# INTEGRATED FLY MANAGEMENT IN POULTRY HOUSES IN JAPAN

YUICHIRO TABARU
Sankyo Co., Ltd. No.7 12,Ginza 2,Tokyo,104 Japan

**Abstract**—Large modern poultry houses in Japan often experience serious fly problems. The house fly, *Musca domestica* and the lesser house fly, *Fannia canicularus* are common in poultry houses from spring through fall. The house fly can be controlled effectively using chitin inhibitors but a resistance problem has been observed when this fly is found in a windowless deep bed poultry houses. The lesser house fly, on the other hand, can be effectively controlled using paint on bait (POB) treatment. When the manure boards in deep bed poultry houses are moved to a lower position the lesser house fly is replaced as a pest by the house fly which can be dealt with effectively using diflubenzuron. A fly attractant was extracted from bamboo shoots and found to be very effective against the lesser house fly.

## INTRODUCTION

### Flies and Structure of Poultry Houses

A significant factor contributing to fly problems is that, compared to other egg producing countries, Japan is situated in a milder climatic zone, between latitudes 30 and 40 degrees North. Therefore, flies can develop for long periods in most parts of Japan. In addition the walls and ventilating windows are opened in the warmer season, and they aid fly dispersion. There are several varieties of poultry house structures and flies exist in all types of houses, except the windowless houses in which broilers are raised. The species of flies which breed in poultry houses depends primarily on the season and on the type of structure.

The lesser house fly was a minor pest species before the introduction of deep bed poultry houses in Japan (Tabaru, *et al.*,1988 a.b.). But it has now become the most pestiferous species near poultry houses because of its reduced susceptibility to larvicides and the extensive flight range of the male (Tabaru and Kobayashi,1991). A great number of male flies have been captured in private houses several kilometres away from breeding sites. On the other hand, the females do not invade the neighborhood, but stay in the poultry houses.

## RESULTS

### Control Strategies for the Lesser House Fly

Farmers are recommended to remove from the houses overwintering manure on the manure boards, to eliminate the hibernating pupae of the lesser house fly. This can result in a marked delay in the first fly outbreak of the year. Paint on baits treatment can then be applied in and around the poultry houses. The POB treatment represents a promising control strategy for the lesser house fly in deep bed poultry houses in the fly season and propetamphos and protiofos can be effective when

**Table 1.** Emergence rate of flies from fresh manure located at different heights.

| Location | *M. domestica* | *F. canicularus* |
|---|---|---|
| 7 m | — | 42.1 % |
| 5 | — | 26.4 |
| 3 | 0 | 13.3 |
| 2 | 1.5 | 7.9 |
| 1 | 7.3 | 4.2 |
| 0.5 | 17.9 | 2.8 |
| Ground | 73.3 | 3.3 |

The test manures for *Musca* were placed in a conventional poultry house and those for *Fannia* were placed in a deep bed poultry house.



Proceedings of the First International Conference on Urban Pests.
K.B. Wildey and Wm H.Robinson (editors). 1993

**Table 2.** Number of lesser house flies captured by ribbons in 60 min. before and after POB treatments in the deep bed poultry houses in Aomori prefecture.

| Ribbons | Aug 6 | Aug 8 | Aug 21 | Aug 24 | Sep 7 |
|---|---|---|---|---|---|
| A | 1280 | 188 | 982 | 18 | 42 |
| B | 1628 | 192 | 1082 | 162 | 177 |
| C | 1136 | 121 | 162 | 25 | 21 |
| D | 3760 | 486 | 452 | 104 | 156 |
| Mean | 1951 | 247 | 670 | 77 | 99 |

POB treatment was done on Aug. 7 and Aug. 22.

mixed with molasses or crude sugar. Flies in poultry houses by nature, tend to stay on the ceiling at both ends of the houses at night. Farmers are therefore asked to apply POB on the ceiling near the entrances. At the same time it has been observed that the lesser house flies lay their eggs in the manure accumulating at a higher position on the manure boards, (See Table 1). By lowering manure boards, farmers can change the fresh manure position and this leads to a change in species, to the common house fly which can be easily controlled by IGRs.

Table 2 shows the result of POB treatments in a poultry house in Aomori prefecture in 1992. A 0.25% propetamphos solution was mixed with molasses at a rate of 0.5% v/v and sprayed on the ceiling and walls at both ends of the poultry house. After two treatments of POB the fly population decreased dramatically. The same results were achieved in four poultry houses in Miyagi prefecture. Since there were few flies in the centre of the houses, the POB treatment was mainly applied to the ceiling at both ends of the houses. The POB treatment continued to be effective two weeks after spraying.

### House Fly Control using Diflubenzuron in Combination with Manure Removal

For the control of the common house fly IGRs can be used effectively in the manure, in combination with manure removal. Farmers with deep bed poultry houses with a lesser house fly problem in Niigata prefecture were advised to move manure boards to a lower position of one meter from the ground. By doing this the lesser house fly would be replaced by the house fly during the summer season and the latter species could then be easily controlled using IGRs. This repositioning of the manure boards also allowed the manure to be removed easily and conveniently using forklifts. In the fall of the previous year, house flies were abundant in two out of nine poultry houses and consequently, the farmers received complaints about flies. At the same time resistance to insecticide was measured by analysing fly colonies obtained from the same houses. The flies were shown to have developed a resistance to OPs and to some pyrethroids. The larvae of the house fly, however, were susceptible to diflubenzuron.

In those poultry houses, the farmers moved the overwintering manure in which the lesser house fly pupae hibernated in February. As a result, the number of the flies dropped to a negligible level from spring through early summer in the houses. The common house fly was then replaced by the lesser house fly from summer to fall.

Nine poultry houses were selected for the field tests. Manure on the boards and at the ground level was moved outside every 3 weeks. One week after the removal of the manure diflubenzuron was sprayed on new manures on the ground at a rate of 1g a.i. per meter square with water solution. Fly population was measured every month from spring through fall in each house by positioning fly ribbons for 60 minutes at the ends of the house. Fly population remained under 20 flies per ribbon in each of the poultry houses through the fly season of 1992, whereas there were over 100 flies in the fall of 1991.

The lesser house fly still developed from spring to early summer in the houses even if the manure boards was moved to lower position. The numbers however are negligible.

### Resistance to diflubenzuron

Since diflubenzuron was introduced in Japan in 1984, it has been used effectively throughout the country. However difficulties in controlling the house fly were experienced in a windowless poultry

house in Aichi prefecture due to multiple pesticide resistance and heavy accumulations of manure. The owner of the houses had been using OPs, pyrethroids and IGRs for an entire year because the house fly develops throughout the year in this type of house and these colonies had developed a resistance to all types of pesticides, including diflubenzuron. This was the first record of diflubenzuron resistance in a Japanese poultry house.

### Fly attractant extracted from Bamboo shoots

In 1989, large numbers of the lesser house fly were observed crowding together on broken bamboo shoots, *Phyllostachys heterocycla*, near a poultry house. An extract from the bamboo shoots, *P. heterocycla* and *P. bambusoides*, was then tested on several flies in the laboratory and in the field with particular success against the lesser house fly. When the extract was used in combination with adulticides, flies flew to the attractant and were killed. It was more effective for both genders of *Fannia* when the bait with attractant was placed in a relatively high position in the poultry house. This is a novel and unique control strategy against the lesser house fly. Table 3 shows the results of the attractant in the fields.

**Table 3.** Numbers of lesser house flies attracted by bamboo shoot extract in the field.

| Locations | Test materials | Numbers | Rate |
|---|---|---|---|
| 1.5 m | Attract + DDVP | 247 | 59.5 % |
| | Attract + Azame | 148 | 58.8 |
| | Azamethifos | 184 | 58.2 |
| 2.0 m | Attract + DDVP | 660 | 74.7 |
| | Attract + Azame | 259 | 61.8 |
| | Azamethifos | 57 | 50.9 |
| 3.0 m | Attract + DDVP | 179 | 69.3 |
| | Attract + Azame | 114 | 64.9 |
| | Azamethifos | 46 | 56.5 |

Location shows the height from the floor. Adulticides were applied to plywoods at a rate of 150 mg/m$^2$ with 10 ml extract and suspended on the wall.

## REFERENCES

**Tabaru Y.*et al* (1988):** *Animal Husbandry*,42(6): 65 68 (in Japanese)
**Tabaru Y.*et al* (1988):** *Animal Husbandry*,42(7): 56 60 (ibid)
**Tabaru Y. and Kobayashi S.(1991):** *Seikatsu to Kankyo*,36(8):106 113 (ibid)