NAME OF THE ORGANISM: Ustilago tritici (USTINT)

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

Justification (if necessary):

Ustilago tritici and U. nuda differ only in pathogenicity [ibid., 23, p. 170] they should be united in one species (U. nuda) (Ainsworth & Sampson, 1950). U. tritici and U. nuda are synonyms according to Index Fungorum (<http://www.indexfungorum.org/names/NamesRecord.asp?RecordID=141349>). **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):

This pest is present worldwide, including Europe (CABI, 1993).

HOST PLANT N°1: Triticum aestivum (TRZAX) for the Cereals (including rice) sector.

Origin of the listing:

RNQP Questionnaire
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:

Ustilago tritici (U. segetum var. tritici) causes loose smut of wheat. Infection is seed-borne within the seed. The spores of Ustilago tritici germinate on the ovary of a flowering plant and hyphae penetrate the ovary wall and grow towards the developing scutellum and embryo and remain dormant in these tissues until the seed starts to germinate. Seed is therefore a pathway. Infected seeds give rise to systemically infected plants and diseased ears are visible directly after heading. The black spores are released between glumes and broken-down grains, and are blown by the wind to infect neighbouring healthy ears (EPPO, 1997). Seed certification and seed treatment are very effective in controlling the disease, which is now practically unknown in intensive cereal cultivation in Europe. If untreated farmer-saved seed is sown, however, these diseases reappear (EPPO, 1997).
The directive 66/402 has a requirement for the seed producing crop that Ustilaginaceae shall be at the lowest possible level, but no seed-testing requirements are given. There is not a seed test by embryo extraction described by ISTA.
Volunteer plants grown from spilt contaminated seed from the previous year could in theory act as a disease source but this appears to be very rare because no references to this could be found. It is concluded seed can be considered as a significant pathway for the pest. **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

In Canada, the percentage of common bread wheat (T. aestivum) fields affected varied from 6% in 1989 to 36% in 1995 with means of 0.1% or fewer infected plants. Durum wheats (T. durum) are generally more susceptible and the percentage of fields affected varied from 45% in 1994 to 78% in 1995, with the mean level of infected durum wheat plants per field ranging from <0.1 to 0.4%. (Thomas and Menzies, 1997). Loose smut disease of wheat in Canada, caused by Ustilago tritici, causes significant economic losses on both durum and bread wheats (Randhawa et al., 2009).
In the UK on T. aestivum it has been rare since the 1970's appearing to be related to more resistant varieites and possibly widespread use of dwarfing genes. The risk of in-crop losses is given as low if grown from certified seed and high if seed saved repeatedly without treatment, and the risk to adjacent crops is moderate only if kept as seed (Paveley et al., 1996).
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:

Yield losses are in proportion to the percentage of infected heads in the crop. Generally losses are low 1% but can be as high as 30%. Teliospores from infected ears can infect ovaries of health plants, re-establishing the disease in the next generation of seed produced. Infected seed are otherwise normal, visibly unaltered and fully germinable (Compendium of wheat diseases and pests, 2010). Potential for the disease to multiply within a few years is great if seed is sown untreated or without a systemic seed treatment. **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:

Control through standards for field inspection and seed, use of less susceptible varieties, and mostly through systemic seed treatment fungicides (e.g. tebuconazole, triticonazole, prothioconazole). These fungicides are not allowable for organic farming (management through testing and field inspections). **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:

A tolerance (0.1% of seeds infected) for Pre-basic and Basic material (alternative option: absence of symptoms in the crop and its immediate vicinity), a tolerance (0.5 to 2% of seeds infected – no consensus within the SEWG) for certified material, with alternative risk management measures.
Justification (if necessary):

Relative importance of field inspection and sample testing was discussed by the SEWG. The SEWG agreed that field inspection, for this pest, will only show the level of presence of the pest in the planted material and not in the final seed lot. The SEWG agreed with the definition of a threshold for seeds and not for field inspection. However the SEWG accepted to introduce one option based on the absence of symptoms observed in the crop and in its immediate vicinity (absence of inoculum) **9 - Risk management measures:**
Is there a need to change the Risk management measure:

Yes
Proposed Risk management measure:

Pre-basic and Basic material:
(a) Field inspection of a representative sample of the plants in the crop and in its immediate vicinity at an appropriate time at which no symptoms are seen; or
(b) On a representative sample of seed not more than 0.1% of seeds are infected; or
(c) Seed treatment with an approved fungicide known to be effective against Ustilago tritici;
Field inspection and inspection of pre and post control plots may be used as an additional risk management measure to avoid any build-up of infection levels during the chain of propagation.

Certified material:
(a) Field inspection of a representative sample of the plants in the crop and in its immediate vicinity at an appropriate time at which no symptoms are seen; or
(b) On a representative sample of seed not more than [0.5-2%] of seeds are infected; or
(c) Seed treatment with an approved fungicide known to be effective against Ustilago tritici;
Field inspection and inspection of pre and post control plots may be used as an additional risk management measure to avoid any build-up of infection levels during the chain of propagation.
Justification (if necessary):

Experts did not agree on the threshold for certified material. This point need to be re-discussed at EU level. **REFERENCES:**

* Ainsworth G G & Sampson K (1950) The British smut fungi (Ustilaginales). The Commonwealth Mycological Institute, 137 pp;
* CABI (1993) Distribution map for Ustilago segetum (Bull.) Roussel var.tritici (Pers.) Brun. Distribution Maps of Plant Diseases, Map 368. Available at: <https://www.cabdirect.org/cabdirect/FullTextPDF/2004/20046500368.pdf>;
* Compendium of Wheat Diseases and Pests (2010) Third edition. The American Phytopathological Society;
* EPPO (1997) Good plant protection practice PP 2/10 (1) Wheat. Bulletin OEPP/EPPO Bulletin 27, 311-338;
* Paveley ND, Rennie WJ, Reeves JC, Wray MW, Slawson DD, Clark WS, Cockerell V & Mitchell AG (1996) Cereal seed health and seed treatment strategies. HGCA Research Review 34, iv-131;
* Randhawa HS, Matheson F, Menzies JG & Fox S (2009) Molecular and virulence relationships among races of Ustilago tritici collected from durum and bread wheat. Canadian Journal of Plant Pathology 31, 220-231;
* Thomas PL & Menzies JG (1997) Cereal smuts in Manitoba and Saskatchewan, 1989-95. Canadian Journal of Plant Pathology 19, 161-165;

HOST PLANT N°2: Triticum durum (TRZDU) for the Cereals (including rice) sector.

Origin of the listing:

RNQP Questionnaire
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:

Ustilago tritici (U. segetum var. tritici [and U. nuda]) causes loose smut of wheat. Infection is seed-borne within the seed. The spores of Ustilago tritici germinate on the ovary of a flowering plant and hyphae penetrate the ovary wall and grow towards the developing scutellum and embryo and remain dormant in these tissues until the seed starts to germinate. Seed is therefore a pathway. Infected seeds give rise to systemically infected plants and diseased ears are visible directly after heading. The black spores are released between glumes and broken-down grains, and are blown by the wind to infect neighbouring healthy ears (EPPO, 1997). Seed certification and seed treatment are very effective in controlling the disease, which is now practically unknown in intensive cereal cultivation in Europe. If untreated farmer-saved seed is sown, however, these diseases reappear (EPPO, 1997).
The directive 66/402 has a requirement for the seed producing crop that Ustilaginaceae shall be at the lowest possible level, but no seed-testing requirements are given. There is not a seed test by embryo extraction described by ISTA.
Volunteer plants grown from spilt contaminated seed from the previous year could in theory act as a disease source but this appears to be very rare because no references to this could be found. It is concluded seed can be considered as a significant pathway for the pest. **5 - Economic impact:**
Are there documented reports of any economic impact on the host?

Yes
Justification:

Durum wheats (T. durum) are generally more susceptible than T. aestivum and in Canada the percentage of fields affected varied from 45% in 1994 to 78% in 1995, with the mean level of infected durum wheat plants per field ranging from <0.1 to 0.4%. (Thomas and Menzies, 1997). Loose smut disease of wheat in Canada, caused by Ustilago tritici, causes significant economic losses on both durum and bread wheats (Randhawa et al., 2009). In Morocco the pest was found in a survey on durum wheat but prevalence (% of contaminated fields) and severity varied from year to year (Ramdami & Ibriz, 2000).
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:

Yield losses are in proportion to the percentage of infected heads in the crop. Generally losses are low 1% but can be as high as 30%. Teliospores from infected ears can infect ovaries of health plants, re-establishing the disease in the next generation of seed produced. Infected seed are otherwise normal, visibly unaltered and fully germinable (Compendium of wheat diseases and pests,2010). Potential for the disease to multiply within a few years is great. **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:

Control through standards for field inspection and seed, use of less susceptible varieties, and mostly through systemic seed treatment fungicides (e.g. tebuconazole, triticonazole, prothioconazole). These fungicides are not allowable for organic farming (management through testing and field inspections). **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:

A tolerance (0.1% of seeds infected) for Pre-basic and Basic material (alternative option: absence of symptoms in the crop and its immediate vicinity), a tolerance (0.5 to 2% of seeds infected – no consensus within the SEWG) for certified material, with alternative risk management measures.
Justification (if necessary):

Relative importance of field inspection and sample testing was discussed by the SEWG. The SEWG agreed that field inspection, for this pest, will only show the level of presence of the pest in the planted material and not in the final seed lot. The SEWG agreed with the definition of a threshold for seeds and not for field inspection. However the SEWG accepted to introduce one option based on the absence of symptoms observed in the crop and in its immediate vicinity (absence of inoculum) **9 - Risk management measures:**
Is there a need to change the Risk management measure:

Yes
Proposed Risk management measure:

Pre-basic and Basic material:
(a) Field inspection of a representative sample of the plants in the crop and in its immediate vicinity at an appropriate time at which no symptoms are seen; or
(b) On a representative sample of seed not more than 0.1% of seeds are infected; or
(c) Seed treatment with an approved fungicide known to be effective against Ustilago tritici;
Field inspection and inspection of pre and post control plots may be used as an additional risk management measure to avoid any build-up of infection levels during the chain of propagation.

Certified material:
(a) Field inspection of a representative sample of the plants in the crop and in its immediate vicinity at an appropriate time at which no symptoms are seen; or
(b) On a representative sample of seed not more than [0.5-2%] of seeds are infected; or
(c) Seed treatment with an approved fungicide known to be effective against Ustilago tritici;
Field inspection and inspection of pre and post control plots may be used as an additional risk management measure to avoid any build-up of infection levels during the chain of propagation.
Justification (if necessary):

Experts did not agree on the threshold for certified material. This point need to be re-discussed at EU level. **REFERENCES:**

* Ainsworth G G & Sampson K (1950) The British smut fungi (Ustilaginales). The Commonwealth Mycological Institute, 137 pp;
* CABI (1993) Distribution map for Ustilago segetum (Bull.) Roussel var.tritici (Pers.) Brun. Distribution Maps of Plant Diseases, Map 368; available at <https://www.cabdirect.org/cabdirect/FullTextPDF/2004/20046500368.pdf>;
* EPPO (1997) Good plant protection practice PP 2/10 (1) Wheat. Bulletin OEPP/EPPO Bulletin 27, 311-338;
* Ramdani A & Ibriz H (2000) Survey of wheat diseases in Morocco during three consecutive seasons 1997, 1998 and 1999. Journal article : Options Méditerranéennes. Série A, Séminaires Méditerranéens 40, 407-411;
* Randhawa HS, Matheson F, Menzies JG & Fox S (2009) Molecular and virulence relationships among races of Ustilago tritici collected from durum and bread wheat. Canadian Journal of Plant Pathology 31, 220-231;
* Thomas PL & Menzies JG (1997) Cereal smuts in Manitoba and Saskatchewan, 1989-95. Canadian Journal of Plant Pathology 19, 161-165;

HOST PLANT N°3: Triticum spelta (TRZSP) for the Cereals (including rice) sector.

Origin of the listing:

RNQP Questionnaire
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:

No records of U.tritici (U. segetum var. tritici) [or U. nuda] could be found infecting Spelt wheat (T. spelta). Therefore it is considered not to be a host and therefore seed for planting is not a pathway. **CONCLUSION ON THE STATUS:**

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

Yes
Proposed Tolerance levels:

Not recommended for the RNQP status. **9 - Risk management measures:**
Is there a need to change the Risk management measure:

Yes
Proposed Risk management measure:

Not recommended for the RNQP status. **REFERENCES:**

* Ainsworth G G & Sampson K (1950) The British smut fungi (Ustilaginales). The Commonwealth Mycological Institute, 137 pp;