Short Communication

Damage of Different Tree Species in Forest Plantations by Elephants in Mt. Kenya Forest

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The African elephant *Loxodonta africana* Blumenbach, a water dependent intermediate bulk feeder is relatively unselective preferring grazing to browsing (Van Soest 1982, Van Wijngaarden 1985). Unlike the elephants found in grasslands (savanna) forest elephants are browsers and feed mainly on shrubs and saplings in secondary forests (Olivier 1978). The forest dwelling elephants in Kenya are found in mixed forests along the farmlands during wet seasons. Sometimes they invade farmlands and eat agricultural crops such as maize, bananas, sugarcanes and potatoes. As the weather becomes drier, the elephants move up the mountain where the forage is greener and more abundant. If the drought persists they change their feeding habit and start feeding on trees (Beekman and Prins 1989) hence destroying forest plantations. The forest elephants change their diet from the scarce shrubs to tree bark during dry season. In 1986 damage of forest plantations by elephants increased and it was decided to assess the severity of the problem. The main objective of this study was to determine most damaged trees by elephants.

The experimental site was at Castle Forest Station on the southern slopes of Mt. Kenya 0° 30′S latitude and 36° 45′ E longitude. The site was a narrow long strip of land on the slopes measuring 1.7 km wide and 4.7 km long surrounded by natural mixed forests. The forest plantation was raised in 1970 with seven different tree species : Hoop pine (*Araucaria cunninghamii* Sweet), Mexican Cypress Cedar of Goa (*Cupressus lusitanica* Mill), East African Pencil Cedar (*Juniperus procera* Hochst ex Endl), Patula pine (*Pinus patula* Schlechtend & Cham), *Premna maxima* T. C. E. Fries, *Prunus africanum* H. K. f., and Meru Oak (*Vitex keniensis* Turrill). The total area covered by the experiment was 69.5 hectares. The spacing of trees was 2.5 m X 2.5 m.

A systematic strip or transect sampling method was used. A sample of one hectare systematic strips were considered for each species. The seven sample strips constituted about ten percent of total area of the plantation. The sample strips starting from one random point were laid out at right angles to a base line of 670 m long. Each strip was ten metres wide, one kilometre long at a

distance of one hundred metres from one another. Using the strips in all the species plots the elephant damage (trees debarked or broken) was monitored every month for six months and damaged trees were marked with paint. The experiment was conducted during dry months of 1990.

Damaged trees were classified into five elephant damage classes based on the amount of bark removed, after Anderson and Walker (1974) as : *Class 1* : no damage 0 -1% bark removed; *Class 2*: slight damage, 1 - 25% bark removed; *Class 3* : moderate damage, 26 - 75% bark removed; *Class 4*: heavy damage, 76 - 90% bark removed, *Class 5* : total damage, 76 - 100% bark removed.

To determine the species which was liked most for food, preference ratios were calculated using the following equations adapted from Petrides (1975) and Ishwaran (1983).

$$\text{Preference ratio (PR)} = \frac{\text{Percentage damage (D)}}{\text{Percentage availability (A)}}$$

where

$$\text{Percentage damage (D)} = \frac{100 \times \text{Number of damaged trees in a given species per unit area}}{\text{Number of damaged trees of all species in same area}}$$

$$\text{Percentage availability (A)} = \frac{100 \times \text{Number of trees in a given species per unit area}}{\text{Number of trees of all species in same area}}$$

It should be noted that preference ratio was assumed to be synonymous with damage ratio because a preferred species was eaten, hence the species was damaged.

The preference / damage ratio values obtained centre on 1.00 as reference point (Petrides 1975) species with preference ratio of exactly 1.00. Species with preference values above 1.00 are those which are sought out as preferred food therefore more damaged. Ratings below 1.00 indicate species which are neglected or avoided. Species which are totally avoided have a zero preference ratio (Barnes 1976, Ishwaran 1983). Analysis of variance was carried out to find out whether there was any statistical difference in damage among the tree species.

Tree damage ratios and extent of damage are shown in Table 1.

Table 1 : Tree damage ratios and damage extent by forest dwelling elephants around Mt. Kenya.

Tree species	No. of trees per plot	No. trees damaged	Preference / damage ratio	Damage extent
Pinus patula	1290	1290	2.00	Total
Cupressus lusitanica	1303	1300	1.99	Total
Araucaria cunninghamii	1400	1380	1.97	Total
Juniperus procera	1240	480	0.77	Moderate
Premma maxima	1180	220	0.37	Slight
Prunus a ricanum	1340	120	0.17	Slight
Vitex keniensis	1320	25	0.03	No damage
Total	9073	5335		

The trees with thick and easily stripped bark suffered more than the ones with thin barks. Some trees were seen without a single strip of bark from ground level up to six metres height. Other trees were knocked over by the elephants when they leaned or passed between them but these were not recorded as damaged.

It was observed that *Pinus patula* was heavily damaged and was followed by *Cupressus lusitanica* and then *Araucaria cunninghamii.* These three species are softwoods and are all exotics. *Juniperus procera* although an indigenous softwood was moderately damaged. The other species generally avoided or slightly damaged were indigenous hard wood species.

There was statistically significant difference in damage between the exotic softwoods and the indigenous hardwood trees. No species was found to be totally avoided. It shows that exotic trees were preferred whereas indigenous trees were neglected or avoided

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