen bivalents

Fig-3- PMC showing simple chromosomal bridge

Fig-4 - PMC showing fertile pollen.

Fig-5- PMC showing thirteen bivalents at metaphase-I stage.

Fig-6- PMC showing chromosomal laggard at anaphase -I

Fig-7- PMC showing anaphase-II with chromosomes at four poles.

Fig-8- PMC showing pollen tetrad.

Figs-9- PMC showing multivalent at metaphase-I

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

Fig-11- PMC showing double bridge at anaphase-I .

Fig-12 PMC showing anaphase-II with equal number of chromosomes.

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