this biodiversity is challenging - both the diverse numbers of drosophilid and cactus species throughout the New World demands familiarization with fly identification and preparation of male genitalia (Vilela, 1983) as well as field cactus identification (Gibson and Horak, 1978; Gibson, 1982; Gibson and Nobel, 1986; Gibson *et al*., 1986; Gibson, 1991; Zappi, 1994; Turner *et al*., 1995; Manfrin and Sene, 2006). Certainly there remain species difficult to identify as evident from the many questionable or unidentified species listed above. The often described numbers of *D. repleta* group species as "ca. > 100 species" (Oliveira *et al*., 2012) has increased as we know there are undescribed, cryptic species present (Beckenbach *et al*., 2008; Heed and Castrezana, 2008), and more new species uncovered through continuing field studies (Stensmyr *et al*., 2008; Acurio and Rafael, 2010; Acurio *et al*., 2013).

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New collection of drosophilids from Font Groga site (Barcelona, Spain).

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On 4th October 2016, a new sample of drosophilids was obtained from Font Groga (Barcelona). This is a well-described site, characterized by a vegetation composed of pinewoods (*Pinus pinea*) with some ilexes (*Quercus ilex*) and Mediterranean brushwood (Araúz *et al.*, 2009). Flies were trapped from 16:30 to 19:40 pm using 12 baits containing fermenting bananas placed along a trail. Individuals were classified according to species and sex (Table 1).

It is worth observing that *melanogaster* group (*D. melanogaster* and *D. simulans*) is the dominant, as was also reported in the 2015 collection (Rosselló *et al.*, 2016). *D. subobscura*, the following species in abundance, scarcely reached 12%. The sex imbalance in this species is also interesting, being females more common than males. In comparison with previous collections, the invasive species *D. suzukii* presented a drastic reduction in percentage: 8.97% in 2015 (Rosselló *et al.*, 2016), 20.35% in 2014 (Esteve and Mestres, 2015), 7.98% in 2013 (Pineda *et al.*, 2014), and 9.20% in 2012 (Canals *et al.*, 2013). Furthermore, only females of this species were trapped. The remaining species sampled presented percentages under 1%. With this drosophild distribution the values of *H'* (Shannon diversity index) and *J* (Shannon uniformity index) were

Table 1. Classification of flies according to species and sex (Font Groga site, Barcelona).

Species	Number	Percentage
D. subobscura (♂)	5	0.91
D. subobscura (♀)	61	11.11
D. simulans (♂)	230	41.89
D. melanogaster (♂)	1	0.18
D. melano / simulans (♀)	240	43.72
D. suzukii (♀)	7	1.28
D. phalerata (♂)	1	0.18
D. phalerata (♀)	1	0.18
D. hydei (♂)	1	0.18
Scaptomyza sp.	2	0.36
Total	549	100

0.474 and 0.294, respectively. For these indexes, the trend to decrease detected in the last two years continues (Rosselló *et al.*, 2016; Esteve and Mestres, 2015).

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Flubendiamide inflicts tissue damage and alters detoxification status in non-target dipteran insect, *Drosophila melanogaster*.

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Abstract

This study aims to assess the safety of a lepidopteran insecticide, Flubendiamide, in a non-target dipteran model insect, *Drosophila melanogaster*, at tissue/cellular and enzyme/protein levels. Enhanced blue coloration through Trypan blue dye exclusion test suggests greater tissue damage. Furthermore, dose-dependent increase ($p < 0.05$) in the cytochrome P450 1A1 enzyme activity suggests activation of the Phase-I detoxifying mechanism. Thus, this study confirms Flubendiamide-induced toxic stress in *Drosophila* that might be replicated in other non-target organisms. Keywords: Cytochrome P450, *Drosophila*, Flubendiamide, Tissue damage.

Introduction

Flubendiamide ($C_{23}H_{22}F_7IN_2O_4S$, CAS No: 272451-65-7), a lepidopteran insecticide, is widely used in agriculture and has been suggested to be chemically safe for non-target insects like *Drosophila melanogaster* (Tonishi *et al*., 2005). Approximately 60 µg/mL Flubendiamide has been recommended for use in case of cotton by Fluoride Action Network Pesticide Project (2007), whereas proposals of US EPA (2010) for soya bean and grain are up to 60 and 103 µg/mL. The recommended Indian field doses in case of paddy and cotton are 50 µg/mL and 100 µg/mL (Government of India, Ministry of Agriculture, 2009). But recent studies revealed that Flubendiamide at very low concentration (far below the agricultural doses) may elicit severe effects on stress gene expression, neurophysiology, and external morphology of dipteran non-target *D. melanogaster* (Sarkar *et al*., 2015a, 2015b). Several workers recognized *Drosophila* as a remarkable model organism for pesticide-induced toxicity monitoring studies (Aurosman Pappus *et al*., 2017; Dutta *et al*., 2017; Rajak *et al*., 2017).