Short Communication

Survey of Potato Spindle Tuber Viroid in Seed Potato Growing Areas of the United States

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ABSTRACT

Fourteen United States (U.S.) seed potato certification agencies surveyed all U.S. seed potato growing areas for presence of the potato spindle tuber viroid (PSTVd). The survey included general surveillance, which involved searching for the occurrence of PSTVd in state seed potato certification records from 1990 through 2000, and a field survey, which involved testing selected crops for PSTVd infection by nucleic acid dot blot hybridization during 1999 through 2001. No PSTVd incident was documented in any of the state certification records, nor was PSTVd detected in the field surveys. All U.S. seed-growing areas were determined to be free of PSTVd. It is concluded that PSTVd has been eradicated and freedom from potato spindle tuber viroid has been successfully maintained in all of the seed potato growing areas in the United States.

RESUMEN

Catorce agencias de certificación de semilla de papa de los Estados Unidos (EEUU) inspeccionaron todas las áreas de cultivo de papa de EEUU para detectar la presencia del viroide del tubérculo ahusado de la papa (PSTVd). La inspección incluyó una vigilancia general que incluía investigar sobre presencia de PSTVd en los registros de certificación de semilla de papa en el estado desde 1990 hasta fines del 2000 y una inspección de campo en campos seleccionados para detección de PSTVd por medio de la prueba de hibridación local de ácido nucleico durante 1999-2001. No se encontró información documentada de la presencia de PSTVd en ninguno de los registros de certificación del estado, ni tampoco se detectó en las áreas de cultivo inspeccionadas. Se determinó que todas las áreas de producción de semilla de papa estaban libres de PSTVd. Se...
concluye que el PSTVd ha sido erradicado y que esta erradicación del viroide del tubérculo ahusado ha sido exitosamente mantenida en todas las áreas de producción de semilla de papa de los Estados Unidos.

INTRODUCTION

U.S. seed potato certification agencies (Table 1) routinely test seed potato stocks for potato spindle tuber viroid (PSTVd) at a number of certification levels starting with pre-Nuclear in tissue culture, continuing with field-increased seed generations during the growing season and ending with post-harvest grow-out plots. PSTVd, which was once reported to cause spindle tuber in commercial plantings in the United States (Hooker 1981), has diminished. At the Certification Section meeting of the Potato Association of America (PAA Certification Section) held in Seattle on 2 December 1998, seed potato certification personnel in attendance all reported an apparent absence of PSTVd in seed potato stocks for the past 10 years.

However, since there is no record of a systematic survey for PSTVd in the U.S., the North American Plant Protection Organization (NAPPO) continues listing PSTVd as an A-2 Quarantine pest in North America. Many seed-importing countries continue to require the U.S. to test potato seed crops to ensure freedom from PSTVd.

At the Seattle meeting, a motion was made to conduct an official PSTVd survey in U.S. seed-growing areas. The purpose was to determine whether PSTVd has indeed been eliminated and, whether U.S. seed potato growing areas can be categorized as PSTVd-free areas.

State certification agencies of Alaska, California, Colorado, Idaho, Maine, Michigan, Minnesota, Montana, Nebraska, New York, North Dakota, Oregon, Washington, and Wisconsin participated in this survey. These agencies constitute all of the official seed potato certification agencies in the U.S. For the convenience of this report, "the U.S. certification agency" will refer to this group. This survey was conducted according to the International Standard of Phytosanitary Measure (ISPM) outline of "the Requirements for the Establishment of Pest Free Area" (FAO 1996). This report describes results of records searches, field surveillance and control of PSTVd in U.S. seed potatoes.

MATERIALS AND METHODS

General Surveillance/Record Data

Disease readings, collected over the past 10 years from each of the certification offices of the aforementioned states, were used to determine the absence of PSTVd. All seed potatoes were started from in vitro tissue culture stocks and had been laboratory tested for freedom from PSTVd. Field-increased plants were systematically inspected three times during the growing seasons. Positive tests for PSTVd incidences were based on visual symptoms with verification by lab testing. Post-harvest grow-out plants were also visually inspected and laboratory tested in the same manner. Post-harvest grow-out sample size was 400 tubers or more per seed lot. Whole seed tubers were planted in November either at Homestead, Florida, or Oceanside, California. Disease readings were made in January and February, respectively. Oregon and Alaska conducted post-harvest tests in greenhouses. Laboratory tests were based on the dot-blot hybridization method (Owens et al. 1981), polyacrylamide electrophoresis (Morris et al. 1977), or return-polyacrylamide electrophoresis (Schumacher et al. 1986).

Field Survey/Detection Survey

Each state certification agency used the same testing protocol. For this protocol, samples of leaves were collected from 10% of all seed lots entering into 1999, 2000, and/or 2001 crops in the respective state certification programs. Fifty or more leaves per seed lot were collected either from fields during the summer or from post-harvest winter grow-out plots.

A composite of 20 or fewer leaves per test was ground in Ames buffer at a ratio of 1:1.5 (w:v). An equal volume of chloroform was added to the homogenized sample, followed by vortexing. After the aqueous and chloroform layers separated, 3-5 µL of the aqueous layer was spotted onto a nitrocellulose membrane. The membrane was placed in a protective jacket and sent to Agdia Inc., (Elkhart, Indiana) for processing by dot-blot nucleic acid hybridization (Podleckis et al. 1993). In the states where commercial potatoes were planted near certified seed potatoes, leaf samples were also collected from the commercial potatoes.