

Spotlight on Agriculture

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THE INVOLVEMENT OF PLANT PATHOGENIC FUNGI IN THE NATURAL DIEBACK OF BLACKTHORN IN NAMIBIA: PART 1

INTRODUCTION



Blackthorn encroachment in the Omaheke Region

Bush encroachment is one of the major stumbling blocks to red-meat production in Namibia. This is mainly because grass production in natural pastures declines, and grazing capacity decreases along with it. Since the cost of bush control is extremely high, a natural cause of bush mortality would be welcomed.

The encroachment of *Acacia mellifera* can be regarded as the principal bush species causing a decline in grass production in Namibia, as it is found widely across all the country north of 23° latitude. *Acacia mellifera* (Vahl) Benth. subsp. *detinens* (Burch.) Brenan, known locally as Blackthorn, is a dense, more or less obconical, deciduous many-stemmed shrub or small

tree. Reaching an average 3–5 m in height, it has a short, compact trunk branching prolifically at or above soil level. In drier parts it is encountered as a shrub around 1.5 to 2.5 m high. This hardy, drought- and heat-tolerant plant, which grows well in warm, semi-arid areas with moderate to high maximum and minimum temperatures, is found in Tanzania and other parts of southern Africa.

During the mid-1970s, Blackthorns were observed to be dying back on the Otjikuoko Farm in the Okahandja District. However, little attention was given to the disease until 1983, when an Extension Officer at Okahandja at the time, a Mr ML Fourie, was consulted about it. In 1985, after various agriculture officials had visited the farm to study the phenomenon, an investigation into the causes of the dieback was launched by Professor G Holz. This paper reviews the initial stage of that research, and will be followed by a series of flyers reviewing the research results. The outcome of the last phase of the research project, which was completed during May 2005, will be published after statistical analyses have been done on the data.

BACKGROUND

A team of experts from South Africa visited Namibia at the request of the former government's Department of Agriculture during March 1983 to investigate the phenomenon of Blackthorn dieback. The team consisted of two rangeland experts, Prof. DJP Opperman from Bloemfontein's University of the Orange Free State and Mr JP van Niekerk of the Glen Agricultural College outside Bloemfontein, as well as a plant pathologist, Prof. W Pauer, also from the latter University. They visited various sites in Namibia to collect climatic data and woody samples from above and below ground level. The plant material was analysed to determine if any plant pathogenic fungi could be causing the dieback of Blackthorn bush. In their report, the researchers found that no plant pathogenic fungi were present, and that dissected roots showed no discoloration due to microbiological infection. They concluded that the dieback could be ascribed to rainfall, low temperatures, soil type, and topographical differences. Rangeland management practices could not be included as a cause of dieback

owing to a lack of data on such practices. The report recommended that all biotic and abiotic aspects that might be related to Blackthorn dieback be monitored and quantified. This information could, in the experts' opinion, assist in clarifying whether bushes recovered with good rainfall (UOFS 1983).

Based on the report's recommendations, aspects such as climate (drought, water logging, and fluctuation of wet and dry years), geological formation, soil type, topography and insects were investigated in respect of their potential role in the dieback of Blackthorn bushes. These investigations brought to light that a micro-organism was more likely to be causing dieback than any of the other aspects considered in the 1983 report (Van Wyk 1985). Consequently, the issue of Blackthorn dieback was recommended to be investigated further. During February 1985, therefore, a delegation from the Department of Agriculture visited Prof. A Vermaas and other experts at the University of Stellenbosch's Department of Wood



Large Blackthorn trees dying back



Dieback area expanding



Smaller bush dying back



Dead bush fallen over

Technology the University of Stellenbosch. During their deliberations it was agreed that a team of experts from the University should visit Namibia in March that year to investigate the Blackthorn dieback issue. The team comprised Prof. Holz, a plant pathologist; Dr J Smit, a botanist; Dr H Joubert, a pasture researcher; and Mr L Lambrechts, a soil scientist.

After the experts' visit, the parties agreed to launch a project in collaboration with the University of Stellenbosch to investigate the issue of Blackthorn dieback in Namibia. During September 1985, Prof. Holz was approved as the consultant appointed to investigate the issue. In a memorandum of agreement approved in October 1985, it was agreed that funding for the project's running costs and equipment would be backdated to April 1985, and carried through to November 1986.

The first project proposal to be approved was submitted in August 1985; a second followed seven years later, in August 1992. Reports were compiled after each facet of the project was completed. Additional visits were also made by the research team during February 1987 in order to establish if the phenomenon of natural dieback in Blackthorn also occurred in South Africa. Targeted during these visits were the Orange Free State, the north-western Cape Province and the northern Transvaal. In 1989, a questionnaire was sent to Namibian farmers. The purpose of this exercise was to estimate the extent of Blackthorn dieback in the country. Farmers were also requested to collect Blackthorn seedlings and send them to Stellenbosch for analysis.

Seven research reports were submitted during the period June 1985 to November 1988. Six contributions relating to the research were published in the *Agricola* (7) of 1989. During 1988 and 1997, two M Sc theses were completed on the topic as well.

In the course of the investigation, Prof. Holz established that fungi were involved in the dieback of Blackthorn bushes and that phytotoxin were causal. Between 1991 and 1992, the Council for Scientific and Industrial Research (CSIR) in Pretoria collaborated with Prof. Holz in phytotoxin studies associated with Blackthorn dieback. Spurring on this research was the belief that if the active phytotoxin could be extracted, isolated and identified, it could be effectively incorporated into a formulation for the biological control of Blackthorn. As a next phase of research it was proposed, therefore, that the CSIR's Food Science and Technology Division collaborate with the Meat Board of Namibia to conduct the necessary research to develop such a product.

Constraining progress of the resultant five-phase project was the bio-evaluation phase, because it was not possible to produce sufficient crude phytotoxin extracts for future bio-evaluation. It was then suggested that a shortcut process

be followed, and that the toxin be synthesised in order to speed up the bio-evaluation process.

However, according to Prof. Holz, this shortcut process had the potential to induce unfavourable results. These fungi are able to produce maximum levels of toxin under a certain set of as yet undetermined conditions. If this synthesised product were tested in vivo, the results might be disappointing since not all the conditions within the set had been identified. The collaborative CSIR project was terminated, therefore.

References

- UOFS/University of the Orange Free State. 1983. *Report on natural dieback of Blackthorn in Namibia*. Bloemfontein: University of the Orange Free State.
- Van Wyk, JAP. 1985. "Natuurlike bosvrektes en die moontlike oorsake daarvan". *Agricola*, 2:May.

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Single Blackthorn tree dying back