

- haviors of the Nearctic species of *Crabro*, including observations on *C. advenus* and *C. latipes* (Hymenoptera: Sphecidae). J. New York Ent. Soc. 76:196-212.
- LECLERCQ, J. 1954. Monographie Systématique, phylogénétique et zoogéographique des Hyménoptères Crabroniens. Thèse, Fac. Sci. Univ. Liège. Lejeunia Press, 371 p.
- RAU, P. AND N. RAU. 1918. Wasp studies afield. Princeton Univ. Press, 372 p.



PHOSPHINE AS A FUMIGANT FOR GRAPEFRUIT INFESTED BY CARIBBEAN FRUIT FLY LARVAE—(Note). Citrus and other fruit infested by larvae of the Caribbean fruit fly, *Anastrepha suspensa* (Loew), must be fumigated with ethylene dibromide prior to shipment from Florida to Japan, California or Texas (A. K. Burditt, Jr. and D. L. von Windeguth; 1975, Proc. Fla. State. Hortic. Soc., 88:318).

Research on phosphine as an alternative commodity treatment has been initiated at Miami. Phosphine ( $\text{PH}_3$ ) generated from aluminum phosphide has been used for several years as a fumigant for insect pests of grain and other stored products (D. L. Lindgren and L. E. Vincent; 1966, J. Stored Prod. Res., 2:141). However, aluminum phosphide has not been used to control insect pests of fresh fruit because of possible phytotoxicity. A new formulation has been tested that involves the use of magnesium phosphide.

This paper reports the results we obtained when magnesium phosphide was used to generate phosphine gas for fumigation of grapefruit infested with Caribbean fruit fly larvae. The test fruit was placed in a large outdoor cage containing over 50,000 adult Caribbean fruit flies for 5 to 7 days. Then they were removed and held at ambient temperature until fumigated.

Fruit were fumigated on 6 dates (about 1 week apart) from July 23 through 27 August 1975. Fumigations were in a 2,000 ft<sup>3</sup> semi-trailer van. Fruit were removed at 6, 12, and 24 hr after fumigation was begun, and the surviving larvae were counted (Table 1). Mortality ranged from 74 to 100% after 6 hr, from 89 to 100% after 12 hr, and from 99 to 100% after 24 hr. Analysis of the data by probit techniques showed that 50% mortality occurred within 2 hr and 95% mortality within 11 hr. The concentration of phosphine gas in the van was determined by using Draeger® detector tubes. The maximum concentration, 300 to 600 ppm, was reached 6 to 8 hr into the fumigation period. Thereafter the concentration declined gradually to between 73 and 200 ppm by 24 hr.

Our studies of the tolerance of fresh fruit to phosphine have shown that grapefruit and avocados tolerate the treatments as applied. In preliminary tests, there were no residues of phosphine or related chemicals in fruit that had been fumigated. Phosphine therefore, may be a potential fumigant for treatment of fresh fruit and other commodities infested by Tephritid larvae. D. L. von Windeguth, A. K. Burditt, Jr. and D. H. Spalding, Subtropical Horticulture Research Unit, Agricultural Research Service, USDA, Miami, FL 33158.

This paper reports the results of research only. Mention of a product or pesticide in this paper does not constitute a recommendation for use by the U. S. Department of Agriculture nor does it imply registration under FIFRA as amended.

TABLE 1. EFFECT OF FUMIGATION WITH PHOSPHINE ON CARIBBEAN FRUIT FLY LARVAE INFESTING GRAPEFRUIT.

Date fumigated (1975)	No. larvae recovered after indicated hr*				Gas conc. (ppm PH <sub>3</sub> )	
	0	6	12	24	Max.	at 24 hr
July 23	4416	1136	469	42	300	150
July 30	372	214	13	0	475	200
August 6	79	8	0	0	600	100
August 12	1208	17	0	0	590	100
August 20	2698	0	0	0	600	100
August 27	983	66	5	0	550	73
TOTALS	9756	1441	487	42		

\*Numbers of fruit examined were: 1478 at 0 hr; 1432 at 6 hr; 1429 at 12 hr; and 1447 at 24 hr.