Final report

Project title:

Chestnut Rot Evaluation Trial

Project leader:

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Delivery partner:

Chestnuts Australia Inc

Report author/s:

Trevor Ranford

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CH23002

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Public summary

Nut rot of chestnuts is an emerging disease becoming of worldwide importance. In Australia up to 70% of chestnuts may be affected, while in Europe losses may be as high as 90%. The disease is mainly expressed after harvest and it is cryptic, as healthy-looking nuts on the surface are rotten internally. It is a disease of great economic importance as infected nuts cannot be consumed, is not easily detected and hence reduce consumer confidence when unknowingly purchasing infected chestnuts.

Investigation into controls for nut rot are limited. The objective of the project was to study the management and/or control methodologies from Australia and overseas to

a) build a library of information,
b) link with researchers from within Australia and International,
c) look to present a suite of management tools that could be used by Australian Chestnut producers.

Some of the previous work undertaken included: -

- Use of selected fungicides and the timing of their applications.
- Use of other chemicals like Phosphonate Salts.
- Biological controls.
- Orchard sanitation and management.

The broad Chestnut Industry objective was to establish scientifically accepted and robust management techniques that would result in the management (and possible elimination) of nut rot.

Technical summary

Nut rot of chestnuts is an emerging disease becoming of worldwide importance. In Australia up to 70% of chestnuts may be affected, while in Europe losses may be as high as 90%. The disease is mainly expressed after harvest and it is cryptic, as healthy-looking nuts on the surface are rotten internally. It is a disease of great economic importance as infected nuts cannot be consumed, is not easily detected and hence reduces consumer confidence when unknowingly purchasing infected chestnuts.

Investigation into chemical control for nut rot is limited. One study was conducted in Australia, where six fungicides were first tested *in vitro* against two isolates, then applied in the orchards (Silva-Campos et al. 2022b).

Based on the *in vitro* study, pyraclostrobin and difenoconazole were selected for field trials and applied during flower anthesis. Active ingredients combined were more effective than single applications in suppressing the level of nut infection caused by *G. smithogilvyi.* Furthermore, pyraclostrobin and difenoconazole were more effective at reducing infection of the stigmas than of styles and nuts.

The project aimed to take these learnings and apply the chemicals in the field and assess their efficacy and residues. From the data the industry would determine the next phase of achieving a workable and effective set of management tools utilising these or other fungicides.

The project also assessed a range of other management tools with the objective of either undertaking further assessments and/or trials or implementing techniques already found to have some benefit in the management of Nut rot.

The broad Chestnut Industry objective was to establish scientifically accepted and robust chemical application techniques that will result in the management (and possible elimination) of nut rot.

Keywords

Chestnuts, nut rot, *in vitro* study, pyraclostrobin, difenoconazole, Phosphonate Salts, *Gnomoniopsis smithogilvyi*

Introduction

Nut rot of chestnuts is an emerging disease becoming of worldwide importance. In Australia up to 70% of chestnuts may be affected, while in Europe losses may be as high as 90%. The disease is mainly expressed after harvest and it is cryptic, as healthy-looking nuts on the surface are rotten internally. It is a disease of great economic importance as infected nuts cannot be consumed, is not easily detected and hence reduces consumer confidence when unknowingly purchasing infected chestnuts.

Investigation into chemical control for nut rot is limited. One study was conducted in Australia, where six fungicides were first tested *in vitro* against two isolates, then applied in the orchards (Silva-Campos et al. 2022b). The fungicides tested *in vitro* included pyraclostrobin, difenoconazole, Iprodione, fludioxonil, prochloraz, and cyprodinil+fludioxonil. The experiments showed that of those tested fungicides, pyraclostrobin followed by difenoconazole-based fungicides inhibited conidial germination and mycelial growth, respectively.

Based on the *in vitro* study, pyraclostrobin and difenoconazole were selected for field trials and applied during flower anthesis. Active ingredients combined were more effective than single applications in suppressing the level of nut infection caused by *G. smithogilvyi*. Furthermore, pyraclostrobin and difenoconazole were more effective at reducing infection of the stigmas than of styles and nuts.

The use of these selected fungicides may provide an additional tool for growers to complement their current practices in the control of chestnut rot, however, the effectiveness of the fungicides tested in suppressing growth of the fungus is a little underwhelming, given that even the most effective combined fungicide treatment, irrespective of time of inoculation, did not result in adequate protection (at most it halved the infection occurrence).

The broad Chestnut Industry objective was to establish scientifically accepted and robust chemical application techniques that will result in the management (and possible elimination) of nut rot.
Ultimately the aim was to establish a result, from a set of chemical trials, which might lead to achieving permit and/or label registration of chemicals to be utilised to control/manage nut rot as required for the Australian Chestnut Industry.

Methodology

The broad Chestnut Industry objective was to establish scientifically accepted and robust chemical application techniques that would result in the management (and possible elimination) of nut rot.

Ultimately the aim was to establish a result, from a set of chemical trials, which might lead to achieving permit and/or label registration of chemicals to be utilised to control/manage nut rot as required for the Australian Chestnut Industry.

To establish an agreed methodology that would offer a base line for growers to implement in the future this project - CH23002 Chestnut rot evaluation trials – undertook some basic grower trials including the evaluation of the methodology and the assessment of vegetative material and nuts to show the level of efficacy (or not) of the trials and ensure there were no issues with the quality and safety of the subsequent nuts.

The starting point was to conduct, assess and review two industry-based trials of Difenoconzole and Pyraclostrobin. The growers' trials were undertaken on selected sites at Wandiligong, Victoria and Tumbarumba, NSW.

The components to the project included: -

1. **Laboratory Testing Technique**
    - Review of laboratory testing and confirm selection of the chemicals.
    - Consider the following chemicals/products: -
        - Difenoconzole
        - Pyraclostrobin.

    The two laboratories engaged were: -
    - Department of Energy, Environment and Climate Action, Crop Health Services, Bundoora, Victoria for the testing for the presence/absence of nut rot.
    - **Agrifood Technology,** Werribee, Victoria for the testing of harvest nut samples were collected from both the control trees/site and the treated trees/site for any chemical residues.

2. **Source Material**

    Liaise with CAI growers in specific regions about their experiences with Nut Rot and farm trials utilising certain chemicals.
    Vegetative samples including buds, leaves, stems and burrs were collected for testing and sent to the laboratory at Bundoora. Similarly harvested nuts were collected and sent to the laboratory at Bundoora for chemical pathogen testing.

    Nuts were collected and forwarded to the laboratory at Werribee for chemical residue testing.

    The results of the testing of these samples are detailed in ***Appendix A*** to the Final Report

3. **Testing**

    Arrange the testing.

    Trial one will be as follows: -
        - Commencement within 10 days.
        - Three applications through the flowering season with 1 row as a control.
        - Variety treated: - Perfection (Premium JF) or selection by grower.
        - Water rate applied - 780 litres/ha.
        - All treatments through flowering only.
        - First spray at 10% flowering. Rosettes about 2-4mm.
        - Second spray@ 50% flowering. Rosettes about 6-8mm.
        - Third spray@ 100% flowering. Rosettes about 12-15mm.

    Trial two is: -
        - A total of three sprays across the season
        - Sprays 30 days apart.

    The results of the testing of these samples are detailed in ***Appendix A*** to the Final Report

4. **Field Trial**

    Arrange two trial sites, one in Wandiligong (Victoria) and one in Tumbarumba (NSW).
    These two trial locations are geographically separated so that the weather would be different between locations.
    The following activities will be undertaken: -
    - Undertake spray trial sites.

- Undertake sampling of nuts to test for diseases presence/absence and chemical residues.
- Undertake sampling of vegetative plant material to test for presence/absence of diseases with the objective of assessing the efficacy of the chemical trials.
- Detail the application methodology and the weather conditions during the season.

The results of the testing of these samples are detailed in ***Appendix A*** that is attached to this Final Report.

5. Review of past chemical trials

Undertake a full review of: -

- Past chestnut industry chemical trials
- Trials undertaken by Deakin University.
- Trials undertaken by industries overseas.

From this information prepare a full report on: -

- Chemicals used.
- Times of application during the phenological cycle of the plant
- Times of application during the disease cycle.
- Design some scientifically sound and practical methodologies that can be utilised in a full chemical trial program commencing in September 2024.

Details of the reviews can be found in the ***Appendices B, C, D and G*** that are attached to this Final Report.

Results and discussion

From past research the following was highlighted.

Fungicide Application Efficacy: In the field, the combined application of pyraclostrobin (100 µg/mL = 0.1mg/mL) and difenoconazole (125 µg/mL = 0.125mg/mL) demonstrated greater effectiveness in reducing the level of chestnut infection caused by *G. smithogilvyi* compared to individual applications of each fungicide. This suggests a synergistic effect when both fungicides are used together.

The objective, in part, of Project CH23002 was to test the hypothesis through grower farm trials.

The following are some of the results:

SUMMARY OF VEGETATIVE TESTS:

TRIAL 1: Test of vegetative material.

SAMPLE NO:	DATE	CONTROL	TREATED	COMMENT
1	11th December 23	Nut Rot Found		Samples taken from trees not sprayed
2	19th December 23	Nut Rot Found	NO Nut Rot	After 1st Round of sprays
3	10th January 24	Nut Rot Found	NO Nut Rot	After the three rounds of sprays

TRIAL 2: Test of vegetative material.

SAMPLE NO:	DATE	CONTROL	TREATED	COMMENT
1	4th December 23	Nut Rot Found		Samples taken from trees not sprayed
2	Spray applied on 4th December and sample taken on the 12th of December 23	Nut Rot Found 26 colonies out of 28	Nut Rot found infrequently 3 colonies out of 28	After 1st Round of sprays
3	Spray applied on the 5th of January and sample taken on the 12th of January 24	Nut Rot Found Frequently	Nut Rot found infrequently	After 2nd round of sprays
4	Spray applied in the first week of February and the samples taken on the 12th of February 24	Nut Rot consistently found	No Nut Rot found	After 3rd round of sprays
5	Sample taken before harvest around 20th March 2024	Consistently recovered Nut Rot	No Nut Rot found	Samples taken before harvest commenced

The following are general comments:

- Infrequent means less than 10% of samples
- Frequently means in excess of 80% of samples
- Other organisms found at times including: -
    - Pestalotiopsis

- Botrytis
- Epicoccum
- Mucor
- Cladosporium
- Yeasts

SUMMARY OF NUT TESTS:

TRIAL 1:

Harvested nuts tested on the 17th of April 2024

- Control: Consistently recovered Nut Rot – 28 out of 28 colonies
- Treated: Infrequently recovered Nut Rot – 10 out of 28 colonies

TRIAL 2:

Harvested nuts tested on the 11th of April 2024

- Control: Consistently recovered Nut Rot – 28 out of 28 colonies
- Treated: Infrequently recovered Nut Rot – 3 out of 28 colonies and Pestalotiopsis – 2 out of 28 colonies.

Nuts collected from cool room and tested on 24th of May 2024

1st Pick

- Control: 28 out of 28 colonies
- Treated: NO Nut rot found

2nd Pick

- Control: 26 out of 28 colonies
- Treated: 14 out of 28 colonies

3rd Pick

- Control: 23 out of 28 colonies
- Treated: 23 out of 28 colonies

In relation to the chemical testing there were **NO residues** found for either chemical in the nuts that had been harvested from both the control and treated trees/sites as detailed in the following report below: -

Agrifood TECHNOLOGY

NATA
Accreditation No. 2726
Accredited for compliance with ISO/IEC 17025 - Testing

ANALYSIS REPORT

Final Report

Job No:	**J2305-1362**
Date Issued:	21-May-2023
Report Number:	221122

Attention:	Trevor Ranford	*Purchase Order:*	Received: 12/5/23
Client:	Chestnuts Australia Inc	*Date Sampled:*	
Address:	27 Ludgate Hill Road ALDGATE SA 5154	*Date Received:*	12-May-2023

The following sample was analysed:

Sample ID		
S23-0050911	Your Reference	A
	Product	Chestnuts
	Description	Chestnuts

Analysis of this sample conducted between 12-May-2023 and 18-May-2023

Analysis Results

	Determinant	MRL	LOR	Result
AT3 Chemicals Test List (TP/311 & 312) ^				
S23-0050911	Difenoconazole	N/A	<0.010	<0.010 mg/kg
AT5 Chemicals Fresh Test List (TP/311 & 312)				
S23-0050911	Pyraclostrobin	N/A	<0.010	<0.010 mg/kg

Note: All samples are analysed on an 'as received' basis, all results are based on the sample received.
This report is not to be reproduced except in full.

Please refer to the following link for the measurement of uncertainty values for all NATA accredited analysis

<https://services.awta.com.au/AFTMeasurementUncertainty/index.php>

N/A denotes no MRL available.
MRL stated is as per Food Standards Code guidelines.
LOR = Level of reporting.

^ - NATA Accreditation does not cover the performance of this test/Component.

The sample(s) referred to in this report were analysed for the following determinant(s):

Analysis	Method	Laboratory
AT3 Chemicals Test List	TP/311 & 312	Food Safety Laboratory
AT5 Chemicals Fresh Test List	TP/312	Food Safety Laboratory

The results in this report were authorised by:

Name	*Title*
Doreen Fernandez	**Divisional Manager**

Doreen Fernandez

Full reports will be made available to APVMA if they are considered as acceptable evidence.

FINAL OBSERVATIONS AND COMMENTS FROM THE TRIALS:

- All 'control' plant material had nut rot spores.
- So, a level of spores in the orchard right from the beginning of the season
- This might be expected.
- Chemical applications reduced the level of infection.

GOING FORWARD:

- Have pathologist(s) and chemical companies assess the results and propose a different(s) set of application regime(s).
- Look at other chemicals to add to the list

FINAL OBSERVATIONS AND COMMENTS IN RELATION TO ORCHARD MANAGEMENT:

- Concerns that burrs are not being removed from the orchard
- Not convinced that mulching is effective in reducing spore loads.
- Suggestion that spore loads have increased in the orchard and given the 'prime' environmental conditions we had a 'perfect storm'.

GOING FORWARD:

- Test of trees – stem material and buds.
- Test of mulched material
- Test of soil

All over the period between now and flowering to try an access spore level in the orchard.

OTHER TRIALS/OPPORTUNITIES:

- Phosphonate/Zinc products – trying to access that used by Europe
- Option is to see if a chemical company can prepare a local mix.
- Review of Trichoderma – but not convinced it is a strong option.
- Continue to communicate with Michigan University researchers and look at seeing if they will undertake like trials.

Following on from the Grower meeting (15th July 2024) a number of other fungicides were suggested as worthy of review and consideration.
They included: -

- Luna Experience (Fluopyram & Tebuconazole)
- Aztec (Azoxystrobin)
- Custodia forte (Azoxystrobin & Tebuconazole)

Outputs

Table A. Output summary

Output	Description	Detail
Farm trials.	The activity was to support a small number of growers to undertake some specific farm trials to see if they could minimise the effects of nut rot.	The growers in conjunction with the Project Leader discussed the options and established an agreed set of protocols to be undertaken. The growers' trials were undertaken on selected sites at Wandiligong, Victoria and Tumbarumba, NSW. Details of the sites/trials are covered in the Grower Farm Trials report which is attached to the Final Report as ***Appendix A.***
Detail the trials.	The Project Leader, in conjunction with the individual growers detailed the trials being undertaken including the application times and rates, weather conditions and other specific application processes.	The two trials were as follows: - **TRIAL 1:** Application of chemicals at 10% flowering. 50% flowering and 100% flowering. **TRIAL 2:** Applications were applied on the basis of every 30 days commencing in the first week of December and then in the first week of January and February. A fourth application was to occur in the first week of March, but harvest commenced early. Details of the sites/trials are covered in the Grower Farm Trials Report which is attached to the Final Report as ***Appendix A.***
Sampling of vegetative material.	Members of the Project Team worked with the individual growers to undertake the collection and delivery of vegetative samples at appropriate times and have the samples tested for the presence/absence of nut rot.	Prior to the commencement of the applications vegetative samples were taken and sent to the Department of Energy, Environment and Climate Action, Crop Health Services, Bundoora, Victoria. After each application vegetative samples were taken and sent to the laboratory. Each sample included vegetative material from the control trees/site and samples from the treated trees/site so that there was a comparison of the trial against untreated trees – the control. Results from each test were supplied to the grower. The results have been included in the Grower Farm Trials Report which is attached to the Final Report as ***Appendix A***.
Sampling of nuts.	Members of the Project Team worked with the individual growers to undertake the collection of nuts, at harvest, and have the samples tested for both the presence/absence of nut rot and any specific chemical residues.	After harvest nut samples were collected from both the control trees/sites and the treated trees/sites and sent to the Department of Energy, Environment and Climate Action, Crop Health Services, Bundoora, Victoria. These samples were tested for the presence/absence of nut rot. Results from each test were supplied to the grower. The results have been included in the Grower Farm Trials Report which is attached to the Final Report as ***Appendix A***. After harvest nut samples were collected from both the control trees/site and the treated trees/site and sent to **Agrifood Technology,** Werribee, Victoria. A full set of chemicals were tested but with particular reference to Difenoconzole and Pyraclostrobin. Based on the results there were NO residues found in either the control and/or treated nuts from both Trial 1 and Trial 2.

Report on the grower trials.	The Project Leader was to prepare a full report on the grower trials.	A Full report on the grower trials and results are attached to the Final Report as ***Appendix A.*** **Due to the sensitivity of the information this Appendix should not be made available to a wide audience.** The Project Team will be discussing the trials and results with APVMA, chemical companies and researchers to draw relevant conclusions and/or assist in taking the results further in the process of seeking permit or label registration.
Review of climatic data.	Members of the Project Team were to undertake a review of past and current available climatic data and make an assessment against past incidents of nut rot.	Neither grower had a weather station on their property and the inclusion of weather stations as part of this project was ultimately left out. Both growers reported on some of the seasonal climatic conditions during the trial period and this has been recorded within the Grower Farm Trial Report. Members of the Project Team have been working through the information and data from the TAFCO Rural Supplies Weather Station Network across the NE Region. Material from these sites is still being assessed but ultimately the observations of growers around the seasonal conditions need to be validated. Anecdotally growers are saying that the 2024 season is similar to 2016. Going forward the establishment of Weather Stations on any trial sites need to be built into the project.
Practical information and methodologies.	The Project Team was to collect and collate practical information and methodologies from: - Past chestnut industry chemical trials Trials undertaken by Deakin University. Trials undertaken by industries overseas.	The Project Team have collected and collated significant information from a range of sources. This includes the following: - • Chestnut fungicide tests 2016 – SARDI: Attached as ***Appendix B***. • Review of Phosphonate Salts to control *Gnomoniopsis smithogilvyi:* Attached as ***Appendix C.*** • Review of Fungicide control of *Gnomoniopsis smithogilvyi:* Attached as ***Appendix D.*** • European Protocol, version 18_3_24_VAN_GB _SC_VAN final draft_march20 GM: Attached as ***Appendix E.*** • Michigan Chestnut Management Guide 2024 V1: Attached as ***Appendix F***. • Chestnut chats May 2024 **CONFIDENTIAL:** Attached as ***Appendix G.***
Prepare a full report.	From this information prepare a full report on: - Chemicals used. Times of application during the phenological cycle of the plant Times of application during the disease cycle.	The Grower Farm Trial Report and the relevant attachments represent the FULL Report for this project. The Project Leader has made initial contact with APVMA in relation to what might be required for chemical registration via permit or label. The initial response is attached to the Final Report as ***Appendix H.*** The material produced from this project has been presented to the following groups: - • CAI R&D Committee – Monday 1st July 2024. The Meeting Papers for this meeting are attached to this Final Report as ***Appendix I***. • Large Chestnut growers – Monday 15th July 2024 This group represented the major growers and covered in excess of 60% of production.

		The Meeting Papers for this meeting are attached to this Final Report as ***Appendix J.*** A copy of the presentation given by Trevor Ranford to the Grower Meeting is attached to this Final Report as ***Appendix K.*** A copy of the minutes from the Grower Meeting are attached to this Final Report as ***Appendix L***. The 'Way Forward' Report is attached to the Final Report as ***Appendix M.***
Design methodologies for utilisation.	Design some scientifically sound and practical methodologies that can be utilised in a full chemical trial program commencing in September 2024.	The Project Team along with the CAI R&D Committee have reviewed the documentation and believe that both application techniques have shown a level of efficacy and are worthy of further trials. The issues are: • Timing – start time and other applications through the flowering and/or growing period. • Number of applications. • Rates of application. The process going forward will be to work with researchers, agronomists and chemical companies in an endeavour to refine the program and utilise this in a future trial.

Outcomes

Table B. Outcome summary

Outcome	Alignment to fund outcome, strategy and KPI	Description	Evidence
Achieve sustainable and profitable.	**OUTCOME 2**: Industry supply, productivity and sustainability. **STRATEGY:** Develop and optimise fit-for-purpose pest and disease management strategies (especially nut rot, Phytophthora root rot and chestnut blight) **KPI:** • New knowledge on disease management and monitoring strategies for nut rot, Phytophthora root rot, chestnut blight, and other key diseases available to industry. • Reduced crop loss from internal nut rot, Phytophthora root rot, chestnut blight, and other major diseases	Given Nut rot is the highest priority disease for the Australian Chestnut Industry and improvements in the management and/or control of Nut rot will assist in achieving sustainable and profitable production of a high quality, healthy and increasingly popular food from paddock to plate. This project was based around the review of management techniques from within Australia and overseas and to test some of the management techniques through grower farm trials.	The reports attached as ***Appendices A, B, C, D, E, F, and G*** detail the relevant information available from • past and current research, and • grower farm trials undertaken during the 2024 production season.
R, D & E strategies and key performance indicators.	**OUTCOME 2:** Industry supply, productivity and sustainability. STRATEGY: Develop and optimise fit-for-purpose pest and disease management strategies (especially nut rot, Phytophthora root rot and chestnut blight). KPIs: Crop loss reduced by sustainable pest and disease practises (e.g., nut rot, Phytophthora root rot, chestnut blight).	The Project Team have considered the R, D & E strategies and key performance indicators below: - • Quality nuts from the producer. • Nut rot triggers, management and control. • Appropriate and adequate chemicals with label/permit registration. In undertaking the work of Project CH23002.	The reports attached as ***Appendices A, B, C, D, E, F, and G*** detail the relevant information that is important in building on the past R&D and establishing a foundation to build on for future research.
Evaluate past grower-based management and trial techniques.	**OUTCOME 2:** Industry supply, productivity and sustainability. **STRATEGY:** Deliver communication capability to support positive change in the areas of biosecurity, IPDM	The Project Team reviewed and documented past grower-based management and trial techniques for the control of Nut rot in chestnuts.	The reports attached as ***Appendices B, C, D, E, F, and G*** detail the relevant information.

	practices and orchard BMPs. **KPIs:** An increase in engagement, awareness and knowledge of R&D project outputs especially in relation to crop protection.		
Review and validate the methodologies.	**OUTCOME 2:** Industry supply, productivity and sustainability. **STRATEGY:** Deliver communication capability to support positive change in the areas of biosecurity, IPDM practices and orchard BMPs. **KPIs:** An increase in engagement, awareness and knowledge of R&D project outputs especially in relation to crop protection.	The Project Team has undertaken a review and validate the methodologies of current grower management trials for the management of Nut Rot.	The reports attached as ***Appendices A, B, C, D, E, F, and G*** detail the relevant information available from • past and current research, and • grower farm trials undertaken during the 2024 production season.
Design and develop methodologies.	**OUTCOME 2:** Industry supply, productivity and sustainability. **STRATEGY:** Develop and implement orchard BMPs. **KPIs:** Development of updated BMPs in collaboration with industry	The Project Team in discussions with the CAI R&D Committee and a number of growers have reviewed the documentation from the Project and have made some suggestions to how a program(s) might be modified and developed to achieve scientifically sound and practical methodologies that can be utilised in a full chemical trial program commencing in September 2024.	The reports attached as ***Appendices I, J, K,*** **L** **and M** detail the discussions and suggested modifications

Monitoring and evaluation

Table C. Key Evaluation Questions

Key Evaluation Question	Project performance	Continuous improvement opportunities
Overall project work plan	The overall project work plan was well defined within the application and this was used to undertake what was a small and short project.	Nothing additional required for improvement and/or further development.
Project KPI's	The overall project KPIs were well defined within the application and this was used to undertake what was a small and short project.	Nothing additional required for improvement and/or further development.
Three monthly milestone report	Prepared, submitted and accepted by Hort Innovation.	Nothing additional is required for improvement and/or further development.
Final project report	Prepared and submitted	Appreciate the flexibility in submitting the Final Report as the project was able to conduct a Grower Meeting not only to report on the work undertaken but to get input into the 'way forward'.
Regular PRG meetings	The PRG along with the CAI R&D Committee held regular meetings by phone or online to discuss relevant aspects of the project and to receive updates from the Project Leader.	Communication between the relevant committees and the individuals has been essential in building trust and transparency. But there is still more to achieve.
Grower contributions.	As part of a continuous improvement process CAI encouraged all - and any - growers to make contributions to the project and associated programs at any time during the life of the project. There were meetings of the CAI R&D Committee at different times during the short project. A face-to-face meeting was held on Monday 1st July 2024 at which the results and reports were tabled. A copy of the R&D Meeting papers is attached to this Final Report as ***Appendix I.*** Further CAI organised a meeting of many of the larger producers to present a full report on past and current R&D activities and to discuss the way forward. This event was held on Monday 15th July 2024. A copy of the Grower Meeting papers is attached to this Final Report as ***Appendix J.***	Going forward it is important that CAI continue to: - • Collect and collate information on nut rot. • Prepare relevant material in an appropriate form and distribute to all growers. • Engage all growers to gather their knowledge and information so that there can be a continuous learning program.

Recommendations

That Chestnuts Australia Inc: -

- Continues to undertake trials on fungicides and other chemicals to assist in the management of Nut rot.
- Looks to develop a system of collecting and assessing climatic information to build an understanding of the climatic factors that influence Nut rot.
- Continues to develop, produce and distribute information 'Tech Sheets' for the growers.
- Investigates other potential fungicides including Luna Experience, Aztec and Custodia forte (both which have group 3 and group 11 active constituents).
- Continues to communicate with APVMA to initial see if the grower trial results would be acceptable.
- Look to implement more formal trials through an R&D Project that would lead to permit registration and/or label registration.
- Continues to liaise with Australian and International researchers to better understand both the endophytic and disease phases.
- Continues to work with the growers to develop practical solutions to managing/controlling Nut rot.
- Believes that going forward the establishment of Weather Stations on any trial sites need to be built into the project.

Refereed scientific publications.

Nil

References

- Trunk Injection Delivery of Biocontrol Strains of *Trichoderma* spp. Effectively Suppresses Nut Rot by *Gnomoniopsis castaneae* in Chestnut (*Castanea sativa* Mill.)
- *Gnomoniopsis castaneae*: An emerging plant pathogen and global threat to chestnut systems.
- Endophytic Fungi and Ecological Fitness of Chestnuts.

Intellectual property

No project IP or commercialisation to report.

But there is trial work that has been undertaken that has sensitive information and should not be openly distributed.

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- CAI R&D Committee members.
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- Growers who attended and actively participated in the relevant project meetings.
- Michigan University Extension Service and researchers.

Appendices

Appendix A: 'Grower Farm Trials Report' – Final Report of the 2024 grower trials. **NOT FOR DISTRIBUTION**

Appendix B: Chestnut fungicide tests 2016 – SARDI.

Appendix C: Review of Phosphonate Salts to control *Gnomoniopsis smithogilvyi.*

Appendix D: Review of Fungicide control of *Gnomoniopsis smithogilvyi.*

Appendix E: European Protocol, version 18_3_24_VAN, GB, SC, VAN final draft, March 2024.

Appendix F: Michigan Chestnut Management Guide 2024 V1.

Appendix G: 'Chestnut chats', Michigan University Extension Webinar, May 2024. **CONFIDENTIAL**

Appendix H: Initial response from APVMA.

Appendix I: Meeting Papers, CAI R&D Committee, 1st July 2024.

Appendix J: Meeting Papers, CAI Grower Meeting, 15th July 2024.

Appendix K: Presentation by Trevor Ranford to the CAI Grower Meeting.

Appendix L: Minutes from the Grower Meeting held on 15th July 2024

Appendix M: 'Way Forward' Report resulting from the meetings on the 1st and 15th July 2024.