

The Effect of Ultraviolet Radiation Filtered Through Pyrex Glass upon Residues of Dicofol (kelthane; 1,1'-bis-(p-chlorophenyl) 2,2,2-trichloroethanol) on Apple Pomace

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Since dicofol (kelthane; 1,1'-bis-(p-chlorophenyl)-2,2,2-trichloroethanol) has been recommended for insect control on apples in California, residues could possibly be present on the apples at the time of harvest and would be found in the pomace (stems, cores, seeds and peelings) by-product of processed apples.

Specific decontamination procedures for removing dicofol contaminants from whole apples and pomace have been published (ARCHER and TOSCANO 1971, ARCHER and TOSCANO 1972, ARCHER 1973). The present investigations were undertaken to study the effect of ultraviolet light irradiation filtered through pyrex glass (> 290 nm wavelength) on dicofol residues on apple pomace in a closed system.

Methods and Materials

The description for the application of the dicofol residue on the apples has been previously published as well as the apple pulping procedure (ARCHER 1969b, ARCHER 1973). Extraction and cleanup of the plant samples has been described by ARCHER (1969a). Gas-liquid chromatography (GLC) and thin-layer chromatography (TLC) analytical procedures were employed routinely, either separately or in combination (ARCHER 1969a). All chemicals used in these studies were reagent grade. The pesticides were analytical standards; the reagent solvents were redistilled shortly before use. The irradiation vessel was a closed pyrex glass cylindrical reactor with a center well for the 8 watt GE F8T5BL ultraviolet light tube similar to the reactor described by CROSBY and TANG (1969) with the exception that the reactor was not gassed with either air or nitrogen.

Results and Discussion

As shown in Table 1, the pomace was analyzed for residues before irradiation was initiated. The dicofol residues applied were intentionally higher than normal so that any photoproducts derived during the irradiation could be detected by the analytical procedures. Only dicofol and 4,4'-dichlorobenzophenone (DBP) were detected, and although no other compounds were evident, effort was taken to detect 4,4'-dichlorobenzhydrol but none was found.

Table 1

The effect of ultraviolet light irradiation on dicofol and 4, 4'-dichlorobenzophenone residues on Red Delicious apple pomace in a closed reactor.

	Time in	Dicofol	DBP ¹	DBP ¹ as Dicofol	Total Dicofol
Sample Treatment	Days	PPM ²	PPM ²	PPM ²	PPM ²
No U.V. ³ Irradiation	0	702.5	7.8	10.9	713.4
U.V. ⁴ Irradiated	2	447.7	78.8	110.3	558.0
	4	473.6	40.0	56.0	529.6
	8	444.0	42.6	59.6	503.6
	10	414.4	44.8	62.7	477.1
	12	414.4	38.8	54.3	468.7
	15	436.6	25.5	35.7	472.3

¹DBP signifies 4,4'-dichlorobenzophenone.

²PPM expressed on a dry weight basis.

³Initial apple pomace moisture content was 40%.

⁴Irradiated with an ultraviolet light approximate spectrum of 290 nm to 400 nm so as to simulate sunlight; temperature ranged 37° to 39°C.

Since a closed reactor was utilized, only approximately 33.8% of the residues were removed from the pomace as compared to expected losses of more than 50% in open reactors. The average DBP levels increased from 1.5% to 14.9% of the total dicofol residue during the treatment period. Any loss of dicofol or DBP from the system probably occurred through small leaks or during sampling. If other compounds were present on the pomace, they were in such small concentrations as to be nondetectable by the analytical procedures employed.

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