



ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 8.4
IJAR 2020; 6(12): 01-03
www.allresearchjournal.com
Received: 12-09-2020
Accepted: 02-11-2020

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Meiotic studies in *Solanum sisymbriifolium* Lamk

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DOI: <https://doi.org/10.22271/allresearch.2020.v6.i11g.7991>

Abstract

Meiotic studies in two populations of *Solanum sisymbriifolium* were carried out in detail each from Railway track at Gaya railway station and from Lal Darwaja of Munger. Meiosis showed anomalies like multivalent and univalent at metaphase-I and soe pollen other cells showed abnormalities like clumping of chromosomes, precocious separation of chromosomes and translocation chains and rings while at anaphase-I, 12:12 chromosomes were recorded in most of the pollen mother cells. About 15% of the PMC at this stage were found to be abnormal.

Keywords: *Solanum sisymbriifolium*, chiasma, pollen sterility, Laggards

Introduction

Solanum sisymbriifolium Lamk, commonly known as sticky nightshade, belongs to the family Solanaceae. This plant has been used as a trap crop to protect potatoes from potato cyst nematode. Weed is often capable of reproducing in more than one way in different situations. Introgressive hybridization is also a common phenomenon in many weeds, Harlan and Dewet (1965) [3]. The present investigation on *Solanum sisymbriifolium* of two p [populations from Gaya and Munger town have been carried. Materials and Methods: Materials for meiosis has been collected from a population (Ss0811) *sisymbriifolium* from Railway track at Gaya railway station and (Ss'0811) from Lal Darwaja at Munger. All plants were directly exposed to sunlight. Meiotic studies were done from anther squash preparation. The materials were fixed in 1:3 aceto-alcohol and stained in 2% acetocarmine. Meiotic slides were made permanent according to method given by Celarier (1956) [2]. *sisymbriifolium* from Lal Darwaja of Munger. Photomicrographs were taken from temporary as well as permanent slides.

Observations

(Ss0811)

The meiotic studies revealed the chromosome number as $n=12$. Meiosis was highly non-synchronised as all the stages right from prophase-I to anaphase-II was recorded in the same anther. At diakinesis, most of the pollen anther cells showed twelve bivalents (Fig-1). Some of the pollen mother cells showed abnormalities like clumping of chromosomes, multivalent and univalent formation, precocious separation of chromosomes and translocation chains and rings. Clumping of chromosomes were pronounced phenomenon (Fig-2). Details of chromosomal association and chiasma frequency have been represented in Tables:1 and 2 respectively. The common abnormalities recorded were chromosomal laggards and inversion bridges (Fig-3). Pollen sterility was found to be about twelve per cent (Table: 3).

(Ss'0811)

The meiotic studies showed the chromosome number as $n=12$. At diakinesis, most of the pollen mother cells showed 12 bivalents (Fig-04). Beside normal metaphase-I, some of the pollen mother cells showed abnormalities like clumping of chromosomes, multivalents and univalents formation, precocious separation of chromosomes and translocation chains and rings. Clumping of chromosomes were a pronounced phenomenon (Fig -05). Details of chromosomal and chiasma frequency have been represented in Tables 3 & 4 respectively. At anaphase-I some of the pollen mother cells found too be abnormal. The common abnormalities recorded were chromosomal laggards,

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Simple bridges of various type (Fig-06& 07), clumping of chromosomes on two poles. Pollen sterility was found to be 9 % (Table-05)



Fig 1: PMC at late diakinesis showing 12 bivalents 1350x.



Fig 2: PMC at metaphase-I showing clumping of chromosomes 1350x.



Fig 3: PMC at anaphase-I showing chromosomal inversion bridge 1350x.



Fig 4: PMC at Meta phase-I sjhowing 12 scatted bivalents.



Fig 5: PMC showing more than 12 bivalents.



Fig 6: PMC at anaphase-I showing double chromosomal bridges.



Fig 7: PMC at anaphase-I showing chromosomal bridges and chromosomal laggard at the same time.

Solanum sisymbirfolium Lamk, n=12

Ss0811, n=12

Fig-01 PMC at late diakinesis showing 12 bivalents 1350x.

Fig-02 PMC at metaphase-I showing clumping of chromosomes 1350x.

Fig-03 PMC at anaphase-I showing chromosomal inversion bridge 1350x.

Ss08'11, n=12

Fig-04 PMC at meta phase-I sjhowing 12 scatted bivalents.

Fig-05 PMC showing more than 12 bivalents.

Fig-06 PMC at anaphase-I showing double chromosomal bridges.

Fig-07 PMC at anaphase-I showing chromosomal bridges and chromosomal laggard at the same time

Table 1: Nature and frequency of chromosome association at metaphase-I of population Ss0811 studied from Gaya town

Chromosomal association						Frequency of PMCs	Populations
VI	V	IV	III	II	I		
0	0	0	0	12	0	24	Ss0811
0	0	0	0	10	4	12	
0	0	2	0	8	0	8	
1	0	0	0	8	0	2	
0	0	1	0	7	3	4	

Table 2.

Populations	No. of PMC studied	No. of Bivalents per PMCs				Total	Chiasmata per PMC		Terminalized chiasmata		½ chiasmata per Chromosome	Term. Co eff
		Ring		Rod			Range	Mean	Range	Mean		
		Range	Mean	Range	Mean							
Ss0811	50	7-8	8.5	2-5	3.5	12	19-22	20.5	18-22	20.0	0.85	0.975

Table 3: Pollen analysis of population of *Solanum sisymbri folium* studied from Gaya town.

Populations	No. of Pollen Studied	No. of Normal Pollen	No. of sterile Pollen	Percentage of sterile pollen
Ss0811	1000	880	120	12

Table 4: Nature and frequency of chromosome association at metaphase-I population: (Ss'0811)

Chromosome association						Frequency Of PMCs	Populations
VI	V	IV	III	II	I		
0	0	0	0	12	0	26	Population: (Ss'0811)
0	0	0	0	8	8	11	
0	0	2	0	8	0	7	
1	0	0	0	8	2	4	
0	0	1	0	7	3	2	

Table 5.

Populations	No. of PMC studied	No. of Bivalents per PMCs				Total	Chiasmata per PMC		Terminalized chiasmata		½ chiasmata per Chromosome	Term. Co eff
		Ring		Rod			Range	Mean	Range	Mean		
		Range	Mean	Range	Mean							
Ss08'11	50	8-10	9	2-4	3	12	20-22	21	19	20.5	0.87	0.975

Table 6: Pollen analysis of population of *Solanum sisymbri folium* studied from Munger town

Populations	No. of Pollen Studied	No. of Normal Pollen	No. of sterile Pollen	Percentage of sterile pollen
Ss08'11	1000	908	92	9

Discussion

Meiotic studies were carried from two populations from Gaya & Munger the studied revealed the chromosome number as $n=12$. Meiosis was found highly non-synchronised as the anomalies recorded multivalents and univalents formation, clumping of chromosomes and translocation chains and rings at metaphase-I stage. Half chiasma per chromosome varied from 0.85-0.77 (Table-02). In population studied from Gaya town and 0.87 to 0.77 (Table-05) studied from the populations of Munger town. At anaphase-I chromosomal laggard and different types of bridges per recorded besides clumping of chromosomes. The genetic system affected by structural changes like inversion and translocation acts mainly as a means of holding together certain favourable gene combination, Darlington, (1973) [4] and therefore promoting immediate fitness at the expenses of flexibility, baker (1965) [1] and Stebbins (1971) [5].

Non- Synchronisation of the meiotic phases was observed in both the populations investigated. This indicate that it is common phenomenon in weeds. This phenomenon can be correlated with the male sterility along with other kinds of meiotic irregularities as found in *Hebe townsonii* (Frankel, 1940) [6]. However translocation and inversion have been found to be significant in certain population. It has been seen that the degree of anomalies is not always the same in all the two populations. It has been concluded that each locality favors its own form of individuals within a species.

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