Washing of potatoes to remove nematodes and to observe effect on storage rot diseases

J. Kimpinski and H. W. Platt[1]

Washing of potatoes in the laboratory indicated that only a few second-stage juveniles of the clover-cyst nematode, *Heterodera trifolii,* had been present in soil on the surface of potato tubers. No mature dead females, or cysts were detected. About 90% of the soil adhering to tubers at harvest was removed by a commercial washing procedure. Clover-cyst nematodes were not detected on tubers which had passed through the commercial wash. Washing did not appear to encourage storage rot diseases of potatoes under recommended storage conditions.

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Le lavage des tubercules de pommes de terre en laboratoire n'a permis de dbcouvrir dans le sol à la surface des tubercules que quelques nbmatodes juvéniles du deuxième stades de dbveloppement, appartenant à l'espèce *Heterodera trifolii.* Aucune femelles adultes mortes et aucun cystes ne furent détectés. Le procédé de lavage commercial permet d'enlever environ 90% du sol adhbrant aux tubercules aprbs la récolte. On n'a pas retrouvb *Heterodera trifolii* sur les tubercules ayant subi un tel lavage. De plus, le lavage des tubercules de pommes de terre ne semble pas encourager le dbveloppement des pourritures d'entrepôt aux conditions d'entreposage recommandées.

Introduction

The clover-cyst nematode, ***Heterodera trifolii*** Goffart, 1932, is a common parasite of forage legumes in eastern Canada (3,6,7) but it usually does not cause detectable damage (5). Although this nematode species does not attack potatoes it may survive as a cyst in soil attached to the tubers. Cysts are mature, dead females which have developed into spherical sac-like structures with tough leather-likewalls, and each may contain several hundred viable eggs that are protected from adverse conditions for extended periods.

Several countries which import seed potatoes from the Maritime provinces have expressed concern about the possible entry of clover-cyst nematodes along with the tubers. One way of alleviating the problem is to wash the tubers prior to storage or shipment. Therefore a test was conducted to assess the effectiveness of commercial washing for soil and nematode removal. In addition to the nematode observations, samples of washed and unwashed potatoes were monitored for the development of storage rot diseases.

Materials and methods

Soil and root samples were collected during August 1981 from fields of Red Pontiac potatoes near Bayview and Linkletter, Prince Edward Island. Soil samples were mixed thoroughly and placed in modified Baermann pans (4) for 7 days. Potato roots were washed free of soil and held in a mist chamber (1) for 7 days. Juveniles of the clover cyst nematode and other vermiform nematodes were recovered by these methods, and examined under the compound microscope.

A few days before harvest, 151 kg and 168 kg of tubers were dug from the Bayview and Linkletter sites, respectively. All the tubers from each site were washed in the laboratory for 4 minutes in 60 litres of water in a rotary washer. Organic matter and other particles were removed from the surface of the wash water with a fine screen (44 μm aperture) and placed on white filter paper. This material was examined with a stereomicroscope at 30 to 60 magnification for nematode cysts which have specific gravities lower than water and float on the surface. The wash water was passed through a fine screen (36 μm aperture), and the sediment at the bottom of the rotary washer was processed through a sugar-flotation technique (2), for recovery of vermiform nematodes.

Potatoes were washed at harvest on location with a commercial washer in which the tubers passed under high-pressure spray nozzles. About 150 kg of washed tubers from the Linkletter site were rewashed in the laboratory to assess the effectiveness of the commercial washer for removing soil and nematodes.

Samples of washed and unwashed potatoes were monitored during the winter for development of storage rot diseases. Stem ends and wounds were examined and samples were cultured on selective media for determination of fungal and bacterial disease organisms.

Results

Worm-shaped, second-stage juveniles of ***H. trifolii,*** the motile infective stage which invades roots of suitable hosts, were recovered from the August soil samples in relatively low numbers at both locations (Table 1). No clover-cyst nematode juveniles were recovered from the potato roots (data omitted).

[1] *Plant Nernatologist and Plant Pathologist, respectively, Agriculture Canada Research Station, P. 0. Box 1210, Charlottetown, Prince Edward Island C1A 7M8.*

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Table 1. Number of clover-cysts nematodes recovered from the surface of potato tubers.

Location	Weight of tubers (kg)	Number of second-stage juveniles			Number of cysts
		Initial count[a]	In sediment[b]	In water[c]	
Bayview[d]	151	100	0	0	0
Linkletter[d]	168	450	15	17	0
Linkletter[e]	150	450	0	0	0

[a]Per kg of field soil from samples obtained during August 1981.
[b]Approximately 100 cc for the field samples and 10 cc in prewashed potatoes.
[c]Approximately 60 litres.
[d]Field sample.
[e]After commercial wash.

No cysts were observed in the particulate matter removed from the surface of the wash water. A few dead second-stage juveniles were recovered from the wash water and sediment of the Linkletter sample.

Virtually all of the soil was removed from the surface of the tubers in each field sample during the washing process in the laboratory. About 90% of the soil adhering to tubers was removed by the commercial washing. Detailed examination of the wash water and sediment from previously washed tubers revealed that the incidence of clover-cyst nematodes had been reduced to a level which was not detectable (Table 1).

The microbial cultures on selective media disclosed the presence of ***Fusarium*** spp. and ***Erwinia*** spp. on both washed and unwashed tubers. However, there were no obvious differences in the levels of storage rots between washed and unwashed potatoes under recommended storage conditions.

Discussion

The results indicated that only a few second-stage juveniles were present in soil adhering to tubers. This was not a matter of great concern since this stage of the clover-cyst nematode is very susceptible to desiccation and would survive only a few days under normal storage conditions or during transit. However, if nematode juveniles or cysts are of concern, for example in the export of seed, then an adequate commercial washing procedure should remove more than 90% of the soil from the tubers and reduce the occurrence of clover-cyst nematodes to levels which approach zero. In addition, the technique does not appear to enhance storage rot diseases of potatoes under recommended storage conditions. As an added control measure, the soil can be treated at planting with a nematicide to further reduce nematode levels, and a fungicide could be applied to the washed tubers to control fungal storage rots.

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