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This Week's Citation Classic®

Warner H L & Leopold A C. Ethylene evolution from 2-chloroethylphosphonic acid. *Plant Physiol.* 44:156-8, 1969.
[Department of Horticulture, Purdue University, Lafayette, IN]

The paper provides evidence that 2-chloroethylphosphonic acid (CEPA) breaks down in the presence of a base to form ethylene, a chloride ion, and phosphonate. The strong ethylene-mimicking response of CEPA in plants is likely due to its breakdown at cytoplasmic pH with the formation of ethylene. [The *SCI*® indicates that this paper has been cited in over 135 publications since 1969.]

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This paper developed from a conversation that one of us (A.C.L.) had with a field representative (Stanley McLaine) of the Amchem Products Company concerning a new plant growth regulator that had been developed by the firm. When the field representative described the physiological responses obtained with this compound, Leopold suggested that they sounded strikingly similar to the effects expected from applications of ethylene. Armed with a sample from Amchem, H.W. (a graduate student in the lab at the time) quickly established that, in fact, ethylene was responsible for the regulator's effects.[1] It soon became evident that the applied chemical was the source of the ethylene, as it gave up ethylene when exposed to alkaline conditions.

We then had some very helpful discussions with colleagues in the Chemistry Department at Purdue, and following their suggestions, it was easy to characterize the reaction. We had made some incorrect interpretations about the actual mechanism of the reaction, and these were subsequently corrected by S.F. Yang.[2]

It is probable that the high citation rate for this paper is due to the evidence presented that CEPA is the first plant growth regulator that produced ethylene by breaking down in the plant. This ability to yield ethylene made the regulator, subsequently named Ethephon, an extremely useful material in plant growth regulation. Our contribution was only in providing the evidence that Ethephon itself broke down to yield ethylene. Leopold's lab was not much concerned with ethylene, and the digression into the possibility that it was intrinsic to Ethephon action was a rather casual follow-up from the conversation with McLaine. In the subsequent 15 years, Ethephon has found many uses in horticulture and has been highly useful in physiological experimentation with plants. A good review of the subject can be found in Nickell's book on plant growth regulators.[3] Leopold's lab has not been involved in work with that compound since 1974.

1. **Warner H L & Leopold A C.** Plant growth regulation by stimulation of ethylene production. *BioScience* 17:722, 1967. (Cited 60 times.)
2. **Yang S F.** Ethylene evolution from 2-chloroethylphosphonic acid. *Plant Physiol.* 44:1203-4, 1969. (Cited 70 times.)
3. **Nickell L G,** ed. *Plant growth regulating chemicals.* Boca Raton, FL: CRC Press, 1983. 2 vols.

