CATHA EDULIS: A THREATENED TREE IN THE WEST USAMBARA MOUNTAINS, TANZANIA

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MSUYA, T. S. & MNDOLWA, M. A. 2005. ***Catha edulis*: a threatened tree in the West Usambara Mountains, Tanzania**. Assessment of the effects of stimulant trade on the future survival of *Catha edulis* trees was conducted in the West Usambara Mountains. A total of 65 plots of 0.1 ha each were established along two transects. All *C. edulis* trees in each plot were counted and recorded based on their health status. Of the 350 sampled trees, only 12% were healthy whereas 88% were either damaged or dead or dying. The number of *C. edulis* trees in the plots reflected a similar situation to trees outside the plots. Health distribution for diameter classes revealed that leafy harvesting had more impact on large trees as compared with small trees. About 93% of all healthy trees had diameter class less than 20 cm. While 86% of all damaged trees had diameter class above 20 cm, no dead trees with diameter class less than 20 cm were recorded. This indicated that most leaves of large old trees were preferred compared with those of small and young trees. However, due to scarcity of leaves from large trees, leaves from regenerated seedlings were also harvested. Thus, in the absence of conservation efforts, *C. edulis* faces danger of extinction.

Key words: Threatened species – leaf harvesting – stimulant trade – health status – conservation

MSUYA, T. S. & MNDOLWA, M. A. 2005. ***Catha edulis*: pokok terancam di Gunung Usambara Barat, Tanzania.** Penilaian kesan perniagaan perangsang terhadap masa depan pokok *Catha edulis* dijalankan di Gunung Usambara Barat. Sebanyak 65 plot, masing-masing 0.1 ha luas didirikan di sepanjang dua transek. Semua pokok *C. edulis* di dalam setiap plot dikira dan direkodkan taraf kesihatannya. Daripada 350 pokok yang disampel, 12% didapati sihat manakala 88% mengalami kecederaan atau telah mati atau hampir mati. Perkara yang sama juga diperhatikan pada pokok-pokok di luar plot. Taburan kesihatan mengikut kelas diameter menunjukkan bahawa pengutipan daun memberi kesan yang lebih pada pokok besar berbanding pokok kecil. Kira-kira 93% daripada pokok sihat mempunyai kelas diameter kurang daripada 20 cm. Manakala 86% daripada pokok tercedera mempunyai diameter lebih daripada 20 cm, tiada satu pun pokok mati mempunyai kelas diameter kurang daripada 20 cm. Ini menunjukkan bahawa daun daripada pokok besar dan tua lebih digemari daripada daun pokok kecil dan muda. Disebabkan kekurangan daun daripada pokok besar, daun daripada anak benih yang dipulihara juga dikutip. Justeru *C. edulis* menghadapi bahaya kepupusan tanpa usaha pemuliharaan.

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Introduction

It is unreasonable to expect harvesting significant quantities of any forest biological resource without causing some changes to the ecosystem (Poore 1989 cited by Boot & Gullison 1995). Perhaps all that we should require of extraction systems is that they result in no loss of species from the forest and no irreversible changes in ecosystem process (Boot & Gullison 1995). However, the fact that some plants possess commercial ingredients attracts both internal and external trade leading to the export of large quantities of products of such plants. This has in many cases resulted in uncontrolled harvesting which may lead to a decrease or extinction of the harvested species. *Catha edulis* is one of the affected forest plants due to excessive illegal harvesting of its young leaves and shoots for sale as stimulant. The effect is obtained by chewing the leaves and shoots.

Catha edulis is an indigenous tree species in the eastern and southern parts of Africa and the Arabian peninsula (Elmi 1979, Noad & Birnie 1989). In Africa the species is known to grow naturally in hillsides and mountain slopes at 1400–2200 m altitude in Ethiopia (Tesemma *et al.* 1993), Uganda (Eggeling 1940), Kenya (Beentje 1994), Tanzania (Mbuya *et al.* 1994) as well as Malawi, Zambia and South Africa (Palgrave 1983). Yemen is the only country where the species has been reported to grow in the Arabian peninsula (Revri 1983). Mbuya *et al.* (1994) reported that the species grow naturally in the highlands of Usambara, Rungwe, Kilimanjaro and Iringa. Besides being a stimulant, its leaves, bark and roots are used by local people as medicines and wood for building poles, furniture, wood pulp and for carving spoons and combs (Palgrave 1983, Mbuya *et al.* 1994). The species is also a good source of firewood with high calorific value (Beekhuis 1997).

In spite of the species being over harvested for stimulant trade, no systematic studies have been done to evaluate the extent of the problem in Tanzania. However, several studies on its utilization and abuse, cultivation, chemistry, toxicity of the stimulatory compounds and distribution have been reported in various parts of the world (Becker & Desta 1989, Al-Bekairi *et al.* 1991, Storck *et al.* 1991, Rudgley 1994, Hirst 1997). The current study was, therefore aimed at assessing the effects of stimulant trade on *C. edulis* in the West Usambara Mountains.

Materials and methods

Study area

The study was conducted in 1997 at Shume-Magamba Forest Reserve in the West Usambara Mountains. The West Usambara Mountains lie between longitudes 38° 10' and 38° 36' E and latitudes 4° 24' and 5° 00' S. Altitude ranges from 400–1400 m asl. The West Usambara Mountains receive rainfall in a bimodal pattern, with short rains in October–December and long rains in March–June. Local intermediate rains may occur in June–August. Rainfall distribution ranges from

600 mm to more than 1200 mm per year (Msangi 1990). The mean annual temperature varies with altitude. At 500 m, the mean annual temperature ranges from 25–27 °C while on the plateau, at 1500–1800 m, the range is 17–18 °C (Wiersum *et al.* 1985).

Data collection and analysis

Primary data were collected from field surveys conducted in Shume–Magamba Forest Reserve. A total of 65 plots of the size 0.1 ha (50 × 20 m) each were established along two transects. The size of each transect was 1300 m long and 50 m wide (6.5 ha). In each plot, all *C. edulis* trees were counted and recordered based on their health conditions. Trees with all twigs and branches or < 20% of the twigs and branches damaged or removed were considered healthy. Those with > 20% of the twigs and branches damaged or removed but with some leaves were taken as damaged. Those with leafless crowns and branches were considered severely damaged or dead. Regenerated seedlings of this species inside the surveyed forests were also counted based on their health condition. Measurement of diameter at breast height (dbh) was also done for each *C. edulis* tree encountered in the plots.

Quantitative method was the only method employed. Basic statistics such as mean, frequency and percentage were used in the analysis.

Results and discussion

Of the 350 sampled *C. edulis* trees, only 12% were healthy, 43% were damaged and 45% were dead (Figure 1). About 88% of sampled trees were either damaged or dead or at the verge of dying. The number of trees in the plots (Table 1) also reflected a similar situation.

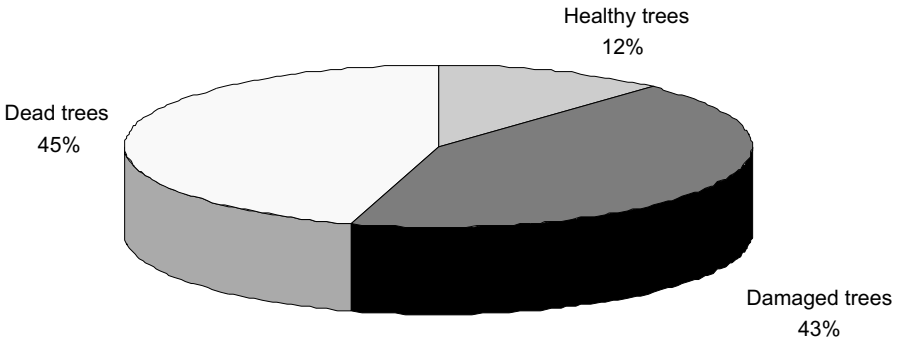

Figure 1 Proportions of healthy, damaged and dead *Catha edulis* trees (from a sample of 350 trees) in the West Usambara Mountains, Tanzania

Healthy *C. edulis* trees were few in the sampled plots compared with damaged and dead trees. A total of 87% of the sampled plots had none to one healthy tree, 42% had none to one damaged and 48% had none dead trees. For plots with two to three trees, 11, 34 and 25% of the plots had healthy, damaged and dead trees respectively. Only one plot (2%) had four to five healthy trees and no single plot had more than five healthy trees. On the other hand, 20 and 18% of the sampled plots had four to five damaged and dead trees respectively, whereas 4 and 9% of the plots had more than five damaged and dead trees respectively. Leafy harvesting had affected regeneration because 72% of the 1125 regenerated seedlings counted in the study area were observed to be leafless, meaning that as leaves from trees became scarce, regenerated seedlings had begun to be a source of leaves. Thus, in the absence of conservation efforts, *C. edulis* faces danger of extinction due to stimulant trade. While the trade of *C. edulis* leaves is illegal in Tanzania, it is legal in Kenya and Somalia (Elmi 1979, Goldsmith & Cohen 1988). In spite of its trade and use being illegal in this country, it is established fact that collectors sell khat leaves to middlemen traders within the country. They in turn find their way to the said countries where there is ready market.

Health distribution for different diameter classes revealed that leafy harvesting had more effect on large trees as compared with small trees (Table 2). Healthy trees were smaller with diameter class less than 20 cm. Only three *C. edulis* trees had diameter class between 20 and 29.9 cm. This means about 93% of all healthy trees recorded in the study area had diameter class less than 20 cm. However, damaged and dead trees recorded in the study area were bigger in size. About 86% of all damaged trees had diameter class above 20 cm and all dead trees had similar diameter class. This meant no dead trees recorded in the study area had diameter less than 20 cm.

Table 1 Health status of *Catha edulis* trees in a sample of 65 plots in the West Usambara Mountains, Tanzania

Number of trees in plot	Health status					
	Healthy		Damaged		Dead	
	Number of plots	%	Number of plots	%	Number of plots	%
0–1	57	87	27	42	31	48
2–3	7	11	22	34	16	25
4–5	1	2	13	20	12	18
> 5	0	0	3	4	6	9
Total	65	100	65	100	65	100

Table 2 Health distribution for different diameter classes of *Catha edulis* trees sampled from 65 plots

Diameter class (cm)	Health distribution					
	Healthy trees		Damaged trees		Dead trees	
	Number	%	Number	%	Number	&
0.0–9.9	25	60	5	3	0	0
10.0–19.9	14	33	16	11	0	0
20.0–29.9	3	7	85	57	18	11
30.0–39.9	0	0	40	27	78	49
> 39.9	0	0	3	2	63	40
Total	42	100	149	100	159	100

This indicated that leaves of large trees were preferred. The reasons for the preference of leaves from large trees could be location, besides getting large quantities of leaf harvest. Moreover, the concentration of stimulants is higher in collections from big trees. *Catha edulis* leaves gathered from plants over six years of age are most prized due to an accumulation of high concentration of alkaloids (Charles 1997). From the regeneration stand point, mother trees are increasingly becoming scarce. Healthy trees are mainly small and young and on reaching maturity they are likely to be decimated by excessive leaf harvesting.

Conclusions

Despite the fact that khat trade is illegal in Tanzania, the two neighbouring countries with different legislation induce clandestine collections destined to those countries. This calls for the harmonization of rules and regulations pertaining to the use of khat and similar resources leading to improved resource conservation.

Conversely, *ex situ* conservation needs to be promoted in countries where the use of khat is not restricted. This suggests that inventory of this species should be updated as well as its phenology, regeneration and propagation methods documented.

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