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PLANTS PEOPLE  
POSSIBILITIES



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SEPASAL is a database and enquiry service about useful "wild" and semi-domesticated plants of tropical and subtropical drylands, developed and maintained at the Royal Botanic Gardens, Kew. "Useful" includes plants which humans eat, use as medicine, feed to animals, make things from, use as fuel, and many other uses.

Since 2004, there has been a Namibian SEPASAL team, based at the National Botanical Research Institute of the Ministry of Agriculture which has been updating the information on Namibian species from Namibian and southern African literature and unpublished sources. By August 2007, over 700 Namibian species had been updated.

Work on updating species information, and adding new species to the database, is ongoing. It may be worth visiting the web site and querying the database to obtain the latest information for this species.

## Internet SEPASAL

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 *Display help*In names list include:  synonyms  vernacular names and display: 10  names per page*Your query found 1 taxon***Colophospermum mopane (Benth.)J.Léonard [1355]**

Family: LEGUMINOSAE-CAESALPINIOIDEAE

**Synonyms**

Copaifera mopane J.Kirk ex Benth.

**Vernacular names**

Afrikaans	mopanie [5147]
Afrikaans (Namibia)	mopani [2136] [5083] [5087] [5121], mopanie [5098], mopaniehout [1304]
Ambo	mupane [5147], mupani [5147]
Barotse	mupane [1340]
Bergdama (Namibia)	!oenis [5087]
Bisa	mupane [5147], mupani [5147]
Bushmen (Namibia)	lgaenb [5087], llaes [5087], llaib [5087]
Chitoka	mwani [1340]
Damara (Namibia)	!oeni [5095], tsaurahi [5095], llgai [5095]
Damara>Nama (Namibia)	!oenis [5098], tsaurahais [5098]
English	Rhodesian mahogany [1340] [5147], balsam tree [5147], butterfly tree [5147], mopane [5147], mopani [1340] [5147], red Angola copal [1340] [5147], Rhodesian ironwood [1340], ironwood [1340], turpentine tree [1340]
English (Namibia)	ironwood [1304] [2136] [5098], mopane [2136] [5083] [5087], turpentine tree [5098], Rhodesian ironwood [1304]
English (Southern Africa)	butterfly tree [1279], mopane [3045] [5082], turpentine tree [1279], mopanie [3045] [5375]
Eunda (Namibia)	omusati [5087]
German (Namibia)	Mopane [5083] [5087] [5098]
Herero	omuntati [1340] [5147], omutati [5147]
Herero (Namibia)	omutati [5083] [5087] [5091] [5121] [5381], omifyati [5083], omuthati [5083]
Herero (Namibia) [fruit]	outwitji [5083] [5087]
Himba (Namibia)	omutati [5087]
Ila (Zambia)	mwane [5147], mwani [5147]
Jul'hoan (Namibia)	llgais [5083] [5121]
Kaonde	mwane [5147], mwani [5147]
Khoekhoegowab (Namibia)	tsaurahais [5121], llgais [5121]
Khukh (Namibia)	!oonis [5083], nameb [5083], tsaurahais [5083], llgais [5083]

Kololo	ipani [1340], mopaani [1340]
Kuangari	musati [1340]
Kunda (Zambia)	chanya [5147]
Kung Bushmen (Namibia)	//gâis [5098] [5121]
Kwaluudhi (Namibia)	omusati [5087]
Kwambi (Namibia)	omusati [5087]
Kwanyama (Namibia)	omufyati [1304] [5083] [5087] [5098], omusati [5087]
Kwanyama (Namibia) [plural]	omifyati [1304]
Kxoe (Namibia)	pana [5083] [5121]
Lala (Zambia)	mupane [5147], mupani [5147]
Lambya	mupane [5147], mupani [5147]
Lozi	mupane [5147], mupani [5147], mwane [5147], mwani [5147]
Lozi (Namibia)	mipane [5083], mopani [5083] [5121], mupane [5087], mwane [5083]
Matabele	ilipani [1340], lipani [1340]
Mbalantu (Namibia)	omusati [5087]
Mbukushu	musati [1340]
Mbukushu (Namibia)	mupanyi [5083]
Nama	omuntat [1340]
Nama (Namibia)	tsaurahais [2136]
Namutoni Bushmen (Namibia)	‡ainba [5087]
Ndau	musara [5147], musaru [5147]
Ndebele	ilipane [5147], ipane [5147], iphane [5147], lipane [5147], ilipani [1340], lipani [1340]
Ndonga (Namibia)	omusati [5083] [5087] [5098]
Ngandjera (Namibia)	omusati [5087]
Nhúnguè	messanha [5147], messano [5147]
Nkolonkhadi (Namibia)	omusati [5087]
Nkoya	mwane [5147], mwani [5147]
Nkumbi (Angola)	ontiati [5087]
Nsenga (Malawi)	lupanye [5147]
Nyanja	sanya [5147], tsanya [5147]
Nyasa	sanya [1340]
Portuguese	chanate [5147]
Senga (Zambia)	mupane [5147], mupani [5147]
Setswana (Namibia)	mophane [5083]
Shangana	nshanatsi [1340]
Shona	musharo [1340] [5147], shanatse [5147], shanatsi [1340] [5147], mopani [1340], mupani [1340], musaro [1340], musaru [1340]
Silozi	Mopani [5121]
Sotho	nxanatsi [5147]
Thimbukushu (Namibia)	mupanyi [5121]
Tjimba (Namibia)	omupungu [5087]
Tonga	mupane [5147], mupani [5147], mwane [5147], mwani [5147], nshanantsi [5147], mopani [1340]
Trade name [timber]	Rhodesian ironwood [144]
Tsonga (South Africa)	nxanatsi [5139]

Tswana	mopane [ <a href="#">1340</a> ] [ <a href="#">5147</a> ], mopani [ <a href="#">5147</a> ], mophane [ <a href="#">5147</a> ], mopanie [ <a href="#">1340</a> ], mophani [ <a href="#">1340</a> ]
Unknown (Angola)	mutiati [ <a href="#">5147</a> ] [ <a href="#">5276</a> ] [ <a href="#">5375</a> ], mufu ti [ <a href="#">5275</a> ], mutiato [ <a href="#">5274</a> ]
Unknown (Caprivi)	mupane [ <a href="#">1340</a> ]
Unknown (Malawi)	tsanya [ <a href="#">5249</a> ]
Unknown (Mozambique)	m'tssanho [ <a href="#">5147</a> ], massamba [ <a href="#">5147</a> ], massanha [ <a href="#">5147</a> ], xanate [ <a href="#">5147</a> ]
Unknown (Okavango)	musati [ <a href="#">1340</a> ]
Unknown (Sabi valley, Zimbabwe)	musharu [ <a href="#">5375</a> ]
Unknown (southern Mozambique)	chanate [ <a href="#">5375</a> ]
Venda	mupane [ <a href="#">5147</a> ], mupani [ <a href="#">1340</a> ] [ <a href="#">5147</a> ], mutanari [ <a href="#">5147</a> ]
Venda (South Africa)	mupani [ <a href="#">5140</a> ], mutanari [ <a href="#">5140</a> ]
Xitsonga/Shangaan (South Africa)	nshanatsi [ <a href="#">5141</a> ], nxanatsi [ <a href="#">5141</a> ]

## Distribution

Plant origin	Continent	Region	Botanical country
Native	Africa	South Tropical Africa	Angola [ <a href="#">1355</a> ] [ <a href="#">5147</a> ] [ <a href="#">5375</a> ], Malawi [ <a href="#">1355</a> ] [ <a href="#">5147</a> ] [ <a href="#">5375</a> ], Mozambique [ <a href="#">1355</a> ] [ <a href="#">5147</a> ] [ <a href="#">5375</a> ], Zambia [ <a href="#">1355</a> ] [ <a href="#">5147</a> ] [ <a href="#">5375</a> ], Zimbabwe [ <a href="#">1355</a> ] [ <a href="#">5147</a> ] [ <a href="#">5375</a> ]
		Southern Africa	Botswana [ <a href="#">1355</a> ] [ <a href="#">5147</a> ] [ <a href="#">5375</a> ], Caprivi Strip [ <a href="#">1355</a> ] [ <a href="#">5121</a> ] [ <a href="#">5147</a> ] [ <a href="#">5375</a> ], Namibia [ <a href="#">1355</a> ] [ <a href="#">5121</a> ] [ <a href="#">5147</a> ] [ <a href="#">5375</a> ], Transvaal [ <a href="#">5104</a> ]
Introduced	Asia-Tropical	Indian Subcontinent	Rajasthan [ <a href="#">5147</a> ] [ <a href="#">5375</a> ]

**ISO countries:** South Africa [[5104](#)] [[5147](#)] [[5375](#)]

## Descriptors

Category	Descriptors and states
DESCRIPTION	Single Stemmed [ <a href="#">5121</a> ]; Can be Coppiced [ <a href="#">1257</a> ] [ <a href="#">1306</a> ] [ <a href="#">5121</a> ] [ <a href="#">5146</a> ] [ <a href="#">5147</a> ]; Fast Growth Rate [ <a href="#">1257</a> ]; Deciduous [ <a href="#">2795</a> ] [ <a href="#">3045</a> ] [ <a href="#">5082</a> ] [ <a href="#">5147</a> ]; Erect; Terrestrial; Shrub [ <a href="#">2136</a> ] [ <a href="#">3045</a> ] [ <a href="#">5121</a> ] [ <a href="#">5146</a> ] [ <a href="#">5147</a> ]; Semi-evergreen/Semi-deciduous [ <a href="#">5097</a> ] [ <a href="#">5121</a> ]; Slow Growth Rate [ <a href="#">5141</a> ] [ <a href="#">5147</a> ]; Tree [ <a href="#">1355</a> ] [ <a href="#">2136</a> ] [ <a href="#">3045</a> ] [ <a href="#">5082</a> ] [ <a href="#">5121</a> ] [ <a href="#">5146</a> ] [ <a href="#">5249</a> ]; Perennial [ <a href="#">1355</a> ]; Foetid/Unpleasant - leaves [ <a href="#">144</a> ] [ <a href="#">1306</a> ] [ <a href="#">1340</a> ] [ <a href="#">5379</a> ]; Foetid/Unpleasant - infructescences [ <a href="#">5082</a> ]; Foetid/Unpleasant - seeds [ <a href="#">1340</a> ] [ <a href="#">5379</a> ]; Plant Height 1-30 m [ <a href="#">5097</a> ] [ <a href="#">5104</a> ]
CLIMATE	Not Frost Tolerant [ <a href="#">5097</a> ] [ <a href="#">5146</a> ] [ <a href="#">5147</a> ] [ <a href="#">5148</a> ] [ <a href="#">5379</a> ]; Annual Rainfall 100-800 mm [ <a href="#">5146</a> ] [ <a href="#">5147</a> ]
SOILS	Deep [ <a href="#">5147</a> ] [ <a href="#">5241</a> ]; Limestone Parent Material [ <a href="#">1306</a> ] [ <a href="#">5249</a> ]; Well Drained [ <a href="#">5147</a> ] [ <a href="#">5241</a> ]; Shallow [ <a href="#">1257</a> ] [ <a href="#">1306</a> ] [ <a href="#">5241</a> ]; Acid [ <a href="#">144</a> ]; Boulders/Rocky [ <a href="#">5121</a> ]; Neutral [ <a href="#">144</a> ]; Gravels/Stony [ <a href="#">2255</a> ] [ <a href="#">5121</a> ]; Alluvial Soils [ <a href="#">3045</a> ] [ <a href="#">5082</a> ] [ <a href="#">5241</a> ]; Poorly Drained [ <a href="#">1257</a> ] [ <a href="#">1306</a> ] [ <a href="#">5082</a> ]; Alkaline [ <a href="#">1257</a> ] [ <a href="#">1306</a> ] [ <a href="#">5082</a> ]; Sandy [ <a href="#">2255</a> ] [ <a href="#">5121</a> ] [ <a href="#">5241</a> ]; Seasonally

HABITAT	Waterlogged [5249]; Loamy [1306] [5241]; Dry; Clayey [1257] [1306] [5146] [5241] [5249] Lowland [5082]; Forms Monospecific Stands [5146] [5147]; Plains/Flats/Pans [144] [5121]; Woodland [1306] [1355] [5082] [5249]; Shrubland/Bushland/Scrub [144] [1355] [5082]; Dominant within Stands of Natural Vegetation [5146] [5147]; Wooded Grassland [144]; Hillsides/Slopes [5121]; Outcrops/Kopjes/Inselbergs [5121]; Termitaria [144] [5146]; Dunes [5121]; Non-Permanent Watercourses [5121]; Altitude 200-1200 m a.s.l. [5104] [5147]
PHYSIOLOGY	Root Nodules Absent [144] [1257]; Mycorrhizal [5146]; Susceptible to Insect Pests [5143]
WOOD PROPERTIES	Heartwood Brown/Shades of Brown [5082]; Very Durable [1257] [3045] [5082]; Wood Resistant to Termites [144] [1304] [1306] [5091] [5140] [5146] [5376]; Heartwood Red/Shades of Red [1257] [1306] [1340] [3045] [5379]; Durable [144] [1306] [1340] [5091] [5379]; Sapwood White/Yellow [1257] [1306] [5379]; Workability - Difficult [1306] [5082] [5097] [5263]; Nailing/Screwing - Difficult [1304]; Wood Susceptible to Termites [1304] [5140]
PRODUCTION AND VALUE	Subsistence Value [1257] [5146]; Potential Commercial Value [1257] [5142] [5146]; Commercial Value [5142] [5258]; Traded Within a Country [2795] [5142]; Potential Material Uses [1257] [5263]
CONSTRAINTS	Susceptible to Fungal Diseases [5147]; Rangeland/Pasture Weed [5121]; Susceptible to Invertebrate Pests [989] [1257]
SOURCES OF PLANTING MATERIAL	RBG Kew Seed Bank; Other Seed Sources [5181]
FURTHER DATA SOURCES	Botanical Illustration [5098] [5121] [5323]; Additional References [5123] [5239] [5240] [5242] [5243] [5244] [5246] [5247] [5248] [5253] [5254] [5255] [5260] [5261] [5264] [5265] [5266] [5267] [5268] [5269] [5270] [5271] [5272] [5273] [5277] [5278] [5279] [5280] [5281] [5282] [5283] [5284] [5285] [5286] [5287] [5288] [5289] [5290] [5291] [5327] [5351] [5367] [5368] [5369] [5370] [5371] [5373] [5374] [5380] [5383] [5386] [5387]; Regional Distribution Map [1257] [5262] [5375]; Botanical Photograph [2795] [3045] [5097] [5239] [5262] [5379]; Databases [5341]; Habit Illustration/Photograph [2136] [2795] [5097] [5147] [5239] [5262] [5379]; Use Related Illustration/Photograph [2795] [5262] [5376]; Grid Map [5121]
SEPASAL DATASHEET STATUS	All Data Transferred from SEPASAL Paper Files; Comprehensively Researched; Nomenclature Checked
CHEMICAL ANALYSES	Unspecified Analyses - other parts [1257] [5147]; Essential Oil Analyses - bark [5147]; Tannins - bark [1257] [5137]; Essential Oil Analyses - leaves [1257] [5147]; Antinutritional Factors - leaves [1306]; Tannins - leaves [1257] [1582] [5385]; Essential Oil Analyses - infructescences [1257]; Essential Oil Analyses - seeds [1257] [5147]; Tannins - 'roots' [5098]; Tannins - unspecified parts; Nutritional Analyses - leaves [144] [1257] [1582] [5147] [5250] [5385]; Nutritional Analyses - unspecified parts [5239]; Nutritional Analyses - other parts [1582] [5379]; Other Analyses - leaves [1257] [5385]; Proteins - leaves [144] [1257] [1582] [5146] [5147] [5385]

## Uses

Major use	Use group	Specific uses
FOOD	Exudates	gums/mucilages [5258]
FOOD ADDITIVES	Unspecified Parts	dairy/dairy-like preparations [5381]
ANIMAL FOOD	Unspecified Parts	game mammals, browse [3045] [5147]; cattle, browse, year round [5147]; fodder [5258]; cattle, browse [3045]; browse [5379]
	Fertile Plant Parts	infructescences, game mammals, browse; fruits, cattle [5082]; infructescences, forage [5095]
	Aerial Parts	leaves, game mammals, browse [5097] [5121] [5146] [5147]; leaves, cattle, browse [144] [1306] [5082] [5239]; fallen leaves, game mammals [1257] [1306] [5097]; fallen leaves, cattle

[1582] [5097]; leafy stems/branches, game mammals, browse [144] [1257] [1306] [5146]; leaves, cattle, fodder [5082]; leafy stems/branches, mammals, browse, dry season [5146] [5147]; mammals, fodder [5147]; leaves, mammals, fodder, dry season [5147]; live plant in situ, game mammals, browse [5147]; game mammals, browse, winter [5147]; leaves, game mammals [1257]; leaves, mammals, browse [5091] [5095] [5121] [5146]; leafy stems/branches, mammals, browse [5146]; leafy stems/branches, game mammals, browse [5146]; fallen leaves, mammals, dry season [5241]; unspecified aerial parts, game mammals, browse [5241]; mammals, browse, dry season [5259] [5376]; game mammals, browse, dry season [5259] [5375]; leaves, forage [5095]; fallen leaves [5379]; fallen leaves, mammals [5097]

INVERTEBRATE  
FOOD

leaves, edible insects/caterpillars/larvae [144] [989] [5082] [5121] [5146] [5147]; leaves, other invertebrates [5095]; edible insects/caterpillars/larvae [3045] [5091] [5095] [5376]

MATERIALS

Unspecified Materials

grain stores [5258]; baskets [5376]

Fibres

bark, cord/string/twine [144] [1257] [1304] [5091] [5139] [5376]; bark, cord/string/twine, buildings [144] [5140] [5144] [5145]; bark, cord/string/twine, huts [1304] [5140] [5141] [5245]; ropes [5258]; bark [1340] [5095]; bark, cord/string/twine, roofs [1304]; inner bark, cord/string/twine, huts [2795]; inner bark, cord/string/twine [5097]

Wood

railway sleepers [5082]; props, mines [144] [1306] [1340] [5082] [5146] [5379]; tool handles [1304]; fences [144] [1304] [1306] [5141] [5258]; constructions [144] [5121] [5140]; pilings, bridges [144]; turned wood; carved wood [1257] [5259]; mortars [5258]; heartwood, pestles [1304] [5376]; defoliated stems/branches, baskets [1304] [5245]; buildings [1257]; other products [144]; poles (from wood), fences [144] [1306]; timber [1257]; defoliated stems/branches, fences [5140] [5141] [5376]; defoliated stems/branches, huts [5140] [5144] [5145]; roots, ornaments [5121] [5142]; stems, fences [5140] [5141] [5245] [5376]; stems, huts [5140] [5245]; trunks, outbuildings [5144] [5145]; trunks, huts [1304] [5144] [5145]; defoliated stems/branches, outbuildings [5144] [5145]; wood, grain stores [5091] [5140] [5141] [5376]; wood, pestles [5140] [5141] [5372] [5376]; wood, poles (from wood), plant supports [5141]; wood, sledges [5139]; wood, tool handles [5141] [5376]; wood [5140] [5141]; yokes [5139] [5140]; wood, furniture [5082] [5097] [5146] [5379]; wood, axe handles [1304] [5141] [5376]; wood, huts [1304] [2136] [5091] [5103] [5140] [5144] [5145] [5146] [5258] [5259] [5376]; wood, fences [2136] [5146] [5376] [5379]; wood, railway sleepers [5097] [5146]; wood, parquet floors [5097] [5146]; stems, outbuildings [5245]; stems, axe handles [1304] [5245]; stems, tool handles [1304] [5245]; stems, pestles [5245]; stems, mortars [5245]; wood, poles (from wood), grain stores [5263] [5376]; wood, turned wood, containers/holders [5263]; wood, turned wood, candlesticks [5263]; wood, turned wood, bracelets [5263]; roofs [5258]; pestles [5258]; stools [5258]; troughs [5258]; wood, whipple trees [1340] [5379]; heartwood, carved wood [5380]; heartwood, turned wood [1340]; heartwood, railway sleepers [1340]; heartwood, parquet floors [1340]; wood, troughs [5091]; wood, constructions [5091];

		wood, poles (from wood), constructions [5095] [5379]; wood, spoons [5095]; wood, pipes (smokers') [5095]; wood, carved wood [2136]; wood, outbuildings [2136]; heartwood, ornaments [3045]; heartwood, furniture [3045]; wood, mortars [5376]; wood, roofs [5376]; wood, wheels [5379]; wood, toys/games [5379]; defoliated stems/branches, hen coops [5376]; heartwood, mortars [5376]; defoliated stems/branches, containers/holders [5376]; wood, poles (from wood), wells [5376]; wood, ladders [5376]; stems, wood, clubs [1304]; defoliated stems/branches, tooth cleaners [2795]; wood, poles (from wood), fences [5097]; wood, poles (from wood), huts [5097]
	Gums/Resins	'roots', resins; bark [144]; resins, adhesives [5147] [5381]
	Tannins/Dyestuffs	bark, tannins; bark, tannins, red [5095]; roots, tannins, red [5095]; bark, tannins, brown [5097]
	Essential Oils	seeds [5135]
	Other Materials/Chemicals	bark, varnishes [144]; bark, blown idiophones [5091]; leaves, blown idiophones [1304] [5091]; defoliated stems/branches, 'jewellery'/personal adornment [5091]; leafy stems/branches, containers/holders [5091]; infructescences, perfumes [5095]; leaves, cigarette wrappers [5095]; infructescences, beads [5095]; defoliated stems/branches, tooth cleaners [2136] [5095]; seeds, other products [5381]
FUELS [510] [1257]	Fuelwood	calorific value - high [1279]; smoky on combustion [1306]; heating fuel, smoky on combustion [1279] [1306]; other uses of fuel, calorific value - high [5141]
[1304] [2136] [2795]		
[3045] [5091] [5095]		
[5097] [5103] [5121]		
[5139] [5140] [5141]		
[5241] [5258] [5259]		
[5372] [5379]		
	Charcoal	
SOCIAL USES	'Religious' Uses	wood, ritual/religion/magic [1304] [5091]; other 'religious' uses [5091] [5121] [5376]; sacred plant [1304] [5091] [5098] [5121]; leaves, ritual/religion/magic [5091] [5095] [5098] [5476]
	Other Eumetazoa	'roots'
NON-VERTEBRATE POISONS		
MEDICINES	Abnormalities	roots, cattle, limbs, oedemas, oral ingestion [5140]
	Digestive System Disorders	leaves, humans, stomach, indigestion, other medicinal applications [5141]; bark, humans, stomach, indigestion, oral ingestion [5141]; roots, humans, gums, mouth washes [5140]; roots, humans, gums, teas [5140]; roots, humans, gums, oral ingestion [5140]; roots, humans, vomiting, oral ingestion [5140]; roots, humans, stomach, indigestion, oral ingestion [5141]; leaves, humans, nausea, oral ingestion [5095]; bark, humans, nausea, oral ingestion [5095]; leaves, humans, stomach, oral ingestion [5095]; leaves, humans, intestine, constipation, enemas [5098]; humans, vomiting [5376]; leaves, humans, constipation, oral ingestion [2795]; roots, humans, intestine, diarrhoea, oral ingestion [5140] [5141]; bark, humans, intestine, diarrhoea, oral ingestion [2136] [2795] [5095] [5098]; other plant parts, humans, intestine, diarrhoea [5381]; leaves, humans, intestine, diarrhoea, oral ingestion [5095]; bark, cattle, intestine, diarrhoea, oral ingestion [2795];

	bark, humans, intestine, diarrhoea [5147]; leaves, humans, intestine, diarrhoea, teas [5141]
Genitourinary System Disorders	roots, humans, ovulation, ovulatory pain, oral ingestion [5141]; roots, humans, kidneys, kidney stones, oral ingestion [5140]; roots, humans, copulation, impotence, oral ingestion [5140]
Infections/Infestations	'roots', humans, anthelmintic [5147]; gum, humans, infections [1304]; bark, humans, syphilis [5147]; bark, humans, other infection/infestation disorders/effects [5147]; leaves, humans, whooping cough/pertussis, teas [5141]; other plant parts, humans, whooping cough/pertussis, oral ingestion [5141]; roots, humans, schistosomiasis, oral ingestion [5141]; bark, humans, tapeworm infections, oral ingestion [5141]; bark, humans, prophylactic, oral ingestion [5141]; bark, humans, head, prophylactic, scarification [5141]; leaves, humans, colds, poultices [5095]; leaves, humans, colds, washes [2136]; leaves, humans, colds, oral ingestion [2136]; wood, humans, syphilis [2136] [5098] [5377] [5382]
Inflammation	stems, humans, eyes; bark, humans, eyes, inflammation [5147]; wood, humans, eyes [1340] [2136] [5097] [5098]
Injuries	fruits, humans, wounds, dressings; gum, humans, wounds [1280]; leaves, humans, burns, external applications [5095]; gum, humans, wounds, external applications [2136]; leaves, humans, superficial injuries [2136] [2795] [5091] [5095] [5098]; leaves, humans, gums, wounds, external applications [2795] [5091]
Metabolic System Disorders	roots, humans, purine and pyrimidine metabolism, gout, oral ingestion [5141]; roots, humans, purine and pyrimidine metabolism, gout, external applications [5141]
Pain	bark, humans, teeth, anodyne, external applications [5141]; bark, humans, thighs, anodyne, external applications [5140]; leaves, humans, thighs, anodyne, external applications [5140]; bark, humans, stomach, anodyne, oral ingestion [5095] [5140]; leaves, humans, eyes, anodyne, poultices [2136] [5095]; leaves, humans, stomach, anodyne, oral ingestion [2136] [5095]; leaves, humans, head, anodyne, poultices [2136] [5095]
Respiratory System Disorders	leaves, humans, coughs, poultices [5095]
Skin/Subcutaneous Cellular Tissue Disorders	leaves, mammals, skin of specific areas, sores, poultices [5141]; leaves, humans, skin, external applications [5140]; inner bark, humans, skin, sores, vapour baths [5140]; inner bark, humans, skin, sores, external applications [5140]; inner bark, humans, skin, external applications [5140]; fruits, humans, skin, external applications [5098]
ENVIRONMENTAL USES	
Shade/Shelter	dispersed trees, homesteads [5258]; homesteads [5376]
Revegetators	dunes [5147]; degraded land [5146]
Indicators	other environments [1306]; alkaline soils [1306]
Soil Improvers	wood, fertilisers [5140] [5147]; leaves [5258]; alkaline soils [1257]; wood, fertility improvers [1340]; live plant in situ [5376]
Boundaries/Barriers/Supports	animal barriers [2136] [5091] [5097] [5139] [5140] [5141] [5147] [5245] [5258] [5259] [5376]; plant/agricultural supports [5140] [5141]; fence supports [5139]



## Picture

None recorded

## Notes

## NOMENCLATURE/TAXONOMY

Colophospermum means oily seed in Greek [2136] .

The word Colophospermum is derived from the Greek words meaning 'seed inhabiting the light', and this possibly refers to the fact that the seed, which is not released from the pod, always remains above ground [5384] .

## DISTRIBUTION

### *Namibia:*

Widespread in the northwestern quarter of Namibia and in eastern Caprivi, with isolated specimens from 1718CB and 1818DC [5121] .

### *Malawi:*

Found in the lower Shire River valley south of Chikwakwa, the upper Shire valley and around the southern shores of Lake Malawi. Covers 9 % of country (10,000km<sup>2</sup>) [5375] .

### *Mozambique:*

Mopane woodland principally associated with the Zambezi, Limpopo and Save river valleys [5375] .

### *Namibia:*

Common around Sesfontein and along some rivers in the northern Namib. Not found in the central or southern Namib [2136] .

### *Namibia:*

From the Kunene River towards the Ugab and northeastwards towards Namutoni. Also small patches in the Caprivi Strip. Covers 9 % of country (77,000km<sup>2</sup>) [5375] .

### *Namibia:*

Kaokoland, Owambo, Etosha, Grootfontein, Outjo, Omaruru [5183] .

### *South Africa:*

A large mopane belt along the Limpopo valley culminates in the Soutpansberg range in the south and at the Limpopo-Luvuvhu confluence. Another belt occurs in the Kruger National Park. Covers 2 % of country (23,000km<sup>2</sup>) [5375] .

### *Zambia:*

Principally associated with the Zambezi, Luangwa, Lukukashi and Lusemfwavalleys. Covers 6 % of country (43,500km<sup>2</sup>) [5375] .

### *Zimbabwe:*

Mostly distributed along the larger river valleys e.g. Zambezi, Limpopo, Sabi and Shangani. Outside these areas it is only found in small patches. Covers 26 % of country (101,500km<sup>2</sup>) [5375] .

### *Botswana:*

Occurs in large concentrations in eastern and northern Botswana [1257] .

### *Angola:*

Occurs only in the southwestern part of the country, lying between Lobito in the north and the Angola-Namibia border in the south. Covers 9 % of country (112,500km<sup>2</sup>) [5375] .

### *Botswana:*

Mainly in the north and northeastern parts of the country [5259] .

### *Botswana:*

Mopane vegetation stretches from the Limpopo River in the east to the Makgadikgadi pans in the north. Covers 15 % of country (85,000km<sup>2</sup>) [5375] .

## RARITY/CONSERVATION

Woodland on good soils likely to be cleared as land pressures intensify and agricultural machinery to deal with heavier soils becomes more available. E.g. Large areas of 'cathedral' mopane woodland are being cleared for settlement and cotton production in the mid-Zambezi valley of northern Zimbabwe (Timberlake and Mapeare, 1992) [5147] .

*Namibia:*

Rate of exploitation may be greater than the rate at which the species can recover. Overgrazing can seriously reduce the production of young plants. Protected by the Forestry Ordinance [5121] .

*Namibia:*

Protected under the Forest Act (Act 72 of 1968), requiring permits for commercial harvesting [5142] .

## DESCRIPTION

*Exudates:*

According to two references by Mai et al in 1905, cited in Watt & Breyer-Brandwijk (1962), the seed yields a balsam [1340] .

*Flowers:*

Flowers in short axillary racemes or sprays, inconspicuous, greenish [3045] .

*Height:*

Up to 10 m [2136] .

*Leaves, seeds:*

According to Bonsma (1942) and Codd (1951), cited in Watt & Breyer-Brandwijk (1962), leaves and seeds smell strongly of turpentine [1340] .

*Height:*

In Namibia, generally up to 8 m high but sometimes taller. Along the Kunene river, in the Cuvelai, in Kamanjab area and in eastern Caprivi there are trees higher than 8 m [5121] .

*Lifeform:*

The chopping of live wood has turned many single-stemmed trees into multi-stemmed shrubs [5121] .

*Leaves:*

Leaflets stalkless, resembling two butterfly wings, with a minute protuberance between the pair, hairless, petiole 20-40 mm long [3045] .

*Odour:*

Meat and milk of animals feeding on green mopane leaves is not tainted even though the breath of the animals and the kraals in which they live smell strongly of onions [5239] [5379] .

*Height:*

Up to 30 m in Caprivi, Namibia, and further north [5097] .

*Plant height:*

2 to 22m [1306] [1600] .

*Pods:*

Flattened, oval, indehiscent [3045] .

*Pods, odour:*

Spicy/fragrant, very pleasant, somewhat resinous [5213] .

*Seeds:*

The seedcoat is resinous [5098] .

*Fruits:*

Insect resistant because of high essential oil content [1257] .

*Fruits:*

Small thin flat pods, comparatively light [1306] .

*Height:*

5-12 m, usually c. 10 m occasionally up to 22 m [1306] .

*Height:*

As a shrub can be up to 2 m [5147] .

*Height:*

Height is determined by soil depth, the taller trees being found on deeper soils [1257] .

*Height:*

The largest tree recorded from Zimbabwe is 24 m tall and 169 cm dbh, near Chiredzi in the southern lowveld [5147] .

*Leaves, odour:*

Smell of turpentine [144] .

*Lifeform:*

When conditions do not favour the development of trees, the plants can remain stunted, forming mopane shrub. C. mopane forms an open parkland of small to medium sized trees or dense thickets of low shrubs [1257] .

*Height:*  
1-20 m [5104] .

*Height:*  
Up to 10 m [2136] .

*Height:*  
Up to 18 m in South Africa but up to 30 m in the Caprivi [5097] .

*Height:*  
In Malawi, typically a branched tree up to 15m tall [5249] .

*Height:*  
Small to medium-sized tree 5 - 12 (20) m high with an erect, narrow crown, though it often occurs as a shrub 1 - 2 m high [5146] .

*Pods, odour:*  
Smell strongly of turpentine [5082] .

*Lifeform:*  
In Venetia Limpopo Nature Reserve, South Africa, there is a strong association between different soil types and vegetation types, with mopane woodland mainly being associated with Oakleaf soils (red/brown, deep alluvial, sandy loams) and mopane shrubland being associated with Valsrivier and Swartland soils (shallow, sandy loam or sandy clay with loam topsoil on dense clay). Mopane/Combretum apiculatum mixed open woodland is associated with Hutton soils (red, deep, sandy and well drained) [5241] .

*Lifeform:*  
It is not uncommon to find expanses of shrub mopane, often surrounded by much larger trees. Suggested causes include frost damage, fire, past cultivation, elephant damage and rooting restrictions due to soil type [5146] .

*Seeds:*  
Sticky [1306] [5379] .

## **FOOD ADDITIVES**

*Water clarifiers, potable water:*  
Mopane can produce a very good quality charcoal that could potentially be used for water filters [5263] .

## **FOOD ADDITIVES - UNSPECIFIED PARTS**

*Dairy products:*  
In Outjo, Namibia, the fresh cambium is used in the calabash to increase the yield of butter extracted from milk [5381] .

## **ANIMAL FOOD - UNSPECIFIED PARTS**

*Browse:*  
Browsed extensively in northern Transvaal [5379] .

*Game mammals, browse:*  
Favourite food of elephants [5379] .

*Cattle, browse, year-round:*  
Although cattle are reported to browse mopane year-round in northern Transvaal (Bonsma, 1942), in most cases browsing is seasonal [5147] .

*Game mammals, browse:*  
An important browse species for elephants. Elephant damage may result in a double-tiered woodland structure, as tree recruitment into taller size classes is prevented [5147] .

## **ANIMAL FOOD - AERIAL PARTS**

*Leaves, bovines:*  
According to Bonsma (1942), cited in Watt & Breyer-Brandwijk (1962), the young leaves in early summer are slightly purgative to the bovine [1340] .

*Fallen leaves:*  
In northern Transvaal, dead leaves are picked from the ground [5379] .

*Game mammals, browse, dry season:*

Young leaves are very palatable to game species such as impala, kudu, steenbok, grey duiker and are crucial for the carrying capacity of an area in the dry season as during that period most other woody plant species are leafless and browsing ungulates would find it hard to obtain other food [5385] .

*Leaves, mammals, browse:*

In Kaokoland, Namibia, mopane leaves are browsed by both large and small stock but only in small amounts [5091] [5095] .

*Game mammals, browse, winter:*

Giraffe in the northeastern Transvaal generally avoid mopane except in late winter when nothing else is available (Oates, 1972) [5147] .

*Leafy stems/branches, game mammals, browse:*

Green leaves and young branches are relished by elephants, but various antelope seem to prefer the dry fallen leaves [1257] [1306] .

*Leaves, cattle, browse:*

Cattle browse leaves readily once they become accustomed to the aromatic smell [1306] .

*Leaves, game mammals, browse:*

Elephants eat both old leaves in July and the new flush in November/December (Lawton, 1980) [5147] .

*Leaves, game mammals:*

Heavily browsed by a number of game species, notably elephants, as well as domestic stock. Normally eaten dried off the ground once some of the essential oil has evaporated [1257] .

*Leaves, mammals, fodder, dry season:*

In Zimbabwe, mopane leaves are sometimes mixed with maize, molasses, urea and bonemeal to provide a nutritious dry season 'bushmeal' (Grassland Society of Zimbabwe Newsletter, October 1992) [5147] .

*Live plant in situ, game mammals, browse:*

Branches and small trees are locally heavily browsed by elephant and often much damaged in the process [5147] .

*Mammals, fodder:*

Leaves alone are not enough for survival and they should be hammer-milled and supplemented with grass hay and molasses (Ludeman, 1966) [5147] .

*Leaves, mammals:*

In early summer, leaves have a laxative effect on animals [5239] .

*Leafy stems/branches, game mammals, mammals, browse, dry season:*

In the dry season the turpentine smell from the leaves has diminished, the dry leaves remain on the plant and very little other forage is available [5146] .

*Unspecified aerial parts, elephants, browse:*

Mopane is a preferred browse for elephants [5241] .

## **INVERTEBRATE FOOD**

*Lepidoptera:*

In Botswana, mopane worms are an important source of food which is high in protein value. There are two harvesting periods per season (Dec/Jan and Apr/May). In Botswana, harvesting has become commercialised and 90% of the harvest is exported to South Africa [5256] [5259] .

*Lepidoptera:*

Dama people, near Brandberg, Namibia, eat the mopane worm which feed on the leaves during summer [5103] .

*Edible caterpillar:*

In Kaokoland, Namibia, during late summer the mopane worm (omungu) occurs in large numbers. This large caterpillar is regarded as a delicacy by most Herero people [5091] .

*Edible caterpillar:*

The edible caterpillar ombwakarumba occurs on mopane [5095] .

*Hemiptera, leaves:*

Dried secretions on mopane leaves, produced by a species of aphid (Hemiptera: Psyllidae, *Retroacizzia mopani*) and containing sugar, are eaten with relish by the Damara people of Damaraland, Namibia [5095] .

*Edible caterpillars:*

Host to mopane worms, an important and popular source of protein for the human diet in rural areas. The large caterpillars are squeezed to remove their intestines, then sun-dried for transport and storage [2795] .

*Edible caterpillars:*

Caterpillars of emperor moth *Imbrasia belina* (*Gonimbrasia belina*), called mopane worms, feed on the leaves. They are collected and roasted, forming an important part of the diet of local people as they have a high protein content. In

times of plenty mopane worms are dried and can be stored for months [5082] .

*Edible caterpillars:*

Larvae of emperor moth *Imbrasia belina* (*Gonimbrasia belina*, *Nudaurelia belina*), called mopane worms, eat the leaves [989] .

*Lepidoptera:*

In 1971, Van den Berg stated that larvae were sold by South African farmers to Bantu people on a large scale [989] .

*Lepidoptera:*

Mopane worms are black-spotted and hairless [144] .

*Lepidoptera:*

Mopane worms are collected by rural people as a food source or to be sold or exchanged. They are prepared by killing in boiling water or in a fire after squeezing out the intestines, then dried for storage or cooked by frying or roasting. They are very nutritious, with a high protein content of 47.5 % and a fat content of 51.5 % [5147] .

*Edible caterpillars:*

Mopane worms have a nutty flavour [144] .

*Edible caterpillars:*

Larvae of *Imbrasia belina* are collected, dried and sold in urban areas (Botswana, southern Zimbabwe, northern Transvaal). The industry has been estimated at UK pounds 4.42 million annually in Botswana alone (Styles, 1995) [5146] .

*Lepidoptera:*

In South Africa the retail price of mopane worms was on average R3.20 per 30g in 1993 (Brandon, 1993). Annual sales in 1982 through agricultural co-operative markets amounted to about 40,000 bags containing 40 kg each (Dreyer and Wehmeyer, 1982) [5241] .

## MATERIALS

*Wood properties - durability:*

Insect resistant [1257] .

*Wood properties - workability:*

Although difficult to work, some fine pieces of furniture have been made from it [5082] .

*Wood properties - workability:*

Timber too difficult to work for furniture [1306] .

*Wood properties:*

Dark reddish-brown to almost black, very durable, hard and heavy. Timber too difficult to work for furniture [1306] .

*Wood properties:*

Density of wood (kg/m<sup>3</sup>) is 1120 air dry or 1280 green in Zambia, 1200 in Zimbabwe and up to 1344 in South Africa [5147] .

*Wood properties:*

Hard, heavy [144] [1257] [1304] [1306] [1340] [5082] .

*Wood properties:*

Heartwood dark reddish-brown to almost black [1306] [5082] .

*Wood properties:*

Moderately coarse grained and evenly textured (Division of Forest Products Research, 1979) [5147] .

*Wood properties:*

Sapwood white [1257] .

*Wood properties:*

Sapwood yellow [1306] [5379] .

*Wood properties:*

Inner heart wood of mopane stems is especially hard and resistant to termites and may last as long as 50 years. Thinner stems and branches last about 6 years [5376] .

*Wood properties:*

High specific weight at 1190 kg/m<sup>3</sup> air dry (Tietema et al 1991) [5147] .

*Leaves:*

Resinous and burn even when green [1306] [5379] .

*Wood properties:*

Heartwood density of around 1,200 kg/m<sup>3</sup> (Goldsmith and Carter, 1981) [5146] .

*Resins:*

Balsam, no commercial value, from seeds and pods [144] .

*Wood properties:*

May or may not be resistant to termites depending on its preparation. If a mopane branch is lightly burnt before being used for fencing, then the wood/bark becomes termite resistant [5140] .

## **MATERIALS - FIBRES**

*Twine, buildings, bark:*

Used to tie buildings together [1304] [5140] [5144] [5145] .

*Twine, huts, fences, bark:*

Bark is used for tying kraal fences and hut frames together, and to hold thatch on roofs. Bark is stripped off limbs used in hut construction and pulled back and forth across a small limb, usually held by bare feet on the ground. This decreases stiffness. Bark may be dried and later soaked in water before using [1304] .

*Twine, roofs:*

Used by Kwanyama people, Namibia, to hold thatch on hut roofs [1304] .

*Twine, bark:*

In Kaokoland, Namibia, bark stripped from saplings is frequently used in the construction process [5091] .

*Twine, huts, bark:*

Vatsonga people (South Africa) use rope made from mopane bark to tie together roof poles for huts and grain stores. Mopane rope can last more than 15 years if not exposed to the elements. When making rope, straight side branches of young mopane trees are cut. Branches are burnt with grass for 15 - 20 min or until the bark on the branch expands. The bark is removed in strips of approximately 10 - 15 mm wide from the wood and the rough outer layer of the bark is removed. The length of the rope depends on the length of the branch taken. The rope is made pliable by being soaked in hot water for about 30 min before use [5141] .

*Twine, huts, bark:*

Young mopane trees are used. Villagers break the young stem in half and strip the young outer bark from the wood. This is stored in bundles for later use. When needed, they soak it overnight in cold water to make it soft and easy to work with. If needed urgently, it is soaked in hot water for about 30 minutes [5140] .

*Bark:*

Is said to yield a fibre [1257] .

*Bark:*

According to Miller (1948), cited in Watt & Breyer-Brandwijk (1962), a strong fibre is obtained from the bark of some trees [1340] .

## **MATERIALS - WOOD**

*Stems, huts:*

In rural areas, huts were found in which the walls were made from mopane stems and side branches plastered with mud on both sides. These huts last for about 3 - 7 years [5140] .

*Carved wood:*

Used for carving in Sesfontein, Namibia [2136] .

*Trunks, huts:*

Important for huts and kraals [5144] [5145] .

*Defoliated branches, hen coops:*

In northern Namibia, shelters are made for hens, and other animals, from mopane sticks [5376] .

*Defoliated stems/branches, containers:*

In northern Namibia, mopane sticks are tied together to make a large cone-shaped container which is suspended above the ground on mopane poles. The container is lined with grass and is used to hold beans and corn cobs for drying in the sun prior to storage [5376] .

*Wood carving:*

The most commonly used wood in northeast Botswana [1257] .

*Fences:*

According to McCrae (1906) and PoleEvans (1948) cited by Watt & Breyer-Brandwijk (1962), the timber is used for fences [1340] .

*Heartwood, railway sleepers, parquet flooring:*

According to Pardy (1953), cited in Watt & Breyer-Brandwijk (1962), the heartwood is suitable for making railway sleepers and parquet blocks [1340] .

*Heartwood, turned wood, carved wood:*

According to Pardy (1953), cited in Watt & Breyer-Brandwijk (1962), the durable heartwood is too hard and heavy for general use but is used for small turned and carved articles [1340] .

*Huts, grain stores, constructions:*

The wood is the most important building material for Herero people in Kaokoland, Namibia and is used in huts, shelters, cattle enclosures, calf, kid and lamb pens and stands for grain storage bins [5091] .

*Axe handles:*

Axe handles made by Vatsonga people (South Africa) average 0.57 m in length and 2.5 kg in weight [5141] .

*Grain stores:*

The whole structure can be made from mopane. Depending on the time of harvesting of the wood, the structure can last for up to 4 years. It is believed that the wood has to be harvested between January and April to avoid attack by termites [5140] .

*Ladders:*

In northern Namibia, ladders or pegs made from mopane wood are used to help climb trees to harvest sap to make drinks from [5376] .

*Ladders:*

In northern Namibia, when wells are being dug or repaired, long wooden ladders normally made from mopane are used [5376] .

*Mortars:*

Vatsonga people (South Africa) do not use mopane wood for mortars as grinding in a mopane mortar results in a bitter-tasting powder [5141] .

*Pestles:*

About 6 kg of wood is used for making a pestle. This can last for up to 15 years. It is believed that removing the bark reduces the chances of it being attacked by termites [5140] .

*Pestles:*

Pestles made from mopane wood by Vatsonga people (South Africa) average 1.28 m in length, 0.22 m in circumference and about 7.5 kg in weight [5141] .

*Plant supports, poles from wood:*

Mopane canes used for holding up grape vines [5141] .

*Sledges:*

Used for sand-sledges [5139] .

*Tool handles:*

Hoe handles made by Vatsonga people (South Africa) average 1.28 m in length and 4 kg in weight [5141] .

*Wood, grain stores, huts, fences:*

The Vatsonga people (South Africa) use mopane wood stripped of bark to build a variety of structures including huts, grain stores, fences, chicken pens and kraals. Although the removal of bark represents a cultural notion that the poles will last longer, there is no scientific evidence to support this. However, it may speed up the drying process and minimise the effect of woodborers and other insects [5141] .

*Poles from wood:*

Used as poles for holding up washing lines [5140] [5141] .

*Wood, yokes:*

Used in construction of cattle yokes [5139] [5140] .

*Branches, huts, outbuildings:*

Important for huts and kraals [5144] [5145] .

*Trunks, outbuildings:*

Important for huts and kraals [5144] [5145] .

*Branches, stems, fences:*

When constructing a fence, Vhavenda (South Africa) villagers used between 1000 and 2500 poles per household. Around residential areas, poles are spaced further apart than around agricultural areas where poles are closer to prevent animals entering and destroying crops. Poles made from the main stem and side branches, with and without bark, are used to construct fences. A fence made from poles harvested between January and April is said to last for about 12 years. The belief is that if it is harvested outside this period it would be less durable [5140] .

*Wells, poles (from wood):*

In northern Namibia, long, thick and strong mopane poles are used to form a platform above wells. This enables a person to stand directly over the water and makes it easier to let down a bucket on a rope and also helps prevent the well walls collapsing [5376] .

*Props, mines:*

According to Chalk et al (1932), Miller (1948) and Pardy (1953), cited in Watt & Breyer-Brandwijk (1962), the timber has been used for mine props [1340] .

*Pulleys:*

In northern Namibia, winches made from mopane timber are used to lift water from deep wells [5376] .

*Tooth cleaners, defoliated stems:*

Twigs are used as chewing sticks to clean the teeth [2795] .

*Troughs:*

In Kaokoland, Namibia, large logs are sometimes hollowed out to make cattle drinking troughs [5091] .

*Whipple trees:*

According to McCrae (1906) and PoleEvans (1948) cited by Watt & Breyer-Brandwijk (1962) , the timber is used for disselbooms. (Note that a disselboom is the central part of a traditional oxwagon, to which the animals were attached) [1340] .

*Whipple trees:*

Used for disselbooms [5379] .

*Grain stores, poles from wood:*

In northern Namibia, large baskets for the storage of omahangu (millet) and other crops such as sorghum are made using green, flexible mopane sticks that act as a framework through which smaller sticks and bark can be woven. The baskets are lined with clay and mounted on wooden legs so that they are held above the ground [5376] .

*Fences:*

In northern Namibia, when a homestead is first being established, mopane is used to construct 'brush fences' made from the small branches cut off larger branches and other bushes. This is replaced after a year or two by a strong fence made from a fence made of mopane trunks and branches [5376] .

*Grain stores:*

In northern Namibia, omahangu (millet) grain stores are made from mopane sticks and stand on mopane legs [5376] .

*Huts:*

In northern Namibia, mopane wood is used for building homesteads and huts. A typical homestead is made from about 4000 poles. Each pole is about 2 to 3 m long and 6 to 10 cm wide. The outer perimeter wall is about 100 m long and the internal partitioning walls are also about 100 m long. To obtain this number of poles, approximately 1000 trees must be cut down [5376] .

*Wheels:*

Used for felloes (the outer circle of wheels) [5379] .

*Branches, fences:*

Sometimes mopane branches are used in keeping down wire fences [5140] .

*Branches, huts:*

In rural areas, huts were found in which the walls were made from mopane stems and side branches plastered with mud on both sides. These huts last for about 3 - 7 years [5140] .

*Constructions:*

Heavy constructions [144] .

*Constructions:*

Used in construction of car ports [5140] .

*Furniture:*

Although difficult to work, some fine pieces of furniture have been made from it [5082] .

*Furniture:*

Occasionally used for furniture but generally considered too heavy and liable to splitting [5146] .

*Other products:*

Small handicraft articles [144] .

*Parquet floors:*

Used in the past for parquet floors [5146] .

*Railway sleepers:*

Used in the past for railway sleepers [5146] .

*Tool handles, stems:*

Hoe handles [5245] .

*Stems, fences:*

Thick poles of approximately 53 mm are usually placed at the corners of the fence [5140] .

## **MATERIALS - GUMS/RESINS**



### *Gums, adhesives:*

In Outjo, Namibia the gum is used to seal cracked calabashes [5381] .

### *Bark:*

Source of copal [144] .

### *Gums:*

Exudes from cambial region on cut branch [5136] .

### *Resins, adhesives:*

It was reported in 1914 that mopane resin or gum was used in parts of Zimbabwe for mending broken pots and gourds and for fixing spear heads, but that yields per tree were low [5147] .

## **MATERIALS - TANNINS/DYESTUFFS**

### *Tannins, red, bark, roots:*

The bark and roots are used as an orange/red leather tanning agent by Damara people in Sesfontein and Khowarib, Namibia [5095] .

## **MATERIALS - OTHER MATERIALS/CHEMICALS**

### *Containers, leafy branches:*

In Kaokoland, Namibia, leafy branches serve as mats on which meat is placed when slaughtering [5091] .

### *Infructescences, beads:*

In Damaraland, Namibia the pods are often used for beads [5095] .

### *Infructescences, perfume:*

The ground pods are used for sâi (perfume) by Damara people in Damaraland, Namibia, either alone or mixed with plant parts of *Thamnosma africana* [5095] .

### *Personal adornment, defoliated branches:*

In Kaokoland, Namibia young, flexible branches are made into waistbands (omapatoka) for young girls (pre-puberty) [5091] .

### *Leaves, blown idiophones:*

Kwanyama owambos in Namibia use the leaf as a whistle, called oshiva, which is used by Christians and non-Christians at weddings [1304] .

### *Seeds, other products:*

In Outjo, Namibia, the powdered seed is used as talcum powder [5381] .

Possible commercial uses include using pods and leaves as florists material. Seeds and leaves could potentially be used for essential oils, and timber for carving and building [1257] .

### *Bark, leaves, blown idiophone:*

In Kaokoland, Namibia, whistles are made by herd boys from thin pipes of bark, as well as from leaves [5091] .

## **FUELS - FUELWOOD**

Wood excellent for slow-burning but hot fires [1304] [5140] .

Wood is resinous and burns well, although with much smoke [1306] .

In Kaokoland, mopane wood is the most popular all-purpose firewood [5091] .

In north-central Namibia, most local households prefer using mopane for fuelwood rather than other trees so much that they are now under threat [5372] .

Heavily utilised as fuel in Namibia [5121] .

The most desirable firewood in northwest Namibia [5095] .

About 7.5 kg of mixed firewood used per Vatsonga family (South Africa) per day, equivalent to 0.018m<sup>3</sup> of wood [5141] .

Average of 7.8 kg of mixed wood (mopane and a mixture of other species) is used per household per meal by Vhavenda people (South Africa), equivalent to 2.7 tonnes per year per family [5140] .

### *Fuel quality:*

Energy content of 21,570 kJ/kg (Tietema et al 1991) [5147] .

### *Fuel quality:*

Very good, giving off a sweet smell and intense heat [1279] [2795] .

In northeast Botswana, many trees are chopped down for timber and firewood [1257] .

Mopane branches take more than 3 weeks to dry, which is longer than most other species used. Said to burn slowly

and produce a constant high heat [5141] .

Useful fuelwood species in Namibia [510] .

*Other uses of fuel, calorific value - high:*

Used by Vatsonga people (South Africa) to fire clay bricks [5141] .

## FUELS - CHARCOAL

According to Miller (1948), cited in Watt & Breyer-Brandwijk (1962), the timber has been used for making charcoal [1340] .

## SOCIAL USES - 'RELIGIOUS' USES

*Wood, ritual/religion/magic:*

Used by Kwanyama Ovambos, Namibia, for the sacred fire that must never go out [1304] .

*Leaves, other religious uses:*

In Kaokoland, Namibia, when praying to the ancestral spirits, the kraal head will stir water in a small bowl with mopane leaves. This act is necessary to focus the attention of the spirits on the person seeking their assistance [5091] .

*Leaves, ritual/religion/magic:*

Amongst the Kaokoland Himba people, leaves are used for cleansing rituals [5098] .

*Other religious uses:*

In Namibia, used for good luck charms [5121] .

*Sacred plant:*

In Himba culture mopane is believed to be sacred, and is used in rituals [5121] .

*Other, religious/ritual/magic:*

During a fieldtrip with a researcher, Damara people in Damaraland placed mopane leaves and tobacco in an offering to the ancestors as a sign of respect and to ensure safe passage through ancestral lands [5095] .

*Sacred plant:*

Amongst the Kaokoland Himba people, Namibia, the mopane is seen as a sacred tree. A sacred fire is surrounded by branches, while leaves are used for cleansing rituals [5098] .

*Sacred plant:*

In Kaokoland, Namibia, branches cut from mopane are used in the otjoto and otjiranda shelters erected during ceremonial occasions by the Herero people [5091] .

*Wood, leaves, rituals:*

Mopane plays many roles during ritual ceremonies of the Herero of Kaokoland, Namibia. One example follows. Knocking out the four lower incisors between the ages of ten and twelve, is an event of considerable religious and social significance in the life of a child. The actual knocking out of the teeth is done using a specially sharpened sliver of mopane wood, holding it against one tooth at a time and tapping it with a heavy object until the tooth can be removed with the fingers. During this process, another piece of mopane wood is used to hold back the tongue. These mopane splinters are later buried next to the sacred fire. When all four teeth have been removed, the child wraps them in a mopane leaf and throws them towards his/her birthplace. A mopane leaf is heated with a glowing coal and held against the torn gums to press the wound shut. This process is repeated during the following days. Apart from the advantage of squeezing out clotted blood, the mopane leaf is also thought to have disinfectant qualities [5091] .

*Wood, ritual/religion/magic:*

For Herero people in Kaokoland, Namibia only mopane wood may be used for the sacred fire. A pile of branches is kept stacked near to the sacred fire on a special stone [5091] .

*Leaves, ritual:*

Damara people 'throw away' medicinally valued leaves to the ancestors, to ask for protection and ensure success in finding required resources [5476] .

## MEDICINES - ABNORMALITIES

*Roots, cattle, limbs, oedemas, oral ingestion:*

Young secondary roots of mopane are boiled in water and allowed to cool. The extract is given orally to cattle on a daily basis to treat swollen limbs. The treatment becomes effective after 3 days [5140] .

## MEDICINES - DIGESTIVE SYSTEM DISORDERS

*Leaves, bark, humans, intestines, diarrhoea, nausea, oral ingestion:*

Leaves or bark are boiled into a decoction which is drunk for stomach pain, nausea and diarrhoea by Damara people in Damaraland, Namibia. A handful of leaves are boiled in a cup and the whole contents of the cup drunk; this procedure is repeated twice a day [5095] .

*Leaves, humans, intestine, constipation, enemas:*

For constipation the Himba, Namibia administer leaf decoction enemas [5098] .

*Leaves, humans, stomach, oral ingestion:*

A decoction of the leaves is drunk for stomach disorders, especially caused by eating too much meat, by Damara people in Sesfontein, Namibia [5095] .

*Leaves, humans, stomach, oral ingestion:*

Damara people speak about the healing power of the leaves and chew them for stomach complaints [5098] .

*Bark, cattle, intestines, diarrhoea, oral ingestion:*

The bark is used as a drench for diarrhoea in cattle [2795] .

*Other plant parts, humans, intestines, diarrhoea:*

In Outjo, Namibia, a decoction of the boiled cambium is used for a running tummy [5381] .

*Leaves, humans, constipation, oral ingestion:*

Leaf infusions are used for constipation [2795] .

*Bark, humans, intestines, diarrhoea:*

A bark extract is reported to be used to treat diarrhoea in northern Zimbabwe (Forest Research Centre archive files, 1914) [5147] .

*Bark, humans, stomach, indigestion, oral ingestion:*

To treat stomach aches, Vatsonga people (South Africa) use the bark of either young or old mopane trees. The bark is mixed with bark from *Diospyros mespiliformis*, *Balanites maughamii* and *Pterocarpus angolensis* then ground and sieved. This is taken daily with soft porridge until the patient's condition improves. Alternatively the mixed bark is boiled and mixed with soft mealie porridge to make a medicine which the patient eats until the pain is relieved [5141] .

*Leaves, humans, intestines, diarrhoea, teas:*

Vatsonga people (South Africa) treat diarrhoea by boiling young fresh mopane leaves in water for 20 min or until the water changes colour. The patient drinks one cup of extract per day for two days only. Relief usually occurs within two days [5141] .

*Leaves, humans, stomach, indigestion, other medicinal applications:*

To treat stomach aches, Vatsonga people (South Africa) collect and chew a few fresh young mopane leaves, the chewed remains being spat out. This process is repeated daily, with relief usually occurring within two days [5141] .

*Roots, humans, intestines, diarrhoea, vomiting, oral ingestion:*

Thin roots of mopane are boiled. The water is allowed to cool and the extract given orally on a daily basis to babies to stop diarrhoea and vomiting [5140] .

*Roots, humans, intestines, diarrhoea, oral ingestion:*

Vatsonga people (South Africa) treat diarrhoea by boiling mopane roots mixed with roots of *Combretum imberbe* and *C. zeyheri* in water until the water changes colour. The medicine is taken orally twice a day until the patient is healed [5141] .

*Roots, humans, gums, mouth washes, teas:*

Thin secondary roots are boiled in water and the extract is used as either a mouthwash or drunk as tea [5140] .

*Roots, humans, gums, oral ingestion:*

Roots can be crushed, mixed with soft porridge and eaten to treat gum bleeding [5140] .

*Roots, humans, stomach, indigestion, oral ingestion:*

Mopane roots mixed with roots of *Combretum imberbe* and *C. zeyheri* are used by Vatsonga people (South Africa) to treat stomach aches. The roots are boiled until the water becomes light red and the decoction is drunk by the patient three times per day until the pain is relieved [5141] .

*Bark, humans, intestines, diarrhoea, oral ingestion:*

The Bushmen drink a bark decoction for diarrhoea [2136] .

*Bark, humans, intestines, diarrhoea, oral ingestion:*

The Heikum Bushmen, Namibia take a bark decoction for diarrhoea [5098] .

## **MEDICINES - GENITOURINARY SYSTEM DISORDERS**

*Roots, humans, copulation, impotence, oral ingestion:*

Young roots of mopane are mixed with *Wrightia natalensis*, *Securidaca longependunculata* and *mutshalimela*

(scientific name unknown). The roots are soaked overnight and the extract is taken 3 - 4 times a day. The dry roots can also be ground into a powder and mixed with alcohol, water or soft porridge. The patient is instructed to drink this mixture on a weekly basis [5140] .

*Roots, humans, kidneys, kidney stones, oral ingestion:*

Young mopane roots are boiled in water and the extract is taken 3 - 4 times a day. Traditional healers indicated that the patient should start to show an improvement after 4 - 7 days [5140] .

*Roots, humans, ovulation, ovulatory pain, oral ingestion:*

Vatsonga people (South Africa) treat menstrual pains by mixing mopane roots with roots of *Ziziphus mucronata* subsp. *mucronata* and *Senna italica* subsp. *arachoides*. The roots are cut into small pieces and boiled until the water turns light red. This preparation is taken orally and relief is said to occur within 5 days. (However, note that menstrual pains are naturally limited to 5 days) [5141] .

## MEDICINES - INFECTIONS/INFESTATIONS

*Leaves, humans, colds, poultices:*

Damara people in Damarland, Namibia use a poultice or wash made from the leaves for coughs and colds [5095] .

*Leaves, humans, colds, washes, oral ingestion:*

In Sesfontein, Namibia, the body can be washed with a decoction of the leaves, or the decoction drunk, to cure colds [2136] .

*'Roots', humans, anthelmintic:*

An infusion of the roots has been used in Mozambique to kill intestinal worms (Gomes and Sousa, 1966) [5147] .

*Wood, humans, syphilis:*

According to McCrae (1906) and PoleEvans (1948) cited by Watt & Breyer-Brandwijk (1962), an extract of the wood is used in the Eastern Transvaal as a remedy for syphilis [1340] .

*Bark, humans, head, prophylactic, oral ingestion:*

Vatsonga people (South Africa) use mopane bark mixed with *Ziziphus mucronata* and *Stylochiton natalense* to prevent meningitis in newborn babies. The bark is boiled and administered orally thrice daily to babies for the first 2 - 3 months [5141] .

*Bark, humans, other infection:*

A bark extract is reported to be used to treat dysentery in northern Zimbabwe (Forest Research Centre archive files, 1914) [5147] .

*Bark, humans, prophylactic, scarification:*

To prevent meningitis in newborn babies Vatsonga people (South Africa) use an extract of burnt ash and ground bark of mopane roots mixed with *Ziziphus mucronata* and *Stylochiton natalense*. The upper portion of the head of the baby is cut using a sharp razor blade and the extract of the bark is repeatedly applied to the cut for a week [5141] .

*Bark, humans, syphilis:*

A bark extract is reported to be used against syphilis in the Eastern Transvaal (Watt and Breyer-Brandwijk, 1962) [5147] .

*Bark, humans, tapeworm infections, oral ingestion:*

Vatsonga people (South Africa) use a decoction made from the bark of young trees, boiled for 10 min, to treat children infested with tapeworms. The decoction is diluted with cold water and one cupful is drunk 3 times a day until dead tapeworms are no longer observed in stools [5141] .

*Gum, humans, infections, external application:*

Resinous gum exuded when branches are heated is cooled and applied to infected wounds [1304] .

*Leaves, humans, whooping cough/pertussis, teas:*

Vatsonga people (South Africa) treat whooping cough by boiling leaves for 20 minutes or until the water changes colour. One cup of extract is recommended per day until the cough is relieved [5141] .

*Other plant parts, humans, whooping cough/pertussis, oral ingestion:*

Vatsonga people (South Africa) treat whooping cough by dissolving ash from mopane and ash from *Combretum* spp. in cold water. This is left for 10 min to allow prolapse and is taken orally three times per day until the cough is relieved [5141] .

*Roots, humans, schistosomiasis, oral ingestion:*

Vatsonga people (South Africa) treat bilharzia by boiling young roots in water for 20 - 30 min. The decoction is taken orally once daily [5141] .

## MEDICINES - INFLAMMATION

*Wood, humans, eyes:*

According to McCrae (1906) and PoleEvans (1948) cited by Watt & Breyer-Brandwijk (1962), an extract of the wood is used in the Eastern Transvaal as an application to the inflamed eye [1340] .

*Bark, humans, eyes:*

A bark extract is reported to be used to treat inflamed eyes (Watt and Breyer-Brandwijk, 1962) [5147] .

## **MEDICINES - INJURIES**

*Gums, humans, wounds, external applications:*

A resinous gum is exuded from the branches when they are heated. This gum is applied to infected wounds by the Topnaar people of Sesfontein, Namibia [2136] .

*Leaves, humans, burns, external applications:*

The Damara people in Damaraland, Namibia used dried leaves pounded into a powder to sprinkle on cuts and wounds such as burns [5095] .

*Leaves, humans, superficial injuries:*

One use of the mopane leaf derives from its ability to stop excessive bleeding. In this case the leaves are chewed until only the coarse white fibres remain, which are then placed on the wound. The matted fibres absorb the blood and promote clotting in the same manner as a gauze bandage. This procedure is followed to stop bleeding after circumcision. The leaves are thought to have antiseptic properties [5091] [5095] [5098] .

*Leaves, humans, gums, wounds, external application:*

Among the Herero of Namibia it is customary to extract the four lower incisors of children between the ages of 10 and 12 and mopane leaves are applied daily to promote healing of the lower jaw [2795] [5091] .

*Gum, humans, wounds:*

In some parts of Namibia, gum extracted from heated wood is used to heal stubborn wounds (Palmer and Pitman, 1972, cited in Von Koenen, 2001) [5098] .

## **MEDICINES - METABOLIC SYSTEM DISORDERS**

*Roots, humans, purine and pyrimidine metabolism, gout, external applications, oral ingestion:*

Vatsonga people (South Africa) treat gout by mixing young mopane roots with roots of *Ozoroa engleri* and *Cassia abbreviata*. The roots of all 3 species are boiled in two different pots. Medicine from one pot is taken orally once or twice a day. The boiled roots in the second pot are used for rubbing on the swollen part twice a day. Drinking and rubbing is repeated until the swelling subsides [5141] .

## **MEDICINES - PAIN**

*Leaves, humans, heads, eyes, anodyne, poultice:*

Damara people in Damaraland, Namibia make a poultice or wash from the leaves for headaches and eye-pains [2136] [5095] .

*Leaves, humans, stomach, anodyne, oral ingestion:*

Damara people in Damaraland, Namibia chew the leaves to treat stomach ache [5095] .

*Bark, humans, stomach, anodyne, oral ingestion:*

The outer bark of mopane is crushed with a stone and then boiled in water for approximately 30 minutes. The patient then drinks the extract and pain relief is said to take place after approximately half an hour [5140] .

*Bark, humans, teeth, anodyne, external applications:*

Vatsonga people (South Africa) place a small piece of mopane bark on the area affected by tooth ache until the ache subsides [5141] .

*Inner bark, leaves, humans, thighs, anodyne, external applications:*

Women travelling long distances chew the young, white, inner bark or the leaves of mopane and then apply the juices on the chaffing of the inner thigh. This application is done once per trip and is reported to soothe away the pain [5140] .

## **MEDICINES - RESPIRATORY SYSTEM DISORDERS**

*Leaves, humans, coughs, poultices:*

Damara people in Damaraland, Namibia use a poultice or wash made from the leaves for coughs and colds [5095] .

## MEDICINES - SKIN/SUBCUTANEOUS CELLULAR TISSUE DISORDERS

*Fruits, humans, skin, external applications:*

A skin cream can be made from the crushed fruit. Extraction of the leaves with ether yields a viscous, brownish, clear balsam with a turpentine-like smell (Deutsch Südwestafrikanische Zeitung 1902, cited in Von Koenen, 2001) [5098] .

*Inner bark, leaves, humans, skin, sores, external applications:*

Women travelling long distances chew the young, white, inner bark or the leaves of mopane and then apply the juices on the chaffing of the inner thigh. This application is done once per trip and is reported to soothe away the pain [5140] .

*Inner bark, humans, skin, sores, external applications:*

The red inner bark is crushed and applied on the sore. Healing of small sores takes roughly 7 - 8 days [5140] .

*Inner bark, humans, skin, sores, vapour baths:*

The red inner bark is boiled for approximately an hour. Then stones that have been burnt are placed into the pot to release steam in order to steam the patient who is covered with a blanket. The smoke is said to heal the sores [5140] .

*Leaves, humans, skin, external applications:*

Women travelling long distances chew the young, white, inner bark or the leaves of mopane and then apply the juices on the chaffing of the inner thigh. This application is done once per trip and is reported to soothe away the pain [5140] .

*Leaves, mammals, skin of specific areas, sores, poultices:*

Vatsonga people (South Africa) treat animals with sores on their ankles by grinding fresh leaves and rolling them in a clean cloth which is then soaked in water for 10 minutes. After cleaning, the injured part is bound with the cloth containing the ground leaves. The cloth is removed periodically to allow for cleaning of the injury but kept bound until healing is complete [5141] .

## ENVIRONMENTAL USES - REVEGETATORS

*Dunes:*

Has been used experimentally in India to stabilise sand dunes but showed poor establishment and survival (Shankarnarayan and Kumar, 1986) [5147] .

*Degraded land:*

Has potential for rehabilitation of some degraded lands owing to its ability to survive under difficult soil conditions [5146] .

## ENVIRONMENTAL USES - INDICATORS

It is often regarded as an indication of high temperatures, low rainfall and shallow, poorly-drained, often alkaline soil [1306] .

## ENVIRONMENTAL USES - SOIL IMPROVERS

*Leaves:*

In northern Namibia, leaves used as green manure [5258] .

*Wood, fertiliser:*

Ash is used as a fertiliser [5140] [5147] .

*Live plant in situ:*

Mopane trees hold soil together and improve the grazing. Wherever there is a place with mopane, the soil can be good. The soil is rich in water and in dry years if you dig close to an area with mopane you will find more water in the soil than in open areas with no mopane [5376] .

*Wood, fertiliser:*

According to McCrae (1906) cited by Watt & Breyer-Brandwijk (1962), the ash from dry timber has been used as a fertiliser [1340] .

*Alkaline soils:*

Stabilises dry alkaline soils [1257] .

## ENVIRONMENTAL USES - BOUNDARIES/BARRIERS/SUPPORTS

### *Supports:*

Used for holding up grapevines [5140] [5141] .

### *Animal barriers:*

The Vatsonga people (South Africa) use mopane wood stripped of bark to make chicken pens and kraals for cattle, goats and pigs [5141] .

## **NUTRITIONAL VALUE**

### *Leaves, phosphorus, protein:*

Leaves are rich in protein and phosphorus [5379] .

### *Leaves:*

Analysis of 4 samples (2 of leaves, 1 of mature leaves and 1 of leaves and twigs) gave the following ranges: 8.25 - 12.06 % crude protein; 0.12 - 0.26 % P; 3.19 - 6.20 % Ca; 87.90 - 92.97 % OM; 92.91 - 96.74 % DM; 18.30 - 25.80 % crude fibre; 25.57 - 37.33 % ADF; 32.61 - 45.41 % NDF; 2.96 - 5.87 % fat; 42.90 - 52.30 % in-vitro digest.; 6.60 - 7.10 MJ/kg metabolizable energy [5250] .

### *Leaves:*

Mature green leaves sampled over 4 seasons in eastern Botswana had the following contents: 9.31 - 12.90 % crude protein; 18.55 - 20.43 kJ/g energy; 32.73 - 45.81 % moisture; 63.19 - 80.05 mg catechin/g condensed tannin; 176.3 - 206.5 mg catechin/g total phenolic; 38.5 - 69.83 protein precipitation capacity; 35.4 - 39.2 % NDF; 27.7 - 32.2 % ADF [5385] .

### *Leaves, calcium:*

In the northern Transvaal calcium levels range between 0.12 to 0.23 % (Bonsma, 1942) [5147] .

### *Leaves, crude protein:*

Crude protein levels range from 8.4 % in September to 16.6 % with leaf flush in November (Bonsma, 1942) [5147] .

### *Leaves:*

Digestion coefficient of leaves 65.6 %. Digestion coefficient of dry matter 41.3 % (southeastern Zimbabwe) (Walker 1980 after Barnes 1979) [1582] .

### *Leaves, fatty acids:*

Leaves have a high essential fatty acid content which help to keep cattle in good condition (Lawton, 1968) [5147] .

### *Leaves, phosphorus:*

In the northern Transvaal phosphorus levels range between 1.15 to 3.23 % (Bonsma, 1942) [5147] .

### *Leaves, protein:*

Dried leaves contain 12.6 % protein (Ministry of Health, Zimbabwe) [1257] .

### *Leaves, protein:*

c. 12 % crude protein [144] .

### *Leaves, twigs, crude protein:*

Leaves 12.3 % of dry matter; twigs 5 % of dry matter (southeastern Zimbabwe) (Walker 1980 after Barnes 1979) [1582] .

### *Leaves, protein:*

Crude protein levels 8.4 % (Sept) to 16.6 % with leaf flush in November [5146] .

### *Leaves:*

Calcium 0.12 - 0.23 % (Transvaal); phosphorus 1.15 - 3.23 % (Transvaal) (Bonsma, 1942) [5146] .

## **TOXICITY/POISONOUS COMPOUNDS**

### *Leaves, antinutritional factors:*

The palatability of the plant is believed to be considerably increased by the secretions of an insect (*Arytaina mopane*), the larvae of which feed on the leaves. The larva secretes a fluid which forms a protective coating over it. The secretions form fairly large, translucent, quite hard 'drops' which adhere firmly to the leaves and are ingested with them [1306] .

### *Leaves, tannins:*

Have very high tannin content when fresh and are avoided by most ungulates. The dry leaves however, are palatable and are picked up off the ground by cattle and wild ungulates [1582] .

## **CHEMICAL ANALYSES - MISCELLANEOUS**

### *Wood, ash:*

Ash content of 3.78 % of dry weight (Tietema et al 1991) [5147] .

*Wood, lime:*

Ash contains 15.5 % [1257] .

*Wood, lime:*

Ash contains 50-55 % lime (Coates Palgrave 1956; Fanshawe, 1962) [5147] .

*Leaves:*

Analysis of 4 samples (2 of leaves, 1 of mature leaves and 1 of leaves and twigs) gave the following ranges: 8.25 - 12.06 % crude protein; 0.12 - 0.26 % P; 3.19 - 6.20 % Ca; 87.90 - 92.97 % OM; 92.91 - 96.74 % DM; 18.30 - 25.80 % crude fibre; 25.57 - 37.33 % ADF; 32.61 - 45.41 % NDF; 2.96 - 5.87 % fat; 42.90 - 52.30 % in-vitro digest.; 6.60 - 7.10 MJ/kg metabolizable energy [5250] .

*Leaves:*

Mature green leaves sampled over 4 seasons in eastern Botswana had the following contents: 9.31 - 12.90 % crude protein; 18.55 - 20.43 kJ/g energy; 32.73 - 45.81 % moisture; 63.19 - 80.05 mg catechin/g condensed tannin; 176.3 - 206.5 mg catechin/g total phenolic; 38.5 - 69.83 protein precipitation capacity; 35.4 - 39.2 % NDF; 27.7 - 32.2 % ADF [5385] .

*Leaves, crude protein:*

Leaves are nutritious and have a high crude protein content of about 13 % [2795] .

*Protein:*

Portions eaten by stock have an average monthly crude protein content of 12.6 %, which is high [5379] .

*Bark, tannins:*

5.9-8.7 % [1257] .

*Leaves, bark, seeds, essential oils:*

Fifty different essential oils were detected in the mature leaves, bark and seeds (Brophy et al, 1992) [5147] .

*Fruits, essential oils:*

High in essential oil [1257] .

*Leaves, tannins:*

Have very high tannin content when fresh and are avoided by most ungulates. The dry leaves are palatable and are picked up off the ground by cattle and wild ungulates [1582] .

*Leaves, essential oils:*

High in essential oil [1257] .

*Leaves:*

Yields positive haemolysis test [1257] .

*Leaves, protein:*

Crude protein levels 8.4 % (Sept) to 16.6 % with leaf flush in November [5146] .

*Unspecified parts, crude protein, fibre:*

Crude protein average 12.6 % dry; crude fibre average 25.3 %; P205 average 0.172 %; CaO average 1.86 % [5239] .

*Leaves:*

Calcium 0.12 - 0.23 % (Transvaal); phosphorus 1.15 - 3.23 % (Transvaal) (Bonsma, 1942) [5146] .

*'Roots', tannins, resin:*

The roots contain a small amount of tannin and a resin (Deutsch Südwestafrikanische Zeitung, 1902, cited in Von Koenen, 2001) [5098] .

*Seeds, resin:*

The resin-covered seeds yield a hard resin on extraction. Coates Palgrave (1956) reports resin yields of up to 20 % of seed weight while archive files of the Forest Research Centre in Harare mention resin yields of 11.6 % of the fruit weight (or 26 % of seeds alone) [5147] .

According to McCrae (1906) and Pole Evans (1948) cited by Watt & Breyer-Brandwijk (1962), the ash contains a high percentage of phosphorus and calcium [1340] [5098] .

*Seeds, essential oils:*

High in essential oil [1257] .

According to McCrae (1906) cited by Watt & Breyer-Brandwijk (1962) the percentage of lime in the ash is 15.5 % from the dry timber [1340] .

*Bark, tannins:*

According to two references by Bennett in 1952-3, cited in Watt & Breyer-Brandwijk (1962), the bark has a low tannin content of 5.9 % [1340] .

## CONSTRAINTS - MISCELLANEOUS



Wood degradation due to heart-rot infestation [5147] .

May secrete an allelopathic chemical which toxifies the soil and discourages growth of other species [1257] .

Many potentially suitable trunks (for making furniture) have heart-rot and are thus not usable [5096] .

## **RAINFALL**

*Malawi:*

700-840 mm [5249] .

## **TEMPERATURE**

*Malawi:*

Maximum mean annual temperature 22 - 25 degrees C [5249] .

## **ALTITUDE**

200 - 1150 m [5104] .

In Malawi, occurs below 700 m [5249] .

## **GEOLOGY**

Often on alluvial or lime-rich soils [3045] .

Occasionally found on limestone [1306] .

## **SOILS**

Various soil types, including grey sand alluvium, red sand with gravel, grey-black clay, clay pan, clay loam, sandy clay, Kalahari sand [2255] .

Grows in compacted, badly drained, clayey soil, usually shallow and with high alkalinity and exchangeable sodium [1257] [5147] .

Typically on eutrophic clay-rich soils, many of them depositional. Rarely occurs on true sandy soils [5146] .

## **VEGETATION**

*Southern Africa:*

Occurs in almost pure stands in hot, low-lying areas [3045] .

Generally mopane occurs in almost exclusively dominant stands with very few other woody species, except those associated with termitaria, drainage lines or rock outcrops. The ecological mechanism resulting in such monospecific communities is unclear but it may be the aggressive shallow-rooting nature of the species, or the comparative unsuitability of the soils for other species, or perhaps a chemical factor. Also notable is the even-sized appearance of the stands indicating episodic or cohort recruitment. There is often little apparent regeneration in many areas [5146] .

Stocking densities for mature woodland range from 7 trees/ha in arid northwest Namibia (Viljoen, 1989) to 481 trees/ha in southeast Zimbabwe (Kelly and Walker, 1976), but a typical figure for mature, non-stunted mopane woodland in the 500 - 700 mm rainfall zone is around 200 - 400 trees/ha (Timberlake, 1995) [5146] .

*Southern Africa:*

Often forms pure stands, giving rise to the term 'mopane woodland'. For more details see Coates Palgrave (2002) [5082] .

## **ENVIRONMENTAL FACTORS - MISCELLANEOUS**

Very susceptible to fire, even when green, because of resinous leaves and wood [1306] .

Absence of seeds and seedlings is probably attributable to game predation. Distribution of surviving seeds is influenced by wind and topographical features which can act as traps [585] .

## **POLLINATION**

Apparently anemophilous (wind pollinated). This is unusual in a family whose flowers are predominantly entomophilous (insect pollinated) [1306] .

## FLOWERING/FRUITING/SEED SET

*Flowering, Africa:*

December to January [5375] .

*Fruiting, Africa:*

Fruits mature in April to May [5375] .

*Flowering, Namibia:*

Mainly December to March with occasional flowers produced at other times. Variable between years and between regions [5121] .

*Fruiting, Namibia:*

Fruits may be found all year but most often February to May [5121] .

*Flowering:*

October to March [5097] .

*Fruiting:*

March to June [5097] .

*Fruiting, southern Africa:*

From middle summer rains, extending to post rain season and sometimes to late dry season. Middle rain fruits tend to be immature and develop later [1306] .

## DISPERSAL

Sticky seeds adhere to animal hooves [1306] [5379] .

Dispersal of the ripe pods is principally by wind (Jarman and Thomas, 1969) [5147] .

Although dispersal of mopane seeds has previously been attributed to epizoochory (dispersal by sticking to the hooves of passing ungulates) an experiment in South Africa found that the seeds are not sticky enough to stick to hooves of mammalian ungulates and, in addition, the seeds are damaged when trodden on by animals. Dispersal is most likely by water and wind [5384] .

## GERMINATION

Germination under natural conditions appears to be very good, and many seedlings can be found in the first few months after the rains [5147] .

Germination was found to be best at a water stress of -0.14 MPa (Choinski and Tuohy, 1991) [5147] .

Seeds germinate easily [5082] .

Seeds germinate easily but are also prone to damping off disease (Palmer & Pitman, 1972) [5147] .

## SEEDLING DEVELOPMENT

Seedlings do not transplant well, possibly due to tap root damage [5213] .

Growth of seedlings increases with increased soil nitrogen and phosphorus when soil moisture content is above 20 % at 0.33 bars matric suction but appears to decline with increasing soil nitrogen on soils with less than 7 % moisture owing to increased soil osmotic suction [5147] .

Seedling growth rate is 2.3-3.2 mm/day for shoots and 8.7-10 mm/day for roots (Mushove 1993) [5147] .

Seedlings are slow-growing [5082] .

## VEGETATIVE GROWTH

Growth rates generally reported to be low but this may be partly due to adverse soil conditions [5147] .

*India, Rajasthan:*

Growth rate of 5 m in 10 years [1257] .

*India:*

Mean annual increment in height of 29.3 cm and in collar diameter of 1.1 cm (Muthana and Arora, 1980 cited in Moss and Taylor, 1983) [1257] .

*Northern Botswana:*

Tietema (1989) reports growth rates of around 10 t/ha/year [5146] [5147] .

Normal diameter of a mature trunk at 1.3 m is 40 - 70 cm, although a diameter of 122 cm has been noted in Liwonde National Park in Malawi [5146] .

## CYTOLOGY

$x=9$  (polyploidy) [5150] .

$2n = 36$  [1480] .

## NITROGEN FIXATION/NODULATION

Specimens examined in South Africa and Zimbabwe lacked nodules [144] .

Specimens examined in South Africa by Grobbelaar and Clarke (1972) and in Zimbabwe by Corby (1974) lacked nodules [1306] .

## MYCORRHIZAL ASSOCIATIONS

Mopane is endomycorrhizal. These symbiotic root fungi probably assist the tree in obtaining some of its nutrient requirements [5138] .

## PHYSIOLOGICAL TOLERANCES

*Water loss:*

During the heat of the day the leaflets are folded together providing very little shade [5147] [5379] .

*Water loss:*

Reduced number of stomata on leaf surfaces and an increased amount of stress metabolite pinitol [5147] .

*Frost:*

In Namibia seldom found in areas that receive frost [5213] .

## ASSOCIATED MAMMALS

Bats (e.g. *Scotophilus leucogaster*) use hollows in the trunk for roosting (Fenton, 1983) [5146] .

Mopane squirrels (*Paraxerus cepapi*) use hollows in the trunk [5146] .

## ASSOCIATED BIRDS

The redbilled hornbill is reported to nest in hollows in the mopane tree [5147] .

## ASSOCIATED INSECTS

*Lepidoptera, diptera:*

Host to several insect species including *Imbrasia belina* (mopane worm), *Gonometa rufobrunnea* (mopane silk moth), *Gynanisa maja* (speckled emperor moth) and *Arytaina mopane* (mopane fly). *Imbrasia belina* and *G. maja* both produce edible caterpillars and *A. mopane* secretes an edible gum on the leaves. Among these insects, *I. belina* is the most important because of its economic importance as a protein food source and its feeding effects on mopane [5256] .

*Hymenoptera:*

Mopane bees/flies lay their eggs on the leaves [5379] .

*Hemiptera:*

Often aphids parasitise the mopane leaves and produce secretions. These dried secretions, which contain sugar and gum, are collected and eaten by people of Sesfontein, Namibia [2136] .

*Hymenoptera:*

Small stingless bees use hollows in mopane trees as hives that have a trumpet-shaped wax entrance. The blackish honey is a local delicacy in mopane woodland [2795] .

*Lepidoptera:*

Larvae of the foxy charaxes (*Charaxes jasius saturnus*) butterfly and mopane worm (*Gonimbrasia belina*) feed on the

leaves [5097] .

*Hemiptera:*

The palatability of the plant is believed to be considerably increased by the secretions of an insect (*Arytaina mopane*), the larvae of which feed on the leaves. The larva secretes a fluid which forms a protective coating over it. The secretions form fairly large, translucent, quite hard 'drops' which adhere firmly to the leaves and are ingested with them [1306] .

*Lepidoptera:*

Caterpillars of emperor moth *Imbrasia belina* (*Gonimbrasia belina*), called mopane worms, feed on the leaves [1600] [5139] .

*Lepidoptera:*

Larvae of emperor moth *Imbrasia belina* (*Gonimbrasia belina*, *Nudaurelia belina*), called mopane worms, eat the leaves [989] [5121] [5147] .

*Lepidoptera:*

Larvae of the wild silk moth *Gonometa rufobrunnea* feeds on leaves (Hartland-Rowe 1992) [5147] .

*Hemiptera:*

The palatability of the plant is believed to be considerably increased by the secretions of an insect (*Arytaina mopane*), the larvae of which feed on the leaves. The larva secretes a fluid which forms a protective coating over it. The secretions form fairly large, translucent, quite hard 'drops' which adhere firmly to the leaves and are ingested with them [1306] .

*Hymenoptera:*

Trigona bees (mopane bees) live in small holes [5146] .

A white substance called nameb, probably associated with insects, found on the leaves of mopane is eaten by Dama people living along the lower Ugab River Valley near the Brandberg, Namibia [5103] .

## ASSOCIATED ORGANISMS - MISCELLANEOUS

*Plants:*

The Leopard Orchid *Ansellia africana* is occasionally found in the forks of mopane trees which are, apparently, its major habitat [5147] .

## INSECT PESTS

*Lepidoptera:*

In Botswana, defoliation by mopane worms was found to affect the ability of the host to produce seeds. Only 14 % of defoliated trees produce seeds while 84 % of undefoliated trees produced seeds. Older trees were able to produce some seeds, even when completely defoliated [5259] .

*Lepidoptera:*

Mopane worms can completely strip all leaves from trees [989] [1257] [5147] [5257] [5259] .

*Coleoptera:*

Attacks on the seeds by the seed borer (*Araecerus* spp.) have been observed in the field and under storage conditions in Moçambique [5143] .

## MAMMALIAN PESTS

*Elephants:*

In drought years, elephants severely damage large numbers of young trees and coppice shoots, this mainly affects trees below seed-bearing age in remote areas [1257] .

## FUNGAL DISEASES

*Phellinus rimosus:*

Trunks are often hollow where the heartwood has been broken down by this fungus (Pearce, 1986) [5147] . Seeds germinate easily but are also prone to damping off disease (Palmer & Pitman, 1972) [5147] .

## SEED STORAGE

An experiment was planned for 1997 at the Department of Forestry of the Eduardo Mondlane University,

Mozambique to assess 10 treatments for seed storage. There were 3 objectives - to determine the most effective treatments including physical, chemical and natural treatments; to assess the effect of treatment on the viability of the seeds; and to recommend the most efficient method in terms of pest control and seed viability [5143] .

## PROPAGATION FROM SEED

Seed can be sown while still in the pod but removing the pod speeds up the process. Place seed on top of river sand in flat trays, keep moist. As soon as seeds germinate reduce the amount of water. Seedlings are initially slow-growing but growth speeds up when the plants reach 200 mm. Transplant into black nursery bags filled with a mixture of compost, sand and loamy soil (1 to 2 to 7) [5097] .

Seed germinates well but seedlings damp off easily [5379] .

Good germination is obtained without seed treatment (National Academy of Sciences, 1980 cited in Moss and Taylor, 1983) [1257] .

*India:*

Survival rate of directly sown seeds was 83.8% (Muthana and Arora, 1980 cited in Moss and Taylor, 1983) [1257] .

No seed pretreatment is required and nursery germination is good, ranging from 45-90% within 2 weeks (Tietema et al, 1992) [5147] .

Removal of seed from the fruit makes germination more even and rapid (Tietema et al, 1992) [5147] .

## 'CROP' MANAGEMENT

*Coppicing:*

In Zimbabwe, field observations suggest that it takes 10 - 15 years for a coppice shoot to reach 5 cm diameter, 25 - 30 years to reach 10 cm, 55 - 60 years to reach 15 cm, 80 - 100 years to reach 20 cm, 120 - 140 years to reach 30 cm and 160 - 180 years to reach 40 cm [5263] .

*Grazing ratio:*

The most desirable livestock option in mopane shrubland areas in northern South Africa is reported to be grazing cattle and goats in a ratio of 1:2 (Donaldson, 1979) as the goats keep the shrubs under control and allow increase in grass growth for the cattle [5147] .

*Weeding:*

Required in early stages to reduce competition from grasses (National Academy of Sciences, 1980 cited in Moss and Taylor, 1983) [1257] .

*Coppicing:*

Can be coppiced to produce poles twice as fast as from seedlings (Tietema et al, 1988) [5147] .

*Coppicing:*

Coppices prolifically from the base following mechanical clearing or the application of herbicide sprays (Scholes, 1990). The resulting shrub mopane, often only 1-2 m high, virtually precludes grass growth and can form almost impenetrable thickets. These areas have little value for grazing animals and their browse value is limited to a few months in the dry season [5147] .

*Coppicing:*

In Namibia the best growth was obtained by keeping coppice growth at 1 to 2 stems per rootstock (Erkkila and Siiskonen, 1992) [5147] .

*Coppicing:*

In northern Botswana, coppicing of natural woodland has been suggested as a way of providing much of the construction and firewood requirements for a refugee camp (Tietema et al, 1988) [5147] .

*Coppicing:*

Trials in southern Zimbabwe have shown that 20-80 % of stumps have coppice shoots 3 months after cutting and that trees coppiced at 1 m height produced more and taller coppice shoots than those cut at 10 cm height. Larger diameter stumps were also slower in sprouting (Mushove, 1992; Mushove and Makoni, 1993) [5147] .

*Harvesting:*

An experiment in Northern Province, South Africa, determined that an optimum harvesting rate of 25% every five years would ensure the best harvestable yields for up to 60 years. There would be a long-term decrease in mopane wood from 8 tons/ha initially to 1.5 tons/ha after 60 years. Approximate yield of charcoal of the harvested wood would be 350kg/ha, equivalent to R700/ha (1996 prices). This is approximately double the land price for the same area (R350/ha) and significantly higher than the return from game ranching (R12/ha/year). Thus charcoal production from mopane could be an extra source of income for areas with marginal farming potential. An additional benefit is that leaf flush occurs earlier in areas thinned through harvesting than in areas not thinned. This is the time of year

when browsers need new leaves the most as most other species have not yet started to flush [5241] .

#### *Coppicing:*

In Malawi, coppice shoots in clear-felled plots fared worse than those where 50 % of the canopy cover had been left, due to greater competition from grass (Lowore and Abbot, 1995). Cutting height is also important. Cutting at one meter above ground in southern Zimbabwe was found to enhance coppice regrowth compared to cutting 10 cm from the ground (Mushove and Muchichwa, 1996). Coppices from shorter stumps are more likely to originate on the root collar, and give stronger, straighter stems (Grundy, 1990) [5263] .

## **HARVESTING**

#### *Wood carving, Botswana:*

Only trees with a diameter of greater than 25 cm are usable and many trees are wasted because they have hollow trunks. White sapwood is discarded. Over-harvesting is a problem [1257] .

#### *Wood, northeast Botswana:*

Total removal of all mature trees in wood carving areas. Many trees chopped down for timber and firewood [1257] .

## **YIELDS**

#### *Fruits:*

Some trees bear no pods at all while others bear hundred or thousands [1257] .

An experiment in Northern Province, South Africa, determined that an optimum harvesting rate of 25 % every five years would ensure the best harvestable yields for up to 60 years. There would be a long-term decrease in mopane wood from 8 tons/ha initially to 1.5 tons/ha after 60 years. Approximate yield of charcoal of the harvested wood would be 350kg/ha, equivalent to R700/ha (1996 prices). This is approximately double the land price for the same area (R350/ha) and significantly higher than the return from game ranching (R12/ha/year). Thus charcoal production from mopane could be an extra source of income for areas with marginal farming potential. An additional benefit is that leaf flush occurs earlier in areas thinned through harvesting than in areas not thinned. This is the time of year when browsers need new leaves the most as most other species have not yet started to flush [5241] .

#### *Biomass:*

Reported figures for mopane in mature woodland range from 61 t DM/ha (Martin, 1974) in northwest Zimbabwe to 80 t FW/ha in northern Botswana (Tietema, 1989). For drier low woodland or shrubland vegetation types in southern Zimbabwe, Kelly and Walker (1976) found a biomass of 17 - 18 t/ha. In Sengwa, northwest Zimbabwe, Martin (1974) found that only 3.7% of the total woodland biomass was browse and that only 1% of this was available to most ungulates i.e. under 2.5 m in height [5146] .

## **PRODUCTION**

#### *Browse, southern Africa:*

Mopane veld is generally regarded as valuable browse, but (for cattle) generally rather low in production [1582] .

## **TRADE**

#### *Southern Africa:*

Mopane firewood is traded on a large scale in many rural parts of southern Africa [2795] .

#### *Namibia:*

In the Outjo district, mopane root stems are collected, sandblasted and marketed as ornaments. An assessment of the resource concluded that the utilisation is sustainable for around 100 years, but recommended that the maximum annual exploitation rate be kept below 2000 tons, ensuring supply for at least 50 years. At the current rate of payment, there is a potential income of N\$24 million, providing the market could absorb such a large volume [5142] .

## **FIELD TRIALS**

#### *Malawi, 1958-1964:*

An experiment to assess the influence of cutting treatment and burning on seedling and coppice growth found that the increase in regrowth tended to be greater under complete fire protection, while early burning appeared better for survival. There is a suggestion that early burning reduced the rate of increase of seedling and coppice establishment

compared to fire protection but permitted a considerable increase in stocking [5249] .

*Malawi, 1993:*

Seven indigenous species were planted using a complete randomised block design at 2 sites and survival, height and root collar diameter were measured after 3 years. It was apparent that mopane is not a suitable species for planting in plantations in the moist, fertile areas of Malawi but is more appropriate in difficult sites requiring rehabilitation within its natural range [5249] .

*Namibia, 1995 onwards:*

A trial in northern Namibia began in 1995 to assess the effects of four coppicing/harvesting regimes. It is expected to run for at least 10 years [5245] .

*South Africa, 1989-1992:*

An experiment in Northern Province, South Africa assessed the effect of 5 thinning regimes on vegetative growth, browse production and reproduction over 3 years. Trees in 5 plots were thinned to the equivalents of 75 %, 50 %, 35 %, 20 % and 10 % of the tree density of the control plot (2,711 trees/ha). Thinning reduced inter-tree competition which resulted in significant increases in the vegetative growth and reproduction of the remaining trees. Though the vegetative growth per tree and the percentage of reproductive trees was higher in the low tree density plots, the larger number of trees in the high tree density plots ensured that the total seasonal leaf dry mass increase exceeded that of the low tree density plots. The total number of trees in the high density plots that flowered and produced seeds was of the same order as those in the low tree density plots. Tree thinning reduced the available browse at peak biomass, but trees from the low tree density plots displayed a wider distribution of browse over the season. Marked differences in the nutritional composition and water content of mopane leaves existed in different phenological states. The seeds from trees within the low tree density plots were larger and heavier than those from the plots with a high tree density, but this did not have a marked effect on their potential to germinate. Seedling numbers were low in all plots and a specific pattern of seedling establishment was lacking [5252] .

## ACKNOWLEDGEMENTS AND DATASHEET PROGRESS

Updated for southern Africa by A. Jarvis, checked by C. Mannheimer; SEPASAL Namibia, National Botanical Research Institute of Namibia, February 2005 .

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SEPASAL's development has been funded by The Clothworkers' Foundation and its Internet development is funded by The Charles Wolfson Charitable Trust. Nutritional information on African wild foods is funded by Nestlé Charitable Trust.

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