European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

Data sheets on quarantine pests
Fiches informatives sur les organismes de quarantaine

Paysandisia archon

Identity

Name: *Paysandisia archon* (Burmeister)
Synonyms: *Castnia archon* Burmeister
Taxonomic position: Insecta: Lepidoptera: Castniidae
EPPO code: PAYSAR
Phytosanitary categorization: EPPO A2 no. 338, EU Annex designation IIAII

Hosts

All known hosts are palms (*Arecaceae*). In South America, the pest has been recorded on the following plants: *Butia yatay*, *B. capitata*, *Chamaerops humilis*, *Livistona chinensis*, *Phoenix canariensis*, *Syagrus romanzoffiana*, *Trithrinax campestris* (Sarto i Monteys & Aguilar, 2005). In Europe it has been recorded on *Brahea armata*, *B. edulis*, *Butia capitata Chamaerops humilis*, *Livistona* sp., *Phoenix canariensis*, *P. dactylifera*, *P. reclinata, P. roebelenii*, *P. sylvestris*, *Sabal mexicana*, *S. minor*, *S. palmetto*, *Syagrus romanzoffiana*, *Trachycarpus fortunei, T. wagnerianus, Trithrinax campestris, Sabal sp*. (possibly *S. minor*), *Washingtonia filifera* and *W. robusta* (Sarto i Monteys & Aguilar, 2005)

Geographical distribution

EPPO region: France (Alpes-Maritimes, Aude, Gard, Hérault, Var and Vaucluse), Italy (Campania, Marche, Apulia, Sicilia, Toscana), Spain (Cataluña, Comunidad Valenciana, Islas Baleares). Isolated findings were reported in the United Kingdom in 2003 and 2007.

South America: Argentina, Brazil (Rio Grande do Sul), Paraguay and Uruguay.

EU: France, Italy, Spain.

P. archon is a neotropical species indigenous to South America. In the EPPO region, it was first found in Spain in one nursery in Girona, Cataluña in 2001 on *T*rachycarpus fortunei, Phoenix canariensis and *Chamaerops humilis* (Aguilar *et al*., 2001) and later in the Comunidad Valenciana, and is now present at several sites along the Mediterranean coast from Girona to Alicante (Sarto i Monteys & Aguilar, 2005). It was first found in France in summer 2001, near Hyères (Var), then in Hérault in 2002 (Reynaud *et al*., 2002). It is now considered established in Alpes-Maritimes, Aude, Gard, Hérault, Var and Vaucluse. Isolated findings have been detected in Aquitaine, Bretagne, Midi Pyrénées, Pays de la Loire and but all were related to recent introductions of infested palms and the plants have been destroyed (L Bouhot Delduc, French NPPO, pers. comm. 2008). More recently, the pest has also been found at several locations in Italy (Colazza *et al*., 2005). There is a single isolated record, in 2002, of an adult in a private garden in West Sussex, England (UK). In May 2007, nine live adult *P. archon* were discovered in the atrium of an office building in West Malling, Kent. The moths had emerged from four 5 m tall *Phoenix canariensis* palms imported from Spain in October 2006. Additionally, in July 2007 three live *P. archon* larvae were discovered at a nursery in North London damaging *Trachycarpus fortunei* palms imported from Italy (Reid, 2008).

Biology

There is very little information on *P. archon* in its native area in the literature mainly because it is not a pest there. This is probably because of the presence of natural enemies (parasites and predators) which limit its populations, but also because, in its native range, it lives on wild palm trees and not on planted trees. Its life cycle has not been studied in Argentina, and the only available publication is a short note with some biological information (Bourquin, 1933). However the life cycle of *P. archon* has now been described in detail by Sarto i Monteys & Aguilar (2005) from observations in Catalunia (Spain).

Adults appear in mid-May and disappear in late September with a peak during June and July. Adults are active day-flying insects. Males are very territorial and fly in hot, sunny weather.

Eggs are laid within the fibre webs closest to or within the palm crowns. The eggs are not glued to the fibres remaining loose within their thick layers. Because of their location, they are not easily seen from the outside. Eggs are laid singly although sometimes, palm fibres may contain several eggs on the same palm crown.

The average number of eggs laid in the wild is not known but Sarto i Monteys & Aguilar (2005) consider that it could be around 140 eggs, based on their observations (on female dissections)

and those from Drescher & Jaubert (2003). Compared to other Heterocera, including other Castniidae, this is not a high fecundity.

Hatching occurs after 12 to 21 days depending on the temperature. Immediately after hatching, the larvae start looking for food and shelter and bore into the host plants. *P. archon* overwinter as larvae and all instars can be found in the palms including prepupal ninth instar larvae.

Larval stage can last from 10.5 to 18.5 months (for the later case this is due to unusual lethargic periods). Consequently some larvae (generally those hatched from June to August) overwinter only once whereas some others will overwinter twice. Live cocoons can be found from mid-March to mid-September. In Cataluñia the full *P. archon* life cycle lasts on average 389 days (i.e. 12.8 months) for specimens with a one year life cycle and 673 days for those with a two year cycle.

Larvae can be found tunnelling in different parts of the palms largely depending on larval size but they are usually located near the crown of the palm. They usually remain in the host until adult emergence.

The prepupal larval stage is long and complex and made up of two periods. The first occurs before making the cocoon and its length is very variable. The second occurs after the cocoon has been built and includes the time spent by the larva inside the cocoon before converting into pupa; this period is around 17 days in early spring although it can be shortened to only 9 days in early summer. The cocoons (average length of 5.8 cm) are stout with inner walls smoothly coated by a layer of silk and mucus. Outer walls are loosely covered by fragments of palm fibres which makes them very cryptic. On average, 66 days were necessary for pupae formed in the second half of March to complete their metamorphosis to adults, 52 days for those formed in the first half of April and 43 days for those formed in the first half of July.

Detection and identification

Symptoms

Symptoms of infestation by *P. archon* on palms as described by Sarto i Monteys *et al*. (2005) are:

- presence of sawdust on the palm crown and/or palm trunk
- presence of perforated or nibbled leaves (non specific)
- presence of gallery (axial and transversal) within the palm trunk (observable when the palm trunk is cut in slices)
- abnormal development of auxiliary leaf buds
- deformation and abnormal twisting of palm trunks
- abnormal drying up of the palms, especially the core leaves

The presence of flying adults may also be the first indication of the presence of the pest.

Morphology

Eggs

The egg of *P. archon* is a typical castniid egg, fusiform, resembling a rice grain, bearing six to eight raised longitudinal ridges which have associated aeropyles along their length, with the micropyle at one end of the long axis. Their colour, when freshly laid, is creamy pink or light brown becoming rosy brown as days pass. Its length is 4.69 ± 0.37 mm, the majority measuring between 4.4 and 5.2 mm. Its width, at the widest section, is 1.56 ± 0.11 mm (n = 118) the majority measuring between 1.50 and 1.60 mm.

Larva

Immediately after hatching, the larva is pink apart from the light brown head capsule and does not present cuticular spinules. Through the first instar, the rosy colour fades towards whitish and the long straight-lined setae become shorter because of multiple folding due to constant friction against the gallery walls where the larva lives. After the first moult, mobility diminishes notably, the larva becomes ivory white, chaetotaxy changes and the setae become much shorter, cuticular spinules appear; all these new traits are retained throughout the remaining larval stages. Earlier instars show a blackish dorsum as a consequence of the blackish longitudinal dorsal vessel clearly seen from outside the body; later instars turn to a more intense ivory white and the dorsal vessel is less obvious. Light brown cuticular spinules on the dorsum of the prothoracic segment form an 'M' mark, more obvious in mid and later instars.

From the first to the last instar, the larvae of *P. archon* increase in size dramatically. After emergence, the body length is 7.3 ± 2.2 mm, the width of the head capsule at the widest part being 1.00 ± 0.10 mm. When full grown, but before entering the prepupal stage when some contraction takes place, the larva may reach a body length of 9 cm, width of 1.5 cm at mid-length, and the width of the head capsule at the widest part being 7.84 ± 0.34 mm.

When fully developed, the larva enters a prepupal stage. This stage normally occurs in the 9th instar (the last one), however occasionally it can be in the 7th or 8th.

Pupa

Immediately after pupation, the pupa is pale yellowish. After darkening and hardening of the pupal cuticle occurs (about two days), it turns to a reddish brown colour. The size of the pupae is about 5.5 cm. Most of the abdominal segments of the pupa are furnished dorsally with transversal rows of short spines pointing backwards. The pupa is protected by a palm-fibre cocoon within the burrow. The cocoons are fusiform with an average length of 5.8 cm (range: 7.4–5.2 cm). Because the spindle is not symmetrical (it is flatter on one of its sides), there is a widest and a shortest width: widest average width 1.9 cm (range: 2.8–1.6 cm); shortest average width 1.7 cm (range: 2.0–1.3 cm).

Adult

The adult is a beautiful moth, with a large wingspan of 9–11 cm. The fore-wings are greenish brown, with a blackish brown median band. The hind-wings are orange with a wide transverse black band containing five or six white cells. The

antennae are clubbed with a typical apical hook. Females are a little larger and are easily recognizable by their chitinous ovipositor at the end of the abdomen.

Pathways for movement

Natural dispersal is ensured by flying adults. Sarto i Monteys & Aguilar (2005) reported an infestation on old palm trees 10 km away from the Girona outbreak with no link to an introduction of potentially infested material in the vicinity. The pathway for movement in international trade has probably been palm plants carrying larvae, which are difficult to detect. *P. archon* was probably introduced into the EPPO region between 1990 and 1995 (Sarto i Monteys & Aguilar, 2005; Drescher & Dufay, 2002) on *B. yatay* and *T. campestris* plants from Argentina. It is not clear to what extent the recorded outbreaks in the EPPO region have resulted from separate introductions, from movement of infested plants within the region, or from spread of flying adults.

Pest significance

Economic impact

Though *P. archon* has not been reported as a damaging pest in its native range in South America, serious damage and plant mortality have been reported in France, Italy and Spain (OEPP/EPPO, 2002; Riolo *et al*., 2004). The presence of numerous dead palm trees in nurseries in France was one of the main indications of the presence of the pest. In Italy (Marche region), Riolo *et al*. (2004) reported that in many nurseries severe damage and plant mortality were observed in 2003, leading to 90% loss of production. In Puglia region (south of Italy), *P. archon* was first found in spring 2004, but remained confined to palm tree nurseries. However, observations made in 2006 in the area of Polignano a Mare (Province of Bari, Apulia) showed that the pest was also present in old palm trees (Porcelli *et al*. 2006). In Pollença, north of Mallorca (Baleares), some stands of native *Chamaerops humilis* were found to be attacked in September 2003 (Sarto i Monteys & Aguilar, 2005). This confirmed the fact that significant damage can occur not only in nurseries but also in palm plantations or amenity palms.

Control

As this moth is not a pest in its native range, no control methods have been developed there. It seems unlikely that the pest can be eradicated in the areas where it has been introduced.

The biological characteristics of *P. archon* make its control difficult (the larvae is endophagous except for the very short time elapsed from eclosion to entering the hostplant) Apart from pulling-up and burning the infested palms, possible control measures using insecticides have been tested; good results were obtained by wetting the palm crown and palm trunk with contact and/or systemic organophosphorus insecticides (chlorpyrifos, acephate and dimethoate) (Sarto i Monteys & Aguilar, 2005). Imidacloprid tree injections have also been used against this pest in Europe (Reid & Moran, 2007). It should be stressed that the availability of products containing these active substances varies nationally. In addition it is difficult to develop insecticide treatments to be used on palms in parks and gardens, especially for curative treatments.

For the moment there is no known method of biological control available. In principle, it seems likely that natural enemies can be discovered in South America and used for classic biological control, but this would require several years of research and development. In the long term, such biological control would be the ideal solution to the problem. Laboratory trials with a strain of the entomopathogenic fungus *Beauveria bassiana* (i.e. strain B*b* 147) have been conducted in France and have showed encouraging results (Millet *et al*., 2007).

In the absence of a known method for biological control the only available approach is suppression and containment of the existing outbreaks.

Phytosanitary risk

Further introduction and spread of *P. archon* in the EPPO region presents a clear risk to the production of nursery palms. This nursery production exists in many Mediterranean countries where *P. archon* is not yet present, and which should therefore take phytosanitary measures to prevent introduction of the pest. In the absence of adequate control measures, *P. archon* also presents a risk of causing damage, disfigurement and even death in amenity palms throughout the Mediterranean region. A similar risk arises for plantations of palms, particularly of date palm (*Phoenix dactylifera*). *P. archon* has not yet encountered *P. dactylifera* in the EPPO region to a significant extent, and data is needed on the susceptibility of this host. However, until such information is available, one can only declare that *P. archon* infests the very similar *P. canariensis*, is polyphagous on palms and very probably presents a significant risk to this highly important cultivated palm. There is thus an immediate risk to the Elche palm forest in Spain (mainly date palms) and, if *P. archon* were to be introduced into North Africa, to date-palm plantations generally.

In addition, the application of insecticides for control of *P. archon*, in plantations or public places, would constitute a new, previously unnecessary use of plant protection products.

Phytosanitary measures

As *P. archon* cannot readily be detected in consignments of young palms, phytosanitary measures to prevent its introduction should concentrate on ensuring the absence of the pest at the place of production. The following possibilities have been considered: origin from a pest-free area, origin from a pest-free place of production (since at least 2 years), plants produced under suitable protected conditions (e.g. under a net), or various combinations of these measures. In addition, countries in which *P. archon* is already present should apply phytosanitary measures to suppress and contain existing outbreaks.

Acknowledgement

The article Sarto i Montes & Aguilar (2005) was used as a major source of information on the biology and description of *P. archon*.

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