to brown in colour, circular to irregular in shape measuring 2 to 8 mm in size and surrounded by yellowish halo. Generally shot holes were produced. Under favourable weather conditions spots start from margins and progress towards the centre of the leaf, usually in 'V' shape with base of V towards the peticle (Fig. 2).

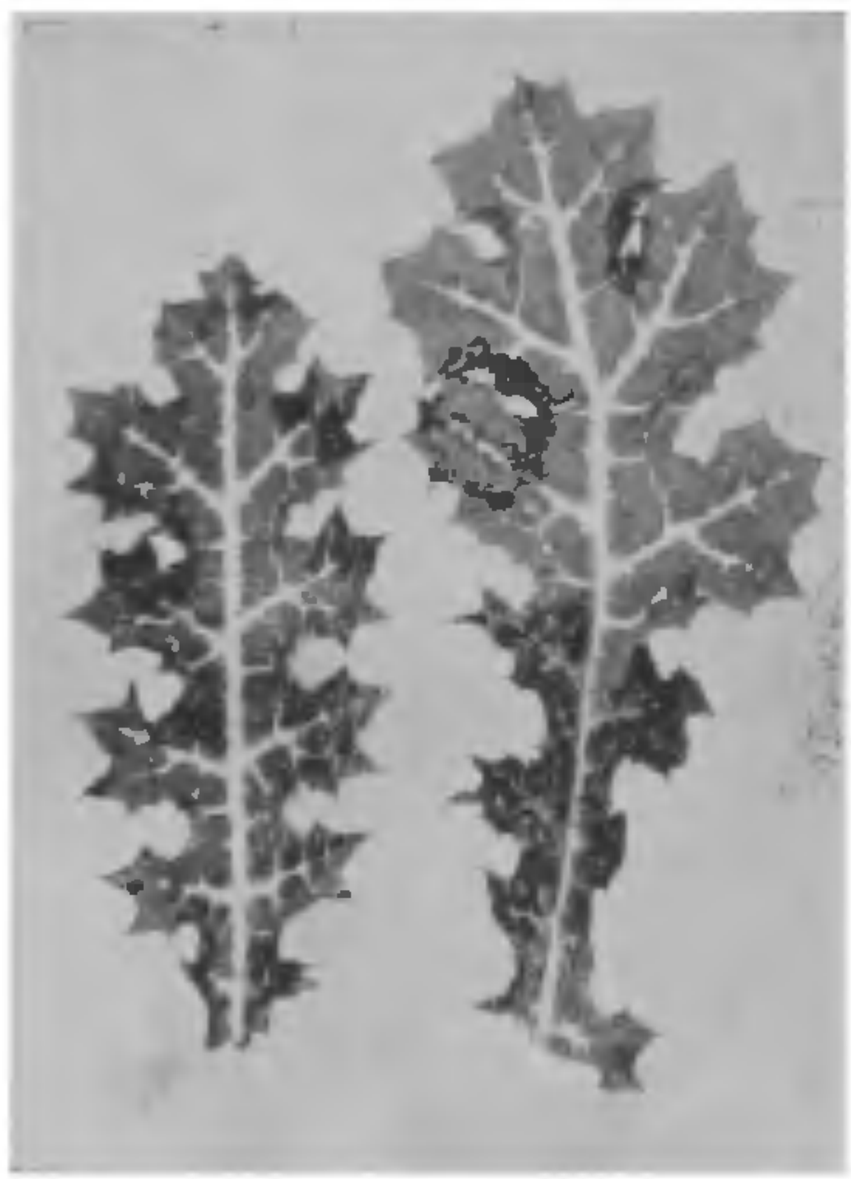

FIG. 1. *X. vesiecatoria* on *A. mexicana* leaves.

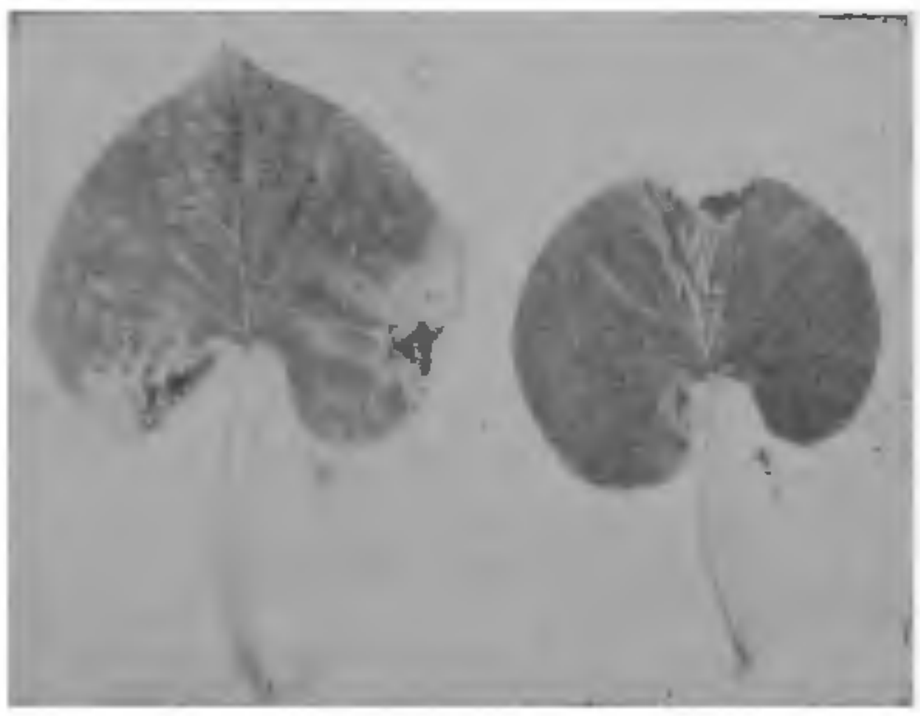

FIG. 2. *X. vesicatoria* on *T. cordifolia* leaves.

Diseased portions from both the hosts always showed profuse bacterial oozing when examined under microscope. The bacterium was isolated on nutrient agar medium and its pathogenicity was proved by inoculating the healthy plants of *A. mexicana* and *T. cordifolia* by pin prick method with their respective isolates (10^7 cells/ml) and typical symptoms of the disease appeared within 7 days.

The morphological and biochemical characters of the bacterium isolated closely resembled with the description of *Xanthomonas vesicatoria* (Doidge) Dowson as given by Buchanan and Gibbons[1].

Isolates of *X. vesicatoria* were raised from infected chilli, bell pepper, tomato, datura, *A. mexicana* and *T. cordifolia* plants. All of them cross infected other hosts on artificial inoculation (10^7 cells/ml) and produced typical disease symptoms thereby showing similarity. A bacterial blight of *A. mexicana* caused by *X. argemonea* was reported from Maharashtra by Srinivasan *et al.*[2]. They described the symptoms as V-shaped lesions extending into the leaf through hydathodes, vascular invasion often results in systemic infection leading to premature wilt; the root turns dark and fragile with bacterial masses in the vascular bundle. According to them the pathogen was host specific, whereas in the present study the symptoms produced are entirely different and the bacterium is cross inoculable to other hosts including tomato and chilli There is no report on the occurrened of a bacterial disease on *T. cordifolia.* The bacterium is thus identified as *X. vesicatoria* (Doidge) Dowson. Its occurrence on *A. mexicana* and *T. cordifolia* in nature is considered as new host records which are probably playing an important role in its survival during the season when there is no tomato crop in the field.

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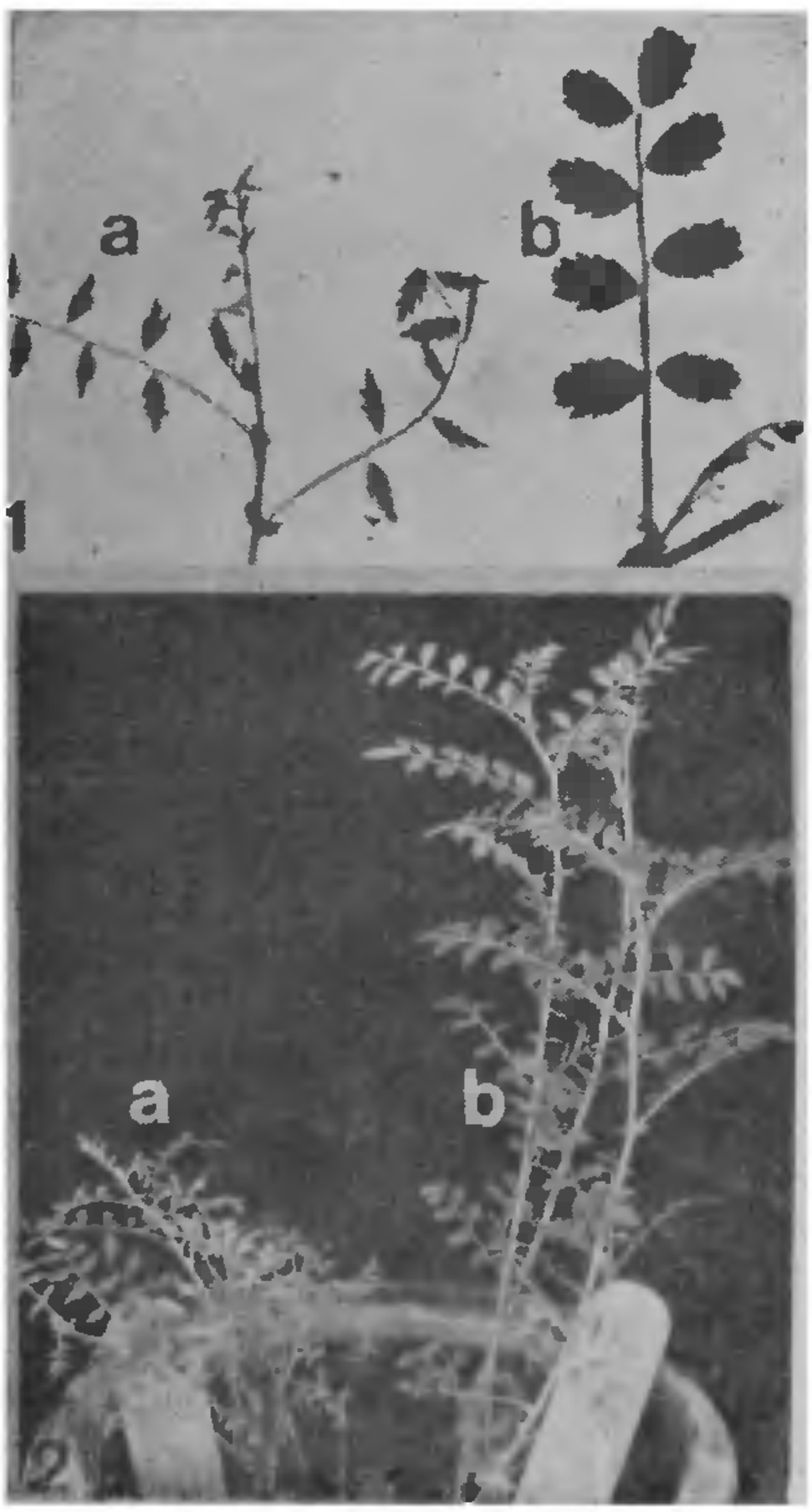
A LEAF REDUCTION DISEASE OF *CICER ARIETINUM* IN INDIA, CAUSED BY A CUCUMO VIRUS

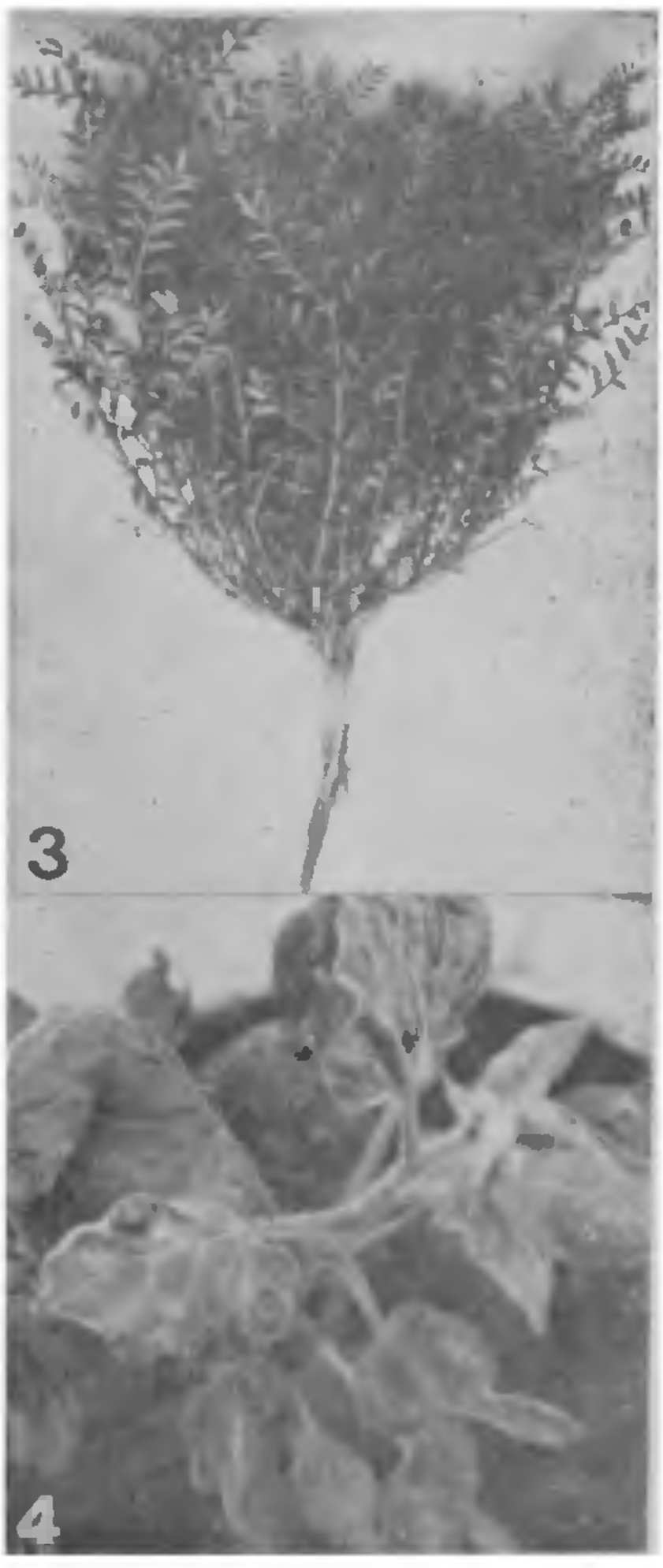
CHICKPEA (*Cicer arietinum* L.) in India is known to be affected by two viral diseases causing tip necrosis[2] and stunting[9]. But, during the last three years, 2–5% of the plants of several cultivars of chickpea—specially BG–2 and G–113–were found affected with another severe virus disease. Diseased plants, both

infected naturally and experimentally, developed (in 3–4 weeks after infection) excessive axillary shoots which bore sligthly chlorotic, very small, narrow and deeply dentate leaves (Fig. 1). The plants remain stunted giving bushy appearance (Figs. 2, 3). Phloem of roots and collar region of stem develops slight necrosis in severe cases of infection. Affected plants bear fewer flowers and pods than the healthy plants and those infected at a very early stage of growth die prematurely. A sap transmissible virus was isolated from the diseased plants and its properties are reported here.



FIGS. 1–2. Fig. 1. Showing reduction of the size of leaflets due to infection (*a*) and production of axillary shoot in freshly infected plant (*b*). Fig. 2. Showing stunting of plant when infected a week after germination (*a*) as compared to uninoculated plant (*b*).

The virus has a wide host-range. It caused systemic mosaic in 7–15 days after inoculation with the virus, through sap and by *Aphis craccivora* Koch., in *Cucumis sativus* L., *Glycine max* (L.) Merr., *Lens esculentum* Mill., *Medicago sativa* L., *Nicotiana glutinosa* L. (Fig. 4), *N. rustica* L., *N. tabacum* L., Cvs. Harrison Special, White Burley and Xanthi, *Phaseolus vulgaris* L., Cv. Contender, *Trifolium alexandrinum* L. and *Vigna sinensis* Savi ex Hassk. Inoculated leaves of *Beta vulagaris* L. and *Chenopodium amaranticolor* Coste and Reyn. developed only local lesions in 3–5 days after incoulation. The virus did not infect the following plant species: *Cajanus cajan* L., *Capsicum annuum* L., *Crotalaria juncea* L., *Cyamopsis tetragonoloba* (L.) Taub., *Datura metal* L., *D. stramonium* L., *Lathyrus odoratus* L., *Petunia hybrida* Vilm., *Pisum sativum* L., *Trigonella foenum-graecum* L. and *Vicia faba* L.



FIGS. 3–4. Fig. 3. Bushy growth of a diseased plant from a field. Fig. 4. Typical mosaic on systemically infected leaves of *N. glutinosa*

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.

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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.