NAME OF THE ORGANISM: Claviceps purpurea (CLAVPU)

GENERAL INFORMATION ON THE PEST

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

Pest category:

Fungi **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: Cereals (including rice) sector

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

Not relevant
Conclusion:

* Candidate: Cereals (including rice) 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 Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Poland, Portugal, Romania, Spain and Sweden (CABI, 2012).

HOST PLANT N°1: Avena nuda (AVENU) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

The plant species is not recorded as a host plant (CABI, 2012) (Australia, 2016). However the genus Avena is considered as susceptible (CABI, 2012). As it is an open flowering cereal, and because the genus Avena is considered as susceptible to C. purpurea, experts suggested keeping this plant species listed. **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Ergot tends to be less common on wheat, barley and oat (Compendium of Wheat Diseases, 2010). It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011; maximum 0,5g sclerotia/kg of grain cereals (except on maize and rice) for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is contaminated with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses; Losses from Claviceps purpurea can occur through direct seed replacement, increased sterility of neighbouring spikelets and reduced kernel weight due to diversion of host nutrients at the expense of adjacent florets (CABI, 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:

Planting seed free from sclerotia and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds in the crop and at field margins. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;

HOST PLANT N°2: Avena sativa (AVESA) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

This species is a host plant (CABI, 2012)(Australia, 2016). Sclerotia can be transported with seeds. Alternative hosts can serve as a source of infection. Wind and insects can transport ascospores, delevoped from sclerotia but are a less significant pathway than contaminated seeds (see possible control of weeds). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Ergot tends to be less common on wheat, barley and oat (Compendium of Wheat Diseases, 2010). It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011; maximum 0,5g sclerotia/kg of grain cereals (except on maize and rice) for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is contaminated with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses; Losses from Claviceps purpurea can occur through direct seed replacement, increased sterility of neighbouring spikelets and reduced kernel weight due to diversion of host nutrients at the expense of adjacent florets (CABI, 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:

Planting seed free from sclerotia and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds in the crop and at field edges. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;

HOST PLANT N°3: Avena strigosa (AVESG) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

The plant species is not recorded as a host plant (CABI, 2012) (Australia, 2016). However the genus Avena is considered as susceptible (CABI, 2012). Experts suggested keeping this plant species listed. **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Reports from southern Brazil link Claviceps purpurea in Avena strigosa to intoxication of female horses (Copetti et al., 2002). It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011; maximum 0,5g sclerotia/kg of grain cereals (except on maize and rice) for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is contaminated with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses; Losses from Claviceps purpurea can occur through direct seed replacement, increased sterility of neighbouring spikelets and reduced kernel weight due to diversion of host nutrients at the expense of adjacent florets (CABI, 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:

Planting seed free from sclerotia and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds in the crop and at field edges. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;
* Copetti M V, Santurio J M, Boeck A A P, Silva R B, Bergermaier L A, Lubeck I, Leal A B M, Leal A T, Alves S H & Ferreiro L (2002) Agalactia in Mares fed with grain contaminated with Claviceps purpurea. Mycopathologia 154, 199-200;

HOST PLANT N°4: Hordeum vulgare (HORVX) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

Species is a host plant (CABI, 2012)(Australia, 2016). Sclerotia can be transported with seeds. Alternative hosts can serve as a source of infection. Wind and insects can transport ascospores, delevoped from sclerotia but are a less significant pathway than contaminated seeds (see possible control of weeds). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Ergot is more common in rye and triticales (Compendium of Wheat Diseases, 2010). Ergot significantly reduced the number of grain and grain weight per ear. Depending on the amount of ergot sclerotia the number of grains per ear declined by 10-80%, and grain weight by 25-93% (Mikaliunaite and Dabkevicius, 2009). It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011 - except on maize and rice; maximum 0,5g sclerotia/kg of grain cereals for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is contaminated with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses; Losses from Claviceps purpurea can occur through direct seed replacement, increased sterility of neighbouring spikelets and reduced kernel weight due to diversion of host nutrients at the expense of adjacent florets (CABI, 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:

Planting seed free from sclerotia and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds in the crop and at field margins. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;

HOST PLANT N°5: Oryza sativa (ORYSA) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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):**

No
Conclusion:

not candidate

Justification:

The plant species is not recorded as a host plant (CABI, 2012) (Australia, 2016). Experts concluded that O. sativa should not be considered as a host plant. **CONCLUSION ON THE STATUS:**

Disqualified: Oryza sativa is not considered to be a host plant. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

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

Yes
Proposed Risk management measure:

Delisting. **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;

HOST PLANT N°6: Phalaris canariensis (PHACA) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

Species is a host plant (Australia, 2016). Sclerotia can be transported with seeds. Alternative hosts can serve as a source of infection. Wind and insects can transport ascospores, delevoped from sclerotia but are a less significant pathway than contaminated seeds (see possible control of weeds). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011 - except on maize and rice; maximum 0,5g sclerotia/kg of grain cereals for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is contaminated with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses; Losses from Claviceps purpurea can occur through direct seed replacement, increased sterility of neighbouring spikelets and reduced kernel weight due to diversion of host nutrients at the expense of adjacent florets (CABI, 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:

Planting seed free from sclerotia and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds in the crop and field margins. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (APS Crop Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;

HOST PLANT N°7: Secale cereale (SECCE) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

Species is a host plant (CABI, 2012)(Australia, 2016). Sclerotia can be transported with seeds. Alternative hosts can serve as a source of infection. Wind and insects can transport ascospores, delevoped from sclerotia but are a less significant pathway than contaminated seeds (see possible control of weeds). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Ergot is more common in rye and triticales (Compendium of Wheat Diseases, 2010). Ergot significantly reduced the number of grain and grain weight per ear. Depending on the amount of ergot sclerotia the number of grains per ear declined by 10-80%, and grain weight by 25-93% (Mikaliunaite and Dabkevicius, 2009). It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011 - except on maize and rice; maximum 0,5g sclerotia/kg of grain cereals for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is contaminated with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses; Losses from Claviceps purpurea can occur through direct seed replacement, increased sterility of neighbouring spikelets and reduced kernel weight due to diversion of host nutrients at the expense of adjacent florets (CABI, 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:

Planting seed free from sclerotia and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds in the crop and field margins. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments [4 for hybrids of Secale Cereale] found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;
* Mikaliunaite R and Dabkevicius Z (2009) The spread of ergot (Claviceps purpurea) on Poaceae plants and incidence on cereals in Lithuania. Zemdirbyste-Agriculture 96, 246–259;

HOST PLANT N°8: Sorghum bicolor (SORVU) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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):**

No
Conclusion:

Not candidate

Justification:

CABI considered the species as a host plant (CABI, 2012). However, in the RNQP Questionnaire, ESA, FR and SI considered that this species should not considered as a host plant. Experts concluded that CABI is probably only referring to very old references. As only Claviceps Africana is known to cause symptoms of ergot on Sorghum, experts proposed the delisting of C. purpurea on this host plant. **CONCLUSION ON THE STATUS:**

Disqualified: Sorghum bicolor is not considered to be a host plant. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

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

Yes
Proposed Risk management measure:

Delisting. **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;

HOST PLANT N°9: Sorghum x drummondii (SORSU) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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):**

No
Conclusion:

Not candidate

Justification:

The plant species is not recorded as a host plant (CABI, 2012) (Australia, 2016). Experts confirmed that this species is not known to be a host plant. **CONCLUSION ON THE STATUS:**

Disqualified: Sorghum x drummondii is not considered to be a host plant. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

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

Yes
Proposed Risk management measure:

Delisting. **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;

HOST PLANT N°10: Sorghum x drummondii (Sorghum sudanense) (SORSU) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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):**

No
Conclusion:

Not candidate

Justification:

The plant species is not recorded as a host plant (CABI, 2012) (Australia, 2016). In the RNQP Questionnaire, ESA, FR and SI commented that this species is not a host plant. This was confirmed by experts during the SEWG. **CONCLUSION ON THE STATUS:**

Disqualified: Sorghum sudanense is not considered to be a host plant. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

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

Yes
Proposed Risk management measure:

Delisting. **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;

HOST PLANT N°11: Triticosecale (1TTLG) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

The plant species is not recorded as a host plant in CABI (2012) and Australia (2016). However triticale is considered to be a host plant (Celar&al., 2015). Sclerotia can be transported with seeds. Alternative hosts can serve as a source of infection. Wind and insects can transport ascospores, delevoped from sclerotia but are a less significant pathway than contaminated seeds (see possible control of weeds). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Ergot is more common in rye and triticales (Compendium of Wheat Diseases, 2010). Ergot significantly reduced the number of grain and grain weight per ear. Depending on the amount of ergot sclerotia the number of grains per ear declined by 10-80%, and grain weight by 25-93% (Mikaliunaite and Dabkevicius, 2009). It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011 - except on maize and rice; maximum 0,5g sclerotia/kg of grain cereals for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is mixed with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses; Losses from Claviceps purpurea can occur through direct seed replacement, increased sterility of neighbouring spikelets and reduced kernel weight due to diversion of host nutrients at the expense of adjacent florets (CABI, 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:

Planting seed free and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;
* Celar F A, Eler K, Strajn B J & Kos K (2015) The incidence of ergot (Claviceps purpurea (Fr.) Tul.) in the species of the grass family (Poaceae) in Slovenia 2014 [Slovenian]. Zbornik predavanj in referatov 12. Slovenskega posvetovanja o varstvu rastlin z mednarodno udelezbo, Ptuj, Slovenija 9, 206-210;
* Mikaliunaite R and Dabkevicius Z (2009) The spread of ergot (Claviceps purpurea) on Poaceae plants and incidence on cereals in Lithuania. Zemdirbyste-Agriculture 96, 246–259;

HOST PLANT N°12: Triticum aestivum (TRZAX) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

Species is a host plant (CABI, 2012)(Australia, 2016). Sclerotia can be transported with seeds. Alternative hosts can serve as a source of infection. Wind and insects can transport ascospores, delevoped from sclerotia but are a less significant pathway than contaminated seeds (see possible control of weeds). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Ergot tends to be less common on wheat, barley and oat (Compendium of Wheat Diseases, 2010). It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011 - except on maize and rice; maximum 0,5g sclerotia/kg of grain cereals for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is mixed with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses; Losses from Claviceps purpurea can occur through direct seed replacement, increased sterility of neighbouring spikelets and reduced kernel weight due to diversion of host nutrients at the expense of adjacent florets (CABI, 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:

Planting seed free and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;

HOST PLANT N°13: Triticum durum (TRZDU) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

Triticum is recorded as a host plant at the genus level (CABI, 2012). Sclerotia can be transported with seeds. Alternative hosts can serve as a source of infection. Wind and insects can transport ascospores, delevoped from sclerotia but are a less significant pathway than contaminated seeds (see possible control of weeds). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Ergot tends to be less common on wheat, barley and oat (Compendium of Wheat Diseases, 2010). It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011 - except on maize and rice; maximum 0,5g sclerotia/kg of grain cereals for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is mixed with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses; Losses from Claviceps purpurea can occur through direct seed replacement, increased sterility of neighbouring spikelets and reduced kernel weight due to diversion of host nutrients at the expense of adjacent florets (CABI, 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:

Planting seed free and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;

HOST PLANT N°14: Triticum spelta (TRZSP) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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:

Triticum is recorded as a host plant at the genus level (CABI, 2012). Sclerotia can be transported with seeds. Alternative hosts can serve as a source of infection. Wind and insects can transport ascospores, delevoped from sclerotia but are a less significant pathway than contaminated seeds (see possible control of weeds). **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Ergot tends to be less common on wheat, barley and oat (Compendium of Wheat Diseases, 2010). It causes the production of alkaloids toxic for human and animal consumption. As a consequence ergot is regulated in cereal grains (maximum 1g of sclerotia/kg of grains for the animal consumption according to the EU Directive 32/2002 and regulation 574/2011 - except on maize and rice; maximum 0,5g sclerotia/kg of grain cereals for the human consumption according to the modified regulation 1881/2006). Over these thresholds, cereal grains are unsellable which causes direct impact for the producer and/or a risk for the final consumer.
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:

If seed is mixed with large numbers of sclerotia the crop can be heavily infected during vegetation followed by yield and quality losses (CABI, 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:

Planting seed free and definition of tolerance levels for seeds. Seed cleaning reduces the primary inoculum source and the economic impact for the intended use. Control of grassy weeds. A crop rotation that allows for a 1-year absence of gramineous host will markedly reduce the number of sclerotia in the fields (Compendium of Wheat Diseases and Pests, 2010). **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. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

Not more than 1 (pre-basic or basic) or 3 (certified) sclerotia or fragments found in a representative sample of the seed lot of a size specified in column 4 of Annex III. Ways of achieving this threshold may be left to the producers. Information from field inspections may be provided to the applicant to inform their subsequent decisions on certification and seed cleaning. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

No
Proposed Risk management measure:

Measures do not need to be specified (see defined thresholds). **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;

HOST PLANT N°15: Zea mays (ZEAMX) for the Cereals (including rice) sector.

Origin of the listing:

2 - Cereals sector: Council Directive 66/402/EEC
Plants for planting:

Seeds **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):**

No
Conclusion:

Not candidate

Justification:

The plant species is not recorded as a host plant (CABI, 2012) (Australia, 2016). In the RNQP Questionnaire, DE, ESA, FR and SI commented that this species is not a host plant. Experts confirmed that C. purpurea is present worldwide on cereal and grasses but not on maize. Experts commented that Mexican species of Claviceps (species not present in the EU, including Claviceps gigantea) are known on Zea mays. **CONCLUSION ON THE STATUS:**

Disqualified: Zea mays is not considered to be a host plant. **8 - Tolerance level:**
Is there a need to change the Tolerance level:

Yes
Proposed Tolerance levels:

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

Yes
Proposed Risk management measure:

Delisting. **REFERENCES:**

* Australia (2016), online, 2016. Database. Ergot fungi of Australia. Host index. Biosecurity Queensland, Department of Agriculture, Fisheries and Forestry. Available from <http://collections.daff.qld.gov.au/web/key/ergotfungi/Media/Html/host.html>;
* CABI (Centre for Agricultural Bioscience International), online, 2012. Datasheets Claviceps purpurea (ergot). Invasive species compendium. CABI, Wallingford, UK. Available from <http://www.cabi.org/isc/datasheet/13794>;