



**NAPPO**

North American Plant Protection Organization  
Organización Norteamericana de Protección a las Plantas  
**MEXICO - USA - CANADA**

## **NAPPO Regional Standard for Phytosanitary Measures (RSPM)**

**RSPM 36**

**Phytosanitary Guidelines for the Movement of Seed**

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## Review

NAPPO Standards for Phytosanitary Measures are subject to periodic review and amendment.

The next review date for this NAPPO Standard is 2018. A review of any NAPPO standard may be initiated at any time upon the request of a NAPPO member country.

## Endorsement

This Standard was approved by the North American Plant Protection Organization (NAPPO) Executive Committee on March 19, 2013 and is effective from this date.

Approved by:

  
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## Implementation

See the attached implementation plans for implementation dates in each NAPPO country.

## Amendment Record

Amendments to this standard will be dated and filed with the NAPPO Secretariat.

## Distribution

This standard is distributed by the NAPPO Secretariat, to the Industry Advisory Group and Sustaining Associate Members, the International Plant Protection Convention (IPCC) Secretariat, and to other Regional Plant Protection Organizations (RPPOs).

## **Introduction**

### **Scope**

This standard describes phytosanitary guidelines for the international movement of seed into, from and among NAPPO member countries and procedures to facilitate the re-exportation of this seed. This standard does not address the regulation of varietal type (including genetic characteristics) or quality grades and standards.

### **References**

ISPM 1. 2006. *Phytosanitary principles for the protection of plants and the application of phytosanitary measures in international trade*. Rome, IPPC, FAO.

ISPM 2. 2007. *Framework for pest risk analysis*. Rome, IPPC, FAO.

ISPM 5. (updated annually). *Glossary of phytosanitary terms*. Rome, IPPC, FAO.

ISPM 11. 2004. *Pest risk analysis for quarantine pests including analysis of environmental risks and living modified organisms*. Rome, IPPC, FAO.

ISPM 12. 2011. *Phytosanitary certificates*. Rome, IPPC, FAO.

ISPM 24. 2005. *Guidelines for the determination and recognition of equivalence of phytosanitary measures*. Rome, IPPC, FAO.

ISPM 31. 2008. *Methodologies for sampling consignments*. Rome, IPPC, FAO.

RSPM 5. (updated annually). *NAPPO glossary of phytosanitary terms*. Ottawa, NAPPO.

### **Definitions, Abbreviations and Acronyms**

Definitions of phytosanitary terms used in the present standard can be found in ISPM 5 and RSPM 5.

### **Outline of Requirements**

This standard outlines the general phytosanitary requirements for a NPPO of the country of origin to follow for moving seed internationally, including seed for re-export, into, from, and among NAPPO member countries. These general requirements include how to properly document country of origin, and guidelines for including additional official phytosanitary information on a phytosanitary certificate that will assist NPPOs in the issuance of phytosanitary certificates for re-export.

In addition, these general requirements address pest risk assessment and pest risk mitigation by including criteria for determining if seed is a pathway for the potential introduction of regulated pests, in particular, determining if pests are known to be seed borne or seed transmitted.

Seed certification, testing and diagnostic protocols for particular seed pests are recommended. This standard also provides guidelines for obscured, and restricted/prohibited seed. Technical appendices and an annex are included to identify specific recommended protocols for seed pests and phytosanitary treatment options for specific seed pests.

## **Background**

The international movement of seed is central to agricultural production in many, if not all, nations. Quality seed is the first step in the production of food, feed and fiber. Development and production of seed involve incorporation of new traits through selection and breeding programs, followed by seed increase programs to produce enough seed with the desired traits.

Breeding and increasing is conducted internationally so that researchers can access new genetics, new environments, new knowledge and accelerate the breeding or seed increase processes. Breeding and evaluation trials must occur in the intended area of release to determine whether new varieties are properly adapted to a range of environments and conditions.

Seed is often moved into and out of many countries, potentially exposing them to quarantine pests. It is in the interest of NPPOs and the seed industry to have mechanisms that ensure the safe movement of seeds in international trade in order to protect agriculture and the environment. For this reason, most countries have phytosanitary requirements on the movement of seed, though there is significant variation in the methods used for assessing the phytosanitary risk associated with seed, the pests of concern, phytosanitary import requirements, diagnostic and inspection methodologies, and acceptable phytosanitary risk mitigation measures.

The objective of this standard is to provide guidelines which will help:

- Prevent the entry and spread of regulated pests associated with seeds,
- Facilitate re-export of seeds from NAPPO countries,
- Promote the use of harmonized phytosanitary import requirements, testing/diagnostic protocols, and phytosanitary certification systems for seed.

## **1. General Requirements**

### **1.1 Pest risk analysis**

Pest risk analyses (PRAs) for seeds should be performed in accordance with ISPM 2: 2007 and ISPM 11: 2004. Phytosanitary measures should be applied based on results of PRAs.

Pests identified during the PRA process may be classified as regulated pests by specific countries, depending on their presence or absence in that country, their potential economic impact and the official control measures applied therein.

Pest risk analyses for seeds are complicated by the fact that many pests may not be transferred by the actual seed. A distinction should be made between seed borne pests which are those that can be found on the seed or within the seed coat but do not necessarily result in the transfer of the pest to the resulting plant, and seed transmitted pests, which are those that can be transferred from the seed into the resulting plant. During the PRA process, care should be taken to ensure that seed is actually a pathway for the introduction of any regulated pests for which phytosanitary measures are to be required. Before phytosanitary measures are implemented, it should be demonstrated through documented scientific observation that the regulated pest can be transferred from the seed under natural environmental conditions. Many studies have documented that transfer by seed of seed borne pests may occur under laboratory conditions but such transfer has never been observed under field conditions. Expert interpretation of scientific publications regarding seed as a pathway for pests is critical.

## 1.2 Phytosanitary measures for pest risk management

Phytosanitary measures for pest risk management should be used to prevent the entry and spread of regulated pests.

Following a pest risk analysis, a number of phytosanitary measures to mitigate pest risk exist for importing seeds into a NAPPO member country. Phytosanitary measures such as inspection, testing, pest free area, pest free place of production, and treatments may be applied or combined to obtain an appropriate level of phytosanitary protection.

Seed treatments include a variety of techniques that may involve but are not limited to: heat, pesticides and chemical disinfectants. Seed treatments are a management tool used to prevent or mitigate damage to a plant during early development from a variety of insects and diseases. Some seed treatments may have phytosanitary value sufficient to eliminate a particular pest from a particular seed type. In these cases, the NPPO may allow a proven treatment to be used as a phytosanitary measure in addition to or in place of growing season inspections or laboratory testing. Seed treatments, such as pesticide based treatments, may be regulated by agencies other than an NPPO and may not be available to some NAPPO member countries.

## 1.3 Equivalence of phytosanitary measures

Equivalence of phytosanitary measures is one of the basic principles contained in ISPM 1: 2006. The process for recognizing equivalence is defined in ISPM 24: 2005, as being "...the objective examination of alternative phytosanitary measures proposed to determine if they achieve the appropriate level of protection of an importing country as indicated by existing measures of that country."

Equivalence of phytosanitary measures is particularly important for the international movement of seed because many different phytosanitary measures are available that can have the same intended effect.

Determination of equivalence should be based on the specified pest risk and involves the exchange of information and evaluation between the NPPOs of the importing and exporting countries.

#### 1.4 Recommended phytosanitary requirements for seed

NPPOs often have similar phytosanitary requirements for seed of the same species. Minor variations in the wording of additional declarations (ADs), (e.g. required methods for field inspections, sampling, testing or treatments), may create obstacles to phytosanitary certification for multiple destinations.

To facilitate international trade, phytosanitary import requirements should be harmonized and equivalent phytosanitary measures recognized. The result would be a consistent level of protection when seed is moved internationally and bilateral agreements would be simplified.

#### 1.5 Documentation requirements

When a phytosanitary certificate is required by the NPPO of the importing country, it should be issued by the NPPO of the exporting country according to the requirements of the NPPO of the importing country and ISPM 12: 2011.

The NPPO of the importing country may also require an import permit prior to allowing importation of the commodity.

## 2. Specific Requirements

### 2.1 Re-export

Seeds may be exported and then re-exported several times before being planted. Re-exported seed is normally subject to import requirements of the country receiving the re-exported seed. The country receiving re-exported seed may also require assurances that the pest situation in any country in the trade chain is acceptable/appropriate before allowing that seed to enter. The NPPO of the re-exporting country should verify the import requirements of the NPPO of the next country of destination.

### 2.2 Communication of technical information between NPPOs to facilitate subsequent phytosanitary certification

NAPPO countries recognize that there are situations when a subsequent importing country will require phytosanitary measures which must be conducted in the country of origin (e.g. growing season inspection, soil sampling).

To help facilitate re-exports, this technical information may be transmitted to the country re-exporting the seed to ensure they are meeting the importing country phytosanitary requirements as well as their international obligation under ISPM 12: 2011.

Additional declarations (ADs) are sometimes required on phytosanitary certificates as a means of providing specific additional information on a consignment in relation to regulated pests. Additional official phytosanitary information attesting to freedom from additional pests which are not required by the first country of import may nonetheless be included on the original phytosanitary certificate to facilitate future re-export to other countries. This information should follow and be separated from ADs required by the first country of import in accordance with ISPM 12: 2011.

The NPPO of the country of re-export may issue a phytosanitary certificate for re-export, if the import requirements of the importing country are met. This will rely on a phytosanitary certificate issued by the NPPO of the country of origin with specific additional declarations or other phytosanitary information, to provide the assurance that the consignment conforms with the current phytosanitary requirements of the importing country. The re-export certificate also confirms that during storage in the country of re-export, the consignment has not been subjected to the risk of infestation or infection. If the importing country has requirements for additional pests that have not already been met by the country of origin, and the country of re-export can meet those requirements using an approved seed treatment or seed health test, then a phytosanitary certificate for re-export may be issued.

NPPOs should follow the guidelines in ISPM 12: 2011 for additional information to facilitate the exportation and the re-exportation of seeds.

### 2.3 Inspection and/or testing of obscure (pelletized, coated, or treated) seed

Obscure seed includes seed that is coated, pelletized or embedded in tape, mats or any other substrate that obscures visibility. Exporters should confer with the importing NPPO to determine if they have specific requirements for obscure seed.

### 2.4 Special considerations for the importation of small quantities of seed

Many companies and research entities have breeding and increase programs in several countries to evaluate seed adjustment to different climates, pest resistance as well as growing conditions and production systems. This necessitates the international movement of seed.

The phytosanitary risk associated with the international movement of small quantities of seed is generally regarded as lower than that for seed intended for commercial planting. Such seed is subject to specific phytosanitary measures which mitigate the risk of spreading pests.

The NPPO of the importing country may establish specific procedures for the importation of small quantities of seeds. Special consideration should be given when determining an appropriate size for sampling and testing small quantities of seed (according to ISPM 31: 2008).

## 2.5 Restricted or prohibited seed

The NPPO may allow the entry of seed which is usually restricted or prohibited if it has the legal authority to do so and when the seed is intended for research or specialized commercial purposes, under a permit with specified conditions.

Those conditions may establish requirements such as laboratory containment, post-entry quarantine, special entry, handling, storage, processing, record-keeping and disposal procedures as may be necessary to provide an appropriate level of phytosanitary protection for the importing country. The importer/exporter should confer with the importing country NPPO to determine if there are specific requirements to export/import a restricted or prohibited seed

## Annex and Appendices

This annex was adopted by the NAPPO Executive Committee on March 19, 2013. The annex is a prescriptive part of the standard.

### Annex 1: Pests (Pathogens) Considered to be Seed Borne (SB) or Seed Transmitted (ST) \*

Pest	Commodity	SB	ST	Remarks	References
<i>Clavibacter michiganensis</i> var <i>michiganensis</i> (CMM)	<i>Solanum lycopersicum</i> (tomato)		Yes		Dhavantari, BN, 1993. Seedborne infection in tomato bacterial canker. Proc. 9 <sup>th</sup> Annual Tomato Disease Workshop, pp. 33-36  Hadas, R, Kritzman, F, Gefen, T, and Manulus, S, 2005. Comparison of extraction procedures and determining detection threshold for <i>Clavibacter michiganensis</i> pv. <i>michiganensis</i> in tomato seeds. Plant Pathology 54(5): 643-649  Tsiantos, J, 1987. Transmission of <i>Corynebacterium michiganensis</i> pv. <i>michiganensis</i> by seeds. Phytopathology 119(2): 142-146
	<i>Capsicum</i> spp. (pepper)		Yes		Alvares, AM, 2006. Detection and risk assessment of invasive bacterial species on imported tomato seed. In: USDA Research, Education, and Economics Information System, Project HAW00964-1014S
<i>Pantoea Stewartii</i> (Stewart's Wilt)	<i>Zea mays</i> (maize)		Yes	Likelihood of seed transmission from good quality corn seed is virtually non-existent (Block et. al., 1999)	Block, CC, Hill, JH, and McGee, DC, 1999 Relationship between late season severity of Stewart's bacterial wilt and seed infection in maize. Plant Disease 83: 527-530
<i>Tilletia indica</i> Matri	<i>Triticum</i> spp. (wheat), x- <i>Triticosecale</i> (triticum) <i>Hordeum</i> spp. (barley) (Canada only) <i>Avena</i> spp. (oat) (Canada only) <i>Secale</i> spp. (Rye) (Canada only)		Yes		Bains, SS, and Dhaliwal, HS, 1989. Release of secondary sporidia of <i>Neovossica indica</i> from inoculated wheat spikes. Plant and Soil Vol. 15 (1): 83-87  Dhaliwal, HS, 1989. Multiplication of sporidia of <i>Tilletia indica</i> on soil and wheat leaves and spikes and incidence of Karnal bunt. Can. J. Botany 67(8): 2387-2390

\*Pest list is not inclusive, data collection underway for other pests

This appendix was adopted by the NAPPO Executive Committee on March 19, 2013. The appendix is for reference purposes only and is not a prescriptive part of the standard.

**Appendix 1: Recommended Seed Testing and Diagnostic Methods for Seed Pests** (list is not all inclusive)\*

PEST	COMMODITY	RECOMMENDED TEST/DIAGNOSTIC	REMARKS	REFERENCES
<i>Clavibacter michiganensis</i> pv <i>michiganensis</i> (CMM)	<i>Solanum lycopersicum</i> (tomato)	So4 ISHI-Veg (2001) method	Methods can be found on NAPPO or SHS website ( <a href="http://www.seedhealth.org">www.seedhealth.org</a> )	Method for the detection of <i>Clavibacter michiganensis</i> pv <i>michiganensis</i> on tomato seed, version 4, August 2011.  International Seed Federation <a href="http://www.worldseed.org/cms/medias/file/Tradelssues/PhytosanitaryMatters/seedhealthtesting">www.worldseed.org/cms/medias/file/Tradelssues/PhytosanitaryMatters/seedhealthtesting</a>
<i>Pantoea stewartii</i> (Stewart's wilt)	<i>Zea mays</i> (maize)	Elisa test	*	Lamka, GL, Hill, JH, McGee, DC, Braun, EJ. Development of an immunosorbent assay for seed borne <i>Erwinia stewartii</i> . <i>Phytopathology</i> 81: 839-846.
<i>Tilletia indica</i> Mitra (Karnal bunt)	<i>Triticum</i> spp. (wheat) Triticale (x-triticosecale), <i>Hordeum</i> spp. (barley) (Canada only) <i>Secale</i> spp. (rye) (Canada only) <i>Avena</i> spp. (oat) (Canada only)	Size selective sieve wash method (SSS) for teliospores Modified SSS method Direct examination of bunted kernels	Methods can be found on NAPPO website ( <a href="http://www.nappo.org">www.nappo.org</a> )	RSPM 13: Guidelines to establish, maintain, and verify Karnal bunt pest free areas in N. America.  RSPM 21: Harmonized procedures for morphologically distinguishing teliospores of Karnal bunt, ryegrass bunt, and rice bunt

\*Pest list is not inclusive, data collection underway for other pests.

This appendix was adopted by the NAPPO Executive Committee on March 19, 2013. The appendix is for reference purposes only and is not a prescriptive part of the standard.

## Appendix 2: Recommended Seed Treatments for Quarantine Pests\*

PEST	COMMODITY	TREATMENT	REMARKS	REFERENCES
<i>Clavibacter michiganensis</i> pv <i>michiganensis</i> (CMM)	<i>Solanum lycopersicum</i> (tomato) seed	Hot water 50 deg C/25 min	Achieves complete eradication; higher temps and/or longer times reduce germination	Miller, SA, y ML Ivey. 2005. Hot water and chlorine treatment of vegetable seeds to eradicate bacterial pathogens. The Ohio State University Extension HYG 3805-05.  Fatmi, M, NW Shaad, and HA Balkan, 1991. Seed treatments for eradicating <i>Clavibacter michiganensis</i> pv <i>michiganensis</i> from naturally infected tomato seeds. Plant Dis 75: 383-385.  Dhanvantari, BN, 1994. Further studies on seed treatments for Bacterial canker. Proceedings of 10th Annual Tomato Disease Workshop, 43-51.
		Hydrochloric acid	Use of HCL to treat pulp in seed extraction followed by drying seeds for 3 H achieved eradication BUT acid extraction followed by pulp in equal volume of 5% HCL for 10 min followed by washing did not entirely eliminate CMM from naturally infected tomato seed	Thyr, BD, RE Webb, CA Jaworski, TJ Radcliffe, 1973. Tomato bacterial canker: control by seed treatment.. Plant Disease Reporter 57: 974-977.  Pradhanang, PM y G Collier, 2009. How effective is HCL to control CMM in tomato seed? Acta Horticulture (Proc 2nd International Symposium on Tomato Diseases, Kuradara, Turkey, 8-12 October, 2007.
		0.05% o-phenylphenol	Treat pulp with pectinase/HCL vs fermentation demonstrated to be effective in disinfecting seeds	Dhanvantari, BN 1989. Efficacy of seed extraction methods and seed treatments on control of bacterial canker. Can. J. Plant Path 11: 401-408.  Dhanvantari, BN y RJ Brown. 1993. Improved seed treatments for control of bacterial canker. Can. J. Plant Path 15:201-205.

PEST	COMMODITY	TREATMENT	REMARKS	REFERENCES
		Calcium hypochlorite	0.5%w/v does not achieve complete eradication	Dhanvantari, BN, 1989. Efficacy of seed extraction methods and seed treatments on control of bacterial canker. Can. J. Plant Path.
<i>Pantoea stewartii</i>	<i>Zea mays</i> (maize)	None for seed	Incidence of seed transmission is almost non-existent if the flea beetle vector is properly managed with available treatments such as imidachlorpid and thiamethoxam	Kuhar, TP, Stivers-Young, LJ, Hoffman, MP, y Taylor, AG, 2002. Control of corn flea beetle and Stewart's wilt in sweet corn with imidachlorpid and thiamethoxam treatments. Crop Protection 21: 25-31.  Pataky, JK, Michener, PM, Freeman, ND, Weinzierl, RA y Teyker, RH. 2000. Control of Stewart's wilt in sweet corn with seed treatment insecticides. Plant Disease 84: 1104-1108.  Munkvold, GP, McGee, DC, y Iles, A. 1996. Effects of imidachlorpid treatment of corn on foliar and <i>Erwinia stewartii</i> transmission by the corn flea beetle. Plant Disease 80: 747-749.
<i>Tilletia indica</i> Matri (Karnal bunt)	<i>Triticum</i> spp (wheat) Triticale (x-triticosecale) <i>Hordeum</i> spp. (barley) (Canada only) <i>Avena</i> spp. (oat) (Canada only) <i>Secale</i> spp. Rye (Canada only)	None for seed	Positive detection of bunted kernels will require disinfection (USA). Treatments are approved only for the equipment used to manage the seeds (seed viability will be affected)	USDA Port of Entry Treatment Manual: Domestic Treatments (EE. UU.).

\*Pest list is not inclusive, data collection underway for other pests.