

An investigation into the ethnobotanical use of *Adansonia digitata* in the Sagole community of the Limpopo Province, South Africa

MJ Potgieter

Department of Biodiversity, University of Limpopo, Private Bag X1106, Sovenga, 0727, South Africa

GM Mathaba

Department of Sociology and Anthropology, University of Limpopo, Private Bag X1106, Sovenga, 0727, South Africa

SA Rankoana

Department of Sociology and Anthropology, University of Limpopo, Private Bag X1106, Sovenga, 0727, South Africa

Abstract

The baobab tree (*Adansonia digitata*), with more than 300 cultural and ethnobotanical uses in Africa, has been identified as one of the most important savanna trees on the African continent. A decline in baobab populations due to overexploitation could have a significant negative effect on African livelihoods. Therefore, it is important to determine potential strategies for its conservation. As a case study, the investigation explored the ethnobotanical use, as well as local and institutional conservation efforts of baobab trees by the Sagole community of the Limpopo Province, South Africa. Forty local community members, five traditional health practitioners, and two members from the Limpopo Tourism were selected via convenience sampling. Results indicate that community members primarily use the tree for food and medicine. Medicinally it is used to cure various ailments, such as stomach aches and skin problems. Younger community members have limited knowledge about the cultural taboos related to harvesting material from this majestic tree, which leads to excessive harvesting and damage. Conservation efforts by the provincial Department of Environmental Affairs, as well as the chief seems to be inefficient. Thus a significant educational effort is needed to inform the younger generations.

Keywords: Conservation, cultural taboos, ethno-medicinal uses.

1. Introduction

Baobabs (*Adansonia* species) are important for many rural people in Africa because they are revered for their spiritual presence, and assist with livelihood sustainability, such as providing food and medicine. It is for this reason that Baobabs are often referred to as the tree of life in Africa (Mwihomeke *et al.*, 2009), and are thus viewed as culturally-protected (Ndabikunze *et al.*, 2011). Despite this, there is growing concern about the persistence of baobabs in many landscapes (Venter & Witkowski, 2010). Every component of the baobab serves a beneficial purpose. The leaves can be freshly eaten as vegetables or used in dried form for the preparation of foods, such as sauces and broths (Randler, 2008). Potentially beneficial uses may also exist in the cosmetic

and food industries. The cosmetic applications of baobab oils and extracts are rapidly expanding. The most valuable component is the fruit pulp, which contains high amounts of vitamin C, calcium, iron, potassium, amino and fatty acids, and antioxidants (Manfredini, 2002). The pulp is usually either eaten fresh or used as a base in the manufacturing of beverages (Chirwa *et al.*, 2006). The seeds are used in food manufacturing as binders, pressed as cooking oil bases, or in the production of coffee (Bobo and Weladji, 2011).

According to Sidibe and Williams (2002), baobab bark is used medicinally as a refrigerant, antipyretic and antiperiodic. Baobab bark is harvested to make traditional medicine in various African communities to cure ailments, such as skin problems and diarrhoea (Adewusi & Afolayan, 2010). Powdered leaves are used to treat excessive perspiration (Kier *et al.*, 2005). Young leaves are used topically, crushed into a poultice, for painful swellings. Fruit pulp is used with buttermilk to treat diarrhoea and dysentery (Wickens, 1982). The fruit pulp extract is also applied as eye drops in cases of measles (Sillitoe *et al.*, 2010). Baobab seeds are used as a medicine (a substitute for quinine as a prophylactic) to cure malaria (Osman, 2014), and also to help reduce fever related to malaria (De Caluwe *et al.*, 2010). A mash prepared from the dried powdered roots is given to malaria patients as a tonic (Adewusi & Afolayan, 2010). The cultural value and preservation of biodiversity is a major concern in South Africa. According to Rankoana (2001), the demonstrated significance of a large number of plant species to the community necessitates the need for proper preservation measures of the resources to ensure continued availability. Thus it is the community's responsibility to preserve the natural resources on which they depend for livelihood. As a case study, this investigation selected the Sagole community of the Limpopo Province, South Africa, because of the prevalence of this species in their area and because Mabogo (1990) showed that this community possessed immense cultural knowledge of their environment. However, since that time the community has adopted a western lifestyle, with many traditional cultural practices and knowledge falling by the wayside. Thus this study investigated the extent of traditional use of the baobab, and preservation efforts by the Sagole community and local government agencies

2. Methods

2.1 Study site

Sagole community is located in an area along the northern border of South Africa in the Limpopo Province (Figure 1). The community depends on a subsistence economy that cultivates rain-fed crops such as maize, peanuts, groundnuts, and beans. Dry season and drought-resistant cereals, such as sorghum and a variety of millet are also cultivated (Hellman and Ramsey, 2004). Mucina and Rutherford (2006) noted that the area is not conserved, and thus heavily impacted by grazing, wood-collecting, and slash agriculture. This has led to some alien species invading this area.



Figure 1. Location of Sagole community (dot) within South Africa.

2.2 Study population

According to the advice of the local chief the informants were selected. The selection of twelve key informants, aged 65 and older, was based on their reputation in the society regarding their knowledge about herbals medicine, plants, and the traditional healthcare system. Other informants (15 men and 23 women, aged between 30 and 65 years) were selected via convenience sampling. The study population comprised Vhavenda people residing in the Sagole community. In addition, five traditional health practitioners (THPs) were recruited through convenience sampling to participate in the study. Participation in the study was limited to the practitioners who resided in the Sagole community. Lastly, two Environmental Officers of the Provincial Department of Environmental Affairs were also interviewed.

2.3 Research design

The study is a qualitative, exploratory inquiry into the cultural value and preservation of *A. digitata*. In qualitative research, the information obtained from participants is not expressed in numerical form. William (1998) defined qualitative research as a system of inquiry that seeks to build a holistic, largely narrative, description to inform the researcher's understanding of a social or cultural phenomenon.

2.4 Data collection

The interviews involved face-to-face interaction at the interviewees' households. The interactions were tape-recorded to ensure best analysis of data transcripts. The designed semi-structured questionnaire was pre-tested on a small sample (n=4) of respondents in the Sagole community. It was then adjusted before a final version was developed. The questionnaire was designed to collect information on the extent of use of *A. digitata* for food, medicine, as well as information related to its agronomy and conservation. The questionnaire also had a range of questions related to the preservation of this tree species, for local inhabitants and officers of the provincial Department of Environmental Affairs. These data were descriptively analysed.

2.5 Ethical consideration

To obtain permission to conduct research in the Sagole community, the local chief was consulted to obtain access to participants. Participants gave their written consent to use their intellectual knowledge after the aim and objectives of the research were explained to them. Participants were also assured of the confidentiality of the project, as well as their choice to opt-out at any stage of the interview. The research has been approved by the University of Limpopo's Ethical Research Committee. Ethical clearance number: TREC/128/2015: PG.

3. Results and discussion

3.1 Extent of use

Although all interviewees noted at least one use of the baobab tree, whether for leaves, bark or fruit, 85% of consumers were able to note multiple uses for *A. digitata* such as food (55%), medicine (35%), and fibres for weaving washing baskets and making ropes (10%). In contrast, 15% used it for very specific purposes. This group comprised mostly traditional healers, using it only for medicine. These results are very similar to those of Masola *et al.* (2009) for *A. madagascariensis* in Madagascar with use categories in food, medicine and utilities. There was no evidence of the use of the tree for ritual or ornamental purposes. Notable was the limited knowledge of younger people in contrast with older respondents. It is consequently clear that it is mostly the older people in the Sagole community who still have a close connection to their natural environment. In the long term, this may ultimately lead to a decline in traditional knowledge and loss of cultural association with baobab trees, with the passing of the older generation. Concurrently, it may also lead to a decline in the usage of this species, especially its fruit, which might result in more recruitment.

3.2 Medicine

Community members (35%) harvest roots, bark and leaves to make home-made decoctions, which to treat fever (85% of interviewees noted this function) stomachache (30%), skin problems (20%), haemophilia (nose bleeding) (18%), diarrhoea (15%), fever (12%) and malaria (5%). This ethno-medicinal knowledge resides mainly with respondents older than 55 years. It was found the younger the respondent; the more limited their ethno-medicinal knowledge. Traditional health practitioners utilize the leaves to treat kidney and bladder disease, asthma, insect bites, and several other maladies. Both interviewed community members and traditional healers alluded to the medicinal use of baobab fruit pulp in treating diarrhoea.

The 35% of community members who utilize baobab for medicine is significantly lower than what other studies reported. For example, Nnam and Obiakor (2003) found in that Zimbabwe 80% of locals use the baobab for traditional medicine. Similarly, Masola *et al.* (2009) found that in Madagascar 85% of community members use this tree as a source of medicine. However, Al-Qarawi *et al.* (2003) noted that most people in Tanzania were uninformed on the use of baobab for medicine. It is thus clear that the extent of use of baobab is not universal, and varies from culture to culture, and from geographical area to geographical area, possibly depending on the level of westernization. As alluded before, this low level of use, coupled to limited

ethno-medicinal knowledge about this tree among the younger generation, could be a blessing in disguise that arrests the destruction of trees, concerning bark and root harvesting. It is known that harvesting of baobab bark is very destructive due to the soft fibrous content of this stem, which could easily rot away. The same applies to the harvesting of its roots.

3.3 Food

Just over half (55%) of respondents knew that *A. digitata* leaves have value as a food source, mainly for making cabbage and spinach. In contrast, all knew that fruits could be used as a food source, in using the fruit pulp to make an indigenous cooking soda, which they utilize as a condiment in vegetables and gruels. Leaves can also be dried and crushed for later use. Seeds are used to make oil and yoghurt, which are sold locally for income generation. The seeds are also roasted and used to make coffee. Participants furthermore grill baobab seeds to make an indigenous oil.

The high (85%) percentage of respondents in the Sagole community who use this species for food comes as no surprise due to its documented nutritional value. For example, Manfredini (2002) noted that the leaves and seeds are rich in vitamin C, sugars, potassium tartrate, and calcium. Although this aids in food security for impoverished rural African communities, such as Sagole, the widespread use of its seed is, however, disconcerting.

The study found that the Sagole community uses the seeds of *A. digitata* for making yogurt. The use of seeds is a widespread phenomenon in the distribution area of *A. digitata*. For example, Chadare *et al.* (2009) found that in Burkina Faso seeds are consumed fresh or dried. When dried it is ground into a flour that can be added to soups and stews as a thickener. In Zimbabwe people use seeds to make a juice, while in Cameroon they roast it as a coffee substitute (Manfredini, 2002). Ndabikunze *et al.* (2011) furthermore found that seed oil has a nearly perfect balance of palmitic acid, oleic and linoleic fatty acid, making it ideal for skin cosmetics. The widespread use of baobab seeds is not surprising, seeing that Manfredini (2002) found that all baobab food products, including the seeds, deliver exceptional nutrition, including extraordinary levels of fibre, electrolytes and antioxidants. The powder of the baobab fruit is vitamin and mineral-packed, and has incredibly high levels of antioxidants and fibre (Manfredini, 2002). Although harvesting its seed for domestic food purposes is seen by the Sagole community as a non-destructive and sustainable practice, care must be taken to not endanger the recruitment of the next generation by overharvesting seeds. Thus this study recommends, in line with Kamatou *et al.* (2011) that due to the increased interest in baobab products and slow growth of the plant, research should be directed on how to develop a new cultivar to alleviate the consumption pressure on natural growing baobab trees.

3.4 Agronomy

Twenty-five percent of respondents (mainly people older than 60) do have some knowledge that relates to the agronomy of *A. digitata*. In this regard, old people plant baobab seedlings in their garden or sell seedlings to people who visit them. Old people also indicated that is easy to cultivate the baobab in their garden, while 75%

of middle-aged people (45-55 years old) and younger (30-45 year-olds) respondents found it difficult to cultivate, as seedlings tend to stay small.

The value of 25% is significantly lower than the 75% found by Shukla *et al.* (2001) in Madagascar. It is also low when compared to Ottaviani (2004) who found that in Burkina Faso and Nigeria, 65% of rural people plant baobab seedlings around their homesteads and on their farms. The difference can probably be attributed to several factors. Firstly, a higher level of cultural loss due to westernization in Sagole compared to the above-mentioned study areas. Secondly, Ottaviani (2004) indicated that young trees require a high degree of protection, including fencing to exclude livestock grazing. Thus it would seem fair to state that this knowledge has not been communicated to the younger generation in Sagole. Lastly, younger generations tend to have a much shorter attention span and thus want activities to happen quicker. However, the cultivation of baobab requires much patience and dedication, which seems to be beyond most youngsters. Thus to ensure the future long-term sustainability of the Sagole area baobabs human intervention from senior community members is needed. This approach has produced very good results in Cameroon where chiefs and traditional leaders initiated an awareness campaign to educate uninformed people in their communities about the cultivation of this species. Ultimately, that awareness campaign played a pivotal role in educating people and led to an increase in young baobab trees. The same could be done for the Sagole community.

3.5 Conservation

3.5.1 Community members

Seventy percent of respondents (community members and traditional healers) indicated that they protect baobab trees, because it is viewed as their heritage. A view also shared by 88% of people in Zimbabwe and Madagascar (Masola *et al.*, 2009). In Sagole conservation is done by not allowing people to decimate them via over-harvesting of leaves, roots or bark. All participants were aware of the role the local chief plays in the management of baobab trees in the Sagole community. Management of the use of baobab trees is also exercised to a certain degree by the chief-in-council. Customary laws are passed when the need arises to protect and preserve endangered species that are culturally and economically important. The chief appointed rangers to monitor the correct harvesting of baobab trees to avoid damage from the harvesters of roots and bark, and to discourage interlopers. The chief also encourages people to protect these trees by becoming the eyes and ears of the community, guarding against interlopers. Harvesters of bark and roots in the community are being warned not to excessively harvest them, and also not harvest continuously from the same tree. Notwithstanding the above, our study found that young people (those younger than 45 years) are ill-informed about the preservation of this species. The situation in Sagole is most probably tied to the widespread practise of migratory job seeking in especially urban areas of the country. Thus these younger employed community members are not always in Sagole to be informed about customary law. Furthermore, none of the respondents knew that *A. digitata* is listed as an endangered species in the South African Red Data List. This lack of conservation information can be attributed

to the low frequency of visits by local conservation authorities and their associated awareness programmes in the Sagole community.

3.5.2 State institutions

The provincial Department of Environmental Affairs officers noted that they do visit the Sagole community every few months to monitor the status of baobab trees, and have erected fences around very old trees to protect them. These efforts are commendable; however, more can be done to inform community residents of the Red Data status of this tree species, and what this classification means.

Conclusion

This investigation documented for the first time the use of *A. digitata* by the VhaVenda tribe of the Limpopo Province of South Africa. Although limited in scope, it definitively showed that significant ignorance exists amongst the youth regarding the tree's use and sustainable harvesting practises. This bodes ill for the future of this majestic tree species. Consequently, provincial conservation agencies need to target this demographic group with relevant scientific information to ensure the long term survival of *Adansonia digitata*. Additional efforts also need to be made to make the VhaVenda, in which territory this species occur, custodians of this important cultural icon. Thus a broad conservation approach is needed in which a number of key stakeholders play defined parts to ensure *A. digitata*'s survival for future generations.

Acknowledgements

The authors acknowledge the assistance of the chief, traditional leaders, and members of the Sagole community.

References

- Adewusi, E. & Afolayan, A. (2010). A review of natural products with hepatoprotective activity. *Journal of Medicinal Plants Research*, 4(13): 1318–1334.
- Al-Qarawi, A.A., Al-Damegh, M.A. & El-Mougy, S.A. (2003). Hepatoprotective Influence of *Adansonia digitata* pulp. *Journal of Herbs Spices and Medicinal Plants*, 10: 1–6.
- Baum, D.A & Oginuma, K. (1994). A review of chromosome numbers in Bombacaceae with new counts for *Adansonia digitata*. *Taxon*, 43: 11–20.
- Bobo, K.S. & Weladji, R.B. (2011). Wildlife and land use conflicts in the Mbam and Djerem conservationn region, Cameroon: Status and mitigation measures. *Seed Science and Technology*, 16(6): 445–457.
- Brady, O. (2011). The characterization and bioactivity determination of *Adansonia digitata* fruit pulp, for commercial product development. PhD Thesis. Dublin Institute of Technology, Dublin.
- Chadare, F.J., Linnemann, A.R., Hounhouigan, J.D., Nout, M.J.R & Van Boekel, M.A.J.S. (2009). Baobab Food Products: A review on their composition and nutritional value. *Critical Review of Food Science and Nutrition*, 49: 254–274.
- Chirwa, M., Chithila, V., Kayambazinthu, D. & Dohse, C. (2006). Distribution and population

- structures of *Adansonia digitata* in some parts of Ntcheu, Dedza and Mangochi Districts, Malawi. FRIM, Zomba, Malawi.
- Danthu, P., Roussel, J., Gaye, A. & El Mazzoudi, E.H. (1995). Baobab (*Adansonia digitata*). Seed pre-treatments for germination improvement. *Seed Science and Technology*, 23: 469–475.
- De Caluwe, E., Halamova, K. & Van Damme, P. (2010). Baobab (*Adansonia digitata*): A review of traditional uses, phytochemistry and pharmacology. In: Juliani, H.R., Simon, J. (Eds). African natural plant products: New discoveries and challenges in chemistry and quality: American Chemical Society, Washington, D.C.
- Esenowo, G.J. (1991). St, udies on germination of *Adansonia digitata* seeds. *Journal of Agricultural Science*, 117(1): 81–84.
- Hellman, M.J. & Ramsey, M.S. (2004). Analysis of hot mineral springs and associated deposits in Yellowstone National Park using ASTER and AVIRIS remote sensing. *Journal of Volcanology and Geothermology Research*, 134(12): 195–219.
- Kamatou, G.P.P., Vermaak, I. & Viljoen, A.M. (2011). An updated review of *Adansonia digitata*: A commercially important African tree. *South African Journal of Botany*, 77(4): 908-919.
- Kier, G.J., Mutke, E., Dinerstein, T.H., Ricketts, W., Küper, H., Kreft, W. & Barthlott, N. (2005). Global patterns of plant diversity and floristic knowledge. *Journal of Biogeography*, 32: 1107–1116.
- Lange, K.E. (2010). Vitamin Tree. National Geographic. <http://blogs.ngm.com/blogcentral/2010/08/vitamin-tree.html>. Accessed on 01 July 2015.
- Mabogo, D.E.N. (1990). The Ethnobotany of the Vhavenda. M.Sc. Dissertation, University of Pretoria.
- Manfredini, S. (2002). *Adansonia digitata*. Il baobab farmacista. *L'integratore Nutrizionale*, 5(4): 25–29.
- Masola, S.N., Mosha, R.D. & Wambura, P.N. (2009). Assessment of antimicrobial activity of crude extracts of stem and root barks from *Adansonia digitata* (African baobab). *African Journal of Biotechnology*, 8: 5076–5083.
- Mucina, L. & Rutherford, M.C. (2006). The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.
- Mwihomeke, S.T., Msangi, T.H., Ylhäisi, J. & Mndeme, K.C.H. (2009). Traditionally protected forests and nature conservation in the North Pare Mountains and Handeni District, Tanzania. *Journal East African Natural History*, 87(2): 279–290.
- Ndabikunze, B.K., Masambu, B.N., Tiisekwa, B.P.M. & Issa-Zacharia, A. (2011). The production of jam from indigenous fruits using baobab (*Adansonia digitata*) powder as a substitute for commercial pectin. *African Journal of Food Science*, 5: 168–175.
- Nnam, N.M. & Obiakor, P.N. (2003). Effect of fermentation on the nutrient and antinutrient composition of baobab (*Adansonia digitata*) seeds and rice (*Oryza sativa*) grains. *Ecology and Food Nutrition*, 42: 265–277.
- Osman, M.A. (2014). Chemical and nutrient analysis of baobab (*Adansonia digitata*), fruit and seed protein solubility. *Plant Foods and Human Nutrition*, 59(1): 29–33.
- Ottaviani, G., Maturri, L., Rossi, L., Lavezzi, A.M. & James, T.N. (2004). Multifocal cardiac Purkinse cell tumor in infancy. *Europace*, 6: 138–141.
- Patrut, A., Mayne, D.H., von Reden, K.F, Lowy, D.A., van Pelt, R., McNichol, A.P., Roberts, M.L. & Margineanu, D. (2010). Fire history of a giant African baobab evinced by radiocarbon dating. *Proceedings of the 20th International Radiocarbon Conference*. RADIOCARBON, 52(2-3): 717–726.
- Rabie, M.A. & Fuggle, R.F. (1992). The Rise of Environmental Concern. In: Fuggle, R.F., Rabie, M.A. (Eds). Environmental Management in South Africa. Juta, Cape Town.
- Ramesh, D., Dennis, T.J. & Shingare, M.S. (1992). Constituents of *Adansonia digitata* root bark. *Fitoterapia*, 63: 278–279.

- Randler, C. (2008). Pupils' factual knowledge about vertebrate species. *Journal of Baltic Science Education*, 7(1): 48–54.
- Rankoana, S.A. (2001). Plant-based medicine of the Dikgale Community of the Northern Province. *South Africa Journal of Ethnology*, 24: 99–104.
- Ritchken, E. (1995). The RDP, governance and rural development. In: Fitzgerald, P., McLennan, A., Munslow, B. (Eds). *Managing Sustainable Development in South Africa*. Oxford University Press, Cape Town.
- Shukla, J., Anderson, J., Baumhefner, D., Brankovic, C., Chang, Y., Kalnay, E., Marx, L., Palmer, T., Paolino, D.A., Ploshay, J., Schubert, S., Straus, D.M., Suarez, M. & Tribbia, J. (2001). Dynamical Seasonal Prediction. *Bulletin of the American Meteorological Society*, 81: 2593–2606.
- Sidibe, M. & Williams, J.T. (2002). Baobab (*Adansonia digitata*). International Centre for Underutilized Crops, Southampton.
- Sillitoe, P, Alshawi, L.A.A & Al-Amir H.A.K. (2010). Challenges to conservation: Land use change and local participation in the Aireem Biosphere Reserve, West Qatar. *Journal of Ethnobiology and Ethnomedicine*, 6(7): 28–33.
- Stein, S. (1993). *Noah's Garden: Restoring the Ecology of Our Own Back Yards*. Houghton-Mifflin, New York.
- Swanapoel, C.M. (1993). Baobab phenology and growth in the Zambezi Valley, Zimbabwe. *African Journal of Ecology*, 31: 84–86.
- Venter, S.M. & Witkowski, E.T.F. (2010). Baobab (*Adansonia digitata*) density, size-class distribution and population trends between four land-use types in northern Venda, South Africa. *Forest Ecology and Management*, 259: 294–300.
- Von Carlowitz, P.G. (1991). Multipurpose Trees and Shrubs. ICRAF, Nairobi, Kenya.
- Wickens, G.E. (1982). The baobab Africa's upside-down tree. *Kew Bulletin*, 37: 173–209.
- William, D. (1998). *The Marketing Research Methodologist*. Marketing Research Magazine, Spring.