18-YEAR VINEYARD TRIAL WITH POLE SLEEVES

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Summary

Three hundred *Eucalyptus grandis* vineyard posts and strainers treated with creosote to Hazard Class 4 retentions were fitted with Field Liner pole sleeve prototypes of the barrier protection system (BPS) now commercially known as the Biotrans Pole Sleeve and used to construct a vineyard on the Agricultural Research Council (ARC) Infruitec-Nietvoorbij Experimental Farm at Elsenburg in 1997. The vineyard was used over the next five years to evaluate different pruning methods, overhead sprinkler irrigation and micro irrigation. Department of Agriculture staff reported that no poles or strainers with BPS leached creosote or rotted but added that creosote was observed to leach from poles without BPS which might have environmental benefits. Over the following five years the effect of the strain of mechanical harvesting was evaluated. At the 10-year stage some of the poles considered too thin to support a new trellis system were extracted and when they were examined it was again reported that none with BPS had rotted. They were replanted in other projects and at the 14-year stage a thorough examination of all 300 poles was conducted. All poles were sound and none showed any signs of rot. The poles remained sound at the 18-year stage, by which time poles without BPS were rotting, proving conclusively that the BPS was a long-term solution to pole decay.

Introduction

Farmers worldwide want their treated wooden poles to last for 30 or 40 years. For reasons of cost and strength South African wine farmers generally prefer creosoted gum (*Eucalyptus* sp.) poles as first choice for their vineyards but there have been numerous reports of failures of these poles after as little as two or three years' service, especially under flood irrigation. The pole sleeve barrier protection system (BPS) for preserved wooden poles was first tested in South Africa (Baecker, 1993a; b) and 24-month field trials proved that BPS on vineyard poles prevented creosote from leaching to soil (Behr and Baecker, 1994). Numerous researchers worldwide have replicated such work since then and the BPS was ultimately approved for use with preserved wooden poles in North America (American Wood Protection Association, 2007). The history of BPS development as a South African invention was recently reviewed by the present author (Baecker, 2010).

It is well-known that field trials in wood preservation provide results that are more meaningful than those of laboratory tests, and it is also well known that the most meaningful performance data in wood preservation is obtained from samples in service. As time has passed it has become possible to provide reports on the long term performance of BPS under actual service conditions. This report presents the results of an 18-year full scale vineyard trial of BPS as conducted by the South African Department of Agriculture.

Material and Methods

Three hundred *Eucalyptus grandis* vineyard poles and strainers were treated with creosote to Hazard Class 4 (H4) retentions and delivered to the writers' industrial premises in Richmond KwaZulu Natal (**Fig. 1a**). Pole sleeves (**Fig. 1b**) were fitted to the ground contact regions of the poles (**Fig. 1c**) and they were transported by road (**Fig. 1d**) to the ARC Infruitec-Nietvoorbij experimental farm at Elsenburg near Stellenbosch in September 1997.

The poles were then used, also with creosoted poles without BPS and not supplied by this writer, to construct a vineyard on the farm. The vineyard was used over the next five years to evaluate different pruning methods, overhead sprinkler irrigation and micro irrigation.

(a)

(b)

(c)

(d)

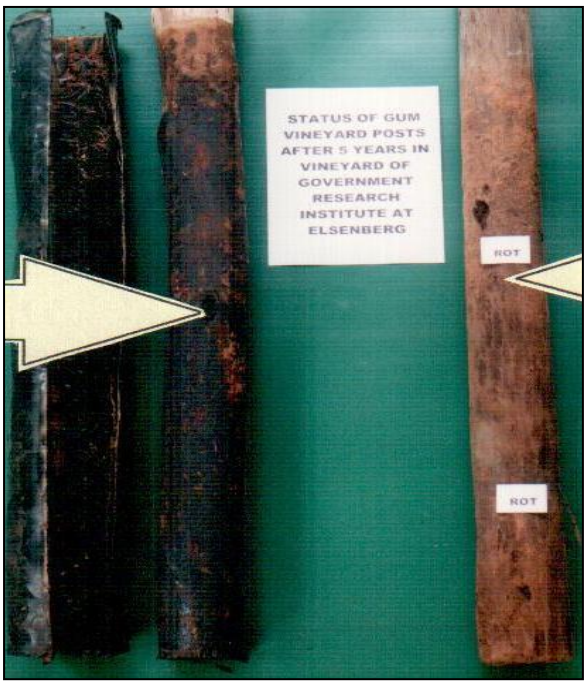
Fig. 1 Creosote-treated *E. grandis* vineyard poles and strainers delivered in KwaZulu Natal in 1997 for application of pole sleeves (**b**). Three hundred poles and strainers with BPS fitted (**c**) were then transported by road (**d**) to the Department of Agriculture's Elsenburg Experimental Farm in the Western Cape.

Results

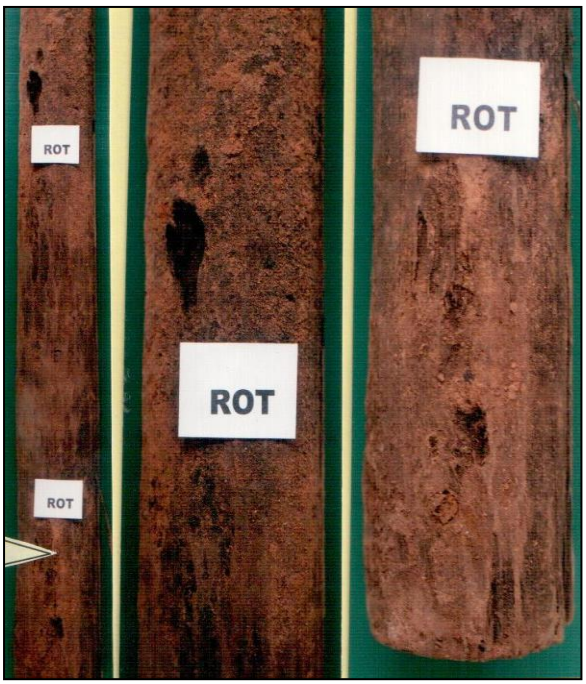
It was decided that only third party assessments should be made after the vineyard poles were despatched to Elsenburg, therefore the results presented here are in the form of appendices written by Department of Agriculture scientists at Elsenburg after the vineyard was established.

Status of poles after 5 years in service

Department of Agriculture staff member Mr. Danie van Schalkwyk reported (**App. 1**) that no poles or strainers with BPS leached creosote or rotted during the period but added that creosote was observed to leach from poles without BPS. The vineyard was visited by Mr. Paul Joubert on the writers' behalf to conduct the 5-year inspection with Mr. van Schalkwyk and collect samples of poles with and without BPS for further examination in the writer's laboratory. The poles were



(a)



(d)

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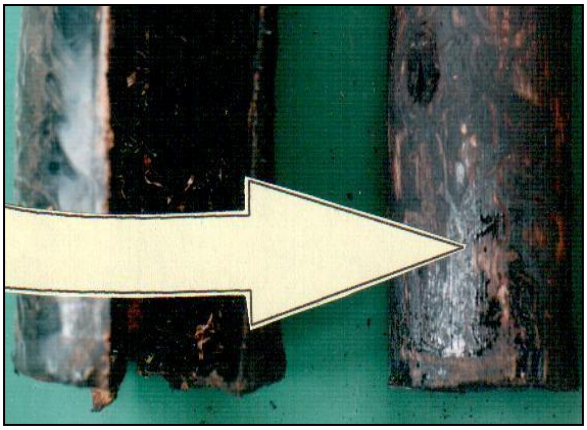

(c)

Fig. 2 *Eucalyptus grandis* poles with and without BPS after 5 years' service in Elsenburg vineyard. When the BPS was removed (**a, left**) the subsoil section of the pole (**a, arrowed, left**) was sound throughout its length (**b**) to the butt (**c, arrowed**) and appeared to have been freshly creosoted in those regions. In contrast, the pole without BPS (**a, right, arrowed; d, left arrowed**) was decayed throughout its length (**d, centre and right**). When the poles were sectioned it was seen that less creosote was visible inside the pole without BPS (**e, right**) than in the pole which had been in service with BPS (**e, left**).

photographed as shown in **Figure 2** and the most striking observation was the apparently freshly-treated appearance of the subsoil sections of poles when their surfaces were exposed (**Figs. 2a, b**

and **c**) after removal of the BPS. The creosote observed also seemed fresh to the senses of touch and smell, while in total contrast to these observations poles without BPS showed signs of creosote loss and incipient decay in their subsoil sections where pockets of rot were visible (**Figs. 2a** and **d**).

Status of poles during the 5 -10 year service period

Over the following five years the effect of the strain of mechanical harvesting was evaluated. At the 8-year stage the vineyard was visited by Mr. Bertus Bressler on the writers' behalf to conduct an inspection with Mr. van Schalkwyk and collect further samples. No poles or strainers with BPS had rotted. A pole with its BPS cut open at this time is shown in **Figure 3** and it was clear that the wood was in sound condition. At the 10-year stage some of the poles considered too thin to support a

(a)

(b)

(c)

Fig. 3 *Eucalyptus grandis* pole with BPS opened (**a, b**) after 8 years' service in Elsenburg vineyard. The BPS had clearly protected the subsoil surface of the pole and when it was sectioned (**c**) it was confirmed that the pole was sound throughout its thickness.

new trellis system were extracted and when they were examined it was again reported that none with BPS had rotted.

Status of poles at the 14-year service period

All 300 poles with BPS were thoroughly inspected by Elsenburg in June 2011 (**App. 3**) and confirmed to be sound and free from rot or any form of degradation.

Status of poles at the 18-year service period

The poles were again inspected in October 2015 by S. Hendrikse, the Manager of Viticulture and Oenology (**App. 4**) and again confirmed all poles fitted with BPS to be sound and free from rot, although, significantly, it was also recorded that other preserved poles installed in the vineyard "much later" after the onset of this in-service trial had already started to rot.

Discussion and Conclusions

Many workers have now confirmed that BPS protect and extend the service lives of preserved wooden poles in soil. Researchers in Australia (Howgrave-Graham, Cookson and Hale, 2008) tested pole sleeves as BPS with water-soluble alkaline copper quaternary (ACQ) preservative under controlled conditions in accelerated field simulation trials and within three years they made significant findings. The ACQ was applied to *E. globulus* and *E. cladocalyx* merely at Hazard Class 1 retentions and it was established (Howgrave-Graham, Cookson and Percy, 2009) that BPS extended the lives of untreated posts 3.6 fold. In contrast, all the treated posts with BPS remained sound throughout the tests therefore it was "not possible to estimate how much a BPS would extend the life of even a lightly treated post or pole." The workers concluded however that if the extension was the same as for untreated posts, "an H5 pole expected to last 35 years without BPS may last 126 years with BPS at a cost of A$17 less than the cheapest alternative to timber."

On the basis of the 18-year vineyard performance reported in service here it was therefore concluded that the BPS constitutes a long term means to use preserved wooden poles in clean technology under H4 service conditions as a safe and environmentally preferable choice that guarantees pole service life of at least the 40 years that farmers desire.

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APPENDIX 1

ARC • LNR

Enquiries/ Navrae
Danie van Schalkwyk

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8/2/6/1

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Dr Albin AW Baecker

PROGRESS REPORT JULY 2002

Evalaution of field liners on gum posts in the experimental vineyard plot at Elsenburg, Stellenbosch.

Professor Archer refered your enquiry to me. It is correct that we received 300 gum posts with Field Liners through Dr Graham Shelver during 1997. These posts have been installed in a field experiment at Elsenburg, a experimental farm, of the Provincial Department of Agriculture of the Western Cape. The posts are in and field trial where the influence of different pruning methods are evaluated. The quality (condition) of the posts we received were of a much poorer standard than the normal creosoted pine posts we normally use. Not all the bark was removed and the posts outerlayers were very rough. Although we were very sceptical of the quality of the posts, they are still surviving. During the last 5 years the vineyard only received 3 supplementary overhead sprinkler irrigations during the year. Until now no rot is visible on any of the posts. At the end of last year permanent micro irrigation has been installed and the vineyard will now receive more intensive irrigation. During this coming harvesting season some of the vines will be mechanical harvested and we will be able to evaluate the effect of the strain mechanical harvesting puts on the posts.

On 13 June 2002 Paul Joubert visited the experimental site with me. He took some photos of the posts fitted with Field Liners. As far as the above ground observations are concerned there is no visible evidence of rot on the posts fitted with Field Liners. Although the posts seem to have lost most of the creosote coverage there is no creosote leaching visible on the soil surface around the posts. However, in the case of the creosote treated pine posts no Field Liners were fitted and some leaching on the soil surface around the post is noticeable. At this stage we do not want to dig up some of the Field Liner to see if there is any leaching of creosote at the base of the posts. It will cause too much damage to the adjacent vines and we cannot afford this in the current vineyard experiment.

At this stage it is evident that the Field Liners are serving their purpose to prevent the rotting of the part of the posts that are in the soil and might prove to be environmental friendly.

Kindest regards

Danie van Schalkwyk

ARC Infruitec-Nietvoorbij

APPENDIX 2

ARC • LNR

Enquiries / Navrae
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2 August 2007

Dr Albin AW Baecker

PROGRESS REPORT JULY 2007

Evaluation of field liners on gum posts in the experimental vineyard plot at Elsenburg, Stellenbosch.

The project at Elsenburg was terminated during 2006 as we have completed our research on the farm. However I visited Elsenburg today to determine whether the block still exists. The vineyard has not been pulled out and most of the posts are still intact. As they are currently busy changing the existing trellis system they removed all the post that are to thin and not suitable for the new system, disregard whether these post were fitted with field liners or not. None of the posts that have been removed showed signs of rotting off, whether it were field liner fitted gum posts or pine posts treated with creosote. The posts were only removed because they were not sturdy enough to accommodate the weight of the vine canopy during the growth season. They kept these posts for any investigation should one of your personnel like to have a look at them. I have spoken to the farm manager and he informed me that up till now none of the posts with Field Liners fitted have rotted. They will keep the posts in the soil until the vineyard is replaced and this should not happen in the next 10 years. The manger informed me that your company can come investigate the condition of the posts at any time and should you like to uplift one of the posts they will replace it.

Kindest regards

Danie van Schalkwyk
ARC Infruitec-Nietvoorbij

APPENDIX 3

DEPARTMENT of AGRICULTURE
Provincial Government of the Western Cape

HIGHER EDUCATION AND TRAINING

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ENQUIRIES: A. Bosman

15 June 2011

Dr Albin W. Baecker

PROGRESS REPORT, JUNE 2011

Evaluation of field liners on gum posts in the experimental vineyard plot at Elsenburg, Stellenbosch

On the 13th of June 2011, a thorough counting of the remaining poles in the experimental plot was carried out. All of the 300 sleeved poles originally used, are still intact, and none of them showed any signs of rotting or degradation.

Kind regards

Anneli Bosman
Lecturer : Viticulture
DATE: 15 June 2011

An Afrikaans or Xhosa version of this document is available on request.

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APPENDIX 4

Western Cape Government
Agriculture

Shawn Hendrikse
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The Managing Director
Biotrans Pole Sleeves (Pty) Ltd

Dear Dr Boecker

PROGRESS REPORT: ELSENBURG EXPERIMENTAL VINEYARD

The poles planted with the Biotrans Pole Sleeves were inspected on 15 October 2015. On initial observation, the poles looks weathered and showing signs of ageing, but upon closer inspection it is still solidly planted in the soil and shows no signs of rot above ground. It is not obvious that these poles have been there for 18 years, as other poles planted much later already have indications of rot.

Sincerely yours,

S HENDRIKSE
FACULTY MANAGER: VITICULTURE AND OENOLOGY

DATE: 16.10.2015