

PEST RISK ANALYSIS FOR *TETRANYCHUS EVANSI*

STAGE 1: PRA INITIATION

1. What is the name of the pest?
Tetranychus evansi Baker and Pritchard Acari Tetranychidae a red spider mite

Note on taxonomy: *Tetranychus evansi* was redescribed by Moraes *et al*. (1987).

2. What is the reason for the PRA?
This spider mite was added to the EPPO Alert list in May 2004 after the EPPO Secretariat was informed by the NPPO of France that the organism was spreading within Mediterranean countries. Since *T. evansi* is considered a damaging pest of tomatoes and other solanaceous crops, the EPPO Secretariat added it to the EPPO Alert List (EPPO, 2004).

3. What is the PRA area?
This organism is already present in the EU (Portugal, Spain and France, see 11.). Consequently the PRA area is confined to the UK.

STAGE 2: PEST RISK ASSESSMENT

4. Is the pest established in the PRA Area? Does it maintain transient populations?
No, *T. evansi* is not established in the UK. *T. evansi* does not maintain transient populations in the UK.

5. Is there any other reason to suspect that the pest is already established in the PRA Area?
No, there is no reason to suspect that *T. evansi* has already established in the UK.

6. What is the pest's EPPO Status? *(A1/A2 quarantine pest or Alert list ?)*
T. evansi was added to the EPPO Alert List in May 2004 (see 2.)

7. What is the pest's EC Plant Health Directive status?
T. evansi is not listed in the EC Plant Health Directive 2000/29/EC.

8. What are its host plants?
T. evansi is polyphagous prefering to feed on wild and cultivated Solanaceae especially tomato (*Lycopersicon esculentum*) and aubergine (*Solanum melongena*) (Moraes & McMurty, 1985a; Leite *et al.*, 2003) but also on potato (*S. tuberosum*) and tobacco (*Nicotiana tabacum*) (Blair, 1989). It has also been found feeding on crops such as beans, citrus, cotton, castor bean, ornamentals e.g. *Rosa* and on many weed species e.g. *Amaranthus, Chenopodium, Convolvulus, Conyza, Diplotaxis, Hordeum murinum, Lavatera, Sonchus, Solanum nigrum* (Moraes *et al*., 1987)

9. What hosts are of economic and/or environmental importance in the PRA area?

9.1 Economic

Economically important hosts grown outdoors include potato, beans and ornamentals such as roses.

Economically important hosts grown underglass include tomatoes and aubergine.

9.2 Environmental

Weed hosts growing in the UK include *Convolvulus, Conyza, Diplotaxis, Hordeum, Lavatera, Sonchus* and *Solanum nigrum.*

10. If the pest needs a vector, is the vector present in the pra area?

Tetranychus evansi is a free-living organism. No vector is needed.

11. What is the pest's present geographical distribution?

T. evansi is of South American origin and has been accidentally introduced to other parts of the world. For example, it spread to Reunion from Mauritius in the 1970s (Gutierrez & Etienne, 1986). In the 1980s it spread into Southern Africa, at the end of 1980s and early 1990s it spread into north Africa. It was first recorded in Spain in 1995, Portugal in 2000 and France in 2005 (Moraes *et al.,* 1987; Ferragut & Escudero, 1999; EPPO, 2004).

Table 1: Geographic distribution of *Tetranychus evansi*

North America:	USA (Arizona, California, Florida, Texas).
Central America:	Puerto Rico.
South America:	Brazil.
Europe:	Spain (Canary Isles, also along the Mediterranean coast from Valencia to Almería, also found on protected crops in Tenerife), Portugal (including Madiera), France (Pyrénées-Orientales).
Africa:	Democratic Republic of Congo, Kenya, Malawi, Mauritius (including Rodrigues island), Morocco, Mozambique, Namibia, Réunion, Seychelles, Somalia, South Africa, Tunisia, Zambia, Zimbabwe.
Asia:	Absent – no records
Oceania:	Absent – no records

12. Could the pest enter the PRA area?

Yes. In April 2005 live *T. evansi* eggs and adults weredetected in a consignment of aubergines from Kenya by PHSI at Manchester Airport (DOMERO ref 41353/2043/1). *T. evansi* was detected again on aubergines from Kenya in September 2005.

The mite could potentially be carried into the UK on other produce (tomatoes and roses) from regions where it occurs in southern MS.

13. Could the pest establish outdoors in the PRA area?

Very unlikely. This is a warmth-loving pest. A study by Bonato (1999) showed that the optimal temperature for population growth is 34°C. The shortest developmental time (6.3 days) occurs at 36°C. At 25°C, the life cycle is completed in 13.5 days. After finding *Tetranychus evansi* on *Solanum nigrum* at two localities in the south of France near the Spanish border, Migeon (2005) compared the climatic conditions in parts of the USA where this organism occurs with the climate of France and concluded that it could only establish outdoors in France in a narrow band around the Mediterranean coast and on

Corsica. Elsewhere in France, colder winters and lower summer temperatures would probably limit the distribution of the pest.

However, Moraes and McMurtry (1987) conducted experiments on *T. evansi* at five constant temperatures, on excised leaves of *Solanum douglasii*, to deduce the theoretical lower threshold temperature for development of each life stage and the thermal sum for complete development (Table 2). Based on the data in Table 2, and using outdoor mean temperature data for southern England, *T. evansi* would be able to develop between late May and mid September, during which two generations could be completed. However, it is unlikely that *T. evansi* would be able to overwinter sucessfully, i.e. survive outdoors from late September until the following May.

Table 2: Threshold temperatures for development of *Tetranychus evansi* life stages

Life stage	Threshold temperature for development	DD required to complete development
Egg	13.2	62
Larva	13.2	36
Protonymph	12.9	25
Deutonymph	12.6	33
Combined immature stages	13.2	148
Adult maturation (preoviposition)	13.7	10

14. Could the pest establish in protected environments in the PRA area?
Likely. Based on 148 DD required above a threshold of 13.2°C (Moraes & McMurtry, 1987) daily records of maximum and minimum temperatures from a heated UK glasshouse, where the minimum recorded temperature during the year was 8.2°C (the mean daily minimum was 16.1°C) and the maximum recorded temperature was 34.2°C (the mean daily maximum was 24.2°C) CSL data (unpublished) suggests that *T. evansi* could very easily survive, year round, with perhaps ten to 15 generations in a heated glasshouse through the year (Annex 1). It could also survive year round in an unheated glasshouse, with perhaps 3 or 4 generations per year.

Migeon (2005) concluded that *T. evansi* has the potential to colonize glasshouses all over France.

15. How quickly could the pest spread within the PRA area?
Very quickly, but only between glasshouses. This organism is only likely to survive in glasshouses in the UK, hence only spread between glasshouses is considered. Over short distances, for example between neighbouring glasshouses, mites can be spread by wind and casual workers, e.g. on clothing and tools. The trade in host plants can ensure long distance dissemination. The small size of *T. evansi*, and its morphological similarity with other spider mite species renders its detection difficult on consignments.

16. What is the pest's potential to cause economic and/or environmental impacts in the PRA area?
A medium-high impact is likely if this pest established in tomato glasshouses. In many countries where *T. evansi* has been introduced, it is reported as a serious pest especially on tomato. *T. evansi* is morphologically similar to other spider mite species already present in Europe e.g. *T. urticae*, it can easily be confused with them and therefore remain

undetected. However, unlike other spider mite species, biological control with predatory mites such as *Phytoseiulus persimilis* and *Neoseiulus californicus* is not effective.

T. evansi is one of four species of red spider mites causing damage in vegetable crops in eastern Spain (Escudero and Ferragut, 2005). In Southern Africa *T. evansi* is considered as the most important dry season pest of tomatoes. Infested tomato plants turn yellow, green then brown. Plants generally show a bleached yellow-orange or russeted appearance. Infested plants may be killed very rapidly (Jeppson *et al*., 1975). In Zimbabwe, up to 90% yield losses have been recorded from field trials. Of the thirteen known spider mite species on Reunion, *T. evansi* is one of the most destructive pests on crops (Gutierrez & Etienne, 1986).

Nymphs and adults more commonly feed on the sensitive upper and middle leaves of crops rather than on the tougher lower leaves (Leite *et al*., 2003). Damage caused by *T. evansi* is similar to that caused by other spider mites. Feeding punctures lead to whitening or yellowing of leaves, leaves then become desiccated and eventually drop. In severe cases plants may die.

17. What is the pest's potential as a vector of plant pathogens?
T. evansi is not recorded as a vector.

STAGE 3: PEST RISK MANAGEMENT

18. What are the prospects for exclusion from the PRA area?
Outdoors: Very good – the climate is unsuitable in the UK. This pest is spreading outdoors in a restricted area around the Mediterranean.

Glasshouses: Medium – *T. evansi* is a pest of glasshouse crops in Spain (Escudero & Ferragut, 2005) and it is possible that plant material carrying *T. evansi* from Spanish glasshouses could be carried into UK glasshouses. The environment of heated glasshouses would be more favourable than unheated glasshouses, although *T. evansi* could survive in both.

19. If the pest enters or has entered the PRA area, what are the prospects of eradication?
Outdoors: Very good – the climate is unsuitable in the UK (see 13. and 18. above).

Glasshouses: Poor – There are no reports of *T. evansi* being eradicated following its introduction into a new region. *T. evansi* is morphologically similar to other spider mite species already present in the UK, e.g. *T. urticae*, and it can easily be confused with them and therefore remain undetected.

T. evansi has a history of developing resistance to chemicals e.g. in Zimbabwe it developed resistance to thiophosphate and organophosphate acaricides. Nevertheless acaricides from other chemical groups such as synthetic pyrethroids can effectively control eggs and adults (Blair, 1989).

20. What management options are available if eradication is not possible?

Contaminated plants could be destroyed. If chemical controls are used, an acaricide rotation scheme should be implemented to reduce selection pressure for resistance (Blair, 1989).

In laboratory tests *T. evansi* appears to be an unfavorable prey for several species of phytoseiid mite predators (Moraes & McMurty, 1985a, b) including commercially available predators such as *Phytoseiulus persimilis* and *Neoseiulus californicus* that are currently widely used to control the related *T. urticae* in glasshouse crops in Central Europe (Escudero & Ferragut, 2005). This is partly due to the eggs of *T. evansi* containing a feeding depressant that means predators rarely consume a whole egg and if they do feed, they feed very slowly (Moraes & McMurtry, 1986).

SUMMARY AND CONCLUSION OF THE PEST RISK ANALYSIS

The EPPO Secretariat added *T. evansi* to the EPPO Alert List in May 2004. This PRA demonstrates that *Tetranychus evansi* is a pest threatening a number of glasshouse crops in the UK. Over the past 30 or so years *T. evansi* has been spreading outdoors in Africa and North America. It has recently reached the EPPO region where it has established in coastal Spain, Portugal and SW France. It has also been found in glasshouses in these regions. Significant crop losses can be caused by this pest.

T. evansi has been been intercepted twice in the UK on aubergines from Kenya (April and September, 2005). Pesticide resistance is known and biological control, as used in many northern European glasshouses growing edible crops, is not currently feasible. Since *T. evansi* is morphologically similar to other spider mite species already present in the UK and Europe it can easily be confused with them and therefore remain undetected.

It would be wise to maintain UK glasshouses free from this pest.

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UNCERTAINTIES AND FURTHER WORK

Section of PRA	**Uncertainties**	**Futher work that would reduce the uncertainties**
Taxonomy	None	-
Pathway	Exchange of material between EU glasshouses	
Distribution	Could be more widespread in Europe but undetected.	Ask other EU MS about status of this pest
Hosts		Check literature more widely.
Establishment		Check literature
Spread	Rate of spread between glasshouses	Develop simple model
Impact	More data on yield impacts needed	Develop simple model
Management	Resistance to measures currently used in UK glasshouses	Determine current UK pest management practice for tomatoes in glasshouses

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