Spectrum

Those hardy radiata pines

Although not reckoned to be the most drought-hardy of pines, radiata pine still shows a remarkable capacity to cope with little rainfall. It's widespread success in plantations throughout Australia offers some evidence of this, but experiments by Mr Kurt Cremer of the CSIRO Division of Forest Research supply more substantial proof.

He planted specimens in 25-litre drums, watered them, then sealed the drums with black polythene film, completely cutting off the supply of water to the soil. The tops of the plants (rooted cuttings about 75 cm high) were left fully exposed to Canberra weather, beginning in late February. He used cuttings because the structure of the leaves and the pattern of their shoot growth resemble those of adult trees.

Mr Cremer then kept a watch on the moisture content of the soil and the transpiration rate of the plants.

After 2 months, the transpiration rate had dropped to 1% of that at the beginning of the experiment. It remained at this level for a further 5 months, until, at the end of September, two of the four plants looked severely affected by their ordeal. All the plants were then treated to a welcome watering.

Within a day, shoot growth was observed in three of the plants, a speed of recovery that astounded Mr Cremer. For the fourth, the stress was too much, and it soon died. However, a post mortem suggested that the cause could have been root rot rather than thirst.

Mr Cremer concludes that radiata pine is really outstanding in its drought tolerance — indeed, to a greater degree than is normally supposed. It even rivals hardy eucalypts in this regard. During a severe drought in 1965, pine plantations near Mt McDonald, A.C.T., suffered less dieback than did neighbouring eucalypt forest.

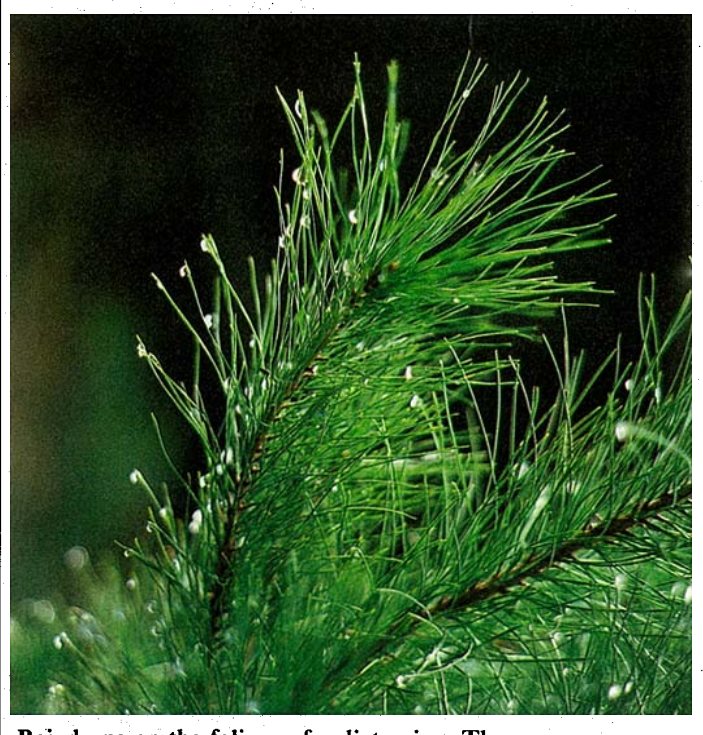
In parts of coastal California, the homeland of radiata (or Monterey) pine, the mean annual rainfall is only 400 mm, but fogs are frequent. It has therefore been suggested that the trees can absorb water through their leaves to aid their survival. The thought came to Mr Cremer that the trees in his experiment, and maybe the drought-subjected plantation trees, survived because they too milked moisture from the air and took in water through their foliage. He undertook a second experiment to check on this.

Instead of intact plants, detached shoots, about 90 cm long, were chosen for this study to ensure that any moisture uptake through the foliage would not be hidden by water taken up by the roots. The shoots were placed in a water mist — some in a growth chamber with controlled environment, others in a glasshouse.

As suspected, all the evidence pointed to the shoots drinking in water through the leaves. Mr Cremer found that the shoots increased in length by up to 5 cm over the course of 6½ days, growing continuously during both light and dark. The shoots gained about 10 grams per day.

Mr Cremer points out, though, that the water uptake through the leaves is much slower than water loss during normal transpiration. He found that it took, on average, 12 hours of misting for a shoot to recover from 1 hour of rapid transpiration (such as occurs when the shoot is growing).

Nevertheless, during drought, when the stomata close and the transpiration rate is at rock bottom, the trees could well make up in one misty day for the water lost during 10 dry days. Although Australia is not notably foggy, radiata pine is quite likely to benefit from dew and light rain on its leaves.



Raindrops on the foliage of radiata pine. The drought-hardy trees can take in water through their leaves.

Changes in length of *Pinus radiata* shoots reflecting loss and uptake of water through foliage and bark surfaces. K.W. Cremer and J.G. Svensson. *Australian Forest Research*, 1979, **9**, 163–72.

Immediate resumption of growth by radiata pine after five months of minimal transpiration during drought. K.W. Cremer. *Australian Forest Research*, 1972, **6**, 11–16.