DISPERSAL PATTERNS OF *Diachasmimorpha longicaudata* REARED ON LARVAE OF *Ceratitis capitata* AND *Anastrepha fraterculus*

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INTRODUCTION

The knowledge of the dispersion distance and time of the *Diachasmimorpha longicaudata* (Ashmead) (Hymenoptera: Braconidae) reared in different hosts is essential to understand the behavior of parasitoids after the release in the field. Different distances from the release site can result in variability in the rate of parasitism in a particular culture, as a result of the biological characteristics of the parasitoid. Therefore, the ability of dispersal and parasitism of *D. longicaudata* reared with the larval host of *Ceratitis capitata* (*Ceratitis* strain) and *Anastrepha fraterculus* (*Anastrepha* strain) was evaluated in a guava orchard.

MATERIAL AND METHODS

Releases of approximately 3,000 parasitoids were conducted at the center of a 15-ha guava orchard during the months of March 2014 to May 2015. The dispersal of *D. longicaudata* was monitored within a distance of 6 m to 272 m from a central point of release (Fig. 1). At each point, a “parasitism unit”, containing 20 third instar larval host (*C. capitata* or *A. fraterculus*) (Fig. 2) were offered to recover the parasitoids into five releases where the parasitoids had no choice by the host and six where it had choice. The “parasitism units” remained for 24 hours in the orchard when they were replaced with new ones, also remained for 24 hours. After 7 and 15 days others “parasitism units” were distributed and maintained for 24 h.

Observations on parasitism, and the direction of dispersal were made in each distance and time of release, with each strain. Data were analyzed using the general linear models and mixed effect models by the R statistical system.

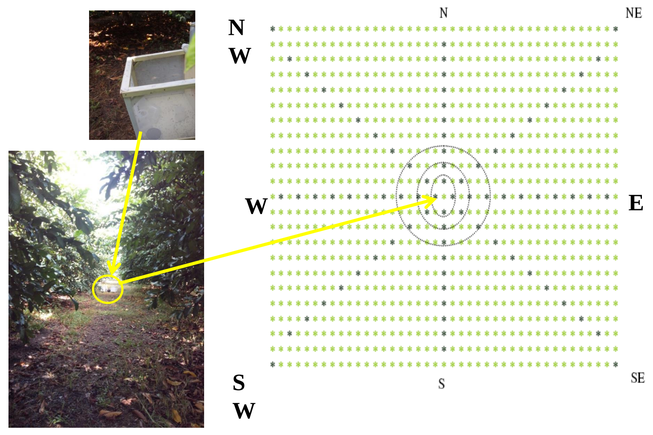

Fig. 1. Distribution of points to evaluate the dispersion capacity of *D. longicaudata* on a guava orchard, Brazil.

Fig. 2. Females *D. longicautada* visiting a “UP" containing larvae of *C. capitata and A. fraterculus* in guava orchard, Jaiba, Minas Gerais, Brazil. (March 2014 to May 2015)

The average distance dispersion (DM) and the dispersion area (S^2) of *D. longicaudata* were determined using the model proposed by Dobzhansky and Wright (1943).

RESULTS AND DISCUSSION

The parasitoid of *Ceratitis* strain (LC) has dispersed more and parasitized larvae up to a maximum distance of 173 m (DM) and has reached an area of up to 34,067.17 m² (S^2). Both parasitoid strains has dispersed in all directions, but showed a tendency to disperse toward the east (Table 1). The two strains were able to survive and parasitize the larvae of *A. fraterculus* and *C. capitata* for up to 15 days after its release, but more of the *Anastrepha* strain (LC) were recovered after 15 days of parasitizing the larvae of the two hosts.

Table 1. Table of contrasts to the dispersion direction of two strains of *D. longicaudata* (LA = *Anastrepha* strain, LC = *Ceratitis* strain) after release in guava orchard and parasitism in *A. fraterculus* and *C. capitata*.

			Direction							
AIC	Strain	Host	N	S	E	W	NO	NW	SW	SE
2341.4	LA	*A.fraterculus*	a	b	c	a	b	b	a	b
8987.7	LA	*C. capitata*	a	b	c	d	e	f	g	h
434.19	LC	*A. fraterculus*	a	b	c	a	a	e	d	a
5967.7	LC	*C. capitata*	a	a	b	a	a	a	a	a

Models chosen by the lowest AIC value. Same letters lines represent similar directions to each other ($p < 0.05$).

Regarding the proportion of parasitism performed by the released strains, the parasitoid LA traveled the greatest distances parasitizing up to 90% of the larvae in parasitism units after being released in the orchard. The parasioid LA showed the highest parasitism rate over larger distances from the point of release, while the LC parasitized the larval hosts that were closer. The time taken for the strains of *D. longicaudata* parasitize 90% of larvae in parasitism units available in the course of dispersion was lower when insects parasitized larvae of *A. fraterculus*. At just one hour the females of LC had already achieved parasitize 90% larvae of the parasitism units containing this host at a distance of 4.8 m (Table 2).

Table 2. Distance and elapsed time for two strains of *D. longicaudata* achieve 50% and 90% of its capacity of parasitism in larvae of *A. fraterculus* and *C. capitata* in guava orchard. PR = parasitism radius in meters, PT = parasitism time in hours, LA= *Anastrepha* strain, LC= *Ceratitis* strain.

Spatial model	Distance covered (m)			
AIC= 12908,7	Host + Strain			
	Anastrepha+LA	*Anastrepha*+LC	*Ceratitis*+LA	*Ceratitis*+LC
PR90%	22,20101	4,883595	43,44014	41,78275
Temporal model	Elapsed time (h)			
AIC= 3772,9				
PT90%	17,86445	1,083487	64,38836	60,32025

*p<0,05.

CONCLUSIONS

The *Ceratitis* strain reached the largest area (S^2) dispersion, however this was dispersed more slowly and acted more strongly in the points nearest to the site of release of the parasitoid. The *Anastrepha* strain reached a smaller area of dispersion that parasitoid of *Ceratitis* strain, however provided the greatest parasitism rates in the most distant points after its release, remained parasitizing for a longer time the two hosts and survived longer in the guava orchard.