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Sex pheromone traps for detection of the invasive box tree moth in Italy

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Abstract

The efficacy of sex pheromone traps for *Cydalima perspectalis* (Walker) (Lepidoptera Crambidae) box tree moth (BTM) was assessed in 2013 and 2014 in North East Italy (Parco Giardino Sigurtà, Valeggio sul Mincio, Verona). In 2013 male moths were trapped during their last flight of the year. In 2014 monitoring performed from May to October highlighted three flight peaks. In the same period the development of preimaginal stages on infested plants was checked. In the study area, according to these field samplings and males trapping, BTM moth undergoes three generations with overwintering as young larva. Sex pheromone traps to assess the spread of this invasive moth into new areas and to identify the correct time of control treatments will be a useful tool for integrated pest management (IPM).

Key words: *Cydalima perspectalis*, males trapping, box tree, IPM.

Introduction

Cydalima perspectalis (Walker) (Lepidoptera Crambidae) previously combined with the genera *Diaphania* or *Glyphodes* (Mally and Nuss, 2010) is an Asiatic species, widespread in Japan, China and Korea (Wan *et al*., 2014). This moth is particularly harmful to different species of box (*Buxus* spp.), and is known as the box tree moth (BTM). In its native land it has been observed also on *Pachysandra terminalis* Siebold et Zucc. (Buxaceae), *Euonymus japonicus* Thunb., *Euonymus alatus* (Thunb.) Siebold (Celastraceae), *Ilex purpurea* Hassk. (Aquifoliaceae), and *Murraya paniculata* (L.) Jack (Rutaceae). So far in Europe there are no reports of the moth infesting other plants apart from boxes (Bella, 2013).

The BTM was introduced accidentally in 2007 into Switzerland (Billen, 2007), Germany (Krüger, 2008), the Netherlands (Muus *et al*., 2009) following the importation of samplings from China, and was first sighted in Italy in 2010 by members of the *Forum Entomologi Italiani* (Bella, 2013). The BTM was also detected in Britain and Ireland (Mitchell, 2009) and eastern Europe too (Székely *et al*., 2011). Further data of BTM invasiveness are reported in the invasive species compendium (CABI, 2015).

In Germany and Switzerland severe attacks of BTM associated with infections of the fungus *Cylindrocladium buxicola* Henricot (box rust) devastated many hectares of box woods (Wan *et al*., 2014).

In 2007 the BTM was included in the EPPO alert list (European and Mediterranean Plant Protection Organization) but was removed in 2011 because no action was requested from the member countries (EPPO, 2012).

In Italy the BTM has proved particularly harmful, and its larvae cause serious damage to the box trees (*Buxus* spp.) both in public and private gardens and parks.

The BTM damages still scattered and the aim of this sex pheromone trapping trial was to know the efficacy of the baits for detect male flight.

Materials and methods

The trials of BTM male trapping were carried out in the park "Parco Giardino Sigurtà" in Valeggio sul Mincio, Verona, Italy (45°21'35.881"N 10°43'53.878"E). The park has a surface area of about 60 ha and contains around 32,000 box trees (figure 1).

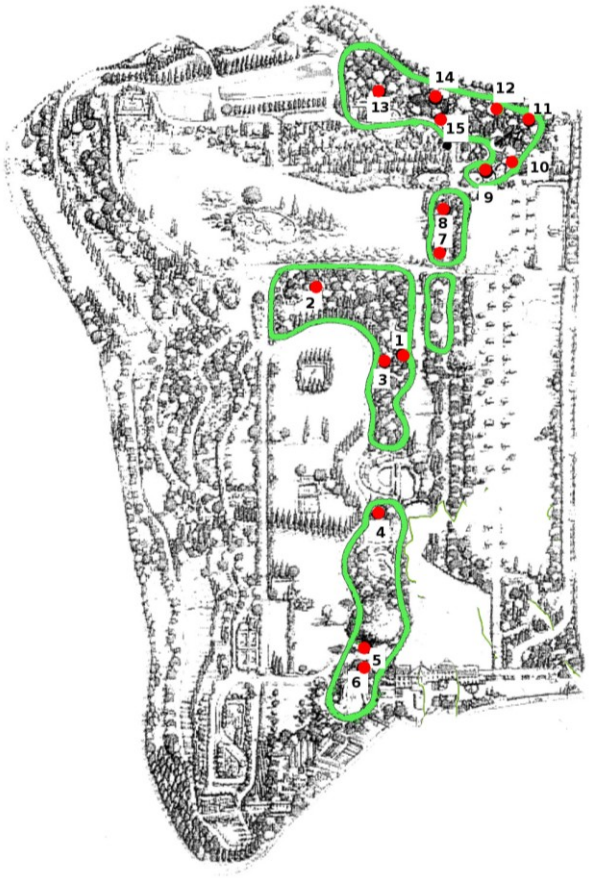

Figure 1. Map of park with location of traps (red dots) and box tree areas (green lines).

On September 3, 2013, 15 sex pheromone traps (funnel traps, Unitrap-Universal Moth Trap) were placed 1.70 m from the ground, hanging from the branches of the box trees, at a distance of more than 20 m among traps in different location of the park (figure 1). In order to assess the efficacy of the lure and of the traps, every two days samplings of males trapped were conducted. The sex pheromone was supplied by Novapher S.a.s., and its composition was: Z11-16:Ald (80%) + E11-16:Ald (20%). The total sex pheromone quantity used per baited trap was 1.0 mg and the dispenser type was a rubber septa, sleeve stopper, natural para, weight 0.73 g. The sex pheromone baits were replaced every 30 days. Three unbaited traps as a control (only in 2013) were also set up.

In 2014 the same experimental plot was applied. The traps were set up in the same locations on May 27 until October 4.

During 2013 and 2014 seasons, twice monthly visual samplings of BTM preimaginal stages were carried out.

Results and discussion

The efficacy of the baits and traps was registered during the last flight of the BTM in 2013. In the same locations, no male catches were observed in the unbaited traps.

In 2014, despite the variability of number of males caught per trap was high, pooling the data of 15 traps, the BTM three periods of emergence were clearly showed (figure 2). The first flight occurred from late May to mid June; the second one from mid July to mid August and the third from early September to early October. Therefore in northern Italy the BTM has three generations per year, the first flight males clearly originated from the overwintering third generation larvae of the previous year.

Our results confirm the observations of BTM biological cycle reported by Leuthardt *et al*. (2010) for Switzerland (Basel region), using sampling and sex pheromone trapping data. New researches, according to Leuthardt and Ramin (2011) and Nacambo *et al*. (2014), showed that BTM develops only two generations per year in northwestern Switzerland.

Our samplings of preimaginal stages indicated that overwintering was carried out by the young larvae of the third generation protected in a light silk cocoon weaved between two leaves. In spring larvae started again to eat and grow, becoming mature and pupating in May. The adults of the overwintering generation emerged from late May to early June, when first catches occurred (first flight). It is noteworthy that the dates of the last flight of 2014 (of 13 males/trap the 18th September 2014) were comparable with those of 2013, when the traps were placed in September and presumably only the males of the third flight were caught (average 15 males/trap the 20th September 2013).

The results confirmed that the funnel traps baited with sex pheromone were useful in capturing BTM males in order to assess flight trends, as previously observed by Kim and Park (2013). The bait with only two sex pheromone components instead of three indicated by Kawazu *et al*. (2007) proved to be efficient. The statement that in Europe the field trials with BTM pheromone were unsatisfactory (F. Griepink personal communication in van der Straten and Muus, 2010) can now be reconsidered following our results. The sex pheromone traps proved very efficient and caught thousands of BTM males (i.e. an average of 144 males caught per trap, during the third flight of 2013 and in 2014 an average of: 10 males - first flight; 31 - second flight and 75 - third flight, including the melanic forms in all three flights). Although insecticide treatments against the

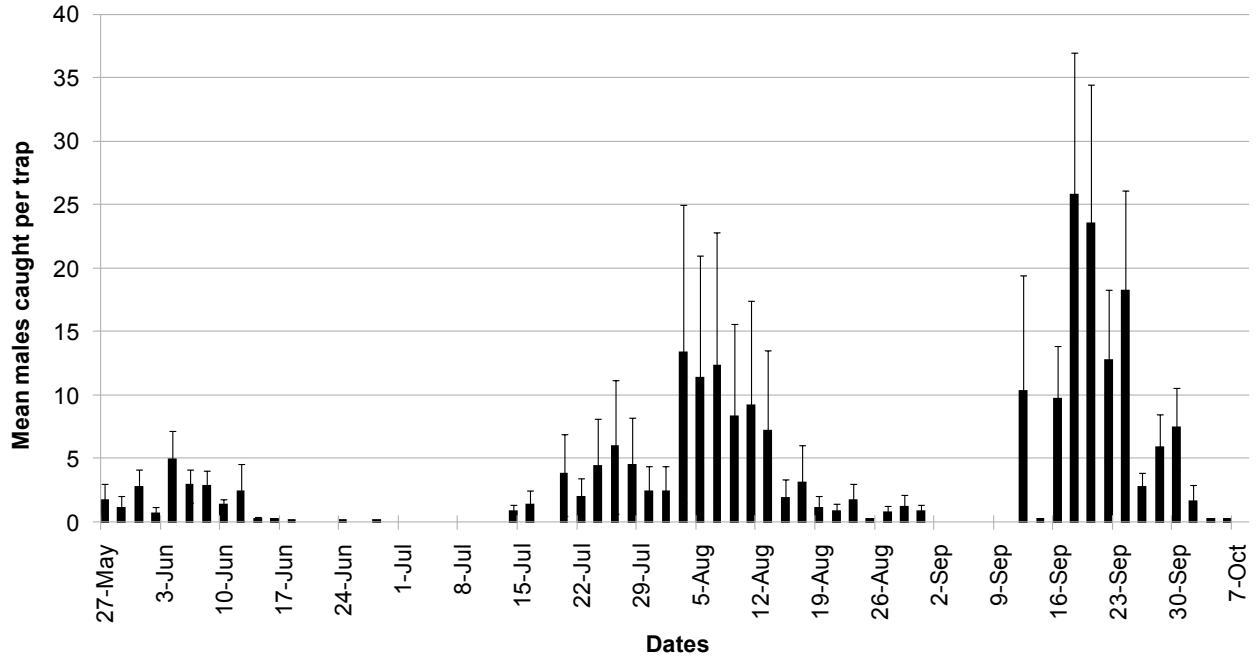

Figure 2. *C. perspectalis* males caught per trap in 2014 season (mean ± SE). Samplings made every two days in 15 sex pheromone funnel traps in "Parco Giardino Sigurtà".

BTM larvae have been performed in the park and caused high larval mortality, the increasing trend of male catches from the first to third flight indicated that males may be attracted by long distance. In the area where traps were located, no other moth species were attracted by the pheromone bait. In the paragraph "Prospect for control in Europe" of the mini-review of Wan *et al*. (2014) no mention was made of the possible use of sex pheromone traps to establish the timing of BTM control treatments and for the detection of BTM spreading. Yet, information such as timing for treatments, economic threshold, early detection and other data supplied by sex pheromone traps, will be of great aid in the IPM of BTM as well as of other exotic invasive insect pests.

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