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ABNORMAL MEIOSIS IN *CAPSICUM ANNUUM*

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ABSTRACT

Meiosis was studied in *Capsicum annuum* L. infected by *Alternaria solani*. Chromosomal aberrations were found in 14.72% of PMC. These included univalents at diakinesis, stickiness, late separation, bridges and fragments at anaphase I and anaphase II. Polyads, multinucleate conditions of pollen grain and pollen sterility were also observed. Possible causes of sterility of pollen grains are discussed.

Key words: *Capsicum annuum*, desynapsis, polyads, pollen sterility, *Alternaria solani*.

Some chilli fields in Gorakhpur, India, were found to be severely infected by *Alternaria solani* in 1985, causing leaf spot disease which led to premature defoliation, fruit rot, and finally to naked dry plants. It was also found that the anthers did not develop properly and most of the fruits were reduced or did not develop at all. Therefore, the present communication presents an account of meiotic aberrations in *Capsicum annuum* L. due to infection of *Alternaria solani*.

MATERIALS AND METHODS

Flower buds of appropriate size were collected from the infected plants in the field and were fixed in acetic alcohol (1:3) with trace of ferric chloride for 24 h. These were later transferred to 70% ethanol and preserved. Acetocarmine squashes were prepared following the usual procedures.

RESULTS AND DISCUSSION

A total number of 726 pollen mother cells (PMC) from 13 different plants showing various stages were studied. The data on chromosomal aberrations during meiosis are presented in Table 1. The photomicrographs of some of the PMC showing aberrations are presented in Fig. 1.

At diakinesis and early metaphase, the chromosomes showed regular pairing and bivalent associations in most cases but univalents (2–4) were also recorded in a few PMC (Fig. 1: 1). The occurrence of univalents could be either due to asynapsis or desynapsis. Spontaneous occurrence of partial desynapsis in chillies has been reported by Murthy and Lakshmi [1]. The material studied by them was a spontaneous mutant.

Since the pachytenes were normal, it seems more probable that the univalents appeared becasue of chiasma failure, a case of partial desynapsis. Reduction in

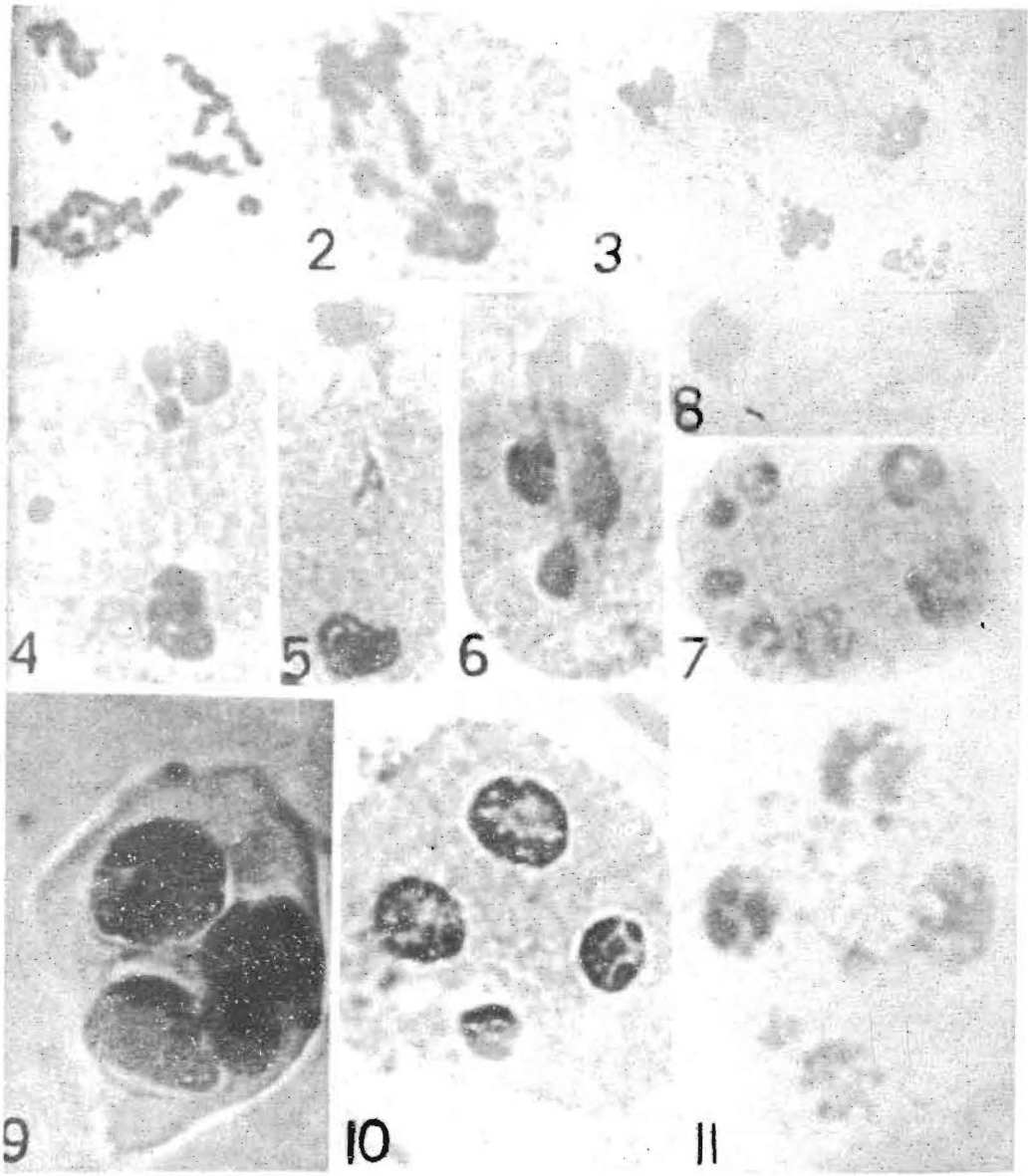

Fig. 1. Abnormal chromosomal association at metaphase I (1) bridges at anaphase 1 (2) and II (3), double spindle at anaphase 1 (4), fragments (5 and 8), micronuclei at anaphase II (6), polyads (7 and 11), unequal microspores in tetrads (9), and unequal nucleus formation (10) under fungal infection of *C. annuum*.

chiasma frequency and partial asynapsis in chillies infected with chilli mosaic virus has been reported earlier [2]. Several mutagens are also known to induce partial desynapsis [3–5]. In the light of these reports it can be argued that the pathogen *(Alternaria solani)* somehow interferes with chiasma formation to some extent, resulting in partial desynapsis. Stickiness and bridges occurred at anaphase I and II (Fig. 1: 2, 3). Laggards were also found at anaphase I as univalents or bivalents (Fig. 1: 5, 8). In some cases, however, one or more bivalents were excluded from the spindle and showed their division in a different plane. It could not be ascertained whether this was due to multiplicity of spindles or splitting of the spindle. Whatever be the mechanism, it leads to the formation of several nuclei/micronuclei (Fig. 1: 6, 7, 11) of unequal size forming polyads or unequal microspores (Fig. 1: 9, 10).

Table 1. Frequency of meiotic chromosomal aberrations in *Capsicum annuum* L. due to fungal infection

S.No. of plant	Total PMC examined	Frequency of different meiotic stages												Frequency of different No. of micronuclei in each cells	
		pachytene	diakinesis		MI	AI and TI					normal AII & TII	unequal separation during AII		4 nuclei	more or less than 4 nuclei (1–8)
			normal	univalent		normal	laggards	bridges	bridges+ fragments	stickiness					
1	56	4	32	2	18	—	—	—	—	—	—	—		—	—
2	45	—	16	—	29	—	—	—	—	—	—	—		—	—
3	56	4	26	1	25	—	—	—	—	—	—	—		—	—
4	52	6	32	2	12	—	—	—	—	—	—	—		—	—
5	52	5	23	2	22	—	—	—	—	—	—	—		—	—
6	48	—	28	1	19	—	—	—	—	—	—	—		—	—
7	58	—	—	—	11	11	—	2	3	1	21	3		3	—
8	59	—	2	—	8	15	1	3	1	—	9	6		14	—
9	55	—	—	—	3	8	3	—	—	—	11	13		17	—
10	67	—	—	—	—	3	1	1	—	2	18	7		30	5
11	64	—	—	—	—	—	—	—	—	—	9	8		37	10
12	60	—	—	—	—	—	—	—	—	—	—	12		40	8
13	54	2	—	—	1	3	1	1	—	1	21	6		16	2
Total	726	21	159	8	148	43	6	7	4	4	89	55		157	25

Such aberrant behaviour of meiotic chromosomes leading to sterility has been reported earlier in virus infected plants [6–8]. Reduction in chiasma frequency and partial asynapsis in chillies infected with chilli mosaic virus is also known [2]. Such aberrations, which lead to a high degree of sterility, seem to occur due to production of certain metabolites by the pathogen as a result of host–parasite interaction which disturbs the cell polarity and/or increases stickiness of the chromosomes. The exact mechanism, however, needs a detailed investigation.

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