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Survey on insecticide usage pattern against house fly (*Musca domestica* L.) population in commercial poultry farms in Namakkal region, Tamil Nadu, India

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Abstract
Fifty commercial poultry farms from different blocks of Namakkal district in Tamil Nadu, India were selected and insecticide usage pattern was surveyed by questionnaire method. The system of management followed was narrow caged poultry house in ten farms and the remaining was high rised poultry house system. Farm capacity ranged from six thousand to two lakhs birds with different age groups were maintained. The incidence of fly problem was higher during the month of March and April followed by September and October in every year in Namakkal region, which usually coincided with the onset of fruiting season and north east monsoon respectively. Disposal of manure was carried out in farms as and when the market price for manure was high and in most of the farms, the manure removal being made 2 to 3 times in a year. Out of fifty farms surveyed, insect growth regulator-cyromazine was used as larvicide in 41 farms, dichlorvos in 18 farms, malathion in 2 farms, cypermethrin in 17 farms, deltamethrin in 4 farms, neonicotinoids in 2 farms and larvend (herbal preparation) in 7 farms as single or mixed treatment. The method of application of insecticides also varied from farm to farm. The insecticides viz., dichlorvos, cypermethrin and cyromazine (IGR) were used for control of house flies in the caged layer houses. Some of the farmer, had experienced control failure in their farms when dichlorvos, cypermethrin and deltamethrin used during fly control programme, which warrants the bioassay studies of flies to assess the insecticide resistance, if any in this poultry region.

Keywords: Houseflies, insecticides, Namakkal region, Tamil Nadu, India

Introduction
House fly *Musca domestica* L. (Diptera: *Muscidae*) is a well-known pest and usually feed and breed on decaying matter, human waste and in poultry manure. Manure accumulation under the cages coupled with prevailing temperature and humidity provide an ideal environment for the breeding and development of house flies. Housefly is capable to transmit many human and animal pathogens [3]. House fly menace is a serious problem in Namakkal poultry belt in the recent years. House fly is capable to transmit many human and animal pathogens mechanically [3]. High density of flies not only cause stress to birds and farmworkers, but they can cause dirty egg, erosion of the metal cages, reduced illumination of lights, degradation of paint due to vomit drops and faecal material. Besides, during high fly season, they cause great annoyance to nearby human habitations which poses a serious public health problem. Manure accumulation under the cages coupled with prevailing temperature and humidity provide an ideal environment for the breeding and development of house flies. The farmers in this area have used various classes of insecticide to control fly population. However, they found control failure. Hence, the present investigation was taken to explore the reason control and to find out suitable solution to control fly menace.

Materials and Methods
Fifty commercial layer farms in different blocks of Namakkal district were selected to study the insecticide usage pattern practised by the farmers. A well-structured questionnaire was prepared (Annexure-I) and used to obtain data on farm size, type of rearing, frequency of manure disposal in a year, insecticides used, frequency, application level and method of application etc., by personal interview with farm owners at farm level (Fig 1). Based on the above survey, farms with continuous and / or moderate levels of fly intensity with poor

response to insecticides application were identified for bioassays studies to assess the status of insecticide resistance.

Fig 1: Personal interview with poultry farm owner on data collection

Results

In the present study, 50 farms were selected from different blocks of Namakkal district in Tamil Nadu, India and surveyed by questionnaire method. The system of management followed was narrow caged poultry house in ten farms and the remaining was high rised poultry house system (Table 1). It was observed that narrow caged house poultry farms had more fly problem than the high rised cage houses. Farm capacity ranged from six thousand to two lakhs birds with different age groups were maintained. The farmers in this belt revealed that the intensity of fly production was more in layer houses than in chick and grower sheds. The incidence of fly problem was higher during the month of March and April followed by September and October in every year in Namakkal region, which usually coincided with the onset of fruiting season and north east monsoon respectively. Disposal of manure was carried out in farms as and when the market price for manure was high and in most of the farms, the manure removal being made 2 to 3 times in a year (Table 1).

Table 1: System of management and manure removal in poultry farms

Types of housing		Frequency of manure removal per year			
High rised	Narrow caged	Once	Twice	Thrice	Four
40	10	6	26	15	3

* Numerical indicates no. of farms

House fly control in surveyed poultry farms of Namakkal region mainly depends on the use of insecticides along with manure management. The common insecticides used in these farms were organophosphate compounds (dichlorvos and malathion), synthetic pyrethroids (cypermethrin, deltamethrin and lamda-cyhalothrin), neonicotinoids (acetamiprid), insect growth regulators (cyromazine) and herbal preparations (larvend). Out of fifty farms visited, cyromazine was used as larvicide in 41 farms, dichlorvos in 18 farms, malathion in 2 farms, cypermethrin in 17 farms, deltamethrin in 4 farms, lamda-cyhalothrin in 2 farms, neonicotinoids in 2 farms and larvend in 7 farms were used as single or combined treatment depends on the fly intensity Fig. 2.

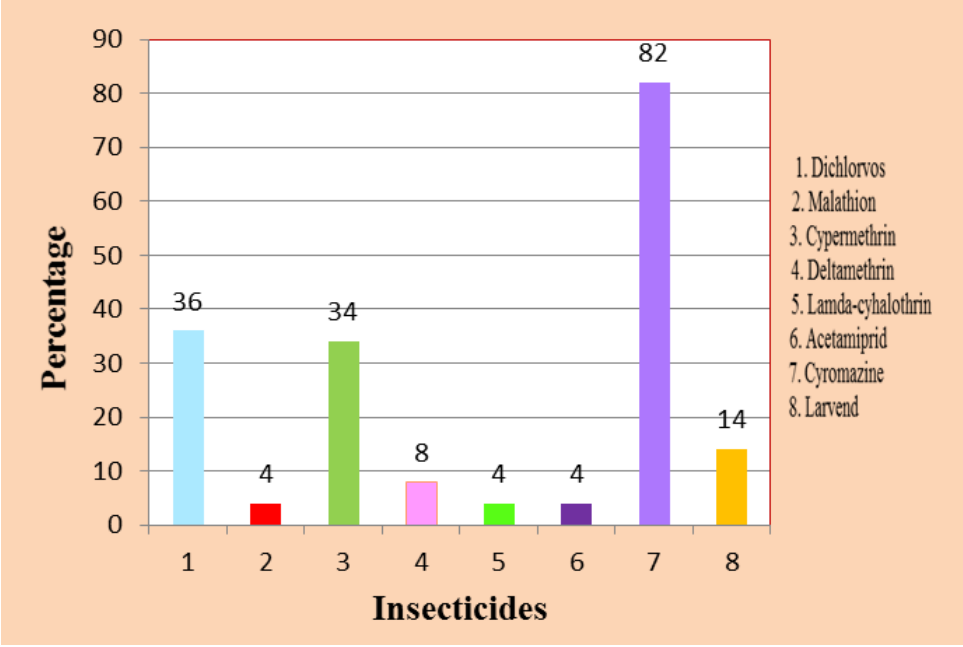

Fig 2: Insecticide usage pattern in poultry farms – Namakkal region

The method of application of insecticides also varied from farm to farm. The commonly used organophosphate viz., dichlorvos was applied directly on the fly aggregation (topical) as well as residual spray on the resting surfaces, while deltamethrin and cypermethrin applied mainly as residual spray. Acetamiprid was used as sugar bait in the farm premises to kill adult flies and spraying of herbal.

Majority of the farms used insecticides only when the fly problem noticed at moderate to higher level. During this time, insecticides were used by the farmers to control adult flies and cyromazine, insect growth regulator was regularly included as feed premix as larvicide for two to three months during the fly breeding season. The dosage and frequency of insecticide application were followed as per manufacturer's

recommendations. However, when the fly intensity exceeded the tolerance level, majority of farmers used the drugs at higher doses than the recommended dosage and frequencies were also increased. Some of the farmers had experienced the control failure in their farms when dichlorvos, cypermethrin and deltamethrin were used during fly control programme in this belt. In general, the poultry farmers in Namakkal belt had been adapted to the practice of using insecticides mostly dichlorvos and cypermethrin for adult fly control and cyromazine as feed through for larval control in the caged layer houses.

Discussion

The results of the current study on insecticide usage pattern revealed that house fly control in poultry farms of Namakkal region mainly depends on the use of insecticides along with manure management. House fly populations in Namakkal regions were exposed to a wide variety of insecticides viz., organophosphate compounds (dichlorvos and malathion), synthetic pyrethroids (cypermethrin, deltamethrin and lamda-cyhalothrin), neonicotinoids (acetamiprid), insect growth regulators (cyromazine) and herbal preparations (larvend) and most widely used insecticides were organophosphates (dichlorovos), synthetic pyrethroids (deltamethrin) and insect growth regulators (cyromazine). The similar patterns in the control of house flies mainly by using insecticides were reported in many countries [6, 12].

The poultry farmers in Namakkal belt had been adapted to the practice of using insecticides mostly dichlorvos and cypermethrin for adult fly control and cyromazine as feed through for larval control in the caged layered houses. The similar type of practice followed by their poultry farmers to control housefly menace reported [8, 4]. The organophosphates and pyrethroids have been used widely and they continue to be the most frequently used insecticides for housefly control in India [9] and also in other countries [11, 5, 1]. The insect growth regulator, cyromazine being used as feed through by farmers in this Namakkal region since 1995 for control of housefly larvae in the caged layer houses. The information collected from the poultry farmers in Argentina that, this larvicide, cyromazine had been frequently used than product label recommendations for prolonged time resulted in field control failures [1]. A survey of the impact of housefly resistance status in intensive animal units in UK revealed that, after 5 years of cyromazine application, all the 15 field populations analysed were found to be fully susceptible to this larvicide [4]. On the other hand, the monitoring program of cyromazine susceptibility developed at the Danish pest infestation laboratory indicated that, after > 10 years of intensive use in poultry farms, tolerance or low-level resistance was found among housefly populations [5].

Information collected from the farmers revealed that majority of the farms used insecticides at recommended level when the fly problem noticed at moderate to higher level. However, the fly intensity exceeded the tolerance level during the month of March and April followed by September and October in every year in Namakkal region, most of the farmers used drugs at higher doses than the recommended level with more frequencies indicating that indiscriminative use of insecticides was practiced. Some of the farmers had experienced the control failure in their farms when dichlorvos, cypermethrin and deltamethrin were used during fly control programme in this belt. This might be due to indiscriminate and extensive use of insecticides resulted in the development of resistance among housefly population in this belt. This is in accordance with Pinto and Prado and White who have reported that, the repetitive and inappropriate use of insecticides in all these classes have led to resistance in houseflies [7, 12].

The data collected in the study signifies the influence of season on fly intensity. The fly populations was higher during the month of March and April in every year in Namakkal region coincided with the onset of fruiting season and favourable environmental condition (short spell of summer rainfall) that are ideal for fly breeding and followed by the onset of north east monsoon in October and November, the fly intensity shoot up in this poultry belt. These observations are akin to the findings of Tamilam who observed that, the fly population increased whenever Namakkal district experienced an average temperature of 30 to 32 ˚C, relative humidity (> 75%) and short spells of rainfall [10]. That prevailing weather conditions (temperature and humidity) might directly influence fly breeding that leads to fluctuation in fly intensity [2]. The survey also showed that, the intensity of fly problem was more in narrow caged system than in high rised system as observed in Namakkal region [10]. This could be attributed to lack of cross ventilation in narrow cage system and availability of ideal substrate (wet manure) for oviposition and development of larval stages help them to proliferate exponentially in a short period of time.

Conclusion

Housefly control in surveyed poultry farms of Namakkal region mainly depends on the use of insecticides along with manure management in organised farms. The common insecticides used in these farms were organophosphate compounds (dichlorvos and malathion), synthetic pyrethroids (cypermethrin, deltamethrin and lamda-cyhalothrin), neonicotinoids (acetamiprid), insect growth regulators (cyromazine) and herbal preparations (larvend). In general, the poultry farmers in Namakkal belt had been adapted to the practice of using insecticides mostly dichlorvos and cypermethrin for adult fly control and cyromazine as feed through for larval control in the caged layer houses.

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