

New access for taro to Australia – Samoa visit (September 2015)

Technical Report 103

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Client: Department of Foreign Affairs and Trade

ABN: 47 065 634 525

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16-Nov-2016

Job No.: 42444251

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Quality Information

Document New access for taro to Australia – Samoa visit (September 2015)

Ref 42444251

Date 16-Nov-2016

Prepared by Bob Fullerton and Joy Tyson

Reviewed by Bronwyn Wiseman

Revision History

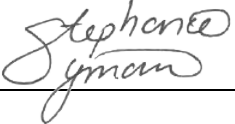
Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
1	16-Nov-2016	FINAL	Stephanie Symon AECOM Project Manager	

Table of Contents

Acknowledgments	i
Acronyms	i
Executive Summary	ii
1.0 Introduction	1
2.0 Schedule of activities	2
3.0 Discussion with Samoan MAF personnel	3
3.1 Ministry of Agriculture and Fisheries meeting (Tuesday 15 September 2015)	3
3.2 Ministry of Agriculture and Fisheries meeting (Friday 18 September 2015)	3
3.3 Analysis of resources and capabilities	6
3.3.1 MAP	6
3.3.2 Scientific Research Organisation of Samoa	6
3.3.3 Conclusion	6
3.4 Final meeting with Ministry of Agriculture and Fisheries (Monday 21 September 2015)	7
4.0 Collection of <i>Phytophthora colocasiae</i>	9
4.1 Taro leaf blight collection	9
4.2 Isolation of <i>Phytophthora colocasiae</i>	12
4.3 Export and storage of <i>Phytophthora colocasiae</i> isolates	12
5.0 References	13
Appendix A	
Agenda for meeting with MAF Samoa (18 Sept 2015)	A
Appendix B	
<i>Phytophthora colocasiae</i> isolates collected	B

Acknowledgments

We would like to thank Kirifi Pouono for his organisational skills and the substantial amount of time spent with the team during the visit to Samoa.

Acronyms

Abbreviation	Description
CTO	Chief Technical Officer
EPA	Environmental Protection Authority
ERMA	Environmental Risk Management Authority (now EPA)
MAF	Samoa Ministry for Agriculture and Fisheries
MPI	Ministry for Primary Industries (New Zealand)
PFR	The New Zealand Institute for Plant & Food Research Limited
SROS	Scientific Research Organisation of Samoa
TLB	Taro leaf blight

Executive Summary

The overall objective of this activity is to develop management measures for taro leaf blight (TLB) in support of achieving access for fresh taro to Australia. A review of relevant literature was completed in 2015, which identified the key questions that needed to be answered to meet Australian biosecurity requirements, and a research plan was drafted to address those questions. That study confirmed that the required research would be substantial and there is no certainty that acceptable measures can be achieved.

The Samoa Market Access Working Group (MAWG) and Samoa Ministry of Agriculture and Fisheries (MAF) have re-confirmed their interest in pursuing the research required and for further support to be provided through the PHAMA program to at least initiate the identified work. Given the substantial nature of the required research programme, it was considered important to clearly communicate this to relevant stakeholders in Samoa, including staff in the MAF Crops and Quarantine Divisions.

Plant & Food Research (PFR) was commissioned by PHAMA to visit Samoa to undertake the following activities:

- Field survey and collection of samples of the fungus that causes TLB in Samoa;
- Discussions with relevant stakeholders on the nature of the required research, and the uncertainty over whether an acceptable and viable export pathway could be established.
- Evaluation of current resources and capacity in Samoa to undertake the required laboratory and field research to develop acceptable risk management measures for TLB to export fresh taro to Australia.

Collection of strains of *Phytophthora colocasiae*

Access to fresh cultures of *P. colocasiae* is essential in preparing for any subsequent research programme. Fifty-four pure cultures of the pathogen were obtained from 13 localities distributed around Upolu. The cultures were duplicated, with one set being retained at the MAF laboratories at Nu'u and the other being taken to New Zealand for preservation.

Discussions on the Research Programme

The review report and the elements of the proposed work plan were discussed in detail with representatives from the Crops Division of Samoa MAF at a meeting at Nu'u Crops Development Station. The meeting was chaired by Asuao Kirifi Pouono, PHAMA National Market Access Coordinator.

The life cycle of the pathogen and the Australian pest risk analysis process were outlined as background to the discussions. Thereafter, all elements of a research programme aimed at meeting Australia's requirements for access for fresh taro were presented and discussed. Despite its scope and complexity, representatives of MAF expressed the wish to proceed with the programme.

Assessment of resources and capabilities

MAF, Nu'u. The MAF pathology laboratory at Nu'u is poorly resourced, with essential facilities and equipment either lacking or non-functional. While it does have a functioning laminar flow cabinet and the microscopes are adequate, there is a critical shortage of glassware, media bottles and containers, and no autoclave.

Plant pathology expertise is limited. Dr Seuseu Joseph Tauati, a molecular pathologist, as advisor to the CEO has limited time available for direct participation. The more senior pathologists, Parate Matalavea and Taelii Mauga, appear to be engaged in other projects. Faalelei Tunupopo and Angie Tugaga, while both entomologists, are energetic and committed, and with appropriate guidance would be able to provide the core technical inputs to the project.

SROS. SROS is an active research organisation with staff engaged across a wide variety of projects including bio-fuels, product development, sensory evaluation, postharvest technology, food microbiology, shelf-life testing and food quality.

The organisation has specialised, well-equipped laboratories including fully operational microbiological facilities, and humidity and temperature controlled store rooms, which would be essential to the taro research programme.

SROS does not have plant pathologists on staff at present.

Conclusions

After reviewing the facilities and capabilities of both organisations the team concluded that:

- Because of superior equipment and facilities, including immediate access to humidity cabinets and controlled temperature rooms, SROS would be the most appropriate organisation to host the project. The uncertainty of access to laboratories at Nu'u during reconstruction was also a factor in the decision.
- Because SROS lacks the plant pathology staff and skills, those capabilities would need to be resourced from MAF and best provided by Faalelei Tunupopo and Angie Tugaga. Support would also be required to assist those two staff.
- The TLB programme should be a collaborative SROS/MAF research project based at SROS but supported by MAF pathologists who in turn would be supported by external specialist pathology expertise.

Final discussions and action plan

The findings and recommendations of the team were presented to MAF at a final meeting on Monday 21 September 2015. While there was some initial resistance by MAF personnel to the concept of a joint project, it was clear from the analysis of facilities and capabilities of both organisations that a joint approach was the only viable option if the project were to proceed. That conclusion was strongly supported by Asuao Kirifi Pouono, PHAMA National Market Access Coordinator.

The first step in developing a collaboration between SROS and MAF would be a meeting between the CEOs of the respective organisations. The proposed steps are:

1. Meeting between CEOs of SROS and MAF to agree on a collaboration.
2. Preparation of a joint project proposal by MAF and SROS scientists.
3. Search for appropriate donors to fund the programme.

1.0 Introduction

Export of fresh taro to Australia remains a priority for the Samoan taro industry. However, taro leaf blight (TLB, caused by *Phytophthora colocasiae*) is a major biosecurity concern for Australia, and Samoa will need to develop and demonstrate management measures that are acceptable to Biosecurity Australia before exports can commence.

A previous project by Tyson and Fullerton (2015):

reviewed the literature around *P. colocasiae* as it relates to the Pacific

reviewed the Australian import risk analysis

developed a list of questions requiring investigation to develop risk management measures for taro leaf blight (TLB)

provided a basic description of the research that could be done to close the knowledge gaps around *P. colocasiae*.

The laboratory and field research needed to meet the requirements is expected to be substantial and there is no certainty that acceptable measures can be achieved. The research needed focuses on the recognition and quantification of corm rots caused by *P. colocasiae*, the likelihood of the new Samoan cultivars having corm rots, the likelihood of survival of external contaminant propagules, and postharvest treatment of corms to eliminate external propagules.

This visit to Samoa was to attend meetings with Samoa Ministry of Agriculture and Fisheries (MAF) personnel, to advise and discuss the scope of the research needed to assess the level of risk and to develop management measures to lower the risk of *P. colocasiae* being present on fresh taro exports.

The visit also aimed to collect fresh strains of *P. colocasiae* from the field to ensure the validity of future research. Although a collection of strains is currently held at Plant & Food Research (PFR), Auckland, few are from Samoa and all have been in culture for at least 18 years. Many have lost pathogenicity over this time.

In addition to the main aims, this trip provided valuable field experience with TLB for Amy Maslen-Miller, a Samoan-New Zealand MSc student who is doing a project on the molecular and pathogenic variability of *P. colocasiae* at the University of Auckland and Plant & Food Research.

2.0 Schedule of activities

September

Monday 14	Arrive Samoa 8:40pm
Tuesday 15	Informal meeting with PHAMA and MAF staff Preparation and organisation of field collecting visits
Wednesday 16	Field collection of TLB, Western Upolu
Thursday 17	Field collection of TLB, Eastern Upolu
Friday 18	Isolations of TLB from leaves Inoculation of taro corms Formal meeting with PHAMA and MAF staff
Saturday 19	Sub-culturing of TLB isolates Visit to SROS Prepare TLB isolates for transport to New Zealand (duplicate set of cultures left at Nu'u) Meeting with PHAMA and MAF to report on visit and provide summary of recommendations Depart Samoa 9:40pm

The collections of TLB were made during the first days of the visit to allow the isolations from leaves to grow, be identified and then captured into pure culture in the time available.

3.0 Discussion with Samoan MAF personnel

3.1 Ministry of Agriculture and Fisheries meeting (Tuesday 15 September 2015)

Attendees:

- Asuao Kirifi Pouono – PHAMA, Samoa National Market Access Coordinator.
- Toilolo Pueata Tanielu – MAF, Principal Crops Development Officer
- Dr Seuseu Joseph Tauati – MAF, Consultant
- Parate Matalavea – MAF, Principal Crops Research Officer
- Faalelei Tunupopo - MAF Entomologist
- Angelika (Angie) Tugaga - MAF Nematologist, entomologist
- Joy Tyson – PFR pathologist
- Dr Bob Fullerton – PFR pathologist
- Amy Maslen-Miller - MSc student

This was primarily a short introductory meeting to introduce Samoan MAF and New Zealand PFR staff and discuss the purpose of the visit and the proposed activities for the coming week.

3.2 Ministry of Agriculture and Fisheries meeting (Friday 18 September 2015)

Attendees:

- Asuao Kirifi Pouono
- Parate Matalavea
- Toilolo Pueata Tanielu
- Dr Seuseu Joseph Tauati
- Faalelei Tunupopo
- Angelika Tugaga
- Joy Tyson
- Dr Bob Fullerton
- Amy Maslen-Miller

This was the key meeting with MAF staff to discuss and work through the report “New Access for Taro to Australia” prepared for PHAMA (Tyson & Fullerton 2015). The aim was to familiarise MAF personnel with the scope and complexity of a research programme aimed at developing a case for access for Samoan taro to Australia and to develop an action plan.

It had been anticipated that more senior staff from the Ministry of Agriculture and perhaps some exporters would be able to attend. In the event, both the CEO and acting CEO of MAF were unavailable and no exporters were present. The Quarantine Division of MAF was not represented.

The meeting was held at Nu'u Research Station and was facilitated and chaired by Kirifi Pouono, with the minutes taken by Amy Maslen-Miller. Opening prayer was given by Parate Matalavea.

The agenda for the meeting is provided in Appendix 1.

Introduction and analysis of review report

Bob Fullerton and Joy Tyson presented a brief outline of the life cycle of *P. colocasiae*, its pathology, and a summary of knowledge to date on corm infections, their symptoms, and the reported incidence of corm infection in different countries. This allowed the MAF participants, most of whom were not pathologists, to better understand the disease in relation to the constraints on exports.

During the discussions it was revealed that Dr Grahame Jackson, the pathologist who conducted extensive studies of corm infection of taro in the Solomon Islands in the 1970s, would be visiting Samoa the following week. MAF staff were urged to consult Grahame further on corm infections.

Joy Tyson then outlined the procedure that would be employed by Biosecurity Australia when undertaking a risk analysis for imported fresh taro. The key steps are:

- 1. Probability of importation**
 - a. How likely is it that *P. colocasiae* will be on the corms?
 - b. How likely it is to survive transit and land in Australia?
- 2. Probability of distribution**
 - a. Once in Australia, how likely is *P. colocasiae* to move from the import area to a suitable host?
- 3. Probability of establishment**
 - a. How likely it is to survive and reproduce in Australia?
 - b. Climate and host availability, pathogen biology
- 4. Probability of spread**
 - a. Once it lands in Australia, how likely is *P. colocasiae* to spread?
- 5. Consequences**
 - a. Impact on Australia if established.
 - b. Economic importance on taro plantation
 - c. Effects on the wider environment
 - d. Cost of eradication and ongoing control
 - e. Effects on trade (e.g. markets closed as a result)

Risk rate is then assigned using the following categories

- High
- Moderate
- Low
- Very low
- Extremely low
- Negligible

Currently the risk of *P. colocasiae* on fresh taro corms has been classified as a moderate risk to Australia, meaning that under present circumstances it is very unlikely Australia would allow importation of fresh taro corms from Samoa. However, the review did state that taro sourced from

areas not declared free of taro leaf blight will be considered on a case-by-case basis. If quarantine risks can be mitigated, then alternative conditions could be proposed.

This then set the scene and the challenges for the proposed project. To achieve access to Australia, the aim of the project must be to reduce the risk level from moderate to extremely low or negligible.

Bob Fullerton then led the discussion through the various components of the Research and Development Programme (Section 5) outlined in the document 'New Access for Taro to Australia' (Tyson and Fullerton 2015). Those discussions covered the range of questions and research needs detailed in Section 5 of the review and which would form the basis for a proposal for funding to support the initiative. The most immediate challenge is the lack of knowledge of corm rots caused by *P. colocasiae*. Although there are reports of *P. colocasiae* infecting corms, the amount of information is limited and little is known of the frequency of infection and the infection process.

It was noted that, while there are many questions to be addressed, the work needed is not technically difficult. It is essential however, that the work be carried out to a rigorous standard acceptable for publication in a peer-reviewed journal.

It was also noted that there is currently a study being carried out in Samoa on heat treatment of taro corms for disinfestation of mites and nematodes (Chhagan et al. 2015). That study could provide useful background on the potential for heat treatment to destroy *P. colocasiae* propagules on the surface of corms.

An essential requirement of the research would be access to fresh cultures of the pathogen for use in the experimental work. That step had already been achieved during the first phase of the visit by PFR and MAF staff who collected samples of TLB from around Upolu and have them saved as duplicate pure cultures. One set will be left at MAF and a second set returned to New Zealand. In the event the MAF cultures are lost, the strains can be imported from New Zealand.

Preliminary discussion on capabilities and resources

It was emphasised that one of the principal aims of visit was to determine the capacity of the different organisations (PFR, MAF, and SROS) to undertake the research and to make recommendations on where the research project could be carried out. It was noted that while Plant & Food Research have the physical facilities and capability to do the work in New Zealand they cannot easily access fresh taro corms essential for the work. The majority of consignments of taro from Samoa are fumigated with methyl bromide because of the presence of mites and/or nematodes on the corms. Methyl bromide damages the corms making them less suitable for critical experimental work. Thus, while technical support can be provided by PFR, the work can only be done in one or other of the Samoa-based organisations. It was an objective of the mission to evaluate the resources available in each of those organisations and to make recommendations on the most appropriate organisation to host the work.

While MAF staff were confident they could carry out the work, Pueata Tanielu explained that MAF have World Bank funding for the renovation of all the laboratories at Nu'u. This is expected to commence in 2016. The renovation programme would seriously disrupt any planned research programme.

It was noted that at the time of the meeting the PFR team had only visited MAF and final recommendations would be made after an analysis of the resources and capabilities of both organisations. Nevertheless, the opportunity was taken to discuss other issues, particularly the preparation of a project proposal and funding.

Asua stressed that the PHAMA involvement was limited to funding the current one-off consultancy and that PHAMA was not a potential funding agency for the research programme.

Dr Seuseu Tauati proposed a process whereby the project could be carried out by MAF by diverting some funding from several other current projects with the key researchers being Faalelei Tunupopo and Angie Tugaga. Talei Fidow-Moors (Principal Quarantine Officer) would also need to be involved. Because of its inherent funding uncertainties, that option was considered neither desirable nor viable. It was stressed that it had to be a formal, stand-alone project with dedicated funding to cover all needs and resources.

Dr Seuseu Tauati outlined the procedure to be followed by MAF in developing a programme of this kind. He would write the backbone of a proposal with input from MAF staff. The proposal would then

be passed to the Project and Planning Division for approval. Dr Seuseu Tauati, who reports directly to the CEO, would consult with the CEO to gain approval for the project. It was noted that, while the PFR team could offer advice on the content of the proposal, its preparation was not within their current brief. Once the proposal is prepared and approved by the CEO, donors could be sought.

Dr Seuseu Tauati also suggested that, while they continue with the preparation of the proposal, the MAF team start preliminary experiments on some of the research questions. If they are able to demonstrate some progress, the CEO of MAF will be more likely to approve this project. All communications on the project and the proposal should be via the Acting CEO Misa Konelio.

3.3 Analysis of resources and capabilities

3.3.1 MAP

The pathology laboratory at Nu'u is not currently equipped for effective pathology work, with essential facilities and equipment either lacking or non-functional. It does have a functioning laminar flow cabinet. The microscopes are adequate though the compound microscopes are in need of maintenance. There is a shortage of basic glassware, media bottles and containers, and no autoclave. Media is prepared in an old pressure cooker operated on a gas burner on the floor of the laboratory. The pressure cooker appeared not to have been used for some time though was said to be operational. There are significant safety issues surrounding the use of the pressure cooker, not only because of its age but also the fact that it is used inside the laboratory immediately alongside the gas bottle. There are no water baths or controlled temperature cabinets, facilities that would be essential for the effective execution of this project.

Plant pathology expertise is limited. Dr Seuseu Tauati, a molecular pathologist, has a senior role as advisor to the CEO and would have limited time available direct participation in the research programme. The more senior pathologists, Parate Matalavea and Taelii Mauga, appear to be engaged in other projects. Faalelei Tunupopo and Angie Tugaga, while both entomologists are energetic and committed and, with appropriate guidance, would be able to provide the core technical inputs to the project.

3.3.2 Scientific Research Organisation of Samoa

The team met with, and was given a tour of SROS facilities, by Pousui Dr Fiame Leo (Manager, Technical Services Division). SROS was established in 2006 to add value to Samoa's local industries through scientific and technical research appropriate to Samoan needs and conditions. The organisation has specialised laboratories for research into bio-fuels (bio-ethanol and bio-diesel), new product development, sensory evaluation, postharvest horticulture, food microbiology, shelf-life testing and food quality factors.

SROS operates as an active research organisation with staff engaged across a wide variety of projects. The laboratories are well equipped including fully operational microbiological facilities which would be essential for the taro project. Of particular interest to the TLB programme are the relative humidity cabinets and temperature controlled store rooms capable of providing different storage conditions for taro.

SROS does not have plant pathologists on its staff at present.

3.3.3 Conclusion

Following the review of the facilities and capabilities of both organisations, the team concluded that, because of appropriate facilities including immediate access to humidity cabinets and controlled temperature rooms, SROS would be the most appropriate organisation to host the project. They do however lack the plant pathology staff and skills needed for the project.

It was recommended therefore that the TLB programme be a joint research project based at SROS but supported provided by Faalelei Tunupopo and Angie Tugaga of MAF, who in turn would be supported by external specialist pathology expertise.

3.4 Final meeting with Ministry of Agriculture and Fisheries (Monday 21 September 2015)

Present:

- Asuao Kirifi Pouono
- Toilolo Pueata Tanielu
- Dr Seuseu Joseph Tauati
- Parate Matalavea
- Faalelei Tunupopo
- Angelika (Angie) Tugaga
- Joy Tyson
- Dr Bob Fullerton
- Amy Maslen-Miller

The purpose of the meeting was to present and discuss the findings and recommendations of the mission and to agree on a plan of action to develop the market access research programme.

The meeting was chaired by Asuao Kirifi Pouono.

Bob Fullerton reiterated the objectives of the visit:

1. To collect new isolates of *P. colocasiae*
2. To introduce the findings of the TLB review report and its conclusions to MAF. To assess capacity/ability of laboratories to do the outlined research programme.
3. To make recommendations on the most appropriate organisation to host and lead the programme.

He thanked MAF and particularly Faalelei and Angie for their organisation of the programme which allowed all objectives to be met in the short time available.

Discussion on recommendations

Bob Fullerton presented the conclusions by the team that:

- SROS is better positioned than MAF to host work that is needed in the project because of their superior facilities and equipment.
- The uncertainties of access to laboratories at Nu'u in the near future because of the impending reconstruction were a factor in that decision.
- MAF has the technical expertise in Faalelei Tunupopo and Angelika Tugaga to contribute to the project but they would need additional technical external support.
- It is recommended that the project be a joint SROS/MAF project hosted at SROS.

The mechanism for developing such a joint project would be up to SROS and MAF to determine. For example, if SROS were to lead the project, they would require pathology inputs from MAF. It was proposed by Dr Seuseu Tauati that the CEOs from both organisations should meet first to agree on the structure of a joint project.

Dr Seuseu Tauati raised the possibility of USP being involved as they also have pathology laboratories and there is the potential for student involvement. While the team had not visited USP during the visit, it was considered that a teaching institution such as USP may not be appropriate to host this sensitive and highly focused programme that will require results that will withstand scrutiny from the Australian Quarantine Authorities.

Asuao Kirifi Pouono, in summing up from the Chair, stated that it was clear where the process needed to go, and that it should be a co-operative project between MAF and SROS. The key steps would be:

- the presentation of the visit report,
- a meeting of CEOs from both organisations,
- the preparation of a project proposal and
- a search for appropriate donors.

4.0 Collection of *Phytophthora colocasiae*

4.1 Taro leaf blight collection

Collections were made over 16–17 September 2015, samples of leaves with obvious taro leaf blight were collected from 13 farms around the island of Upolu, Samoa. This was greatly facilitated by, and would not have been possible without, the organisational skills, local knowledge and general assistance provided the Crops Research Team at Nu'u.

Over the collection period of 16 and 17 September, at least 10 leaves with active leaf blight lesions (Figure 1) were taken from each field (Table 1). Figure 2 shows the location of the farms visited. The weather was cloudy and cool on the Wednesday and rainy on the Thursday, good weather for taro leaf blight activity. Sporangia had been formed on many of the lesions the previous nights.

Leaves were transported back to the laboratory at Nu'u Research Station in plastic bags, on ice in a chilly bin. Isolations were made from the leaf material on the afternoon it was collected.



Figure 1. Taro leaf blight lesions (Samoa, September 2015)

Table 1. Taro leaf blight collection sites

Host/variety	Plant part	Locality & farmer	Date
Colocasia esculenta	leaf lesion	Lalonea, John Maposua	16-Sep-15
Colocasia esculenta	leaf lesion	Aleisa, George Harder	16-Sep-15
Colocasia esculenta	leaf lesion	Tanumalala, Samalaulu & Moe	16-Sep-15
Colocasia esculenta	leaf lesion	Savaia, Rev. Poka Maua	16-Sep-15
Colocasia esculenta 'Fusi'	leaf lesion	Vaiee, Meauli Teo	16-Sep-15
Colocasia esculenta	leaf lesion	Siumu, Fatani Asotasi	16-Sep-15
Colocasia esculenta 'Samoa 2'	leaf lesion	Tiavi, anon. farmer (roadside)	17-Sep-15
Colocasia esculenta	leaf lesion	Saleilua, Tulau Manu	17-Sep-15
Colocasia esculenta 'Samoa 2'	leaf lesion	Malaemalu, Unai Solia	17-Sep-15
Colocasia esculenta	leaf lesion	Sapunaoa, Mesepa Leauasa	17-Sep-15
Colocasia esculenta	leaf lesion	Aufaga, Enele Pauni	17-Sep-15
Colocasia esculenta	leaf lesion	Samusa, Siaki Ioapo	17-Sep-15
Colocasia esculenta	leaf lesion	Tiavea Uta, Tanielu Rasmussen	17-Sep-15



Figure 2. Location of taro leaf blight collection sites (amended from map provided by Fa'alelei Tunupopo, Samoa MAF)

4.2 Isolation of *Phytophthora colocasiae*

Isolations of *Phytophthora colocasiae* were made as follows:

Small pieces of the edge of an active TLB lesion, or clusters of sporangia from the edge of a lesion, were transferred to CARPP medium plates. This is a selective oomycete medium, modified from Jeffers and Martin (1986), consisting of corn meal agar amended with 2 mg/L carbendazim, 250 mg/L ampicillin, 10 mg/L rifampicin, 5 mg/L pimaricin and 100 mg/L pentachloronitrobenzene (Tyson et al. 2014).

Isolation plates were incubated at ambient temperature in the laboratory (c. 25°C).

After 48 h growth, the resulting colonies were aseptically sub-cultured from the expanding edge of the colony onto V8 juice agar (Hine & Aragaki 1963).

4.3 Export and storage of *Phytophthora colocasiae* isolates

On Sunday 20 September 2015, at least three isolates from each collection site were sub-cultured in duplicate onto CARPP medium slopes in glass Universal bottles. One set of cultures remained at Nu'u, the other was carried to New Zealand.

The cultures were imported into New Zealand under MPI import permit no. 2014055089 and BACC no. 0003323. They are currently held at the PFR containment facility #2712, MARC, Rm 0414 (PC2 laboratory), under ERMA approval no. NOC07009 and CTO approval 20141112 *Phytophthora colocasiae* (expires 30 November 2019).

The isolates were examined for contamination on arrival in the New Zealand PFR laboratory, sub-cultured onto V8 juice agar and their identity confirmed as *P. colocasiae* morphologically. Appendix B gives the details of the *P. colocasiae* isolates held.

Amy Maslen-Miller is currently using a selection of these isolates in her MSc research.

5.0 References

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Appendix A

Agenda for meeting with
MAF Samoa (18 Sept
2015)

Appendix A Agenda for meeting with MAF Samoa (18 Sept 2015)

Access for Samoan Taro to Australia

Meeting with Samoa Ministry of Agriculture to discuss scope of research programme to develop case for access

Nu'u Research Station

18 September 2016

10.00-12.00 AM

Chair: Asuao Kirifi Pouono - PHAMA

AGENDA

1. Life cycle of *Phytophthora colocasiae* – Bob Fullerton
2. Introduction to review document – Bob Fullerton
 - a. Focus on 'corm rots' – Joy Tyson (P4)
 - b. Existing Australian import health standards – Joy Tyson
3. Proposed Research and Development Programme (P13)
 - a. Recognition and quantification of corm infections (5.1)
 - b. Survival of propagules (sporangia) (5.2)
 - c. Corm treatments (5.3)
 - d. Critical work (5.4)
4. Capability needs for programme
 - a. External - Joy, Bob, Amy
 - b. Local - MAFFM, SROS?
 - c. Physical resources
 - i. Microscopes
 - ii. Laboratory resources (laminar flow, incubators, fridges, glassware, containers etc.
 - iii. Autoclave
 - iv. Transport
 - v. Status of laboratories over next year
5. Action Plan
 - a. Independent project
 - b. Buy-in by Samoan agencies (MAF, SROS)
 - c. Preparation of concept proposal and budget
 - d. Identify donors
 - e. Preparation of full proposal



Appendix B

Phytophthora colocasiae
isolates collected

Appendix B *Phytophthora colocasiae* isolates collected

PFR culture no.	Previous accession no.	Host/variety	plant part	Country	Locality, Farmer	Date
Pc64	Samoa 1.2	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Lalonea, John Maposua	Sep-15
Pc65	Samoa 1.6	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Lalonea, John Maposua	Sep-15
Pc66	Samoa 1.8	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Lalonea, John Maposua	Sep-15
Pc67	Samoa 1.9	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Lalonea, John Maposua	Sep-15
Pc68	Samoa 2.1	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Aleisa, George Harder	Sep-15
Pc69	Samoa 2.4	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Aleisa, George Harder	Sep-15
Pc70	Samoa 2.5	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Aleisa, George Harder	Sep-15
Pc71	Samoa 2.8	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Aleisa, George Harder	Sep-15
Pc72	Samoa 3.2	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Tanumalala, Samalaulu & Moe	Sep-15
Pc73	Samoa 3.6	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Tanumalala, Samalaulu & Moe	Sep-15
Pc74	Samoa 3.7	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Tanumalala, Samalaulu & Moe	Sep-15
Pc75	Samoa 3.10	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Tanumalala, Samalaulu & Moe	Sep-15
Pc76	Samoa 4.1	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Savaia, Rev. Poka Maua	Sep-15
Pc77	Samoa 4.4	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Savaia, Rev. Poka Maua	Sep-15
Pc78	Samoa 4.6	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Savaia, Rev. Poka Maua	Sep-15
Pc79	Samoa 4.8	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Savaia, Rev. Poka Maua	Sep-15
Pc80	Samoa 5.1	<i>Colocasia esculenta</i> 'Fusi'	leaf lesion	Samoa	Vaiee, Meauli Teo	Sep-15
Pc81	Samoa 5.3	<i>Colocasia esculenta</i> 'Fusi'	leaf lesion	Samoa	Vaiee, Meauli Teo	Sep-15
Pc82	Samoa 5.5	<i>Colocasia esculenta</i> 'Fusi'	leaf lesion	Samoa	Vaiee, Meauli Teo	Sep-15
Pc83	Samoa 5.8	<i>Colocasia esculenta</i> 'Fusi'	leaf lesion	Samoa	Vaiee, Meauli Teo	Sep-15
Pc84	Samoa 6.2	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Siumu, Fatani Asotasi	Sep-15

PFR culture no.	Previous accession no.	Host/variety	plant part	Country	Locality, Farmer	Date
Pc85	Samoa 6.4	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Siumu, Fatani Asotasi	Sep-15
Pc86	Samoa 6.5	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Siumu, Fatani Asotasi	Sep-15
Pc87	Samoa 6.10	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Siumu, Fatani Asotasi	Sep-15
Pc88	Samoa 7.1	<i>Colocasia esculenta</i> 'Samoa 2'	leaf lesion	Samoa	Tiavi, anon. farmer (roadside)	Sep-15
Pc89	Samoa 7.3	<i>Colocasia esculenta</i> 'Samoa 2'	leaf lesion	Samoa	Tiavi, anon. farmer (roadside)	Sep-15
Pc90	Samoa 7.6	<i>Colocasia esculenta</i> 'Samoa 2'	leaf lesion	Samoa	Tiavi, anon. farmer (roadside)	Sep-15
Pc91	Samoa 7.10	<i>Colocasia esculenta</i> 'Samoa 2'	leaf lesion	Samoa	Tiavi, anon. farmer (roadside)	Sep-15
Pc92	Samoa 8.2	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Saleilua, Tulau Manu	Sep-15
Pc93	Samoa 8.3	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Saleilua, Tulau Manu	Sep-15
Pc94	Samoa 8.5	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Saleilua, Tulau Manu	Sep-15
Pc95	Samoa 8.9	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Saleilua, Tulau Manu	Sep-15
Pc96	Samoa 9.1	<i>Colocasia esculenta</i> 'Samoa 2'	leaf lesion	Samoa	Malaemalu, Unai Solia	Sep-15
Pc97	Samoa 9.4	<i>Colocasia esculenta</i> 'Samoa 2'	leaf lesion	Samoa	Malaemalu, Unai Solia	Sep-15
Pc98	Samoa 9.5	<i>Colocasia esculenta</i> 'Samoa 2'	leaf lesion	Samoa	Malaemalu, Unai Solia	Sep-15
Pc99	Samoa 9.7	<i>Colocasia esculenta</i> 'Samoa 2'	leaf lesion	Samoa	Malaemalu, Unai Solia	Sep-15
Pc100	Samoa 10.1	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Sapunaoa, Mesepa Leauasa	Sep-15
Pc101	Samoa 10.3	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Sapunaoa, Mesepa Leauasa	Sep-15
Pc102	Samoa 10.6	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Sapunaoa, Mesepa Leauasa	Sep-15
Pc103	Samoa 10.7	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Sapunaoa, Mesepa Leauasa	Sep-15
Pc104	Samoa 11.3	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Aufaga, Enele Pauni	Sep-15
Pc105	Samoa 11.4	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Aufaga, Enele Pauni	Sep-15
Pc106	Samoa 11.6	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Aufaga, Enele Pauni	Sep-15

PFR culture no.	Previous accession no.	Host/variety	plant part	Country	Locality, Farmer	Date
Pc107	Samoa 11.7	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Aufaga, Enele Pauni	Sep-15
Pc108	Samoa 11.10	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Aufaga, Enele Pauni	Sep-15
Pc109	Samoa 12.1	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Samusa, Siaki loapo	Sep-15
Pc110	Samoa 12.3	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Samusa, Siaki loapo	Sep-15
Pc111	Samoa 12.6	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Samusa, Siaki loapo	Sep-15
Pc112	Samoa 12.7	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Samusa, Siaki loapo	Sep-15
Pc113	Samoa 12.8	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Samusa, Siaki loapo	Sep-15
Pc114	Samoa 13.2	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Tiavea Uta, Tanielu Rasmussen	Sep-15
Pc115	Samoa 13.3	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Tiavea Uta, Tanielu Rasmussen	Sep-15
Pc116	Samoa 13.5	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Tiavea Uta, Tanielu Rasmussen	Sep-15
Pc117	Samoa 13.7	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Tiavea Uta, Tanielu Rasmussen	Sep-15
Pc118	Samoa 13.8	<i>Colocasia esculenta</i>	leaf lesion	Samoa	Tiavea Uta, Tanielu Rasmussen	Sep-15