

retardation was evident by the presence of large number of immature stage I and a few early maturing stage II oocytes, and corroborative reduction in the gonadosomatic index. Some of the stage II oocytes exhibited nuclear degeneration which initially started by disruption of nuclear membrane, and nucleolar necrosis and its irregular distribution (figure 1). In a later phase, the entire nucleus degenerates leaving its remnant, and oocyte exhibited atretic changes like cytoplasmic liquefaction, swelling of the follicular wall and its separation from the cytoplasm (figure 2). Ultimately such oocytes degenerate, as part of a degenerated oocyte is also seen in figure 1. Binucleated stage II oocytes are also seen in ovaries of two fish among the treated group (figure 3), which may be due to the abnormal cell division induced by Emisan.

In *C. punctatus* exposed to mercuric chloride for 6 months, Ram and Sathyanesan² reported inhibition of gonadal growth and comparable changes in

the pituitary gonadotrophs, suggesting the impairment of 'pituitary-gonadal axis' without any obvious sign of gonadal degeneration. In the present investigation, Emisan-induced degenerative changes observed in stage II oocytes are suggestive of its direct action on ovary. Methyl mercury (MeHg) compounds have been reported to disturb mitosis *in vivo* and *in vitro* studies³. Skerfving *et al*⁴ reported an increased frequency of chromosomal breaks, and the presence of extra fragments and sister-chromatid fragments that lack centromeres in Swedish fishermen on a high dietary intake of fish contaminated with MeHg. In the ovaries of *C. punctatus*, the occurrence of some binucleated stage II oocytes might be due to methoxy ethyl mercury chloride (MeEHgCl) induced abnormal cell division during oogenesis in which nuclear division may not be followed by cytokinesis. These observations suggest that MeEHgCl may act directly on ovary inducing adverse nuclear changes in the oocyte of this species.

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GAMMA-RAY-INDUCED MEIOTIC ABNORMALITIES IN MULBERRY (*MORUS L*)

S. P. CHAKRABORTI and A. SARKAR

Central Sericultural Research and Training Institute, Berhampore 742 101, India.

ARTIFICIAL induction of mutation for the improvement of mulberry has been investigated by many workers¹⁻³. The present investigation deals with the

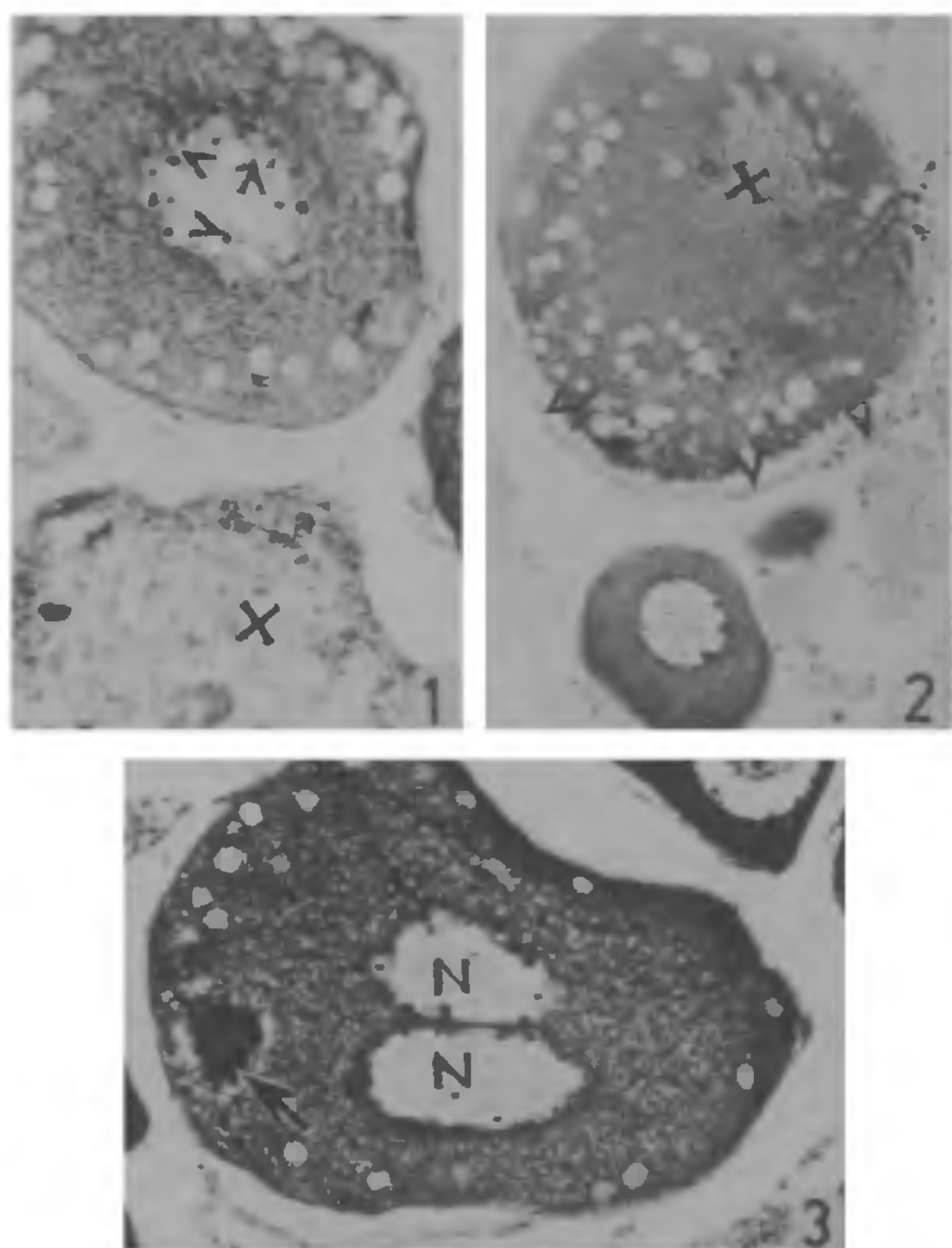
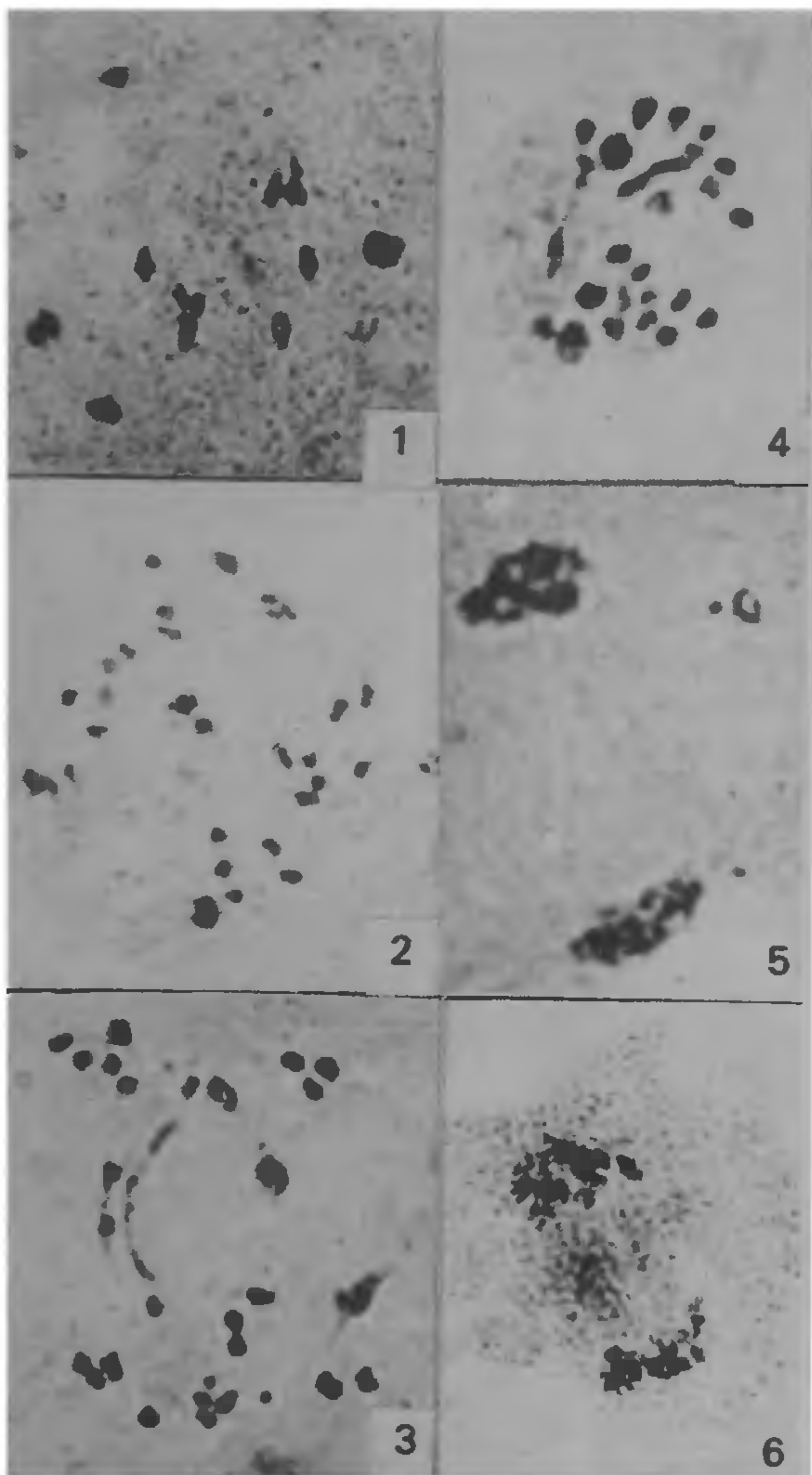


Figure 1-3. 1. Emisan (MeEHgCl) treated fish stage II oocyte, showing degenerative changes in periphery of the nucleus. 2. Treated fish stage II oocyte. 3. Binucleated stage II oocyte of treated fish.



Figures 1-6. 1. PMC showing the formation of multivalent in metaphase I ($\times 3500$). 2. Non-disjunction in anaphase I ($\times 3500$). 3. Formation of double bridge in anaphase I ($\times 3500$). 4. Stickiness in chromosomes in anaphase I ($\times 1100$). 5. A lag of one bivalent and a fragment. 6. Lag chromosome and a fragment in anaphase I ($\times 1100$).

study of meiotic chromosomes of M_1 plants raised from the irradiated seeds of mulberry with gamma rays at three different doses (10 kr, 15 kr and

20 kr). Meiotic chromosomes were studied following the aceto-carmin method⁴.

Meiosis in the control plant showed normal configuration with 14 bivalents at metaphase I. Regular separation of 14:14 chromosomes was also observed at anaphase I. In 10 kr and 15 kr dose, no abnormalities could be traced, while in 20 kr, notable abnormalities in the meiotic chromosomes were detected. In metaphase I, univalents were observed in low frequency whereas multivalents (figure 1) were quite common (15%). Anaphase movement was irregular indicating non-disjunction in the bivalents (figure 2). Lagging chromosome occurred frequently (19%) in anaphase I with or without fragments. Sometimes one bivalent with dot-like fragments was also observed as laggards (figures 5, 6). Double bridges also occurred in a higher frequency (45%) in anaphase I (figure 3).

The occurrence of various meiotic irregularities due to gamma rays agreed with the findings of many other workers⁵⁻⁷. Occurrence of multivalents in considerably high frequencies which increased with dosage, has been noticed in the present study. This indicated that probably high dosage of gamma rays produced many breaks in the cell which might have lead to reciprocal translocation, resulting in multivalent formation and dicentric bridges. The fragments and lag chromosome were finally lost in the cytoplasm. The pollen sterility (63%) and variable pollen size ($12\ \mu$ - $21\ \mu$) seemed to be the cumulative effect of various aberrant meiotic stages observed in this plant due to the radiation effect.

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