Decline of Peppermint (*Agonis flexuosa*) at Yarloop

Interim report on inspection of affected trees with Shire of Harvey personnel on 7 November 2001

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Concern has been expressed by the Shire of Harvey regarding "mass death" of peppermint (ornamentals) in Yarloop town-site. A meeting was held on site on 7 November with the following Shire personnel: Mr Keith Leece (CEO), Cr John Sabourne, Mr Scott Dandridge (Environmental Health Officer), Mr Peter Anderson (Shire Engineer), Mr Don Smith (Works Overseer) and Mr Ivan Tressider (Reserves Maintenance).

Trees inspected

The peppermint trees inspected in the Yarloop town-site were all planted ornamentals (not remnants), as follows:

- Recreational park at School Road corner, south of Workshops – very large old landmark trees (Fig.1, 2).
- Residential block west of railway – young trees to c.6m.
- Parkland adjacent to railway station, west side – young trees to 3.5m (Fig.3).
- Sotico Mill boundary, Johnson Rd near South West Highway – young trees to c.4m.
- Several other trees on street verges and private blocks were noted.

Background and information from Shire personnel

- Peppermint trees in Yarloop town-site have shown symptoms for some 18 months.
- General paling/yellowing of foliage colour, followed by some reddening, and thinning of crowns has occurred. Shire personnel do not expect the affected trees to survive.
- Symptoms were seen first on the north-east side of tree crowns in the School Rd park – this has led to local concerns that air-borne emissions from Alcoa's Wagerup Refinery might be involved.
- All other tree species (native and exotic) in the town are generally healthy (but a large Moreton Bay fig on the west side of the School Rd park has some old branch dieback).

Description of symptoms

Whole tree: Trees are currently showing general yellowing and reddening of foliage that is clearly visible from a distance, in particular the larger, mature specimens (Fig. 1, 2). Some new foliage is currently forming, but this is not prolific. Thinning of foliage has occurred on some trees but significant branch dieback has not occurred (Fig. 2). No dead trees were seen.

Leaves: Two distinct symptoms (either separately or in combination) may be visible on the leaves:

- interveinal chlorosis, which appears to progress to heavy yellowing, sometimes with development of reddish coloured spots and extended areas (Fig. 4, 5), and
- a more irregular pale green-to-yellow discolouration (sometimes with reddening), with less pronounced interveinal chlorosis, but with blocks of green mesophyll remaining (Fig. 6).

These symptoms are seen on both the fully exposed and shaded foliage (Fig.4), on all sides of the tree, and throughout the crown, although shaded foliage is generally greener. Foliage of all ages is affected. The new season's flush of growth, particularly on the larger affected trees, is minimal and appears weak; in contrast, new growth is already extensive and vigorous on healthy trees. Flowering was seen on affected trees, but is possibly reduced.

The symptomatic foliage on affected trees generally remains turgid, and is not visibly becoming desiccated. Affected trees appear to be transpiring effectively, with exposed leaves always cooler than atmosphere to touch.

Further investigations of rooting conditions are advisable. Predawn water potentials would need to be checked for diagnosis of competence of the root system and state of soil water depletion as summer develops. Backhoe excavation would be advisable to inspect soil conditions, root system morphology and condition of roots, though this will require disturbing and possibly sacrificing at least one tree.

Some insects (Cicadellidae – leafhoppers, and Psillidae – lerps) were seen on affected foliage, but not in unusually large numbers and not in numbers commensurate with the amount of leaf damage. There was no visible evidence of borer attack on affected trees as there were no exit holes or frass vents. Activity of fungal pathogens was not clearly evident, although a stem dissection would be required to properly check this.

Trees of all ages are affected. However, whilst virtually all mature trees show severe symptoms, there is considerable variation among younger trees, ranging from severe (occasionally), to moderate, to very mild/apparently healthy. On the railway parkland, for example, there are several healthy trees close to (5-30m from) an apparently affected tree.

Relevant information and possibly contributing factors

- All peppermints in Yarloop town-site are planted, in an area where the species does not occur naturally. The first natural occurrence noted is several kilometres west along Johnson Road, on the Spearwood sands; these trees are healthy, though they are of smaller stature with much less leaf area per tree. All other exotic and native tree species in Yarloop appear healthy.
- The sites involved in Yarloop are either on Ridgehill Shelf or sands overlying the Guildford formation. The most severely affected trees are on Ridgehill Shelf sites.
- There has been a record drought in the last year that is likely to have affected the vigour of mature trees (see Appendix, Bureau of Meteorology).
- There is considerable phenotypic (and presumably genotypic) variation within the peppermint species, eg in tree form and growth habit, and in leaf size and shape. There are large differences in symptom expression among younger trees, but more uniform, severe expression among older (mature) trees. This may reflect either provenance differences or differences in physiological age of trees.
- Some evidence of herbicide application was noted around some, but not all, affected trees.
- Symptoms similar to those in Yarloop were seen on some, but not all, planted peppermints in Waroona, Pinjarra and Mandurah.
- Decline of peppermint has also been reported recently in the Busselton/Margaret River areas (we have not inspected these). This problem may also be related to that in Yarloop. There have been earlier reports of similar symptoms on peppermint at flowering time south of Busselton, with trees recovering in later months.
- Damage to peppermints at Busselton, caused by borers and also by rot fungi, has been reported.

Samples taken

Foliar samples were collected for further examination and for nutrient analysis (to be done at the Science Division labs). Samples will also be sent to University of Adelaide for testing for Mundulla Yellows associated RNA (however, this test has only been used with eucalypts at this stage). Results of these tests will follow as soon as they are available.

Conclusions and recommendations

From our inspection we offer the following points:

- The cause of the decline of peppermints at Yarloop is not immediately clear.
- The symptoms may be related to pest and pathogen activity. Excavation of the roots and cutting into the butt and possibly branches would be required for proper examination and sampling. At least one tree would need to be sacrificed.
- This appears to be a complex problem that may involve a range of contributing factors.
- The symptoms are different from the drought deaths observed in Perth suburbs in the 1980s and early 1990s, where street peppermint trees died suddenly in summer-autumn.
- Trees that are now still healthy (eg those near the railway station, and along the Mill boundary on Johnson Rd) should be monitored to see if they develop the same symptoms as affected trees. Affected trees should also be monitored to see if they recover or die.
- Dr Elaine Davison, a private consultant, has recently been involved with the Margaret River peppermint decline problem; she could offer valuable assistance to the Shire of Harvey (Tel. 9351 3106).
- The question of any involvement of Alcoa's Wagerup Refinery in the peppermint decline has not been addressed by us as this is outside our area of expertise. It is recommended that the Shire of Harvey seek advice if required on this matter from the Department of Environmental Protection (contact: Andrea Hinwood, 9222 7000).
- Additional conclusions and recommendations will be developed as further data comes to hand from the testing of foliage samples.

Fig. 1. Mature Peppermint (*Agonis flexuosa*) with chlorotic foliage in park south of Workshops, Yarloop.

Fig. 2. Mature Peppermints in park south of Workshops, Yarloop. Tree in Fig. 1 is at extreme right. Note thin crowns of centre and left trees.

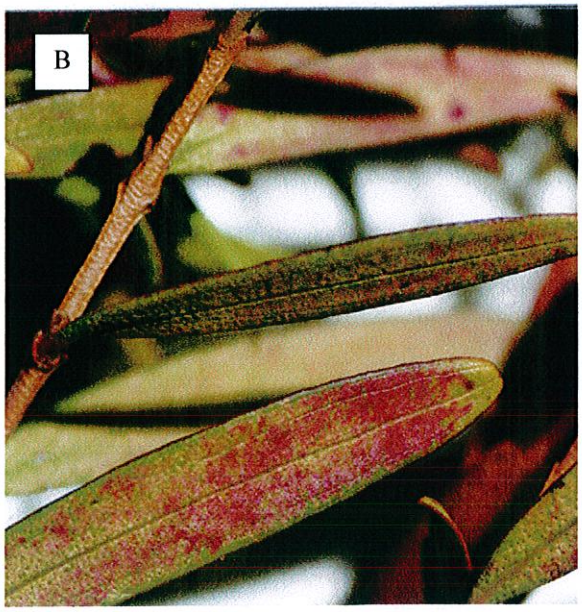


Fig. 3A. Young tree near railway line in Yarloop showing reddened and chlorotic foliage.

Fig. 3B. Detail of foliage.

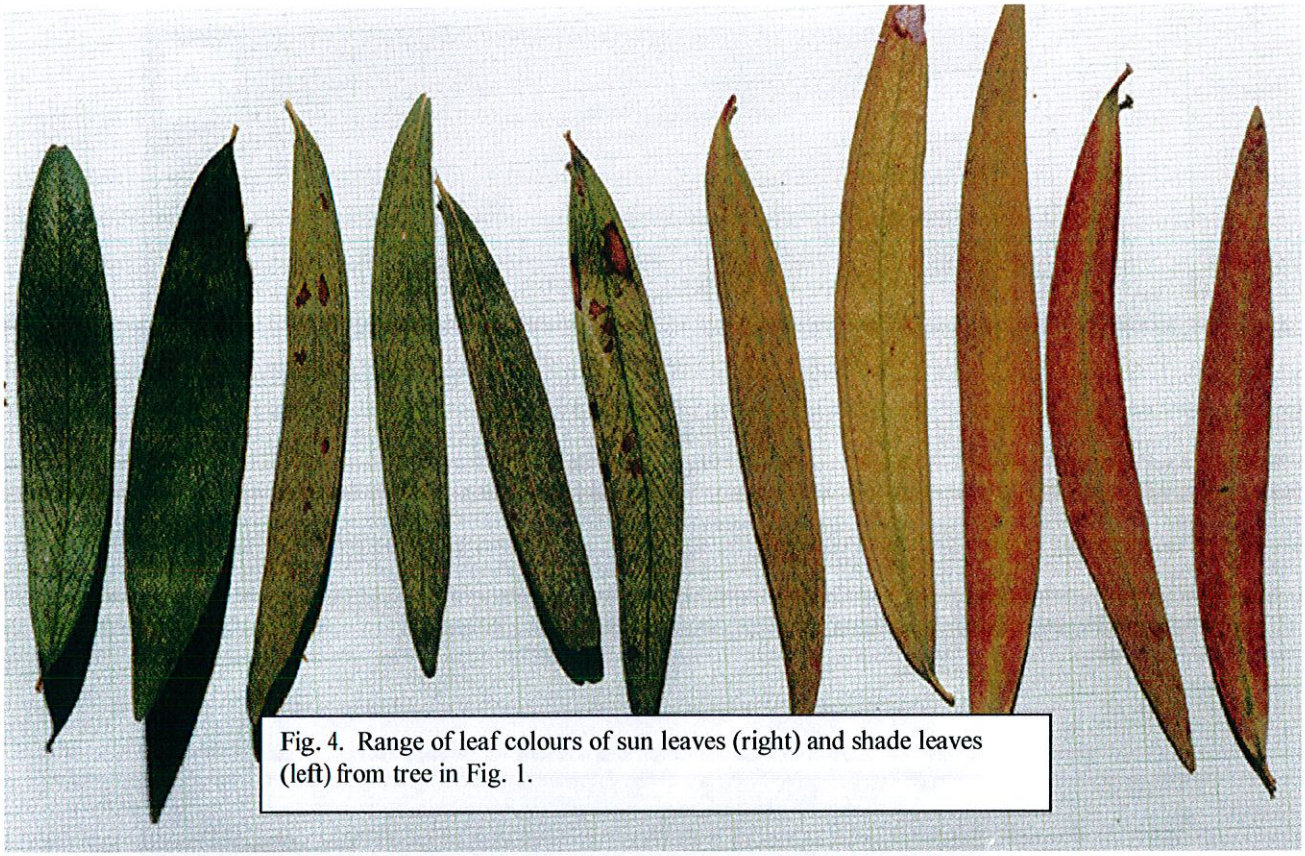


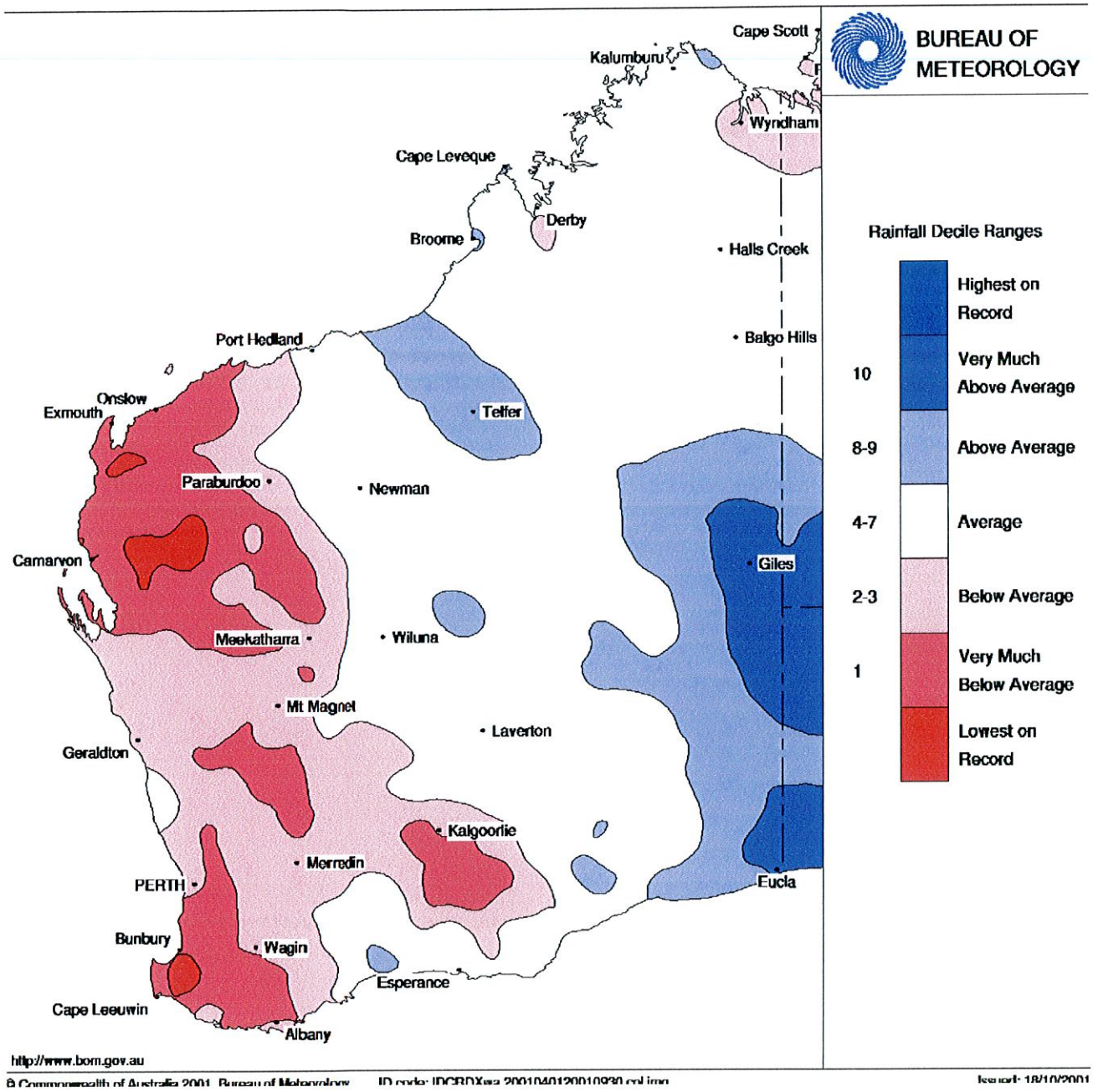
Fig. 4. Range of leaf colours of sun leaves (right) and shade leaves (left) from tree in Fig. 1.

Fig. 5. Twig showing detail of interveinal chlorosis

APPENDIX

Western Australian Rainfall Deciles 1 April to 30 September 2001

Distribution Based on Gridded Data
Product of the National Climate Centre



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