CSL PEST RISK ANALYSIS FOR *SCIRTOTHRIPS DORSALIS*

STAGE 1: PRA INITIATION

1. What is the name of the pest?

Scirtothrips dorsalis	Hood	Thysanoptera	Thripidae	chilli thrips yellow tea thrips strawberry thrips

Notes on taxonomy / Synonyms:

Anaphothrips andreae Karny
Anaphothrips fragariae Giard
Heliothrips minutissimus Bagnall
Neophysopus fragariae Girault
Scirtothrips andreae (Karny)
Scirtothrips fragariae (Grault)
Scirtothrips minutissimus (Bagnall)
Scirtothrips padmae Ramakrishna
Scirtothrips dorsalis var. *padmae* Ramakrishna

Bayer Code: ANAPFR; SCITDO (Note: Although the Bayer code system should prevent two codes from being used for the same species, there are two Bayer codes for *S. dorsalis*).

2. What is the reason for the PRA?

This PRA updates a previous PRA from 2001 following a sudden increase in the detection of *S. dorsalis* in consignments of produce from India, Kenya, St. Lucia and Thailand during 2005.

The original PRA was initiated when *S. dorsalis* were detected on *Anacardium occidentale* (cashew) from Ghana imported to a glasshouse visitor attraction in July 2001 (CSL unpublished data). Statutory action was taken under Article 22(2)b of the Plant Health (Great Britain) Order 1993.

3. What is the PRA area?

This PRA considers the EU as the PRA area[1].

STAGE 2: PEST RISK ASSESSMENT

4. Does the pest occur in the PRA area or does it arrive regularly as a natural migrant?

No.
Scirtothrips dorsalis does not occur in the PRA area. It is not a natural migrant.

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 the pest is already established in the PRA area?

6. What is the pest's status in the European Union Plant Health Directive?[2]

Scirtothrips dorsalis is listed in Annex II/A1 of Council Directive 2000/29/EC. (A pest whose introduction and spread within all Member States shall be banned if present on certain plants or plant products. In the case of *S. dorsalis*, these plants are, *Citrus*, *Fortunella*, *Poncirus*, and their hybrids).

[1] Excluding locations such as the French DOMS, Spanish Canary Isles and Portuguese Azores.
[2] http://europa.eu.int/eur-lex/en/consleg/pdf/2000/en_2000L0029_do_001.pdf

7. What is the pest's status in the European and Mediterranean Plant Protection Organisation (EPPO)? (www.eppo.org)

EPPO List:	A1 regulated pest list		A2 regulated pest list	✓	Action list		Alert list	

Scirtothrips dorsalis is on the EPPO A2 list of regulated plant pests, meaning that it is a regulated pest of quarantine significance that is present in at least one EPPO Member State. *Scirtothrips dorsalis* moved from list A1 to A2 in September 2004 following its establishment in Israel (EPPO, 2004).

8. What are the pests host plants?
Scirtothrips dorsalis is highly polyphagous having been recorded from more than 100 plant species spread across 40 families. Hosts include, *Acacia*, *Actinidia chinensis* (kiwi fruit), *Allium cepa* (onion), *Anacardium occidentale* (cashew nut), *Arachis* (groundnut), *Brownea*, *Camellia sinensis* (tea), *Capsicum annuum* (chilli; sweet peppers), *Citrus*, *Cuphea*, *Gossypium hirsutum* (cotton), *Fragaria* (strawberry), *Ficus*, *Hevea brasiliensis* (para rubber tree), *Hydrangea*, *Lycopersicon esculentum* (tomato), *Mangifera indica* (mango), *Mimosa, Nelumbo* (water lotus), *Nicotiana tabacum* (tobacco), *Ricinus communis* (castor oil plant), *Rosa*, *Saraca*, *Tamarindus indica* (tamarinds) and *Vitis vinifera* (grape vine), (EPPO, 1997; CABI, 2001).

9. What hosts are of economic and/or environmental importance in the PRA area?
Citrus is the single most important host. Other hosts of importance are grape vines, onions, sweet peppers, roses, strawberries and tomatoes.

10. If the pest needs a vector, is it present in the PRA area?
No vector is required. This is a free living organism.

11. What is the pest's present geographical distribution?
Scirtothrips dorsalis occurs widely across tropical Asia from Pakistan to Japan and southwards to northern Australia. In recent years, however, it has started to spread around the world, associated with the movement of people and plants. Most recently, it has arrived in Florida where it is reported to be present on roses and peppers.

Table 1: Distribution of *Scirtothrips dorsalis*

North America:	USA (Hawaii; Florida)
Central America:	St. Lucia (currently known to be spreading across the Caribbean where it has been confirmed in Barbados, Jamaica, St. Vincent and Trinidad).
South America:	Venezuela*
Europe:	Absent – intercepted only.
Africa:	Ivory Coast, South Africa (plant health quarantine interceptions suggest a wider distribution across West Africa (Ghana & Senegal) and a presence in East Africa (Kenya)).
Asia:	Bangladesh, Brunei Darussalam, China (southern), India (widespread), Indonesia, Israel, Japan, Korea, Malaysia, Myanmar, Pakistan, Philippines, Saudi Arabia, Sri Lanka, Taiwan, Thailand.
Oceania:	Australia (Queensland: restricted distribution), Papua New Guinea, Solomon Islands.

(Source: EPPO PQR, 2005; * L. Mound, Thripsnet Dec. 2005)

12. How likely is the pest to enter the PRA area?

Very likely [✓] Likely [ ] Unlikely [ ] Very unlikely [ ]

Historically *S. dorsalis* was regarded as exclusively feeding on young plants with soft green tissue (see 16. below) and adults and nymphs were thus only likely to be carried on young seedlings or cuttings with young growing leaf buds. Pupae were considered as potentially being carried in leaf axils, in leaf curls and under the calyces of flowers and fruits, as well as in the soil. The initial PRA for *S. dorsalis* followed findings on a young cashew plant (see 2.). Critically, mature fruits of hosts were not recorded as being attacked, thus the risk of *S. dorsalis* being carried into the PRA area on harvested fruit produce was regarded as small. However, evidence from recent detections in consignments of harvested *Momordica* indicates that the risk of entry via mature fruit has significantly changed.

Scirtothrips dorsalis has previously been found moving via international trade, e.g. in the Netherlands, *S. dorsalis* has been intercepted on *Asparagus officinalis* from Thailand (Vierbergen, 1999); an outbreak occurred on *Cuphea* and *Ficus* in the Netherlands in 1992 (Vierbergen, 1992); in the UK in August 1999, *S. dorsalis* was found on Thai orchids at Heathrow (CSL unpublished data).

Between 1984 and 2005, USDA APHIS inspectors intercepted live *S. dorsalis* 89 times on 48 plant taxa (DW Collins, pers. comm., based on figures quoted on a USDA poster presented at the VIII International Symposium on Thysanoptera and Tospoviruses, California, Sept. 2005).

13. How likely is the pest to establish outdoors in the PRA area?

Very likely [ ] Likely [✓] Unlikely [ ] Very unlikely [ ]

Scirtothrips dorsalis currently has a tropical and sub-tropical distribution. Tatara (1994) calculated the temperature threshold for development as 9.7°C, with 265 degree-days (DD) required for complete development. Shobao (1996) gives the developmental threshold, on *Vitis*, as 8.5°C and effective accumulative temperature required for oviposition to adult emergence as 294.1 DD. Both results suggest that *S. dorsalis* is most likely to establish in the warmer, e.g. southern, regions of Europe and that the climate in central and northern European regions is unfavourable for the establishment of *S. dorsalis*, despite hosts being present.

14. How likely is the pest to establish in protected environments in the PRA area?

Very likely [✓] Likely [ ] Unlikely [ ] Very unlikely [ ]

S. dorsalis is a pest of *Hydrangea* under glass in Japan (Vierbergen, 1992). An outbreak of *S. dorsalis* was found on *Cuphea* and *Ficus* grown in protection in the Netherlands in 1992. The outbreak was eradicated. Because the host range of *S. dorsalis* includes a number of protected vegetable and some flower crops, it is a candidate for introduction into European glasshouses.

15. How quickly could the pest spread within the PRA area?

Very quickly [ ] Quickly [✓] Slowly [ ] Very slowly [ ]

Spread could be facilitated via trade of host plants. Thrips are especially difficult to detect in low numbers. Eggs are inserted into leaves where they avoid detection. Many hosts are widely distributed and commonly transported within the PRA area.

16. What is the pest's potential to cause economic and/or environmental damage within the PRA area?

very Small [ ] Small [✓] Medium [ ] Large [ ] very Large [ ]

S. dorsalis has a wide host range. Whatever the host, damage usually occurs, and is most severe on young parts of the plant. As is the case with other phytophagous thrips, *S. dorsalis* damage is caused by continuous sucking of the cell sap, leading to necrosis of the cell tissues. Eggs are also laid inside the soft tissues and the larvae leave large circular holes causing deformation of plant parts.

In *Acacia* spp., *S. dorsalis* causes bunchy top (loss of apical dominance and development of a large number of side shoots from the axils of the condensed stem) (Ashwath & Houston, 1990). In India, *S. dorsalis* can cause 15% - 25% loss in fruit yield in cashew (Gowda *et al*., 1979). Large numbers of *S. dorsalis* have been found on chillies, causing young leaves to shrivel or curl badly. Leaves may be shed. In India, *S. dorsalis* may cause 30 to 50% loss in chillies and is responsible for transmitting leaf curl disease (Butani, 1976). Kumar (1995), reported more than 90% yield loss in chillies and 32% yield loss in sweet peppers due to *S. dorsalis* in India. Host plant resistance research is being conducted in India to develop new chilli varieties (Kumar *et al*., 1996). *S. dorsalis* has been reported causing serious damage on cotton (EPPO RS 2000/129) and is a serious pest on castor, infesting growing tips, young leaves, shoots, flowers and young fruits. In extreme cases there is total deformation and defoliation (CABI, 2001). *S. dorsalis* causes damage to groundnuts in India, tea in Japan (Mound & Palmer, 1981) and strawberry in Queensland (Palmer & Mound, 1983). *S. dorsalis* is the most frequent pest of Japanese *Citrus* groves, although it only became an important pest in the 1990's (EPPO RS 94/219). In Japan, Tatara & Furuhashi (1992) developed an economic threshold for treatment of *S. dorsalis* on satsuma mandarin fruit. If 8% of fruit pedicels were infested during early June to late July, spray treatments were warranted. Onkarappa & Mallik (1998) reported *S. dorsalis* causing severe damage to rose buds in India. *S. dorsalis* damages grapevines in Japan (Shibao *et al*., 2000) where, without insecticides, 90% of fruit clusters can be damaged (60% damages with insecticides) (Shibao, 1997).

However, not all hosts suffer economic damage, e.g. although multiple generations of *S. dorsalis* were observed in kiwifruit orchards from May until October in Japan, no economic damage was caused (Sakakibara & Nishigaki, 1988).

17. What is the pest's potential as a vector of plant pathogens?

Scirtothrips dorsalis is a vector of three plant viruses, *Groundnut chlorotic fan-spot virus*, *Groundnut yellow spot virus* and *Tobacco streak virus* (Chung *et al*., 1996; Chen & Chiu, 1997; Yeh & Chu, 1999).

Work from India examining the ability of *S. dorsalis* to transmit *Groundnut bud necrosis virus* concluded that *S. dorsalis* was not a very efficient vector (Reddy, 1980; Amin *et al*., 1981; Plumb & Thresh, 1983) trials by Palmer *et al.* (1990) were inconclusive. There is now doubt as to the validity of the reported transmission of *Groundnut bud necrosis virus* by *S. dorsalis.*

STAGE 3: PEST RISK MANAGEMENT

18. How likely is the pest to continue to be excluded from the PRA area?

Very likely [ ] Likely [ ] Unlikely [✓] Very unlikely [ ]

In recent years *S. dorsalis* has spread within Africa and to the Middle East (Israel & Saudi Arabia). As a polyphagous thrips, it has many pathways into the EU. Spread from Israel to southern EU MS bordering the Mediterranean is likely.

19. How likely are outbreaks to be eradicated?

Very likely ☐ Likely ☐ Unlikely ☑ Very unlikely ☐

As is the case with other quarantine organisms, eradication is more likely if outbreaks are identified as quickly as possible. Chemical measures could be used although some insecticide resistance to fenvalerate, cypermethrin and alphacypermethrin, has been reported in India (Prasad, Reddy & Rao, 1994). In 1992, an outbreak on *Cuphea* and *Ficus* in the Netherlands was successfully eradicated (Vierbergen, 1992). Experience has shown that only a concerted, multi-tactic control programme would be expected to achieve eradication of an outbreak of thrips.

20. What management options are available for containment and control?

Infested plants should be kept separated from other hosts to inhibit spread. Statutory action can be taken, e.g. treat with insecticides (malathion, nicosoap, nicotine space treatments).

Chlofenapyr – a contact insecticide and acaracide with translaminar activity – was found to be the most effective compound in reducing populations of *S. dorsalis* on pepper plants in the West Indies, but this chemical is not registered in the UK. The next most effective insecticides against this pest were found to be spinosad and imidacloprid. Spinosad (Conserve), which is registered for use on ornamentals and cucumbers in the UK, is probably the most effective chemical tool available for use against *S. dorsalis*, although other insecticides used against thrips, such as abamectin (Dynamec), thiacloprid (Calypso) and imidacloprid (Intercept), may also be of use. Similarly, space treatments of nicotine (Nicotine 40% Shreds) would probably be effective against flying *S. dorsalis*. Nevertheless, despite the availability of a few potentially useful chemicals, a fully effective control programme would also need to utilise several other methods, including physical and cultural controls. Plant destruction is also an option.

UNCERTAINTIES AND FURTHER WORK

Section of PRA	Uncertainties	Further work that would reduce uncertainties
Taxonomy	-	-
Pathway		Frequency and volume of imports of hosts
Distribution	Could be more widespread in Africa and South America. *S. dorsalis* could well be spreading faster than the literature can keep up with.	Be alert for new records of *S. dorsalis*
Hosts	-	-
Establishment	-	-
Spread	Rate of spread if moved in trade.	
Impact	Although *Citrus* is a host, it is uncertain what damage can be expected to be caused by *S. dorsalis* in the EU. Uncertainty on virus transmission.	

Management	Some pesticide resistance is reported.	Resistance testing may be required if an outbreak is found.

21. Summary

Scirtothrips dorsalis is a polyphagous pest from tropical and subtropical Asia that is already regulated by the EU on *Citrus, Fortunella, Poncirus* and their hybrids. The risk posed by *S. dorsalis* has increased in recent years as the pest has spread internationally and has begun to be found on produce, and several different species of plants for planting. Since *Scirtothrips dorsalis* is a risk to a number of vegetable and ornamental crops in northern European glasshouses and to a broad range of crops grown outdoors in southern Europe, extending measures to all plants for planting would seem logical.

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