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

PM 5/5(1)

Guidelines on Pest Risk Analysis
Lignes directrices pour l'analyse du risque phytosanitaire

Decision-Support Scheme for an Express Pest Risk Analysis

Specific scope: This standard provides a simplified scheme for the rapid production of pest risk analyses.

Specific approval and amendment: 2012-09

Introduction

The EPPO Standards on Pest Risk Analysis (PRA) are intended to be used by National Plant Protection Organizations (NPPOs), in their capacity as bodies responsible for the establishment of phytosanitary regulations and the application of phytosanitary measures while respecting the requirements of the International Plant Protection Convention, ISPM no. 1 (*Phytosanitary principles for the protection of plants and the application of phytosanitary measures in international trade*) and ISPM no. 11 (*Pest Risk Analyses for Quarantine Pests including analysis of environmental risks and living modified organisms*). They are also used by the technical bodies of EPPO to formulate recommendations on phytosanitary measures to the NPPOs. In this framework EPPO has developed different Standards to be used in different circumstances. PM 5/2 was developed to provide a simplified PRA scheme to be used when an unfamiliar pest is detected in an imported consignment, in order to decide whether phytosanitary action is needed. PM 5/3 is based on ISPM no. 11 and provides detailed instructions for the following steps of PRA for quarantine pests: initiation, pest categorization, probability of introduction and spread, assessment of potential economic consequences and pest risk management.
This standard provides a simplified scheme for undertaking a rapid PRA to determine whether an organism has the characteristics of a quarantine pest, and if appropriate, to identify potential management options. Its use is particularly suitable to support recommendation of phytosanitary measures for an emerging pest. This scheme may also be used in the framework of a pathway-initiated PRA to evaluate individual pests likely to be carried by this pathway. In the case of an express PRA initiated by an outbreak, risk managers should also use the information provided to consider actions to be taken internally (such as establishing surveillance to confirm the status of the pest in the country).

An EPPO Standard on "*Generic elements for contingency plans*" (PM 9/10) describing essential elements for an emergency response for a pest outbreak or a suspected pest outbreak was adopted in 2009. In addition, a decision-support scheme for prioritizing action during outbreaks is under development to decide on measures to be applied in an outbreak area.

It is important that all steps of the Express PRA should be documented, indicating how each decision was reached and on what information it was based. The assessor may stop the assessment at any point if the evidence provided is sufficient to reach a conclusion on the pest risk.

A computerized version of this Express PRA Scheme with the CAPRA software will be prepared.

Summary[1] of the Express Pest Risk Analysis for *Chaetosiphon fragaefolii* (strawberry aphid)

PRA area: Norway ***(specify the PRA area being assessed)***

Describe the endangered area: *(see question 14)* All strawberry producing areas in Norway, but especially coastal areas with mild winters and clusters of growers aiming to extend the season (e.g., Agder and Rogaland).

Main conclusions

Overall assessment of risk (Copy your answer from Q 15): The tolerance level of 1% of plants harbouring *C. fragaefolii* makes the likelihood of entry with imported plants and establishment during the growing season very high. The likelihood of long-term establishment through several years is smaller. Still, if viruses are present in imported material together with *C. fragaefolii*, these viruses may be spread by winged aphids to other plantings before winter, regardless of the fate of the aphid population in winter. We perceive this mechanism as the greatest phytosanitary risk. Statistically, if 1 % of plants harbour virus, and 1 % aphids, one plant in every 10 000 plants will have both, and there will be 3 such double-infected plants per ha.

Phytosanitary Measures: indicate whether the pest should be recommended for immediate action in the PRA area. Summarize your answer from Q 16.
Ideally, the tolerance level of 1% should be lowered. Importers/ growers should check imported plants for aphids throughout the season, and inspections from the National Food Authority should take place. A guideline for aphid management in imported plants, especially in protected crops, should be made. The aphidicides used at the export sites should be made known to the buyers to slow down resistance development. Buying CATT (Controlled Atmosphere Temperature Treatment) plants will probably lower the risk of introducing live aphids, especially in plants not subjected to long cold storage.

Note: If the assessment shows that phytosanitary measures are not required for your country but there are indications that other EPPO countries are at higher risk, mention it.

Phytosanitary risk for the *endangered area* **(***Individual ratings for likelihood of entry and establishment, and for magnitude of spread and impact are provided in the document***)**	High ☐	Moderate X	Low ☐
Level of uncertainty of assessment (see Q 17 for the justification of the rating. Individual ratings of uncertainty of entry, establishment, spread and impact are provided in the document)	High X	Moderate ☐	Low ☐

Other recommendations:

- ***Inform EPPO or IPPC or EU:*** No
- ***Inform industry, other stakeholders:*** Yes (see main conclusions on phytosanitary measures)
- ***State whether a detailed PRA is needed to reduce level of uncertainty (if so, state which parts of the PRA should be focused on):*** Compare winter conditions (including length of such conditions) in mildest areas of Norway to those in selected regions where *C. fragaefolii* is a known pest (e.g. England, Netherlands, Northern Germany).
- ***Specify if surveys are recommended to confirm the pest status:*** Yes, a survey in the endangered area is highly recommended.
- ***State what additional work/research could help making a decision.***

-Knowledge on how cold storage of strawberry plants affects *C. fragaefolii* survival
- Knowledge on how CATT affects *C. fragaefolii* survival.

[1] The summary should be elaborated once the analysis is completed

Express Pest Risk Analysis, *Chaetosiphon fragaefolii* in Norway

Prepared by: Dr Nina Trandem, Bioforsk, Plant Health and Plant Protection Division, Høgskoleveien 7, 1430 Ås, Norway

Date: 21 October 2014

Stage 1. Initiation

Reason for performing the PRA: Proposition to include *C. fragaefolii* in Appendix 2 of "Forskrift om planter og tiltak mot planteskadegjørere", making it illegal to introduce and spread the aphid in Norway if it occurs in plants and propagation material of *Fragaria* (seeds excluded). The background is a proposal of lifting the import ban on strawberry plants for planting, requiring imported material to follow the EPPO certification scheme (EPPO 2008) for certified material (CM). This scheme has a non-zero tolerance (1%) of *C. fragaefolii*.

PRA area: Norway

Stage 2. Pest risk assessment

1. Taxonomy: *Chaetosiphon* (subgenus *Pentatrichopus*) *fragaefolii* (Cockerell, 1901), Hemiptera: Aphididae (Class: Insecta). Common name: The strawberry aphid (Norwegian: called "liten jordbærbladlus" in one publication, not an official name, and not a valid name according to current rules for Norwegian names.

2. Pest overview

- ***Life cycle/ biology****:* In North America (assumed area of origin) this aphid reproduces both sexually (overwintering as an egg) and asexually (overwintering as wingless adult females/ nymphs). European populations mainly reproduce asexually, although eggs are sometimes observed when kept in the lab, and winged males are produced (Dicker 1952). The asexual life cycle includes production of winged females in the late spring and autumn. The aphid is able to produce nymphs at temperatures above 4 °C, the fastest birth rate and least mortality being at ca 25 °C (Schaefers & Allen 1962) After harsh winters, populations in the UK (Dicker 1952) and Netherlands (De Fluiter 1954) are very small. After milder winters in these countries, the aphid is everpresent in strawberry fields in these countries. The assumed reason for mortality during frost is food shortage (plants being frozen) as much as frost per se (Dicker 1952). The developmental time (deposition of nymph to adult female) is 29 days at 10 °C and 7-9 days at 25 °C (Schaefers & Allen 1962, Bernardi et al 2012), but nymph production does not start at once. At 25 °C, about a week passes before the adult female starts to give birth to new nymphs (Bernardi et al. 2012). Each female typically produce at least 20 nymphs (Dicker 1952; Schaefers & Allen 1962). Krczal & Merbecks (1988) reported of aphids living as long as 229 days in November in Germany (at 3-9 °C).
- ***Host plants:*** Species of *Fragaria* (mainly on cultivated varieties, rarely on *F. vesca* in Europe) and *Potentilla (P. anserina)* (Blackman and Eastop 2000). *Rosa rugosa* is also mentioned in some sources.
- ***Symptoms:*** Inhibition of growth and development, honeydew and sooty mould. Severity depending on aphid population size and strawberry cultivar.
- ***Detection and identification:*** By inspecting plants for aphids (low populations) or symptoms (high populations). Identification: By the combination of host plant and presence of conspicuous knobbed (capitate) body hairs; in the absence of host plant, Heie (1994) provides a key. No species-specific traps are available, but winged specimens can be trapped in yellow pan traps.
- ***Occurrence in Norway:*** Two winged specimens (1 female and 1 male), trapped at Ås in September 1955, are the only finds of this species published from Fennoscandia (Tambs-Lyche 1970, details provided by Steffen Roth, NHM Bergen, where specimens are kept). Stenseth (1989) surveyed aphids on strawberry in Norway and did not find the species.

3. Is the pest a vector? **Yes** X **No** ☐

If the pest is a vector, which organism(s) is (are) transmitted and does it (do they) occur in the PRA area?

Pathogen	**Occurrence in Norway**
Strawberry crinkle virus (SCV)	*Not found in Norway*
Strawberry mild yellow edge virus (SMYEV)	*Not found in Norway*
Strawberry mottle virus (SMoM)	*Not found in Norway*
Strawberry veinbanding virus (SVBV	*A case in 1990, in cultivar Mimek, was eradicated*

"There is no appreciable spread of strawberry viruses unless *[Chaetosiphon] fragaefolii* occurs" (De Fluiter 1959, as cited by Stultz 1968, on the situation in Holland).

4. Is a vector needed for pest entry or spread? **Yes** ☐ **No** X

If a vector is needed, which organism(s) serves as a vector and does it (do they) occur in the PRA area? Consider both the pest and the vector in the assessment.

5. Regulatory status of the pest

Is the pest already regulated by any NPPO, or recommended for regulation by any RPPO? (Assessors can check this by reference to EPPO PQR, RPPO and IPPC websites in addition to normal search mechanisms).

The species is on the list of targets for visual inspection in EPPO's strawberry certification scheme (zero tolerance in nuclear stock and propagation stock I; 1 % tolerance in propagation stock II and certified material).

6. Distribution

Continent	***Distribution*** *(list countries, or provide a general indication , e.g. present in West Africa)*	***Provide comments on the pest status in the different countries where it occurs*** *(e.g. widespread, native, introduced….)*	***Reference***
Africa			
America	North and South-America	The assumed area of origin. Part of a species complex.	(Blackman et al 1987)
Asia	Israel, Japan, Philippines		EFSA 2014
Europe	Austria, Belgium, Bulgaria, Czech Republic, France, Germany, Hungary, Ireland, Latvia, Netherlands, (Norway), Italy, Portugal, Spain, UK	Unknown number of winged specimens trapped in Norway (Ås) in 1955 (2 are in collections). Not found since. Not recently surveyed in Norway and Sweden. In Finland, the risk of establishment is rated as medium (Vänninen et al 2011).	EFSA 2014, Tambs-Lyche 1970, Steffen Roth, pers. comm.
Oceania	New Zealand, Australia		EFSA 2014

Information on distribution may be retrieved from PQR (http://www.eppo.int/DATABASES/pqr/pqr.htm), CAPRA datasets (http://capra.eppo.org/), CABI maps, etc.

Comments on distribution: Largely follows the distribution of strawberry growing.

7. Host plants /habitats* and their distribution in the PRA area

If the host range is large, you may group plants (e.g. deciduous trees, or at the family level, e.g. Brassicaceae, Rosaceae), and/or focus on those occurring in the PRA area. When appropriate, the difference of susceptibility between hosts should be noted. If there are many habitats, focus on those occurring in the PRA area. Reference to FAOSTAT and EUROSTAT may help assess distribution of host plants.

Host Scientific name (common name)	**Presence in PRA area (Yes/No)**	**Comments (e.g. total area, major/minor crop in the PRA area, *major/minor habitats**)**	***Reference***
Fragaria ananassa	Yes	Considered the main host. Ca 1500 ha of cultivated strawberry in Norway.	Blackman & Eastop 2000
Fragaria vesca	Yes	Common in the PRA area, but not considered an important host plant in Europe	Blackman & Eastop 2000
Other wild *Fragaria* spp	Yes	At least two species in Norway, but not common. Validity of host record needs further check of references	Blackman & Eastop 2000
Potentilla anserina	Yes	Common in Norway. Host plant both in America and Europe	Blackman & Eastop 2000
Other *Potentilla* spp	Yes	Geography of references needs to checked. Several *Potentilla* species are very common in Norway	Dicker 1952

**Specify habitat for invasive plants, host plants for other pests.*

8. Pathways for entry

Which pathways are possible and how important are they for the probability of entry?

Examples of pathways are:

- *Plants for planting*
  - plants for planting (except seeds, bulbs and tubers) with or without soil attached
  - bulbs or tubers
  - seeds
- *Plant parts and plant products*
  - cut flowers or branches
  - cut trees
  - fruits or vegetables
  - grain
  - pollen
  - stored plant products
- *Wood and wood products*
  - non-squared wood
  - squared wood
  - bark
  - wood packaging material
  - chips, firewood, waste wood…
- *Natural spread*
- *Other possible pathways*
  - other packaging material
  - soil/growing medium as such
  - conveyance and machinery
  - passengers
  - hitchhiking
  - plant waste
  - manufactured plant products
  - intentional introduction (e.g. scientific purposes)

Possible pathways *(in order of importance)*	**Short description explaining why it is considered as a pathway**	Pathway prohibited in the PRA area? Yes/No	Pest already intercepted on the pathway? Yes/No
Plants for planting	Cultivated strawberry is the main host and the aphid is common in most European countries exporting strawberry plants. Tolerance of 1% of plants in certified material according to EPPO scheme	At the moment, yes	Not after 1986 (import ban). Imported material is a likely source of the find in pan traps near the Agricultural University at Ås 1955
Natural spread	Winged aphids can migrate long distances	N.a.	Another possible pathway for the 2 winged individuals (1 male and 1 female) found in 1955.
Strawberry fruits with husks	Small nymphs may probably be present on husks if very high population levels at the time of picking. The likelihood of finding a new host plant must be considered very small, however.	No	No (berries not inspected with this in mind at entry)

Rating of the likelihood of entry	*Low* ☐	*Moderate* ☐	*High* ☐X
Rating of uncertainty	*Low* ☐	*Moderate* ☐X	*High* ☐

Comment on the rating: The find in pan traps in 1955 proves the species is able to enter the country, although the pathway in that case was not investigated.

9. Likelihood of establishment outdoors in the PRA area

Consider in particular the presence of host plants/habitats and climatic suitability and describe the area where establishment is most likely (area of potential *establishment). Reference to maps such as Köppen-Geiger climate zones, day degrees and hardiness zones may help assess the likelihood of establishment (see e.g. http://capra.eppo.org/files/links/Rating_Guidance_for_climatic_suitability.pdf).*

The bottleneck for establishment of this species in Norway is the long and cold winter season, at least for the asexual populations assumed to dominate in Europe*. It should be kept in mind that the species is well adapted to low temperatures in other parts of the season, being able to reproduce at temperatures down to 4-5 ºC, as well as surviving for more than 200 days at low temperatures. However, in areas where the foliage is frozen for longer periods, aphid populations will perish because they are unable to feed, as well as directly from the frost at very low temperatures (Dicker 1952). With a milder climate in the coming years, and in certain areas with little frost, the species is probably able to establish in Norway for some years, especially if it has built up a significant population before the first winter (i.e., in sheltered environments like polytunnels etc) and the same plants are kept for early production next year.

We have compared the number of days with frost (all 24 hours below zero) in three important Norwegian strawberry growing areas during the two last winters (one exceptionally cold and one exceptionally mild) in the table below (data from Agrometeorology Norway, lmt.bioforsk.no). This illustrates the variation between winters and areas. Looking at these data, it should be kept in mind that snow cover, as well as the general use of fleece cover to improve plant winter survival, often will provide higher temperature for aphids sitting in the plants than the temperatures 2 m above the ground shown here. The last winter in Rogaland was certainly not harsher (but maybe longer) than many winters further south where *C. fragaefolii* is well established.

	Number of days with *daily maximum* below zero during November-February (lowest daily max ºC measured)	
Area (Climate station)	**Winter 2012-13**	**Winter 2013-14**
Rogaland (Særheim)	27 (-5.6)	8 (-1.0)
Oslofjord (Lier)	66 (-13.7)	32 (-8.5)
Hedmark (Kise)	72 (-16.2)	36 (-11.0)

*It should be noted that *C. fragaefolii* reproduces sexually, with winter eggs, in Canada and the USA, and that one of the individuals trapped in Norway 1955 was a male.

Rating of the likelihood of establishment outdoors	*Low* ☐	*Moderate* ☐X	*High* ☐
Rating of uncertainty	*Low* ☐	*Moderate* ☐	*High* ☐X

10. Likelihood of establishment in protected conditions in the PRA area

Consider the presence of host plants within protected cultivation (e.g. glasshouses, shade houses) and describe the area of potential establishment. For invasive plants consider if protected conditions are a suitable habitat.

Winter production (heated glasshouse necessary) of strawberry in Norway is rare, but several growers in the areas with best climate are extending the season by using plastic tunnels in the spring and (to a less degree) by growing everbearing cultivars in tunnels in the autumn. As long as plants are exposed to winter conditions during winter, we assume the likelihood for survival in polytunnels to be similar to the one in open field. However, the use of polytunnels will promote aphid reproduction and survival (and spread) in the growing season and may thus contribute to a higher likelihood of some specimens surviving winter in the area (because populations in the autumn will be higher).

Rating of the likelihood of establishment in protected conditions	*Low* ☐	*Moderate* ☐X	*High* ☐
Rating of uncertainty	*Low* ☐	*Moderate* ☐	*High* ☐X

11. Spread in the PRA area

- *Natural spread*
- *Human assisted spread*

Briefly describe each mode of spread (e.g. natural flight of invertebrate pests, wind dispersal, carried within plants or plant products, carried with traded commodities), and indicate the rate or distance of spread.

Once established in an area, the main mode of spread will be natural, by winged aphids dispersing into new areas. The range of winged aphids can be very long, as aphids actively use wind currents to disperse. It is important to note that spread (including spread of viruses) may take place in the autumn even if the source population does not establish (i.e., survives the following winter).

Human-assisted spread is less likely as most aphids will be unwinged and not able to survive without being transplanted to a new host plant. An exception is spread through planting material (plant producers or gardening centres) situated near infested fields, selling plants to hobby gardeners or growers. We have not found information on whether spread by pickers (on clothes, tools, etc) from one field or plantation to another is likely.

If possible consider how long it would take for the pest to spread widely within the area of potential establishment if no phytosanitary measures are taken. If no specific data are available, compare with similar organisms.

According to Dicker (1952), “it is most unusual to find more than an occasional alate [winged] aphid developing on strawberry during the spring and summer following planting.” If aphids are introduced through plant material in low densities at planting (e.g., low aphid numbers on 1% of plants), it will therefore take some time before they start producing a lot of winged individuals, most likely in the autumn. If winged aphids (adults or nymphs with winglets) may be present on the plants imported, however, spread may start at once.

Rating of the magnitude of spread	*Low* ☐	*Moderate* ☐	*HighX* ☐
Rating of uncertainty	*Low* ☐	*Moderate* ☐	*High* X☐

12. Impact in the current area of distribution
Briefly describe the economic, ecological/environmental and social impacts in the current area of distribution. Briefly describe the existing control measures applied against the pest.

We have not studied the criteria for rating impacts in detail. This aphid is the main vector of several damaging viruses in strawberry, as well as an important pest in its own right. On the other hand, it is not affecting other crops than strawberry. Control measures include pesticides (broad spectrum and aphidicides) and biological control. Insect nets may prevent winged individuals entering glasshouses.

Rating of the magnitude of impact in the current area of distribution	*Low* ☐	*Moderate* ☐X	*High* ☐
Rating of uncertainty	*Low* ☐	*Moderate* ☐	*High* ☐X

The rating chosen should be based on the highest type of impact.

13. Potential impact in the PRA area
Consider whether impacts in the area of potential establishment will be similar to that in areas already infested, taking into account availability of plant protection products, natural enemies, cultural practices, etc.in the area of potential establishment. Consider other consequences (e.g. export loss) if applicable.

Will impacts be largely the same as in the current area of distribution? Yes /No YES (in particular considering its role as virus vector and Norway currently having none of the strawberry viruses spread by this vector)

If No

Rating of the magnitude of impact in the area of potential establishment	*Low* ☐	*Moderate* ☐	*High* ☐
Rating of uncertainty	*Low* ☐	*Moderate* ☐	*High* ☐

14. Identification of the endangered area
Define the endangered area (see definition in ISPM 5): describe in which part of the area of potential establishment significant impact is expected.

All strawberry producing areas in Norway, but especially coastal areas with mild winters and clusters of growers using polytunnels to extend the season (e.g., Agder and Rogaland).

15. Overall assessment of risk
*Summarize the likelihood of entry, establishment, spread and possible impact without phytosanitary measure. **An overall rating should be given in the summary part which is placed at the beginning of the Express PRA.***

The tolerance level of 1 % of plants harbouring *C. fragaefolii* makes the likelihood of entry and establishment during the growing season very high. The likelihood of long-term establishment through

several years is smaller. Still, if viruses are present in imported material together with *C. fragaefolii*, these viruses may be spread by winged aphids to other plantings before winter, regardless of the fate of the aphid population in winter. This mechanism we perceive as the greatest risk associated with the topic of this PRA, although it is not really covered by any of the above question**.** Statistically, if 1% of plants harbour virus, and 1 % aphids, one plant in every 10 000 plants will have both, and there will be 3 such plants per ha.

Then consider whether phytosanitary measures are necessary.
If the assessment shows that phytosanitary measures are not required for your country but there are indications that other EPPO countries are at higher risk, mention it.

To minimize the risk of virus spread, phytosanitary measures are necessary.

Stage 3. Pest risk management

16. Phytosanitary measures
Describe potential measures for relevant pathways and their expected effectiveness on preventing introduction (entry & establishment) and / or spread. If possible, specify prospects of eradication or containment in case of an outbreak. Indicate effectiveness and feasibility of the measures

As described in PM 5/3 possible options for phytosanitary measures include
Options at the place of production
- Detection of the pest at the place of production by inspection or testing
- Prevention of infestation of the commodity at the place of production (treatment, resistant cultivars, growing the crop in specified conditions, harvest at certain times of the year or growth stages, production in a certification scheme)
- Establishment and maintenance of pest freedom of a crop, place of production or area

Options after harvest, at pre-clearance or during transport
- Detection of the pest in consignments by inspection or testing
- Removal of the pest from the consignment by treatment or other phytosanitary procedures (remove certain parts of the plant or plant product, handling and packing methods, specific conditions or treatments during transport)

Options that can be implemented after entry of consignments
- Detection during post-entry quarantine
- Consider whether consignments that may be infested be accepted without risk for certain end uses, limited distribution in the PRA area, or limited periods of entry, and can such limitations be applied in practice

Prohibition
Surveillance, eradication, containment

The pathway considered is import of plants.

Options at the place of production (beyond the ones required to produce certified material (CM) by EPPO standards):
- -Plants grown in aphid secure greenhouses (with screens) combined with preventative measures and close monitoring.
- -Harvest plants at a time when production of winged individuals is very low
- -Aphidicide treatment with specified compound just before harvest*
- -Inspection of plants before harvest

Options after harvest, at pre-clearance or during transport
- -CATT treatment (kills aphids, but efficacy against specific species has not been documented)
- -Lower tolerance of *C. fragaefolii* (tolerance of *Phytonemus (Tarsonemus) pallidus* is 0.1%)

Options that can be implemented after entry of consignments
- -Mandatory check of plants for aphids at arrival (before planting) and every month after planting
- -Routinely apply an aphidicide within a couple of weeks after planting*
- -Mandatory use of preventative biological control in protected crops through summer.

*Resistance issues need to adressed. For example, whether *C. fragaefolii* is resistant to the aphidicides allowed in Norway. No recent info on resistance in this species in resistance database www.pesticideresistance.org/search.php, but it has previously developed resistance to endosulfan (Shanks 1967).

17. Uncertainty

List and describe the main sources of uncertainty within the risk assessment and risk management. State whether a detailed PRA is needed to reduce key aspects of uncertainty (if so state which parts of the PRA should be focused on). Comment on what work would be needed to address uncertainties (e.g. for distribution the need for surveys, produce epidemiological data…)

-Detailed information on cold/frost tolerance is lacking
-Recent survey of aphid fauna in Norwegian strawberry crops is lacking
-Info on typical aphid density, life forms, survival and pesticide resistance in plants sold as certified material is lacking
-Incomplete info on potential for sexual reproduction (winter eggs) of European populations

A more detailed PRA, comparing the winter climate in Rogaland to that of Netherlands and the UK could be useful. But it should also be checked if *C. fragaefolii* is currently present in Norway as the country's aphid fauna has not been investigated since the 1980s (Stenseth 1989). We recommend a new survey targeting the mildest climates, possibly in cooperation with Sweden, which is in the same situation (i.e, not knowing if *C. fragaefolii* is present). The aphid is easy to identify if it is collected on strawberry. If the aphid is found, it would be of great interest to check for pesticide resistance and viruses.

18. Remarks

Add any other relevant information or recommendations. For example when phytosanitary measures are not considered appropriate, recommendations for the development of other control strategies can be made (e.g. Integrated Pest Management, certification schemes).

Once the analysis has been completed, a summary should be prepared (see the summary box at the beginning of the Express PRA)

19. REFERENCES

Provide references cited above (see Instructions for authors to the EPPO Bulletin)
When referring to websites, include the web address and date accessed.

Alford DV (2007) *Pests of fruit crops, a colour handbook*. Manson Publishing Ltd, London (UK).

Bernardi D, Garcia MS, Botton M & Nava DE (2012) Biology and fertility life table of the green aphid *Chaetosiphon fragaefolii* on strawberry cultivars. *Journal of Insect Science* **12**, Article 28.

Blackman RL & Eastop VF (2000) *Aphids on the world's crops: an identification and information guide*. 2nd edn John Wiley & Sons, New York (USA).

Blackman RL, Eastop VF, Frazer BD & Raworth DA. The strawberry aphid complex *Chaetosiphon (Pentatotrichus)* spp. (Hemiptera: Aphididae): taxonomic significance of variations in karyotype, chaetotaxy and morphology. *Bulletin of Entomological Research* **77**, 201-212.

Cedola C & Greco N (2010) Presence of the aphid, *Chaetosiphon fragaefolii*, on strawberry in Argentina. *Journal for Insect Science* **10**, Article 9.

De Fluiter HJ (1954) [Observations on the phaenology of the strawberry aphid, *Pentatrichopus fragaefolii* Cock. in the Netherlands]. *Entomologische Berichten* **15**, 94-98 (in Dutch, English summary).

Dicker GHI (1952) The biology of the strawberry aphid, *Pentatrichopus fragaefolii* (Cock.), with special reference to the winged form. *Journal of Horticultural Science* **27**, 151-178.

EFSA (2014) Scientific opinion on the risk to plant health posed by Strawberrry crinkle virus to the EU territory with the identification and evaluation of risk reduction options. *EFSA Journal* **12**(4):3630.

Frazer, BD & Raworth DA (1984) Predicting the time of hatch of the strawberry aphid, *Chaetosiphon fragaefolii* (Homoptera: Aphididae). *Canadian Entomologist* **16**, 1131-1135.

Heie OE (1994) The Aphidoidea (Hemiptera) of Fennoscandia and Denmark, V. *Fauna Entomologica Scandinavica* **28**.

Judge FD & Schaefers GA (1971) Effects of crowding on alary polymorphism in the aphid *Chaetosiphon fragaefolii*. *Journal of Insect Physiology* **17**, 143-148.

Krczal H (1959) Untersuchungen über die Verbreitung der Erdbeerblatlaus *Passerinia fragaefolii* und das Auftreten von Erdbeervirosen in der Bundesrepublik. *Phytopatologische Zeitschrift* **37**, 1-20

Krczal H & Merbecks H (1988) Einfluss der Temperatur auf Lebensdauer der Knotenhaarlaus Chaetosiphon (*Pentatrichopus) fragaefolii* (Homoptera: Aphididae), und Latenzzeit des Erdbeer-Kräuselvirus im Vektor. *Entomologica Generalis* **13**, 221-227.

OEPP/EPPO (2008) Certification scheme for strawberry. *OEPP/EPPO Bulletin* **38**, 430-437.

Schaefers GA & Allen WW (1962) Biology of the strawberry aphids, *Pentatotrichus fragaefolii* (Cockerell) and *P. thomasi* Hille Ris Lambers, in California. *Hilgardia* **32**, 393-431.

Schaefers GA & Judge FD (1971) Effects of temperature, photoperiod, and host plant on alary polymorphism in the aphid *Chaetosiphon fragaefolii*. *Journal of Insect Physiology* **17**, 369-379.

Shanks CH (1967) Resistance in the strawberry aphid to endosulfan in southwest Washington. *Journal of Economic Entomology* **60**, 968-70.

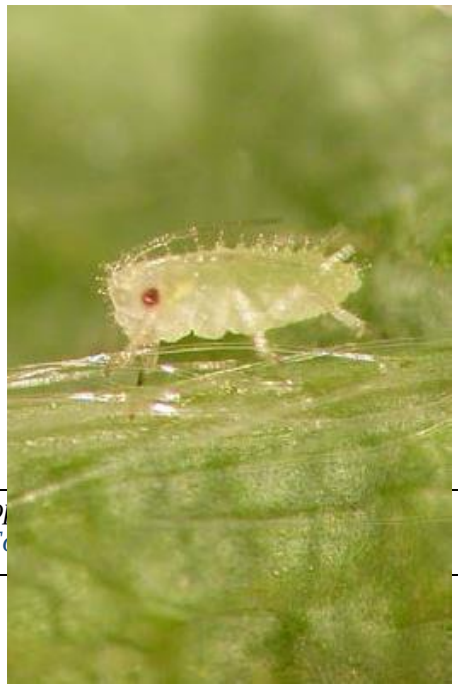
Stenseth C (1989) [Aphids on strawberry in Norway]. *Norsk Landbruksforskning* **3**, 139-141 (in Norwegian, English summary).

Stultz HT (1968) Aphids on strawberry in Nova Scotia. *Canadian Entomologist* **100**, 869-878.

Tambs-Lyche H (1970) Studies on Norwegian aphids (Hom., Aphidoides) II. The subfamily Myzinae (Mordvilko) Börner. *Norwegian Journal of Entomology* **17**, 1-16.

Vänninen I, Worner S, Huusela-Veistola E, Tuovinen T, Nissinen, A & Saikkonen K (2011) Recorded and potential alien invertebrate pests in Finnish agriculture and horticulture. *Agricultural and Food Science* **20**, 96-114.

Appendix 1. Relevant illustrative pictures (for information)

Photo 1 (pest)	*Photo 2 (e.g. symptoms)*
	
Source/ co *F*	*Source/ copyright owner*