NAME OF THE ORGANISM: Pseudomonas syringae pv. lachrymans (PSDMLA)

GENERAL INFORMATION ON THE PEST

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

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: Vegetable propagating and planting material (other than seeds) sector

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

Yes
Conclusion:

* Candidate: Vegetable propagating and planting material (other than seeds) sector

**2 – Status in the EU:**

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

No
Presence in the EU:

Yes
Conclusion:

candidate
Justification (if necessary):

The pest is present in Bulgaria, Czechoslovakia, Denmark, France, Germany, Greece, Hungary, Italy, Netherlands, Poland, Romania and UK (CABI, 1987)

HOST PLANT N°1: Cucumis melo (CUMME) for the Vegetable propagating and planting material (other than seeds) sector.

Origin of the listing:

2 - Vegetable seedling sector: Commission Directive 93/61/EC
Plants for planting:

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

No
Conclusion:

Evaluation continues **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:

Angular leaf spot is the most widespread bacterial disease of cucurbits (Compendium of Cucurbit Diseases, 1996). Natural hosts of the bacterium include Cucumis sativus, C. melo, C. melo var. indorus, C. anguria, C. dipsaceus, Citrullus lanatus, Cucurbita maxima, C. pepo var. melopepo, C. pepo var. medullosa, C. pepo var. condensa, Bryonopsis laciniosa, Lagenaria leucantha and Luffa acutangula (Bradbury, 1986). It is most serious in cucumbers grown in warms and humid conditions. Infection first appears on leaves, then infecting fruit and contaminating seed. The pathogen is seed-borne and infestation occurs beneath the seed coat so infecting the cotyledons and hence spreading to other plants. Therefore seed and young plants are a pathway. Control can consist of outside rotation for 2 years, cultivation when dry, copper sprays and resistant cvs. If these methods are effectively carried out (or being grown indoors), then young plants for planting can be considered the main pathway (Compendium of Cucurbit Diseases, 1996). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

It is a serious pathogen of cucurbits, causing cosmetic damage to skin, disfiguring fruit and causing a fruit rot (Compendium of Cucurbit Diseases, 1996).
What is the likely economic impact of the pest irrespective of its infestation source in the absence of phytosanitary measures? (= official measures)

Minor
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?

No
Conclusion:

Not candidate
Justification:

Economic impact is considered minor, compared to cucumber and squash. **CONCLUSION ON THE STATUS:**

Disqualified: impact is acceptable on this host plant. The 'substantially free from' requirement is a sufficient risk management measure. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

No
Proposed Tolerance levels:

Delisting. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Delisting. **REFERENCES:**

* CABI (1987) Distribution map for Pseudomonas syringae pv. lachrymans (E.F. Smith & Bryan) Young, Dye & Wilkie. Distribution Maps of Plant Diseases. Map No. 355 (Edition 4);
* Compendium of Cucurbit Diseases (1996) First edition. The American Phytopathological Society;

HOST PLANT N°2: Cucumis sativus (CUMSA) for the Vegetable propagating and planting material (other than seeds) sector.

Origin of the listing:

2 - Vegetable seedling sector: Commission Directive 93/61/EC
Plants for planting:

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

No
Conclusion:

Evaluation continues **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:

Angular leaf spot is the most widespread bacterial disease of cucurbits (Compendium of Cucurbit Diseases, 1996). Natural hosts of the bacterium include Cucumis sativus, C. melo, C. melo var. indorus, C. anguria, C. dipsaceus, Citrullus lanatus, Cucurbita maxima, C. pepo var. melopepo, C. pepo var. medullosa, C. pepo var. condensa, Bryonopsis laciniosa, Lagenaria leucantha and Luffa acutangula (Bradbury, 1986). It is most serious in cucumbers grown in warms and humid conditions. Infection first appears on leaves, then infecting fruit and contaminating seed. The pathogen is seed-borne and infestation occurs beneath the seed coat so infecting the cotyledons and hence spreading to other plants. Therefore seed and young plants are a pathway. Control can consist of outside rotation for 2 years, cultivation when dry, copper sprays and resistant cvs. If these methods are effectively carried out (or being grown indoors), then young plants for planting can be considered the main pathway (Compendium of Cucurbit Diseases, 1996). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

It is a serious pathogen of cucurbits, causing cosmetic damage to skin, disfiguring fruit and causing a fruit rot (Compendium of Cucurbit Diseases, 1996). Annual economic loss of 0.5 million dollars in production of cucumber crop due to this disease, alone in Wiscosin state of USA has been reported (Kennedy & Alcorn, 1980). Mohamed et al. (2000) reported from Egypt that infection of P. syringae pv. lachrymans caused a reduction of 4 to 30 per cent in dry weight, 8 to 35 per cent in water content, 7 to 14 per cent in shoot length and 16 to 25 per cent in root length of different cultivars of cucumbers. The disease has been reported to cause a yield reduction of up to 50 per cent in Moscow province of Russia. In India, the disease has been reported to occur in all cucumber growing areas of Kashmir valley with incidence and intensity ranging between 23 to 74 % and 11 to 26 % respectively. The pest can inflict up to 37 and 40 per cent reduction in fruit number and fruit weight, respectively besides rendering some fruits as unmarketable culls (Baht et al., 2010).
What is the likely economic impact of the pest irrespective of its infestation source in the absence of phytosanitary measures? (= official measures)

Massive
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:

 **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:

Resistance to P. lachrymans is controlled by a large number of recessive genetic factors (Klossowska 1976). However, it has also been reported that the disease is controlled by a single recessive gene „pl“ (Dessert et al. 1982). The resistance does not work in the crop when it is wet. Cultivation in dry soil is the most effective in reducing bacterial survival (Kritzman and Zutra 1983). Chemical controls are most effective antibiotic when integrated with cultural control pratices. Streptocycline is an effective antibiotic against bacterial plant pathogens at a rate of 400 ppm. Copper-based bactericides are often neccesary at an interval of 4-7 days to reduce the severity of the disease (Schwartz & Gent 2007). The biological control agent pentaphage (lysate of the virulent strain of P. syringae) was most effective when applied at high relative humidity (90%) in the morning and evening at intervals of 12-14 days (Korol & Bylinskii 1994). Kutova and Filipova (1976) reported that soaking of cucumber seeds for 18 hours in zinc sulphate or manganese sulphate at 0.02 per cent, copper sulphate or boric acid at 0.03 per cent or in pencillin or streptomycin at 0.04 per cent greatly reduced infection of P. syringae pv. lacrymans and markedly increased field germination, root length and seedling viability with 4 to 16.4 per cent increase in fruit yield. Similarly, Kutova and Vlakhov (1977) reported that wet treatment of cucumber seeds with antibiotics tetracycline, oxytetracycline, C-7/21 and C-06 reduced angular leaf spot infection and increased field germination by about 10 per cent. **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:**

Not recommended for listing as an RNQP: This pest/host/intended use combination meets all the criteria for RNQP status [and could also be considered for seed, if this is the major pathway by which young plants become infected]. However, the requirement for absence of visual symptoms on the traded material (current general 'Substantially free from' requirement in the EU) is considered to be sufficient for solanaceous vegetable hosts. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

No
Proposed Tolerance levels:

Delisting. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Delisting. **REFERENCES:**

* Bhat NA, Bhat KA, Zargar MY, Teli MA, Nazir M & Zargar SM (2010) Current status of angular leaf spot (Pseudomonas syringae pv. lachrymans) of cucumber: a review. International Journal of Current Research 8, 1-11;
* Bradbury JF (1986) Guide to Plant Pathogenic Bacteria. CAB Internationa.l Mycological Institute, p. 329;
* CABI (1987) Distribution map for Pseudomonas syringae pv. lachrymans (E.F. Smith & Bryan) Young, Dye & Wilkie. Distribution Maps of Plant Diseases. Map No. 355 (Edition 4);
* Compendium of Cucurbit Diseases (1996) First edition. The American Phytopathological Society;
* Dessert JM, Baker LR & Fobes JF (1982) Inheritance of reaction to Pseudomonas lachrymans in pickling cucumber Euphytica, 31: 847-55;
* Kennedy BW & Alcron SM (1980) Estimates of US crop losses to prokaryote plant pathogens, Plant Disease 64, 674-676;
* Korol AL & Bylinskii AF (1994) Pentaphage against angular leaf spot. Zashchita Rastenii (Moskva) 4, 16-17;
* Kritzman G & Zutra D (1983) Systemic movement of Pseudomonas syringae pv. Lachrymans in the stem, leaves, fruits and seed of cucumber. Canadian Journal of Plant Pathology, 273-278;
* Kutova I & Filipova N (1976) The influence of seed treatment with microelements and antibiotics on bacteriosis and yield of cucumbers. Gradinarstvo 57, 29-31;
* Mohamed ZK, El-Hindawy HH & Fayed OS (2000) Physiological and biochemical studies on phytopathogenic bacteria isolated from cucumber in Egypt. Egyptian Journal of Microbiology 35, 1-20;
* Pessarakli M (2016) The Handbook of Cucurbits: Growth, Cultural Practices, and Physiology. CRC Press, Science, 574 pages;
* Schwartz HF & DH Gent (2007) Cercospora leaf spot (Cucumber, Melon, Pumpkin, Squash, and Zucchini). Available at: <http://wiki.bugwood.org/uploads/CercosporaLeafSpot-Cucurbits.pdf>;

HOST PLANT N°3: Cucurbita pepo (Cucumis pepo) (CUUPE) for the Vegetable propagating and planting material (other than seeds) sector.

Origin of the listing:

2 - Vegetable seedling sector: Commission Directive 93/61/EC
Plants for planting:

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

No
Conclusion:

Evaluation continues **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:

Angular leaf spot is the most widespread bacterial disease of cucurbits (Compendium of Cucurbit Diseases, 1996). Natural hosts of the bacterium include Cucumis sativus, C. melo, C. melo var. indorus, C. anguria, C. dipsaceus, Citrullus lanatus, Cucurbita maxima, C. pepo var. melopepo, C. pepo var. medullosa, C. pepo var. condensa, Bryonopsis laciniosa, Lagenaria leucantha and Luffa acutangula (Bradbury, 1986). It is most serious in cucumbers grown in warms and humid conditions. Infection first appears on leaves, then infecting fruit and contaminating seed. The pathogen is seed-borne and infestation occurs beneath the seed coat so infecting the cotyledons and hence spreading to other plants. Therefore seed and young plants are a pathway. Control can consist of outside rotation for 2 years, cultivation when dry, copper sprays and resistant cvs. If these methods are effectively carried out (or being grown indoors), then young plants for planting can be considered the main pathway (Compendium of Cucurbit Diseases, 1996). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

It is a serious pathogen of cucurbits, causing cosmetic damage to skin, disfiguring fruit and causing a fruit rot (Compendium of Cucurbit Diseases, 1996). Under natural conditions, a severe out break of angular leaf spot of cucumbers in Michigan, USA was reported to have affected squash (Baht et al., 2010).
What is the likely economic impact of the pest irrespective of its infestation source in the absence of phytosanitary measures? (= official measures)

Major
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:

 **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:**

Not recommended for listing as an RNQP: This pest/host/intended use combination meets all the criteria for RNQP status [and could also be considered for seed, if this is the major pathway by which young plants become infected]. However, the requirement for absence of visual symptoms on the traded material (current general 'Substantially free from' requirement in the EU) is considered to be sufficient for solanaceous vegetable hosts. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

No
Proposed Tolerance levels:

Delisting. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Delisting. **REFERENCES:**

* Bhat NA, Bhat KA, Zargar MY, Teli MA, Nazir M & Zargar SM (2010) Current status of angular leaf spot (Pseudomonas syringae pv. lachrymans) of cucumber: a review. International Journal of Current Research 8, 1-11;
* CABI (1987) Distribution map for Pseudomonas syringae pv. lachrymans (E.F. Smith & Bryan) Young, Dye & Wilkie. Distribution Maps of Plant Diseases. Map No. 355 (Edition 4);
* Compendium of Cucurbit Diseases (1996) First edition. The American Phytopathological Society;