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*Pests and diseases of New Zealand yam (oca) (*Oxalis tuberosa*)*

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A report prepared for
Fresh Sector, New Zealand Vegetable and Potato Growers Federation Inc.

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Contents

1 Executive summary

This report covers the first six months of research on the pests and diseases of New Zealand yam (oca). The aim of the project is to determine the key pests and diseases of New Zealand yam and to develop appropriate management strategies.

Ten growers are co-operating with stage 1 where we are characterizing the key pest and disease problems in the main growing regions: Manawatu and the southern part of the South Island.

The key pests of New Zealand yam to date are: weevils, corn seed beetle, grass grub, wireworm and cutworms. A very wide range of diseases have been identified, but they are all generalist types, with no clear indication of which ones are quantitatively most important at this stage of the study.

The key finding is that plant density and vigour are affected by seed tuber quality. Where seed tubers were sound with few or no rots, the plant populations were greater than where the seed tubers were infected with rots at planting.

Conclusions about effects of seed tuber quality on plant population and yield will be clear once the monitor crops have been harvested.

Plant density is affected by seed tuber quality.

2 Introduction

New Zealand yam (oca) *(Oxalis tuberosa)* is an increasingly important gourmet tuber vegetable in New Zealand. Innovation in cultivars and marketing are increasing market size, and there are potential export markets.

New Zealand yam growers have had to deal with a range of pest and disease problems in their crop. Although rots and related diseases have reduced yields, the causative organisms are not well characterized. To develop disease management strategies the causative organisms need to be characterized so that the appropriate control measures can be integrated into an effective system. The pests known for New Zealand yam are all difficult to control: weevils, wireworms and somewhat unusual pests such as corn seed beetle. Control measures for these types of pests are complicated and the focus needs to be on detection and prevention rather than control

This progress report itemizes methods and issues identified in the project to date.

3 Collaborators

Blair Spain: testing new cultivars on light Southland soils.

Andrew and Kerry Barnes: experienced growers on light Southland soils.

John Freeman: experienced vegetable grower on clay soils close to Invercargill.

Ray Goddard: very experienced yam grower on clay soils on north facing slopes near Port Chalmers.

Colin Boyce: very experienced grower near Waimate.

Almadale Partnership (Peter & David Halford, Clint Smythe): very experienced specialist growers on volcanic soils near Fielding.

Warren and Kerry Osbourne: experienced growers in a mixed cropping system on silt loam near Bunnythorpe.

Cho Min Sam, Zhu Ye Phing, Ken Wong and Tom Young: commercial vegetable growers on the rich alluvial soils of the Whakarongo river flats near Palmerston North.

4 Methods

The New Zealand yam crops being grown by the project collaborators are being visited at varying intervals. All diseases are being recorded and all insects found are being identified.

A key initiative for this growing season is to relate final tuber productivity to the quality of the planting material for a sub-sample of the collaborators.

4.1 Insect trapping

Technology is being developed and tested to determine the density of pests such as wire worm in yam paddocks.

5 Results

5.1 Diseases

The diseases recorded so far from the various regions are listed in Table 1 for *Fusarium* spp. and Table 2 for other fungi.

Fusarium spp. attack both seed tubers and stems of growing crops. So far they have been found as the major pathogen in the Manawatu, Canterbury and Otago. The species are all generalist pathogens that affect a wide variety of crops.

Other fungi such as *Geotrichum* sp. and *Penicillium* sp. have been the main pathogens in Southland.

There are two key issues: all the rots found have been multi-species; and they are all generalist pathogens. All the pathogens found in damaged stem tissue have been the same as those found in the tubers, indicating very strongly that the original infection was tuber based.

Table 1: Fusarium *species associated with rots in New Zealand yam (oca). S=Southland, O=Otago, C=Canterbury, M= Manawatu.*

Fusarium species	Effects	Tissue	Mixed with other pathogens	Region
Fusarium avenaceum	Major	Stem	Yes	M
	Minor	Tuber	Yes	S
	Major	Stem	Yes	C
Fusarium culmorum	Minor	Stem	Yes	S
	Major	Stem	Yes	O
	Minor	Tuber	Yes	S
	?Major	Tuber /Stem	Yes	M
Fusarium gramminareum	Minor	Tuber	Yes	M
Fusarium moniliforme	Minor	Stem	Yes	S
Fusarium oxysporium	Major	Stem	Yes	M
	Minor	Tuber	Yes	S
Fusarium solani	Minor	Stem	Yes	S
	Minor	Tuber	Yes	S

Table 2: Pathogenic fungi associated with New Zealand yam (oca) other than Fusarium spp. *S= Southland, O = Otago, C= Canterbury, M = Manawatu*

Pathogen	Effects	Tissue	Mixed with other pathogens	Region
Alternaria alternata	Minor	Stem	Yes	M
Aureobasidium pullulans	Minor	Stem	Yes	M
Botrytis cinerea	Minor	Tuber	Yes	M
	Minor	Tuber	Yes	S
Colletotrichum trifolii	Minor	Stem	Yes	M
	Minor	Stem	Yes	C
Cylindrocarpon candidum	Minor	Tuber	No	S
Cylindrocarpon olidum	Minor	Tuber	Yes	M
	Minor	Stem	Yes	M

Pathogen	Effects	Tissue	Mixed with other pathogens	Region
Epicoccum purpurascens	Minor	Stem	Yes	M
Erwinia sp.	Minor	Stem	Yes	M
	Minor	Tuber	Yes	M
Erwinia herbicola	Minor	Tuber	Yes	M
Geotrichum candidum	Minor	Tuber	Yes	M
	Major	Tuber	Yes	S
	Minor	Tuber	Yes	S
Gliocladium roseum	Minor	Stem	Yes	M
	Minor	Tuber	Yes	M
	Minor	Tuber	Yes	S
	Major	Tuber	Yes	S
	Minor	Stem	Yes	M
	Minor	Stem	Yes	C
Glomerella cingulata	Minor	Stem	Yes	M
Mucor sp.	Minor+	Stem	Yes	O
	Minor	Stem	Yes	M
	Minor	Tuber	Yes	S
	Minor	Stem	Yes	C
	Major	Tuber	Yes	S
Nectria radicicola	Minor	Tuber	Yes	S
	Minor	Tuber	Yes	M
	Minor	Stem	Yes	M
Penicillium sp.	Minor	Tuber	Yes	M
	Major	Tuber	Yes	M
	Major	Stem	Yes	M
	Minor	Tuber	Yes	S
	Major	Tuber	Yes	S
Phoma exigua	Minor	Tuber	Yes	S
	Minor	Tuber	Yes	M
	Minor	Stem	Yes	M
Phomopsis sp.	Minor	Tuber	Yes	M
	Minor	Stem	Yes	M
Plectrosphaerella cucumerina	Minor	Tuber	Yes	S
	Minor	Stem	Yes	M
	Major	Stem	Yes	C
Phytophthora megasperma	Minor	Tuber	Yes	S

Pathogen	Effects	Tissue	Mixed with other pathogens	Region
	Major	Tuber	Yes	M
Pythium sp.	Minor	Stem	Yes	O
	Minor	Tuber	Yes	S
	Major	Tuber	Yes	M
Rhizoctonia sp.	?Major	Stem	Yes	M
	Minor	Tuber	Yes	S
Stilbellum sp	Minor	Tuber	Yes	M
Trichoderma viride	Minor	Stem	Yes	O
Xanthomonas sp..	Minor	Stem	Yes	M

5.2 Insects

The insect pests found are listed in Table 3. The pests found to date (with crop maturity and harvest still to come) are all generalist soil pests. The most severe insect pests problems appear to occur when New Zealand yams follow pasture in a rotation

*Table 3: Pests of New Zealand yam (oca): preliminary evaluation by region. *** = very common, ** = common, * = present, - = not known, ? = unsure at present.*

Pest	Manawatu	Canterbury	Otago	Southland
White-fringed weevil	***	-	-	-
Catoptes weevil	***	-	-	-
Wireworm	**	***	?	***
Leatherjacket	**	**	?	?
Grass grub	***	**	?	?
Corn seed beetle	**	?	?	?
Native cutworm	*	-	-	-
Greasy cutworm	**	?	*	*
Porina	-	?		?

6 Experimental programme

Experiments to assess the following aspects of New Zealand yam production will be completed during the 2000 harvest:

- Effects of seed tuber quality on yield;
- Effects of agronomic practice on yield

7 Discussion

Isolations from the eyes of sound New Zealand yams show that there is always an inoculum of a variety of pathogens present. Growers who select sound seed tubers appear to have fewer losses to rots than those who plant whatever material they have on hand. It may be that the selections/cultivars that yield the best crops have been strongly selected for low rot incidence. This hypothesis will be tested next season.

The very mixed nature of the pathogen suite makes management difficult. It will require more reliance on selection and agronomic practice than on fungicides, although we may be able to find some temporary benefits with fungicides. All the stem rots isolated so far appear to be related to infections in the tuber. Thus, poor seed tuber quality may result in unnecessarily high crop losses.

Similarly, control strategies for soil–borne pests are complicated. There are one or two pesticides that may provide some control for these complicated pest suites, but the long term solution is likely to be an integrated system of rotation, trapping and tactical pesticide use.

8 Research development

- We are currently developing control strategies for the mixed pathogen loads found on New Zealand yam for testing for the 2000 planting season.
- We are developing approaches to soil pest control, (including looking for natural controls in association with AgResearch specialists).