The virus was also easily transmitted through graft, dodder (*Cuscuta reflexa* Roxb.) and aphids. Four species of aphids, *viz.*, *Aphis craccivora* Koch., *A. euonymi* Fabr., *A. gossypii* Glov. and *Myzus persicae* Sulz., transmitted the virus in non-persistent manner from chickpea to tobacco and *vice versa*. Acquisition feeds of less than 1 minute (15–60 seconds) were sufficient to acquire the virus. Even single aphid of different species transmitted the virus but the efficiency was better when 20–30 aphids per test plant were used. *Aphis craccivora* and *M. persicae* transmitted the virus more efficiently than the other two species of aphids.

In extracts of the diseased *N. glutinosa* leaves dilution-end-point of the virus was between 1 : 5,000 to 1 : 10,000, thermal-inactivation-point between 65 and 70° C. The virus remains viable for two weeks in desiccated leaves stored at 5–7° C.

The virus could be concentrated by butanol centrifugation[4,5], butanol-chloroform centrifugation[10] or heat clarification centrifugation[12] methods giving highly infectious preparations. The concentrated preparations negatively stained with phosphotungstic acid[1] were examined under a Philip's electron microscope EM 300. The concentrated preparations were also examined after fixing with 1% formalin for 1 hour before staining with PTA. Isometric particles of 28 nm were observed in all the preparations. No bacilliform particle was, however, seen.

In Ouchterlony agar gel-diffusion tests the virus produced sharp precipitate band with antisera of 'wild' and 'Ixora'[11] strains of cucumber mosaic virus but not with 'M'[8] and 'Q'[3] strains of CMV. No reaction was observed with alfalfa mosaic virus.

The virus reported here is different from that of chickpea tip necrosis which is a Poty–virus[13] and chickpea stunt[9] which is not transmitted through sap, graft and dodder. It is also different from alfalfa mosaic virus in antigenicity, particle morphology and host reactions. On the basis of characteristics reported above, the virus has been identified as chickpea isolate of Cucumber Mosaic Virus (CMV–Cp).

Cucumber mosaic virus has been found to naturally infect chickpea in Iran[6,7] but this is the first report of occurrence of cucumber mosaic virus in chickpea in India.

The disease is potentially very serious considering the severity of symptoms in chickpea and prevalence of *A. craccivora*, which is an efficient vector of CMV–Cp, in the crop season. Further stuidies specially on the epidemiology of the disease are warranted.

The authors are thankful to Dr. R. I. B. Francki, University of Adelaide, Australia, for providing antisera of CMV–'M' and 'Q' strains, Dr. H. E. Waterworth USDA, Glenn Dale, Maryland, U.S.A., for providing antiserum of CMV–'Ix' strain and Dr. Nam Prakash, IARI, New Delhi, for examining the samples in electron microscope. Antiserum to alfalfa mosaic virus was obtained from Microbiological Associates, Bethesda, U.S.A.

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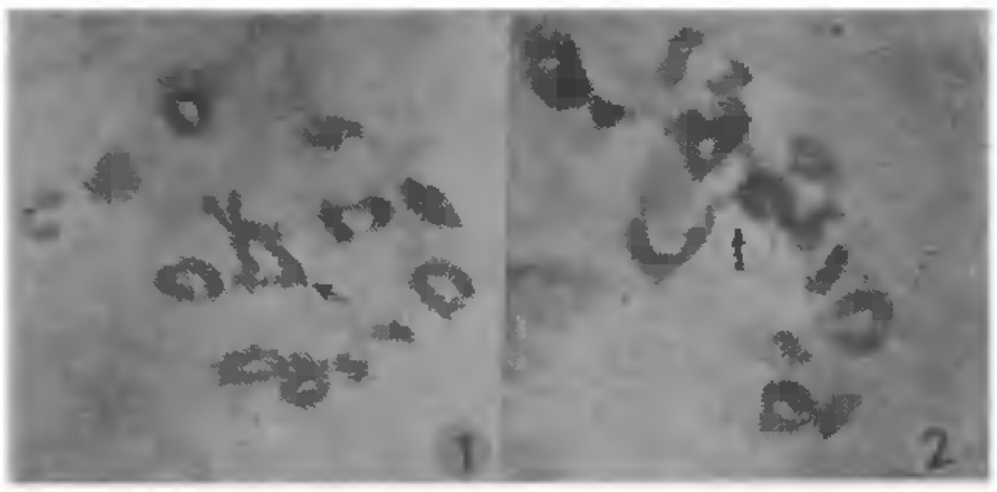
1. Gibbs, A. J., Varma, A. and Woods, R. D., *Ann. Appl. Biol.*, 1966, 58, 231.
2. Grewal, J. S., *P.I.P. Sem. Rept.*, held at Karaj Agric. Coll. Univ., Tehran and USDA, 1969, p. 35.
3. Habili, N. and Francki, R. I. B., *Virology*, 1974, **57**, 392.
4. Hollings, M. and Stone, O. M., *Ann. Appl. Biol.*, 1964, **53**, 103.
5. — and —, *Ibid.*, 1965, **56**, 73.
6. Kaiser, W. J. and Danesh, D., *Phytopathology*, 1971, **61**, 372.
7. — and —, *Ibid.*, 1971, **61**, 453.
8. Mossop, D. W., Francki, R. I. B. and Grivell, C. J., *Virology*, 1976, **74**, 544.
9. Nene, Y. L. and Reddy, M. V., *Trop. Gr. Leg. Bull.*, 1976, **5**, 31.
10. Steere, R. L., *Phytopathology*, 1956, 46, 60.
11. Waterworth, H. E. and Povish, W. R., *Phytopathology*, 1975, **65**, 728.
12. Varma, A., Gibbs, A. J. and Woods, R. D., *J. Gen. Virology*, 1970, **8**, 21.
13. — and Grewal, J. S., Personal Communication.

A TRANSLOCATION HETEROZYGOTE IN *CAPSICUM ANNUUM* L.

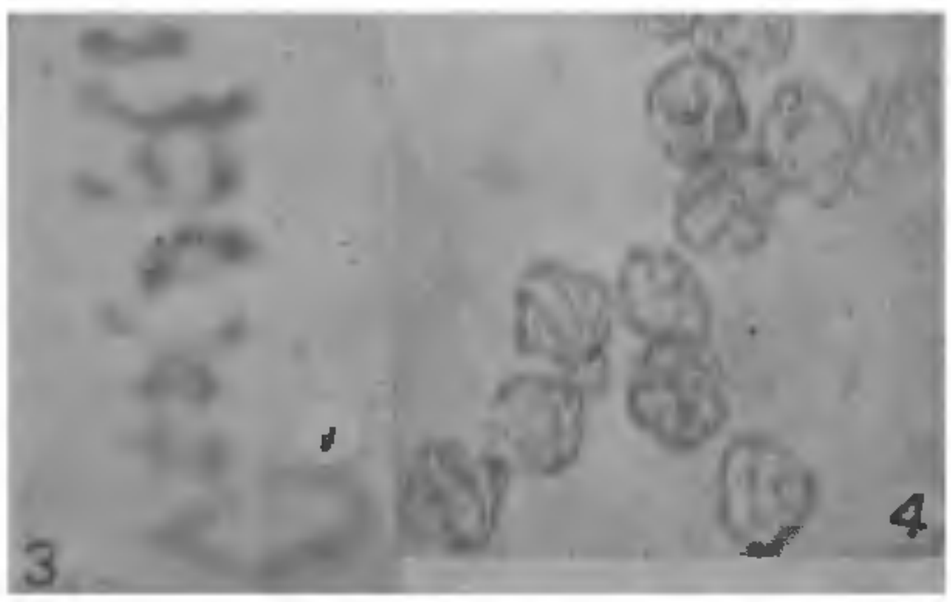
A SINGLE barren *Capsicum annuum* L. plant was noticed in the local collection at the All India Co-ordinated Vegetable Improvement Project, Rahuri. Cytological observations made in the PMCs of this plant revealed the presence of $2n = 24$ chromosomes with one pair showing interchanges. A ring of four chromosomes was observed in almost all the PMCs examined from pachytene to metaphase I (Figs. 1–3). Various meiotic irregularities leading to pollen sterility (69%) (Fig. 4) were also observed during the second meiotic division.

Burnham[1] reviewed literature on the interchanges involving non-homologous chromosomes in different crop plants, many of which exhibited sterility or semi-sterility. According to Burnham[2] the natural occurrence of interchanges could be explained on the basis of breakages and reunion of interlocked bivalents and crossing over, taking place between duplicated segments in non-homologous chromosomes. Occurrence of this abberrent plant in nature might be the result of inter-crossing between individual with non-homo ogous interchanged segments.

Spontaneous occurrences of haploid ($2n = 12$) and triploid ($2n = 36$) plants have been reported in these local collections of *Capsicums* by Thombre *et al.*[5] and Sonone *et al.*[4] respectively indicating that this collection of different *Capsicum* varieties is a source of different chromosome variant



FIGS. 1–2. 1, Diakinesis; 2, Late diakinesis (× 1150).



FIGS. 3–4. 3, Metaphase I showing a ring involving nonhomologous interchanges (× 1150); 4, Sterile pollen grains (× 450).

The chromosome in *C. annuum* being uniformly medium in size (Cheenaveeraiah[3]), the particular bivalents involved in interchange could not be detected. The plant is vegetatively maintained.

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1. Burnham, C. R., *Bot. Rev.*, 1956, **22**, 419.
2. —, *Discussions in Cytogenetics*, Burgess Publ. Co., Minnesota, 1962.
3. Cheenaveeraiah, M. S., In *Aspects of Plant Sciences*, Ed. P. K. K. Nair, Nat. Bot. Gard., Lucknow, 1976, **1**, 27.
4. Sonone, H. N., Mehetre, S. S. and Thombre, M. V., *MAU. J.*, 1978, **3** (2), 146.
5. Thombre, M. V., Sonone, H. N. and Mehetre, S. S., *Sci. and Cult.*, 1978 (in press).

SEQUENCE OF STOMATAL MERISTEMOID FORMATION IN SOME LEGUMINOSAE

ZIEGENSPECK[1] distinguished two patterns of stomatal differentiation in plants, basipetal and mixed. According to Pant[2], the differentiation may be mixed, gradate or simultaneous. Most wide leaved plants, *e.g.*, ferns, gymnosperms, dicots and some monocots with reticulate venation show mixed type of stomatal formation, with new meristemoids developing between older ones in successive generations. Among the gradate types are the narrow leaved forms, *e.g.*, Lycopodiales, some ferns, most monocots with parallel veins and a few dicots. These show a basipetal differentiation. In *Psilotum* and *Tmesipteris* the stomata develop in an acropetal sequence.

While studying the development of stomata in *Erythrina* (with Professor Pant), it was found that differentiation of stomatal meristemoids was almost simultaneous. Based on this observation, Pant[2] has pointed out a parallelism between the developmental types of fern sori and stomata.

Subsequent studies on *Erythrina indica* and some other Leguminosae have confirmed the presence of a simultaneous or almost simultaneous mode of stomatal development in these plants. In epidermal peels of leaflets, it was found that all the young stomata in a particular preparation were almost at the same stage of differentiation.

The stomata in these plants are of the mesogenous paracytic type and a peel from a young leaflet may show only triangular initials, or meristemoids with one or both subsidiary cells or with guard cell mother cells having two parallel subsidiaries, or with the guard cell mother cells divided into the guard cells (Figs. 1–4). Rarely, a stoma in a particular preparation is in a different stage of development from that of others.

The most significant aspect of this preliminary study is the presence of simultaneous development only in genera having small or very small leaflets (Area between 3 to 50 mm^2).

In plants having normal sized or large leaves or leaflets, the difference in the size of leaf primordia and the mature organ is manifold and the leaf has to expand considerably in order to attain that size. With the expansion of the leaf, the stomatal meristemoids become situated away from each other and the inhibitory zones as envisaged by Bünning[3] are also displaced. A new meristemoid is formed in this non-inhibited zone.

In the plants which show simultaneous development (at least in this study) the ratio of the area of leaflet at initiation and size at maturity is not very great. It appears that the growth is mainly due to expansion of epidermal cells and not by the formation of additional stomatal meristemoids.

Could it be that in these plants there is only one generation of stomata, the subsequent generations