



What are eucalypts?

Eucalypts are a group of trees belonging to the *Myrtaceae* (myrtle) family, containing the genera *Angophora*, *Corymbia* and *Eucalyptus*. Eucalypts are generally long-lived, evergreen angiosperm plants that flower and form fruits with seeds. However, the flowers have no petals. Instead, the bloom consists of hundreds of stamens. The seeds are enclosed in a dry or woody fruit that develops from the ovary within the flower. Many eucalypts, but not all, are known as 'gum trees' because they exude copious amounts of sap from any break in the bark.

What are hybrids?

Hybrids are the result of crossing two different taxa through sexual reproduction. Sappi produces several inter-specific (between species) hybrids, including *Eucalyptus grandis* x *Eucalyptus nitens* (often referred to as 'GN') and *Eucalyptus grandis* x *E. urophylla* (GU).

Where do *Eucalyptus* trees come from?

The eucalypts originate predominantly from Australia, where they grow in a wide variety of climatic regions, ranging from deserts to swamps to mountainsides – hence their environmental plasticity. Four species of *Eucalyptus* (*E. deglupta*, *E. orophila*, *E. urophylla* and *E. wetarensis*) originate outside Australia in Indonesia, the Southern Philippines and

New Guinea¹. Eucalypts are thus not indigenous to South Africa and are classified as exotic species.

What characterises the eucalypts?

There are over 700 species of *Eucalyptus*² that exhibit remarkable diversity across their native range. Developmental characters such as bark, leaf and inflorescence type, ability to make epicormic shoots, adaptation to fire damage, as well as tremendous chemical variation underlying herbivore defence, vary within, and between, groups.

The *Eucalyptus* genus includes species with very fast growth rates (mean annual growth rates of up to 20-35 m³/ha/year)^{3,4}, allowing many varieties to reach maturity as early as ten years in comparison to other hardwood species that can take 18-25 years to reach early maturity.

Do eucalypts have any disadvantages?

Living eucalypts are prone to biotic and abiotic stresses. This includes susceptibility to numerous pests and diseases, evidenced by the presence of stem cankers, root rot, foliar wilting and necrosis that can impact survival and growth. Abiotic stresses caused by environmental factors can also result in growth stresses, which affect yield. Productivity can be enhanced with effective risk management strategies, such as genotype-by-site matching, maintaining genetic diversity, breeding for resistance, and reducing stress caused by negative impacts such as drought, frost, snow, pest and diseases.

¹ Grattapaglia D, Vaillancourt RE, Shepherd M, Thumma BR, Foley W, Külheim C, Potts BM and Myburg AA. 2012. Progress in Myrtaceae genetics and genomics: *Eucalyptus* as the pivotal genus. *Tree Genetics and Genomics*. DOI 10.1007/s11295-012-0491-x.

² Brooker MIH. 2000. A new classification of the genus *Eucalyptus* L'Her. (Myrtaceae). *Australian Systematic Botany* 13: 79-148.

³ Stape JL, Gonçalves JLM and Gonçalves AN. 2001. Relationships between nursery practices and field performance for *Eucalyptus* plantations in Brazil. *New Forests* 22: 19-41.

⁴ Binkley D and Stape JL. 2004. Sustainable management of *Eucalyptus* plantations in a changing world. In *Proceedings of the IUFRO Conference of Eucalyptus in a Changing World*. (Eds Borralho N, Pereira JS, Marques C, Coutinho J, Madeira M, and Tomé M. Aveiro, Portugal, October 2004, pp 11-17.

Fast facts

- There are over 700 *Eucalyptus* species, originating mainly from Australia.
- The plasticity of the *Eucalyptus* genus is extraordinary - its uses are equally diverse.
- Eucalypts are among the fastest-growing woody plants in the world.
- Each clean kilogram of seed produces enough seedlings to establish about 500 hectares (ha) of plantation.
- At over 20 million ha worldwide, the eucalypts are the world's most valuable and most widely planted commercial plantation tree genus.

What value do eucalypts offer?

The diversity within the eucalypts has been the basis of a multitude of uses, including timber, pulp, lignocellulosic biomass, oils, and ecosystem services. Some of their key uses include:

- **Cellulosic fibre**

Some eucalypt species are very good for kraft pulping and dissolving wood (DP) pulping. Both Saiccor and Ngodwana Mills use eucalypts to manufacture Verve. This is a purified cellulose pulp suitable for subsequent chemical conversion into a range of products. DP with 91-95% cellulose content is mostly used to make viscose fibres for use in textiles. Higher cellulose content DP is used to make rayon yarn for industrial products such as the cord used in tyres, rayon staple for high-quality fabrics, acetate and other speciality products.

- **Biorefinery applications**

At Sappi, we make the most of every tree harvested, including the extraction of sugars for various purposes including production of xylitol – widely used as a sugar substitute – and furfural, used mainly for resins.

- **Bioenergy production**

Eucalypts are also receiving attention, as most of the extracted lignin can be used in recovery boilers for energy production.

- **Medicinal value**

Eucalyptus oils derived from the leaves of about a dozen *Eucalyptus* tree species are used for therapeutic and medicinal purposes. Medicinal effects are primarily due to a chemical compound called eucalyptol (or cineole). *Eucalyptus* oil is packed with numerous natural compounds that work in synergy to produce a variety of health-promoting effects, from relieving cold symptoms to reducing pain or cleaning cuts and scrapes⁵.

Why is woodfibre quality important?

Wood quality is critically important to our industry. During pulp and paper manufacturing, many aspects such as pulp yield, consumption of cooking liquor and potential for bleaching, are dependent on the chemical composition of wood.

What affects woodfibre quality?

Wood quality is influenced by three major factors: environment, genetics and silvicultural management.

- **Environmental factors**

The environmental factors to consider include soil, geology, climate and topography. The eucalypt species and varieties we grow have different growing preferences and fibre quality. We manage these differences by carefully matching genotypes to suitable sites and conditions.

- **Genetics**

Our breeding programmes ensure that we maintain a broad genetic base for breeding purposes. We implement a robust process to test and evaluate tree performance based on growth, wood properties and pest and disease resistance before commercialisation of any new varieties.

- **Site selection and plantation management**

We closely match wood fibre with mill requirements. Carefully matching growing sites and species or hybrids planted, ensures optimal conditions for tree growth. Equally important is the post-planting care of trees (for example, by reducing stress through the application of small quantities of fertiliser at planting and controlling weed competition) to ensure maximum growth potential.

Which eucalypt tree species does Sappi grow?

The major species and taxa we grow are *Eucalyptus dunnii* (26.6%) and two *E. grandis* hybrid taxa: *E. grandis* x *E. nitens* (13.0%) and *E. grandis* x *E. urophylla* (11.8%). Most of our hardwoods are eucalypt taxa; this includes a very small proportion of *Corymbia henryi* (<0.1%; synonym *Eucalyptus henryi*).

We also grow a small proportion of wattle, *Acacia mearnsii* (0.5%).

Other minor eucalypt species planted, covering 11.6% of landholdings, are *E. benthamii*, *E. macarthurii*, *E. nitens*, *E. smithii* and *E. grandis*. About 36.6% of our landholdings are deployed to various pine taxa.

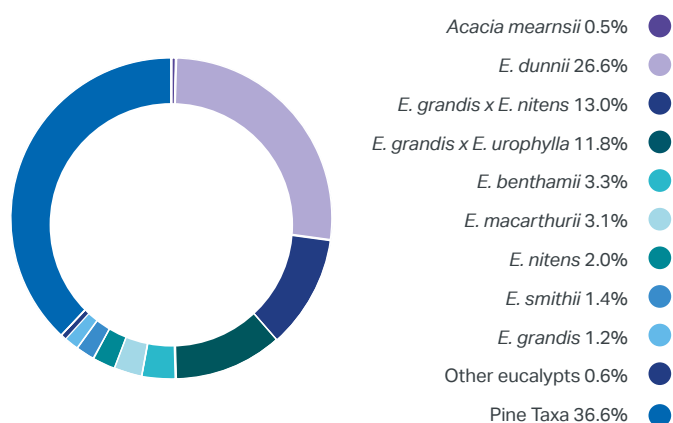
⁵ Krouse L. 2020. Seven genius ways Eucalyptus oil can benefit your health according to experts. Prevention Home. <https://www.prevention.com/health/a30615989/eucalyptus-oil-benefits/>

Frequently asked questions about eucalypts

Continued

Sustainability FAQs

Our current species deployment represents a substantial shift from the predominant pure species deployment of the past (e.g., *E. grandis* and *E. nitens*). The increased deployment of hybrids has been in response to major pest and disease threats.



Distribution of the taxa deployed by Sappi as at February 2022.

What are the characteristics of the key eucalypt species that Sappi grows?

• *Eucalyptus dunnii*

Eucalyptus dunnii has a range of pulping properties suitable for both dissolving pulp (DP) and kraft pulping processes. A small canopy and the ease with which bark can be stripped make *E. dunnii* especially well-suited to harvesting. Suited to summer rainfall regions in temperate planting ranges, *E. dunnii* is mildly drought tolerant but susceptible to wind, frost and snow damage, from which it generally recovers well. This species is prone to the snout beetle (*Gonipterus*) and *Eucalyptus* gall wasp (*Leptocybe invasa*).

• *Eucalyptus grandis* x *E. urophylla* hybrids

This hybrid cross combines the good growth traits of *E. grandis* with the *Eucalyptus* stem canker tolerance (*Teratosphaeria zuluensis*, previously *Coniothyrium zuluense*) of *E. urophylla*. It is appropriate for sub-tropical zones; humid to sub-humid conditions, but is not suited to areas where frost and snow occur.

• *Eucalyptus grandis* x *E. nitens* hybrids

Eucalyptus grandis x *E. nitens* combines good growth and rooting ability derived from *E. grandis* with the cold tolerance of *E. nitens*, resulting in moderate frost and snow tolerance and moderate coppicing ability. Unlike *E. nitens*, the hybrid shows higher resistance to cossid moth and to *Phytophthora* root rot. It is suited predominantly to the warm and cool temperate zones.

How does Sappi propagate eucalypts?

Seeds are derived, predominantly, from our own seed orchards where the parent trees have been specially selected for their growth qualities, disease resistance and desirable pulping characteristics. For the production of hybrids, we develop control pollinated seed, by crossing selected parents to generate offspring that carry desirable traits for further testing.

All our seed is collected by hand using skilled tree climbers. It is then processed and cleaned. Our eucalypt seedlings are produced in two nurseries, one based in Mpumalanga and one in KwaZulu-Natal.

Selected trees are also propagated vegetatively, using rooted cuttings to rapidly increase the deployment of high value individuals / varieties with good growth and pulping properties. All eucalypt cuttings are produced in large, modern nurseries. One nursery is based near Pietermaritzburg in KwaZulu-Natal and the other in Mpumalanga, where skilled staff manage selected mother plants, in large sand beds, for clonal cutting production. Recently, cutting production expanded to the use of biodegradable paper pots, which result in improved planting efficiency, growth and survival, especially on harsh sites.

All seedlings and cuttings leaving our nurseries are assessed using our in-house developed Plant Quality Index (PQI) to ensure the dispatch of top quality plants. The PQI guarantees that all plants dispatched from the nurseries meet defined physical and physiological specifications and that acceptable survival and growth is achieved.