



KENYA FORESTRY RESEARCH INSTITUTE
FOREST PRODUCTS RESEARCH CENTRE - KARURA

CLASSIFICATION OF WOOD CARVING SPECIES USING
MACROSCOPIC PROPERTIES



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Photos on the Cover page are:

An elephant carving made from olive wood (*Olea europaea*)
A Maasai couple made from African ebony wood (Mpingo [*Dalbergia melanoxylon*])

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1.0 INTRODUCTION

Wood carving species can be classified into 3 main categories, i.e. major, minor and alternative species. The major species are those that are the most popular and are found in almost all wood carving centres. These are Mpingo [*Dalbergia melanoxylon*], African brown olive [*Olea europaea*], Muhuhu [*Brachylaena huillensis*] and Mugurure [*Combretum schumannii*]. The minor species are those occasionally used as alternatives to the most popular ones. Most of these are historically linked to the origin of wood carving in Ukambani. These include: Mwangati [*Terminalia spinosa*], Muhutu [*Terminalia brownii*], Mbambaro [*Terminalia kilimandscharica*], Mutoo [*Terminalia prunoides*], Mjafari [*Zanthoxylum chalybeum*], Muthea [*Cordia sinensis*] and Mukau [*Melia volkensii*]. The alternative species are those that have not been widely used for wood carving but have potential.

The eleven main species for wood carving in order of preference are *Dalbergia melanoxylon*, *Olea europaea*, *Combretum schumannii*, *Terminalia spinosa*, *Brachylaena huillensis*, *Terminalia brownii*, *Terminalia kilimandscharica*, *Zanthoxylum chalybeum*, *Cordia sinensis*, *Terminalia prunoides* and *Melia volkensii* (Obunga, 1995). The criteria for preference are based on multiple attributes which include durability where the wood should not change physically under any weather condition, with particular reference to European weather; resistance to wood borers; workability where the wood should be easy to work on; and aesthetic values derived from grain texture, colour and patterns. These factors dictate the price of the product. The most popular species is Mpingo, which is marketed under the trade name Ebony, combines all the above attributes.

This bulletin gives the macroscopic features of 52 wood carving species and classifies them into three categories based on *Dalbergia melanoxylon* features as the reference point. The species are categorised into major and alternative wood carving species as shown in Table 1.

2.0 MACROSCOPIC AND PHYSICAL FEATURES.

Wood is an inherently variable substance because of its origin as a product of metabolism of the living tree. As a result, its properties are subject to wide variations due to the physiology of the trees and the external factors affecting its growth. The examination of an unknown wood sample usually begins with the observation of macroscopic features such as colour, odour, growth rings, grain patterns, and density. However, these characteristics alone are not usually sufficient for a reliable identification.

The next step, of macroscopic examination, is conducted with a 10-power hand lens. Features that are difficult or impossible to distinguish with naked eye may be observed with the hand lens

The main macroscopic and physical features of the wood species observed in this bulletin are the pores, heartwood and softwood colour, odour, growth rings, texture, rays and density (Table 1).

Some of the salient features that make Mpingo the most preferred wood carving species are: heartwood is distinctively darker than sapwood, non irritating odour, minute pores and rays, fine to medium wood texture, straight grain, distinct growth rings and high density. The macroscopic features and the densities for major (M), minor (MR) and alternative (A) species are shown in Table 1.

Based on the macroscopic features alternative wood carving species can be broadly classified into three groups namely: high potential with more than 69 % of their characteristics similar to those of Mpingo, medium potential with at least 50-69 % of their characteristics similar to those of Mpingo and low potential with less than 50 % similar characteristics to those of Mpingo (Table 1 and 2). Based on the wood characteristics (density, hardness and macroscopic features) the 52 species can be ranked as shown in Table 2 in terms of their suitability for woodcarving.

Table 1: Macroscopic features, density and categories of 52 Wood Carving Species from Kenya

SPECIES	FAMILY	PORES	COLOUR HW/SW	ODOUR	GROWTH RINGS	GRAIN	TEXTURE	RAYS	DENSITY	CATE-GORY
<i>Brachylaena huillensis</i> (Muhuhu [Swa])	<i>Compositae</i>	NVNE	Grey/Yellow Brown	Distinct but non irritating	Distinct	Straight	Fine	NVNE	Heavy	M
<i>Combretum schumannii</i> (Mgurure[Swa])	<i>Combretaceae</i>	NVNE	Purplish brown/Whitish yellow	Distinct but non irritating	Distinct	Straight	Medium	VNE	Heavy	M
<i>Dalbergia melanoxyton</i> (Mpingo [Swa])	<i>Papilionaceae</i>	NVNE	Purple to Brownish Black/Yellow to White	Distinct but non irritating	Distinct	Straight	Fine	VHL (x8)	Heavy	M
<i>Olea europaea</i> (Mutamaiyu [Kik])	<i>Oleaceae</i>	NVNE	Medium to dark brown/Pale yellow	Distinct but non irritating	Distinct	Straight	Fine	VNE	Heavy	M
<i>Cordia sinensis</i> (Muthea [Kam])	<i>Boraginaceae</i>	NVNE	Dark brown / Brown	Not distinct	Not distinct	Straight	Medium	NVNE	Heavy	MR
<i>Melia volkensii</i> (Mukau [Kam])	<i>Meliaceae</i>	VHL(x8)	Light pink/Light yellow	Not distinct	Distinct	Straight	Medium to coarse	VNE	Moderately heavy	MR
<i>Terminalia brownii</i> (Muuku [Kam])	<i>Combretaceae</i>	NVNE	Brown/Yellow	Not distinct	Distinct	Interlocked	Medium	VHL (x8)	Moderately heavy	MR
<i>Terminalia kilimandscharica</i> (Muuku [Kam])	<i>Combretaceae</i>	NVNE	Greyish brown / Pale yellow to brown	No smell	Distinct	Straight	Fine to medium	NVNE	Heavy	MR
<i>Terminalia prunioides</i> (Mutoo [Kam])	<i>Combretaceae</i>	VHL (x8)	Light yellow to brown	Distinct but non irritating	Distinct	Interlocked	Medium	VHL (x8)	Moderately heavy	MR
<i>Terminalia spinosa</i> (Mutula [Kam])	<i>Combretaceae</i>	Minute	Yellow to chocolate brown/Light yellow to brown	Not distinct	Distinct	Interlocked	Medium	VNE	Heavy	MR
<i>Zanthoxylum chalybeum</i> (Mukenea [Kam])	<i>Rutaceae</i>	NVNE	Greyish brown/Yellow	Distinct but non irritating	Distinct	Straight	Fine to medium	VNE	Moderately heavy	MR
<i>Acacia mellifera</i> (Muthia [Kam])	<i>Mimosaceae</i>	VNE	Dark brown with black markings/ Yellowish brown	Not distinct	Not distinct	Straight	Medium	VNE	Heavy	A ₁

SPECIES	FAMILY	PORES	COLOUR HW/SW	ODOUR	GROWTH RINGS	GRAIN	TEXTURE	RAYS	DENSITY	CATE-GORY
<i>Acacia nilotica</i> (Musemi [Kam])	<i>Mimosaceae</i>	VNE	Purple to Reddish brown/Light yellow to white	No smell	Distinct	Straight	Medium	VNE	Heavy	A ₁
<i>Albizia amara</i> (Mwona [Kam])	<i>Mimosaceae</i>	VNE	Light yellow to light brown	Distinct but non irritating	Distinct	Straight	Medium to coarse	VNE	Heavy	A ₁
<i>Albizia versicolor</i> (Mtango [Kam])	<i>Mimosaceae</i>	VHL (x8)	Dark brown/White to pale cream	Distinct but non irritating	Distinct	Straight	Medium	VHL (x8)	Moderately heavy	A ₁
<i>Azadirachta indica</i> (Mwarubaini [Swa])	<i>Anacardiaceae</i>	VHL (x8)	Pinkish brown/Light yellow	Distinct and irritating smell	Distinct	Interlocked	Medium	VNE	Moderately heavy	A ₁
<i>Balanities aegytiaca</i> (Mulului [Kam])	<i>Balanitaceae</i>	VHL (x8)	Yellow to light brown	Distinct but non irritating	Distinct	Straight	Medium	Very large	Moderately heavy	A ₁
<i>Balanities aegytiaca</i> (Mulului [Kam])	<i>Balanitaceae</i>	VHL (x8)	Yellow to light brown	Distinct but non irritating	Distinct	Straight	Medium	Very large	Moderately heavy	A ₁
<i>Boscia angustifolia</i> (Mulule [Kam])	<i>Capparaceae</i>	VHL (x8)	Light brown/White to Pale cream	Distinct but non irritating	Distinct	Interlocked	Fine to medium	VHL (x8)	Heavy	A ₁
<i>Casuarina equisetifolia</i> (Mvinje [Swa])	<i>Casuarinaceae</i>	NVNE	Light pink to creamish white	Not distinct	Not distinct	Straight	Fine	VHL (x8)	Heavy	A ₁
<i>Cordia monoica</i> (Msasa (Swa), Muthii [Kam])	<i>Boraginaceae</i>	VHL (x8)	Brown to greyish brown	Not distinct	Not distinct	Straight	Medium	VHL (x8)	Moderately heavy	A ₁
<i>Cupressus lusitanica</i> (Cypress)	<i>Cupressaceae</i>	Absent	Pink to pale brown/White	Distinct but non irritating	Distinct	Straight	Fine	NVNE	Moderately heavy	A ₁
<i>Cynometra webberi</i> (Mfunda [Gir])	<i>Caesalpiniaceae</i>	NVNE	Reddish brown/White brown	No smell	Not distinct	Straight	fine	NVNE	Heavy	A ₁

SPECIES	FAMILY	PORES	COLOUR HW/SW	ODOUR	GROWTH RINGS	GRAIN	TEXTURE	RAYS	DENSITY	CATE-GORY
<i>Eucalyptus grandis</i> (Musanduku [Kam])	<i>Myrtaceae</i>	VNE	Pinkish brown/ Creamish white to light grey	Not distinct	Distinct	Straight	Medium	VNE	Heavy	A ₁
<i>Eucalyptus saligna</i> (Musanduku [Kam])	<i>Myrtaceae</i>	VNE	Pink to red/White to light brown	Distinct but non irritating	Distinct	Straight	Medium	VHL (x8)	Heavy	A ₁
<i>Grewia bicolor</i> (Mulawa [Kam])	<i>Tiliaceae</i>	NVNE	Yellow to dark brown/Yellow	Distinct but non irritating	Distinct	Straight	Fine- Medium	VNE	Heavy	A ₁
<i>Hymenaea verrucosa</i> (Mtandarusi [Swa])	<i>Caesalpiniaceae</i>	VNE	Purple to reddish brown/Creamish white to light brown	Distinct but non irritating	Distinct	Straight	Medium	VNE	Heavy	A ₁
<i>Juniperus procera</i> (Mutarakwa [Kik])	<i>Cupressaceae</i>	Absent	Pale yellow to red/ White	Distinct but non irritating	Distinct	Straight	Fine	NVNE	Moderately heavy	A ₁
<i>Manilkara sansibarensis</i> (Mngambo [Gir])	<i>Sapotaceae</i>	NVNE	Light pink/Light brown	Not distinct	Distinct	Straight	Fine	NVNE	Heavy	A ₁
<i>Oldfieldia somalensis</i> (Mbilandu [Gir])	<i>Euphorbiaceae</i>	NVNE	Greyish brown/Light brown	Distinct but non irritating	Distinct	Wavy	Fine	NVNE	Moderately heavy	A ₁
<i>Rhus tenuinervis</i> (Kitheu [Kam])	<i>Anacardiaceae</i>	NVNE	Pinkish/Pinkish white	Distinct and unpleasant	Distinct	Straight	Fine	NVNE	Moderately heavy	A ₁
<i>Spirostachys africana</i> (Mutanga [Kam])	<i>Euphorbiaceae</i>	VHL (x8)	Dark brown with dark markings / Light yellow	Distinct but non irritating smell	Distinct	Straight	Fine	VHL (x8)	Heavy	A ₁
<i>Tamarindus indica</i> (Kithumula (Kam), Mkwaju [Swa])	<i>Caesalpiniaceae</i>	VNE	Black to dark purple / White	Distinct but non irritating	Distinct	Interlocked	Medium	VNE	Moderately heavy	A ₁

SPECIES	FAMILY	PORES	COLOUR HW /SW	ODOUR	GROWTH RINGS	GRAIN	TEXTURE	RAYS	DENSITY	CATE-GORY
<i>Ziziphus mucronata</i> (Mkunazi [Swa])	<i>Rhamnaceae</i>	NVNE	Pinkish brown/White	Not distinct	Distinct	Interlocked	Medium	NVNE	Moderately heavy	A ₁
<i>Azelia quanzensis</i> (Mbambakofi [Gir])	<i>Caesalpiniaceae</i>	VNE	Reddish brown/Light yellow	Distinct but non irritating	Distinct	Interlocked	Coarse	VNE	Heavy	A ₂
<i>Acacia etbaica</i> (Muswiswi [Kam])	<i>Mimosaceae</i>	VNE	Light yellow to pale cream	Distinct but non irritating	Distinct	Straight	Medium to coarse	VNE	Moderately heavy	A ₂
<i>Albizia anthelmintica</i> (Mporojo [Swa], Mwowa [Kam])	<i>Mimosaceae</i>	VNE	Yellow to white	Distinct but non irritating	Not distinct	Wavy	Medium to coarse	VNE	Moderately heavy	A ₂
<i>Brachystegia spiciformis</i> (Mrihi [Swa])	<i>Caesalpiniaceae</i>	VNE	Pale Brown /Pale cream to white	Not distinct	Not distinct	Interlocked	Medium to coarse	VNE	Moderately heavy	A ₂
<i>Combretum molle</i> (Kiama [Kam])	<i>Combretaceae</i>	VNE	Yellow/Purplish black	No smell	Not distinct	Wavy	Medium	NVNE	Moderately heavy	A ₂
<i>Grevillea robusta</i> (Mukima [Kik])	<i>Proteaceae</i>	VNE	Pale pink to brown / Creamish	Not distinct	Distinct	Straight	Moderately coarse	Very large	Moderately heavy	A ₂
<i>Hagenia abyssinica</i> (Mumondo [Kik])	<i>Rosaceae</i>	VNE	Reddish brown/Pink to cream	Not distinct	Not distinct	Straight	Medium	VNE	Moderately heavy	A ₂
<i>Jacaranda mimosifolia</i> (Jacaranda)	<i>Bignoniaceae</i>	NVNE	Creamish white	Distinct but non irritating	Distinct	Straight to wavy	Medium	VNE	Moderately heavy	A ₂
<i>Lanea schweinfurthii</i> (Muasi [Kam])	<i>Anacardiaceae</i>	VHL (x8)	White/ Light brown	Distinct but non irritating	Distinct	Straight to Interlocked	Medium	VHL (x8)	Moderately heavy	A ₂
<i>Melia azedarach</i> (Persian-lilac, Dwele [Luo])	<i>Meliaceae</i>	VNE	Pinkish brown/White	Not Distinct	Distinct	Straight	Medium	VNE	Moderately heavy	A ₂

SPECIES	FAMILY	PORES	COLOUR HW/SW	ODOUR	GROWTH RINGS	GRAIN	TEXTURE	RAYS	DENSITY	CATE-GORY
<i>Newtonia buchananii</i> (Mukui [Kam])	<i>Mimosaceae</i>	VNE	Pale brown to golden brown / Greyish white	Not distinct	Distinct	Interlocked and straight	Medium to coarse	VNE	Moderately heavy	A ₂
<i>Tectona grandis</i> (Teak)	<i>Verbenaceae</i>	VNE	Yellowish brown with dark brown marks/White	No smell	Distinct	Straight	Medium	VNE	Moderately heavy	A ₂
<i>Mangifera indica</i> (Mwembe [Swa,Gir])	<i>Anacardiaceae</i>	VNE	White to pale cream	Distinct but non irritating	Not distinct	Interlocked	Medium to coarse	VNE	Moderately heavy	A ₂
<i>Ocotea usambarensis</i> (Muthaiti [Kik])	<i>Lauraceae</i>	VNE	Yellowish brown to deep brown	Not distinct	Not distinct	Straight to interlocked	Medium	VNE	Moderately heavy	A ₂
<i>Trichilia emetica</i> (Muwamaji [Swa], Mgalana [Gir])	<i>Meliaceae</i>	VNE	Creamish white to light pink	Distinct but non irritating	Not distinct	Interlocked	Medium to coarse	VNE	Moderately heavy	A ₂
<i>Anarcadium occidentale</i> (Mkanju [Swa])	<i>Anacardiaceae</i>	VHL (x8)	White to light brown	Not distinct	Not distinct	Interlocked	Medium to coarse	VHL (x8)	Light	A ₃
<i>Commiphora africana</i> (Ikuu Kam)	<i>Bursereceae</i>	VHL (x8)	Light brown	Distinct but non irritating	Not Distinct	Interlocked	Medium to coarse	VNE	Light	A ₃
<i>Erythrina abyssinica</i> (Muruti [Kam])	<i>Papilionaceae</i>	VNE	Light yellow	Not distinct	Not distinct	Straight	Coarse	VNE	Light	A ₃

Key

Colour HW	- colour of the heartwood
Colour SW	- colour of the sapwood
NVNE	- Not Visible to the naked eye
VNE	- Visible to the naked eye
VHL	- Visible with hand lens
M	- Major wood carving species
MR	- Minor wood carving species
A ₁	- Alternative wood carving species with high potential
A ₂	- Alternative wood carving species with medium potential
A ₃	- Alternative wood carving species with low potential

Swa	-	Swahili
Kik	-	Kikuyu
Gir	-	Giriama
Kam	-	Kamba
Luo	-	Luo
Dur	-	Duruma

Density

$\geq 0.75 \text{ g/cm}^3$	-	Heavy
0.40 g/cm^3 to 0.74 g/cm^3	-	Moderately heavy
$< 0.40 \text{ g/cm}^3$	-	Light

Table 2: List of 52 wood carving species in Kenya in ranked order of suitability for carving based on macroscopic features, density and hardness as compared to those of Mpingo (*Dalbergia melanoxylon*)

Category	Botanical name	Local/Standard Names	Source
1	<i>Dalbergia melanoxylon</i>	Mpingo (Swa)/Ebony	Kitui, Makueni, Kwale
	<i>Brachylaena huillensis</i>	Muhugu (Kik)/Muhuhu (Swa)	Ngong, Karura, Nyeri (Kabaru) forests
	<i>Combretum schumanii</i>	Mgurure (Gir)Mku-mari (Luh)	Kyulu Hills, Kitui, Kwale, Kilifi
	<i>Olea europaea</i>	Mutamaio (Kik)/Brown olive	Kyulu Hills, Kwale, Rift Valley forests
2	<i>Spirostachys africana</i>	Mutanga (Kam)/Tambootie	Kitui, Makueni, Coast (Kilifi)
	<i>Terminalia spinosa</i>	Mutula (Kam) / Mwangati	Kitui, Wamunyu
	<i>Manilkara sansibarensis</i>	Mbichuma (Swa)/Mngambo	Coast, Machakos, Kitui
	<i>Grewia bicolor</i>	Mulawa (Kam)	Kitui, Makueni, Machakos
	<i>Terminalia kilimandscharica</i>	Muuku (Kam)/Mbambaro(Swa)	Kitui, Makueni, Machakos
3	<i>Cordia sinensis</i>	Muthea (Kam)	Kitui
	<i>Oldfieldia somalensis</i>	Mbauri (Swa)	Malindi
	<i>Cynometra webberi</i>	Mfunda (Swa)	Malindi
	<i>Casuarina equisetifolia</i>	Mvinje (Swa)/Whistling pine	Malindi
	<i>Boscia angustifolia</i>	Mulule (Kam)	Kitui, Malindi, Machakos
4	<i>Rhus tenuinervis</i>	Kitheu (Kam)	Kitui, Wamunyu
	<i>Ziziphus mucronata</i>	Mkunazi (Swa)/Buffalo thorn	Wamunyu, Kitui
	<i>Acacia nilotica</i>	Musorii (Kam)	Malindi, Kitui
	<i>Acacia elatior</i>	Munga (Dur)	Kitui, Makueni, Machakos
5	<i>Terminalia brownii</i>	Kivuku (Kam)/Muhutu	Kitui, Malindi
	<i>Albizia amara</i>	Mwona (Kam)	Kitui, Machakos, Makueni
	<i>Acacia mellifera</i>	Muthiia (Kam)	Kitui, Machakos, Makueni
	<i>Zanthoxylum chalybeum</i>	Mukenea (Kam)	Wamunyu, Malindi
	<i>Albizia versicolor</i>	Mtango (Kam)	Kitui, Machakos, Makueni
	<i>Eucalyptus saligna</i>	Masanduku (Kam)/Saligna gum	Nairobi
	<i>Terminalia prunoides</i>	Mutoo/Mwangati-Punda	Kitui, Wamunyu
	<i>Hymenaea verrucosa</i>	Mutandarusi (Swa)/Gum copal tree	Kilifi, Kwale
	<i>Eucalyptus grandis</i>	Musanduku (Kam)/Rose gum	Nairobi, Rift Valley
	<i>Juniperus procera</i>	Mutarakwa/Cedar	Nairobi, Rift Valley
	<i>Azadirachta indica</i>	Mwarubaini (Swa)/Neem	Kwale, Kilifi
6	<i>Tamarindus indica</i>	Kithumula (Kam)/Tamarind	Kitui, Coast
	<i>Balanites aegyptiaca</i>	Mulului/Desert date	Kitui, Machakos, Makueni
	<i>Cordia monoica</i>	Muthii (Kam)	Kitui
	<i>Cupressus lusitanica</i>	Cypress	Nairobi, Rift Valley
	<i>Melia volkensii</i>	Mukau (Kam)	Kitui

Category	Botanical name	Local/Standard Names	Source
7	<i>Afzelia quanzensis</i>	Mbambakofi (Swa)/Afzelia	Kwale, Kilifi
	<i>Melia azaderach</i>	Dwele (Luo)/Persian lilac	Nairobi
	<i>Tectona grandis</i>	Teak	Malindi
	<i>Combretum molle</i>	Muama (Kam)	Kitui
	<i>Brachystegia spiciformis</i>	Mrihi	Kwale, Kilifi, Kitui
	<i>Hagenia abyssinica</i>	Bondet (Kam)/Hagenia	Central, Rift Valley Provinces
	<i>Grevillea robusta</i>	Mukima (Kik)/Grevillea	Nairobi
8	<i>Lannea schweinfurthii</i>	Muasi (Kam)	Machakos, Kitui
	<i>Albizia anthelmintica</i>	Mporojo (Swa)	Kitui, Machakos, Makueni
	<i>Jacaranda mimosifolia</i>	Mucakaranda (Kik)/Jacaranda	Nairobi
9	<i>Acacia etbaica</i>	Muswiwi (Kam)	Kitui, Machakos, Makueni
	<i>Newtonia buchananii</i>	Mukuu (Kik)/Newtonia	Kitui, Wamunyu
	<i>Ocotea usambarensis</i>	Muthaita (Kik)/Camphor	Mt. Kenya/Nyeri
	<i>Mangifera indica</i>	Mwembe (Swa)/Mango	Coast
	<i>Trichilia emetica</i>	Muwamaji (Swa)/Natal Mahogany	Malindi
10	<i>Anarcadium occidentale</i>	Mkanju (Swa)/Cashewnut	Kwale, Kilifi
	<i>Commiphora africana</i>	Mbambara (Swa)	Kitui, Makueni, Machakos
	<i>Erythrina abyssinica</i>	Mbamba Ngoma (Swa)/Red hot poker tree	Kitui, Makueni, Machakos

Key: Categories and the percentage of features of the species that are similar to those of Mpingo

- Category 1 - 95-100%
- Category 2 - 94%
- Category 3 - 88%
- Category 4 - 81%
- Category 5 - 75%
- Category 6 - 69%
- Category 7 - 63%
- Category 8 - 56%
- Category 9 - 50%
- Category 10 - < 50%

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