Table 1 *Effect of magnetic fields on Cucumis pubescens Willd*

Character	Control	1,000 g	2,000 g	3,000 g	5,000 g
Length of vine (cm)	97.00 ± 1.28	102.90 ± 1.29**	137.80 ± 2.17**	147.20 ± 0.96**	135.06 ± 0.92**
No. of lateral branches	6.40 ± 0.49	8.20 ± 0.65*	7.93 ± 0.40*	8.85 ± 0.84*	8.46 ± 0.69*
Days to produce first male flower	33.00 ± 2.00	58.00 ± 3.50**	55.00 ± 3.00**	51.60 ± 4.00**	58.00 ± 2.00**
Days to produce first female flower	39.00 ± 2.00	65.00 ± 2.50**	63.00 ± 3.50**	62.00 ± 3.00**	65.00 ± 2.00**
Total no. of male flowers	549	350	365	423	398
Total no. of female flowers	9	4	6	10	6
Sex ratio	61 : 1	87.5 : 1	60.83 : 1	42.30 : 1	66.33 : 1
No. of fruits/plant	9.41 ± 0.55	5.35 ± 1.33**	4.56 ± 0.93**	7.80 ± 1.17	5.12 ± 0.95**
Length of fruit (cm)	9.08 ± 0.25	10.35 ± 0.18**	10.58 ± 0.27**	14.11 ± 1.25**	14.80 ± 0.87**
Diameter of the fruit (cm)	13.72 ± 0.41	14.80 ± 0.17*	15.41 ± 0.31**	17.90 ± 1.25**	14.80 ± 0.87*
Yield/plant (g)	587	525	590	830	500
Pollen fertility (%)	95	83	80	78	75
Total yield (kg)	7.215	7.167	8.278	12.556	6.256

t test–*Significant at 5% level; **Significant at 1% level;

female flowers due to magnetization of cucumber sprouts was also observed by Abroskin *et al*[7]. Krylov and Tarakanova[8] proposed an auxin-like effect to the influence of magnetic fields. Kolin[9] suggested that magnetic fields act at molecular level.

The possible mechanisms of biological effect of magnetic fields have been discussed earlier[10]. The work of Dunlop and Schmidt[11] on *Pithophora* and *Allium cepa* indicates that the magnetic fields can also alter the normal course of development. Probably these changes might have brought an increased uptake of nutrients as a result of the increased size of the fruit, ultimately resulting in higher yield.

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1. Whitaker, *Am. J. Bot.*, 1931, **18**, 359.
2. Nitsch, J. P., Kurtz, E. B., Liverman, J. L. and Went, F. W., *Am. J. Bot.*, 1952, **39**, 32.
3. Tiedjens, V. A., *J. Agric. Res.*, 1928, **36**, 721.
4. Pitman, U. J. and Ormord, D. P., *Can. J. Plant Sci.*, 1970, **50**, 3, 211.
5. Reddy, P. R. *et al.*, Paper presented at *Int. symp. on improving crop and animal productivity by nuclear and allied techniques*, Delhi, February 1977.
6. Reddy P.R. *et al.*, Paper presented at *Symposium on the role of induced mutations in crop improvement*, Hyderabad, Abstract page 87, Sept. 1979.
7. Abroskin, V. V. and Zadonski, *Zap. Voronezh. Slch. Inst.*, 1968, **91**, 86.
8. Krylov, A. V. and Tarakanova, G. A., *Fiziol. Rast.*, 1960, **7**, 191.
9. Kolin, A., *Sciences (Paris)*, 1969, **60**, 40.
10. Barnothy, M. F., *Biological effect of magnetic fields*, Plenum Press, New York, 1969, Vol. 2.
11. Douglas, W. D., Barbara, L. S. and Barnothy, M. F., *Biological effects of magnetic fields*, Plenum Press, New York, 1969, Vol. 2, p. 167.

PLATE ASSAY TO SCREEN FUNGI FOR PROTEOLYTIC ACTIVITY

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PROTEOLYTIC enzyme finds wide application in various industries and pharmaceutical preparations[1]. Although proteolytic enzymes can be obtained from animals and higher plants, it is the microorganisms that are preferred in industrial application of enzymes due to the technical and economic advantage. Most of the proteases, currently used in various industries, are of microbial origin. Many fungal proteinases have been proved to be valuable reagents in the laboratory and in industrial processes[2]. In view of the commercial application of fungal proteases, there is a need

Table 1 *Lysis of milk protein by extracellular fungal proteases at the neutral pH 7 and alkaline pH 10*

	Diameter of the lysed zone (cm) (period of incubation)									
	24 hr		48 hr		72 hr		96 hr		120 hr	
Mycoflora	pH 7	pH 10	pH 7	pH 10	pH 7	pH 10	pH 7	pH 10	pH 7	pH 10
A. aculeatus	0	0	0	0.8	0.6	1.8	1.0	2.2	1.6	3.9
A. flavipes	0.5	1.0	1.5	1.8	2.0	2.5	2.4	3.5	2.9	4.9
A. flavus	0.5	0.9	2.2	1.3	3.5	3.0	4.0	4.2	4.8	5.4
A. nidulans	0	0.7	0	1.3	0.5	3.0	1.0	4.1	2.0	5.0
A. niger	0	0.4	0	1.1	0	2.0	0.5	2.9	1.0	3.2
Penicillium sp.	0.4	0.3	0.6	1.0	1.0	2.0	1.5	2.9	2.1	3.3
C. cladosporioides	0	0.4	0.5	1.8	1.6	3.0	2.0	3.8	2.2	4.2
C. oxysporum	0.9	0.5	2.2	1.9	2.4	2.4	3.1	3.3	4.0	4.3
F. oxysporum	0.6	0.6	2.5	1.8	3.5	2.8	4.0	3.6	5.2	4.8

to screen mycoflora with proteolytic activity. This paper describes an easy method to screen fungi for proteolytic activity.

For this purpose, the effluents from two different cattle slaughter houses were chosen as they were rich in organic substrate upon which the proteolytic enzymes act. The fungi isolated from protein-rich substrate were screened for protease-producing ability, using well-buffered skimmed milk agar plates[3].

Altogether nine species of fungi were isolated. They were *Aspergillus aculeatus*, *A. flavipes*, *A. flavus*, *A. nidulans*, *A. niger*, *Penicillium* sp., *Cladosporium cladosporioides*, *C. oxysporum* and *Fusarium oxysporum*.

The highest frequency of occurrence was registered by *A. flavus* and *F. oxysporum*, and least frequency by *A. niger*.

The reagents required for the preparation of the medium are: (i) A standard milk solution was prepared by mixing 10 g of skim milk powder (Difco) thoroughly in 100 ml of distilled water; (ii) 100 ml of 10% agar (Difco); (iii) 300 ml of 0.05 M NaH_2PO_4, Na_2HPO_4 buffer pH-7 or 300 ml of 0.05 M $NaHCO_3$, Na_2CO_3 buffer pH-10.

The solutions (i), (ii) and (iii) were autoclaved separately at 1.034×10^5 N/m^2 for 20 min. and aseptically mixed. Sterile medium (10 ml) was poured into each Petri plate (8 cm diameter) under aseptic condition. The fungal cultures were inoculated at the centre of the plate using pinpoint inoculum. The cultures thus inoculated were incubated at room temperature. After 24, 48, 72, 96 and 120 hr incubation, 5 ml of trichloroacetic acid (TCA) were added to each Petri dish over the agar surface. After 10 min, the excess of TCA was drained off.

Each plate was then examined and the transparent zone was observed around the fungal colony which is due to the hydrolysis of milk protein by extracellular proteases and the rest of the region remained opaque due to the coagulation of milk protein by TCA. The diameter of the lysed zone was measured and the results are tabulated.

The proteolytic activity of the fungi is given in table 1. Almost all the fungi produced more of alkaline proteases than neutral protease, whereas *A. niger* and *A. aculeatus* produced the least amount of neutral protease. Moreover, *A. aculeatus* and *A. nidulans* did not elaborate any neutral protease even at 48 hr of incubation whereas *A. niger* could not produce any neutral protease even at 72 hr of incubation.

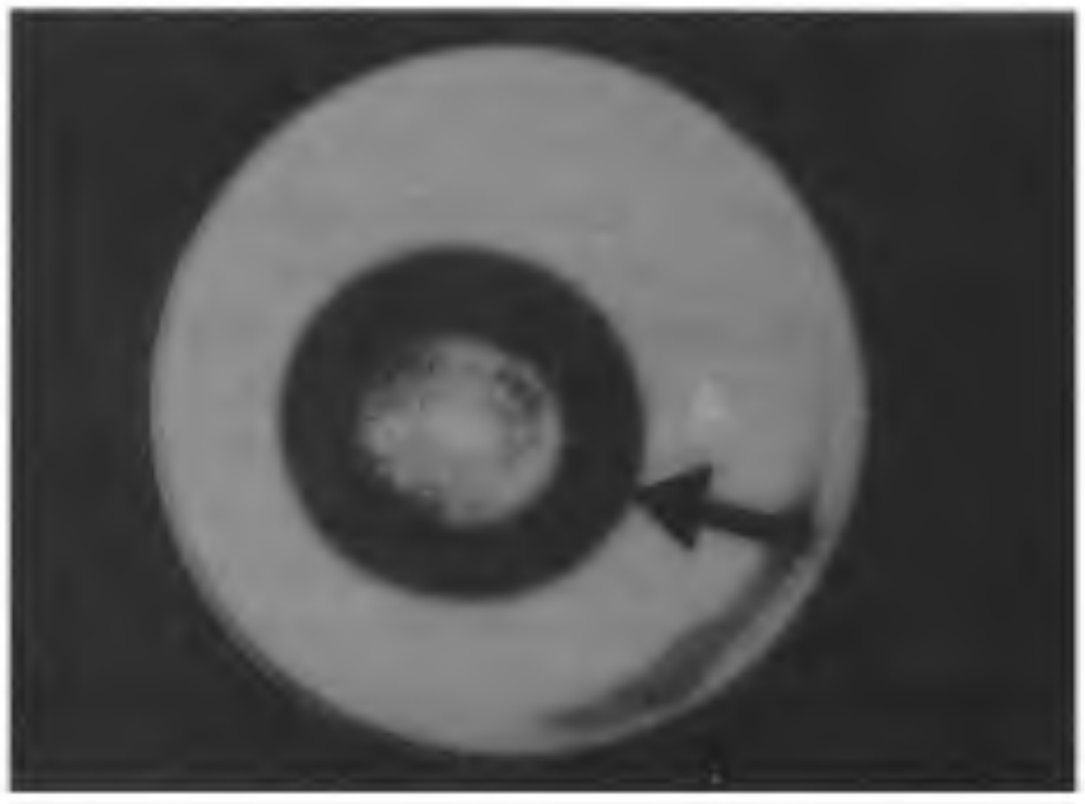

Figure 1. Lysis of milk protein by extracellular fungal protease.

Lesser amount of neutral proteases was elaborated by *A. flavipes, C. cladosporioides* and *Penicillium* sp. and they showed a gradual increase with increase in time. However *A. flavus*, *A. flavipes*, *A. nidulans*, and *F. oxysporum* showed higher degree of alkaline proteases, whereas *A. niger* showed minimal activity.

A few fungi like *A. flavus*, *C. oxysporum* and *F. oxysporum* produced both alkaline and neutral proteases almost equally. Figure 1 depicts the lysis of milk protein in the Petri plate by extracellular protease produced by the fungi.

Khanmova and Esperantina[4] reported that *A. niger* was the best proteolytic enzyme producer and surpassed considerably *Penicillium olsoni* which is the most active species of this genus *Penicillium.* The present study showed that *A. niger* is the least active fungus in the production of both alkaline and neutral protease. The differential response of the same species might be due to variation in environmental parameters or the species in question may be a different physiological strain which needs further detailed investigation.

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1. Davies, R., *Biochemistry of industrial microorganisms,* (eds) C. Rainbow and A. H. Rose, Academic Press, New York, 1963, p. 68.
2. Gutcho, S. J., *Microbial enzyme production*, Noyes Data Corporation, London, 1974, p. 191.
3. Chandrasekaran, S. and Dhar, S. C., *Leather Sci.*, 1982, **29**, 430.
4. Khanmova, T. and Esperantina, P., *Rastenievd. Nauki*, 1979, **16**, 38.

CYTOLOGY OF A TETRASOMIC PLANT OF *CAPSICUM ANNUUM* L.

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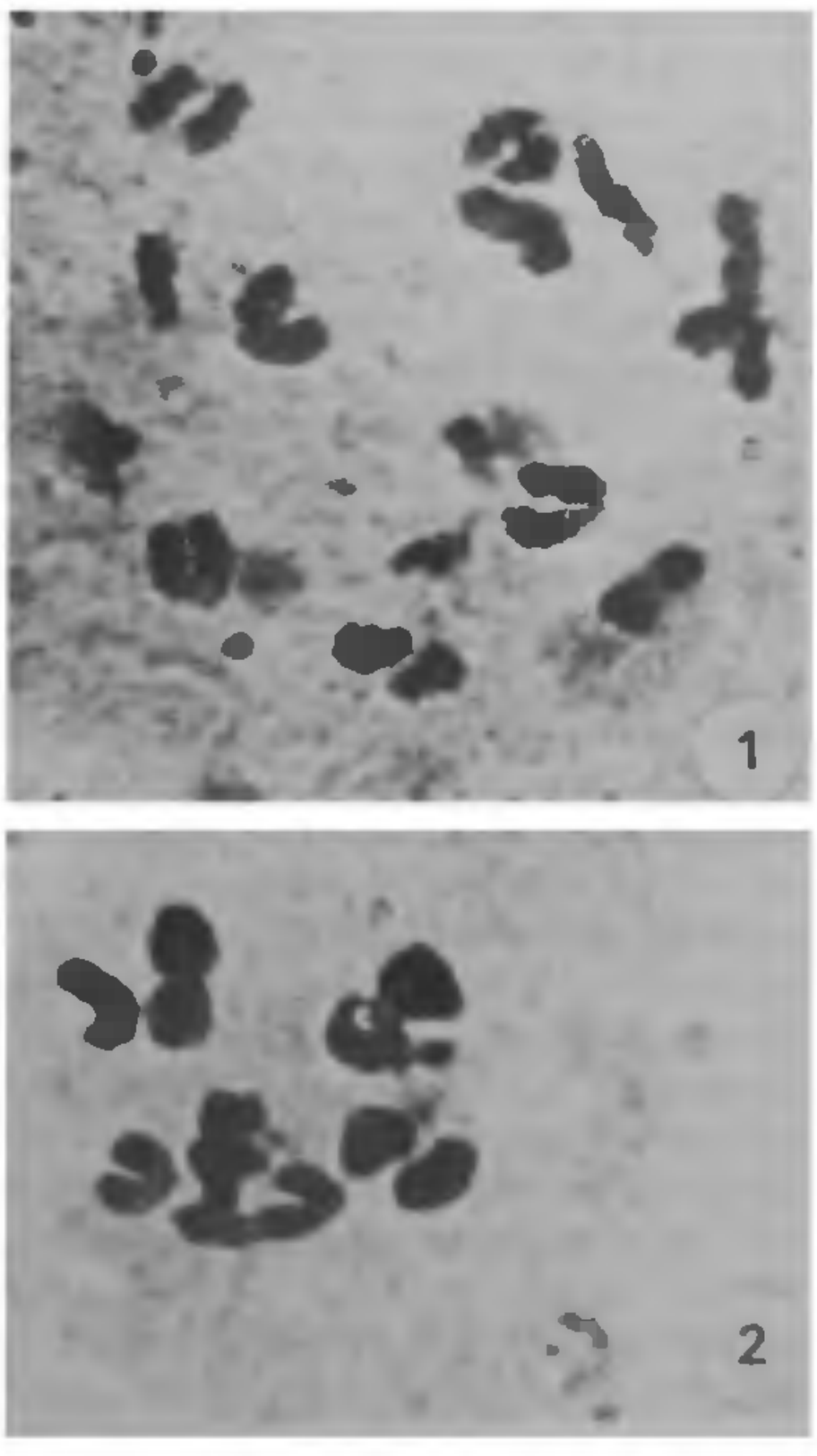
DURING the course of cytogenetic investigation of progeny of four autotriploids obtained spontaneously in intervarietal hybrid swarm, a number of cytological variants viz trisomics, tetrasomics, interchange heterozygotes, asynaptics and mosaics were encountered. The present paper gives an account on the morphology and cytology of the tetrasomic located.

The tetrasomic was late in flowering and quite distinct from the normal with increased plant height, decreased spread and number of branches. The leaves were pale green in colour and were almost double in size than those of the control. The flowers were comparatively larger with six petals and big ovary.

Cytological studies revealed the presence of 26 chromosomes ($2n + 2$) in contrast to the disomic $2n = 24$ chromosomes (figure 1). The different associations of the 4 homologous chromosomes were IV, III + I, 2 II and 1 II + 2 I but no PMC showing all the four univalents was encountered. The most frequent configuration seen in 59.38% cells was 13 II. The other configurations 1 IV + 11 II (ring, rod and Y types), 1 III + 11 II + 1 I and 12 II + 2 I were observed in 29.68%, 7.81% and 3.13% respectively (table 1, figures 2). The chiasma frequency per cell was high (22.92) when compared to that of the disomic (21.16%). During metaphase,



Figures 1 and 2. (×2250) **1.** Diakinesis with $2n = 26$ chromosomes (1 IV + 10 II + 2 I). **2.** Metaphase I with chain IV.