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Research note:

Fire damage to *Schinziophyton rautanenii* (Schinz) trees in North-eastern Namibia

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Abstract

The nuts of the Mangetti, Schinziophyton rautanenii*, are an important food source for a number of rural communities. The environment in which the tree grows, however, is subject to frequent burning.*

A number trees have been seen with a characteristic inverted U-shaped fire lesion on the base of the trunk. A collapsed trunk as well as a vertical scar in the same tree showed that heavy branches or a second trunk may collapse under their own weight, thus providing a point for fire entry.

Introduction

Fire has been described as an important factor in savannah woodland dynamics and has been the subject of a number of studies. These include the South African Ecosystem Project at Nylsvlei (Scholes & Walker, 1993), the Ndola plots in Zambia (Chidomayo, 1988) and additional fire trials in Northern Namibia (Geldenhuys, 1977). Even now the Directorate of Forestry is in the process of establishing a series of trials near Kanovlei (Louw pers com).

The ability of woodland trees to cope with fire varies. Adaptations to deal with fire include thick bark, as may be observed on *Schinziophyton rautanenii* or *Pterocarpus angolensis* trees, or the ability to produce coppice shoots. For more information, Rutherford (1981) describes the reaction of a number of other woodland tree and shrub species to fire.

While the overall effect of burning on the vegetation depends on the season and frequency of such burns (Graz, 1996), the effect of fire on individual plants is dependent on the degree to which they are able to recover in the intervals between burns (Trollope 1982). As the interval between burns decreases plants have progressively less time for recovery.

The effect of fire is aggravated by injury to the bark, which allows fire to damage the wood or cambium. Yeaton (1988) observed, for instance, that adult *Burkea africana* trees would only be affected by a fire when the bark was removed by porcupine (*Hystrix* species) such that the heartwood was exposed.

Fire Damage

In north-eastern Namibia fire damage, in the form of hollow stems, can frequently be observed on the trunks of large *S. rautanenii* trees, while smaller trees show such damage much less often. The hollow is usually open at the base showing a characteristic inverted 'U' shape, such as shown in Figure 1.

Figure 1: Characteristic fire lesion on the base of the trunk of *S. rautanenii* trees. (photo: F.P. Graz, 1995)

Figure 2: Fire lesion on trunk of *S. rautanenii* tree showing vertical splitting, charring and cavity development (photo: U. Graz, 2001)

During a field visit to a stand of *S. rautanenii* trees it became evident that many trees have multiple trunks, joined at the base. As the crown carried by such trunks grows progressively heavier, the trunk starts to develop vertical checks and splitting, (see Figure 2). Once a certain mass threshold is exceeded, the trunk breaks off from the remaining tree and collapses. This is clear from Figure 3, showing the opposite side of the trunk in Figure 2.

Once the trunks, or even low branches, have broken off, there is no protective covering of bark to prevent fire scarring. In addition, splinters will provide ideal small size fuel, thus providing fire with a point of entry into the bole.

Figure 2 shows the initial stages of fire damage after a large branch has broken from the tree. Charring is evident on the right part of the hole in the trunk. Not so evident on the picture is the extent of the damage at the upper part, where a cavity extends further up into the trunk.

Once such a cavity opens at the top, the damaged section acts like a chimney, concentrating the heat within the section, and increasing the rate of damage. Other trees showed profuse coppicing from the base of a collapsed trunk. It is not clear what effect fire may have on the coppice, although it may be assumed that many shoots will be killed.

Figure 3: A large trunk broken from a tree (photo: F.P. Graz, 2001).

While it was not verified in the field, it is likely that more female trees are damaged than male trees. The nuts produced by the trees increase the weight of a branch substantially before the fruit are shed, thus causing branches to break. While some authors link the production of fruit crops to rainfall (Graz 2001), Mwamba (1996) reports that nut yield also increases with tree age and size. Keegan (1982) reports that 1t of nuts per hectare were produced by a stand of trees in the Tsumeb forest in northern Namibia.

Despite heavy fire damage trees are able to continue growing and produce fruit. It is unclear at what stage trees are killed.

A comparison of the distribution of *S. rautanenii* given by Graz (2001) and the areas burnt as provided by the Etoscha Ecological Institute show that about 75% of the area in which the species occurs burnt at least once between 1996 and 2000. During the same period approximately 25% of the area burnt annually or biannually.

S. rautanenii stands are often burnt by the local population to facilitate collection of nuts (Tuomasjukka *et al.* 1998) since collection is made easier when the undergrowth is removed. This trend is likely to continue particularly in view of a increasing human population.

Conclusion

In the event that *Schinziophyton rautanenii* is propagated artificially, either through cuttings or seedlings, it will become important to monitor crown form particularly of female trees, and to influence tree development through pruning or planting density. Pruning should reduce trees to single stems that may then grow vertically, and remove such branches that would later break off.

In a controlled environment where fire can be excluded, this will also reduce injury to trees in general. However, in places where fire will continue to occur, a modified tree-form will reduce the rate at which trees are damaged or killed.

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