Historic, archived document

Do not assume content reflects current
scientific knowledge, policies, or practices.

420
R31
Copy 2

ARS 33-136
February 1970

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service

BIODEGRADING POULTRY EXCRETA WITH HOUSE FLY LARVAE: THE CONCEPT AND EQUIPMENT

By N. O. Morgan, Entomology Research Division, and C. C. Calvert and
R. D. Martin, Animal Husbandry Research Division

The excretion of one White Leghorn laying hen amounts to 0.25-0.40 pound per day. Therefore the daily production of 100,000 layers ranges from 12.5 to 20 tons and creates an enormous problem of disposal. Also, odors and air and water pollution are associated problems compounded by local and State legislation against transportation, the encroachment of suburbs, application of raw excreta and the expense to the egg producer.

Methods available at this time for disposal of such excreta include incineration, drying, spreading on the land, and storage in either piles or lagoons. All these methods may be unsatisfactory and may also be expensive.

Therefore biodegradation, that is, the use of natural living organisms to break down the excreta, may be a practical means of solving the difficulty. In experiments at Beltsville, Md., we are using the larva of the house fly (Musca domestica L.) to process the raw excreta of hens and to produce a fertilizer or soil conditioner and a feed supplement.^{1/}

The house fly larvae were selected for testing because they can develop in organic wastes. Fly eggs placed on fresh waste hatch within 24 hours, and the young larvae immediately begin feeding and tunneling into the medium. Then after 6-7 days the larvae migrate to a drier site where they pupate.

U. S. DEPT. OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY

FEB 27 1970

CURRENT SERIAL RECORDS

^{1/} Calvert, C. C., Martin, R. D., and Morgan, N. O. House fly pupae as food for poultry. Jour. Econ. Ent. 62:938-939. 1969.

EQUIPMENT AND APPLICATION

Our preliminary studies encouraged us to work with large quantities of excreta in a specially designed device. It consisted of two wooden boxes,^{2/} each 24 by 12 by 3 5/8 inches, mounted one on top of the other (fig. 1). The top box was divided into a center area, 22 by 9 inches, and two end sections, each 22 by 1 1/4 inches. The center section contained the poultry feces; the end sections were air vents that released the ammonia accumulating below. The floor of this box was 1/8-inch mesh hardware cloth. The bottom box was unsectioned. It had a removable tray, which was a wooden frame covered with 1/16-inch plastic-coated fiber glass screen, supported 2 3/8 inches above the solid wood floor. For best results the inside of this bottom box should be painted black.

Poultry feces were placed in the center section of the top box to a depth of 2 1/2-3 inches. Then newly laid house fly eggs were seeded onto the feces at a rate of three eggs per gram of feces. The device was placed in a room where it was kept for 7-8 days with continuous overhead light and an air temperature of 68 or 80° F. During this time the eggs hatched and the larvae developed and aerated the medium by their tunneling. By the sixth day most of them had passed through the 1/8-inch hardware cloth floor to the tray below. (The continuous light prevented the negatively phototactic fly larvae from wandering upward in search of a pupation site.) Some particles of the larval medium dropped through the hardware cloth to the fiber glass screen tray. This lower screen was sufficiently flexible to allow the vermiform larvae to wriggle through and drop to the solid floor to pupate, but very little medium passed through this screen.

USABLE PRODUCTS OF EXCRETA CONVERSION

Large quantities of poultry excreta, about 10-12 pounds, were converted from wet excreta to semidry, crumbly waste in only 8 days, and most of the pupae were separated from the medium by the larval migrations.

Additional drying and pelleting would now be all that would be necessary to prepare this biodegraded organic waste as a soil conditioner. These pellets, when watered, disintegrate rapidly and do not have the obnoxious odor of fresh excreta.

A secondary product of the biodegradation is a poultry feed supplement made from fly pupae. Preliminary evidence indicates that with a rate of seeding of fly eggs and the excreta from 100,000 hens we could produce between 500 and 1,000 pounds of pupae daily. These dried pupae were shown by Calvert and others^{1/} to be a satisfactory source of protein for growing chicks.

^{2/} Any inert material of a strength comparable to wood would be satisfactory.

Figure 1. Device used to separate negatively phototactic house fly larvae from chicken hen excreta.