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Project Summary

Safe Disposal Methods for Agricultural Pesticide Wastes

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During the 3-year period from October 1976 to 1979, comprehensive chemical, biological, climatological, and engineering studies were conducted at Iowa State University, Ames, Iowa, to determine effectiveness of pesticide disposal facilities being used at the school and to compare controlled systems that might provide a basis for improvement. Evaluation of the pit disposal systems included detailed chemical sampling of the systems and their surrounding environments, identification and counts of bacterial populations, entomological studies, estimation of pesticide volatilization rates, and evaluation of pit design for efficiency, effectiveness, and convenience of operation.

This Project Summary was developed by EPA's Municipal Environmental Research Laboratory, Cincinnati, OH, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

A polyethylene-lined open pit at the Agronomy-Agricultural Engineering Research Center had been used for dumping surplus dilute pesticides, primarily herbicides, for about 14 years. In 1978, a new pit was built; it was lined with two layers of 6-ml-thick polyethylene plastic; filled with sand, soil, and gravel, and covered by a metal building. Sampling wells were installed for monitoring purposes.

To test pit disposal methods under controlled conditions, 56 polyethylene minipits, each with a capacity of 115 liters and equipped with a cover, were installed partially underground. Combinations of four herbicides (alachlor, atrazine, trifluralin, and 2,4-D) and two insecticides (carbaryl and parathion) were studied in mixtures and individually at two concentrations after being incorporated with 15 kg of soil and 55 liters of water per container. One half of the containers were aerated. For each combination of pesticide, chemical dissipation, bacterial activity, and bioassays were conducted.

A concrete pesticide disposal pit at the Horticulture Station, in operation since 1970, was systematically monitored, and the chemical disposal, accumulation, bacterial activity, and evaporation were evaluated. The inside pit dimensions are 3.35 m (width) x 8.84 m (length) x 1 m (depth). It is filled with soil and gravel layers each approximately 30 cm thick. A motorized cover triggered by rainfall closes to prevent flooding. Climatological data were collected on the site and correlated with pan and pit evaporation. Programs were developed to predict pit evaporation rates from local evaporation data. Leakage from the pit was monitored as well as pollution of a lake and well located on the station.

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Results

After 14 years of dumping dilute pesticides (primarily herbicides) in the open, polyethylene-lined pit at the Agronomy-Agricultural Engineering Research Center, the surrounding area obviously had been affected The pit was ineffective because it had overflowed, rainfall had not been excluded, and the plastic had deteriorated. A large area, free of all vegetation, was cultivated, planted with corn, soybeans, and selected weed species. Only corn grew, which indicated a high concentration of triazine compounds.

The newly constructed polyethylene-lined pit covered with a metal building appears to have a seepage problem since the water level fluctuates. Obviously two 6-ml-thick layers of plastic are inadequate regardless of the care taken in installation. In areas where the water table is high or where seepage will occur, similar systems for disposal are unsatisfactory. In colder climates, where freezing and thawing of soil occurs to a considerable depth, pit liners must be selected with extreme care.

The reinforced concrete disposal pit at the Horticulture Station appears to be completely environmentally safe and effective for pesticide waste disposal. Following 10 years' use and the disposal of over 40 different pesticides (insecticides, fungicides, herbicides, etc.), the system continues to function efficiently and no leakage has occurred Aerobic bacterial activity in the soil is highly effective in biodegrading many of the compounds. Liquids continue to evaporate with no detectable atmospheric pollution. The rainfall-activated cover functions to prevent overflowing and excludes all outside water

Evaporation and climatological data collected on the site were used to develop models for predicting evaporation at other geographic locations. During a normal season, over 6,000 gallons of water are evaporated from this pit.

A new cover design was developed to reduce initial cost and restrict access to the disposal area. All pesticide sprayers being used have been modified to permit excess liquids to be dumped into the pit without the equipment entering the pit.

After 68 weeks, of which only about 30 were conducive to active pesticide decay, data collected from residues in the micropits containing the six selecte pesticides were evaluated. The effect aeration and nutrient supplements c decay rate and bacterial and insecticid activity were measured. Those con pounds most resistant to decay wer atrazine, alachlor, and trifluralin; the were, however, contained and did n contaminate surrounding areas.

Complete methodology for all phase of research were developed and ar described in the final report.

The full report was submitted in fu fillment of Grant No. R-804533 by low State University under the sponsorshi of the U.S. Environmental Protectio Agency.

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***Charles J. Rogers** is the EPA Project Officer (see below).*
The complete report, entitled "Safe Disposal Methods for Agricultural Pesticide Wastes," (Order No. PB 81-197 584; Cost: $18.50, subject to change) will be available only from:
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