phenotypic trend is the sum of the genetic and environmental trends. The phenotypic trend is almost identical to the yearly averages of the records. The environmental and phenotypic trends of the two methods are almost identical.

Table 3 shows the genetic evaluations of sires used in the herd with 10 or more progeny. The years in which each had progeny is indicated. The prediction by method 2 of the direct genetic value of sire 5 was 0 pounds. This means that his genetic ability, within the herd, for weaning weight was 0 pounds. It also means that, if he is mated randomly to the cows in the herd, the resulting weaning weights of his progeny are predicted to average 3 pounds above the average weaning weight of the progeny of a sire with a predicted genetic value of −6 pounds. The prediction by method 2 of the sire's maternal genetic value was 44 pounds. This means that the average mothering ability of the sire's daughters is predicted to be 22 pounds above the average mothering ability of the daughters of a sire with a maternal genetic evaluation of 0. Animals with high predicted genetic values should be selected to remain in the herd.

CONCLUSION

A viable procedure exists for obtaining sophisticated, within-herd genetic evaluations of beef cattle for weaning weight at considerable savings in computer time.

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LARVACIDAL AND OVIPOSITIONAL DETERRENT ACTION OF UNSLAKED LIME AGAINST THE HOUSE FLY

Odell A. Johnson and I. A. Schipper

The presence of lime in the potential house fly larval rearing medium has a twofold action against the fly. The lime discourages the female house fly from laying eggs. It also has a significant effect on reducing the number of house flies that complete development in medium with lime on or mixed into it. The addition of water such as might occur in rainfall did not significantly reduce the effectiveness of lime as a larvicide. Advantages of utilizing a nontoxic house fly oviposition inhibitor are discussed.

INTRODUCTION

Fly control in and around feedlots and dairy barns has become a serious problem because many effective but potentially hazardous chemicals have been removed from use. Several methods of population control have been proposed which include alternatives to the use of such materials. It has been demonstrated in preliminary experiments that lime spread in feedlots is an effective deterrent to foot rot. A literature search indicated that various researchers have used lime as a repellent against insects. It has been used as a repellent to the Narcissus fly (2) and on apple and pear trees to kill bark beetles (4). It has also been effective against thrips and aphids (4). Lime also acts as an ovipositional repellent against the moth *Euzaphuss* (3) and against *Rhagoletis pomonella* (Walsh), the apple maggot (1).

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EXPERIMENTAL PROCEDURE

The project was undertaken to determine possible ovipositional deterrent and larvicidal effects of lime against house flies. The house flies used in these tests had been reared for 35 generations in the laboratory on a standard CSMA larval medium. CSMA is a commercial preparation of alfalfa meal, wheat bran, and malting grains used to rear house fly larvae. The adults were fed reconstituted dry milk (fresh daily) and sugar cubes. Aged 1-day-old medium was placed in cages to induce egg deposition.

Initial tests were conducted to determine the larvicidal activity of lime by inoculating 50 eggs into 14.5 gm of CSMA. Six cartons of CSMA were utilized for each test: a control, one with lime on top of the media, and one with lime stirred into the upper 1.5 cm of CSMA. The three other cartons were treated the same but 5 cc of water was added on the third day after inoculation.

A separate investigation was conducted to determine the effect of the presence of lime on house fly oviposition. Aged CSMA medium was placed in flat-bottomed watch glasses at a depth of 0.5 cm. One glass had 1.7 gm of lime spread evenly over the surface of the medium. A second glass had the same amount of lime mixed into the medium, and a third contained only the medium. Clear watch glasses were used so that the eggs could be observed from the underside since the female lays her eggs beneath the surface of the medium. A battery of three cages was used with the same number of gravid females in each. The treatments were rotated among the cages so that the same treatment recurred every third day.

RESULTS

The results (Fig. 2) indicated a significant larval mortality related to lime distribution. Figure 2 shows the graph of the tests run and indicates the treatment and control results and represents the means of all the tests.

The least significant difference test (Table 1) of the means of the larvicidal tests indicates that there was a significant difference between the control and the treatments when lime was spread on top, mixed in, or spread on top with water added. The addition of water apparently allowed more larvae to survive the presence of lime. The graphs show a great variability in the number of flies emerging from the 50 eggs. A variety of factors could cause this: sterile eggs, handling of eggs for counting, heat or humidity changes during larval growth, mold formation in the larval medium, and heavy crust on the medium making it difficult for the adult fly to complete emergence. Three replicates utilizing levels of 4.25 gm, 0.850 gm, and 1.275 gm of lime gave similar results. Table 2 presents the results of 17 replicates of the oviposition test. In no case did the house fly female oviposit when lime was present on or mixed into the medium. The fact that in several cases the eggs were laid in a secondary location indicates that the flies were gravid but avoided the lime treatments for oviposition. Replicates were not counted if the control plate did not contain eggs or larvae. The milk feeder fitted into the top of the cage, and occasionally eggs were laid in the wet cotton. The eggs hatched and larvae would fall into the test dishes (see Fig. 1).

Table 1. Average adult emergence from 50 eggs seeded in following treatments.

Treatment	Mean Emergence
1. 10.7 gm lime on top	10.8
2. 10.7 gm lime on top + 5 cc H_2O	11.8
3. 10.7 gm lime stirred in	7.1-
4. 10.7 gm lime stirred in + 5 cc H_2O	12.4
5. Control	17.0
6. 5 cc H_2O added — no lime	13.6

LSD 5% level = 5.5*

*Least significant difference

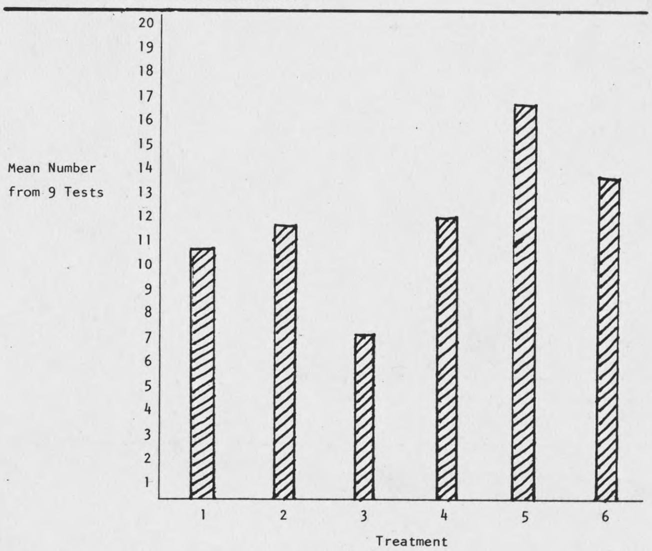
Fig. 1. Stock culture cage

A — milk feed unit
B — access door
C — oviposition unit

DISCUSSION AND SUMMARY

House fly larvae apparently do not survive the presence of lime either in or on either growing media. Lime also is an effective deterrent to egg deposition by the adult female. Lime therefore may be an excellent candidate for field testing in house fly control. Chemical control of dairy insect pests has been severely restricted due

Fig. 2. The mean number of adults emerging from 50 eggs in CSMA larval medium with lime and water treatments.



Treatment Key

1. 10.7 gm lime on top of medium
2. 10.7 gm lime plus 5 cc water
3. 10.7 gm lime stirred in
4. lime stirred in + 5 cc water
5. control
6. control plus 5 cc water

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Table 2. Number of eggs laid in oviposition deterrent test using medium as an attractant.

Test No.	Aged Medium With Lime on Top	Aged Medium With Lime Mixed In	Aged Medium Control
1	0	0	90
2	0	0	123
3	0	0	183
4	0	0	375
5	0*	0*	626
6	0	0	364
7	0	0	375
8	0	0	529
9	0	0	226
10	0	0	39
11	0	0	133
12	0	0	234
13	0	0	111
14	0	0	109
15	0	0	583
16	0	0*	58
17	0	0	107

*Larvae present from milk feeder.

to milk contamination by the insecticide or its by-products. It is apparent that restrictions will be applied to more chemicals in the future. Some other chemical means for control will become unacceptable due to resistance developed by the fly.

Larvicidal treatment by lime would be unlikely to cause flies to develop resistance since it is more an abroding physical action rather than chemical action. Results of the oviposition tests indicate that good management will be required to make this method of control practical. The house fly female will leave the preferred egg laying area with lime on it and lay her eggs in a "second best" place. The operator will then be forced to keep secondary breeding sites at a minimum. Preventive control, where eggs are not laid or where the immature forms do not become adults, is doubly effective for the house fly where the adult is the pest and the vector of disease. The reproductive potential of each adult female is so great that any interruption of egg laying is a form of control. The added benefit of a lower incidence of foot rot would be welcome bonus to the livestock producer.

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