

Chrysanthemum White Rust Eradication Protocol for Nurseries Containing Plants Infected with *Puccinia horiana* Henn.



Photo: Daniel J. Kepich, USDA-APHIS-PPQ, Bugwood.org

**United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine**

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I. Introduction

Puccinia horiana Henn. is the causal agent of chrysanthemum white rust (CWR), an obligatory parasite which only grows and reproduces on select species of 3 genera in the plant family Asteraceae. In countries where it is known to occur, CWR is a serious disease in nurseries. It may cause a complete loss of commercial chrysanthemum crops. The disease is indigenous to Japan, where it was first noted in 1895. It remained confined to Japan and China until 1963. Since 1964, *P. horiana* has spread rapidly on infected shipments of cut flowers and has become established in the Far East, Europe, Africa, Australia, Central America, and South America.

Detections of CWR on cut flowers imported to the United States from various countries where the disease is known to occur initiated APHIS' decision to place administrative restrictions on cut flowers hosts of CWR. Plants for propagation, as well as cut flowers are considered primary pathways for the introduction of CWR. Due to the risk of introducing CWR from countries where the disease is known to occur, APHIS regulates the entry of CWR host plants and cut flowers.

CWR is not established in the United States but has been introduced, detected, and eradicated in a number of locations. If CWR were to become established within the United States, it would impact the commercial horticulture and florist industries. Refer to Appendix II for management practices for growing CWR-free host plants.

II. Intended Use

CWR detections catalyzed the need for a standard protocol for use by State and Federal regulators to respond to new finds of CWR in nurseries in the United States. To ensure that there is consistency in responding to new infections of CWR, this eradication protocol describes the official activities performed within affected nurseries by USDA-APHIS in cooperation with State and County agriculture regulatory officials.

The goal of this protocol is to ensure that all infections are effectively and consistently addressed and eradicated. Early detection and reporting of potential CWR infections are critical to ensure that spread is contained and eradicated. The strategies employed in this protocol are similar to those utilized in Canada, the European Union, and other areas where CWR is under eradication.

III. Definitions

Containment Facility: A structure whose purpose is to prevent escape of material held within it, into the environment.

Emergency Action Notification (EAN): A Federal document stating notice under which emergency action will be taken to eliminate or mitigate pest risk; stipulations are binding until notice is rescinded by issuing authorities. Penalties may apply for violations of the stipulations of the EAN. An EAN is issued under Federal authorities.

Exposed Plants: Host plants located within a 1-meter radius of infected plants, or as

deemed appropriate after an assessment of the infected area and surrounding plants.

Free From: Of a consignment, field or place of production, without pests (or a specific pest) in numbers or quantities that can be detected by the application of phytosanitary procedures. (FAO,1996).

Hold Order: A signed official document or verbal order given by State plant regulatory officials, requiring that plant material suspected to be infected with CWR be held on site. Additional stipulation(s) may apply to Hold Order. This type of order is usually used while awaiting results of a suspect CWR sample and/or the issuance of an EAN.

Host Free: A place of production such as single plot, single green house or entire nursery without host material, including all host plants, leaves, roots, stems, flowers, host tissue debris, and sprouts of host plants.

Infected Plants: Plants infected with *Puccinia horiana* Henn.

Nursery: Any location where CWR host plants and flowers are grown, propagated, stored, or sold.

Nursery/Facility Quarantine: Official confinement of plants or plant products subject to phytosanitary regulations for observation and research or for farther inspection, testing and/or treatment (FAO, 1996). During this period, the movement of host plants is regulated to eliminate or contain the movement of the pest. The quarantine period begins with the confirmation of CWR and continues until inspection, sampling, and testing reveals no further CWR within the regulated block or area. The quarantine may be communicated by an official Hold Order or EAN. A facility is not released from quarantine until all orders have been satisfied and officially rescinded.

Parallel Regulation: A parallel regulation is one which is imposed by a State or local plant regulatory authority and is substantially the same as a Federal regulation.

Regulated Area: An area, County, State, or portion of a State, in which nurseries produce and move CWR host plants, plant parts, or cut flowers of host plants that have been placed under specific regulations governing movement of said plants or plant parts due to CWR.

Suspected Infected Plants: Plants with visible symptoms suspected to be caused by *P. horiana* infection but not yet confirmed positive for CWR by APHIS or State officials.

IV. Trigger Events for Use of Protocol

This protocol should be implemented by APHIS-PPQ and/or State Plant Regulatory cooperators when the presence of CWR has been detected.

V. Regulatory Authority

CWR is not established in the United States, and is a pest of quarantine significance requiring appropriate regulatory measures when found [Title 7, Code of Federal Regulations (CFR) 319.37-2 (a), 319.37-5(c)]. The regulations in 7 CFR part 319

prohibit or restrict the importation of plants, plant parts, and related materials to prevent the introduction of plant pests and noxious weeds into the United States.

The regulations in “Subpart–Plants for Planting” §§ 319.37 through 319.37-14 restrict, among other things, the importation of living plants, plant parts, and seeds for propagation.

Conditions governing the importation of cut flowers into the United States are contained in “Subpart--Cut Flowers” (§§ 319.74-1 through 319.74-4). Section 319.37-2 of the plants for planting regulations prohibits the importation of CWR-susceptible plant species from countries where the disease is established.

Introduction of CWR from abroad through imported host material is regulated under 319.37-5(c) which states:

“Any restricted article (except seeds) of *Chrysanthemum* spp. (chrysanthemum, includes *Dendranthema* spp.), *Leucanthemella serotina*, or *Nipponanthemum nipponicum*, from any foreign place except Andorra, Argentina, Australia, Belarus, Bosnia and Herzegovina, Brazil, Brunei, Canary Islands, Chile, China, Colombia, Croatia, Ecuador, Iceland, Japan, Korea, Liechtenstein, Macedonia, Malaysia, Mexico, Moldova, Monaco, New Zealand, Norway, Peru, Republic of South Africa, Russia, San Marino, Switzerland, Taiwan, Thailand, Tunisia, Ukraine, Uruguay, Venezuela, Yugoslavia; the European Union (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom); and all countries, territories, and possessions of countries located in part or entirely between 90° and 180° East longitude shall, at the time of arrival at the port of first arrival in United States, be accompanied by a phytosanitary certificate of inspection. The phytosanitary certificate of inspection must contain a declaration that such article was grown in a greenhouse nursery and found by the plant protection service of the country in which grown to be free from white rust of chrysanthemum (caused by the rust fungus *Puccinia horiana* P. Henn.) based on visual examination of the parent stock, the articles for importation, and the greenhouse nursery in which the articles for importation and the parent stock were grown, once a month for 4 consecutive months immediately prior to importation”.

Under the Plant Protection Act (7 U.S.C. 7701 et seq), the United States Secretary of Agriculture is authorized to take actions to eradicate pests that are not established in the United States and are injurious to United States agriculture. Both Federal and State/County governments may cooperate in the eradication efforts.

VI. Confirmation/Communication/Notification

When a suspected CWR detection is located, the inspector should immediately notify the State Plant Health Director (SPHD) and the State Regulatory Official (SPRO) of the State in which the suspected CWR detection is located.

Suspect samples must be confirmed by the USDA-APHIS-PPQ National Mycologist.

Send samples to:

Dr. John M. McKemy and Dr. Megan Romberg
National Mycologist/Plant Pathologist

USDA-APHIS-PPQ PHP RIPPS NIS
Rm. 324, Bldg. 010A, BARC-West
10300 Baltimore Avenue
Beltsville, MD 20705

Phone: (301) 313-9390 or (301) 313-9391

Important notes:

1. A completed "PPQ Form 391-Specimen for Determination" must be submitted with the suspect sample. Link to form:
http://www.aphis.usda.gov/library/forms/pdf/PPQ_Form_391.pdf
2. When a suspect positive is sent to the National Mycologist for confirmation, the USDA-APHIS-PPQ Domestic Diagnostics Coordinator (Dr. Stephen Bullington, Riverdale, MD) *must* be notified concurrent to shipment of the suspect sample. Fax a copy of the PPQ Form 391 to 301-734-3621.

USDA-APHIS-PPQ Emergency and Domestic Programs personnel are responsible for communicating presumptive and confirmatory CWR identifications to internal and external parties. EDP staff receives the identification information from NIS staff and results will be communicated via the protocol shown in Appendix V. This official communication protocol is intended to assure timely transmission of pest identification notifications, either by e-mail or telephone, to internal and external parties who coordinate actions to address this information.

VII. Annual Nursery Survey

All nurseries handling CWR host material should be periodically surveyed for CWR. In areas where CWR has been known to occur, two surveys should be conducted per year by trained personnel during periods of symptomatic expression. Survey results must be added to a national database. Historically, the National Agricultural Pest Information System (NAPIS) database has been used. Plans are underway to transition to the Integrated Plant Health Information System (IPHIS).

VIII. Nursery with Infected Plants

If CWR is detected in a nursery, collection of the information outlined on the CWR regulatory incidence form (Appendix VII) will be useful for trace-back or trace-forward

investigations.

A. Emergency Action Notices

A Federal Emergency Action Notification (EAN) will be issued to the infected nursery. States may issue a Hold Notice. The EAN will remain in place until the nursery has satisfactorily completed the required sanitation measures. Prior to issuance of any notice, the inspector will evaluate the exposure level of all areas of the nursery and determine areas for inclusion/exclusion under the EAN. This evaluation will clarify the status of the areas at-risk that will be regulated, and determine the required sanitation measures for plants, cut flowers, and other products. Many nurseries have numerous growing areas; some are divided by walls; some are under the same roof but divided by space; some are divided by long distance within the grounds of the nursery. These and other factors may be included in the evaluation of the potential spread and extent of the disease.

B. Emergency Actions

1. The Emergency Action Notification (EAN) will define treatments and required sanitation measures. Host plants within the nursery, for sale or under propagation, will be inspected. Plants placed under EAN may not be removed from the nursery, from any holding area within the nursery, or moved within the nursery until they are found to be (1) free of *P. horiana*, or (2) until the nursery is officially declared free-from *P. horiana* and removed from quarantine status, and/or (3) unless specifically approved by a State or Federal Regulatory Official.
2. Samples taken from Suspected Infected must be submitted to State or Federal identification authorities. The final confirmation must be made by the USDA-APHIS-PPQ National Mycologist.
3. Trace forward Investigations will be initiated. Identify shipments made prior to the discovery of *P. horiana*. Notify your PPQ Field Operations Office of all interstate shipments made within the 15 days prior to the first positive detection of *P. horiana* at the nursery. This includes all hosts plants in the nursery, not just those found infected.
4. Trace back investigations will be conducted to determine the origin of all infected hosts. Trace back the plants to point of origin (propagator). Trace back nurseries should be inspected and results provided to the relevant regulatory officials. Determine all sources of other CWR host plants that have been introduced into the facility within the past eight weeks. This may include propagative and non-propagative material, including potted plants, cut flowers for floral arrangements, cuttings, and vendor samples. Include such information in trace backs as determined necessary.
5. Record the location of any cull piles that may be contaminated with infected plant material. Check all cull piles for symptomatic plants and

plant material and sample if detected. Determine how the nursery disposes of culled plant material.

6. Determine if equipment used at this nursery is shared with other facilities or field areas. Are equipment sanitation procedures in place at this nursery?

7. Determine if fungicides are used on host plants at the nursery. If fungicides were used, then record the date, material, amount and application rate.

C. Eradication

All host plants within a nursery with infected plants will not be allowed to be moved for sale or to any other nursery until the infected nursery has been declared CWR-free. Within a nursery, all the infected plants showing symptoms as well as plants located within 1-meter radius of the infected plants shall be destroyed. All remaining host plants must receive three applications of myclobutanil or other fungicide with curative properties at 5-7 day (preferably 5-day) intervals. An inspection of all plants must be conducted between each application. Any infected plants as well as plants located within a 1-meter radius must be destroyed. The final inspection must be performed 5-7 days after the third fungicidal application. If no signs of CWR are detected in the final inspection, plants will be released and the facility will be declared CWR-free.

If CWR infections are detected during the final inspection, regulatory officials will assess the situation and determine remedial measures, including destruction of all CWR host material as well as instituting an 8-week host-free period at the nursery. An alternative to the 8 week host-free period is steam treatment of the nursery beds.

All costs associated with treatments and/or destruction shall be the responsibility of the owners of the infected CWR nursery. The treatments and destruction of host material will be monitored by the regulatory officials or their designee.

Sanitary measures include but are not limited to:

- Bagging of plant debris in the nursery and removal using approved disposal methods;
- Proper decontamination of tools and personnel moving between blocks, growing areas, greenhouses, and growing units, depending upon structure of the facility and other risk factors.

Destruction methods for Infested Plants include: (refer to Appendix VIII)

- Incineration
- Burial

- Steam sterilization
- Composting as outlined in the California codified Integrated Waste Management Board regulations.

D. Cut Flowers

Nurseries growing plants for shipment as cut flowers will follow treatments and inspections for eradications (see VIII C above). However, after each fungicidal treatment, regulatory officials will assess if cut flowers can be harvested and sold. If the inspector determines that cut flowers can be harvested, the following conditions will apply:

1. 100% of the ready to harvest cut flowers will be inspected by regulatory officials before the flowers are cut.
2. Ready to harvest cut flowers with symptoms of CWR and any plants within 1 meter of infected plants shall be destroyed.
3. Remaining cut flowers without CWR symptoms may be harvested and sold until the next fungicidal treatment and assessment.

The cut flowers may not be used for propagative purposes. It is recommended that cut flowers do not go to retail establishments that have a floral shop attached to a facility where CWR host plants are produced. A buyer who has a floral shop connected to a host plant production facility risks infecting their host crop(s). If symptomatic plants are still found, after three applications of myclobutanil on the remaining plants, the inspector may also require appropriate mitigation measures such as an 8 week host-free period or steam sterilization (see section VIII C above).

E. Alternative Treatments

In lieu of the treatments and inspections outlined in VIII C and VIII D above, a nursery may voluntarily destroy all CWR hosts plants and apply a steam treatment to the nursery. Alternatively, an 8 week host-free period at the nursery's cost or steam sterilization of nursery beds using the steam jet method may be employed.

Steam Jet Sterilization of Nursery Soil

Soil must be steamed at 70°C for a minimum 30 minutes and to a depth of 15 centimeters. Temperature must be measured at points farthest from the source of steam. Steam at a temperature of 70°C will destroy most pathogenic microorganisms, including CWR spores or their common vegetative forms, either in the growing or vegetative state. Moist, high temperature soil conditions reduce the duration of teliospore survival, so soil in plots or beds should be kept well watered during the pre-planting interval to aid in the destruction of any residual inoculum. The beds must be inspected by a State and/or USDA-APHIS official to ensure efficacy of the steam treatment (*i.e.*, all green plant material has been destroyed).

Repeat steam treatment after 48 hours to destroy any newly developed, germinating or remaining fungal spores.

F. Recommendations for Equipment and Personnel (Inspectors & Employees) within Nurseries with Infected Plants

1. Access to infected areas and hold areas should be limited, as much as possible, to officials and employees. Everyone entering and leaving the nursery needs to scrape off loose soil from their shoes. Those working with, or in contact with suspected infected material (including plants), need to wash their hands using soap or an approved disinfectant.
2. On the day that CWR is detected and/or inspections or treatments are made, personnel should not enter other parts of the nursery after entering the infected area.
3. Inspectors and nursery workers should not visit other nurseries in potentially contaminated work clothing and footwear. The nursery must take precautions to prevent the movement of infected plants, contaminated soil, or debris with visitors and workers.

G. Releasing the Nursery

Nurseries and their plants may be released from regulatory control by USDA-APHIS or another designated official after this protocol has been followed, and *P. horiana* infected plants are not found, all stipulations of EAN have been satisfied, and the EAN has been rescinded by regulatory officials.

IX. Environmental Survey

It is recommended that a modified 400 meter delimiting survey be conducted around each infected nursery. This survey can be conducted by walking through and carefully examining the survey area. The objective is to locate any obvious planting of CWR host plants in the area and to inspect these plants for symptoms of CWR. Normally this survey should take no longer than 1 day unless unforeseen difficulties arise. If the same nursery is found to be infected in 2 consecutive years, a more thorough survey of up to 800 meters should be conducted.

X. References

FAO, 1996. Secretariat of the International Plant Protection Convention, Food and Agriculture Organization of the United Nations, Rome. Glossary of phytosanitary terms. <http://www.fao.org/docrep/W3587E/w3587e01.htm> (*last accessed*, May 11, 2012).

Plant Protection Act (7 U.S.C. 7701 *et seq*) 2000. The Plant Protection Act (PPA) is a US statute relating to plant pests and noxious weeds that became law in 2000. [The PPA is codified in The Code of Laws of the United States of America (variously

abbreviated to Code of Laws of the United States, United States Code, U.S. Code, or U.S.C.) in Title 7, Chapter 104, Section 7701 *et seq.*

United States of America. Code of Federal Regulations (CFR). Title 7- Agriculture. Subtitle B-Regulations of the Department of Agriculture. Chapter III-Animal and Plant Health Inspection Service, Department of Agriculture. Part 319-Foreign Quarantine Notices. Subpart-Plants for Planting. §319.37.

United States of America. Code of Federal Regulations (CFR). Title 7- Agriculture. Subtitle B-Regulations of the Department of Agriculture. Chapter III-Animal and Plant Health Inspection Service, Department of Agriculture. Part 319-Foreign Quarantine Notices. Subpart-Cut Flowers. §319.74.

Appendix I: Cut Flower and Plant Hosts of Chrysanthemum White Rust

Cut Flower and Plant Hosts of Chrysanthemum White Rust.		
Accepted Scientific Name	Synonym(s)	Common Name
<i>Chrysanthemum arcticum</i> L. ¹	<i>Arctanthemum arcticum</i> (L.) Tzvelev <i>Dendranthema arcticum</i> (L.) Tzvelev	Arctic chrysanthemum Arctic daisy
<i>Chrysanthemum boreale</i> (Makino) Makino ^{1,2}	<i>Chrysanthemum indicum</i> L. var. <i>boreale</i> Makino <i>Dendranthema boreale</i> (Makino) Ling ex Kitam.	
<i>Chrysanthemum indicum</i> L. ^{1,2,3}	<i>Dendranthema indicum</i> (L.) Des Moul.	
<i>Chrysanthemum japonense</i> Nakai ^{1,2}	<i>Dendranthema japonense</i> (Nakai) Kitam. <i>Dendranthema occidentali-japonense</i> Kitam.	Nojigiku
<i>Chrysanthemum japonicum</i> Makino ^{1,2}	<i>Chrysanthemum makinoi</i> Matsum. and Nakai <i>Dendranthema japonicum</i> (Makino) Kitam.	Ryuno-giku
<i>Chrysanthemum ×morifolium</i> Ramat. ^{2,4}	<i>Anthemis grandiflorum</i> Ramat. <i>Anthemis stipulacea</i> Moench <i>Chrysanthemum sinense</i> Sabine ex Sweet <i>Chrysanthemum stipulaceum</i> (Moench) W. Wight <i>Dendranthema × grandiflorum</i> (Ramat.) Kitam. <i>Dendranthema × morifolium</i> (Ramat.) Tzvelev <i>Matricaria morifolia</i> Ramat.	Florist's chrysanthemum Mum
<i>Chrysanthemum pacificum</i> Nakai ¹	<i>Ajania pacifica</i> (Nakai) K. Bremer & Humphries <i>Dendranthema pacificum</i> (Nakai) Kitam.	Iso-giku
<i>Chrysanthemum shiwogiku</i> Kitam ¹	<i>Ajania shiwogiku</i> (Kitam.) K. Bremer & Humphries <i>Dendranthema shiwogiku</i> (Kitam.) Kitam.	Shio-giku
<i>Chrysanthemum yoshinaganthum</i> Makino ex Kitam ²	<i>Dendranthema yoshinaganthum</i> (Makino ex Kitam.) Kitam.	
<i>Chrysanthemum zawadskii</i> Herbich subsp. <i>yezoense</i> (Maek.) Y. N. Lee ¹	<i>Chrysanthemum arcticum</i> subsp. <i>maekawanum</i> Kitam <i>Chrysanthemum arcticum</i> var. <i>yezoense</i> Maek. [basionym] <i>Chrysanthemum yezoense</i> Maek. [basionym], <i>Dendranthema yezoense</i> (F. Maek.) D. J. N. Hind, <i>Leucanthemum yezoense</i> (Maek.) Å. Löve & D. Löve	
<i>Chrysanthemum zawadskii</i> Herbich subsp. <i>zawadskii</i> ¹	<i>Chrysanthemum sibiricum</i> Turcz. ex DC., nom. inval. <i>Dendranthema zawadskii</i> (Herbich) Tzvelev <i>Dendranthema zawadskii</i> var. <i>zawadskii</i>	
<i>Leucanthemella serotina</i> (L.) Tzvelev ³	<i>Chrysanthemum serotinum</i> L. <i>Chrysanthemum uliginosum</i> (Waldst. & Kit. ex Willd.) Pers. <i>Pyrethrum uliginosum</i> (Waldst. & Kit. ex Willd.)	
<i>Nipponanthemum nipponicum</i> (Franch. ex Maxim.) Kitam ²	<i>Chrysanthemum nipponicum</i> (Franch. ex Maxim.) Matsum. <i>Leucanthemum nipponicum</i> Franch. ex Maxim.	Nippon daisy Nippon-chrysanthemum

¹ Water, J.K. Chrysanthemum White Rust. EPPO Bulletin, No. 11, pp. 239-242 (1981).
² Hiratsuka, N. Three species of Chrysanthemum rust in Japan and its neighboring districts. Sydowia, Series 2, Supplement 1, pp. 34-44 (1957).
³ Dickens, J.K. kl. The resistance of various cultivars and species of chrysanthemum to white rust (*Puccinia horiana* Henn.). Plant Pathol, No. 17, pp. 19-22 (1968).
⁴ Yamada, S. Experiments on the epidemiology and control of chrysanthemum white rust caused by *Puccinia horiana*. Annals of the Phytopathological Society of Japan, No. 20, pp. 148-154 (1956).

Appendix II: Management Practices for Growing CWR-free Host Plants

These Management Practices may help prevent the disease caused by *P. horiana*. Any nursery may incorporate these practices into their Standard Operating Procedures.

A. Exclusion

1. Maintain production areas at less than optimum humidity for growth of CWR and reduce other cultural practices conducive to optimal CWR-growth conditions.
2. Require specific sanitation protocol for personnel movement between greenhouses and growing areas. Enforce one-way movement of personnel from least restrictive to most restrictive areas of sanitation.
3. Actively train personnel for identification of CWR symptoms and proper practices to guard against the spread of the disease.
4. No over-story or under-story of known hosts should be grown on nursery grounds unless there is regular monitoring of those hosts.
5. Confirm that host stock is propagated from materials originating on site or is received from shipping nurseries which are free from CWR.
6. All incoming host plants (buy-ins, transfers), regardless of origin, should be visually inspected for symptoms of CWR by trained nursery personnel prior to being incorporated into the production area.
7. Incoming host plants, propagative material, cuttings should be stored away from the main production area.
8. Incoming cuttings should be treated with a maintenance fungicide before planting.
9. The mother stock should be located away from the main production area, *i.e.*, in a different structure with no connected air flow.

B. Prevention

1. Use an effective fungicide program for the control and prevention of CWR on susceptible host plants.
2. Off load incoming shipments to an area that can be cleaned of the leafy debris. Sweep debris from the receiving pad and the delivery truck; collect debris and bag for disposal.
3. Avoid product returns of nursery stock from a receiver in a quarantined area. If unavoidable, contact your State Regulatory Official (if in California, your County Agricultural Commissioner) prior to accepting the nursery stock return. One-way

movement of plant material through nurseries regardless of known CWR-status may be required. Otherwise, have designated quarantine zone in the nursery that prevents returns from co-mingling with “clean” stock.

4. If the infestations have been detected in a place of production, the fungicidal dip treatment of chrysanthemum cuttings before planting should be considered.

C. Monitoring

1. Nursery personnel should attend one or more CWR workshops available through State Agriculture Departments and Universities in your state.
2. All host buy-ins should be maintained separately from other hosts plants and periodically inspected for symptoms of the disease over the course of a growing season.
3. Monitor host plants in surrounding area for symptoms of *P. horiana*.
4. Identify sources of disease recognition fact sheets, and/or develop and distribute disease recognition fact sheets on host plants to educate all field nursery personnel.
5. Record Keeping: Maintain accurate shipping documentation identifying product, amount, date and origin or receiver for the purpose of identifying trace backs and trace forwards.
6. If the disease is found in the area surrounding a nursery, immediately contact Department of Agriculture in your state or your County Agriculture Commissioner.

Appendix III: Prohibited Articles

Prohibited Articles under USDA-APHIS-PPQ regulations for Chrysanthemum White Rust		
Prohibited article (includes seeds only if specifically mentioned)	Foreign places from which prohibited	Plant pests existing in the places named and capable of being transported with the prohibited article
<p><i>Chrysanthemum</i> spp. (Chrysanthemum)</p> <p><i>Dendranthema</i> spp. (Chrysanthemum)</p> <p><i>Leucanthemella serotina</i> (Giant daisy, High daisy)</p> <p><i>Nipponanthemum nipponicum</i> (Nippon daisy, Nippon-chrysanthemum)</p>	<p>Andorra, Argentina, Australia, Belarus, Bosnia and Herzegovina, Brazil, Brunei, Canary Islands, Chile, China, Colombia, Croatia, Ecuador, Iceland, Japan, Korea, Liechtenstein, Macedonia, Malaysia, Mexico, Moldova, Monaco, New Zealand, Norway, Peru, Republic of South Africa, Russia, San Marino, Switzerland, Taiwan, Thailand, Tunisia, Ukraine, Uruguay, Venezuela, Yugoslavia; the European Union (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and United Kingdom); and all countries, territories, and possessions of countries located in part or entirely between 90° and 180° East longitude.</p>	<p><i>Puccinia horiana</i> P. Henn. (white rust of chrysanthemum).</p>

Appendix IV: List of Chrysanthemum White Rust Contacts

Current USDA-APHIS-PPQ Chrysanthemum White Rust Program Contacts			
National Policy Manager	Lynn Evans-Goldner	301-851-2286	Lynn.Evans-Goldner@aphis.usda.gov
National Operations Manager	Philip Mason	919-855-7318	Phillip.A.Mason@aphis.usda.gov
S&T	Russ Bulluck	919-855-7646	Russ.bulluck@aphis.usda.gov
Diagnostic Authority	Megan Romberg	301-313-9390	Megan.Romberg@aphis.usda.gov
Diagnostic Authority	John McKemy	301-313-9391	John.McKemy@aphis.usda.gov
Domestic Diagnostic Coordinator	Stephen Bullington	301-851-2115	Stephen.Bullington@aphis.usda.gov

Appendix V: Communication Protocol

Plant Pest Identification Notifications to State Departments of Agriculture March 21, 2008 Amended December 4, 2014*

Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Plant Health Programs

Introduction

Timely notification of new plant pest[†], disease, or noxious weed identifications is critical for effective response planning, execution, and communications. Plant Protection and Quarantine's (PPQ) Plant Health Programs (PHP), Pest Detection & Emergency Programs (PDEP) staff is responsible for communicating presumptive and confirmatory pest identifications to internal and external parties. PDEP staff receives its pest identification information from the PPQ, PHP, National Identification Services (NIS) staff. This communication protocol applies to samples that were forwarded to NIS- recognized authorities because they were considered potentially actionable suspect samples (PASS) by the submitters. The communication protocol is intended to assure timely transmission of pest identification notifications, either by e-mail or telephone, to internal and external parties who coordinate actions that may include a possible response.

Notification Considerations

Notifications occur upon a *positive confirmation, negative determination, or inconclusive result* of pest identification. While NIS may use other officially recognized laboratory or expert identifiers to identify a pest, NIS will always be the direct link to PDEP for pest identification results; external labs or experts are not to communicate results directly to any entity except NIS.

The urgency and circulation of notifications may vary widely based upon the plant pest's regulatory significance and history. Accordingly, there are two primary questions to be asked to determine the circulation list for notifications within PPQ and to outside cooperators: (1) is this a new or significant pest detection, and (2) if not, is there a management/eradication program already underway in the United States?

* PPQ Diagnostic Notification to States v7.pdf; Last edit: December 29, 2014.

† A pest is defined in ISPM 5: Glossary of Phytosanitary Terms, as "Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products [FAO, 1990; revised FAO, 1995; IPPC, 1997].

Limiting Conditions

When conditions allow, PDEP will notify parties of identification confirmations within the hour if possible, and within 24 hours as a standard. PPQ wishes to strike a balance between notifying parties of all suspect samples (including potentially thousands of samples pending analysis by non-PPQ laboratories) to which it has been made aware, and notifying parties only of the most significant findings when confirmations are completed.

It is important to clarify that there will be situations where there is not enough information about a suspect plant pest detection to confirm the identity of the pest. Making this determination may take some time, based upon the biology of a pest and the availability of relevant scientific expertise and literature. For example, many plant pathogens can only be identified through molecular techniques. It also can be difficult to identify some insect pests in larval or pupal life stages. There may be situations where so little is known about an unidentified plant pest that new diagnostic protocols must be developed and validated to accomplish the identification.

While we believe that this notification protocol will broadly serve to ensure timely and effective notification of identification confirmations, it may not be applicable in all circumstances. In the event that they are not applicable, the protocol can be used as a basis for determining how best to communicate internally and externally under the given circumstances.

Notification Protocol

For both new pests and established program pests, the guide on the following pages identifies standardized subject lines and the individuals and points-of-contact who must receive notification from PDEP.

Notifications of pest identifications and diagnostic results are sent from NIS to the PHP Board of Directors, the Phytosanitary Issues Management (PIM) Directors, and the PDEP staff who will forward the notifications. Notifications are forwarded as in the tables that follow. *It is the responsibility of those receiving the notifications to further forward the message to those in their respective organization or agency that have a need to know, as well as to the submitting laboratory, identifier, or originator of the sample(s).*

Certain pests, when first detected, may have potentially significant impacts on trade. Accordingly, final positive confirmation may be handled at very high administrative levels. Communication under these circumstances is held at extremely high confidence and further communication may not be allowed unless the recipient of the message is authorized to do so.

Please note that the information contained in these notifications is confidential, for your information only, and should not be shared with or forwarded to those outside of the affected state.

If the message is to communicate the status of a pest that is:	Then send the message:	And title the subject as:
<p>Not new to the U.S.</p>	<p>To:</p> <ul style="list-style-type: none"> ▪ National Policy Manager, PM ▪ National Operations Manager, FO ▪ SPHD of affected state ▪ SPRO of affected state <p>CC:</p> <ul style="list-style-type: none"> ▪ Executive Director, S&T ▪ Associate Directors, S&T ▪ Biological Control Coordinator, S&T ▪ Director Pest Management Programs, FO ▪ Director Detection & Response, FO ▪ NIS Domestic Diagnostic Coordinator, PM 	<p>CONFIRMED ID / CONFIRMED NEGATIVE / INCONCLUSIVE: x samples positive/negative/inconclusive for <i>genus species</i>, common name (or abbreviation) from state (two-letter code).</p> <p>In body of the message, say: “Please forward to the appropriate laboratory/identifier, originator, and/or submitter of the sample/specimen.”</p>
<p>New to US or Not new to the US, but a significant detection in a new state</p>	<p>To:</p> <ul style="list-style-type: none"> ▪ Pest Evaluation & Response Coordinators, PM ▪ National Operations Manager–New Pests, FO ▪ SPHD of affected state ▪ SPRO of affected state <p>CC:</p> <ul style="list-style-type: none"> ▪ PPQ Management Team ▪ PHP Board of Directors ▪ Associate Directors, S&T ▪ Biological Control Coordinator, S&T ▪ PPQ Intergovernmental Relations ▪ PPQ Outreach & Communication ▪ LPA Public Affairs Director ▪ NPB President & Executive Secretary ▪ NPAG ▪ Director Pest Management Programs, FO ▪ Director Detection & Response, FO ▪ NIS Domestic Diagnostic Coordinator, PM 	<p>CONFIRMED ID: x samples positive for <i>genus species</i>, common name (or abbreviation) from state (two- letter code) – New US/State Record</p> <p>In body of the message, say: “Please forward to the appropriate laboratory/identifier, originator, and/or submitter of the sample/specimen.”</p>

TABLE 1: Subject Heading and Distribution for Pest Identification and Diagnostic Results

Subject Line Examples

Subject: CONFIRMED ID: one sample positive for *Xyleborus glabratus*, Red bay ambrosia beetle, from Lincoln Parish, LA

Subject: CONFIRMED ID: one sample positive for *Duponchelia fovealis* (Crambidae) in PA - new state record

Subject: CONFIRMED NEGATIVE: six samples negative for *P. ramorum* from IN

Subject: INCONCLUSIVE: two samples inconclusive for HLB from LA

Subject: CONFIRMED ID: two samples positive for *Chrysodeixis chalcites* (Noctuidae) Golden-twin spot moth in samples from MI - new US record

Appendix VI: Chrysanthemum Facility Routine Inspection Report

Chrysanthemum Facility Routine Inspection Report (Use attachments if necessary)		
Facility		
Name of Owner: Tel: Email:	Name of Manager: Tel: Email: No. of greenhouses/blocks in production:	Total acreage of nursery: Facility map of mum growing area No. of plants:
Location: Location of other associated facilities involved in production of mums	Type of operation: [check all that apply] wholesale.....retail.....cutflower.....breeding..... rooting station.....diagnostic.....tissue culture..... Other (explain)..... Are plants currently exported: Yes No If yes, to what countries: To whom are plants sold in U.S.:	List all sources of propagative material, both domestic and imported, including tissue culture. Varieties grown at the facility. Is rooting done at this facility?
Entry to the facility is secure and excludes any external source of <i>Puccinia horiana</i> from entering the facility: Yes No Chrysanthemum plants are located within an enclosed greenhouse in pots during all stages of growth: Yes No Chrysanthemum plants are located within an enclosed greenhouse in ground soil during all stages of growth: Yes No Chrysanthemum plants are located outside in an open field during all stages of growth: Yes No Is there complete separation between rooting station increase and production blocks? Yes No Do employees work exclusively in rooting block, and production block greenhouses or increase block greenhouses during a single workday? Yes No		
Greenhouse Construction or Configuration of Mum Growing Area		
Entry	Rooting green house is located away from production area and has single air tight entrance Yes No Direct access to hand wash station(s), and protective clothing (aprons, lab coats, etc.) prior to entering rooting green house: Yes No If No, describe. Entry to rooting green house is restricted to authorized personnel: Yes No If No, describe. Are personal items stored before entry to greenhouse? Yes No If no, describe.	
Sanitation: Describe Sanitation Procedure Required of Employees Having Access to Mum Growing Area		
Wash Stations	There is a wash station/ sink prior to entering the production area: Yes No Sink drains immediately to outside of rooting and production area: Yes No	
Employee Training	There is a training program covering proper greenhouse procedures, including information on how <i>Puccinia horiana</i> spreads: Yes No Description of training: How often is training conducted? A list of trained personnel is maintained: Yes No Access to mum production facilities is limited to trained and certified individuals: Yes No	
Protective Clothing	Protective clothing routinely used: Yes No Protective clothing dedicated to each greenhouse and removed before exiting: Yes No Clothing is maintained free of debris, potting media, soil, or plant material: Yes No Protective clothing washed in detergent weekly or replaced in the case of disposable aprons: Yes No	
Tools	Carts and collection baskets are cleaned of soil and plant debris: Yes No Cutting tools used to cut flowers are cleaned when moving between greenhouses: Yes No	

Growing Chrysanthemum: Identify Greenhouse/Field

Type of growing area and name of unit	Plants are grown in: Glasshouse....drop-side greenhouse....shade house....indexing area...breeding area...production field.... research area.... tissue culture lab....rooting station....containment laboratory....other (describe): List varieties grown with emphasis on those with special susceptibility to <i>Puccinia horiana</i>:
Numbers	Total planting acreage or number of potted plants: Plant density in growing ground (number of plants per meter) or pots per meter of bench space: Number of separate houses on the property:

Results of Inspection:

How many samples suspicious for CWR taken during survey?

Laboratory results of samples submitted for CWR identification:

Was 100% facility inspected? Yes No If no, when will inspectors return?:

Did APHIS or State Inspectors survey the facility prior to this inspection? Yes No

If yes, how many times has the Facility been inspected in the past 6 months? :

Are copies of Inspection reports available? Yes No

Does the greenhouse receive an annual inspection timed for optimum observation of the presence of CWR?: Yes No

OR Is the inspection a general one and non-specific for CWR? Specific_____General_____

Comments:_____

Inspector(s):_____ Inspector(s):_____

Date inspection completed: _____

Air Flow	Type of air intake: Type of exhaust system: Is humid air exhausted out of nursery block into environment or into other parts of mum growing facility? Yes No Are individual sections of the facility connected by the air ventilation system? Yes No Relative humidity at which facility maintains growing site:_____
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Appendix VII. Chrysanthemum White Rust Regulatory Incidence

If CWR is detected in a nursery, collection of the following information will be useful for trace-back or trace-forward investigations. Use attachments if necessary for topics with lengthy information.

[Add additional sheets if necessary]

A. Overall Facility: Type of Inspection

1. Routine Plant Inspection: [Check one] Yes No

Note: _____

2. Regulatory Trace-forward/Trace-back: [Check one] Yes No

Note: _____

B. Facility Information

1. Name _____

2. Street Address _____

3. Location(s) of Additional Facilities (associated with main facility)

a. Name _____

b. Street Address _____

4. GPS Location(s) _____

5. Owner Name(s) _____

6. General Manager Name(s) _____

7. Total Acreage/Area of Nursery _____

8. Number of Greenhouses/Blocks in Mum Production _____

9. Number of Plants _____

10. Type(s) of operation (wholesale; retail; cut flower; research; plant diagnostics; tissue culture; breeding, rooting station, etc.)

11. List all other companies-facilities involved in production, sales and distribution of your mum product and additional nursery locations. (*i.e.*, rooting stations; trial fields; contract growers; brokers, etc.).

12. List all sources of propagative mum materials both domestic and imported including tissue culture; breeding; research; and propagative. Include licensed/unlicensed varieties that are owned by the business and/or grown at off- shore facilities and shipped back to the United States for production.

13. Are any of the following received from outside sources?:

a. Un-rooted cuttings [Check one] Yes No

b. Rooted cuttings [Check one] Yes No

c. Potted mum material [Check one] Yes No

d. Cut-flowers [Check one] Yes No

If so, list the sources _____

14. Describe sanitation requirements for entry into nursery and for movement between greenhouses or other growing units. _____

15. List chemical regiments used in mum production in the facility. Give names of chemicals and intervals used. _____

16. ***Please provide facility map identifying all mum areas.***

C. Individual Chrysanthemum Growing Area or Greenhouse

The following information should be completed for each separate growing area or greenhouse type.

1. Site Information

a. Type of growing area and name of unit (*i.e.*, glasshouse; drop-side greenhouse; shade house; indexing, breeding, production field, research; tissue culture, rooting station, etc.).

b. Name of growing area manager _____

c. Number of suspect samples collected by regulatory inspectors and submitted for identification to pathologist(s).

d. Identity of sites where suspect samples were taken.

e. Was CWR found anywhere:

i. On/in this area? [Check one] Yes No

ii. In this nursery? [Check one] Yes No

iii. During this regulatory incident? [Check one] Yes No

f. Action taken (from 5 above)? _____

g. Is entry to greenhouse/unit restricted to authorized personnel and/or monitored?

[Check one] Yes No

i. Who is authorized to enter? _____

ii. How is area secured? _____

2. Construction or configuration of growing area:

a. Growing area

i. Open Field (not under any type of structure) Yes No

ii. Enclosed Structure Construction (including shade houses) Yes No

- b. Describe the airflow, what type of Air Intake and Exhaust system(s)? _____

- c. Is humid air exhausted out of nursery block into environs or into other parts of the growing nursery? _____
- d. Are individual sections of the nursery connected by the air ventilation system?

- e. Are houses ventilated; how & why? _____

- f. Are houses/areas maintained at a specified relative humidity? Yes No
If yes, what RH? _____
- g. Are houses/area heated or cooled? Yes No
- h. What temperature(s) range & describe schedule _____

- i. If a cut flower grower: are houses subject to 12-hrs darkness during initiation of the flowering stage? Yes No
If yes, how is this accomplished and does it contribute to fungal growth conditions? _____

3. Sanitation Procedures

- a. Describe the sanitation procedures required of the employees having access to this area. _____

- b. What chemicals, if any, are used for the decontamination procedures? _____

- c. Have the environs and nursery landscape and/or neighboring properties contiguous with the Nursery been inspected for the presence of CWR host material and CWR infection? Yes No
If yes, how far out?

- d. How many times has the Nursery been inspected by State, County, and/or Federal inspectors during the past year? _____

Are copies of the inspection reports available? (Please provide)

- e. If this nursery is positive for CWR, provide invoices for all chrysanthemum materials sold or moved to other nurseries. Please include invoices for the time span one week prior to date CWR infection is estimated to have begun and for all plants considered exposed. Also, include information for disposal areas of infected plant material if different than already described above.

D. Regulatory and Phytosanitary Information

1. Identify the Positive infection triggering regulatory investigation (may be infected at this nursery or an infection in an associated nursery).
2. Has there been a CWR infection at this Nursery in the past? If so, when?
3. Is production area under inspection physically connected to another part(s) of the nursery that handles chrysanthemum material in any capacity?
4. Is a retail outlet connected to the production nursery, either physically or under the same ownership? (i.e., contiguous spaces with retail shop and greenhouse connected; customers moving freely between areas, common air ducts, etc.)?
5. Do employees move freely between greenhouses, nursery, field blocks, retail outlet, etc.? (For example, do employees work in any/all areas of the nursery as needed in the course of a day as opposed to employees restricted from working in multiple areas of the nursery)?
6. Describe preventative measures in place to stop fungal infections from spreading between the entities listed in the previous question. (Include sanitation procedures already discussed, as well as additional physical barriers such as filters, etc. in place to prevent spores from spreading via air ducts).
7. Outline details of the progression of plant material from start to finished product. (This may be a very simple progression or can be very complicated depending upon the nursery's set-up).

Example 1: Plants begin as cells in tissue culture; grown to small plantlets; plantlets grown out in "contained glasshouse"; cuttings taken from plantlets and stuck in "increase house" ; increase moved to production field ; cuttings sent to: wholesale nurseries as rooted and/or un-rooted depending upon order and/or shipped via company trucks with one stop over for repacking and distribution direct to client, etc.

Example 2: A wholesale nursery receives rooted cuttings from a broker; sticks cuttings in pots; grows to 4-in pot size and sells retail on site.

8. List all sources of non-propagative mum material that may have been on the premises in the past year, such as cut flowers; retail potted materials; diagnostics; R&D materials, etc.
9. Is any mum material received under special permit(s), such as:
 - USDA CIP?
 - USDA Post-entry Permit?
 - Other State or Federal Permits?
10. List chemical regiments used in mum production in the nursery. Give names of chemicals and intervals used.
11. Are spray records maintained and accessible to inspectors?
12. Are chemicals considered to be “curative” agents used in routine production as a “preventative” measure?
13. How are culls & plant debris disposed off site? At what intervals?
14. Is plant debris disposed immediately or left in greenhouse/field?
15. Does nursery/outlet utilize a “cull pile” and if so; where is the cull pile located and how long is it left before it is removed?
16. Does nursery “compost” its cuttings/culls?
17. Is chrysanthemum stock sold interstate and/or intrastate and is it exported? To whom is stock sold and in what form (un-rooted cuttings, rooted cuttings, potted plants; bare-root plants; cut flowers, etc.)?
18. Are sales invoices available for inspector(s) to view?
19. Does this Nursery propagate licensed/patented varieties of mums that are registered to other companies (can be for production or for R&D-only)? If so, list the varieties and the sources of each.
20. What other companies are licensed to sell your patented/licensed varieties?
21. Additional information

Name of the Inspector(s) _____

Date: _____

Office phone: _____ Mobile phone: _____

Office phone: _____ Mobile phone: _____

E-mail: _____

E-mail: _____

Copies of this report will be provided by the above individual to the following: (list officials receiving copy from inspector):

Name: _____ Affiliation: _____

Name: _____ Affiliation: _____

E. Infected Property – EAN Action Log

1. Date of EAN Action _____

2. Date infected plants and exposed radius of plants destruction complete _____

3. Date & Results of Inspection One after destruction of infected plants _____

a. Were more infected plants found? If so, identify the location in the facility & include map.

b. Date additional plants destroyed _____

c. Note any additional regulatory actions taken _____

4. Date & Results of Inspection 2 after original destruction of infected plants _____

a. Were more infected plants found? If so, identify the location in the facility & include map.

b. Date additional plants destroyed _____

c. Note any additional regulatory actions taken _____

5. Date & Results of Inspection 3 after original destruction of infected plants _____

- a. Were more infected plants found? If so, identify the location in the facility & include map.
 - b. Date additional plants destroyed_____
 - c. Note any additional regulatory actions taken_____
6. Is further regulatory action initiated?
- a. Host-free period for 8-weeks; date beginning_____
 - b. Host-free period with approved steam sterilization_____
 - c. Host-free with another approved decontamination of soil to render it host-free. List method & who approved it_____
7. Date nursery is approved to replant chrysanthemums in the regulated area_____
8. Date EAN rescinded_____
9. Additional Information
- Name of the Inspector(s)_____
- Date:_____
- Office phone:_____ Mobile phone:_____
- Office phone:_____ Mobile phone:_____
- E-mail: _____
- E-mail: _____
- Copies of this report will be provided by the above individual to the following: (list officials receiving copy from inspector):
- Name:_____ Affiliation:_____
- Name:_____ Affiliation:_____

Appendix VIII: Disposal of Infected Plant Material

A. Host material, including leaf litter, must not be removed from the facility as trash. The infected plant may be cut with a sharp knife near the root without any shaking and dispersing of the fungal spores.

B. All plant debris including leaves, stems, flowers, roots, and any other plant parts will be removed and destroyed using one of the following methods. Other methods deemed proper by the regulatory authorities may be used.

1. Incineration (burning to ash): Infected plants, all leaf debris may be disposed of by incineration at a facility or other location. Off nursery movement must be properly safeguarded. Burning may be through open burning or in an incinerator.

2. Burial: Infected plants, all leaf debris may be bagged, buried and covered with two inches of soil.

3. Steam sterilization: Dry heat or steam commonly heated to internal temperatures of 212° F (100° C) for 30 minutes followed by burial in a landfill.

4. Composting method as outlined in the California codified in California Integrated Waste Management Board regulations: Title 7, Division 7, Chapter 3.1 Article 7, Section 17868.3 (b) and (c) located at <http://www.ciwmb.ca.gov/Regulations/Title14/ch31a5.htm#article7>).