

First interception in Europe of *Philephedra tuberculosa* Nakahara & Gill (Hemiptera: Coccidae), a neotropical pest of ornamental plants and fruit crops

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Philephedra tuberculosa Nakahara & Gill (Coccidae) was detected in Sweden on croton (*Codiaeum variegatum*) foliage imported from Ecuador via the Netherlands during October 2008. This is the first finding of this polyphagous Neotropical pest in Europe. In Florida, it is a serious pest of papaya, custard apple and a range of ornamental plants. The geographical distribution, host range, biology and economic importance of *P. tuberculosa* are reviewed.

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Introduction

Some unusually large scale insects were found on croton (*Codiaeum variegatum*) foliage imported into Sweden from Ecuador via the Netherlands during October 2008 during a phytosanitary inspection carried out by the Swedish Board of Agriculture. The foliage was intended for flower arranging. The scale insects were submitted to the Central Science Laboratory (UK) (CSL) for identification and found to be *Philephedra tuberculosa* Nakahara & Gill. There were three live and four dead adult females, two dead male pupae and several dead early instars present. Two of the live females had started to produce ovisacs. This appears to be the first finding of this polyphagous Neotropical pest in Europe (it has not been listed in the European Plant Protection Organisation (EPPO) non-compliance reports and has not been intercepted in the Netherlands, Maurice Jansen, pers. comm. 2008). The purpose of this communication is to report its potential pathway of entry into Europe and to review its geographical distribution, host range, biology

and economic importance.

Slide-mounted specimens of *P. tuberculosa* have been deposited at the CSL and the Natural History Museum, London (UK).

Detection and identification

All developmental stages of *P. tuberculosa* occur on the bark, foliage and fruits of the host plant. Adult females (Fig. 1) are oval, convex, and vary in colour from yellow to bright green to dark brown; they attain a length of 7 mm and width of 4 mm. They form an ovisac that is about twice the length of the adult female that partially covers the dorsum. The male pupae (Fig. 2) produce a glassy test, often with radiating filamentous white wax strands. There are numerous colour photographs of the pest available on the Internet (e.g. Osborne 2008). There are ten species currently assigned to the genus *Philephedra* (Ben-Dov 2006). *Philephedra tuberculosa* is morphologically similar to other species of *Philephedra* in lacking dorsal setae, having conspicuous two-ring ducts, spinose marginal setae, robust legs,



Figure 1. *Philephedra tuberculosa* teneral adult female on croton © CSL 2008.

Philephedra tuberculosa, nykläckt adult hona på croton.

and 8-segmented antennae (Anon. 2008). It belongs to a group of six *Philephedra* species characterised by having two-ringed ducts in the medial and submedial areas of the dorsum. *Philephedra tuberculosa* may be distinguished by having more than 65 two-ringed ducts on the dorsum (*P. colimensis* (Cockerell), *P. floridana* Nakahara & Gill, *P. mimosae* (Townsend & Cockerell), and *P. parvula* (Cockerell) all have fewer than 65) and by having 3 spiracular setae in each spiracular furrow (*P. ephedrae* (Cockerell) has 1 or no spiracular setae) (Nakahara & Gill 1985).

Teneral adult females are required for identification and were described and illustrated by Nakahara & Gill (1985), who also provide a diagnostic key.

Host plant range and biology

Philephedra tuberculosa is highly polyphagous and has been recorded feeding on 55 plant species belonging to 24 plant families (Anon. 2008, Nakahara & Gill 1985). It attacks many tropical and subtropical crops including citrus (*Citrus* spp.), custard apples (*Annona muricata*, *A. reticulata*, *A. squamosa*, *A. squamosa* x *A. cherimola*), fig (*Ficus carica*), guava (*Psidium guajava*), mamey sapote (*Pouteria sapota*), mango (*Mangifera indica*), papaya (*Carica papaya*), sea grape (*Coccoloba uvifera*), and the herb rosemary (*Rosmarinus officinalis*). It also feeds on a wide range of ornamental plants grown in Europe including the genera *Acacia*, *Acalypha*,



Figure 2. *Philephedra tuberculosa* immature male on croton © CSL 2008.

Philephedra tuberculosa, hannymf på croton.

Ambrosia, *Anthurium*, *Bauhinia*, *Cassia*, *Codiaeum*, *Dahlia*, *Diffenbachia*, *Euphorbia*, *Ficus*, *Helianthus*, *Hibiscus*, *Ipomoea*, *Solidago* and *Zingiber*.

The only detailed study of the biology of *P. tuberculosa* is that of Peña et al. (1987) who examined the pest on papaya in the laboratory (T 27 ± 2°C; RH 75 ± 3%) in Florida. Gravid females produced an average of 87 first instars (crawlers) over a 7-day period. The first instar lasted 2-8 days. The male second instar lasted 4-6 days, third instar (prepupa) 7-8 days, fourth instar (pupa) 5.5 days and the adult survived for 10-22 hours. The female second instar lasted 8 days and third instar 6-8 days. The adult female produced an ovisac after 8-10 days and completed the ovisac after about 30 days. Each fully formed ovisac contained 360-900 eggs. The average life span for males was 24 ± 2 days and for females 59 ± 1 day. Population peaks occurred in July-October during the rainy season in Florida.

The following natural enemies have been reported from Florida (Peña et al. 1987): *Coccophagus lycimnia* Walker (Hymenoptera, Aphelinidae); *Trichomastus portoricensis* Crawford (Hymenoptera, Encyrtidae); *Azya* sp., *Cryptolaemus montrouzieri* Mulsant, *Diomus austrinus* Gordon, *Hyperaspis ornatella* Gordon, *Olla ? abdominalis* (Say) (Coleoptera, Coccinellidae); *Diadiplosis pulvinaria* (Felt) (Diptera, Cecidomyiidae); *Ocyptamus* sp. (Diptera, Syrphidae); *Laetilia* sp. (Lepidoptera, Pyralidae). In



Figure 3. *Philephedra tuberculosa* heavy infestation on croton in a glasshouse in Florida © L. S. Osborne and the University of Florida, MREC.

Ett hårt angrepp av *Philephedra tuberculosa* på croton i ett växthus i Florida.



Figure 4. *Philephedra tuberculosa* infestation on croton in a glasshouse in Florida © L. S. Osborne and the University of Florida, MREC.

Angrepp av *Philephedra tuberculosa* på croton i ett växthus i Florida.

addition, the fungus *Lecanicillium lecanii* (Zimmerman) Gams & Zare also attacks the scale insect (Peña & McMillan 1986).

Geographical distribution

Philephedra tuberculosa is native to an area that extends from northern South America to southern North America. It was accidentally introduced to Florida (USA) in about 1982 on imported ornamental plants (Frank & McCoy 1992). It now occurs in the following countries: Bahamas, Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Puerto Rico, Venezuela and the USA (Florida and Texas) (Anon 2008, Kondo 2001, Miller 1996, Nakahara & Gill 1985, Peña & Bennett 1995). It is reported here on plant mate-

rial imported from Ecuador, although it has not yet been collected in the field in Ecuador (Bendov 2006, Nakahara & Gill 1985).

Economic Importance

Infestations of *P. tuberculosa* have resulted in considerable losses for nurserymen in southern Florida (Figs 3 & 4) and can severely damage papaya and sugar apple crops (Gill & Kosztarab 1997, Peña et al. 1987). It feeds on the plant phloem, which weakens the host and can cause leaf loss and slow dieback. For example, infested young papaya plants lose their leaves and flowers. The young leaves are distorted and the fruit is unmarketable due to the presence of the insect (Peña et al. 1987). In addition, it eliminates excess sugar-rich plant sap as 'honeydew';

this encourages the growth of black sooty mould (Hamon 1986), detracting from the aesthetic appeal of ornamental plants, reducing their area of photosynthesis and promoting leaf drop. Moreover, because of its wide range of hosts, including citrus, it has the potential to become a very serious pest.

Conclusion

Philephedra tuberculosa is a broadly polyphagous pest of several tropical and subtropical fruit crops and of a wide range of ornamental plants. It has only been detected once in Europe (on foliage for flower arranging) but a potential pathway exists for its entry on ornamental plants and cut foliage from South, Central and North America and the Caribbean. It is a tropical and subtropical insect and would therefore likely be restricted to indoor plantings in Northern Europe, although it may survive outdoors in warmer parts of the Mediterranean, where potential hosts such as citrus, croton, fig and hibiscus are common.

Suspected outbreaks, or interceptions, of non-native plant pests in Sweden should be reported to the Swedish Board of Agriculture, Plant Protection Service, SE-551 82 Jönköping, Sweden. E-mail: vaxtinspektionen@sjv.se

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Sammanfattning

Sköldlusen *Philephedra tuberculosa* Nakahara & Gill (Coccidae) är ett skadedjur på många olika växter i de tropiska delarna av Amerika. Arten hittades i Oktober 2008 i Sverige på crotonplantor (*Codiaeum variegatum*) importerade från Ecuador via Nederländerna. Det är det första fyndet i Europa. I Florida är arten ett besvärligt skadedjur på papaya, cherimoya och flera arter av prydnadsväxter. I södra Europa finns gott om bl.a. citrusfruktträd som kan vara värdar åt denna sköldlus och det finns därför risk att den kan etablera sig där. I norra Europa kan bör den bara överleva inomhus eftersom den ursprungligen är en tropisk art. Misstänkta fynd av denna art bör rapporteras till växtinspektionen på Statens jordbruksverk.