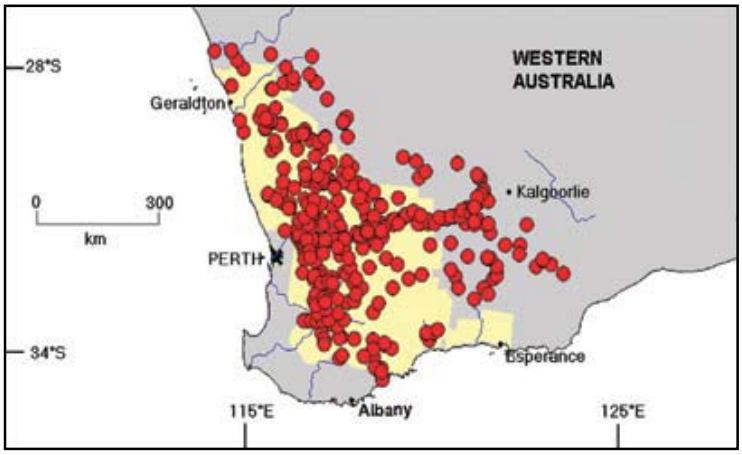
Acacia acuminata Benth.

Common Name

Jam.

Special note



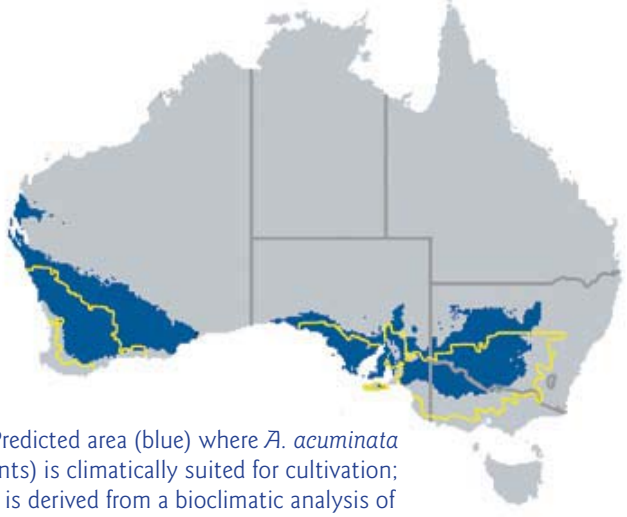
Map 4. Distribution of *A. acuminata*.

Maslin *et al.* (1999) conducted a preliminary taxonomic review of *A. acuminata* and showed that the species appears to comprise five main variants. Insofar as the current project is concerned it is *A. acuminata* (*typical variant*), *A. acuminata* (*narrow phyllode variant*) and *A. acuminata/burkittii (Variant 2)* that have the best potential for wood biomass production and therefore it is these taxa that are detailed here. Most publications on *A. acuminata* appeared prior to the Maslin *et al.* (1999) study and it is likely that the information they contained refer to the typical and narrow phyllode variants; the name *A. acuminata* is used in the broad sense below to identify these previously published data.

Habit

Typical variant. Tall obconic shrubs or trees 3–7 (–10) m high, plants in open sites away from competition tend to have wider and more rounded crowns (to about 8 m across) than those from within closely spaced (about 1–3 m apart), often monospecific, populations; branchlets ascending to erect or rarely pendulous to sub-pendulous; few-branched at ground level (2–6 main stems) or with a single, straight to almost straight bole 0.3–1.5 (–2) m long and 10–30 (–45) cm dbh; crowns dense, rounded to sub-rounded and up to 7–8 (–10) m across.

Narrow phyllode variant. Obconic or rounded shrubs or small obconic trees commonly 2–5 m tall and 1.5–4 m wide, sometimes (e.g. around granite rocks) trees 6–7 m tall and spreading to about 7 m across, plants in open sites away from competition tend to have more rounded crowns than those in dense populations; with 2–6 main stems arising from ground level, sometimes with a single bole up to 0.5 (–1) m long, the main stems rather straight, slender and ascending to erect; crowns dense to mid-dense, rounded to sub-rounded, spreading and occupying 20–40% of the total plant height.



Map 5. Predicted area (blue) where *A. acuminata* (all variants) is climatically suited for cultivation; this area is derived from a bioclimatic analysis of the natural distribution (red circles, Map 4), see also Table 5. Target area shown in yellow.

Acacia acuminata/burkittii (Variant 2). Rounded or obconic shrubs or trees 3–6 m tall, dividing at or up to 1 m above ground level into a few main stems.

Bark (all variants) longitudinally fissured on main stems (especially near base), smooth on upper branches, grey.

Botanical descriptions and illustrations/photographs of the above three variants are given in Maslin *et al.* (1999).

Figure 1. *Acacia acuminata* 'typical' variant

A – Mature tree showing characteristic obconic outline. (Photo: B.R. Maslin)

B – Single-stemmed tree. (Photo: M.W. McDonald)

C – Regeneration from rootstock (apparently rare in this species) following fire. (Photo: B.R. Maslin)

D – About 8 year old *A. acuminata* plants in Sandalwood host trials near Katanning, W.A. (Photo: J. Brand)

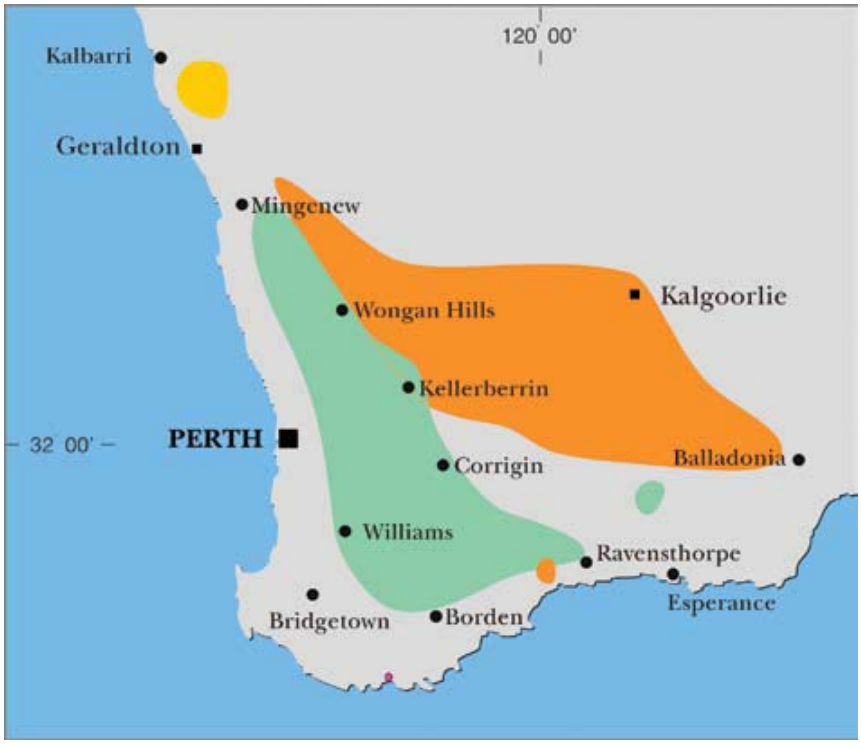
E – Flowering branch showing sessile spicate inflorescences. (Photo: M.W. McDonald)

Taxonomy

Acacia acuminata is referable to *Acacia* section *Juliflorae* a diverse, and probably artificial, group of about 235 species (Maslin 2001) which are characterized by having plurinerved phyllodes and flowers arranged in cylindrical spikes (see Maslin & Stirton 1998 and Maslin 2001 for discussion). Section *Juliflorae* is widespread in Australia with the main centres of species richness occurring in the north, northwest and southwest of the continent and secondary centres of richness located along the Great Dividing Range in eastern Australia; although plants of this group often form a conspicuous element of the arid zone flora, species numbers in these areas are generally not great (Hnatiuk & Maslin 1988, Maslin & Pedley 1988). Only three species of section *Juliflorae* are detailed in this report, namely, *A. acuminata*, *A. doratoxylon* and *A. lasiocalyx*.

As discussed by Maslin *et al.* (1999) *A. acuminata* is a polymorphic species showing complex variation patterns in phyllodes, pods and growth form. Most of the variation is contained in three informal variants, namely, *A. acuminata* typical, narrow phyllode and small seed variants. Two additional variants, referred to *as A. acuminata/burkittii* Variant 1 & 2, which may represent hybrids involving *A. burkittii*, occur in the Geraldton area. These taxa are separated by finely graded morphological differences (mainly phyllode and pod/seed features) and are broadly supported by chloroplast DNA and isozyme data. However, further study is needed before they can be formally described and their complex patterns of variation and evolutionary relationships fully understood.

Acacia acuminata has very close affinities to the widespread arid zone species *A. burkittii*, a relationship that is embodied in a recent classification by Kodela & Tindale (1998) where they are treated as subspecies, namely, *A. acuminata* subsp. *acuminata* and *A. acuminata* subsp. *burkittii*. Although this classification is not adopted here the rank of all taxa in the *A. acuminata* group will need to be reassessed in the light of further taxonomic study. Other species (all from Western Australia) closely related to *A. acuminata*, but which are not considered worthy of inclusion in the present report, are *A. drepanophylla*, *A. jibberdingensis*, *A. multispicata, A. oldfieldii* and *A. sessilispica.*



Map 6. Indicative distribution of A. acuminata discussed in text: 'typical' variant – green, 'narrow phyllode variant' – orange, *acuminata/burkittii* (variant 2) – yellow.

Distribution and habitat

Acacia acuminata is confined to the wheatbelt region of southwest Western Australia, and its distribution is mostly within the target area. This species is quite common in the places where it occurs. Indicative distributions of the three variants included in this report are shown in Map 6 (see Maslin *et al.* 1999 for further details).

Typical variant. Occurs in the western part of the wheatbelt from near Mingenew south to Borden and Ravensthorpe with an apparent outlier from

Figure 2. *Acacia acuminata* (variants)

A – 'Narrow phyllode variant': mature plant showing characteristic obconic outline. (Photo: B.R. Maslin)

B – 'Narrow phyllode variant': multi-stemmed base. (Photo: B.R. Maslin)

C – *Acacia acuminata/burkittii* (Variant 2): mature plant. (Photo: B.R. Maslin)

D – 'Narrow phyllode variant': young branch showing very dark heartwood & pale sapwood. (Photo: B.R. Maslin)

E – *Acacia acuminata/burkittii* (Variant 2): old plant in open site showing very spreading growth habit. (Photo: B.R. Maslin)

F – 'Narrow phyllode variant': flowering branch showing sessile spikes & phyllodes characteristically fringed with minute hairs. (Photo: S. Armstrong)

Peak Charles, about 130 km due northeast of Ravensthorpe Most commonly occurs in brown loamy clay or sandy loam (pH 5.5–7) in lower parts of the landscape (often near water courses) or in low hilly country, in low eucalypt Woodland. Soil colour varies from dark brown, red-brown, pink-brown to grey-brown. It has also been recorded from shallow white sand over laterite near Corrigin, from clays and from around granite outcrops. At the northern extremity of its range this variant may occur on low sandy rises associated with salt lakes.

Narrow phyllode variant. Occurs in the northern, central and eastern wheatbelt region and extending just into the adjacent arid zone. It extends from near Morawa southeast to Balladonia with an outlier near Ravensthorpe. Commonly found on brown or red-brown loam or clay-loam flats (pH 6–7) in tall shrubland or open eucalypt woodland. It is also commonly found on sandy loam associated with granite rocks and commonly forms dense fringing communities around the base of these outcrops. It has also been recorded from low sand rises associated with salt lakes and appears slightly to moderately salt tolerant.

Acacia acuminata/burkittii (Variant 2). Common in the Northampton–Nabawa area but ranging south to Eradu (Greenough River) and Mt Fairfax, and north to Ajana on the Murchison River. Low hilly country in rich brown clay-loam (pH 6–7).

Comprehensive habitat details are provided for *A. acuminata* by Hall & Turnbull (1976), Boland *et al.* (1984) and Barrett (1995), but as these works were published prior to that of Maslin *et al.* (1999) the information presented is not aligned against the variants that are now known to exist within the species.

Flowering and fruiting

Typical variant. Flowers from September to October. Fruiting specimens with mature seeds have been collected mainly between mid-December and mid-January, infrequently in late November. This variant is somewhat variable in its fruiting. In some years pods may fail to develop completely, or only a proportion of the plants will set fruit.

Narrow phyllode variant. Flowers from late July to September, sometimes extending to October. Pods with mature seed have been collected mainly in late November and December. Not all trees in a population necessarily produce fruit and those that do commonly display considerable differences with regard to the amount of fruit set. It is not known what factors cause this variation but it is likely that the timing and/or intensity of rainfall events play a role.

Acacia acuminata/burkittii (Variant 2). Flowers from August to September. Mature seeds appear from late November to December.

Biological features

Moderately fast growth rate and moderately long-lived (perhaps in excess of 50 years). Coppicing ability absent or very low; unlikely to sucker. It is drought and frost tolerant but will not tolerate waterlogging (Barrett 1995). It is reported to be killed by fire (Hussey, pers. comm.), however, following a recent fire near Brookton most plants of the typical variant resprouted vigorously from the base of the burnt stems. Roughley (1987) noted that *A. acuminata* is a promiscuous host with nodulation by 75–100% of the 20 *Rhizobium* strains tested. An analysis of gum characteristics of *A. acuminata* is given in Anderson *et al.* (1980); under natural conditions plants of this species produce very little gum.

Genetics

The results of detailed chloroplast DNA and isozyme studies of genetic diversity and phylogeographic patterns of variation in *A. acuminata* are presented in Maslin *et al.* (1999), Broadhurst & Coates (2002) and Byrne *et al.* (2002).

Cultivation

A detailed review of germination techniques for *A. acuminata* is provided in Barrett (1995). As noted in Maslin *et al.* (1999) growth form of this species (in nature, and therefore probably also in cultivation) can vary depending upon spacing between plants (i.e. a more upright habit occurs when plants are closely spaced).

Trials

Assessment trials of *A. acuminata* were recently established in plots on farmland at various locations in south-western Australia by the "Search" project (see Acknowledgements). At age 10 months plants of the best performing provenance of 'typical' *A. acuminata* showed an average survival of 84% and an average height of 79 cm. The 'best' plot was located on a downslope site with heavy soil in the southern Avon Wheatbelt IBRA region, with plants averaging 133 cm high.

The 'narrow phyllode' variant of *A. acuminata* was also included in the 'Search' trials but did not perform as well as the 'typical' variant. At age 10 months plants of the best performing provenance of this variant showed an average survival of 54% and an average height of 49 cm. The two 'best' plots were located on a downslope site with light soil in the northern Avon Wheatbelt IBRA region and a saline seep site in the Mallee region, with plants averaging 60 cm high.

Pests and diseases

Plants of both the typical and narrow phyllode variants of *A. acuminata* sometimes show signs of light Gall Rust infection. In the Toodyay–York area in particular the typical variant is sometimes heavily infected with the aerial parasite, *Amyema*, as are some plants of *A. acuminata/burkittii* (Variant 2) from near Northampton.

As summarised by Barrett (1995) larvae of the Bag-Shelter Moth can cause severe defoliation, and eventually death; also, locusts, wingless grasshoppers, rabbits, and other native and feral animals can also cause severe grazing damage.

Weed potential

No records of weediness for this species. Does not display any weed tendencies in its natural habitat despite producing prolific quantities of seed.

Wood

Hard and durable with the odour of Raspberry Jam when freshly cut. The wood is finely textured with an attractive grain (often with fiddleback). The heartwood is dark chocolate brown and the sapwood pale yellowish. It has a basic density of 899 kg/m^3 (Ilic *et al.* 2000: note, the value 1171 kg/m^3 which also appears in this report for this species should have been listed under the air-dry density column). A basic density value of 1077 kg/m^3, based on analyses of a single wood sample is also reported by CALM's NHT-supported 'Search' project (unpublished data).

Utilisation

Wood

As summarised by Barrett (1995) the wood is used for craft and turning, fencing, specialty saw logs (however, only the typical variant would be suited to this purpose) and occasionally charcoal.

Land use and environmental

Acacia acuminata is generally considered well-suited for revegetation in the wheatbelt, particularly for well-drained loamy soils (see Wilcox *et al.* 1996 and Lefroy *et al.* 1991); it often regenerates well in previously cleared areas once grazing animals are excluded (amount of regeneration dependent upon

how long the land has been under pasture). It provides good shelter and has been used for erosion control. It would be suited to amenity planting.

Sandalwood silviculture

The various forms of *A. acuminata* and its close relative *A. oldfieldii* are currently under trial in Western Australia to assess their suitability as Sandalwood (*Santalum spicatum*) host plants (Brand 2002, Woodall & Robinson 2002).

Fodder

Streets (1962) states that the phyllodes make excellent fodder but other authors place little value on the species for this purpose (Hall & Turnbull 1976).

Other uses

Acacia acuminata has sometimes been advocated as a human food because the seed is said to have a good 'nutty' flavour; however, it is not recommended for large-scale production of seed by Maslin *et al.* (1998) because of its annual variability in pod production.

Potential for crop development

Acacia acuminata is regarded as having only moderate prospects as a crop plant for high volume wood production. It is ranked a category 3 species (see Table 6) and current evidence suggests that it would be best suited to development as a long cycle crop for solid wood products. Its very dense wood lowers its attraction for use in reconstituted wood products. It has only a moderately fast growth rate and there are many other species (especially eucalypts) within its geographic area of occurrence that are likely to perform much better. Nevertheless, additional to its use in sandalwood silviculture *A. acuminata* is regarded as important in Western Australia because it is one of the few common, arborescent acacias that occur in the cropping zone of that State. Silviculturally jam has a number of desirable attributes: it is genetically diverse, has a reasonably wide ecological tolerance, is easy to germinate and apparently does not sucker. Although the variants of Jam discussed above produce reasonable quantities of woody biomass, their suitability as a fuel stock for bioenergy will depend upon them attaining acceptable growth rates under cultivation; other acacias such as *A. saligna, A. microbotrya* etc. are likely to do better in this regard. Any utilisation of Jam will need to take account of the taxonomic variation within this species in order that the appropriate variant/provenance is used (special care should be taken if plants from the Geraldton area are used as there is much unresolved taxonomic complexity in that area).

The area predicted to be climatically suited to the cultivation of *A. acuminata sens. lat.*, based on its natural climatic parameters, is shown in Map 5. This analysis indicates that *A. acuminata* is suited to the climatic conditions prevalent throughout the target area in Western Australia and much of the eastern target area. It predicts conditions suitable for growth well beyond its natural distribution in South Australia, Victoria and New South Wales. In the eastern target area, the 300 metre elevation contour appears to represent the limit of climatic conditions suitable for its cultivation. This suggests cold winters and low temperatures will be a limiting factor for its successful cultivation. This species has the potential to be cultivated on a wide range of loamy soil types.