Response of Meristems of Seedlings to Benzene Hexachloride Used as a Seed Protectant[1]

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Benzene hexachloride is the active ingredient in several commercial insecticidal seed protectants. Seed technologists have noted that a heavy dosage of the protectant produces malformed radicles and plumules. Cytological examination of these structures shows that the response of the meristems is similar to that obtained with several compounds that are used as fungicides (*1*), herbicides (*2*), or polyploidizing agents (*3, 4*).

The gross aspects of the somatic prophase seem to be normal. Abnormal nuclear behavior becomes evident at early anaphase. Normal chromosome separation does not occur. Total failure of separation produces a large, polyploid restitution nucleus. Irregular separation produces a multinucleate cell in which the several nuclei may have from a few to a very large number of chromosomes.

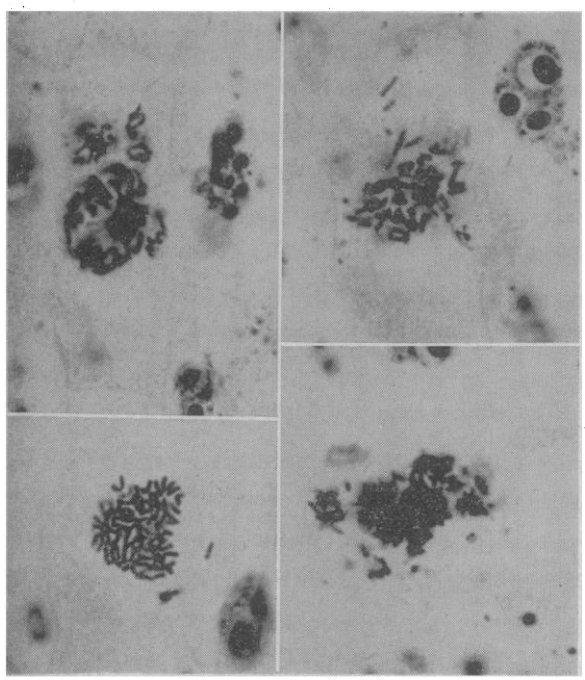

FIG. 1. Abnormal mitotic figures in cells of root tip of *Zea*.

Cell division is completely inhibited, but considerable cell enlargement occurs. Elongation of the radicle and plumular organs is retarded and eventually stopped, and the organs become greatly thickened. Breakdown of tissues occurs and the seedling dies. The responses of maize, garden pea, and soybean are essentially similar (Fig. 1). The cytological figures in the above plants are very similar to figures from various animal cancers (*5*).

[1] Journal paper No. J-1956 of the Iowa Agricultural Experiment Station, Ames. Project No. 858.

References

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The Inhibition of Hematopoietic Action of Cobalt by Ethylenediamine Tetracetic Acid (EDTA)

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Ethylenediamine tetracetic acid (EDTA) reacts with metallic ions to form soluble nonionic metal chelate compounds. The stability of these complexes is so great that the metallic ions are practically completely inactivated (*1*). The chelation is preferential; that is, one metal will be complexed before another. In preliminary experiments on rats, it was found that the toxicity of mercury, copper, and lead was reduced by the simultaneous administration of the sodium salt of EDTA. It was of interest to determine whether EDTA could inhibit the hematopoietic activity of cobalt. The addition of 0.5% of cobalt to the food of rats has been shown to raise the red count to 11 million and the hemoglobin to 165% (*2*). This polycythemia occurs in all vertebrates on which experiments have been tried (*3*).

The rats used in our experiments were from an inbred strain derived from Wistar stock. They were fed Purina dog chow, which was contaminated with the chemicals used in the experiments. The sodium salt of EDTA[1] and cobaltous acetate were used. Thirty female rats, each weighing about 200 g, were

TABLE 1

INHIBITION OF THE HEMATOGENIC ACTION OF COBALT EDTA IN ALBINO RATS

Group	Concentration of chemicals in food: Cobalt (%)	Concentration of chemicals in food: EDTA (%)	Blood analyses: Red blood count ($\times 10^6$)	Blood analyses: Hemoglobin (g/100 ml)	Blood analyses: Hematocrit (%)	Blood analyses: White blood count ($\times 10^3$)
1	0	0	8.9	15.5	50.4	8.2
2	0.1	0	12.2	20.6	59.6	12.4
3	0.1	0.2	11.3	18.4	57.6	11.0
4	0.1	1.0	10.3	18.0	55.0	10.5
5	0.1	5.0	9.0	15.5	51.0	13.2
6	0	5.0	8.7	15.7	50.8	11.5

[1] Generously supplied by the Bosworth Chemical Co.