NAME OF THE ORGANISM: Candidatus Phytoplasma mali (Apple proliferation mycoplasm) (PHYPMA)

GENERAL INFORMATION ON THE PEST

Name as submitted in the project specification (if different to the preferred name):

Apple proliferation mycoplasm
Pest category:

Bacteria **1- Identity of the pest/Level of taxonomic listing:**
Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?

Yes
Is the pest defined at the species level or lower?:

Yes
Can listing of the pest at a taxonomic level higher than species be supported by scientific reasons or can species be identified within the taxonomic rank which are the (main) pests of concern?

* Not relevant: Fruits (including hops) sector, Ornamental sector

Is it justified that the pest is listed at a taxonomic rank below species level?

Not relevant
Conclusion:

* Candidate: Fruits (including hops) sector, Ornamental sector

Justification (if necessary):

Main host plant is the Apple tree (Malus x domestica). All cultivars and rootstocks are potential host plants, including ornamentals and wild plants belonging to the genus Malus (ANSES, 2012). This justifies a listing of host plants at the genus level. **2 – Status in the EU:**

Is this pest already a quarantine pest for the whole EU?

No
Presence in the EU:

Yes
List of countries (EPPO Global Database):

Austria (2011); Belgium (2013); Bulgaria (1993); Croatia (1996); Czech Republic (2013); Finland (2013); France (2011); Germany (2011); Greece (2011); Hungary (2010); Italy (2013); Netherlands (2015); Poland (2015); Romania (1992); Slovakia (1978); Slovenia (2011); Spain (2011)
Conclusion:

candidate
Justification (if necessary):

Data of the presence of this pest on the EU territory are available in EPPO Global Database (<https://gd.eppo.int/>). This pest is a candidate for the RNQP status according to the IIA2AWG

HOST PLANT N°1: Malus (1MABG) for the Fruits (including hops) sector.

Origin of the listing:

IIA2AWG
Plants for planting:

Plants intended for planting, other than seeds **3 - Is the pest already listed in a PM4 standard on the concerned host plant?**

Yes
Conclusion:

Evaluation continues

Justification (if necessary):

Decision by the HEWG to continue the evaluation in view of the problematic of vector transmission. **4 - Are the listed plants for planting the main\* pathway for the "pest/host/intended use" combination? (\*: significant compared to others):**

Yes
Conclusion:

Candidate

Justification:

Plants for planting can be an efficient pathway, when propagated from infested plants and depending on the grafting technique (Seemüller et al., 2011). Pathogen concentration and repartition in the trees is fluctuant in space and during the year. In absence of phytosanitary measures, vector transmission is the most important pathway (ANSES, 2012), with vertical transmission of the pathogen through psyllids generations (Mittelberger et al., 2017). Infection by root-bridges are possible but need short distances (<1m) between the infected Malus and the phytoplasma-free Malus to be infected. The infected trees shows altered phloem and metabolic alterations such as hormone synthesis modifications that may influence vector reproduction (Zimmermann et al., 2015 ; Siewert et al., 2014). Transfer from other host in the same place of production is very limited. The plant for planting pathway is considered to be a significant pathway compared to other pathways. **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

The phytoplasma is present in the EU area and the principal factor of impact is the decrease of the fruit size (30% to 60% of mean decrease). Fruits may also have less flavour and and a rolled aspect. In case of high infestations, 30% to 90% of harvested fruits are not marketable anymore. However, impact of the disease can reduce with the time, until sometimes symptoms totally disappear. It is the case in France where its impact on the fruit production is considered as limited (ANSES, 2012). The impact is mostly affected by the local existence of reservoirs and by the size of vector populations. Where CPs does occur, its impact can be significant but shows high yearly fluctuations associated with fluctuations in the population densities of insect vectors and of wild plant reservoirs that cannot be easily controlled (Prima phacie, 2012).
What is the likely economic impact of the pest irrespective of its infestation source in the absence of phytosanitary measures? (= official measures)

Medium
Is the economic impact due to the presence of the pest on the named host plant for planting, acceptable to the propagation and end user sectors concerned?

No
Conclusion:

Candidate
Justification:

Crop losses in yield and quality on the affected trees, extra costs of harvesting and grading, costs of replanting could be important. While the pathogen and its vector is widely distributed in the EU area the economic losses are considered as medium or low, depending the country/area (Bertaccini et al. 2014; ANSES, 2012). **6 - Are there feasible and effective measures available to prevent the presence of the pest on the plants for planting at an incidence above a certain threshold (including zero) to avoid an unacceptable economic impact as regards the relevant host plants?**

Yes

Conclusion:

candidate
Justification:

Despite the presence in the EU area of both the phytoplasma and its vectors, the combination of prophylactic measures including the choice of varieties, rootstocks, the use of certified material for both, keeping pre-basic material under insect-proof conditions, removing each symptomatic tree in orchard, the targeted fight against vectors may maintain the infestation under an acceptable level (ANSES, 2012 ; PrimaFacie, 2012). Other disease management strategies focus on vector control, and recent strategies are considering strategies of biocontrol (Bulgari et al., 2014) or the use of suppressive strains (Schneider et al., 2014). **7- Is the quality of the data sufficient to recommend the pest to be listed as a RNQP?**

Yes

Conclusion:

Candidate
Justification:

Epidemiological data is lacking on the presence and impact of the proliferation of the disease in all EU regions. However the impact of the pathogen on the production is documented, and the pathogen is widely dispersed throughout EU, with natural hosts present in the environment (M. sylvestris) and wide areas of production of M. communis. The psyllids vectors are aslo widely distributed in EU. Economical impact is likely to be more important on plant production, and several measures are identified to prevent the propagation of the phytoplasma with plant material : using certified/controlled material; measures against the vectors. **CONCLUSION ON THE STATUS:**

Recommended for listing as an RNQP - based on data. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

No
Proposed Tolerance levels:

Zero tolerance approach, based on visual examination and/or testing. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

Yes
Proposed Risk management measure:

Non-certified material (‘CAC’):
(A) Derived from mother plants which have been inspected and found free from symptoms of 'Candidatus Phytoplasma mali';
AND
(B) (a) Plants produced in areas known to be free from 'Candidatus Phytoplasma mali';
or
(b) Site of production found free from 'Candidatus Phytoplasma mali' over the last complete growing season by visual inspection and any symptomatic plants in the immediate vicinity rogued out and destroyed immediately;
or
(c) No more than 2% of plants in the site of production showing symptoms during inspections at appropriate times during the last growing season, and those plants and any symptomatic plants in the immediate vicinity rogued out and destroyed immediately, and a representative sample of the remaining asymptomatic plants in the lots in which symptomatic plants were found has been tested and found free from 'Candidatus Phytoplasma mali'.

Pre-basic, Basic and Certified:
Additional measures could include
• Cultivation under insect-proof conditions (pre-basic);
• Isolation of mother plants from host plants of the pest and the vector, including uncultivated plants;
• Testing of candidate trees for mother plants;
• Mother plants in protected cultivation - retesting of all plants (pre-basic) or a representative sample (basic and certified) at least every 15 years;
• Other mother plants - testing of a representative sample (basic and certified) at least every 5 years;
• More testing in case of finding of an infection, including testing of all mother plants in the production site;
Justification (if necessary):

The SEWG considered that visual examination of the mother plant was sufficient (no support for testing of the mother plants, as symptoms on mother plants are considered to be easily seen).
Later the coreHEWGplus discussed the ratio cost/benefit of a more systematic testing of CAC mother plants: This would allow detection of asymptomatic plants. However, this was counterbalanced by the difficulty of testing (testing of the roots would be more reliable, but not practical) and by the risk of reinfestation in case of high vector pressure. No consensus was reached within the core-HEWGplus on the added value of such a more systematic testing, in the context of the RNQP status. **REFERENCES:**

* ANSES (2012) Rapport d'expertise collective. Groupe de travail "ARP phytoplasmes des arbres fruitiers". Available at <https://www.anses.fr/fr/system/files/SVEG2011sa0137Ra.pdf>;
* Bertaccini A, Duduk B, Paltrinieri S & Contaldo N (2014) Phytoplasmas and phytoplasma diseases: a severe threat to agriculture. American Journal of Plant Sciences, 2014;
* Bulgari D, Casati P, Quaglino F & Bianco P A (2014) Isolation of potential biocontrol agents of ‘Candidatus Phytoplasma mali’. Phytoplasmas and phytoplasma disease management: how to reduce their economic impact. International Phytoplasmologist Working Group. Food and Agriculture COST Action FA0807, 226. Available at: <http://www.cost.eu/download/FAP_FA0807>;
* EU COM (2016) Recommendation of the Working Group on the Annexes of the Council Directive 2000/29/EC – Section II – Listing of Harmful Organisms as regards the future listing of Candidatus Phytoplasma mali [Apple Proliferation Mycoplasm];
* Mittelberger C, Obkircher L, Oettl S, Oppedisano T, Pedrazzoli F, Panassiti B, Kerschbamer C, Anfora G & Janik K (2017) The insect vector Cacopsylla picta vertically transmits the bacterium ‘Candidatus Phytoplasma mali’ to its progeny. Plant Pathology.
* Prima phacie (2012) Pest risk assessment for the European Community plant health: A comparative approach with case studies. External scientific report by group of authors: <http://www.efsa.europa.eu/fr/supporting/doc/319e.pdf>;
* Schneider B, Sule S, Jelkmann W & Seemüller E (2014) Suppression of aggressive strains of ‘Candidatus phytoplasma mali’by mild strains in Catharanthus roseus and Nicotiana occidentalis and indication of similar action in apple trees. Phytopathology, 104, 453-461;
* Seemüller E, Carraro L, Jarausch W & Schneider B (2011) Apple proliferation phytoplasma. In: Virus and Virus-Like Disease of Pome and Stone Fruits. Edited
* by Hadidi A, Barba M, Candresse T and Jelkman W, p. 67-73;

HOST PLANT N°2: Malus (1MABG) for the Ornamental sector.

Origin of the listing:

IIA2AWG
Plants for planting:

Plants intended for planting, other than seeds **3 - Is the pest already listed in a PM4 standard on the concerned host plant?**

Yes
Conclusion:

Evaluation continues

Justification (if necessary):

Decision by the HEWG to continue the evaluation in view of the problematic of vector transmission. **4 - Are the listed plants for planting the main\* pathway for the "pest/host/intended use" combination? (\*: significant compared to others):**

Yes
Conclusion:

Candidate

Justification:

Plants for planting can be a very efficient pathway, when propagated from infested plants. Vector transmission is also a pathway but it is considered less efficient than plants for planting. **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

No
Justification:

No information on impacts on ornamental Malus. Remark: There are reports of other ornamental plants being infected by this pathogen, e.g. Magnolia liliiflora (Kaminska & Sliwa, 2003), rose (Kaminska & Sliwa, 2004), dahlia, lilies (Kaminska & Sliwa, 2008a,b). There are no data on economic impact on these plants.
What is the likely economic impact of the pest irrespective of its infestation source in the absence of phytosanitary measures? (= official measures)

Minimal
Is the economic impact due to the presence of the pest on the named host plant for planting, acceptable to the propagation and end user sectors concerned?

Yes
Is there unacceptable economic impact caused to other hosts (or the same host with a different intended use) produced at the same place of production due to the transfer of the pest from the named host plant for planting?

Yes
Conclusion:

Candidate
Justification:

There is probably no economic impact for the ornamental use. However ornamental plants may be produced at the same place of production than plants for the fruit production. It may be necessary to take measures on ornamental plants, in view of the risk they pose to the fruit sector (Celetti, 2013). **6 - Are there feasible and effective measures available to prevent the presence of the pest on the plants for planting at an incidence above a certain threshold (including zero) to avoid an unacceptable economic impact as regards the relevant host plants?**

Yes

Conclusion:

candidate
Justification:

 **7- Is the quality of the data sufficient to recommend the pest to be listed as a RNQP?**

Yes

Conclusion:

Candidate
Justification:

 **CONCLUSION ON THE STATUS:**

Recommended for listing as an RNQP - based on data of possible indirect economic impacts for the fruit sector. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

No
Proposed Tolerance levels:

Zero tolerance approach, based on visual examination and/or testing. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

Yes
Proposed Risk management measure:

(A) Derived from mother plants which have been inspected and found free from symptoms of 'Candidatus Phytoplasma mali';
AND
(B) (a) Plants produced in areas known to be free from 'Candidatus Phytoplasma mali';
or
(b) Site of production found free from 'Candidatus Phytoplasma mali' over the last complete growing season by visual inspection and any symptomatic plants in the immediate vicinity rogued out and destroyed immediately;
or
(c) No more than 2% of plants in the site of production showing symptoms during inspections at appropriate times during the last growing season, and those plants and any symptomatic plants in the immediate vicinity rogued out and destroyed immediately, and a representative sample of the remaining asymptomatic plants in the lots in which symptomatic plants were found has been tested and found free from 'Candidatus Phytoplasma mali'.
Justification (if necessary):

Experts recommended extrapolating measures from the fruit sector. **REFERENCES:**

* ANSES (2012) Rapport d'expertise collective. Groupe de travail "ARP phytoplasmes des arbres fruitiers". Available at <https://www.anses.fr/fr/system/files/SVEG2011sa0137Ra.pdf>;
* Celetti M (2013) Apple Proliferation Disease. Orchard Network. Ontario Ministry of Agriculture, Food and Rural Affairs. Available from: <http://www.omafra.gov.on.ca/english/crops/hort/news/orchnews/2013/on-0413a9.htm>;
* EU COM (2016) Recommendation of the Working Group on the Annexes of the Council Directive 2000/29/EC – Section II – Listing of Harmful Organisms as regards the future listing of Candidatus Phytoplasma mali [Apple Proliferation Mycoplasm];
* Kaminska M & Sliwa H (2003) Effect of antibiotics on the symptoms of stunting disease of Magnolia liliiflora plants. Journal of Phytopathology, 151:59-63;
* Kaminska M & Sliwa H (2004) First report of phytoplasma belonging to apple proliferation group in roses in Poland. Plant Disease, 88:1283;
* Kaminska M & Sliwa H (2008a) Mixed infection of dahlia plants in Poland with apple proliferation and aster yellows phytoplasmas. Plant Pathology, 57:363;
* Kaminska M & Sliwa H (2008b) First report of ‘Candidatus Phytoplasma mali’ in oriental lilies and its association with leaf scorch in Poland, Plant Pathology, 57:363;
* Prima phacie (2012) Pest risk assessment for the European Community plant health: A comparative approach with case studies. External scientific report by group of authors: <http://www.efsa.europa.eu/fr/supporting/doc/319e.pdf>;