Removal of DDT from Sweet Potato Washwater

by JOHN W. IMPSON
Extension Assistant, Pesticide Safety, Louisiana Cooperative Extension Service, Louisiana State University, Baton Rouge, La.
ERNEST A. EPPS, JR.
Professor and Chief Chemist, Feed and Fertilizer Laboratory Louisiana State University, Baton Rouge, La.
and
JOSEPH L. SMILIE
Specialist, Agricultural Engineering, Louisiana Cooperative Extension Service, Louisiana State University, Baton Rouge, La.

The sweet potato weevil (*Cylas formicarius elegantus* [Summers]) has long been a serious pest of stored sweet potatoes in southwestern Louisiana. Since 1950 stored sweet potatoes have been protected from damage from this insect by the application of about 1 ounce of 10% DDT dust per crate of sweet potatoes. The amount of DDT residue on sweet potatoes is variable but is on the order of 100 ppm on the whole potato basis.

When sweet potatoes are removed from storage, they are washed prior to grading and shipping. Residue of DDT on the washed potatoes is usually 1 ppm or less. The washwater, however, may contain enough DDT to be a danger to aquatic biota and could result in unacceptable levels in fish and other seafood.

A method for treatment of the washwater to remove DDT was devised by GADDIS and EPPS (1953). This served as a basis for the first state regulations of treatment of washwater which was being discharged from sweet potato packing sheds. In this treatment, lime was added to the washwater for coagulation and the water was passed through a settling basin to allow the floc to settle out. In this study the amount of lime added to washwater was not adjusted according to the flow rate of the washwater. The increasing concern over DDT residues in the environment and the need to calibrate the addition of lime according to flow rate of the washwater prompted a re-evaluation of this process.

Preliminary laboratory work by Epps indicated that 3 to 6 pounds of hydrated lime per thousand gallons of water and 1-hour settling time would give good DDT removal. DDT and other chlorinated hydrocarbons become bound to colloidal materials such as clay which are present in the washwater. Calcium ions cause floccutation and settling out of the clay and pesticide.

Through the courtesy of Mr. Alfred LaGrange, a sweet potato shipper, and the Louisiana Sweet Potato Commission, it was possible to conduct a full scale test of the DDT removal process. Two concrete pits, 25' x 4' x 5', were constructed in series at the LaGrange packing shed near Opelousas, Louisiana. Waste water from the packing shed was passed through a 1/4-inch mesh screen to remove roots, fragments of sweet potatoes, etc., before discharge

Bulletin of Environmental Contamination & Toxicology,
Vol. 13, No. 1 © 1975 by Springer-Verlag New York Inc.

into the first pit. The water flowed out of the opposite end of this pit through a 4-inch pipe into the second pit and was finally discharged into a roadside ditch. Flow rate from the washer was 5,000 gallons per hour giving a residence time in the pits of about 1 hour. Hydrated lime was mixed with water at the rate of 1 pound per gallon in a drum with an agitator. The lime slurry was sprayed into the wastewater prior to discharge into the first pit.

Treatments and DDT removal are shown in Table 1. Duplicate 1 quart water samples were taken. The initial water sample was taken prior to the addition of the lime slurry mixture. Another sample was taken at the exit drain of pit number two as the water was discharged into the roadside ditch.

Results of the untreated check samples were quite variable. In one case, 90% removal was effected. The amount of soil left on the sweet potato and subsequent level of the residue of DDT which was removed upon washing caused the levels of DDT residues in the washwater to fluctuate widely. From casual observation it appears that better floccutation is obtained with "dirty" sweet potatoes. Although the level of DDT removal at the 6 pound lime rate was high, the discharge still contained enough DDT to be unacceptable. Further attempts to improve removal by use of higher rates of liming and combination of lime and ferrous sulfate (1 part ferrous sulfate to 3 parts lime) gave but slight improvement.

The velocity of the water through the pits was enough to prevent settling of some of the finer floc. Installation of baffles in pit number one and a carbon filter (4" hand packed charcoal briquettes 4 x 5 feet) in pit number two gave some improvement but not enough to assure absolutely safe levels of DDT in the discharge. If reduction to less than 10 ppb is necessary, larger stilling basins or use of a filter cloth or other filter medium would be necessary.

REFERENCES

GADDIS, C. H. and E. A. EPPS, JR. Dusting Stored Sweetpotatoes to Prevent an Increase in Sweetpotato Weevil. USDA Publ. E-864, ARS, BEPO, Sept., 1953.

TABLE 1

DDT IN TREATED AND UNTREATED SWEET POTATO WASH WATER

Run	Treatment	DDT ppb		Percent Removal
		Entrance, Pit #1	Exit, Pit #2	
1	Check, no treatment	2,027	211	90
2	Check, no treatment	300	226	25
3	10 pounds lime/hour (1)	1,071	305	74
4	3 pounds lime/1000 gallons	12,495	630	95
5	6 pounds lime/1000 gallons	3,800	179	96
6	6 pounds lime/1000 gallons	6,108	192	97
7	12 pounds lime/1000 gallons	18,021	225	99
8	12 pounds lime/1000 gallons + ferrous sulfate	18,609	481	97
9	6 pounds lime/1000 gallons, baffles & filter	7,734	185	98
10	6 pounds lime/1000 gallons, filter	13,796	78	99
11	6 pounds lime/1000 gallons, filter	4,045	35	99