SHORT COMMUNICATION

Color preference of *Anastrepha obliqua* (Diptera, Tephritidae)

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ABSTRACT. Color preference of *Anastrepha obliqua* (Macquart) (Diptera, Tephritidae). The color preference of *A. obliqua* was evaluated in two-choice tests. The results showed that both sexes were attracted to wavelengths ranging from 340 nm to 670 nm, although the broad major peak of attraction occurred between 380 and 570 nm.

KEYWORDS. Behavior; fruit fly; olfactometer.

RESUMO. Preferência de cor por *Anastrepha obliqua* (Macquart) (Diptera, Tephritidae). A preferência de cor por *A. obliqua* foi avaliada em testes de dupla escolha. Os resultados mostraram que ambos os sexos foram atraídos aos comprimentos de onda que variam de 340 nm a de 670 nm, embora o principal pico da atração de *A. obliqua* tenha ocorrido entre 380 e 570 nm.

PALAVRAS-CHAVE. Comportamento; mosca-das-frutas; olfatômetro.

The West Indian fruit fly, *Anastrepha obliqua* (Macquart), is considered a pest of several economically important fruit crops (Enkerlin *et al.* 1989). The most common host of this species is the hogplum fruit (*Spondias* spp.), although its principal economic damage occurs in mango (*Mangifera indica* L.), sapodilla (*Achras zapota* L.) and guava (*Psidium guajava* L.) (Hernández-Ortiz 1992). This fruit fly has been recorded from the USA (Florida and Texas) to South America, including the Caribbean Islands (Hernández-Ortiz & Aluja 1993).

Tephritid fruit flies use visual and chemical cues to seek and assess habitat, food, mating sites and ovipositional resources (Economopoulos 1989). Several studies have examined the response of tephritids to models of different shape, size and color (Katsoyannos 1989; Epsky & Heath 1998). The results obtained by these studies have allowed the design of more effective traps for monitoring tephritid populations. In the case of *A. obliqua* little is known about its visual ecology (López-Guillén 2008). The aim of this work was to determine the preference of *A. obliqua* to different wavelengths of light under laboratory conditions. The information obtained could eventually allow the improvement of traps used for monitoring *A. obliqua*.

Fruit flies used in this study were obtained as pupae from the Moscafrut mass-rearing facility in Metapa de Domínguez, Chiapas, Mexico. The insects were sexed after adult emergence and maintained as reported by López-Guillén (2008). The color preference of 8 to 12-d-old males and females was evaluated in two-choice tests. The flies were exposed to two wavelengths of equal quanta flux of 0.1 ìA and 2.3 mV measured with microammeter (Master® Mod. MAS830L) in a T-tube olfactometer similar to that described by Brown *et al.* (1998). The olfactometer consisted of a T-shaped glass tube with an internal diameter of 20 mm. The main arm of the apparatus was 300 mm long with a side arm 50 mm long placed at the centre. The main arm was divided into three equal 100 mm sectors and secured horizontally to a wooden base. Bandpass filters of 20 nm (Andover Corp., NH) were placed at the ends of the main arm. The light was provided by two illuminators with optical fiber (Fiber-Lite PL-750, Dolan-Jenner Industries, MA), one at each end, equipped with a halogen lamp of 150 W (Osram, Mexico City). The bioassays were performed in a darkroom so that the only sources of light consisted of the two light sources at each end of the main arm.

During each bioassay, one end of the chamber was illuminated with a control wavelength (570 nm), to which most insects possess photoreceptors (Briscoe & Chittka 2001), and the other by one of 14 wavelengths between 340-670 nm, chosen in random order. A fly chosen at random was introduced into the side arm of the olfactometer, which was then sealed with hyaline plastic film (Great Value, Mexico City). Then, the lights were turned off and the olfactometer was covered with a black box. After 5 min, the position of the fly inside the olfactometer was recorded. The position of the filters was reversed after five replicates. The olfactometer was washed out periodically with water and acetone, and dried in an oven at 100°C for at least 30 min to remove any traces left by the insects. In total, 10 replications per sex were performed for each wavelength. The flies were used only once. During the experiments, the temperature and relative humidity in the bioassay room were maintained at 25 ± 2°C and 60 ± 10% RH, respectively.

The data regarding the preference of female and male *A. obliqua* was analyzed using an analysis of variance (ANOVA). Fly response to the different wavelengths and control wavelength were analyzed using a log likelihood ratio test (*G*-test) for goodness-of-fit with Williams' correction.

The tests showed that there was no sexual difference in the response of *A. obliqua* to the different wavelengths tested ($F = 0.0002$; $df = 1, 278$; $P = 0.989$) (Fig. 1). Both sexes were attracted to wavelengths between 380 and 570 nm. In all cases, the attraction was different between wavelength treatment and wavelength control ($P < 0.05$) (Table I), with the exception of the 540 nm wavelength ($P > 0.05$). In contrast, flies were not attracted to wavelengths ranging between 340 and 370 nm, and from 590 to 670 nm, in these cases the response was lower than the wavelength control ($P < 0.05$) (Table I and Fig. 1).

The relative attraction of *A. obliqua* females and males was similar, ranging from 340 nm and 670 nm. The broad major peak of *A. obliqua* attraction occurred between 380 and 570 nm, this range corresponds to ultraviolet (UV) and visible spectrum light. Within the visible spectrum, the wavelengths preferred by *A. obliqua* correspond to violet, blue, green and yellow. Similar tendencies have been observed in *Rhagoletis pomonella* (Walsh) to monochromatic light stimuli from ultraviolet (350 nm) to red (675 nm) wavelengths, with the peak of response occurring from 380 to 570 nm (blue-green to yellow), with a plateau from 600 to 625 nm (orange-red) (Agee 1985). In *Bactrocera dorsalis* (Hendel), the plateau response occurred between 350 and 490 nm (Wu et al. 2007). Laboratory and field studies have shown that *A. ludens* is attracted to yellow and green (Robacker *et al.* 1990; Robacker 1992), whereas *A. suspensa* showed a preference for orange (580 - 590 nm) (Greany *et al.* 1978).

Both sexes of *A. obliqua* were attracted to UV wavelength.

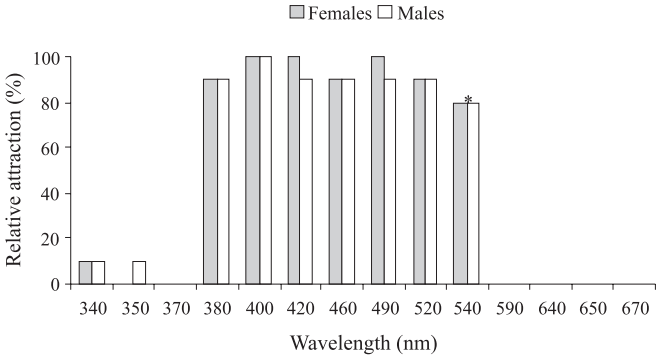

Fig. 1. Behavioral response of *Anastrepha obliqua* to different wavelength of light under laboratory conditions. The values indicated with * are similar to the control ($P > 0.05$).

A similar situation has been reported for other tephritids such as *R. pomonella* and *B. dorsalis* (Agee 1985; Wu *et al.* 2007). In nature the surface wax of several fruits reflects UV light (Willson & Whelan, 1989), which may partly explain the attraction of tephritids to host fruits (Drew *et al.* 2003). From a practical point of view our results suggest that the addition of the UV component on traps could improve their efficiency in capturing *A. obliqua*, such as has been demonstrated with *B. dorsalis*, *Bactrocera tryoni* (Froggatt) and *Bactrocera cacuminata* (Hering) (Drew *et al.* 2003; Wu *et al.* 2007).

In conclusion, the results of this study demonstrated that both sexes of *A. obliqua* were similarly attracted to wavelengths ranging from 340 nm to 670 nm, although the broad major peak of attraction occurred between 380 and 570 nm.

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Table I. Results of G test testing the response of *Anastrepha obliqua* to different wavelengths of light under laboratory conditions.

	Females		Males	
Ë	*G*	*P*	*G*	*P*
340	7.01	0.008	7.01	0.008
350	12.27	0.000	7.01	0.008
370	12.27	0.000	12.27	0.000
380	7.01	0.008*	7.01	0.008*
400	12.27	0.000*	12.27	0.000*
420	12.27	0.000*	7.01	0.008*
460	7.01	0.008*	7.01	0.008*
490	12.27	0.000*	7.01	0.008*
520	3.67	0.008*	7.01	0.008*
540	3.67	0.055 NS	3.67	0.055 NS
590	12.27	0.000	12.27	0.000
640	12.27	0.000	12.27	0.000
650	12.27	0.000	12.27	0.000
670	12.27	0.000	12.27	0.000

Ten flies tested per replication. Asterisk indicates values are significantly higher than the control (*G*-test, $df = 1$, $P < 0.05$). NS indicates non-significant differences ($P > 0.05$). Values without asterisk and NS indicate that the control was higher than the treatment ($P < 0.05$).

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