

Focusing on the Future of *Pterocarpus chrysothrix* (Mukula) in Zambia: A Brief Review of Its Ecology, Distribution and Current Threats

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Abstract

Pterocarpus chrysothrix (*P. chrysothrix*) locally known as 'Mukula' is a multipurpose tree species extensively harvested and currently facing a threat from extinction in Zambia. It is as a result of its good utility properties such as quality timber and medicinal values that have triggered the illegal harvest and export of timber to developed countries. This paper focuses on briefly reviewing the ecology, distribution and current threats on *P. chrysothrix* from the on-going indiscriminate cutting in many parts of Zambia. This tree species is not very common in Zambia, however, it can be propagated by using different methods such as seeds, cuttings and tissue culture. The limited literature existing shows that it is illegally overharvested and exported in a semi-processed form without undergoing formal legal procedures such as inspection and taxation. The problem of overharvesting of Mukula can be reversed by finding suitable propagation methods and developing sound legal strategies for the protection and management of this important tree species.

Keywords

Pterocarpus chrysothrix, Illegal Harvesting, Extinction, Propagation

1. Introduction

Pterocarpus chrysothrix (Mukula) a synonym of *Pterocarpus tinctorius*, is a tropical tree species which grows to up to 25 m in height and is commonly found in Central, East and Southern Africa (Lemmens, 2008). This tree species is believed to be exploited for industrial purposes primarily for furniture and in pharmaceutical industry. *P. chrysothrix* is suspected to be on high demand in the pharmaceutical industry due to its biochemical properties which have either not been fully investigated and/or readily available in literature. It is generally believed that *P. chrysothrix* is used according to its three layers (Figure 1); (1) the heart wood is used for making gun stocks and ornamentals, (2) the outer layer is used in the timber industry for furniture, and (3) the bark is used in the pharmaceutical industry for making drugs.

Owing to its multiple uses, this tree species has recently been commanding a high market value as evidenced in Rufunsa district of Lusaka Province and many other localities

in Zambia were a tone of *P. chrysothrix* is locally sold at over 300 United States Dollars (Chilala, 2014, Personal communication). The tree species is believed to be exported to Asia, and larger quantity of it goes to China. Additionally, *P. chrysothrix* is currently facing immense pressure due to widespread illegal harvesting accelerated by its high international demand. It is against this background that the Government of the Republic of Zambia through the Forestry Department imposed a moratorium on the harvesting and trade of *P. chrysothrix* in 2014. However, with the moratorium in place, widespread illegal harvesting still persists as evidenced in the high number of illegal traders that are appearing in courts of Law (Ngosa, 2014). Indiscriminate harvesting of *P. chrysothrix* in Zambia has raised many questions on the future of this tree species. The current exploitation trend threatens the existence of *P. chrysothrix*. This paper lays the foundation for future

research on *P. chrysothrix* by reviewing; (1) its ecology, (2) propagation, (3) Utilization, and (4) current threats.



Fig. 1. The three (3) layers of *P. chrysothrix*. Note the exudate on the bark characteristic with all *Pterocarpus* species.

2. Ecology of *P. chrysothrix*

P. chrysothrix has not been extensively studied, though its ecology, botany and utilization have been partially documented. *Pterocarpus* species are distributed in the following countries: Democratic Republic of Congo, Tanzania, Angola, Zambia, Malawi and Mozambique (Burkill, 1995; Chilufya and Tengnäs, 1996). In Zambia, *P. chrysothrix* occurs in the hilly places of following provinces: Northern, Eastern, Central, North Western, Luapula, Muchinga and Lusaka.



Fig. 2. The hills in Rufunsa district of Lusaka province were *P. chrysothrix* occurs

P. chrysothrix occurs in the Miombo woodland and dry forests at the altitudes between 450 - 1750 m. It grows as a small tree to up to 25 m in height and 70 cm in diameter; and is evergreen or deciduous (Lemmens, 2008; Storrs, 1995). It has glandular leaves and long golden hairs on the ponds. Similar to *Pterocarpus angolensis* ('Mukwa, Kiaat'), the bark surface of *P. chrysothrix* is grey to dark brown and scaly; its inner bark is whitish exuding a reddish sap on slashing. The crown for this tree species is round, flattened and dense; twigs are usually short and hairy when young with compound leaves (Drummond and Moll, 2002).

3. Propagation of *P. chrysothrix*

P. chrysothrix has the potential of being propagated through different ways. Like many other tree species in the Miombo woodland, it is possible to propagate *P. chrysothrix* from seed, cuttings and field wildlings (Chidumayo, 1997). Literature on propagation of *P. chrysothrix* is non-existent. However, field observations from Rufunsa district indicated that *P. chrysothrix* easily coppices as seen in photo A1 (Figure 3).

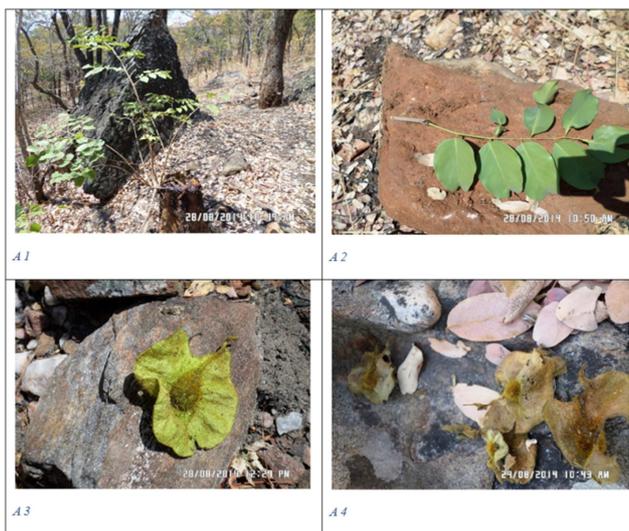


Fig. 3. A1 shows coppice, A2 show a leaf, A3 and A4 shows the fruit of *P. chrysothrix*.

The ability to easily coppice can help advance sustainable management of this tree species *in-situ* with good forest management practices in place. Field observations also showed that the fruit is easily attacked by pests' way before it matures. This has negative implications on possible future propagation and domestication programs. To circumvent the possible challenge of low seed availability, plant tissue culture (micro propagation) could be employed to rapidly multiply this tree species. Exploration of the genetic material using tissue culture methods has not been done. Tissue culture has the potential of increasing the genetic resource of this valuable tree species even with very limited seed or genetic material (Murashige and Skoog, 1962; Jaenicke, 1999). The largest challenge with *P. chrysothrix* like many other indigenous hardwood timber tree species, is the slow growth rate. Burkill (1995) indicated that this tree species can take over 90 years to reach maturity. The tree is however resistant to season fires hence it can easily be established. Propagation methods are essential for the establishment of woodlots and reforestation of *P. chrysothrix* hence the need for more research to explore the best propagation methods for this tree species.

4. Utilisation of *P. chrysothrix*

P. chrysothrix serves different purposes both at large scale like in furniture industries and at local level for medicinal

purposes. Its golden reddish hardwood has a larger proportion of heartwood with density between 450 - 900 Kg/m³ which make it easily workable; glues and screws well, and takes a fine polish (Drummond and Moll, 2002). This wood is popular for furniture, cabinet making and decorative wooden floor. Furthermore, it can be used for light construction, joinery, interior trim, boxes, crates, tool handles, carving, turnery, veneer, plywood, hardboard, particle board, and pulpwood for paper production. Locally, it is used by the local communities as firewood, curving and even charcoal manufacturing. The foliage is browsed by many domestic animals such as cattle, sheep and goats. The reddish, sticky, bloodlike sap (dye) from the wood has been used for colouring different materials such as clothing and other decorative purposes. Drummond and Moll (2002) indicated that, just like the dye for *P. angolensis*, *P. chrysothrix* dye can be used to cure different infection. In the Democratic Republic of Congo, it is reportedly used to treat lung congestion in children (Burkill, 1995). Additionally, it is used as a source of pollen for bees hence important for organic honey production.

5. Current threats to *P. chrysothrix*

Over exploitation of *P. chrysothrix* has raised many questions and debate on the future of this important tree species. The major challenge is the rate at which this tree species is being harvested illegally. If this situation is not controlled, extinction of this valuable tree species which has the potential in contributing to the wellbeing of people both at individual and nation level is likely to happen. At this level, the concern is on reversing the loss of this tree species which has already been over harvested due to different reasons such as weak legal structure, corruption and institution inefficiency from both the local people and government institutions (Ngosa, 2014).

Over harvesting through indiscriminate cutting of the *P. chrysothrix* has been reported in the media in Zambia. This tree species has been illegally harvested in many areas of Zambia such as Lusaka, Eastern, Central and Northern provinces were transporters have been intercepted and arrested because of non-possession of legal documents. The logs which have been on transit in most cases are intended for export to developed countries where it is commanding a high market value. According to the media and political voices, the illegal harvest of *P. chrysothrix* is triggered by weaknesses in the institution arrangement and corruption among the officers given the authority to protect the forest resources. For instance, the latest 1999 Forest Act is not enforced while the old act (1973 Forest Act) is the one being used (Vinya et al., 2011). The 1973 Forest Act number 39 of 1973 CAP 199 does not provide for protection of *P. chrysothrix* (Ngosa, 2014). Furthermore, Statutory Instrument number 52 of 2013 which lists species and their prices does not list *P. chrysothrix*. Before the moratorium was enforced, relevant authorities that license exploitation of tree species in Zambia were licensing *P. chrysothrix* as “other

species” which is at lower price than the high valued *Pterocarpus angolensis* a close related tree species of *P. chrysothrix*. Efforts are under way to list this tree species in the Statutory Instrument.

6. Conclusion

P. chrysothrix is an important species at both national and local level as it has the potential to significantly contribute to the economy and social wellbeing of the people. However, it is facing a major challenge of overharvesting which has been accelerated by exporting its timber in a semi-processed form to other countries by local and foreign business communities. The over harvest has a major challenge of leading to extinction of this valuable tree species. However, propagation and strategic legal framework like stiff punishment to the people involved in illegal harvesting needs to be put in place in order to protect and conserve this valuable tree species. Furthermore, taxation strategies need to be developed so that export of this tree species makes a significant contribution to the nation Gross Domestic Products (GDP). Therefore, the following has been recommended for further research in order to realise the full potential of *P. chrysothrix* in Zambia; (1) determining the current distribution and extent of *P. chrysothrix* exploitation around the country, (2) characterizing the physical and phytochemical properties of *P. chrysothrix* as they relate to its exploitation in order to realize full potential for pharmaceutical and industrial purposes, (3) establishing suitable propagation methods for *P. chrysothrix* in order to come up with suitable reforestation strategies, and (4) determining the value chain and community involvement in the management and protection of *P. chrysothrix* in Zambia.

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