THE RELATION BETWEEN MICROHABITAT CONDITIONS AND RELATIVE FLEA DENSITY IN HOUSES OF AN EGYPTIAN VILLAGE

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INTRODUCTION

In Egypt, most studies on fleas were directed to the collection and identification of fleas associated with wild and domestic animals especially rodents. As far as we could know, from the available literature, few studies (among them are Sofi, 1980, Abd El-Ghaffar *et al.*, 1985 and Shalaby *et al.*, 1990) were carried out on the ecology of house hold fleas.

Most fleas are neither strictly host parasites as lice nor strictly nest parasites as bedbugs. The nests or lairs of the host are the normal breeding places and are the homes of the eggs, larvae, and pupae; frequently adults are found in them too. The relative density of fleas, on hosts and in the nests, are markedly influenced by microclimate (Lewis, 1993) and microhabitat conditions. On the basis of the important role which may be played by microhabitat conditions on flea index in a particular place, it was found necessary to carry out this study to explore the relation between microhabitat elements and flea density in an Egyptian village so that in construction of new houses and in designing of new villages, conditions favoring flea breeding could be minimized.

MATERIAL AND METHODS

The study was carried out in Imiay village, which lies 10 Kms west of Benha city, Qaluobiya Governorate, Egypt. The village has an area of about 7 Sq. Kms and a population of about 14,000 (1986 census). Imiay represents

the typical Egyptian village, where most houses are built of mud and surrounded by agricultural fields. Animal rooms or stables (usually inside houses) were distributed. Most inhabitants are villagers, there is a regular movement by a lot of people from the village to Benha city (capital of the Governorate) for merketng, education, entertainment,... and other purposes.

The relative density of fleas was measured in houses with different microhabitat conditions throughout the period from April, 1992 to March, 1993 using the light tray described by Klionzo, (1977) with minor modifications. It consists of a plastic white enamel pan (22 x 15 x 5 cm), half filled with water containing 10 gms of a house hold detergent. A small kerosene lamp was placed in the middle of the pan as a weak source of light. One trap was placed overnight in the middle of each bed room, the traps were collected early in the morning and drowned fleas were collected using a paint brush, placed in a sample tube half filled with 70% alcohol. On reaching the laboratory, fleas collected/trap/night were poured in a petri dish, examined, counted and recorded.

The microhabitat conditions studied :

1. *Floor nature* : 14 houses were selected; 6 of them with dusty ground floor, 5 with cement floor and the other 3 were tiled.
2. *Presence of pets (dogs and/or cats)* : 6 houses were selected, 2 of them with permanent pets, 2 with temporary pets and the other 2 houses without pets.
3. *Illumination* : 7 houses were selected, 3 of them were shaded, 2 were semi-shaded and the other 2 were exposd to the sun.
4. *Cleaning level of the house* : 3 houses were selected, one of them (high level) with a daily regular cleaning, the second house (moderate level) was usually left without cleaning for 2 or 3 days, and the third house (low level) was usually left without any cleaning for a long period.
5. *Floor height* : 2 houses were selected, one of them is at the first and the other is at the second floor.
6. *Number of inhabitants/room* : 3 houses were selected, one of them with one inhabitant/room, the second house with 4 inhabitants/room and the third house with 6 inhabitants/room.

All houses selcted for the study of each condition were relatively similar to each other.

RESULTS AND DISCUSSION

1. *Floor nature :*

High significant difference ($P > 0.01$) was found between flea densities in the three types of houses, (Fig. 1). The highest density of fleas was found in houses with dusty floor, followed by houses with cement floor, whereas comparatively very low number of fleas was found in houses with tiled floor. Due to the difficulty of its cleaning, houses with dusty ground usually contain rubbish, debris in addition to dust. Places containing these materials are usually selected for egg laying by females (Roy and Brown, 1970), and are suitable for immature breeding. Yamatsu (1952), reported a successful breeding of flea larvae in a medium of dust from beneath straw and mats. This may explain the high abundance of fleas in houses with dusty floor. Cement floor contains a rough surface, and so interspaces are usually filled with dust and larval food. Again this may explain the moderate density of fleas in houses with cement floor, whereas houses with tiled floor are easily cleaned and so are unsuitable for egg laying or breeding of immature stages; the presence of fleas in these houses may be largely due to transmission from the outside by the house inhabitants or visitors. It may be concluded that, the population must be advised to tile the floor of their houses at the same time, flea control programs must be directed firstly to houses with dusty and cement floor as these places usually contain the highest densities of fleas.

2. *Presence of pets (dogs and/or cats)*

Results of the present investigation (Fig. 2) indicated that houses containirg pets had higher density of fleas than those without pets ($P > 0.01$).

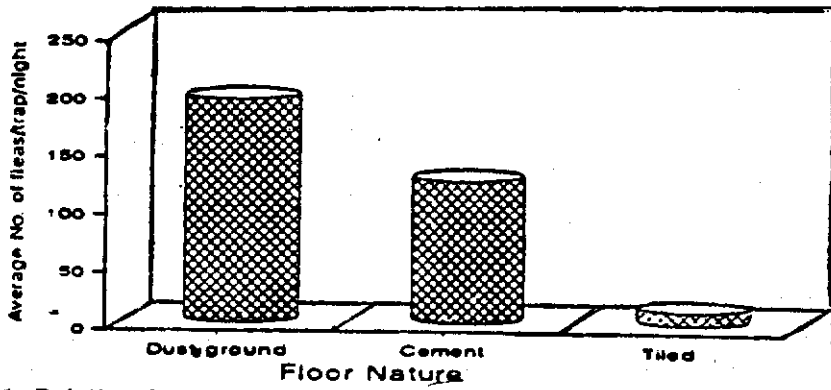

Fig. 1. Relative density* of fleas in houses with different floor nature in Imiay village, Qaloubiya Governorate, Egypt, throughout the period from April, 1992 to March, 1993 using light traps.

The presence of pets may increase the density of fleas because larvae and adult fleas are sometimes found in the fur of dirty pets as dogs and cats (Lewis, 1993). Infected animals may carry fleas into houses and/or provide a blood meal source. At the same time, houses with permanent pets contained lower density of fleas than those with temporary pets. This may be due to the continuous movement of temporary pets between outdoor and indoor of houses which may increase their potentiality in transmitting fleas to houses. It may be concluded that the presence of pets inside houses is not recommended and must be decreased to the lowest level or even prevented as these pets may transmit fleas to the house, provide a blood meal source for fleas and it may serve as a reservoir host for disease agents.

3. *Illumination*

It seems that, sun light greatly affect the density of house hold fleas (Fig. 3). The highest densities of fleas were recorded in semishaded (47.9 fleas/trap/night) and shaded houses (46.9 fleas/trap/night), whereas the lowest density of fleas was recorded in sunny houses (16.4 fleas/trap/night). This may be due to a direct effect of sunlight on fleas which are negatively attracted to sunlight during larval and adult stages. At the same time, female usually selects dark places for oviposition and larvae are rapidly killed when exposed

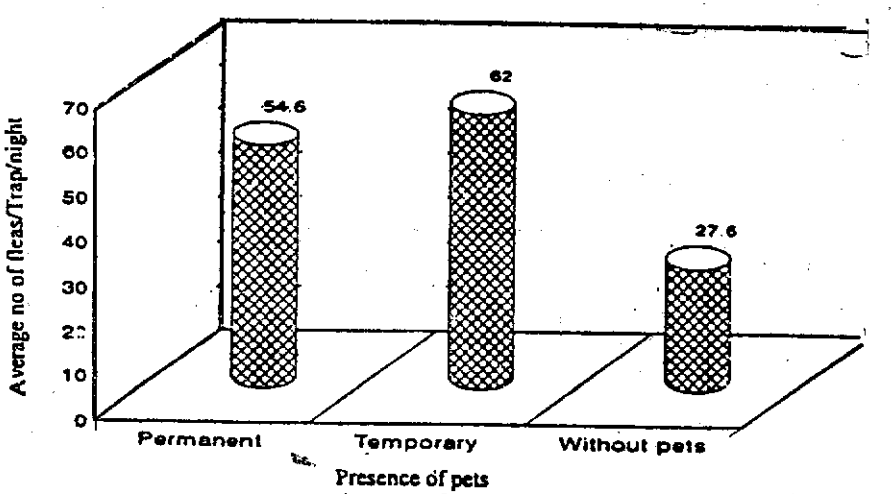

Fig. 2. Relative density* of fleas in relation to the presence of pets (dogs and/or cats) in houses of Imiay village, Qaluobiya Governorate, Egypt, throughout the period from April, 1992 to March, 1993 using light traps.

* In Figs 1 & 2 the relative density of fleas was measured on weakly basis throughout the period of study i.e. Average of 48 sampling time/house.

to direct sunlight (Roy and Brown, 1970). Sun light may also affect other elements of flea microenvironment as temperature, R.H., nature and composition of larval food. Sun rays may also eradicate a considerable population of microorganisms in the breeding medium of larvae; these microorganisms may provide essential vitamins or any other growth medium for flea larvae. In construction of new houses and in designing of new villages it may be recommended that all houses must be designed so as to permit sunlight to cover the greatest area of the house.

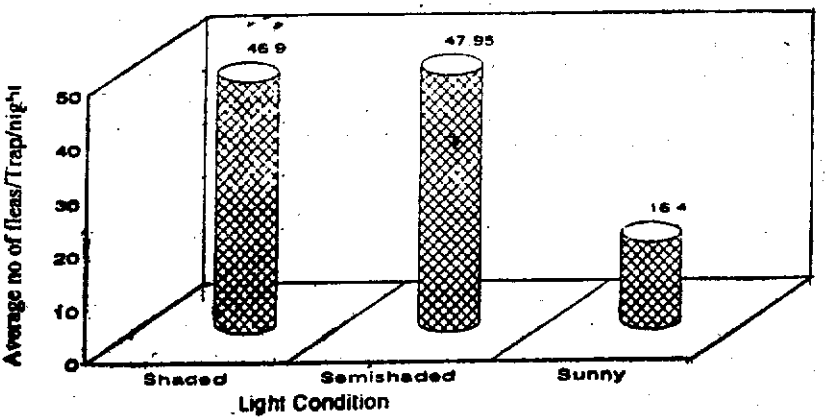

Fig. 3. Relative density* of fleas in houses with different illumination in Imiay village, Qaloubiya Governorate, Egypt, throughout the period from April, 1992 to March, 1993 using light traps.

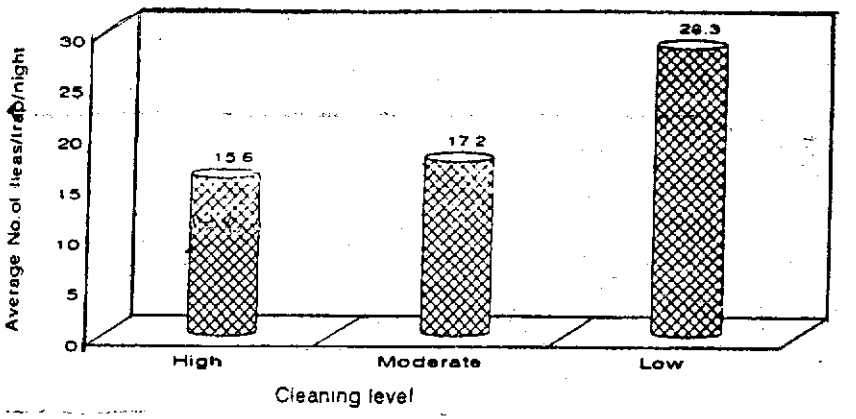

Fig. 4. Relative density* of fleas in houses with different cleaning levels in Imiay village, Qaloubiya Governorate, Egypt, throughout the period from April, 1992 to March, 1993 using light traps.

* The relative density of fleas was measured on weakly basis throughout the period of study i.e. Average of 48 sampling time/house.

4. *Cleaning level*

The cleaning level of the house may play an important role in determining the population density of fleas inside houses. The present results (Fig. 4) indicated that houses with low level of cleaning contained higher density of fleas than those with high cleaning level. This may be attributed to the act of cleaning itself which may remove dust and dirt containing immature stages or favouring flea breeding. The small difference observed between densities of fleas in houses with high and moderate cleaning levels may be explained by that, cleaning in case of houses with moderate cleaning level is usually carried out at intervals of 2 - 3 days which is not enough time to permit a complete life cycle of the flea population. It may be recommended that, houses must be cleaned at regular intervals not exceeding the duration time of immature stages of fleas.

5. *Floor height*

The results in Fig., (5) show that the density of fleas observed in the first floor (32.6 fleas/trap/night) was higher than those of the second floor. This may be due to that villagers usually spend most of their time, receive their visitors and raise animals and pets in the first floor. Also the presence of this floor in close proximity of the street makes it receives a higher population of fleas.

6. *Number of inhabitants*

A significant difference ($P > 0.05$) was found between the density of fleas in crowded houses (6 inhabitants/room) and houses containing 1 or 4 inhabitants/room (Fig., 6). This may be due to a direct relation between the

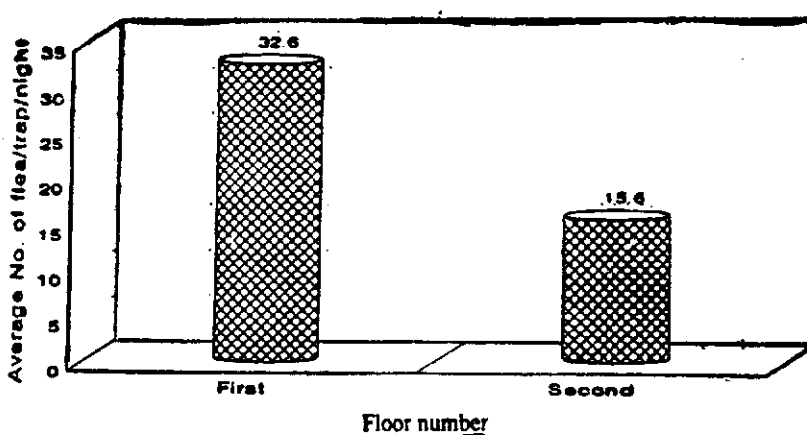

Fig. 5. Relative density* of fleas in the first and second floor in houses of Imiay village, Qaloubiya Governorate, Egypt, throughout the period from April, 1992 to March, 1993 using light traps.

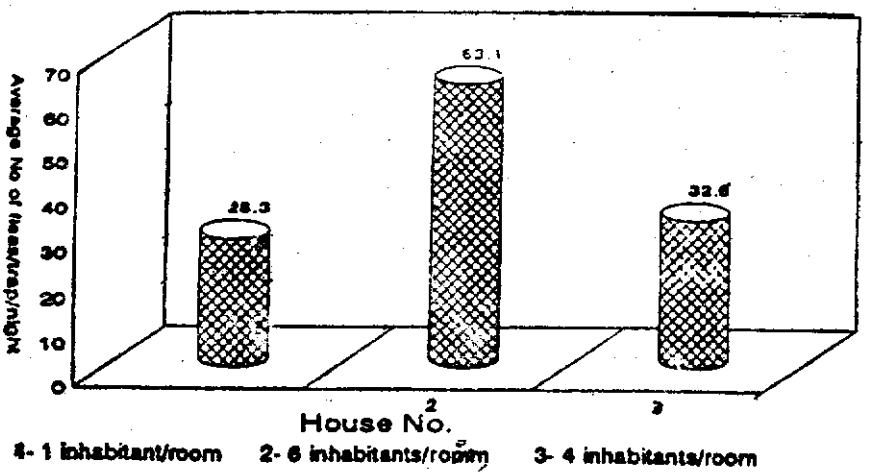

Fig. 6. Relative density* of fleas in houses with different number of inhabitants in Imiay village, Qaluobya Governorate, Egypt, throughout the period from April, 1992 to March, 1993 using light traps.

* In Figs 5 & 6 the relative density of fleas was measured on weekly basis throughout the period of study i.e. Average of 48 sampling time/house.

number of flea hosts prevailed and the number of fleas inhabiting a place. At the same time high number of inhabitants usually receive more visitors and hence more fleas from the outside.

SUMMARY

The relative density of fleas was measured in 35 houses of diversed conditions in Imiay village, Qaluobiya Governorate, Egypt, throughout the period from April, 1992 to March, 1993 using the light tray traps. The relative density of fleas were higher in houses containing pets and characterized by dusty floor, low level of cleaning, reduced illumination and crowded population. The relative density of fleas in the first floor was significantly higher than that of the second floor.

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