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The Characteristics and Economic Values of *Colophospermum mopane* (Kirk ex Benth.) J. Léonard in Botswana

W. Mojeremane and A.U. Lumbile
Department of Crop Science and Production,
Botswana College of Agriculture, Private Bag 0027, Gaborone, Botswana

Abstract: This study reviews the characteristics and economic value of *Colophospermum mopane* a multipurpose indigenous tree growing in many countries of southern Africa. In Botswana the tree is confined to the north-eastern parts of the country and provide goods (fire wood, timber and poles) and services (soil and water, environmental and biodiversity conservation). The tree is a host to mopane worm (*Imbrasia belina*) that feeds on its leaves and the worm is a famous protein rich human food and economical resource in southern Africa.

Key words: *Colophospermum mopane*, mopane worm, indigenous tree, Botswana

INTRODUCTION

Indigenous trees though undomesticated play many important roles in lives of people living in rural areas of Botswana. They provide people with goods such as firewood, poles, building material etc. Indigenous trees in Botswana also provide intangible benefits such as soil and water conservation, environmental and biodiversity protection.

Colophospermum mopane commonly called mopane is one of the most important trees especially in the North-eastern part of the country. The tree is popular for its multiple uses and for the edible mopane worm (*Imbrasia belina*) that feeds on the trees. *Colophospermum mopane* represents a monotypic genus of African occurrence. The genus *Colophospermum* belongs to the Fabaceae (legume) family. It also belongs to the caesalpinioideae subfamily, which are leguminous plants mostly with leaflets like butterfly wings^[1,2]. *Colophospermum mopane* is known by a number of common names; such as butterfly tree, turpentine tree etc.

DISTRIBUTION

Colophospermum mopane is an indigenous tree widely distributed in Southern Africa. It is widely distributed in Angola, Botswana, Malawi, Mozambique, Namibia, South Africa and Zimbabwe^[2,3] and occurs in pure stands (mopane woodland) in hot, dry low-lying areas on alluvial or lime rich soils^[4,5] at altitude of 300 to

600 m above sea level^[6]. The species tolerates alkaline and poorly drained soils better than will many other species^[1,2]. The mopane woodland forms part of what is broadly called savannas, which is characterized by arid and semiarid grassland with a sparse tree and shrub cover. In Botswana mopane is found in the north and eastern parts of the country^[6] occurring about 80 km north of the Tropic of Capricorn.

PLANT DESCRIPTION

Colophospermum mopane is a shrub or tree with a heavy rounded, but occasionally narrow crown^[7]. Most mopane trees are multi-stemmed and spread upward in a narrow V-formation^[5] and the bole can reach about 40 cm but occasionally very big^[8]. Mopane trees differ in growth form depending on the local ecological conditions varies from dwarf (very old and stunted tree less than 2.5 m high) to cathedral mopane, which may reach heights of 18-20 m (Fig. 1a). In Botswana some trees can reach 25 m especially on alluvial soils and when condition are less favourable small mopane shrubs known as mopane scrub is evident^[5]. The bark of mopane varies from dark grey to blackish and characteristically deeply (Fig. 1b), vertically fissured and flaking in narrow strips^[2,8]. The bark is fire resistant^[2], exudes gum when damaged^[7] and contains 5.9% tannin^[5].

The leaves of mopane are alternate compound, drooping with 2 leaflets arising close together^[1]. An underdeveloped terminal 3rd leaflet forms a very small



Fig. 1a: *Colophospermum mopane* tree



Fig. 1b: *Colophospermum mopane* stem with a deeply fissured bark



Fig. 1c: Typical butterfly shaped *C. mopane* leaves and green pods/fruits

appendage between the pair of leaflets. The leaflets are stalkless resembling butterfly wings^[4] (Fig. 1c). The leaflets of *C. mopane* are on average 4.5 to 10 cm x 1.5 to 5 cm and a tapering apex^[1]. The leaves are greenish-yellow, glossy, hairless^[7] and dotted with translucent

glands^[1,7] that give a distinct smell of turpentine when crushed^[2,4,5,7-9]. *Colophospermum mopane* is a deciduous tree and produces leaves between October and April. Mopane trees do not always drop their leaves during the dry months (July/August) like many other species in Botswana. Leaf fall is subject to the amount and timing of rainfall events.

Flowers are inconspicuous, greenish-white in colour and occur in short axillary racemes or sprays near twig terminals^[6,7]. Flowers appear from October-March. Pods are golden brown kidney-shaped with a narrow wing and mature from May to October^[7]. Each pod contains a single pale cream wrinkled, kidney-shaped seed, which is sticky with red brown resin^[2,7,8]. The pod does not open and usually the seed germinate in the pod^[2,7]. Mopane wood has yellow sapwood, which is distinct from the red to brown or blackish heartwood, which is termite resistant. The wood is resinous, very hard, heavy (air-dry 1200 kg m⁻³)^[5,10] and very durable^[4,10].

Economical value of *C. mopane* in Botswana: *Colophospermum mopane* provides many benefits which are of great importance to the people of Botswana especially those living in rural areas.

Leaves and pods: Leaves of mopane are eaten by all domestic animals especially during drought^[8,11-13]. The leaves have a crude protein content of the order of 12-15%^[5,10] during summer and autumn and around 9% during winter and spring^[10]. Leaves retain their nutritional value even after falling to the ground and are eaten by animals of the ground^[7]. Green leaves and young twigs by elephants^[10,11,14-19]. Mopane is so liked by elephants that some areas of mopane woodland in northern parts of Botswana are being devastated, the elephants push over the trees to make the leaves more accessible. Though leaves and seeds smell strong turpentine the smell does not affect milk and meat of animals feeding on them^[5].

Wood: Households in rural and urban areas of Botswana use mopane wood as fuel primarily for cooking, heating and lighting purposes. Mopane is the most preferred firewood species in north-eastern Botswana^[20]. The wood also makes very good charcoal^[5,9]. Mopane fire produces copious amounts of slow burning, intensively embers which can last for several hours or days depending on the size of wood. Its ash has a 50% lime content^[9] and high percentages of phosphorus and calcium^[5]. The ash is frequently used as fertiliser in rural areas. In the north east of Botswana the mopane poles are most important building material and are used in building huts and cattle enclosures, as it is resistance to termites. The poles are

also ideal for fencing^[5,7,9]. The wood is used for furniture making^[4] and carving^[7]. The bark contains 5.9% tannin^[5] and is used in tanning leather^[7,10,12]. The inner bark can be used for making a very strong rope^[10].

Medicine: Gum exuded by heated wood is used to treat wounds that are slow to heal^[5,13]. The leaves, bark and roots are used in the preparation of traditional medicine^[2,12] used for treating various diseases. A decoction made from the wood is used for inflammation of the eyes^[10].

Other uses: *Colophospermum mopane* trees offer nesting sites to hole-nesting birds such as hornbills and small mammals^[12]. A sap sucking insect known as *Arytaina mopani* (mopane psyllid) that produces a sweet waxy cover on mopane leaves is found on mopane trees. The wax is eaten by people in Botswana especially children. mopane trees also host a tiny bee known as *Plebina denoita*, which produces an edible honey that is popular with herd boys. Mopane is host to mopane worm, the larvae of the moth (*Imbrasia belina*). The moth lays eggs on mopane trees. The larvae (mopane worm) feed on the leaves of the tree and can grow up to 70 mm long. The worms are spiny and vividly coloured red yellow and black. In spite of their repulsive appearance, the worm is a famous protein rich human food and economical resource in southern Africa^[5,12,13,19,21]. The mopane worm business is well established in Botswana and provides seasonal employment to many rural households^[22].

Husbandry and management: *Colophospermum mopane* occurs naturally as a component of the open vegetation and in pure mopane stands. Establishment of mopane plantations has not been attempted in Botswana but management and planting of few or single trees for shade take place in homesteads. The species regenerates naturally from seed, coppice and suckers. The seeds are plentiful and germinate easily if planted while still in the pod^[5,10] or sometimes germinate readily above the ground^[9]. Seedlings are initially slow growing^[1,10] but growth speeds up when the plants reach a height of 200 mm^[10]. The seedling are sensitive to frost^[5,10] and therefore not suitable for plant in frost-free sites.

Agroforestry potential: In the north eastern parts of Botswana crops such as maize, sorghum millet etc. are grown in areas that were previously a *Colophospermum mopane* woodland. During land clearing farmers leave few isolated trees to provide shade during ploughing, weeding and harvesting. Casual observations have shown that farmers get better yields in the first few years

of mopane tree clearing and the yield tend to decline with continuous cropping. *Colophospermum mopane* has not been intercropped with maize, sorghum millet etc. in Botswana. However a lot of livestock grazing takes place in *Colophospermum mopane* woodland especially in the north-eastern parts of Botswana.

Mopane is an important indigenous tree in Botswana and provide a miscellany of good to households in rural areas and low-medium income households in urban areas. In Botswana, very little research has been done on the species and what is known is its uses. There is need to study the ecology and silviculture of mopane in Botswana.

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