

**AFPP – PALM PEST MEDITERRANEAN CONFERENCE
NICE – 16, 17 AND 18 JANUARY 2013**

**MONITORING RED PALM WEEVIL, *RHYNCHOPHORUS FERRUGINEUS* OLIVIER, WITH
PHEROMONE TRAPS: FIVE YEARS OF EXPERIENCE IN SICILY**

F. CONTI⁽¹⁾, E. RACITI⁽¹⁾, D. CARTA CERRELLA⁽¹⁾

⁽¹⁾REGIONE SICILIANA, DIPARTIMENTO INTERVENTI STRUTTURALI PER
L'AGRICOLTURA, SERVIZIO FITOSANITARIO, PALERMO, ITALY. fconti@regione.sicilia.it

SUMMARY

Red Palm Weevil adults are attracted by a male aggregation pheromone. During 2006 and 2008, we placed pheromone traps in different infested sites of Eastern Sicily for monitoring the population dynamics of the insect. Traps consisted of a 15-liter plastic bucket and contained the pheromone and an emulsion of water and mineral oil. No food baits were added. The pheromone was changed every 2 months. In the period 2010-12 we compared the captures in urban area and in nurseries in order to assist the spray decision for protecting plots of different palm species. In the same period we compared red and black colored traps. Starting from 2012, monitoring traps have been placed on the whole regional territory as planned in the Regional Action Plan.

Key words : Red Palm Weevil, IPM strategies, ferrugineol.

RÉSUMÉ

**SURVEILLANCE DU CHARANÇON ROUGE DU PALMIER PAR DES PIÈGES A
PHEROMONE : CINQ ANS D'EXPÉRIENCE EN SICILE**

Les adultes du charançon rouge du palmier (CRP) sont attirés par une phéromone d'agrégation émise par les mâles. En 2006 et 2008, nous avons placé des pièges à phéromones dans les différents sites infestés de Sicile orientale pour le suivi de la dynamique des populations de l'insecte. Le piège se compose d'un seau plastique de 15 litres contenant la phéromone et une émulsion d'eau et d'huile minérale. Aucun appât alimentaire n'a été ajouté. La phéromone est changée tous les 2 mois. Dans la période 2010-2012, nous avons comparé les captures dans les zones urbaines et dans les pépinières, afin d'aider la décision de traitement pour la protection des parcelles de différentes espèces de palmiers. Dans la même période, nous avons comparé des pièges colorés rouges et noirs. A partir de 2012, des pièges de surveillance ont été placés sur l'ensemble du territoire régional, comme prévu dans le Plan d'action régional.

Mots-clés : Charançon Rouge du Palmier, IPM, stratégies de protection intégrée, ferruginéol.

INTRODUCTION

In Italy, *Rhynchophorus ferrugineus* was first detected in October 2004 in a palm nursery near Pistoia (Tuscany) (Sacchetti *et al.*, 2006). In the following years, Red Palm Weevil (RPW) spread to other regions in Southern and central Italy including Sicily, where it was detected mainly on old *Phoenix canariensis* Hort. Ex Chabaud palms growing along the eastern coast of the island (Longo and Tamburino, 2005; Longo, 2006; Conti *et al.*, 2008). The pest has affected consistently the green urban area of the island, and represents nowadays a major threat for the commercial nurseries of palm trees, widespread in the coastal area of Eastern Sicily. The chemical approach, including the application of various chemical formulations, has resulted in a partial control of the pest in urban area; it is difficult to manage and requires frequent chemical applications to be effective (Ferry and Gomez, 2002). In nursery condition the frequent application represents the only reliable strategy for the growers. Further, the chemical protection is mandatory for the maintenance of the plant passport (Decision 2007/365/EC) in authorized nurseries, submitted to periodical official inspections. In general, this intensive chemical application is very expensive and time consuming. In addition it poses major concerns regarding pollution and ecological impact, especially in urban areas. For this reason a technical approach is needed to avoid a calendar system for the chemical applications. The traps are considered a useful tool for the early detection of the pest and monitoring the dynamic of the population. Even the mass trapping action is considered effective in commercial orchards of date palms (Abraham *et al.*, 1998; Soroker *et al.*, 2005; Faleiro, 2006). Many authors have reported that dark traps are more attractive for the Red Palm Weevil adults (Hallett *et al.*, 1999; Sansano *et al.*, 2008; Al-Saoud *et al.*, 2010). In this work the result of the activity of monitoring RPW with pheromone traps in the coastal area of the Eastern Sicily are shown. The different approach for managing the pest in green sites (private and public) and in the commercial nurseries is pointed out. The strategies for improving the reliability of the traps are investigated.

MATERIAL AND METHODS

This study have had two major objectives: 1) to observe whether the captures of RPW in urban area are comparable with the captures in nursery sites, in order to drive the spray decision and timing the applications. 2) to compare the captures of adults with red and black coloured traps. Finally the constitution of a network of traps for monitoring the RPW infestation in the Sicily is briefly described.

LOCATION OF THE EXPERIMENTAL SITES

The traps were installed starting from 2006 in the urban area of Acireale (Catania) and have been maintained till the end of the study. In 2010 additional traps were positioned closely to three nurseries specialized in palms production in the cities of Mascali, Fiumefreddo and Giarre (Catania) and in three urban places of the same cities. All the urban and the nursery sites were located along the coastal area of the Eastern Sicily characterized by a mild climate that favours the growth of palm trees. Since 2005, the presence of RPW has been detected in the study area. The infestation has dramatically increased in the following years. The urban sites were located in medium size cities with several green areas where the species *P. canariensis*, *Washingtonia* spp., *Chamaerops humilis* L., *Trachycarpus fortunei* (Hook.) H.Wendl. and *Syagrus romanzoffiana* (Cham.) Glassman have been largely planted. The nursery area was marked by the presence of big premises, specialized in cultivation of several species of palm trees, both in open airs than in protected condition (screenhouse).

TRAPS AND EXPERIMENTAL LAYOUT

In 2006 the traps were hand-made with common plastic buckets of around 10 l with 2 rectangular holes in the lateral faces. Traps were covered with canvas tissue to assist the RPW adults in climbing to the holes. Traps were baited with aggregation pheromone TRIPHERON, "Pheromone Trap System," and were hanged (3 m) to adult *P. canariensis* in three squares of Acireale. Since 2008, commercial traps were installed (Rhynchotrap® BIO INTRACHEM), baited with ferrugineol (4-methyl-5-nonanol) in the urban centre of Acireale.

This traps was constituted by a red-coloured cilindric bucket with 2 rectangular holes cut equidistantly along the lateral faces. In the lid of the traps 3 additional circular holes were present. The pheromone dispenser was suspended under the lid. In the traps a mixture of water and liquid mineral oil or seed oil was added in order to avoid the exit of adults captured. The traps were buried in the ground till the level of the lateral windows. The pheromone was changed monthly and the adults of RPW counted every week. The mixture was replenished monthly. Since 2010, in the urban areas of Acireale, Mascali, Fiumefreddo and Giarre a red trap was installed while two red traps were positioned in the nursery areas of Mascali, Fiumefreddo and Giarre. In 2011 and 2012, red traps were compared with black traps obtained painting the original traps with acrylic permanent colour. In the table I all sites are resumed.

STATISTICAL ANALYSIS

The data were transformed $(x + 0.5)^{1/2}$ for ensuring the normal distribution. Data were subjected to 1-way ANOVA (being the factor the colour of the trap). The means were separated by performing the test T of Student.

Table I : Sites, location, and type and colour of RPW traps positioned in the period 2006-12 in Eastern Sicily

Sites, emplacement et type et couleur de pièges à CRP placés dans la période 2006-2012 dans l'Est de la Sicile.

Sites	Area	2006	2008	2010	2011	2012
Acireale	Urban	Hand made (3)	* red (1)	red (2)	red (1) black (1)	red (1) black (1)
Mascali 1	Nursery**	-	-	red (2)	red (1) black (1)	red (1) black (1)
Mascali 1	Urban	-	-	-	red (1)	-
Giarre 2	Nursery*	-	-	-	red (1) black (1)	red (1) black (1)
Giarre 2	Urban	-	-	-	red (1)	red (1)
Fiumefreddo	Nursery*	-	-	red (2)	red (1) black (1)	red (1) black (1)
Fiumefreddo	Urban	-	-		red (1)	red (1)

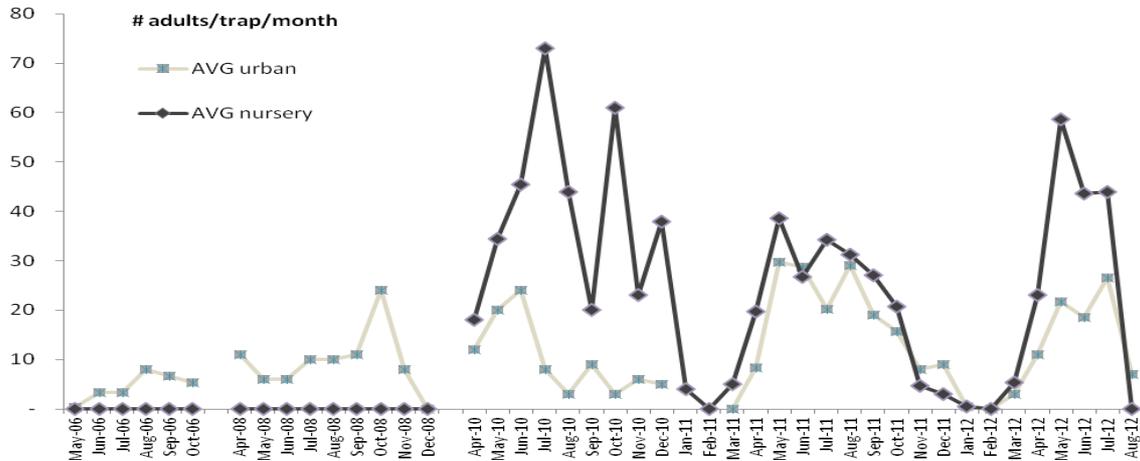
* Unless specified, all traps were commercial RPW traps: Rhynchotrap® (in brackets the number of traps positioned); ** area with several places of palms production;

RESULTS

COMPARISON OF CAPTURES IN URBAN AREA AND IN NURSERY SITES

In urban area the population of RPW increased from 2006 to 2011 and remained stationary in the following years, ranging from 10 to 30 captures per month. When the traps were positioned at ground level have caught more adults than at 3 m high (only in 2006). In nursery areas captures were higher than in urban area, demonstrating a consistent source of attraction for the pest due to the high presence of sensible plants (Arecaceae). Nevertheless, the continuous applications of chemical compounds in the nursery are capable to protect palms from attacks of the RPW, according to the scarce detection of infested plants recorded during official surveys. The infestations peaked in the late spring period with a maximum of 75 adults captured.

Figure 1 : Mean numbers of RPW captured monthly in urban area and nurseries in Eastern Sicily in the period 2006-2012 (Traps installed in nurseries since 2010)
 Nombre moyen de RPW capturés dans les zones urbaines et les pépinières dans l'Est de la Sicile dans la période 2006-2012 (Pièges installés dans les pépinières à partir de 2010)



COMPARISON OF RED AND BLACK TRAPS

With regard to the monthly records, the black traps captured on average constantly more adults than red ones (Figure 2). In the hot months the black traps captured much more than in the cold period. But, there were not statistically significant differences during the study period between red and black traps (Table II).

Figure 2 : Mean numbers \pm SEM of RPW captured monthly in red and black traps positioned in Eastern Sicily in the period 2006-2012.
 Nombre moyen \pm erreur standard de CRP capturés par mois dans des pièges rouges et noirs positionnés dans l'Est de la Sicile dans la période 2006-2012.

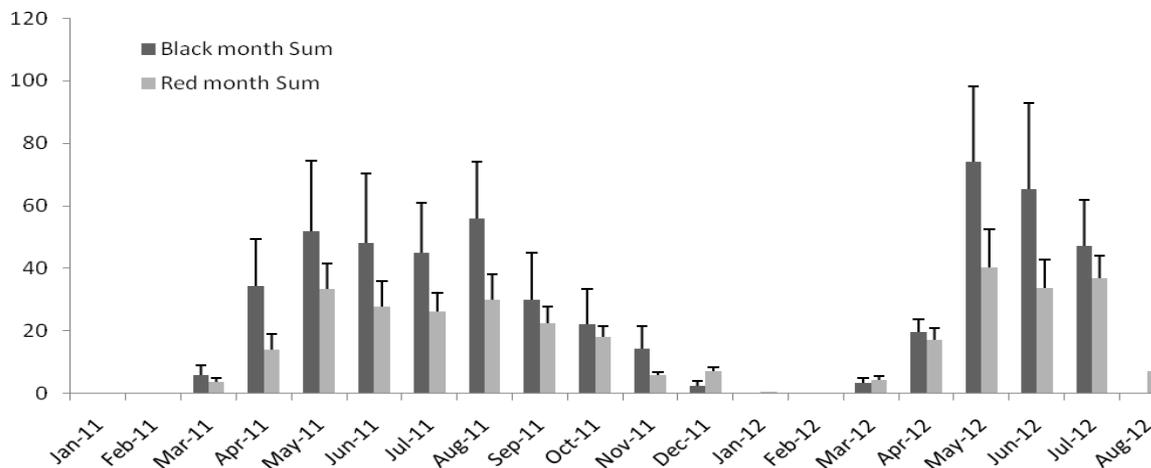


Table II : Inter-treatment differences, T Student on data transformed $(x + 0.5)^{1/2}$
 Différences inter-traitements, T de Student sur les données transformées $(x + 0,5)^{1/2}$

Month	Value t	df	p
Mar 11	0.9426	8	0.37
Apr 11	0.8889	8	0.40
May 11	0.8165	8	0.44
Jun 11	0.1909	8	0.85
Jul 11	1.3590	8	0.21
Aug 11	1.4881	8	0.18
Sept 11	0.1501	8	0.88
Oct 11	0.0163	8	0.99
Nov 11	1.1345	8	0.29
Dec 11	-0.2345	8	0.82
Jan 12	-1.2649	8	0.24
Mar 12	-0.3609	8	0.73
Apr 12	0.5564	8	0.59
May 12	1.1630	8	0.28
Jun 12	0.9376	7	0.38
Jul 12	0.5667	7	0.59

The lack of statistical significance was due to the high variability of the data across the different replications, since traps were positioned both in urban area and nursery area where the captures have been different .

DISCUSSION

In the study period we observed a narrow correspondence between the pattern of the captures in urban area and in the nursery sites. In both sites the early captures were detected since the month of March, confirming the assumption that the adults of the weevil rarely are recorded in the period December-February (winter), while in the period March-November the activity of the insect is constantly intense. During all the study period (five years) the number of captures, after a initial growth, remained on a comparable level. A preventive programm of chemical protection is necessary in this period of the year in the coastal area; in the internal area and/or in relation to altitude, 800 m above the sea, the lenght of the period of applications could be reduced. Recently in Italy several chemical compounds have been registered for their use in urban green area, but the use of Entomopathogenic nematods (EPNs) could be advisable in urban contest (Dembilio *et al.*, 2010; Jacas *et al.*, 2011). These control measures are reported in the Regional Action Plan, in actuation of the European Decision (467/2010/EC) and the National Decree (D.M. 7 February 2011). An additional measure of the Action Plan is the network of pheromone traps currently implemented in Sicily by the Plant Protection Service for the official survey of the RPW in the regional territory. For the nurseries in Italy, the official protocol prescribes a program of applications every 20-30 days starting from March; but it is possible to reduce the number of unnecessary treatments, with the help of monitoring traps, in order to timing better the sprays. An additional reduction of applications can be obtained on potted small palms, widely traded (Raciti *et al.*, 2009), and species not sensible, rarely attacked by RPW (Raciti *et al.*, in press), as emerged by the periodical official inspection carried out in Sicily on authorized premises. The use of traps for mass trapping, as integrative control strategy, must be investigated in nursery sites, where a large concentration of palm trees is located. In this case a kairomonal adjuvant is necessary for increasing the attractiveness of the pheromone (Hallett *et al.*,1999). The use of dark traps is to prefer for their best attractiveness, although must be statistically confirmed. This performance could be attributable to the effect of heating that determines an higher pheromone rate of release, amplifying its volatility (Hallett *et al.*,1999) or for a closer similtude with the dark colour of the trunk (Al-Saoud *et al.*, 2010). When the captures are greater (summer), the black traps can help for the applications timing.

CONCLUSION

The experience carried out in Sicily with pheromone traps in recent years suggest us to evaluate whether, in the precision management for the protection of the nurseries, can be included the use of traps with the aim of reducing the environmental impact and the costs of the chemical applications through: 1) reduction of the number of treatments and 2) utilizing the EPNs, which efficacy could be favoured by the high level of moisture present in the nurseries. The efficacy and cost of EPNs must be further investigated. The use of mass trapping in the nurseries can be an interesting tool to develop. It is advisable to modify the compulsory measures, for the authorized nurseries, which at present prescribe the total absence of noxious organism inside the cultivated plots, discouraging in this way the growers to install traps inside the nursery for detecting the organism or for mass trapping. For the urban areas the precise application of the preventive chemical control assures the protection of the trees. This approach can be reliable in particular for the historical trees, but on the long term it is not sustainable and must be reviewed in an ecological framework.

ACKNOWLEDGEMENTS

We sincerely thank Mr. Cardile Vincenzo, Mr. Natalino Corrado, Mr. Messina Carmelo and Mr. Cappadonna Giacomo (from Extension service office of Giarre) for helping us in the management of the Red Palm Weevil traps.

REFERENCES

- Abraham, V.-A., Faleiro J.-R., Al Shuaibi M.-A. and Al Abdan S., 2001 - Status of pheromone trap captured female red palm weevils from date gardens in Saudi Arabia. *Journal of Tropical Agriculture*, 39, 197-199
- Al-Soud A. -H., Al-Deeb M. -A. and Murchie A. -K., 2010 - Effect of Color on the Trapping Effectiveness of Red Palm Weevil Pheromone Traps. *Journal of Entomology*. 7(1), 54-59.
- Conti F., Sesto F., Raciti E., Tamburino V., and Longo S., 2008 - Ecological Factors Affecting the Spread of *Rhynchophorus ferrugineus* (Red Palm Weevil) in Eastern Sicily. *Palms*, 52(3),127-132.
- Dembilio O., Llacer E., Martinez de Altube M. -M., Jacas J. -A., 2010 - Field efficacy of imidacloprid and *Steinernema carpocapsae* in a chitosan formulation against the red palm weevil *Rhynchophorus ferrugineus* (Coleoptera Curculionidae) in *Phoenix canariensis*. *Pest Management Sciences* 66, 365-370.
- Faleiro, J.-R., 2006 - Insight into the management of red palm weevil *Rhynchophorus ferrugineus* Olivier: Based on experiences on coconut in India and date palm in Saudi Arabia. In: Fundación Agroalimed (Ed.). I Jornada Internacional sobre el Picudo Rojo de las Palmeras (November, 2005). Fundación Agroalimed. Valencia. Spain, 35-57.
- Ferry, M. & Gomez, S., 2002 - The Red Palm Weevil in the Mediterranean area. *Palms* 46(4), 172-178.
- Hallett R. -H., Oehlschlager A. C. and Borden J. -H., 1999 - Pheromone trapping protocols for The Asian Palm Weevil, *Rhynchophorus ferrugineus* (Coleoptera: Curculionidae). *International Journal of Pest Management*, 1999, 45(3), 231-237.
- Jacas J.-A., Dembilio O. and Llacer E., 2011 - Research activities focused on management of red palm weevil at the UJI-IVIA Associated Unit (Region of Valencia, Spain). *Bulletin OEPP/EPPO*, 41, 122-127.
- Longo S., Tamburino, V., 2005 - Gravi infestazioni di punteruolo rosso della palma. *Informatore Agrario* 50, 73-74.

Longo S., 2006 - Ulteriori acquisizioni sul punteruolo rosso asiatico dannoso alla Palma delle Canarie in Sicilia. *Informatore Fitopatologico* 10, 40-44.

Raciti E, Salamone M. -E., Buonocore E., Di Graziano M., Conti F., 2009 - Il vivaismo e le misure di emergenza fitosanitaria per il Punteruolo rosso delle palme. In Regione Siciliana: La ricerca scientifica sul punteruolo rosso e gli altri fitofagi delle palme in Sicilia. SBN. Pal0217180. *Centro Stampa Rubino, Marsala*, 207-210.

Raciti E., Conti F., Carta Cerrella D., Morabito M., Li Destri A., Malfitana S. and Romano D., in press - Palm species potentially resistant to red palm weevil attacks in sites of eastern Sicily heavily infested. *Palm Pest Mediterranean conference*, Nice – 16, 17 and 18 January 2013.

Sacchetti, P., Camera, A., Granchietti, A., Rosi, M. -C. and Marzialetti, P., 2006 - Identificazione, biologia e diffusione del curculionide *Rhynchophorus ferrugineus* (Olivier). *Informatore Fitopatologico* 6: 35-40.

Sansano Javaloyes M.-P., Gomez Vives S., Ferry M., Diaz Espejo G., 2008 - Ensayos de campo para la mejora de la eficacia de las trampas de captura de *Rhynchophorus ferrugineus*, Olivier (Coleoptera: Dryophtoridae), picudo rojo de la palmera. *Bol. San. Veg. Plagas.*, 34, 134-145.

Soroker, V. Blumberg, D., Haberman, A., Hamburger-Rishard, M., Reneh, S., Talebaev, S., Anshelevich, L. and Harari, A. -R., 2005 - Current status of Red Palm Weevil in date palm plantation in Israel. *Phytoparasitica* 33(1): 97-106.