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

1. SASS, J. E. *Am. J. Botany*, **25**, 624 (1938).
2. ENNIS, W. B., JR. *Ibid.*, **35**, 15 (1948).
3. CAREY, M. A., and MCDONOUGH, E. S. *J. Heredity*, **34**, 283 (1943).
4. LEVAN, A. *Hereditas*, **24**, 471 (1938).
5. LEVINE, M. *Am. J. Cancer*, **15**, 144 (1931).

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

	Concentration of chemicals in food		Blood analyses			
Group	Cobalt (%)	EDTA (%)	Red blood count ($\times 10^6$)	Hemoglobin (g/100 ml)	Hematocrit (%)	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.

divided into 6 groups and given the food containing the chemicals in concentrations as indicated in Table 1. The rats were weighed weekly. After 4 weeks they were sacrificed by guillotine, and blood analyses were performed by the usual clinical methods.

Table 1 summarizes the results. Cobalt produced the usual increase in red blood cells, hemoglobin, and hematocrit. The animals fed 0.2% and 1% EDTA along with the cobalt showed some diminution of the cobalt effect. There were no essential differences in the blood counts of those animals given 5% EDTA, with or without cobalt, and the controls. The rats in all the groups appeared normal in all outward respects during the course of the experiment and suffered no loss of weight. No gross pathological conditions were discernible at autopsy.

References

1. DAUGHERTY, T. H. *J. Chem. Education*, **25**, 482 (1948).
2. WALTNER, K., and WALTNER, K. *Klin. Wo-chschr.*, **8**, 313 (1929).
3. SUTTER, J. *Compt. rend. soc. biol.*, **116**, 994 (1934).

Device for Stirring Liquids under Reduced Pressure in the Absence of Air and Mercury[1]

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In the course of investigations concerned with liquid solutions that had to be thoroughly stirred in the absence of foreign gas, particularly air and mercury, we have made several improvements in an apparatus designed by L. J. Heidt (*1*) for this purpose, especially for the study of photochemical reactions produced by the irradiation of such solutions in a stationary reaction vessel. Heidt's description is very brief and is not accompanied by a sketch or any details of construction, since it is given incidental to some other work. The improved model is sketched in Fig. 1. The device operates by rotating in air a strong magnet, which turns an iron rotor inside a vacuum chamber made of brass.

Among the improvements is the construction of the vacuum chamber in such a way that there is easy access to the parts within it, especially the bearings, which need to be cleaned and lubricated frequently. Access to these parts is obtained by disengaging the joint marked *A* in the sketch.

Another improvement is the provision for adjustment of the force between the magnet and the rotor so that this force can be kept small enough not to break the glass stirrer when it becomes stuck in the reaction vessel. This adjustment is made by means of the screw so marked at the top of the sketch of the vacuum stirring head.

[1] The work on this device was assisted by a grant-in-aid from the Charles F. Kettering Foundation as part of its integrated program of research on the photosynthesis problem.

A third improvement is the use of commercial turned cone-thrust ball bearings instead of conical steel pins riding in brass; the latter often gave rise to great changes in the speed of stirring, because it was practically impossible to lubricate them adequately when they were operated continuously for several days. The ball bearings can be lubricated satisfactorily with Apiezon M vacuum stopcock grease.

Most of the device is constructed of brass, but the shaft driving the magnet is made of cold rolled steel, and the shaft attached to the rotor and the chuck at-

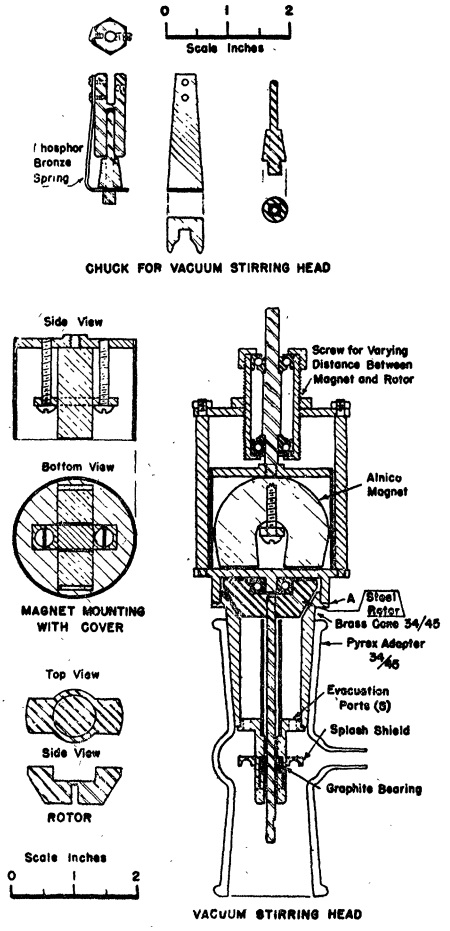

FIG. 1.

tached to this shaft are made of stainless steel. The shaft of the glass stirrer is held in the chuck by de Khotinsky or Sauereisen Insulate cement when the reaction mixture is made up of water or an organic solvent, respectively. The thrust-type ball bearings are Nice No. 702, 11/16 in. OD, and accommodate a 3/16-in. shaft.

The magnet is surrounded by a brass shield, primarily for safety. The flat top on the magnet was ground there to facilitate mounting. The plate holding the screw for adjusting the position of the magnet is held in place by three equally spaced posts, only two of which are shown in Fig. 1. Other details of con-