Bubbly bark

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BUBBLY BARK REPORT 2006/2007

For
Chestnuts Australia Inc

Prepared by Michael Brain

TECHNICAL SUMMARY

Bubbly bark of chestnuts is characterised by bubbling and softness of the bark; poor bud development and /or bud death; wilting and dying of branches, or death of the entire tree. Bubbly bark has been observed in North-east Victorian chestnut orchards for over a decade, though in recent years its occurrence has spread geographically.

Observations about chestnut bubbly bark include:
All varieties appear to be affected.
Bubbly bark symptoms are present in early spring. Bubbly bark is most prevalent in spring when the July-October rainfall is high, and also when the mean maximum temperatures for July-October are at their lowest.
Some trees may suffer severe limb die back and eventually die whilst other affected trees may recover and grow vigorously. Many affected trees re-shoot from below the bud or graft union.
Chestnut trees between the ages of 2 and 10 are most commonly affected, while older trees are infrequently affected.
Seedling trees have a lower rate of infection.
Leaf distortion and discolouration may occur.
Calcium soil levels and soil pH are significantly higher under bubbly bark trees compared to non-affected trees.
Potassium levels are significantly higher in bubbly bark affected trees compared to non-affected trees.

Previous studies have found many factors which are shown not to be correlated with bubbly bark incidence, including:
Soil salinity,
Soil nutrient levels,
Foliar nutrient levels,
Environmental factors, - including slope, aspect, elevation and adjacent vegetation.
Management practices – including irrigation, pruning, weed control and previous land use.

Pathology testing of bubbly bark affected trees and adjacent soil has been inconclusive. The list of found pathogens includes;
Botryosphaeria obtusa, Schizophyllum commune, Xyloborus perforans, Botryosphaeria parva, Fusicoccum luteum, Pestalotiopsis maculans, Diaporthe perniciosa, Microsphaeropsis sp, Phomopsis castaneae, Cylindrocarpon lucidem, Fusarium oxysporum, Cylinrocladium florianum, Macrophomina phaseolina, Pseudomonas syringae, Hafnia alvei, Phytophthora spp, Cytospora spp, Pythium spp, Fusarium spp, Aurobasidium spp, Coryneum modonium, Chondostereum spp.

Recommendations from pathology testing suggest cultural practises and environmental factors that may have caused stress and/or injury leading to or contributing to this problem continue to be examined.

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Introduction

Pathology testing and a copper spray trial have been the mainstays of current bubbly bark investigation. Chestnut trees and plant and soil material have been sent to Crop Health Services to investigate whether a principle pathogen could be isolated from material collected during the growing period. A budding trial was carried out to discover if infection is entering during the budding process.
Dr S Chin Gouk (Senior Plant Pathologist, DPI, Tatura) has become involved in the search for greater understanding of chestnut bubbly bark.

Method and materials

The copper trial used a flowable copper fungicide Tri-Base Blue applied 6 times through the year to 2 year old chestnut trees at Beechworth. The trial was conducted on 640 chestnut trees. Application rates used - (420ml per 100 litres water) were in line with label recommendations for walnut blight. Sprays were applied from first leaf fall until after total leaf fall. Three varieties of chestnut tree were in the trial: Red Spanish, Purtons Pride and Di coppi marone.

Chestnut plant material and soils have been sent to Crop Health Services. Samples collected during the growing season were sent to see if a pathogen was present and detectable during this period.

Within the budding trial, a sample of 40 seedling trees had budding tape applied without any cut being made: A sample of 40 seedling trees had a cut made and were then taped up although no bud was inserted; a sample of 40 seedling trees had a cut made, and a bud was inserted and were then taped up.

Copper trial results

No conclusive results could be determined from the copper trial since as repeated and severe frosts during early spring (when bubbly bark symptoms appear) caused extensive damage to the trees. The copper trial was conducted over a one year period and proved to be quite expensive, primarily due to labour costs. The trial was not continued the following year. Pruning and regrafting of approximately one third of the trees within this trial group by the grower also influenced the decision to discontinue the trial.

Budding trial results

No conclusive results could be drawn from the budding trial as these trees were also dramatically affected by severe frosts in early spring. All trees within this trial were equally damaged.

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Pathology Results

The fungus Phytophthora was frequently detected from soils taken from around chestnut trees and from chestnut stem material.
The bacterial pathogen Pseudomonas syringae was isolated on 2 occasions from chestnut stem material.
Phomopsis castaneae was detected from a canker lesion on the stem.
Results from plant material collected during the growing period revealed fungi species that had not previously been detected from earlier pathology testing.
A Cytospora fungus was isolated from rot affected stem wood.
Coryneum modonium was isolated from stem cankers.
A Stereum fungus (Chondostereum) was consistently isolated from affected chestnut wood.

Secondary fungal pathogens isolated (determined by Crop Health Services Pathology diagnostician Ramez Aldoud) included,- Pythium, Fusarium, Aureobasidium, Alternaria, Cylindrocarpon and Chaetomium.

Dr Chin Gouk visited 5 chestnut orchards around Beechworth to investigate bubbly bark and to collect plant material for further testing. She has extensive experience with Psuedomonas syringae. She plans to go reinvestigate earlier testing and retest a few cultures before attending a chestnut bubbly bark meeting to discuss findings and issues with growers.
Dr Chin Gouk is keen to witness first hand bubbly bark in early spring. A Department of Primary Industries, Chestnut Australia Inc and Horticulture Australia Limited, funded project is a possibility.

Discussion

Based upon tests undertaken, Crop Health Services have stated that they are unable to determine the primary cause of the bubbly bark problem. They have suggested that cultural and environmental factors that may have caused stress or injury leading and / or contributing to this problem be examined.
Consistent results, from pathology testing have not been obtained.
Phytophthora has been the most frequently isolated pathogen, although it is not always detected.
Pseudomonas syringae was detected on 2 occasions, but also has not been consistently isolated. Pseudomonas syringae might be present though not active, as it can inhabit plant surfaces without causing disease.

Stereum can be aggressive pathogens, which mainly enter through harsh, improper flush cuts and topping cuts or mechanical injuries. Testing was unable to determine the exact identity (variety) of the Stereum fungus. A positive identification can be obtained for an additional cost of $318.00.
Chondrostereum purpureum is colloquially called silverleaf.

Stereum and Cytospora fungi incidence can be reduced using correct natural target pruning. Management of these pathogens may increase health and vigour of susceptible trees.

Further investigation of the effects and life cycle of phomopsis on chestnut trees may provide valuable information helping to greater understand bubbly bark.

It is possible that more one key agent or pathogen is responsible for chestnut bubbly bark. Combinations of pathogens and limiting environmental factors may be responsible: for example Phytophthora + Phomopsis + Stereum + drought stress = bubbly bark in chestnuts

Recommendations

The plan for the future is to continue pathology testing, principally just prior to, and during bud burst (when symptoms are the most dramatic).

Continuation of monitoring in order, to build a database, and to continue to investigate whether or not bubbly bark is a physiological reaction to wet, mild conditions in late winter and spring, as per Ray Borschmann's report,

A trial to investigate if bubbly bark is a physiological response by chestnut trees to a range of stresses and attempt to induce bubbly bark symptoms on some trees grown under trial conditions is being considered. An investigation into whether there is a progression of pathogens in bubbly bark affected trees could possibly be undertaken at the same time.

It is anticipated that greater bubbly bark investigational direction and information can be provided by Dr Chin Gouk.

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