BACK BOX

A lesson from rusty match trees

Poplars are decorative trees, and rows of them make good wind breaks. Perhaps less-well known is the fact that most of the match-sticks sold in Australia are poplar wood.

Until quite recently, Australia's match manufacturers imported all their poplar. Their local source of wood was hoop pine, some of which is still used.

Australia's first commercial poplar plantations were established in the early 1960s, mainly to supply the match industry. Plantations of about 500 ha each are now established near Grafton and Tumut, N.S.W., and Cobram, Vic., and smaller plantations exist elsewhere.

Most of the ornamental poplar varieties in Australia came from Europe, but the poplars chosen for the plantations are mainly North American. Among the desirable qualities of their wood are flexibility, lack of splintering, and ability to absorb the chemicals that turn sticks into matches.

In both Europe and North America, rust fungus diseases attack poplar leaves, and can defoliate trees in summer and greatly retard their growth. They affect some poplars much more severely than others.

Australia was free of poplar rust when the plantations were established, so resistance to the fungi wasn't one of the attributes planters looked for when they chose their initial stock. Most of their poplars are clones—genetically identical individuals—derived from cuttings from a few North American trees and an Italian hybrid of North American and European trees.

One rusty leaf can harbour a million spores.

In 1967 the Forest Research Institute, now the CSIRO Division of Forest Research, began a project aimed at providing better poplars for plantations. Seed from trees from many areas of U.S.A. was imported. In 1969, as part of the project, planting trials to select clones for vigorous growth, stem straightness, and wood quality began at Upper Colo, north of Sydney.

This planting proved unexpectedly important. On January 27, 1972, pustules appeared on the leaves of poplars at Wright's Creek, about 30 km west of Upper Colo. Soon the leaves were covered with orange-yellow dust. Rust disease had arrived.

A week later, rust appeared at Upper Colo. Some poplar clones there proved to be much less severely affected than others, giving the scientists a starting point for the research to find suitable resistant clones, which began immediately. People from State forest services, the Australian National University, and plantation companies, as well as a CSIRO team led by Dr Ken Eldridge and Miss Christel Palmberg, are now engaged in this effort.

Within 6 weeks of its appearance at Upper Colo, rust was reported as far away as Canberra, Tumut, and Grafton. All Australia's poplar plantations are now infected, and the disease has crossed the sea to New Zealand and Tasmania. The orange-yellow dust—spores of the fungi—travels on the winds. Enormous numbers of spores blow about; the infection on a single leaf can produce more than one million of them.

How did the rust get to Australia? It seems unlikely that it blew here. As the Southern and Northern Hemisphere growing seasons are 6 months apart, when rust is abundant in the north the trees are leafless in the south. Also, little air movement that could carry the rust occurs across the equator.

Probably the disease came with a traveller—on an infected poplar cutting, or possibly even as spores on someone's clothing. A second rust variety appeared about a year after the first.

The plantations were hard hit. Unfortunately the few clones growing there proved highly susceptible to the rusts. Some trees had to be removed, and growth rates of those remaining fell. The position has begun to improve lately with the planting of more-resistant clones.

A clear lesson from the episode is that it is a mistake to rely on only one or two clones in such plantations. Susceptibility to diseases differs markedly among genetic types, and one that has proved resistant to the rust fungi here now may be susceptible to others that could follow.

A genetically diverse plantation is not likely to be severely hit by any single disease strain. The Division of Forest Research scientists suggest that perhaps 10 or more poplar clones should be used in any plantation.

Genetic variation in resistance to poplar leaf rust. K. G. Eldridge, A. C. Matheson, and W. Stahl. *Australian Forest Research*, 1973, **6**, 53–9.

Poplar experiments 1967–1974. J. C. Doran, A. C. Matheson, K. G. Eldridge, and A. G. Brown. *Forestry and Timber Bureau Technical Note* No. 10, 1974.