

COMPARISON OF THE EFFECTIVENESS OF BAITS USED IN TRAPS FOR ADULT FLY COLLECTION

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Abstract. The effectiveness of 6 different baits used in fly traps for adult fly collection was compared in October-November, 2000, near the cafeteria of Maharaj Nakhon Chiang Mai Hospital, Chiang Mai Province, northern Thailand. The baits used were fresh viscera (pork, beef and fish) and fresh meat (pork, beef and fish), with 500 g of each kind being used in each fly trap for each experiment. All were replicated four times. Pork viscera yielded the highest effectiveness (35.2%), followed by fish meat (30%). Four other kinds of bait showed relatively low efficiency, *ie* fish viscera (12.0%), beef viscera (9.0%), pork meat (8.4%) and beef meat (5.4%). The calliphorid *Chrysomya megacephala* was the most abundant fly species collected, while sarcophagids and muscid flies were found in much smaller numbers. The number of females was higher than males in all collections. Although all baits used were parts of animal carcasses that were very attractive for adult flies to feed upon and oviposit, the result of this study showed the differences in their effectiveness for fly collection, particularly during the late rainy season to early winter in Chiang Mai. Pork viscera showed the highest efficacy for metallic fly collection, but not for all species. Further study of suitable baits for the medically important fly species that exist in urban areas should, therefore, be performed.

INTRODUCTION

Dipteran flies, particularly of the Calliphoridae, Muscidae and Sarcophagidae families are medically important insects worldwide. They are annoying, cause myiasis and/or transmit several pathogens to humans. In Thailand, many fly species have been reported as causes of several cases of myiasis (Kruatrachu and Chinachoti 1957; Papasarathorn and Piyarasana 1962; Papasarathorn *et al*, 1967; Sucharit *et al*, 1981). Besides, such species as the blow fly *Chrysomya megacephala* (Calliphoridae) and the house fly *Musca domestica* (Muscidae) have been reported as mechanical carriers of several bacterial pathogens (Echeverria *et al*, 1983; Sukontason *et al*, 2000a,b). As for medically-important flies in combination with the rapid proliferation of fly populations, the urgent control of flies is imperative, particularly during epidemics of some diseases that they cause.

Bait-trapping appears to be a generally useful way of studying fly populations (Norris, 1965), and has been used for the study of several fly species (Parker and Welch 1991; Ashworth and Wall 1994; Pickens *et al*, 1994; Mihok *et al*, 1995; Chapman *et al*, 1999). The advantages include simple and inexpensive materials, which are available everywhere. Bait traps have no chemical reagents, do not harm the environment, and can be used both for short- and long-term control. To successfully use this method, a suitable bait must be employed in the trap to attract the adult fly population. The purpose of this study was to conduct a preliminary test to compare the effectiveness of baits used in traps to collect the two most abundant fly species in Chiang Mai, *C. megacephala* and *M. domestica*.

MATERIALS AND METHODS

The study was conducted during the period October - November 2000, near the cafeteria of Maharaj Nakhon Chiang Mai Hospital, Chiang Mai Province, northern Thailand. The baits used were fresh viscera [pork (*Sus scrofa*), beef (*Bos*

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indicus) and fish (*Tilapia nilotica*) and fresh meat (pork, beef and fish), with 500 g of each kind being used in each trap for each experiment. All were replicated four times. Six fly traps (50x50x50 cm) were placed in a single row approximately 2 m above the ground. The bait used in each trap was randomized for each experiment, which lasted 24 hours for adult fly collection. A large black plastic bag was used to plug the hole of each trap to prevent the flies from escaping, and the traps were transported to the laboratory of the Department of Parasitology, Faculty of Medicine, Chiang Mai University. All traps were placed in a large refrigerator set at 4°C for 30 minutes to anesthetize the flies. The flies from each trap were placed separately into individual transparent plastic bags, which were closed using rubber bands, and the insects were killed by placing the bags into a freezer set at -70°C. All flies were identified using the taxonomic keys of Tumrasvin and Shinonaga (1978) and Kurahashi *et al* (1997). They were also counted and sexed.

RESULTS

Of a total of 1,294 flies collected, at least three families of the Diptera were found; Calliphoridae, Sarcophagidae and Muscidae, together with unidentified species, with Calliphoridae being the majority (96.5%; 1,249/1,294) (Table 1). Of these blow flies, *Chrysomya megacephala* was the most prominent species found (n=1,246), while *Chrysomya rufifacies* was the rarest (n=3). Adult sarcophagid flies could not be identified to a species level, whereas all of the Muscidae were *Musca domestica*, the common house fly.

Table 1
Number and families of flies collected using a fly-trap in Chiang Mai from October to November, 2000.

| Family | Number | (%) |
|---------------|--------|---------|
| Calliphoridae | 1,249 | (96.5) |
| Sarcophagidae | 20 | (1.5) |
| Muscidae | 18 | (1.4) |
| Unknown | 7 | (0.6) |
| Total | 1,294 | (100.0) |

Table 2
Number of *Chrysomya megacephala* collected using different baits in a fly-trap in Chiang Mai from October to November, 2000.

| Bait | Number | (%) |
|--------------|--------|---------|
| Pork viscera | 439 | (35.2) |
| Fresh fish | 374 | (30.0) |
| Fish viscera | 150 | (12.0) |
| Beef viscera | 112 | (9.0) |
| Fresh pork | 105 | (8.4) |
| Fresh beef | 66 | (5.4) |
| Total | 1,246 | (100.0) |

As for the majority of *C. megacephala* in these collections, a comparison was made regarding this species' attraction to the six kinds of bait used. Table 2 shows that pork viscera produced the highest attraction (35.2%; 439/1,246), followed by fresh fish (30.0%). The attraction to the remainder of the baits was fish viscera (12.0%), beef viscera (9.0%), fresh pork (8.4%) and beef (5.4%). More females were collected than males in all collections (data not shown).

DISCUSSION

C. megacephala formed the majority of all flies collected using six kinds of meat as bait. The adults of this species were attracted to different foods, *eg* human food, human corpse, animal feces and carrion (Norris, 1965; Zumpt, 1965; Smith, 1986). Sucharit *et al* (1976) suggested that *Chrysomya* is found on high-protein food, and a similar conclusion was contributed by Daengharn *et al* (1998). In this study, although all baits used constituted a high-protein content, pork viscera was the most effective. Fresh fish gave inferior results when used as a bait for adult flies by several investigators (Sucharit *et al*, 1976; Wells, 1991). Similarly, mashed fish was highly attractive to the larvae of *C. megacephala* (d'Almeida and Salviano, 1996). In contrast, very few sarcophagid flies were collected in this study. This was probably due to the baits being incapable of attracting sarcophagids, which usually prefer carrion (Smith, 1986). Moreover, the low number of offspring produced by each female (Zumpt, 1965)

and/or the minor adult fly populations in this given area resulted in relatively few flies being collected. A similar number of muscids, particularly *M. domestica*, was obtained. The low-protein food preferred by *M. domestica* (Sucharit *et al*, 1976) was most likely the appropriate explanation. A mixture of cooked rice and chicken was reported as the most effective bait for this species (Pickens *et al*, 1994).

This study suggested that wind direction should be considered, to increase the collection in the traps baited with pork viscera and fresh fish, more than in the others. Blow flies come upwind in response to odor (Norris, 1965), which they perceive via the olfactory receptors. Studies of the blow fly, *Lucilia sericata*, (Wall and Smith, 1996) indicated that the strength of responses to visual cues is weak in relation to smell, which is attained by the antennal receptors (DeVaney *et al*, 1970; Greenberg, 1970). Greenberg (1970) provided the apparent morphology of such structures detected at the pedicel or second antennal segment using scanning electron microscopy.

Surveys of medically important flies in urban areas of Thailand indicated that *M. domestica* and *C. megacephala* were the two most abundant fly species (Sucharit *et al*, 1976; Tumrasvin *et al*, 1978; Sucharit and Tumrasvin, 1981). They have a remarkable capacity as mechanical carriers of several bacterial pathogens in Thailand (Echeverria *et al*, 1983; Sukontason *et al*, 2000a:b), which leads to the need for a control program for these eusynanthropic flies. The result of this study provided information about the efficacy of several kinds of bait, enabling practical control and helping public health practitioners to make decisions regarding the availability of baits for fly control strategy.

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