

THE ESTABLISHMENT OF FUCHSIA GALL MITE, *ACULOPS FUCHSIAE* (ACARI: ERIOPHYIDAE) IN ENGLAND, A SERIOUS PEST OF FUCHSIA

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ABSTRACT

The Fuchsia gall mite *Aculops fuchsiae* Keifer, which is native to South America, was first detected in England in 2007. The mite causes extensive galling and unsightly distortion of the aerial parts of its host plants, *Fuchsia* species and cultivars. The establishment and known distribution of *A. fuchsiae* in England is presented along with details of its host range, lifecycle and control. The current and future impact of this pest in the UK and Europe is discussed.

INTRODUCTION

The Fuchsia gall mite, *Aculops fuchsiae* Keifer, is native to South America, and has become a problem in California, the Channel Islands and France (Ostojá-Starzewski & Eyre, 2012). In 2007 the mite was reported on the British mainland for the first time and it has since spread across southern England.

Aculops fuchsiae was described in 1972 from specimens collected from a *Fuchsia* sp. in Sao Paulo, Brazil in 1971 (Keifer, 1972); type specimens are held at Instituto Agronomico, Campinas, Estado São Paulo, Brazil and paratype specimens at the Entomological Research Division, USDA, Beltsville, Maryland, USA (CABI, 2012). The mites are 0.20 to 0.25 mm in length and 0.055 to 0.060 mm in width (Plate 9, Fig. 1). Similar to many eriophyid mites the body is fusiform, pale yellow to white in colour and bears only two anterior pairs of legs. The species is characterised by the short and acuminate anterior shield lobe over the rostrum, which is truncate underneath, plus the granules on the shield surface that obscure the shield pattern on the posterior part of the shield. This species closely resembles many of the other members of the genus; however, *A. fuchsiae* is host specific and is the only eriophyid mite recorded from *Fuchsia* species. Due to their small size the mites themselves can be difficult to identify, however the symptoms induced on infested fuchsias are diagnostic. The galls develop gradually, starting with a noticeable reddening of the leaves, particularly at the shoot tips, the leaves and flowers becoming grossly thickened and deformed as the infestation develops. Initially galled tissue is yellowish green and has a felt-like appearance (Plate 9, Fig. 2) but becomes reddened with age (Plate 10, Fig. 3). Symptoms of infestation are most strongly expressed at the terminal shoots, and can result in the complete suppression of new growth (Ostojá-Starzewski & Eyre, 2012), flower buds are also infested, causing grossly abnormal blooms. Feeding on pre-emergent leaf and flower buds by capsid bugs such as *Lygocoris pabulinus* (L.) (Miridae) can cause small ragged holes to appear on affected leaves followed by characteristic tattering and distortion and few flowers to subsequently develop (Plate 10, Fig. 4). This damage has frequently been mistaken by members of the public for fuchsia gall mite damage.

ESTABLISHMENT AND DISTRIBUTION IN EUROPE AND THE UK

Aculops fuchsiae was first reported outside Brazil in 1981 from San Francisco, California, USA, and it spread quickly throughout the state (Koehler, Allen & Costello, 1985). It has also been found intermittently in Western Washington and Oregon, but infestations there are believed to be periodically wiped out by winter cold (Anon, 2006). In Europe *A. fuchsiae* was first confirmed in December 2003 from specimens collected from eight sites around the Gulf of Morbihan, Brittany, France. However, it had probably been present since 2002 when symptoms were observed at the Festival de Trévarez, Brittany (May–September) on a *Fuchsia* from a private collection (Streito *et al.*, 2004), but is now widespread in Brittany (CABI, 2012). It was detected in the Channel Islands on Guernsey in July 2006 and on Jersey in October 2006, although it may have been present since 2001 on Jersey and is now widespread on the Islands (Ostojá-Starzewski & Eyre, 2012). The first report of *A. fuchsiae* on mainland Britain was made on 4th September 2007, when infested fuchsia shoots were sent to the Royal Horticultural Society (RHS) Advisory Service from a private garden in Portchester, Hampshire. Further investigations by the RHS and Food and Environment Research Agency (FERA) found that the mite was present in several private gardens in southern England (South Hampshire, West Kent, Middlesex and Surrey). The RHS and FERA have since received more than 200 records; in 2008 *A. fuchsiae* was reported on three occasions, from East Cornwall, South Devon and Middlesex; in 2009 there were seven reports spread across East and West Cornwall, South Devon, South Hampshire, the Isle of Wight and Middlesex. In 2010 32 reports were received from across southern England with the first records in the vice counties of Dorset, South Somerset, East Kent, West Sussex and North Essex. In 2011 108 records were received, mostly from counties where it had been reported in the preceding years, with the addition of Berkshire. During 2012 and 2013 more than 60 records were received, all from counties where the mite had been previously recorded. *Aculops fuchsiae* is now widespread in southern England (Fig. 1).

The mode of spread of *A. fuchsiae* is not well known, but it is likely to be similar to that of other eriophyid gall mites, which are spread locally by wind/air currents and pollinating insects, and in its native range possibly hummingbirds (Koehler, Allen & Costello, 1985). However the major route of dispersal over longer distances is likely to be anthropogenic movement of infested plant material, particularly as fuchsias are often propagated by vegetative means (cuttings) and this is thought to be its likely pathway of introduction into mainland Europe and the UK (Ostojá-Starzewski & Eyre, 2012).

LIFECYCLE

Aculops fuchsiae has four life stages: egg, larva, nymph and adult. Females lay up to 50 eggs at one time. At 18°C the eggs take 4 to 7 days to hatch and the lifecycle takes 21 days to complete (Ostojá-Starzewski & Eyre, 2012). All life stages are able to overwinter within the buds of fuchsia (Natter, 1982; Crawford, 1983). The mite is known to survive minimum temperatures of 5°C in California (Koehler, Allen & Costello, 1985) but, in the Pacific North West of the USA the mite is thought to be killed in severe winters, when temperatures remained below –6°C for 3 to 4 nights (Anon, 2006). The presence of *A. fuchsiae* on hardy (outdoor) fuchsias in southern England over five consecutive winters (2007–2012/3, Table 1), two of which saw prolonged periods with temperatures below 0°C may indicate that winter temperatures in southern England are not low enough to kill the mite (Met Office,

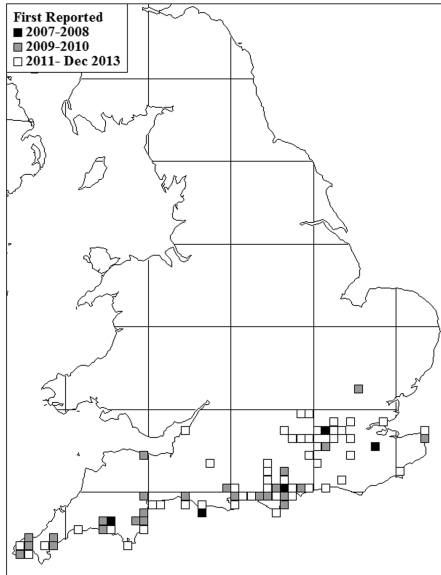


Fig. 1. Records of the Fuchsia gall mite, *Aculops fuchsiae* Keifer in England, 2007 to December 2013. RHS and Fera data. Produced using Dmap©.

2012); the mites are naturally more cold hardy than previously thought or that the populations now present have already adapted to survive at lower ambient temperatures. However, it is not known if the plants in these cases harboured the mite throughout the winter or became infested during the summer and further investigation is required. The mite may be intolerant of high temperatures as it was difficult to infest fuchsias under glasshouse conditions and its spread into warmer inland regions of California appears to have been slow (Koehler, Allen & Costello, 1985).

HOSTS

Host plants of *Aculops fuchsiae* are limited to *Fuchsia* species and cultivars. The mite has been shown to survive on most *Fuchsia* species investigated although there is some variation in host susceptibility, with some species and cultivars showing no symptoms or only a trace of injury (Table 1, Koehler, Allen & Costello, 1985). Fuchsias that can be severely damaged include three species (*F. procumbens* R.Cunn, *F. coccinea* Dryander and *F. magellanica* Lam.) and 35 cultivars, whilst three species (*F. microphylla* Kunth, *F. thymifolia* Kunth and *F. arborescens* Sims) and 11 cultivars were noted to be highly resistant, with little signs of damage, although they were able to support populations of the mite. The same authors also noted that resistant cultivars tended to have small leaves and flowers. These may be less attractive horticulturally but may offer the potential for breeding more attractive mite-resistant garden worthy plants. In addition to the susceptible cultivars listed by (Koehler, Allen & Costello, 1985), samples of eleven named cultivars were received by the RHS and FERA which showed severe galling and so should be considered susceptible

Table 1. *Fuchsia* species and cultivars known to be resistant or susceptible to the *Fuchsia* gall mite *Aculops fuchsiae*. Plant hardiness category based on British *Fuchsia* Society (2001) and Boulemler (1991). Where H=hardy to at least RHS definition H3 ('plants hardy outside in some regions of the British Isles'), NH=Not hardy (RHS definition H2 or below, 'Plants requiring unheated or heated glasshouse conditions in the British Isles), U=no information available.

Fuchsia (Group/Cultivar)	Data Source
Resistant¹	
Encliandra group (Native to Mexico and Central America) <i>F. microphylla</i> (H), <i>F. thymifolia</i> (H), 'Baby Chang' (H), 'Cinnabarina' (H), 'Isis' (H), 'Mendocino Mini' (H), 'Miniature Jewels' (H), 'Ocean Mist' (H)	Koehler, Allen & Costello, 1985
Schufia group (Native to Mexico and Central America) <i>F. arborescens</i> (NH)	Koehler, Allen & Costello, 1985
Cultivars of unknown origin	
'Chance Encounter' (H), 'Englander'(U), 'Golden West' (H), 'Voodoo' (H)	Koehler, Allen & Costello, 1985
Susceptible²	
Procumbentes group (Native to New Zealand)	
<i>F. procumbens</i> (H)	Koehler, Allen & Costello, 1985
Quelusius group (Native to Southern Andes and South East Brazil)	
<i>F. coccinea</i> (H), <i>F. magellanica</i> (H)	Koehler, Allen & Costello, 1985, RHS/FERA ³
Cultivars of unknown origin	
'Angel's Flight' (H), 'Bicentennial' (H), 'Capri' (H), 'China Doll' (H), 'Christy' (H), 'Dark Eyes' (H), 'Display' (H), 'Dollar Princess' (H), 'First Love' (H), 'Golden Anne' (U), 'Jingle Bells' (H), 'Kaleidoscope' (H), 'Kathy Louise' (H), 'Lena' (H), 'Lisa' (H), 'Louise Emershaw' (H), 'Marinka' (H), 'Novella' (H), 'Papoose' (H), 'Pink Marshmallow' (H), 'Psychedelic' (H), 'Raspberry' (H), Rose of Castle (H), 'South Gate' (NH), 'Swingtime' (H), 'Tinker Bell' (H), 'Troubadour' (H), 'Vienna Waltz' (H)	Koehler, Allen & Costello, 1985 ²
'Anita' (NH), 'Beacon' (H), 'Celia Smedley' (H), 'Jolly Nantes' (H), 'Lye's Unique' (H), 'Margaret Brown' (H), 'Mrs Popple' (H), 'Susan Olcese' (NH)	RHS/FERA ³

1 In trials evaluated in California (Koehler, Allen & Costello, 1985). Although deemed resistant, these cultivars were able to support the mite and some showed traces of injury.

2 In trials evaluated in California (Koehler, Allen & Costello, 1985) showing moderate to severe injury in trials.

3 It is assumed that all reports to the RHS and FERA are of susceptible cultivars as initial diagnosis was made on the presence of galling.

hosts. Current information suggests that whilst all *Fuchsia* can at least support *A. fuchsiae*, those cultivars known to be bred from the Encliandra and Schufia taxonomic *fuchsia* groups and native to central America appear to be resistant, whilst those from the Procumbentes and Quelusius taxonomic groups appear to be susceptible. Further testing is required to determine if this remains true across all *Fuchsia* species in these groups.

CONTROL

As with most gall-forming eriophyoid mites *A. fuchsiae* is difficult to control using the currently approved acaricides as any treatment needs to be applied before the mites enter the leaf and flower buds to be effective i.e. before symptoms become evident (Ostojá-Starzewski & Eyre, 2012). In California several pesticides (now mostly unavailable) were tested in a designed field trial. Although some suppression of the mite population was observed, surviving mites rapidly reproduced and no long-term control was gained (Koehler, Allen & Costello, 1985). Repeated applications are necessary to break the mite lifecycle, and one suggested regime is based on the knowledge that *A. fuchsiae* eggs hatch 4 to 7 days after being laid and so requires at least three acaricide applications at four-day intervals (Ostojá-Starzewski & Eyre, 2012). Trials in California showed that pruning and safe disposal of infested plant tissue in conjunction with any pesticide sprays gave the most satisfactory results (Koehler, Allen & Costello, 1985). Heat treatment of 45°C for 3½ hours failed to control the mite and caused some necrotic tissue on the plants (Koehler, Allen & Costello, 1985). Although several species of predatory mesostigmatid mites (Phytoseiidae) feed on eriophyoid mites, *A. fuchsiae* are relatively inaccessible to these predators once the galls have formed. However the mite *Amblyseius californicus* (McGregor), a commercially available biological control agent, has been found in association with *A. fuchsiae* in California and it is thought that it may be responsible for some “dampening” of fuchsia gall mite populations (Koehler, Allen & Costello, 1985).

Due to the difficulties associated with achieving effective control and the disposal of infested plants, quarantine measures should be implemented to reduce the likelihood of introducing this pest to more gardens. Good horticultural hygiene should also be followed, e.g. washing of hands and tools after contact with infested plant material and the movement of plants and cutting from areas where *A. fuchsiae* is prevalent should be carefully considered.

DISCUSSION – THREATS TO EUROPEAN FUCHSIA PRODUCTION

Aculops fuchsiae is considered a major pest of all but the most resistant species and cultivars of *Fuchsia*. In California some gardeners have given up growing fuchsias due to this pest (Koehler, Allen & Costello, 1985). The economic impact of *A. fuchsiae* in Europe is not yet known (Ostojá-Starzewski & Eyre, 2012) although there are undoubtedly economic impacts of legislation which attempts to stop its spread. *Aculops fuchsiae* is currently a regulated quarantine pest in the European Union (EU), therefore fuchsias require a phytosanitary certificate if they are imported from outside the EU. In addition, imports from Brazil and the USA require inspection immediately prior to export and a declaration that the place of production is free from *A. fuchsiae*. In Brittany, France, legislation now requires destruction of infested plants, increased official inspection and prevents propagation and movement of *Fuchsia* from infested areas (Ostojá-Starzewski & Eyre, 2012). Whilst these measures regulate the professional trade the exchange of material between amateurs is difficult to control, and this route may be the primary mode of spread of this pest to new areas. It is clear that the phytosanitary measures implemented so far have not stopped the spread of this pest to the Channel Islands and mainland UK and it is clear that the mite is established in southern England and may spread northwards.

Due to the number of records received from private gardens in England statutory action will only be taken on outbreaks reported in plant production nurseries or on

plant imports; in England and Wales these should be reported to FERA (tel: 01904 465625, planthealth.info@fera.gsi.gov.uk), in Scotland to the Scottish Government (tel: 0300 244 9772, hort.marketing@scotland.gsi.gov.uk), and in Northern Ireland to the Department of Agriculture and Rural Development (tel: 0300 200 7852, dardhelpline@dardni.gov.uk). The RHS is interested in records of this pest from gardens and findings can be reported to advisory_entomology@rhs.org.uk.

ACKNOWLEDGEMENTS

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SHORT COMMUNICATION

***Acleris variegana* (D.&S.) (Lep.: Tortricidae) feeding on Cornelian Cherry – A specimen of Cornelian Cherry *Cornus mas* cv. Jolico (an edible cultivar) was observed with a small tortricid infestation at Macknade, Faversham, Kent in early August 2014. Pupae were collected and adults of *Acleris variegana* duly emerged on 10.viii. and 11.viii.2014, each a different colour form. The larva is known to be polyphagous feeding on Rosaceae and various other plants including *Ulmus*, *Vaccinium*, *Corylus* and *Berberis* (Bradley & Tremewan, 1973; Emmet, 1991). This appears to be the first recorded instance of *A. variegana* larvae feeding successfully on a species of Cornaceae.**

This may represent a recent extension of host plant range, but there is insufficient detailed information in the published literature on larval food plants to substantiate such a hypothesis. – JOHN BADMIN, Coppice Place, Selling, Kent ME13 9RP.

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PLATE 9. Fig 1. Various life stages of *Aculops fuchsiae* Keifer feeding on the surface of a flower stalk. Adult mites reach 0.20 to 0.25 mm in length FERA[©]. Fig 2. Fuchsia gall mite *Aculops fuchsiae* galls at the green stage RHS[©].



PLATE 10. Fig 1. Fuchsia gall mite *Aculops fuchsiae* galls at the red stage RHS[®]. Fig. 2 Green capsid bug *Lygocoris pabulinus* feeding damage on *Fuchsia Fera*[®].