Effectiveness of augmenting biological control agents of house flies with commercially-reared material on a dairy in Comanche, Comanche County Texas 2003

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Purpose: 1) determine the effectiveness of parasitoid wasps for suppressing house flies, 2) determine wasp species present on dairies.

Introduction

Biological control is the use of parasitoids, predators, pathogens, antagonist, or competitor populations to suppress a pest population, making it less abundant and thus less damaging than it would otherwise be (Van Driesche and Bellow 1996). A common practice used to suppress house fly, *Musca domestica* L., populations associated with confined animal facilities (CAFO), such as dairies, is the purchase and mass release of fly parasitoids. Parasitoids used to suppress house flies are typically wasps that will lay single or multiple eggs in the pupal stage of the fly. The parasite eggs then hatch and the resulting maggot will feed on the developing house fly thereby killing it. This method, in conjunction with a active integrated pest management program, can be useful for suppressing house fly numbers. We conducted a study to determine the efficacy of augmenting parasitoids on dairies to suppress house flies.

Materials and Methods: Augmentation to suppress house flies. Two dairies were examined in Comanche County, Texas for house fly pupal parasitoids. Dairy (A) has been receiving approximately 25,000 parasitized house fly pupae per week from a

commercial insectary for more than a year. Dairy (B) does not augment house fly parasitoids. From 3 July through 11 August two sampling methods (placing sentinel pupae in the field versus sampling wild house fly pupae) were used at each dairy to address the following objectives:

1. Determine effective method for sampling house fly pupal parasitoids.
2. Determine rate of parasitism of house fly pupae on a dairy with a biological control program versus one without such a program.
3. Determine parasitoid species present at each dairy.

Both sampling methods were used at each dairy. Method one used irradiated sentinel house fly pupae supplied by Dr. Chris Geden at the USDA, ARS, CMAVE Laboratory in Gainesville, Florida. The pupae were stored in a plastic container and placed in a refrigerator at 4 ^{o}C prior to use.

Six sentinel stations were selected on the south side of the open feedlot of Dairy (A) as well as on Dairy (B). Stations were placed on a transect with a minimum of 5 m between consecutive stations. Each station consisted of 50 pupae placed in a 10 x 10 cm nylon screen pouch. The sides of the pouch remained open to allow attracted parasitoids to enter. Additionally, the screen material was large enough to allow the parasitoids to have access the sentinel pupae. The pouch was attached at ground level to a 40 cm long wooden stake placed in the ground. A cardboard sleeve was slipped over the pouch and stake to provide thereby shielding the pupae from direct sunlight.

Product Quality: Additionally, each week we sampled approximately 500 house fly pupae from the shipments released from the beneficial insectary to determine.

1. Percent house fly pupae resulting in adult parasitoids
2. Parasitoid species being released.

Results & Discussion:

Proper method for sampling parasitoids. Using the sentinel system proved ineffective. No parasitoids were collected using this system during the five-week trial. Collecting wild house fly pupae was effective for addressing all questions regarding the effectiveness of augmenting parasitoid wasps on these two dairies. Accordingly, time required to sample house flies was minimal accounting for approximately one hour per dairy.

Effectiveness of augmenting parasitoid wasps for house fly suppression. No real differences in percent parasitism were recorded between the dairy with or the dairy without the augmentation program (Table 1). However, the number of parasitoid species was much greater at the dairy with the release program than the other. The following species were collected from the dairy with the parasitoid augmentation program; *Muscidifurax raptor*, *Spalangia nigroaenea*, *Spalangia cameroni*, *Splangia endius*. Of these species, *M. raptor* and *S. nigroaenea* were collected from the dairy without the augmentation program. Here is a brief summary of each species collected from the two dairies.

Table 1. Percent of wild house fly pupae sampled (n = 60 pupae sampled per week) at dairies with and without parasitoid release programs to result in adult parasitoids and house flies.

	Dairy with augmentation program		Dairy without augmentation program	
Date	% Parasitoid emergence	% House fly emergence	% Parasitoid emergence	% House fly emergence
10 July	26.6	25.0	33.3	35.0
17 July	13.3	65.0	10.0	53.0
24 July	10.0	53.3	25.0	0.0
1 August	11.6	41.6	18.3	8.3
7 August	1.6	10.0	0.0	20.0

Muscidifurax raptor. This species is the most commonly sold parasitoid for house flies. It is distributed throughout the United States and will parasitize blowflies, fleshflies, as well as house flies. These parasitoids are primarily most active in the top two inches of substrate. Therefore, fly pupae below this level are typically not affected. It is found throughout the year, and each one deposited approximately 100 individual eggs throughout its life.

Spalangia nigroaenea. This parasitoid is commonly collected from confined animal facilities. It is known to kill both house flies and stable flies.

Spalangia cameroni. This parasitoid will lay its eggs in a variety of host and can also discriminate between parasitized and unparasitized hosts. Generally it selects unparasitized hosts for its offspring. Each adult can produce approximately 25 offspring during its life. Generally, this species confines its host searching to the top two inches of substrate but is known it penetrate as deep as five inches. It is distributed throughout North America is primarily active from late summer through the fall in North Carolina.

Spalangia endius. The host range of S. endius is similar to the other species and is distributed throughout the United States. Adults lay on average 34 offspring during their lifetime. Searching is primarily restricted to one to five inches below the substrate. This species is also active from summer through fall in North Carolina. It is one of the most common in confined animal facilities.

Quality of material distributed by insectary. Percent of house fly pupae shipped to result in adult parasitoids was never above 50%. Therefore, improvements are needed by the insectaries to increase the quality of their material.

Table 2. Percent material received from insectary and stored in a rearing chamber set at 30 °C to result in adult parasitoids (n = number of house fly pupae per sample from insectary examined).

Date	n	% parasitoids to emerge from sample of shipped material after storage in rearing chamber	Amount of time (wks) material stored in rearing chamber to allow parasitoids emergence
28 May	384	33.8	1
4 June	569	23.9	3
11 June	498	31.1	3
18 June	401	23.0	6
25 June	347	23.0	5
2 July	511	23.0	5
9 July	416	31.0	5
16 July	297	30.0	8
23 July	403	42.0	7
30 July	203	30.0	6
8 August	220	28.0	5

Material received from the insectary already had a large percentage of the material to emerge before being released (Table 3). These data indicate that great measures are needed to insure that material being shipped from the insectary does not emerge until after being release. Emergence of the parasitoids while on route to the confined animal facility for release could result in even fewer parasitoids surviving long enough to parasitize house fly pupae.

Table 3. Percent parasitoids to have already emerged when shipment received from insectary (n = number of pupae sampled).

Date	n	% parasitoids already emerged when shipment received
18 June	405	26.6
25 June	345	20.8
2 July	397	14.6
9 July	399	25.5
16 July	258	22.1
23 July	398	24.0