

EFFICACY OF TWO TRAPS AND THREE DIFFERENT PHEROMONE-BASED ATTRACTANTS TO CONTROL THE BANANA WEEVIL ADULTS *COSMOPOLITES SORDIDUS* (COLEOPTERA: CURCULIONIDAE) IN BANANA ORCHARDS ON TERCEIRA ISLAND, AZORES

David Horta Lopes¹, Elisa Tarantino & Cristina Moules²

¹ CE3C – Centre for Ecology, Evolution and Environmental Changes / Azorean Biodiversity Group and Universidade dos Açores, Faculdade de Ciências Agrárias e do Ambiente, Departamento de Ciências e Engenharia do Ambiente, Rua Capitão João D'Ávila, 9700-042 Angra do Heroísmo, Terceira, Açores, Portugal. E-mail address: david.jh.lopes@uac.pt
² Serviços de Desenvolvimento Agrário da Terceira (SDAT), Secretaria Regional de Agricultura e Desenvolvimento Rural, Vinha Brava, 9700– Angra do Heroísmo, Terceira, Açores, Portugal



Introduction The banana (*Musa acuminata* Colla) production is the second most important agricultural crop in area in Azores (PRDF, 2019). There are several pests that affect the banana orchards such as thrips, snails, mites but the banana borer weevil. *Cosmopolites sordidus* (Germar, 1824) (Coleoptera: Curculionidae) is considered among the most serious pests of banana (Jayaraman *et al.*, 1997). This pest was detected in the Azorean Archipelago only in 2003 (Lopes *et al.*, 2006). Different traps with various characteristics (colour, type and shading) have been also studied to enhance efficacy to *C. sordidus* (Fu *et al.*, 2019). Among different kind of traps, pitfall traps with an aggregation pheromone have been used with success in the past three decades in integrated pest management (IPM) strategies (Tresson *et al.*, 2021). In this study, one set of two different trapping systems containing different aggregation pheromone-based lures was tested to evaluate in the field the efficiency of attracting *C. sordidus* adults. Similar studies were also made in recent years on Terceira Island (Ventura *et al.*, 2012), as well as on Canary Islands (Delgado *et al.*, 2019). recent years on Terceira Island (Ventura *et al.*, 2012), as well as on Canary Islands (Delgado *et al.*, 2019).



Figure 2. The parapheromone-based lures tested: CosmoPlus (top left), Cosmolure (left), Cosmogel (middle right) and Ecosordidina 90-K (top right).

Material and Methods This study took place in the Azores Archipelago (Portugal) on Terceira Island for two years (2021 and 2022) in two banana orchards that were chosen in the city of Angra do Heroísmo. Two different types of traps were used: CosmoTrack and Stopweevil traps (Figure 1). In 2021 four parapheromone-based lures (Figure 2) were tested: CosmoPlus (Scyll'Agro), Cosmogel (NovAgrica), Cosmolure (Chemtica Internacional S. A) and EcoSordidina 90-K (Ecobertura). In 2022 only three pheromone-based lures (Figure 2) were tested: CosmoPlus (Scyll'Agro), Cosmogel (NovAgrica) and Cosmolure (Chemtica Internacional S. A). In 2021 were tested two-trapping systems with the four attractants: Cosmotrack + Cosmoplus; Cosmotrack+ Cosmogel; Stopweevil + Sordidin and Stopweevil + Cosmolure. In 2022 were also tested the two trap types but with only three attractants (Cosmotrack+ Cosmoplus; Stopweevil+ Cosmolure and Stopweevil + Cosmogel). Each combination has constituted a set. Three repetitions of each set were placed in each of the two experimental sites: São Bento and São Pedro (3 traps of each combination per site) and those were randomly moved every fifteen days on the soil surface from May until September 2021 and from January to May in 2022. All the data were analysed using SPSS statistical program (Levine, 2013).



Figure 1. The two trap types studied (right Cosmotrack and left Stopweevil).

Results and Discussion In 2021 from January to December in the two sites were captured 16540 *C. sordidus* adults. São Pedro registered 66,3% adults captured (10956) and in São Bento 33,7% (5584) what gave an average of 913 adults per month. In 2022 from January to May in the two sites were captured 3505 adults. São Pedro registered 68% adults (2385) and in São Bento 32% (1120) what gives until May an average of 701 adults per month (Table 1). These results shown that weevil abundance was significantly greater in São Pedro banana orchard (Table 1) and this most likely due the amount of unremoved organic and plant material that is an important source for attraction and also a focus of infestation attractive to banana borer weevils more than any other crop residues (Okolle et al., 2020). Another adverse consequence of poor cultural management could cause the accumulation of material in the lateral openings of the ground trap Stop Weevil transported by the wind which can be also a way of prevent banana borer weevils from entering this trap. The captures in the Stopweevil trap were in 2021 less (around 24,6% - 3270 adults) when compared with those on the Cosmotrack trap (13270 adults) and in 2022 where greater reaching 64,6% (31216 adults) but also much less of those registered in Cosmotrack (48343 adults).

Conclusion Pitfall traps like Cosmotrack trap are very recommended for banana orchards in Terceira Island because little vegetal material, mostly soil matter, was found in pitfall openings and because of the smaller size which cause less hindrance to farmers during agronomic practices. In this study adult's from banana borer weevils attracted to the aggregation pheromone bait inside Cosmotrack traps were unable to get out of that type of trap. This study has highlighted that trapping systems are very important to know the pest densities and their fluctuations in time and monitoring with Sordidin-baited trapping systems including pitfall traps like the Cosmotrack and the attractant Cosmoplus had the best results in the capturing *C. sordidus* adults. The surface ground traps like Stop Weevil trap are not recommended because of its low efficiency in capturing *C. sordidus* on banana orchards in Terceira Island. Further investigation of the natural predators of the banana borer weevil weevil is also needed in order to enhance biological control actions on this important banana pest.

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Table 1. Total of *C. sordidus* adults captured in the different trap /attractant's combination tested in 2021 and 2022 for each location.

Year	Location	Cosmotrack +Cosmoplus	Cosmotrack +Cosmogel	StopWeevil + Ecosordidin	StopWeevil+ Cosmolure
2021	São Pedro	5732	2788	1218	1218
	São Bento	3373	1377	508	326
Year	Location	Cosmotrack +Cosmoplus	StopWeevil+Cosmolure	StopWeevil+ Cosmogel	
2022	São Pedro	16238	7523	2944	
	São Bento	32105	14861	5888	

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