odors are detected coming through the mask. Special precautions should be taken to prevent unsuspecting persons from entering a building where a fumigation is taking place and even during the aeration period, until all odors of the fumigant have vanished.

If a person should be overcome from vapors or feel ill from inhaling them, he should be removed to fresh air and kept warm. Medical attention should be obtained promptly.

Feeding of Livestock The experiments with animals indicate that the feeding of grain freshly fumigated with Dowfume EB-5 at the dosages used constituted no hazard to life for chickens, hogs, or cattle. Actually, the freshly fumigated wheat and corn used in these tests were taken from the tops of the drums where the concentration of fumigant (particularly ethylene dibromide) is the highest. All samples gave off a strong, definite odor of the fumigant immediately prior to feeding. In the commercial use of EB-5, it is recommended that fumigated grain not be fed to livestock until aeration has been adequate to remove all odor of the fumigant, thus assuring an even greater margin of safety.

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INSECTICIDE RESIDUES

Simplified Method of Estimating DDT Residues

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Nitrated DDT reacts with isopropylamine in benzene solution to give an intense yellow color which is more stable than the color similarly produced by alcoholic potassium hydroxide. Traces of DDT may be estimated by the use of this reaction. It has advantages where the work must be done under primitive laboratory conditions.

A SIMPLE METHOD of estimating DDT deposits on leaves or slides placed in the field during spraying trials was required for estimating efficiency of deposition of spray material and the gradual loss of the deposits from leaf surfaces. It was essential that the method should be rapid, capable of use where full laboratory facilities are not available, and sufficiently simple to be used by semiskilled assistants.

Of the two methods in use at present, the Schechter-Haller method (*2*) has the required sensitivity, but is tedious when used on many samples. The Alessandrini method (*1*), although simple, has the serious drawback that the color produced fades rapidly and must be estimated immediately. The blue color shows a red fluorescence which, under certain conditions, confuses the color matching. No suitable color standards have yet been found and the technique requires a spectrophotometer.

A modification of the Alessandrini method has, therefore, been attempted, substituting an amine for alcoholic potassium hydroxide in the production of a color with the tetranitro derivative of DDT. A number of amines were tried and it was found that the rate of development of color was in the order primary > secondary > tertiary; with primary amines the color develops instantaneously. Isopropylamine was chosen because of its availability and lower volatility than the lower members of the series. It gives an intense yellow compound soluble in benzene, with a single absorption peak at 3500 A. The reaction has not been investigated, but is presumably the replacement of chlorine by amine in a manner analogous to the reaction of picryl chloride and amines.

Although the color is much more stable, even in the presence of strong alkalies, than that developed by potassium hydroxide, it tends to redden appreciably after several hours, and permanent color standards cannot, therefore, be made up using the isopropylamine compound. However, aqueous solutions of potassium dichromate can be prepared at various dilutions to give tolerably good permanent color standards. No independent investigation was made of the effect of other insecticides, because the method was required for assessment.

It is intended to test this method under semifield conditions in the tropics, using native assistants. The method is expected to be as quick to use as the Alessandrini method and sensitive down to 0.05 mg. of DDT, and between 0.1 and 1.0 mg. the results are reproducible to the nearest 0.1 mg. For deposits of 1 to 10 mg., the color is diluted 1 to 10 with benzene, giving results reproducible to the nearest milligram.

The stability of this yellow color gives great advantage, as by successive dilutions the range of the estimation can be extended to cover 0.05 to 100 mg.

Method of Estimating DDT

Wipe the slide or leaf surface gently with a clean cotton swab washed with ether. Wash the cotton with ether through a funnel into a clean test tube;

also wash the leaf or slide surface, using as little solvent as possible. Then place the tube in boiling water to evaporate the ether, making certain that no trace of ether remains. As no bumping occurs, it is practicable to treat a number of tubes together.

Nitration. Add to the tube 3 to 4 ml. of freshly prepared nitration mixture consisting of equal volumes of fuming nitric acid and concentrated sulfuric acid. Immerse in boiling water; 2.5 minutes after brown fumes have begun to evolve, remove and cool in a beaker of water. (The authors have found that nitration is almost complete in 2.5 minutes. More accurate results could perhaps be obtained in 10 minutes, but they prefer not to use a longer period, owing to more drastic attack on the nitro compound.) Wash the mixture into a 40-ml. stoppered test tube containing 10 ml of distilled water, using three 2-ml. amounts of water. Cool the tube in a beaker of cold water.

Extraction. Add 10 ml. of benzene and shake vigorously for 30 seconds. Then remove 1 ml. of the benzene layer with a pipet. This apparent waste of potential sensitivity is incurred in the interests of quick operation, as the benzene layer tends to contain emulsion. Greater sensitivity can be obtained by using a smaller volume of benzene for extraction, but the method may then be slower. Carbon tetrachloride has been found unsuitable as an extracting solvent. Chloroform extracts the color, but rapid fading occurs.

Color Reaction. The benzene extract can, if necessary, be left for 24 hours before the color reaction is carried out provided the tube containing it is securely stoppered. Place the 1 ml. of benzene solution in a clean dry test tube of standard diameter (ca. 5 × $^5/_8$ inch) and add from a buret 3 ml. of a mixture of isopropylamine and benzene in the proportions of 1 to 3 by volume. Shake gently and compare the yellow color formed against tubes of yellow color solutions of potassium dichromate and a blank tube containing the benzene isopropylamine mixture. If the impurities mixed with the DDT deposit, such as oils and chlorophyll, give a yellow tint to the benzene extraction, replace the blank of isopropylamine benzene mixture with the unused portion of the layer.

Estimation

Color estimation should be carried out within 2 hours of development. The potassium dichromate standards are first calibrated against the colors produced from known quantities of DDT. A pale yellow can be distinguished with as little as 0.05 mg. of DDT, and differences of 0.1 mg. can readily be distinguished.

Ten color standards covering the range 0.05 to 1 mg. are usually sufficient. If quantities in excess of 1 mg. are to be estimated, the color can be diluted a known number of times with benzene to bring the color down to the scale being used. The color standards should be numbered to give a straight-line relationship with DDT.

Acknowledgment

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SUGAR BEET EVALUATION

Determining Respiration Rate and Sampling For Chemical Analysis of Sugar Beets

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METHODS OF HANDLING and storing sugar beets have been rapidly improved during the past decade. The mechanical harvester has brought about direct delivery of the crop after lifting, thereby eliminating exposure of the beets to frost, sun, and wind before piling. This, plus greater use of forced ventilation of storage piles, has done much to reduce storage losses by providing a better storage environment within the pile. Further improvement seems to be divided into two separate approaches: improvements in harvester and piler efficiency and more effective control of the environment within the pile and on its surface exposures; and improvement of the beet itself, to reduce respiration rate and susceptibility to attack by fungi.

The first approach can be best accomplished by engineers, machinery manufacturers, and agricultural departments of the sugar companies who design, make, and use or supervise the use of the equipment and have direct control over the large and expensive installations.

Improving the beet itself has been studied very little in modern breeding methods. The old method, used by all sugar-beet breeders, of selecting superior mother beets or stecklings in the fall, storing until the following spring, and replanting for seed production, has eliminated most lines or individuals that were extremely susceptible to attack by fungi. This has greatly improved resistance to spoilage, but individual differences are still evident within commercial varieties and some inbred lines are extremely susceptible to spoilage. Gaskill (*1*) has shown by progeny tests that greater resistance to attack by certain fungi can be bred into lines of beets.

Very little work has been done to breed beets for low respiration rate. This has been partly due to the lack of a rapid method of sampling and measuring respiration rate and of making chemical analyses on an individual beet basis without impairing the subsequent growth of the beet. Nelson and Oldemeyer (*2*) reported studies on sliced pieces of uniform thickness from the tail section of the beet; respiration rates ranged from about 150 to 300 mg. of carbon dioxide per kg. of beets per hour at 20° C. The present report describes a sampling technique, a method of measuring respiration rate, and preparation of diffusate for chemical analysis without undue in-