

(3) Deoxyribonucleic acid or DNA:

a) In young ears: The DNA extracted by the Ogur-Rosen method is found to be contaminated with some RNA (RNA-3), because of the incomplete extraction of RNA from the ear material. After necessary correction for this RNA, the total amount of DNA expressed per unit fresh or dry weight of tissue is found to be the same for both normal and ameiotic material.

The earlier finding (MNL 33; Science, 1959) of a possible difference in the so-called apurinic DNA fraction obtained after a brief hydrolysis with dilute hydrochloric acid is being further analyzed in this light. Since the difference was indicated in the base composition of this fraction, an analysis of the base composition of RNA has appeared necessary.

The ratio of RNA/DNA is higher in the ameiotic plants than in their normal sibs.

b) In root tips: In the root material, however, the DNA extracted by the Ogur-Rosen method is found to be free from any contaminating RNA indicating thereby an absence of the acid resistant RNA (RNA-3) in root tips. The estimated values for DNA are found to be the same in the ameiotic plants and their normal sibs.

(4) "Histones" and other proteins:

a) In young ears: The estimation of proteins extractable by the Daly-Mirsky method for histone determination has given much higher values for ameiotic material. If this is a true measure of histones, then the histone/DNA ratio is about twice as high in the ameiotic ears. Besides "histones", there are indications for a higher level of other proteins in the ameiotic material and further analysis is in progress.

Values obtained for "histones" in the root tips are too low to be given any weight. These are to be redetermined.

These results permit attempting a tentative and unified scheme to explain the suppression of meiosis in ameiotic maize so as to guide the course of further work towards an understanding of the physiology of meiosis and the delicate balance between meiosis and mitosis. It appears that the gene partially blocks some step(s) in the conversion of ribonucleosides into deoxy compounds, thereby preventing their rapid incorporation into DNA and leading to their accumulation in the ameiotic ears. An increase in the concentration of these precursors would favour an increased synthesis of RNA, which in its turn would cause greater synthesis of proteins. Excess of RNA even in the absence of any accumulation of precursors as in ameiotic root tips and in the extremely early stage of ameiotic ears perhaps points to a second possibility, that the pathway for RNA synthesis is more active at all stages of development of the ameiotic plants, which may or may not be associated with a partial block of DNA synthesis.

For normal meiosis a critical balance between 1) DNA and RNA, 2) DNA and histones as well as other proteins, and 3) two different types of RNA (one metabolically more active than the other) appears essential. A high RNA/DNA, histone/DNA, and RNA-1/total RNA appears to favour mitosis and suppress meiosis.

-- S. K. Sinha

2. A preliminary biochemical study of the action of the 'asynaptic' gene in maize.

Encouraged by the results obtained from the biochemical studies of the "ameiotic" gene (MNL 33; Science, 1959), an attempt has been made to see if the gene "asynaptic" affects nucleic acid metabolism in some way. Only three young ears of asynaptic plants and three of their normal sibs have been

analyzed as a preliminary trial. Analyses have been made with material fixed in Carnoy's fluid, following the Ogur-Rosen procedure for nucleic acid extraction and estimation.

Acid soluble RNA per unit weight of fixed tissue is significantly greater in asynaptic plants than in the normal sibs. The "apparent" DNA (probably containing some acid resistant RNA) is found to be in equal amounts in both normal and asynaptic material. The amount of "histones" (Daly and Mirsky) is only slightly higher in the asynaptic material.

Besides the possible effect of histones (Ansley's finding), an excess of RNA appears detrimental to meiotic pairing in asynaptic maize plants. In view of a similar situation in ameiotic maize, it appears interesting and necessary to examine in detail as to how the situation in asynaptic plants differs from that in the ameiotic ones. Further work will be undertaken with regard to this and other biochemical aspects.

-- S. K. Sinha

3. Chemically induced chromosomal asynapsis in maize.

Paper chromatographic studies have indicated the presence of some phenolic compounds in ameiotic maize plants and their virtual absence in the normal sibs (MNL 33). In the ameiotic plants meiosis is found to be replaced by a type of mitotic division. The possibility of converting meiosis to mitosis experimentally by the administration of several phenols has been investigated.

The compounds tested were: 1) phenol, 2) resorcinol, 3) hydroquinone, 4) catechol, 5) pyrogallol. Solutions of these compounds in two different concentrations, viz. 0.01M and 0.1M, were fed into the plants through cut stems for 24 hours about a week before the initiation of meiosis in the tassels. A few plants were similarly fed with distilled water to serve as controls. All plants were heterozygous for Inversion-4a against a KYS background. Two replicate plants were taken for each concentration of a particular compound. Pollen mother cells were examined 9 days after treatment.

At the higher concentration all compounds prevented an appreciable percentage of meiocytes from undergoing any division. The nuclei appeared pycnotic. However, no mitotically dividing meiocytes were observed. On the other hand, various degrees of asynapsis of chromosomes were noted. Since no asynapsis was observed in the control plants fed with distilled water, the effect was evidently due to phenols. A maximum degree of asynapsis was found in plants treated with 0.1M phenol. Other compounds produced less extreme effects at this concentration, and still less at the lower concentration. In most cells, where asynapsis was less drastic, at least one chromosome was found to be more severely affected than the rest. In some cells this could be identified as the chromosome heterozygous for the inverted segment. Thus the synapsis of the segment heterozygous for an inversion appears more readily affected. A second feature noted in the mildly affected cells was that the segments containing knobs were more frequently asynapsed than the other regions.

However, more thorough examination is necessary before ruling out the possibility of involvement of some phenolic compounds in suppression of meiosis or its conversion to mitosis.

-- S.K. Sinha

4. Effect of RNA on meiosis in maize.

The finding that there is an excess of RNA in ameiotic plants suggested the possibility of converting meiosis to mitosis by treatment with RNA. Treatments were made as above along with necessary controls. No mitotically dividing meiocytes could be observed. However, several other interesting