The soil markedly sorbed the remaining four toxic gases studied. In fact, after 40 min, practically all of the sulfur dioxide and phosgene had disappeared. The fact that only 35% of the original sulfur dioxide was found after 1 hr in the no-soil tests underlines the sorbability of this chemical. Only 20% of the hydrogen sulfide and 14% of the hydrogen cyanide remained after 1 hr.

Since these data demonstrate the importance of the sorbability of a gas, an examination of the presently-used rodenticide fumigants in the light of these results may prove to be useful. One burrowing rodent, the woodchuck, is best controlled with fumigants (*5, 8*). Calcium cyanide is used quite successfully, as is carbon disulfide and also a Fish and Wildlife Service cartridge which liberates carbon monoxide upon burning. The present experiments suggest strongly that, inherent toxicity aside, the effectiveness of the latter two rodenticides is due to a considerable degree to their low sorbability by soil. On the other hand, calcium cyanide is often satisfactory because a large excess is used in practice. In this way, sufficient hydrogen cyanide is generated in the burrow over a period of time long enough to kill the animal.

The factor of sorbability should, in fact, be kept in mind whenever it is necessary to maintain a concentration of vapor in a confined space. This is true, for example, in the fumigation of wheat, cotton, fruit, etc. for the removal of injurious insects.

References

1. BARTHOLOMEW, E. T., SINCLAIR, W. B., and LINDGREN, D. L. *Calif. Citrograph,* 1944, **29,** 309.
2. CHISHOLM, R. C., and KOBLITSKY, L. *J. econ. Ent.,* 1943, **36,** 549.
3. LUBATTI, O. F. *J. soc. Chem. Ind.,* 1944, **63,** 257.
4. LUBATTI, O. F., and HARRISON, A. *J. soc. Chem. Ind.,* 1944, **63,** 353.
5. SILVER, J. *Bur. biol. Surv. Leaf. 21,* 1928.
6. TURNER, J. A., and SEN, D. L. *Mem. Dept. Agric. India* (Ent. Ser.), 1928, **10,** 69.
7. WINTERINGHAM, F. P. W., and HARRISON, A. *J. soc. Chem. Ind.,* 1946, **65,** 140.
8. ————. Wildlife Leaflet 237, Fish and Wildlife Service, 1943.

Staining of the Stem Tissue of Plants by Triphenyltetrazolium Chloride

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In the course of developing a process for the manufacture of 2,3,5-triphenyltetrazolium chloride (*1, 4, 5, 6*), it has been found that portions of the cross-section of twigs from certain trees, particularly the willows, are stained by the reagent. This was not entirely unexpected in view of the findings of Kuhn and Jerchel (*2*), Lakon (*3*), Porter, Durrell, and Romm (*7*), and Mattson, Jensen, and Dutcher (*5*) on the staining of yeasts and of the seeds and fruit of various plants by tetrazolium salts.

Tips of twigs, cut in December from living trees and shrubs, were immersed in a 1% aqueous solution of 2,3,5-triphenyltetrazolium chloride. Sections from the same twig were heated in a test tube suspended in a boiling water bath for 15 min.

All of the unheated sections tested, with the exception of those of sumac and mock orange, developed a distinguishable red coloration in the cambium layer. The sumac was initially so highly pigmented that it is doubtful that any staining could be distinguished if it occurred. The mock orange showed a rusty red circle around the pith which may have been caused by the reagent or by normal enzymatic browning. The heated sections of all varieties tested exhibited neither browning nor reddening.

Most of the sections (maple, apple, plum, hawthorn, pine, spruce, cedar, etc.) required about 4 hrs for the development of the red color. The band of color usually appeared first in the cambium, but, in the maple and apple, a distinct colored band was observed around the pith as well. Considerable browning preceded the staining in most of the deciduous species. Pine, spruce, and cedar were stained irregularly over the cross-section.

In contrast to the varieties discussed above, sections of willow were stained in the cambium within 1–2 min, followed by slow development of color throughout the phloem. No color appeared in the xylem or pith. This remarkably rapid reaction of the willows suggested that there might be a fundamental difference between the cambium of the willows and that of the other shrubs. Because of the well-known ease with which willow cuttings are able to root, it was thought that the rapid reaction might be connected with this characteristic. Since, however, a rose cutting required nearly 24 hrs for the reddening of the cambium, the significance of the extremely rapid reaction of willows is still obscure.

Inasmuch as these experiments have shown that sections of a number of living trees and shrubs are stained by immersion for 4–24 hrs in a 1% aqueous solution of 2,3,5-triphenyltetrazolium chloride, that sections of twigs which have been heated are not stained, and that sections of willow are stained with exceptional rapidity, it is considered that this new application of triphenyltetrazolium chloride will be of value in determining the viability of trees, shrubs, and cuttings.

Since this laboratory is equipped and staffed primarily for chemical research, the above findings are presented in the hope that biological laboratories may find them of sufficient interest to subject the problem to systematic study.

References

1. KUHN, R., and JERCHEL, D. *Ber. dtsch. chem. Ges.,* 1941, **74–B,** 941.
2. KUHN, R., and JERCHEL, D. *Ber. dtsch. chem. Ges.,* 1941, **74–B,** 949.
3. LAKON, G. *Ber. dtsch. bot. Ges.,* 1942, **60,** 299, 434.
4. MATTSON, A. M. Master's thesis, The Pennsylvania State College, 1947.
5. MATTSON, A. M., JENSEN, C. O., and DUTCHER, R. A. *Science,* 1947, **106,** 294.
6. PECHMAN, H. V., and RUNGE, P. *Ber. dtsch. chem. Ges.,* 1894, **27,** 2920.
7. PORTER, R. H., DURRELL, M., and ROMM, H. J. *Plant Physiol.,* 1947, **22,** 149.