

Growing grevillea in Kenya

This popular species plays significant socio-economic and environmental roles

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G*revillea robusta* (silky oak) belongs to the family *Proteaceae* and is locally known as mukima (Kikuyu), omakabiria (Kisii), wakhuisi (Luhya), bolebolela (Luo), kapkawet (Nandi), among others. In its native range of south eastern Australia, it is found in a restricted zone at latitude 22°S to 30°S with mean annual temperatures of 15 - 25°C and mean annual rainfall of 700 - 2000mm.

G. robusta is a fast-growing tree and performs best on well-drained fertile soils. However, it also grows moderately well on medium textured soils (loam, clay-loam to light sandy). On suitable sites, the species has recorded a yearly growth of 2 metres in the early years of growth. It does not tolerate heavy clays and water-logged soils, thus performing poorly in very wet areas where annual rainfall exceeds 2000mm and in tropical lowland environments where mean annual temperature exceeds 23°C.

The stems are dark grey, rough and vertically divided while the leaves are fernlike, divided and silvery grey, thus the name silky oak.

The species provides timber, poles, posts, fuel wood, shade, fodder during drought periods, soil erosion control and soil fertility improvement. The bright yellow to orange flowering parts make grevillea a beautiful ornamental tree (Figure 1) and the leaves are used in cut flower arrangements.

In Kenya, *G. robusta* is popular among small-scale farmers due to its fast growth and ability to tolerate heavy pollarding and pruning of branches. Its deep rooting characteristics show that it mixes well with other crops. Since the 1990s, *G. robusta* has been a contributor to household incomes.

Propagation of *G. robusta*

G. robusta is mainly propagated through seeds



Figure 1: A healthy grevillea tree.

and wildings from natural regeneration. It is a prolific seeder and a single mature tree can produce about 2 kilograms of clean seed. A kilogram of seed may contain 70,000 - 120,000 seeds. The seeds are viable for about three months but viability can be extended by storage under sub-zero to 4°C temperatures.

According to Kalinganire (1999), the species is self-incompatible and out-crossing and there is a very short period of two to three days between maturity and dispersal by wind. As such, most of the seed is lost before it is collected, resulting in an ever acute shortage of seed for raising seedlings. Seed maturity must therefore be closely monitored and collection must be timely.

Two-winged seeds are borne in small dark pods which vary in size from 1 to 1.5cm and are easily blown away by winds. Seed germination

is relatively good. The seeds do not require much pre-treatment but soaking in cold water enhances germination.

Planting lay-outs and tree management

A recent study that surveyed 18,000 trees on 95 farms in Kenya's central highlands found that boundary planting was still the most popular at 55 per cent, 17 per cent were planted as woodlots, 15 per cent as terraces/alleys and 13 per cent were scattered among crops such as tea, coffee, maize, bananas and beans, among others.

Planting along farm boundaries is usually done in single rows at 2 to 2.5 metres spacing. However, in small farms, especially in the central highlands, it is common to find the tree planted at a spacing of less than 1.5 metres. Closely spaced trees grow slowly and achieve smaller diameters compared to those planted at wider spacing. The Kenya Forestry Research Institute (KEFRI) recommends a spacing of 2.5 x 2.5 metres for plantations and woodlots.

Pollarding (removing the whole crown), as is commonly done in many farms (Figure 2) is popular because it reduces shade on the crops under the trees. However, pollarding was reported to reduce tree diameter growth and is therefore not encouraged if the primary product expected is timber. Nevertheless, moderate tree pruning (removing one third or half the crown) was found to improve tree form and increase the value of the tree.

Grevillea is pruned regularly to provide stakes, firewood and leaves for various uses. Its ability to coppice easily makes it ideal for the provision of the said products.

Timber yield

Grevillea trees can be harvested for wood and poles at 4 - 5 years on good sites. Trees over 30 years produce good amounts of durable timber. A



Figure 2: Sprouts on a pollarded tree.

stand density of 200 trees per hectare is reported to optimise wood production (Muchiri et al 2001). However, due to the current shortage of timber in the Kenyan market, it is common to find trees as young as 10 years or less being used for timber. Such immature timber is susceptible to attacks by pests such as wood borers and rot fungi.

When grown in competition with other crops in an agro-forestry setting, grevillea trees were found to yield satisfactorily as compared to trees under no competition. Under such conditions, the species

Table 1: Yield of grevillea trees with age on a 20 year rotation cycle

Age Class (years)	Mean trees per ha	Mean dbh (cm)	Mean height (m)	Volume (m ³ /ha)
5-7	200	10.5	9.1	4.4
8-10	175	29	18	8
11-15	214	25	18	12
16-20	199	27	20	13
25	53	43	27	8*

Source: Muchiri et al 2002.

*The data is based on very low stand density of 53 trees per hectare. The yield would be higher at high stand densities. The trees show significant increment in wood volume from year 8.

was recorded to increase by approximately 1.2cm per year and 1.1 metres per year in diameter at breast height (dbh) and height respectively between 1 to 30 years. The total volume of wood produced increases with age (see Table 1 below).

Diseases and pests

G. robusta has for a long time been believed to be free of serious attacks from pests or diseases. However, a recent survey showed that the species is now under threat from a canker and dieback disease in all regions where the species is cultivated. The disease is characterised by dieback of young shoots, branches and branch tips, leaving naked shoots and branches, stem cankers and rotten heart wood (Figures 3A and B).

The disease is mild in the humid-sub humid zones and severe in the semi-humid to the semi-arid areas. The cankers vary in size from small lesions and small cracks of a few millimetres, to large open wounds sometimes extending over 1 metre, along the stem on severely infected trees. Internally, the fungus causes disruption of the vessels through which resin oozes (Figure 3C).

Four disease-causing fungi were isolated from the cankers and dieback symptoms. These fungi are associated with stressed trees whose growth vigour is compromised by extreme environmental conditions (normally drought) and lack of nutrients (Slippers and Wingfield 2007).

The fungi infect the young shoots and leaves first and spread to the mature parts of the stems. Wounds from pruning branches provide direct entry to fungi into the wood of the trees, and they destroy the timber and hence the commercial value of the trees. To manage dieback, it is recommended that infected branches be removed as soon as cankers or dieback symptoms are noticed. Under unfavourable conditions such as semi-arid lands, termite damage accelerates the death of infected trees.

Poor germination has also been reported due to infection of seeds by fungi mostly in the genus *Fusarium* and other seed-borne fungi such as *Lasiodiplodia theobromae* which also causes the canker and dieback disease. These fungi cause seed rots (Figure 4A) and damping off, stem collar rots, seedling blights, tip dieback and deaths.

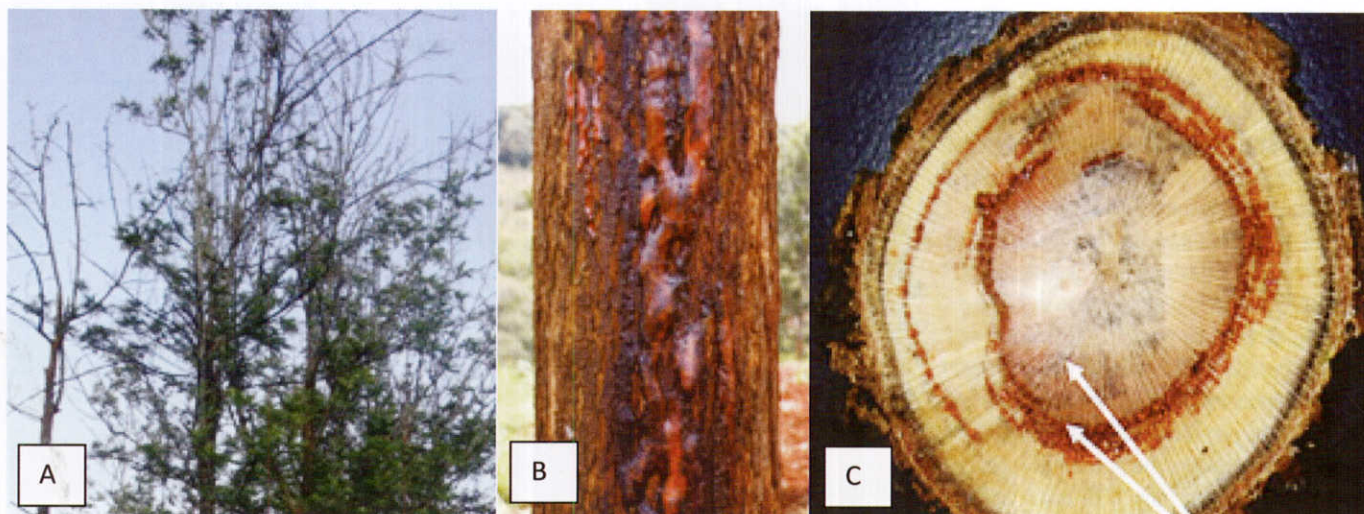


Figure 3, (A) Severe dieback and death (B), Resinous stem cankers, (C) Internal destruction of wood.

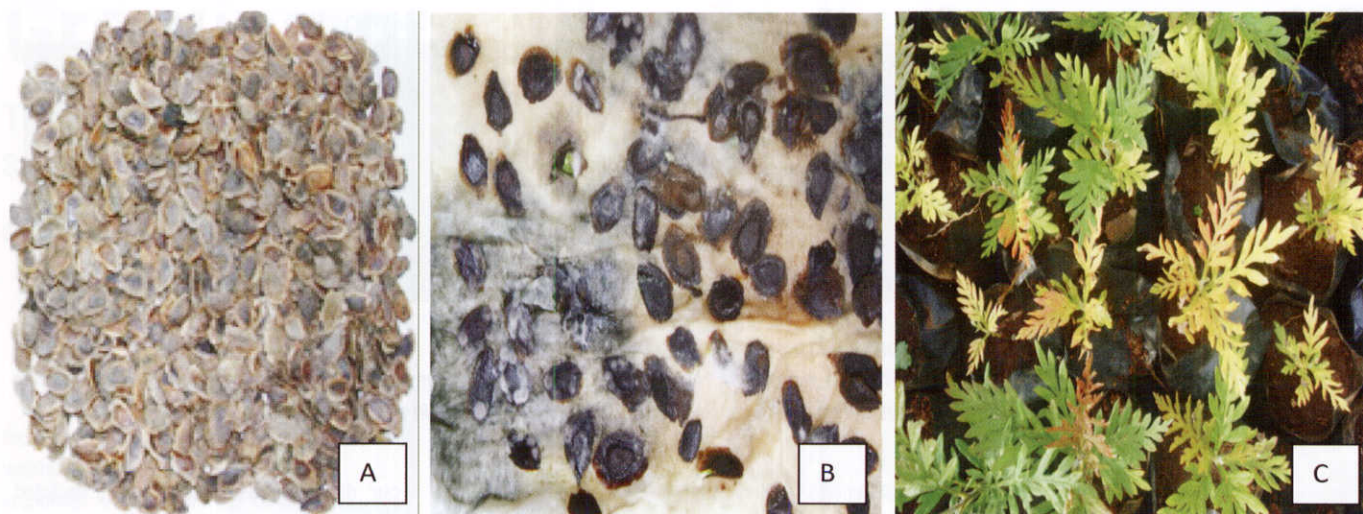


Figure 4(A), Clean seeds (B) *Grevillea* seeds infected by fungi, (C) Mineral deficiencies on grevillea seedlings.

Surveys show that most seedlings in Kenyan nurseries exhibit poor growth due to a variety of factors, including poor nutrition (Figure 4B), poor seedling management, such as excessive watering, and disease-causing fungi.

Disease management is easier at the seed and seedling stages. Farmers and other stakeholders should use certified tree seeds, or treat seeds before storage and before sowing to reduce contamination by fungi. Treating seeds also protects the emerging seedlings from infection by surface disease-causing agents.

Strict nursery hygiene and regular spraying with systemic fungicides should be observed. Addition of organic and inorganic fertilisers to improve the immunity of young seedlings is also recommended. When plants are infected after the nursery stage, pruning of infected branches and removing infected trees are the best options to reduce and stop further spread of infection.

Commercial value of grevillea timber

Grevillea produces a hard timber with beautiful grain structure. The timber makes attractive furniture. Prices of timber vary from merchant to merchant and from region to region. Available information shows that farmers sell large quantities of grevillea tree products. However, farm level prices are low and vary from place to place. Information from timber merchants in Nairobi and the peri-urban areas around the city shows that on average, the price of *G. robusta* wood compares favourably with other locally grown species (see Table 2).

The demand for firewood by tea-

Table 2: Comparative commercial prices of one board foot of various tree species in Nairobi and surrounding peri-urban areas

Species	Price (Ksh) per board foot (6"x 2") in Nairobi and peri-urban areas			
	Kikuyu	Kawangware	Gikomba	Kariobangi
<i>Grevillea robusta</i>	46	50	60	60
<i>Eucalyptus</i> species	50	56	70	70
<i>Pinus</i> species	65	62	75	60
<i>Cupressus</i> species	70	65	80	70
Mahogany	200	180	200	200

Grevillea wood is clearly competitive among the locally grown tree species.

Grevillea grows best on moderately fertile to fertile, well drained soils such as those found in the medium to high potential zones in Kenya.



processing factories has pushed prices for the commodity upwards. The factories buy a stack (1 cubic metre) of firewood at between Ksh 1,200 - 1,800 in central Kenya but the same sells for over Ksh 3,000 in Nairobi.

Conclusions

Grevillea robusta continues to play significant socio-economic and environmental roles in

Kenya. Its performance and yield, as well as susceptibility to diseases and pests, depend to a high degree on site, competition and management methods. *Grevillea* grows best on moderately fertile to fertile, well drained soils such as those found in the medium to high potential zones in Kenya. Planting the species outside these areas will compromise its performance and consequently, the products expected.

Due to its susceptibility to attack by canker pathogens and termites in ASAL, the species should not be planted beyond agro-ecological zone 3. Therefore, site characteristics should be assessed for suitability before planting.

(A list of references for this article is available at the Miti offices)

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