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Responses of House Fly, *Musca domestica* L. to a Baiting System

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ABSTRACT

Responses of house fly, *Musca domestica* L. to different colored strips and non insecticide baits were studied. Flies were attracted to black and green strips more than other strips. Non-insecticide bait (a mixture of blood, sugar, honey, dried yeast and baking powder) was comparable to one that contained few drops of methomyl in the bait at different time points over a period of 24 h.

Key Words: House fly; Baiting system; *Musca domestica*

INTRODUCTION

House fly (*Musca domestica* L.) is well known for its pestiferous activities of being the vector of many human diseases such as gastroenteritis, cholera, typhoid, dysentery, diarrhea and peptic ulcer (Li-Shineng & Sutzenberger, 2000). Control of this important pest has been dependent upon insecticides since long, but house fly has developed resistance to almost all types of insecticide groups and it is now a global problem (Phillip *et al*., 2001). The insecticides are applied in the form of surface sprays, baits, aerosols and wet sprays (Mabbet, 1996). For good and all, integrated pest management of house fly has been advocated and, many studies have shown that house fly could best be controlled with integration of cultural, biological, chemical and physical methods. For example, sticky papers and attractant have been used for the control of house fly (Ye-ZongMao *et al*., 1991). Likewise, biocontrol agents have given satisfactory results (Crespo *et al*., 1998).

Baiting with and without insecticides is recommended a good choice for the treatment of house fly (Tajuddin, 1993; Hogsette *et al.,* 2002). In a baiting system, color of background play an important role to attract the house fly, therefore, many colored lights are being used (Grutzmacher & Nakano, 1997). A number of non-insecticide baits using readily available materials such as crushed wheat; wax, sucrose blood serum and dried yeast have been developed for this purpose (Chirico, 1998). There is no information on the use of non-insecticide baits for the suppression of house fly in Pakistan. The present studies focused on a bait, comprising blood, baking powder, honey, sugar and dried yeast. The color attraction was also studied for proper utilization of such bait material.

MATERIALS AND METHODS

House fly was reared on room temperature in the Eco-toxicology Laboratory, University of Agriculture, Faisalabad, according to procedure developed by Ahmed *et al*. (1998). Different color strips of ribbon (8 cm^2) were used for attraction study. A batch of 100 house fly individuals (3 days after emergence) was released in a cage and this was replicated thrice. The number of flies congregating on the ribbon strips were monitored at 4 h intervals starting from 0 to 24 h. Sugar coated strips were hung as an attractant and behavioural response to the color strips were noted. The comparison of mean number of flies was done by One Way ANOVA at 5% level of probability.

Non-insecticide bait was a mixture of blood (14%), sugar (37%), honey (5%), baking powder (37%), dried yeast (4%) in 100 g bait with distilled water. This bait was divided into solid with composition described above and wet bait was formulated with same composition of ingredients but 1:2 (w/v) with water. Bait with insecticide contained some drops of 0.1% methomyl in water. Bait was placed in Petri dishes and mortality data were taken at 4, 8, 12, 16, 20, 24 h after release of a batch of 100 flies in a cage. The comparison of mean number of flies was done by One Way ANOVA at 5% level of probability.

RESULTS

Black red, blue yellow and orange colors had non-significant differences among themselves, but these were significantly different from other colored strips. White strip showed minimum number of house fly attracted at 4 h after release in the cage (Table I). At 12 h, black colour strips had maximum number of flies (26) and were significantly different from other color strips; whereas, white again attracted the least number of flies (11.3). At 16 h, red, white, sky blue and yellow had non-significant difference among themselves, while significant difference were observed when these were compared with green and blue color strips. Minimum number of flies was attracted to white colored strips (9.7); whereas, maximum was black (28). At 20 h, black and green color strips showed non-significant difference between each other but they had significant difference from other strips. White and sky blue had non-

significant difference between each other. At 24 h, non-significant difference was observed between black and green color strips when no coating of sugar was done on colored strips (Table I).

Table II shows the sugarcoated strips of ribbon and number of flies attracted to these strips. At 4 h, green strips had maximum number of flies (18.3) and was statistically at par with orange (17.7), yellow (15) and dark blue (15.3). White strips had minimum number of flies (9.7). After 8 h, black, green and blue had non-significant difference among them but had significant difference when compared with other strips. At 12 h, dark blue strips had significant difference from all strips; white and sky blue had non-significant difference among them. At 16 h, green strips showed significant difference from other strips. Blue and black had non-significant difference between each other. Red strips harboured minimum number flies. At 24 h, black and green strips showed significant difference from other strips. Green and white had maximum and minimum number of flies attracted, i.e., 42 and 10.7, respectively.

Table III shows the response of flies to different baits at various time points. At 4, 8, 12 and 16 h, solid and wet baits, though having non-significant difference between each other, had significant difference from one having drops of methomyl. At 20 and 24 h, solid and bait with methomyl had non-significant difference between each other.

DISCUSSION

Response of house fly to colored strips, papers and cards has been practiced for a long time to understand the components of baiting system. Black color was generally thought to attract more flies than others do but there are chances that flies may attract to white color in contrast too. Behaviour of flies may also vary at different time points as normally seen that at night, flies congregate at the white rope, piece of cloth (Grutzmacher & Nakano, 1997). Sugarcoated strips were used to determine the length of time spent by flies on a strip. Black strips did attract flies with and without sugarcoating on the strips; nevertheless, green

Table I. Mean number of flies attracted to different colour strips without coating of sugar solution at different time points

Colour Strips	Time points					
	4 hrs	8 hrs	12 hrs	16 hrs	20 hrs	24 hrs
Black	13.3±1.2 ab	18±1.5a	26.3±0.9a	28±1.9e	34.7±1.5a	36.7±3.5a
Red	10.7±1.7ab	14±0.6b	17.7±2cde	12±1.1c	14±2.6cd	13.9±0.9de
White	7.3±0.8c	12±0.6bc	11.7±1.2de	9.7±1.2c	10.7±0.7d	9.3±1.4e
Green	14±0.6a	19.7±0.9a	19±2.5bc	38.6±1.9a	39.7±2.6a	35±2.5a
Sky blue	10.3±0.9c	9.6±0.7c	10.7±0.9e	14±0.6c	12.5±1.2cd	12.3±0.9de
Dark Blue	12.3±0.9ab	17.7±1.2a	22.3±2.2ab	30.7±1.4b	27.7±1.4b	25±1.1b
Yellow	12.7±0.9ab	10.3±0.9c	17±1.5cd	13.7±1.4c	17.3±1.4c	17.7±1.4cd
Orange	12.7±1.4ab	10.7±1.8bc	12±1.1de	13.7±2.2c	17.7±1.4c	20.3±2.7bc

Values are means±SE. Means with same letters in a column are not significantly different among one another at ∝=0.05.

Table II. Mean number of flies attracted to different colour strips with coating of sugar solution at different time points

Colour Strips	Time points					
	4 hrs	8 hrs	12 hrs	16 hrs	20 hrs	24 hrs
Black	13±1.1cd	23.3±1.8a	23.7±1.4b	32±2b	38±1.5a	38.7±1.9a
Red	11.3±1.4cd	15±1.7b	15.3±2de	11.3±1.4d	13±2.3d	13±1.6de
White	9.7±1.4d	13.3±1.8b	12±1.7e	16.7±2.4cd	16.3±1.4cd	10.7±1.7e
Green	18.3±2a	21.3±1.9a	20.7±2.7ab	45±3.5a	37±1.73a	42±1.5a
Sky blue	11.3±0.3c	14.7±1.2b	11±1.5e	15.7±1.9cd	14.7±2cd	18.3±1.7c
Dark Blue	15.3±1.4abc	20±1.1a	34±2.3a	33±1.5b	27.7±1.4b	28±1.7b
Yellow	15±1.5bc	12.3±0.9b	14.7±2.2cde	19.7±1.9c	17.5±1.5cd	18.6±2c
Orange	17.7±1.7ab	11.7±1.4b	20±1.1cd	20±1.5c	20±1.1c	17±1.1cd

Values are means±SE. Means with same letters in a column are not significantly different among one another at ∝=0.05.

Table III. Mean number of flies dieing at different time intervals on different baits

Baits	Time points					
	4 hrs	8 hrs	12 hrs	16 hrs	20 hrs	24 hrs
Solid Bait	17±1.1b	35.3±1.2b	56.7±0.9b	76.3±1.2b	90.6±0.9a	99.3±0.3a
Wet Bait	15.3±0.9b	32.3±1.2b	58±0.9b	76.3±1.4b	81.7±1.4b	92.7±1.4b
Bait + methomyl	39±1.1a	66±1.1a	79±1.5a	88.5±0.9a	94±0.6a	100±0.0a

Value are means±SE. Means sharing same letter in a column are not significantly different at ∝=0.05.

strips were favoured when coated with 10% sugar solution. White strips in both cases attracted less number of flies.

Development of non-insecticide baits for households is very important component of IPM for house fly, because house fly has ability to resist chemicals tested for routine toxicological studies. On the other hand, insecticides as residual sprays may pose a problem for children and may lead invisible poisoning. Baiting with safer chemicals /materials is a choice for abatement of house fly (Crespo *et al*., 1998; Hogsette *et al*., 2002). Sugar cubes were provided to flies to remove the chances of flies dieing with hunger. The mortality of flies occurred in the presence of sugar cubes in solid and liquid baits. In another study, the blood was replaced with chicken's dried liver powder. The results were not very contrasting than those presented here (results not shown). Further investigations are needed to improve and add the materials readily available for the environmental safer control of house fly.

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