na and at Badhaura, and existence of a thick sequence in the Salt Range, amply confirms the existence of glaciers/icebergs during the Upper Carboniferous in Western India and Pakistan. They radiated from the Aravallis, followed by deposition, under marine condition, as well, of Permian sediments and their extensive removal eventually from elevated lands, by intense Post-Permian erosional agencies. The Bap Boulders do not occur anywhere else in the Jaisalmer and Barmer Basins to deduce Post-Palaeozoic age. The existence of Malani pebbles and boulders in the Badhaura sandstone settles the age relationship of the Bap Boulder Spread, which, based on lithologic, bio-stratigraphic, and palaeogeographic associations cannot be of an age other than the one associated with the Late Paleozoic glaciation.

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ACTION OF PARACETAMOL ON DIVIDING CELLS OF *ALLIUM CEPA*

THE cardinal importance of evaluating the mutagenicity of several environmental contaminants and the potentiality of *in vivo* cytogenetic assay, among the battery of tests available for the purpose, have been stressed by many investigators[1-9]. Drugs which find their places in our modern lives have also to be assessed from these angles. Some attempts have been made in this direction on a few of them using cytogenetical parameters in this laboratory[6,8,12]. Analgesic and antipyretic agents also deserve special consideration. *In vivo* experiments with mice on the effects of Paracetamol (N-acetyl-P-aminophenol) have shown structural aberrations and numerical abnormalities in the form of polyploidy and univalency of sex chromosomes and autosomes occurring at all periods of treatment. It is surmised that they could collectively be of some genetic risk[13]. There is a lack of information about its action on somatic chromosomes. It is known that such an analysis could be carried out on more than one test system. The utility of root tip cells of *Allium cepa*, from this point of view, has been recognised by Kihlman[14]. The present study has been undertaken to determine its effects on dividing cells.

Roots growing from bulbs of *A. cepa* were treated at room temperature with 0·5%, 1·0% and 1·5% of Paracetamol (Crocin, Duphar Interfran Ltd.) for 2, 6, 12, 18, 24, 48 and 72 hours. Adequate controls were grown under identical conditions in distilled water. The roots from both series were processed for haematoxylin squashes as reported earlier[15] after fixation in acetic alcohol.

The action of the drug on dividing cells has been estimated on the basis of changes in mitotic index (MI; Table I) and chromosome aberrations induced by it. A strong dosage effect is obvious from a decline in the MI values with the highest concentration exhibiting a marked decrease. These values for controls and treatments are plotted against periods in Fig. 1. The control curve for MI shows a decline from 2 to 12 hr and then exhibits an upsurge till 24 hr. From then onwards it shows very little change till 72 hr. These variations may be accounted as due to changes in the diurnal rhythm and periodicity of cell division[16,17]. The curious feature of the experimental curves is that they follow the same trend during the period of treatment as with the control. This interesting observation denotes that the degree of mitotic depressions[18] for various periods were considerably lower than those for controls (see also Table I). However individual differences between concentrations are retained without altering the above trend.

TABLE I

Mitotic index following treatment with Paracetamol*

Time of treatment (in hrs)	Control	0·5%	1·0%	1·5%
2	3·3	2·2	1·9	1·8
6	1·8	1·6	1·0	0·8
12	1·4	1·3	0·8	0·8
18	2·0	1·8	1·5	1·0
24	3·3	2·6	2·4	2·2
48	3·1	2·7	2·3	2·2
72	3·0	2·6	2·2	2·0

* estimated from 6000 cells.

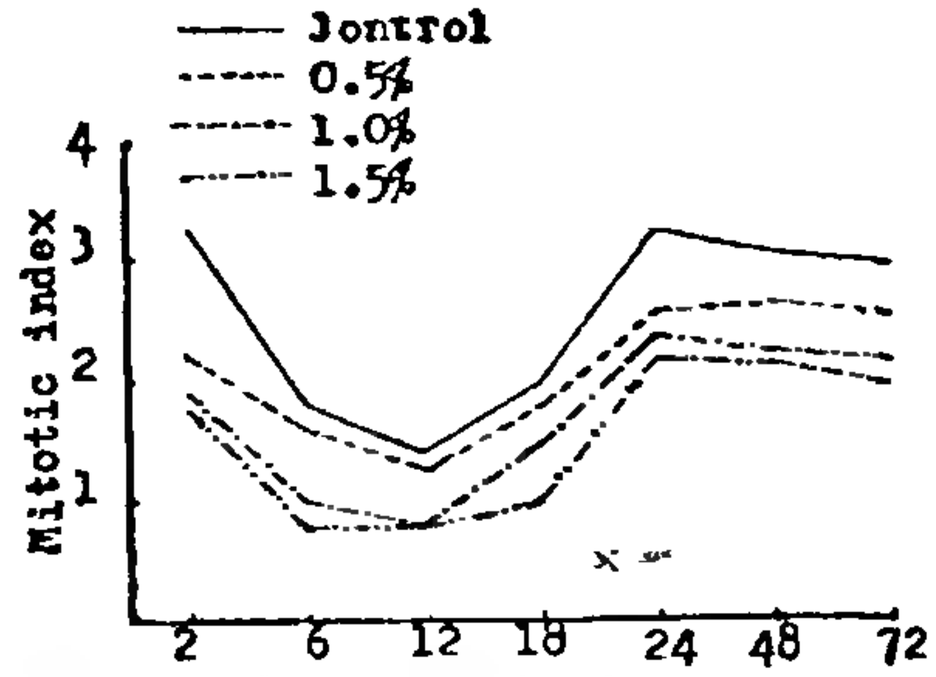
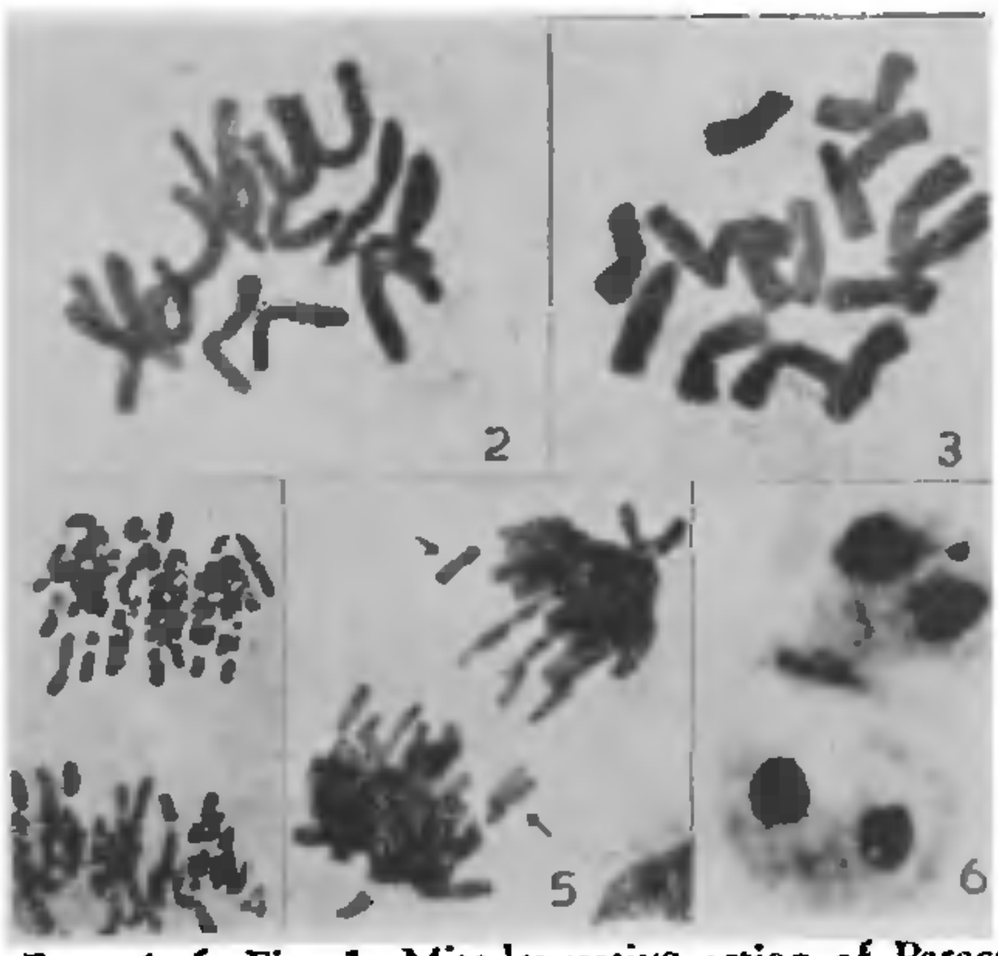


FIG. 1



FIGS. 1–6. Fig. 1. Mitodepressive action of Paracetamol. Fig. 2. Control metaphase. 2 hr × 1,100. Fig. 3. 2 hr treatment, 1·5% × 1,100. Fig. 4. 72 hr treatment, 1·5% × 700. Fig. 5. 48 hr treatment, 0·5% (arrows show fragments) × 1,100. Fig. 6. 12 hr treatment, 1% × 1,100.

Abnormalities in the form of rare contracted chromosomes (Fig. 3) were seen as compared to the control (Fig. 2). These point out the partial mitoclasic action[18] of Paracetamol. Numerical increase by way of polyploidy or duplication was not observed in any of these experiments. The occurrence of chromosome fragmentations (Figs. 4 and 5) indicate the chromatoclasic[18] property of Paracetamol acting at the G_2 phase of the cell cycle[14]. An extreme case of chromosome fragmentation is represented in Fig. 4. Instances of cells with nucleoli (Fig. 6) were observed in experimental material treated for longer periods and at higher concentrations. As controls never revealed such pictures the results testify that this is due to treatment with the drug since both are fixed in acetic alcohol. Such a phenomenon was also reported earlier after treatment with the flavonol glycoside Polygalacin[19]. The quantitative estimation of chromosomal aberrations induced by Paracetamol is being made. Experiments are in progress to see whether the MIs return to control levels and the intensity of chromosomal abnormalities show variations on recovery following treatment with it. These detailed results will be reported elsewhere.

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RADIATION-INDUCED "BUNCHY TOP" MUTANT IN GROUNDNUT

A NEW type dwarf mutant (Fig. *A*) in groundnut (*Arachis hypogaea*, L.) with extremely suppressed plant growth as well as reduced leaflet size was isolated during 1974. A comparative morphological characters and the inheritance of the mutant are reported here.

Dormant seeds of a variety, Spanish Improved, were treated with 10 to 60 kR gamma rays. Plants were grown and their susbequent progenies were screened for mutations. The mutant appeared in a M_2 progeny of 50 kR treatment. It was sterile, hence, maintained through the heterozygous progenies where genetic segregation was studied.

The comparative morphological characteristics of the mutant and the unirradiated parent are given in Table I. The basal two leaves in the mutant seedlings

TABLE I

Characteristics of the parent and the mutant

Characters	Spanish Improved	Mutant
Height (cm)	71·0 ± 2·11	8·5 ± 1·15
Number of branches (primary and secondary)	6 + 7	6 + 6
Number of nodes on stem	34·0 ± 1·2	32·0 ± 1·9
Internode length (cm)	2·5 ± 0·2	0·3 ± 0·11
Leaflet size (length × breadth) :		
basal node	2·8 × 1·8	2·4 × 1·5
upper node	7·3 × 3·8	1·3 × 0·7
Rachis length (cm)	8·4 ± 0·4	1·2 ± 0·12
Flowering and pod setting	Present	Absent

TABLE II

Genetic segregation of the mutant character

Genration	Number of progenies	Segregation: Phenotype: Normal	Mutant	χ^2 (3:1)	Genotype: Dominant homozygote	Hetero-zygote	χ^2(1:2)
M_1	1	13	..	..	..	..	..
M_2	13	405	..	—	—	—	—
M_3	1	29	9	0·035	..	..	..
M_4	28	569	168	1·90	10	18	0·05
M_5	50	744	252	0·04	17	33	0·017
Total heterozygotes	.. 79	1342	429	0·56	27	51	0·057