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ATTACKS OF *RHYNCHOPHORUS FERRUGINEUS* (OLIVIER) (*Coleoptera Curculionidae*) ON NATURAL SPECIMENS OF DWARF FAN PALM *CHAMAEROPS HUMILIS* L. (*Arecaceae*) IN SICILY

SUMMARY

The red palm weevil *Rhynchophorus ferrugineus* was recently introduced into Europe where it has destroyed many *Phoenix canariensis* palms. This weevil attacks different species of palms in different countries, mainly cultivated date palms (*Phoenix dactylifera*) in Egypt and cultivated Canary palms (*Phoenix canariensis*) in Europe. In Europe, sporadic attacks of the weevil to native dwarf fan palm (*Chamaerops humilis*) have been reported. The current paper reports attacks of *R. ferrugineus* on dwarf fan palms in natural environments of Sicily. This insect represents an important threat to dwarf palms and to the complex ecosystem where they live.

RIASSUNTO

Attacchi di punteruolo rosso delle palme Rhynchophorus ferrugineus *(Olivier) (Coleoptera Curculionidae) su popolamenti sponanei di palma nana* Chamaerops humilis *L. (Arecaceae) in Sicilia*. Il punteruolo rosso delle palme è stato recentemente introdotto in Europa. Questo coleottero attacca diverse specie di palme in diversi Paesi, preferenzialmente palme da dattero coltivate (*Phoenix dactylifera*) in Egitto e palme delle Canarie coltivate (*Phoenix canariensis*) in Sicilia. In Europa sono stati segnalati attacchi sporadici su palma nana (*Chamaerops humilis*) ma soprattutto su individui coltivati. Tuttavia, come accertato recentemente in Sicilia, gli attacchi su popolamenti naturali di palma nana da parte del punteruolo sono sempre più frequenti e fanno temere per la sopravvivenza degli ecosistemi ove vive questa palma nel Mediterraneo.

Introduction

The red palm weevil *Rhynchophorus ferrugineus* (Coleoptera Curculionidae) was first recorded in Sicily in 2005 (Longo & Tamburino, 2005;

EPPO, 2006). In Sicily, *R. ferrugineus* infests mainly the Canary palm *Phoenix canariensis* Chabaud. This palm, originated from the Canary Islands, is widespread in Sicily, where it is cultivated as an ornamental plant in both private gardens and public green areas. In Sicily, since 5 years from its accidental introduction, *R. ferrugineus* infested and killed more than 39,000 *P. canariensis* plants (GIOVINO *et al.*, 2009; LO VERDE *et al.*, 2011). In other regions of the world, *R. ferrugineus* infests different taxa of palms. Although a recent study (DEMBILIO *et al.*, 2009) indicated that the palms *Whashingtonia filifera* (Lindl.) H.Wendl. and *Chamaerops humilis* were resistant to *R. ferrugineus* and remained uninfested. *R. ferrugineus* has been occasionally found on *Whashingtonia* spp., *C. humilis* and other ornamental palms (GIOVINO *et al.*, 2009).

The dwarf fan palm *Chamaerops humilis* is only other palm species native to Europe, apart from the Cretan Date Palm *Phoenix teophrasti*. It grows in Mediterranean areas, from Portugal to Malta Island and from Morocco to Libya. In Italy, *C. humilis* is widely distributed along the coasts of the Tyrrhenian Sea in Sicily and Sardinia. This species is valued as the relict of Tertiary tropical vegetation, which was shifted to the current locations by the strong climate changes in the Quaternary. In addition, *C. humilis* plays an important role in the ecology of typical Mediterranean forest woodland and shrubland communities because it can grow in arid environments on rocky or otherwise poor soil and under the influence of salt and wind; it is also important because of its ability to proliferate after a fire event (GIOVINO *et al.*, 2011a, 2011b).

Our recent observations in Sicily indicate that *R. ferrugineus* may attack the dwarf fan palm in natural conditions. The aim of this study is to determine the possibility that *R. ferrugineus* could move from ornamental to native palms, like *C. humilis*. This risk has been highlighted in the past (Sidoti, Giglione, s.d.) but now has a dramatic confirmation.

MATERIALS AND METHODS

R. ferrugineus infestations on cultivated and spontaneous *C. humilis* plants were recorded in 2010 and 2011 in Sicily, including Lampedusa island (Fig. 1). Palms from private gardens were examined. Natural populations of *C. humilis* along the coastal path were also examined for *R. ferrugineus* symptoms or specimen presence. Stems were cut at different distances along their lengths, and, when possible, longitudinal sections were made to determine the presence of adult, larvae, and pupae of *R. ferrugineus*. Palms showing any other sign of damage were particularly considered. The following data were recorded for plants identification: location (determined by GPS), number of stems per specimen (each *C. humilis* specimen can be composed by many

Fig. 1 — Location of study area.

stems), height, and stem diameter. Attack symptoms were noted and photographed.

Results

On cultivated *C. humilis*, *R. ferrugineus* was detected at six locations from 2010 to 2011 (Table 1).

In the past, 7 attacks of *R. ferrugineus* on *C. humilis* were recorded (Longo *et al.*, 2009): 3 and 1 respectively on private gardens on Catania and 4 on Palermo. During 2011 attacks of *R. ferrugineus* on cultivated dwarf fan palms were observed on Palermo (B. Massa, pers. comm.) and on Castellammare del Golfo (Trapani) (F. Fiordilino, pers. comm.). In natural *C. humilis* populations, *R. ferrugineus* was detected on five plants in the Zingaro Nature Reserve (Trapani) and on 1 plant in Menfi (Agrigento) (Table 1). These data indicate a low level of infestation.

R. ferrugineus did not show any clear preference for male vs. female plants but all infestations were recorded on adult palms (≥ 50 years) over 1 m high (Table 1).

Table 1.
Rhynchophorus ferrugineus *infestations on* Chamaerops humilis *in cultivated plantings and in natural populations in Sicily*

Site/ Plant code	Date (day.month. year)	Number of infested stems***	Sex of plant	Stem height (m)	Stem diameter (cm)	Resin emission	Note
Acireale (CT)*	10.07.2010	9	female	1.20	12-16	No	*Paysandisia archon* (10-12 larvae/stem)
Menfi (AG)*	10.10.2010	1	–	–	–	No	
Lampedusa Is. (AG)*	20.10.2010	1	–	–	–	No	
	20.10.2010	1					
Catania*	18.05.2011	1	male	1.80	12	No	
Bagheria (c.da Montagnola) (PA)*	02.10.2011	1	female	1.80	13	No	
Bagheria (PA)	October 2010	1	female	–	–	–	
S. Vito lo Capo (TP)*	15.10.2011	1	–	–	–	–	
Zingaro Reserve/1**	14.09.2011	1	male	3.70	13	Yes	Dead larvae embedded in resin
Zingaro Reserve/2**	14.09.2011	1	female	1.8	20	No	
Zingaro Reserve/3**	14.09.2011	2	male	3.15	17,5	Yes	
Zingaro Reserve/4**	20.09.2011	2	male	3.3	20	No	
Zingaro Reserve/5**	20.09.2011	1	male	2.9	20	No	
Menfi (AG)**	20.10.2011	5	male/female	–	–	–	

*: cultivated; **: natural populations; ***: each row provides data for one plant, which can have many stems.

All infested plants showed typical symptoms on the crown (wilting and bending down of leaf) (Fig. 2). Symptoms on infested plants changes from slight wilting to total plant collapse and death within a few months. Larval galleries and pupal chambers typical of *R. ferrugineus* were detected in stem sections of all plants listed as infested. Live larvae and pupae within their galleries and pupal chambers were also found in most of the dissected palm stems, while some adults that were flying around the plant or close to the stem apex were captured. Resin was sometimes emitted from the plants near the location of recently hatched larvae.

Discussion

Our observations have established the presence in which *R. ferrugineus* infestations in natural ecosystems of the Mediterranean in which the dwarf fan palm is native. In Sicily and throughout the Mediterranean basin, an invasion of natural populations of the Mediterranean dwarf fan palm by the red palm weevil could seriously threaten ecosystems where these palms live. Recently Dembilio & Jacas (2012) have highlighted this aspect: "Although *Chamaerops humilis* and

Fig. 2 — One of the dwarf fan palms attacked in Zingaro Nature Reserve.

Phoenix theophrasti show antixenotic and antibiotic mechanisms of resistance, respectively, they cannot be considered as resistant against *R. ferrugineus*".

The presence of resin emitted by infested palms indicates that the palms have an antixenotic resistance mechanism, as stated also by DEMBILIO *et al.* (2009). Our observations show, however, that weevil larvae are able to develop within the stem and that this led to serious damage and then to plant death. Even when the attack was considered to be moderate, the infested palms died within a few months.

Control of *R. ferrugineus* is difficult because safe and effective control methods are unavailable. Many cultivated infested *Phoenix canariensis* palms located near the Zingaro Nature Reserve were detected during this study. These infested plants represent a source of the insect and a threat to the natural palm populations living in the Reserve; they should be removed immediately just at the first attack of the weevil. The detection of *R. ferrugineus* on Lampedusa Is. shows the potential dispersion power of the weevil; in fact the island is located in the middle of the Mediterranean Sea and is quite distant from other locations with infested palms. Thus, natural *C. humilis* populations in North Africa might be threatened. We point out the need for future investigations concerning the spread and control of *R. ferrugineus*.

CONCLUSIONS

Currently, the *R. ferrugineus* attack involves only a small number of mature dwarf fan palms that, considering the environment and recurrent wildfire are probably highly stressed and have reduced ability to resist insect colonization. Another study (LONGO *et al.*, 2011) reported that cultivated dwarf fan palms previously damaged by the palm borer *Paysandisia archon* (Burmeister, 1880) (Lepidoptera Castniidae) became less resistant to *R. ferrugineus* attack. The results of the current study show, however, that *R. ferrugineus* may damage and kill *C. humilis* in natural ecosystems and highlight the need for tools that can be used to detect early infestations over wide areas, such as natural ecosystems. In addition, other than threatened by *R. ferrugineus*, *C. humilis* and its ecosystem may be severely damaged by introduced wild pigs, that are now increasing in number in the Zingaro Nature Reserve (LA MANTIA *et al.*, 2010). Additional studies are required to increase our understanding of the interaction between *C. humilis* and *R. ferrugineus* with the aim of reduce the threat to natural palm populations.

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REFERENCES

DEMBILIO O., JACAS J. & LLACER E., 2009 — Are the palm *Whashingtonia filifera* and *Chamaerops humilis* host for the red palm weevil, *Rhynchophorus ferrugineus?. — J. appl. Entomol.*, 33: 565-567.

DEMBILIO O. & JACAS J., 2012 — Bio-ecology and integrated management of the red palm weevil, *Rhynchophorus ferrugineus* (Coleoptera: Curculionidae), in the region of Valencia (Spain). — *Hell. Pl. Prot. J.,* 5: 1-12.

EPPO (EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION), 2006 — First report of *Rhynchophorus ferrugineus* in Italy — *Reporting Service*, 1, 2.

GIOVINO A., ZIZZO G.V., COLAZZA S. & LONGO S., 2009 — Monitoraggio visivo su palmacee potenziali ospiti del Punteruolo rosso e del Castnide delle palme presenti in Sicilia. — *Flortecnica*, 33 (323): 3-8.

GIOVINO A., LA MANTIA T. & SCIBETTA S., 2011a — *Chamaerops humilis* L.: variabilità ed ecologia delle popolazioni naturali in Sicilia. Prima parte. — *Flortecnica*, 35 (343): 63-68.

GIOVINO A., LA MANTIA T. & SCIBETTA S., 2011b — *Chamaerops humilis* L.: variabilità ed ecologia delle popolazioni naturali in Sicilia. Seconda parte. — *Flortecnica*, 35 (344): 67-70.

LA MANTIA T., GIOVINO A., SAPIENZA L. & SCIBETTA S., 2010 — I cinghiali (*Sus scrofa* L.) come fattore di potenziale decremento della palma nana (*Chamaerops humilis L.*). — *Naturalista sicil.*, 34: 245-248.

LONGO S. & TAMBURINO V., 2005 — Gravi infestazioni di Punteruolo rosso della palma. — *Inf. agr.*, 50: 1-3.

LONGO S., ZIZZO G.V., GIOVINO A. & COLAZZA S., 2009 — Piante ospiti del Punteruolo rosso e del Castnide delle palme in Sicilia. In: La ricerca scientifica sul Punteruolo rosso delle palme e gli altri fitofagi delle palme in Sicilia. — *Regione Siciliana, Assessorato Agricoltura e Foreste*, 1: 85-86.

LONGO S., ANDERSON P.J., SMITH T.R., STANLEY J.D. & INSERRA R.N., 2011 — New palm hosts for the red palm weevil, *Rhynchophorus ferrugineus,* in Sicily. — *Palms*, 55 (1): 15-20.

LO VERDE G., LA MANTIA G. & GRIFFO R., 2011 — El estado de la infestaci por *Rhynchophorus ferrugineus* (Olivier) en Italia y los resultados de las pruebas de cirug arb ea para el control de palmeras infectadas. — *Phytoma España*, 226: 85-88.

SIDOTI A. & GIGLIONE S., S.D. — Monitoraggio fitosanitario in boschi della Sicilia 2007-2008. — *Dipartimento Regionale Azienda Regionale Foreste Demaniali*, 46 pp.

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