THE INVOLVEMENT OF PLANT PATHOGENIC FUNGI IN THE NATURAL DIEBACK OF BLACKTHORN IN NAMIBIA: PART 3

INTRODUCTION

In the previous paper (Part 2 in this series, Spotlight on Agriculture No. 82), it was concluded from the observed symptoms that one or more micro-organisms could be causal in the dieback of Blackthorn bushes. From the material collected in the field, four fungi – namely Phoma glomerata, P. cava, P. eupyrena and Cytospora chrysosperma – were constantly isolated. However, no definite conclusion was reached regarding the involvement of plant pathogenic fungi in the dieback of Blackthorn due to inadequacies in the sampling method. It was recommended, therefore, that a follow-up project be conducted, using a more systematic sampling method. This implied sampling in areas with different dieback intensities, and sampling sections of a whole plant (Holz & Schreuder 1989; Schreuder 1989).

This paper describes the observations that were made during the recommended follow-up project in respect of the symptomatology of dieback, disease development, the relation between the decline and infection at the trunk base, and the isolation and identification of organisms from affected tissues. The latter study was carried out on material collected at different localities in Namibia between 1985 and 1988, as well as on material collected in South Africa’s north-western Cape Province and the Transvaal during February 1987.

METHODOLOGY

From the previous observations (see Part 2 in this series) the criteria for determining the state of health of Blackthorn bushes were (a) twig and branch dieback, (b) leaf cover, and (c) chlorosis (yellowing) of the leaves.

In order to describe the health status of individual bushes and estimate disease development and dieback severity (decline), 96 bushes in various stages of disease development were selected and rated for dieback and decline, after which they were dug out and removed. Twig and branch dieback was assessed on a 10-point scale: 0 represented no dead twigs or branches and no evidence of leaf chlorosis or defoliation, while 10 represented 91–100% of twigs and branches dead and defoliated.

After the bush had been dug out and removed, it was split open at the base of the trunk and upper taproot. Base infection was then also assessed on a 10-point scale, where 0 represented no discoloration or decay evident in these parts, and 10 represented virtually all of the sapwood and heartwood discoloured and decayed. The data were analysed statistically to estimate the correlation between above-ground symptoms and basal rot.

RESULTS

Disease symptoms, disease development, and the relationship between the decline and infection at the trunk base

The first symptom of disease, which is usually more prevalent at the end of the growing season (March–April), is a yellowing of leaves on individual twigs or branches. The observed symptoms mentioned above, namely dieback, decline, and everything associated with those two phenomena, are similar to those of some well-known stress-initiated diseases. However, in other stress-initiated diseases, unlike the case of Blackthorn dieback, internal decay in sapwood and heartwood are not observed.
The most conspicuous symptoms of disease are an internal greenish-yellow to blackish-green discoloration, and the decay of wood at the base of the trunk and the upper taproot. However, in most many-stemmed bushes – especially when they are young – a discoloration that may extend from the stem downward for several centimetres into the upper taproot can usually be traced back to a dead stump or branch at or near soil level. Initially, only the sapwood in the vicinity of a dead stump or a canker becomes discoloured. As the discoloration gradually expands, it eventually reaches the heartwood. The distinct reddish-brown heartwood assumes a blackish-green colour that extends tangentially up or down in the trunk base or taproot. The heartwood and parts of the sapwood start to decay and, in some plants, a hollow-base condition develops – with only a small portion of the xylem being functional. According to the wood technology experts at the University of Stellenbosch who were involved in the study, in all cases the discoloration is an abnormal phenomenon and differs in colour from normal heartwood. Heartwood is not usually attacked live wood and are only found in sick (dead) parts of plants. These insects are, therefore, not causal in any dieback.

Since dieback in Blackthorn follows after the decay of heartwood and extensive parts of sapwood at the base of the trunk and upper taproot, it is postulated that the progressive decay causes a gradual cut-off of water and nutrient supply to the crown, followed by the dieback and decline of twigs and branches, and then the entire bush or tree. No recovery of diseased bushes in dead patches has been observed.

Blackthorn bushes that were growing vigorously and showing no symptoms of dying back also usually had no discoloration, decay or dead stumps at the base of their trunks. The heartwood was a healthy and distinct reddish-brown colour, or, when no heartwood had formed, the sapwood was not affected by disease. It was also found that bushes and trees that showed none of the described symptoms of disease above-ground also showed no signs of discoloration or decay at the base of their trunks and in their upper taproots.

**Organisms isolated**

Twenty-four pathogenic fungi and a number of saprophytes – i.e. organisms that do not cause disease – were isolated from the affected tissues of the plant material collected. The same range of plant pathogens (fungi) were isolated from this plant material as those isolated and disease were isolated from the affected tissues of the plant material collected. The same fungi were identified from the plant material collected during the initial field trip. It was concluded, therefore, that all possible plant pathogens that could play a role had been identified.

**DISCUSSION**

The fact that the same four pathogenic organisms initially isolated were once again consistently isolated from affected parts of all plant material collected during this study suggested that these four fungi played a casual role in the dieback of Blackthorn.

The association of these four different fungi with affected parts indicates that the disease could be stress-initiated. In Namibia, rainfall is characterised by great spatial and temporal variability, and drought and heat stress are common. Blackthorn is considered as a drought-tolerant plant that has adapted to the climatic conditions of the territory. Therefore, the primary initiating stress factor(s) and the pressure they exert on Blackthorn remain obscure.

**References**


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