

THE EFFECT OF SEASON AND TREATMENT ON THE SURVIVAL RATE AND COPPING ABILITY OF FIVE ENCROACHING WOODY SPECIES.

III: COMPARING THE EFFECTS OF FELLING HEIGHTS AND FIRE-GIRDLING.

B.J. STROHBACH

National Botanical Research Institute
Ministry of Agriculture, Water and Rural Development, P/Bag 13184, Windhoek

ABSTRACT

Five encroaching species (*Acacia mellifera*, *A. nilotica*, *Dichrostachys cinerea*, *Terminalia prunioides* and *T. sericea*) were been felled or fire-girdled at various heights and during various seasons (Strohbach, 1996a and 1996b). In this concluding paper, the effectiveness of the two treatments are compared. Fire-girdling is more effective than felling in the *Acacia* species and *Dichrostachys cinerea*, while no marked difference was observed between the results of felling and fire-girdling with the *Terminalia* species. Several inconsistencies were noted in the results, for which no explanations can be given at this stage.

INTRODUCTION

Two methods of killing encroaching woody species were tested, viz clear-felling and fire-girdling. These two methods were applied on five encroaching species, i.e. *Acacia mellifera*, *Acacia nilotica*, *Terminalia sericea*, *T. prunioides* and *Dichrostachys cinerea*. As these methods were applied simultaneously on the same sites (as described in Strohbach, 1996a and 1996b), an opportunity was provided to compare the effects of these treatments.

METHODS

The results obtained in the two trials (Strohbach, 1996a and 1996b) were compared by plotting the mortality and height of regrowth after two years against the time of treatment. Each treatment height (i.e. 5 cm, 20 cm and 50 cm above ground level) was plotted separately. The season of treatment was plotted as starting from July and ending in June, to enable the comparison of the graphs with the climate diagrams for the test sites. (See Strohbach (1996a)).

A summarising table, indicating the most effective treatments, was compiled (Table 1). In this table, treatments killing more than 50 % of the plants were indicated with an F for felling and a G for fire-girdling, with the height of the effective treatment indicated as a subscript.

RESULTS

Acacia mellifera (Vahl) Benth.

Fire-girdling is shown to be far more effective as a bush control measure than felling (Figures 1, 2 and 3). Fire-girdling

at 5 cm above ground level proved to be especially effective when compared to felling at 5 cm above ground level.

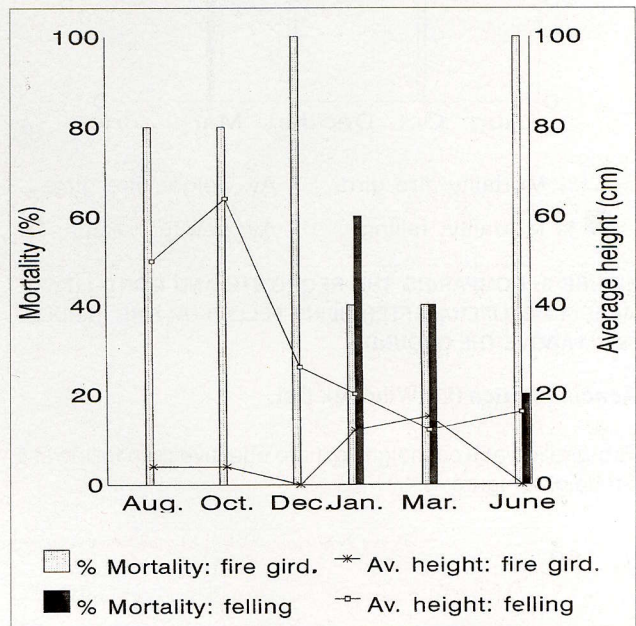


FIGURE 1: COMPARING THE REGROWTH AND MORTALITY OF *ACACIA MELLIFERA*, AFTER BEING FELLED OR FIRE-GIRDLED 5 CM ABOVE THE GROUND.

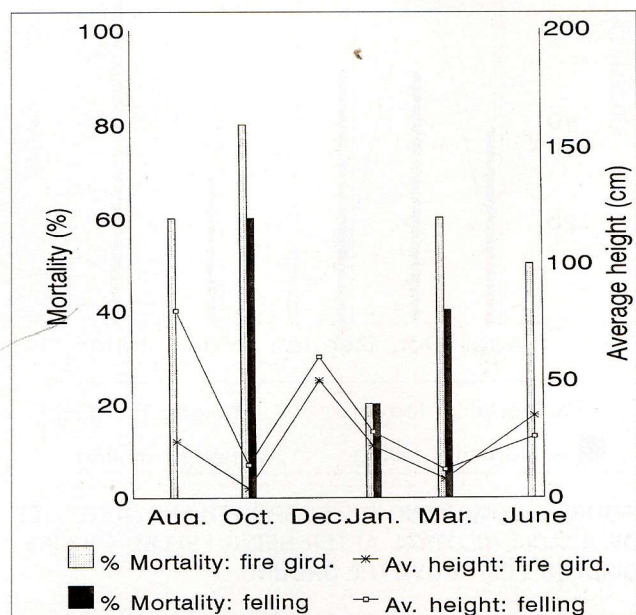


FIGURE 2: COMPARING THE REGROWTH AND MORTALITY OF *ACACIA MELLIFERA*, AFTER BEING FELLED OR FIRE-GIRDLED 20 CM ABOVE THE GROUND.

However, felling during the rainy season seems to be more effective than fire-girdling, with a higher % mortality and a lower coppicing ability.

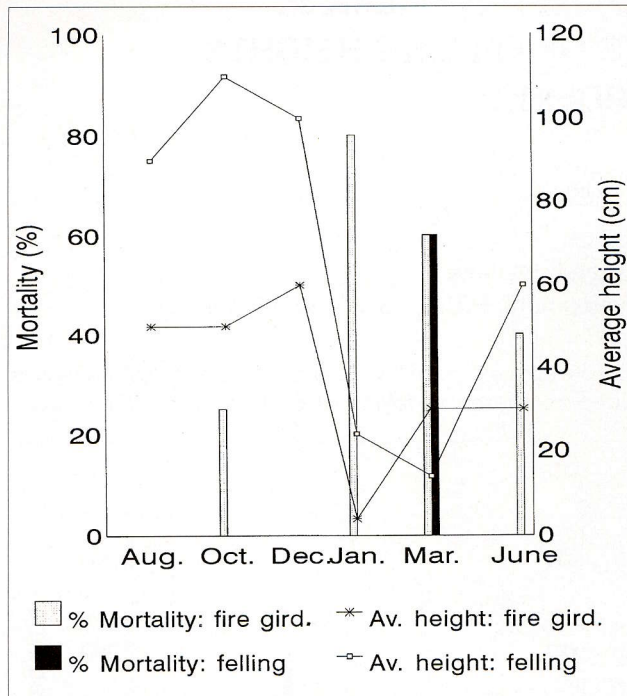


FIGURE 3: COMPARING THE REGROWTH AND MORTALITY OF *ACACIA MELLIFERA*, AFTER BEING FELLED OR FIRE- GIRDLED 50 CM ABOVE THE GROUND.

Acacia nilotica (L.) Willd. ex Del.

Fire-girdling at 5 cm height is more effective than felling at 5 cm height (Figure 4).

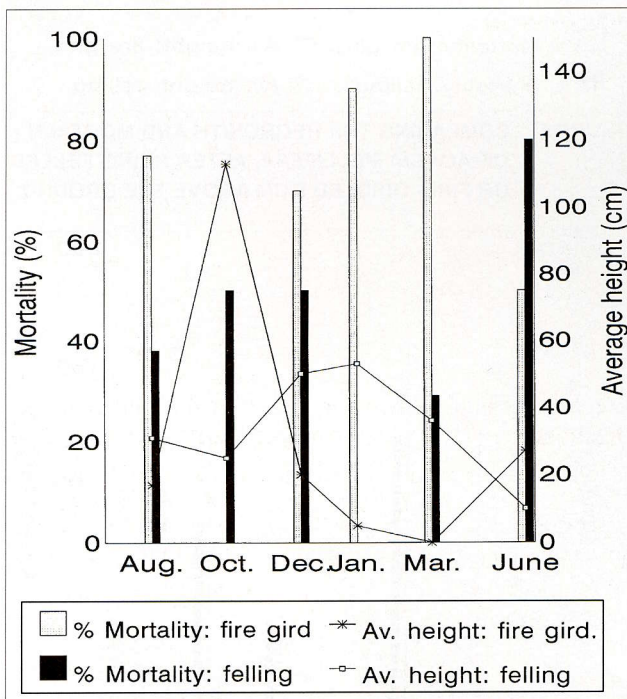


FIGURE 4: COMPARING THE REGROWTH AND MORTALITY OF *ACACIA NILOTICA*, AFTER BEING FELLED OR FIRE- GIRDLED 5 CM ABOVE THE GROUND.

Treatments applied at a higher level (i.e. felling and fire-girdling at both 20 cm and 50 cm above ground level) show little difference in effectiveness (Figure 5 and 6).

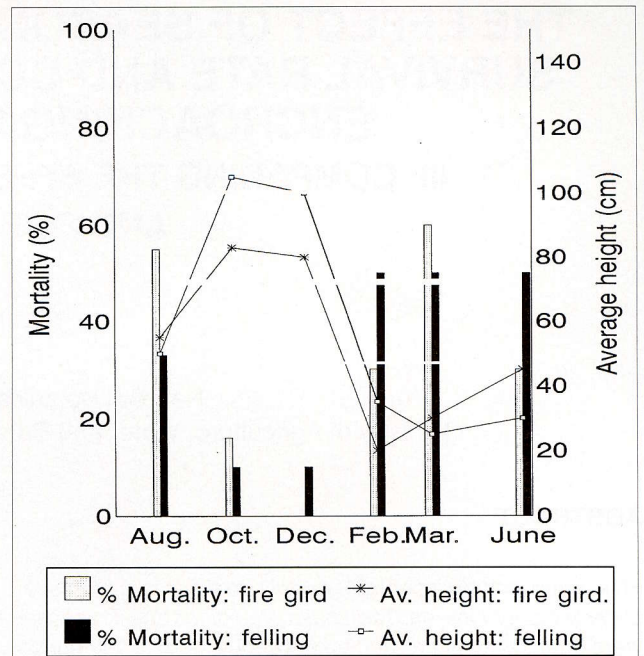


FIGURE 5: COMPARING THE REGROWTH AND MORTALITY OF *ACACIA NILOTICA*, AFTER BEING FELLED OR FIRE- GIRDLED 20 CM ABOVE THE GROUND.

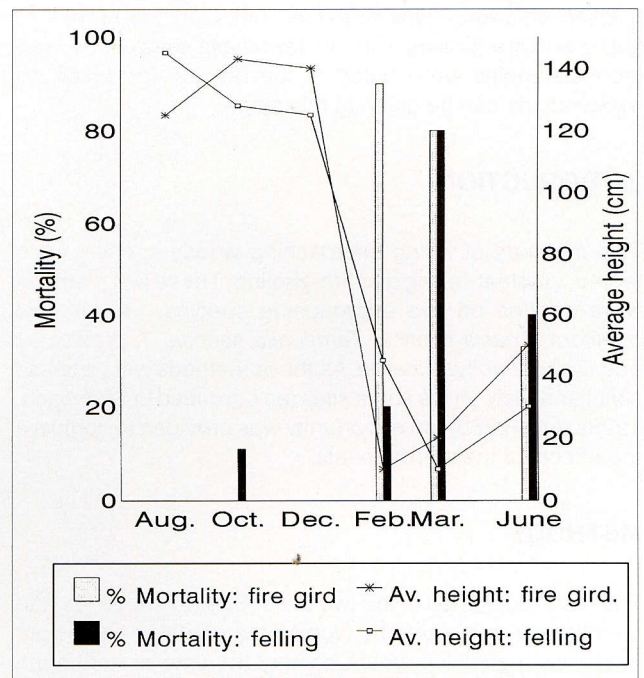


FIGURE 6: COMPARING THE REGROWTH AND MORTALITY OF *ACACIA NILOTICA*, AFTER BEING FELLED OR FIRE- GIRDLED 50 CM ABOVE THE GROUND.

These results indicate that damage is not only done to the cambium and phloem of the stem during fire-girdling near the ground level, but also to the hypocotyl¹.

Dichrostachys cinerea (L.) Wight & Arn.

No great differences exist in the effect of fire-girdling and felling. Fire-girdling at 5 cm during the rainy season seems to be marginally more effective than felling (Figure 7). A similar trend is followed by treatments at 50 cm height, while no marked difference exists between the results of the treatments at 20 cm height (Figure 8).

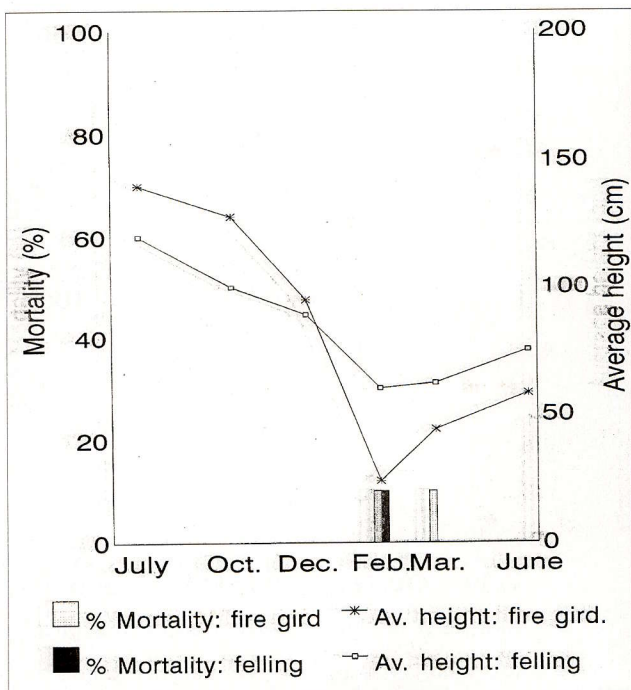


FIGURE 7: COMPARING THE REGROWTH AND MORTALITY OF *DICHROSTACHYS CINEREA*, AFTER BEING FELLED OR FIRE-GIRDLED 5 CM ABOVE THE GROUND.

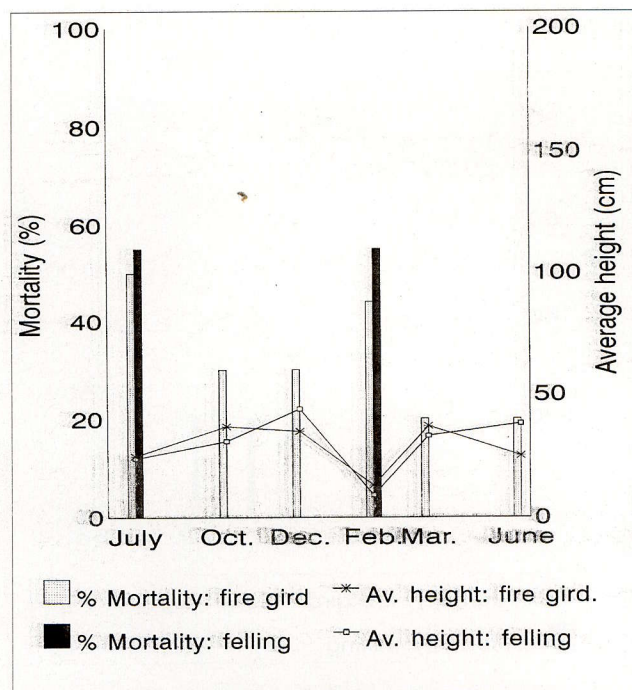


FIGURE 9: COMPARING THE REGROWTH AND MORTALITY OF *TERMINALIA PRUNIOIDES*, AFTER BEING FELLED OR FIRE-GIRDLED 5 CM ABOVE THE GROUND.

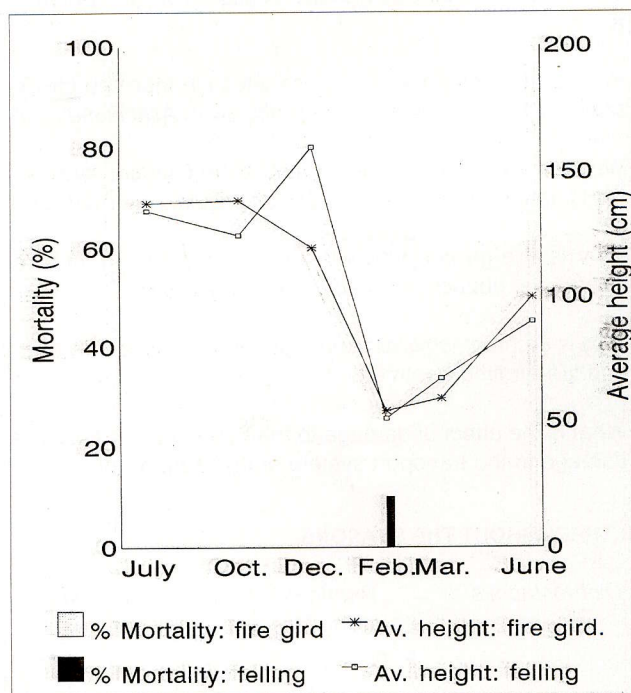


FIGURE 8: COMPARING THE REGROWTH AND MORTALITY OF *DICHROSTACHYS CINEREA*, AFTER BEING FELLED OR FIRE-GIRDLED 20 CM ABOVE THE GROUND.

***Terminalia prunioides* Lawson**

No difference could be found between the treatments executed at 5 cm height (Figure 9).

However, treatments done at 20 cm and 50 cm height above ground level, showed that fire-girdling is by far less effective than felling (Figures 10 and 11).

***Terminalia sericea* Burchell ex DC.**

Comparing the effects of fire-girdling and felling (Strohbach,

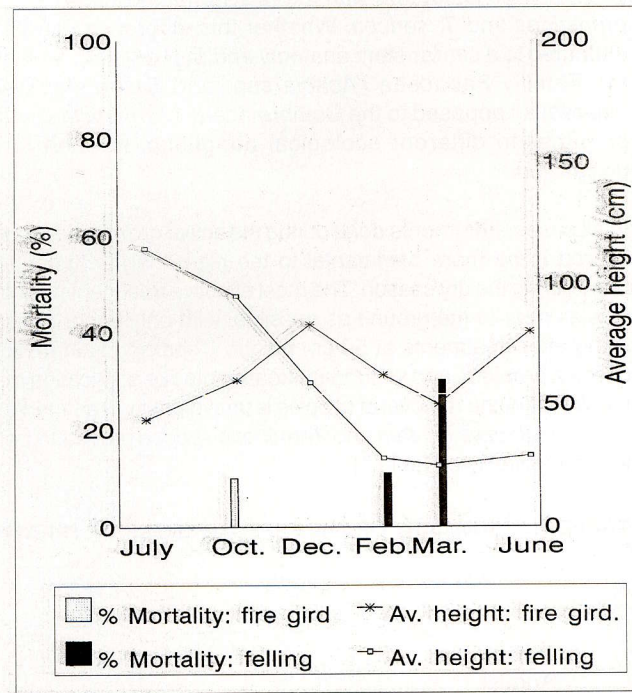


FIGURE 10: COMPARING THE REGROWTH AND MORTALITY OF *TERMINALIA PRUNIOIDES*, AFTER BEING FELLED OR FIRE-GIRDLED 20 CM ABOVE THE GROUND.

1996 a & b), suggest that no marked difference exists between the effects of these treatments (Figure 12).

DISCUSSION AND CONCLUDING REMARKS

Fire-girdling is more effective in killing, or at least retarding the growth, of *Acacia mellifera*, *A. nilotica* and *Dichrostachys*

1) The hypocotyl is the transition region between stem and root, according to Cutler (1978).

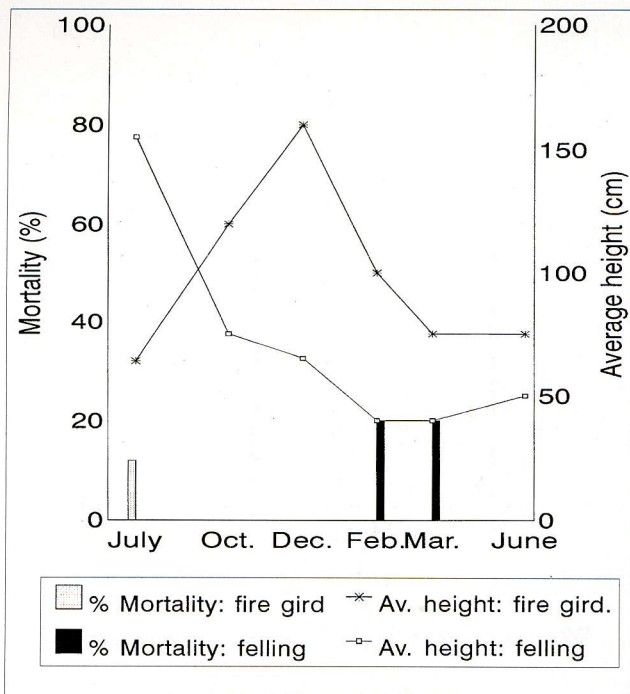


FIGURE 11: COMPARING THE REGROWTH AND MORTALITY OF *TERMINALIA PRUNIOIDES*, AFTER BEING FELLED OR FIRE-GIRDLED 50 CM ABOVE THE GROUND.

cinerea. This is not true with the two *Terminalia* species, *T. prunioides* and *T. sericea*. Whether this difference can be attributed to a similar stem anatomy and/or physiology within the Family Fabaceae (*Acacia* spp. and *Dichrostachys cinerea*) as opposed to the Combretaceae (*Terminalia* spp.) or rather to different ecological adaptations, is open for discussion.

In all cases, treatments done during the active growing season proved to be more detrimental to the plant than treatments done during the dry season. The most effective treatment height was as near to the ground as possible, with only larger trees dying after treatments at 50 cm height. Coppicing is in most cases a problem, and secondary treatments like application of herbicides or the removal of coppice is unavoidable. Treatments to *Dichrostachys cinerea* and *Terminalia sericea* proved to be virtually ineffective (Table 1).

TABLE 1: SUMMARY OF THE EFFECTIVENESS OF TREATMENTS THROUGHOUT THE SEASONS.

	<i>Acacia mellifera</i>	<i>Acacia nilotica</i>	<i>Dichrostachys cinerea</i>	<i>Terminalia prunioides</i>	<i>Terminalia sericea</i>
July/ August	G _{5,20}	G _{5,20}		F ₅ G ₅	
September/ October	F ₂₀ G _{5,20}	0			
November/ December	G ₅	F ₅ G ₅			
January/ February	F ₅ G ₅₀	F ₂₀ G _{5,50}		F ₅	
March/ April	F ₅₀ G _{20;50}	F _{20;50} G _{5,20;50}			
May/ June	G _{5,20}	F _{5,20} G ₅			

F - felling treatments resulting in more than 50 % mortality.
 G - fire-girdling treatments resulting in more than 50 % mortality.
 The subscripts indicate the heights of the effective treatments (in cm).

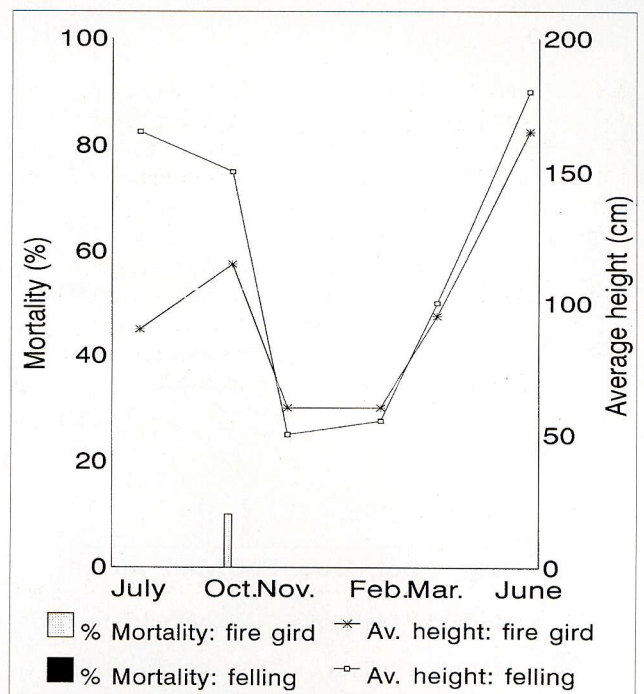


FIGURE 12: COMPARING THE REGROWTH AND MORTALITY OF *TERMINALIA SERICEA*, AFTER BEING FELLED OR FIRE- GIRDLED 5 CM ABOVE THE GROUND.

Several inconsistencies with the results did occur. To mention a few:

Why is fire-girdling at 5 cm less effective than fire-girdling done at 50 cm during the rainy season with *Acacia mellifera*?

Why are the results obtained during the October 1990 and the October 1991 treatments of *Acacia nilotica* so different?

Why is fire-girdling more effective than felling with the Fabaceae, but not with the *Terminalia* species?

Why is *Dichrostachys cinerea* in general unaffected by felling and fire-girdling treatments?

What is the effect of damage to the hypocotyl, compared to damage to the transport system of the stem or root?

These questions suggest that the trial should be repeated on an expanded basis, also comparing fire-girdling to ring-barking treatments as described by Noel (1968) and Teague & Killilea (1990). In such a trial various post-felling and post-girdling treatments can be applied and evaluated.

The physiological status of the trees is crucial in the effectiveness of the treatments in killing the plants. An in-depth study on the phenology of the various encroaching woody species is a priority. Only in this way can anomalies like the difference in effect of treatments between the various species be explained.

ACKNOWLEDGEMENTS

I would like to thank Mr U. Düvel for the use of the study site on his farm Omambonde Tal. The co-operation and assistance by the staff of Sonop Research Station with the project, especially with the recording of the climate data and with the fencing of the trial plot, is gratefully acknowledged. A special word of thanks to my colleagues - Miss Renate Kubirske for valuable ideas given during the discussions of the results, and Miss Gillian Maggs and Mr F.V. (Bessie) Bester for commenting on the manuscripts.

REFERENCES

- CUTLER, D.F., 1978. Applied plant anatomy. London: Longman. 103 pp.
- NOEL, A.R.A., 1968. The effects of girdling, with special reference to trees in south central Africa. *Kirkia* 6:181-196.
- STROHBACH, B.J., 1998a. The effect of season and treatment on the survival rate and coppicing ability of five encroaching woody species. I: The effect of felling heights. *Agricola* (in press.)
- STROHBACH, B.J., 1998b. The effect of season and treatment on the survival rate and coppicing ability of five encroaching woody species. II: The effect of fire-girdling. *Agricola* (in press.)
- TEAGUE, W.R. & KILLILEA, DIANE M., 1990. The effect of ringbarking *Brachystegia spiciformis* Benth., *Julbernardia globiflora* (Benth.) Troupin and *Terminalia sericea* Burch. ex Dc. trees at different heights with or without the addition of a picloram/2,4-D mixture. *J. Grassl. Soc. South. Afr.*, 7(3):157-165.