



ORGANISATION NORD AMERICAINE POUR LA PROTECTION DES PLANTES  
NORTH AMERICAN PLANT PROTECTION ORGANIZATION  
ORGANIZACION NORTEAMERICANA DE PROTECCION A LAS PLANTAS  
CANADA UNITED STATES MEXICO

## **NAPPO TREATMENT PROTOCOLS**

**TP No. 03**

### **Phosphine Fumigation of Grain or Grain Products for Control of Stored Product Pests**

The Secretariat of the North American Plant Protection Organization  
1431 Merivale Road, 3<sup>rd</sup> Floor, Room 309  
Ottawa, Ontario, Canada, K1A 0Y9  
October 19, 2009

Name of treatment	Phosphine fumigation of grain or grain products for control of stored product pests
Active ingredient	Aluminium and magnesium phosphide (produces phosphine gas: PH <sub>3</sub> )
Treatment type	Chemical
Target pest	Various storage insects infesting grain and grain by-products as indicated in the product label.
Target regulated articles	Raw, processed and milled grain
Treatment schedule	Varies depending on type and size of storage area, and temperature of the product. Applicators will follow the directions outlined on the product label which has been approved by the each country's pesticide regulatory authority (United States Environmental Protection Agency, the Canadian Pest Management Regulatory Agency or the Mexican Comisión Federal para la Protección contra Riesgos Sanitarios).
Other relevant information	Recirculation of the fumigant is an important option in controlling storage pests in grain and grain by-products. Detailed technical information on process is available in the Federal Grain Inspection Service treatment manual.
References	NA

<b>Feasibility and applicability</b>
<b>Procedure for carrying out the phytosanitary treatment</b>
The chemical is applied typically in solid form as either an aluminium or magnesium phosphide formulation (other gaseous formulations are available that include phosphine gas but these have not been widely adopted in grain shipments). Upon contact with ambient moisture, the formulation generates phosphine gas and an inert powder residue. The application is normally done in an enclosed environment. The formulation can be applied either directly, or in paper sleeves or sachets to facilitate recovery of residual powder. After the prescribed exposure period, the fumigated product is aerated to remove the phosphine gas.
<b>Cost of typical treatment facility and operational running costs if appropriate</b>
The usual application takes place in existing facilities (e.g. shipholds, storage facilities, etc). Cost of product and application is variable and affected by several factors (volume, location, type of facility, product availability, etc.).
<b>Commercial relevance, including affordability</b>
The chemical has a long history of commercial feasibility. The United States Department of Agriculture (USDA) developed procedures for in-transit ships fumigation of grain with phosphine over 30 years ago. This practice has since been successfully used on U.S. grain export shipments to meet contract requirements and in some cases address specific phytosanitary concerns. USDA records indicate that historically about 50% of U.S. grain shipments are fumigated in-transit with phosphine gas.
<b>Extent to which other NPPOs have approved the treatment as a phytosanitary measure</b>
United States, Canada and Mexico all recognize the use of phosphine gas as an effective phytosanitary treatment for infestations in grain and grain-related products.
<b>Availability of expertise needed to apply the phytosanitary treatment</b>
Application techniques are widely known and fairly routine. A wide range of commercial applicators are available to properly and effectively apply the chemical.
<b>Versatility of the phytosanitary treatment</b>
Highly versatile. It can be used to treat a wide range of grain and agricultural products stored in a variety of containers/conveyances.
<b>The degree to which the phytosanitary treatment complements other phytosanitary measures</b>
The chemical is used when a visual examination of the product for phytosanitary purposes reveals the presence of regulated insects, or to prevent development of latent infestation.

**Summary of available information of potential undesirable side-effects**

Toxic effects of phosphine gas are widely known and can be found on the product label as well as other government issued warning documents (e.g., The United States requires manufacturers to issue Material Safety Data Sheets for toxic products including phosphine to inform employees of the hazardous nature of chemicals in the workplace).

**Applicability of treatment with respect to specific regulated article/pest combinations**

Highly applicable across insects and agricultural product combinations.

**Technical viability**

Persons applying the chemical require technical training to ensure efficacy and safety.

**Phytotoxicity and other effects on the quality of regulated articles, when appropriate**

No phytotoxic effects when used at recommended dosages.

**Consideration of the risk of the target organism having or developing resistance to the treatment**

As with most chemical treatments, resistance in target insects may be possible from improper use of the chemical.

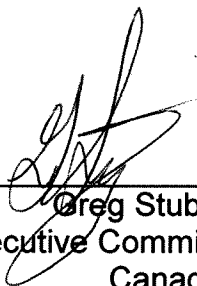
**Review**


NAPPO Treatment and Diagnostic Protocols are subject to periodic review and amendment. The next review date for this NAPPO protocol is 2014. A review of any NAPPO Protocol may be initiated at any time upon the request of a NAPPO member country.


**Approval**

This Protocol approved by the North American Plant Protection Organization Executive Committee on October 19, 2009 and is effective from this date.

Approved by:

  
\_\_\_\_\_  
Greg Stubbings  
Executive Committee Member  
Canada

  
\_\_\_\_\_  
Paul R. Eggert  
Executive Committee Member  
United States

  
\_\_\_\_\_  
Javier Trujillo Arriaga  
Executive Committee Member  
Mexico