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Dept. of Botany, T. SREERAMULU.*
Imperial College of Science
and Technology,
London, S.W.-7, *November* 22, 1957.

* Present address: Aerobiology Laboratory, Department of Botany, Andhra University, Waltair, India.

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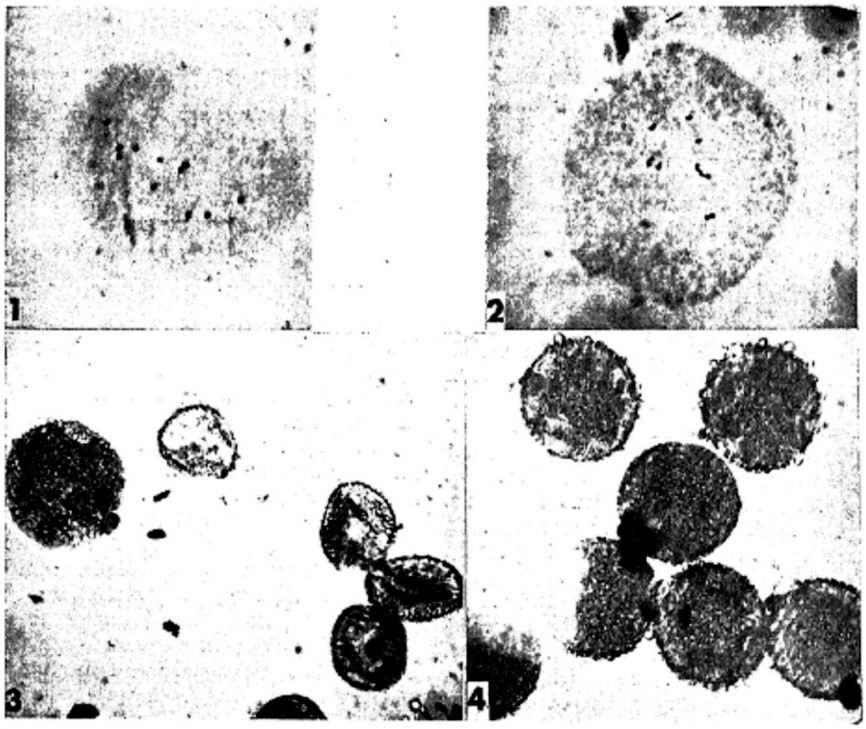
X-RAY INDUCED SOMATIC HAPLOIDY IN WATERMELON

DRY seeds of watermelon (*Citrullus vulgaris* Schrad. var. *Asahi Yamato*) were irradiated with 24,000, 36,000 and 48,000 *r* of X-rays with a view to study the effects of the radiation on sex expression in the treated plants and their progenies. During a study of microsporogenesis in plants raised from the irradiated seeds, it was found that a whole branch in a plant belonging to the 48,000 *r* treatment had only the haploid number of chromosomes ($2n = 11$ as against the normal $2n = 22$ found in the other branches). The leaves and flowers on this branch were smaller and the stem and petioles were thinner. Chromosome configurations at metaphase I of meiosis in 14 cells were found to be: all univalents in 7 cells (Fig. 1), 9 univalents and 1 bivalent in 5 cells and 7 univalents and 2 bivalents in 2 cells. Among the bivalents observed, three had chiasmata in both arms of the chromosomes and the rest were of the rod type with a terminal chiasma in one of the arms. Only about 12% of pollen took stain in acetocarmine; the well-stained pollen were also larger in size and had an average diameter of 85·4 microns. The unstained pollen grains were small (about 40 to 45 microns in diameter) and were often irregular in shape (Figs. 3 and 4). The large, well-stained pollen obviously represent dyads, since they have the same size as the pollen of diploid water-



FIGS. 1–2. Metaphase I of meiosis in the haploid showing 11 univalents. In Fig. 1, two univalents are secondarily associated and in Fig. 2, there is one group of three chromosomes, two groups of two chromosomes and four single chromosomes.

FIG. 3. Pollen from the haploid. Most are shrivelled but occasionally a large well-stained grain is seen.

FIG. 4. Pollen from a normal watermelon plant.

melon. A solitary pistillate flower was formed in the haploid branch but no fruit setting could be obtained though the flower was hand-pollinated with normal pollen.

The haploid branch probably owes its origin to some process of reductional mitosis which should have taken place in cells of the shoot meristem prior to the initiation of branching. Menzel[1] reported the occurrence of spontaneous somatic reduction of chromosome numbers in some polygenomic hybrids in *Gossypium*. Using pollen size and fertility as indices, we examined every branch of a large number of control watermelon plants for possible occurrence of spontaneous haploidy but no haploid could be detected. It is therefore very probable that the somatic reduction in chromosome number has been caused by the X-ray treatment. This inference is further supported by the observation made in this laboratory that haploid cells occur occasionally in root meristems of barley and *Triticum monococcum* following exposure of seeds to X-rays. While irradiation of pollen and inflorescences had been used for many years as a method of obtaining haploids in several plant species,[2] there seems to be no record so far of the occurrence of wholly haploid sectors in plants raised from seeds subjected to any type of radiation.

An interesting feature of meiosis in some microsporocytes of the haploid was a strong tendency for secondary pairing among the univalent chromosomes. The maximum secondary association occurred in a cell which had seven groups comprising one group of 3 chromosomes, two groups of 2 chromosomes each and four single chromosomes (Fig. 2). Thus, while the evidence from primary pairing suggests segmental duplications in 4 chromosomes of the haploid set thereby rendering 9 as a probable basic chromosome number for this species, the secondary association data suggest a basic number of 7. Opinions, however, vary regarding the real significance of secondary association of chromosomes. Also, the conclusions that could be drawn from the present data suffer from the limitations that first, it is difficult to be sure that the 11 chromosomes found represent a complete haploid set instead of a random assortment of 11 chromosomes of the diploid complement, including a few homologous pairs and secondly, prior to somatic reduction, segmental interchanges and duplications could have taken place among some chromosomes, thereby leading to the observed primary and secondary pairing. No abnormalities were found with regard to morphological or growth characteristics in the branch with 11 chromosomes and this would suggest that a complete haploid complement is present. Since regular bivalent formation and anaphase separation were observed during meiosis in the other branches of this plant, the possibility of occurrence of gross structural changes in chromosomes could also be ruled out. No haploid has so far been reported in watermelon and hence it is not possible to draw inferences by comparison with previous data. However, it is of interest that the lowest haploid chromosome number recorded in Cucurbitaceæ is 7, which occurs in the genus *Cucumis*,[3] and it could well be that the genus *Citrullus* is derived from a basic number 7 by a process of chromosome fragmentation and segmental duplication, analogous to the mechanism of speciation already postulated by Bhaduri and Bose[4] for several cucurbits.

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EFFECTS OF MALEIC HYDRAZIDE ON AN EARLY VARIETY OF RICE

THE recent discovery of Maleic Hydrazide has led many workers in the field of plant physiology to study the role of this chemical on various plants.[1-8] The present investigation has been designed to study the effect of Maleic Hydrazide on the growth and reproduction of an early variety of rice.

Grains of the variety N. 136 were obtained from the Central Rice Research Institute, Cuttack. After a preliminary selection for uniformity, the seeds were soaked with 10,000, 1,000, 100 and 10 p.p.m. of MH-40 for 48 hr. on December 30, 1956. The pre-soaked seeds were washed thoroughly in water and were sown in earthenware pots containing a mixture of soil and cowdung manure in the proportion of 8 : 1. The plants were next subjected to weekly foliar spray with the corresponding solutions in which they were previously soaked. As the spraying produced detrimental effects it was discontinued after the second spray.