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Alternaria anigozanthi sp.nov., the cause of big blotch disease of *Anigozanthos* spp. (Kangaroo Paws) in Australia

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Abstract

Alternaria anigozanthi sp.nov is described and shown to be the cause of big blotch of Kangaroo Paws.

Introduction

The genus *Anigozanthos* Labill. is a member of the Haemodoraceae and comprises 11 species endemic to the south-west of Western Australia (Hopper 1987). Known as Kangaroo Paws, both species and hybrids are used for cut flower production for domestic and export markets and have also become popular as ornamental garden plants.

Several foliar diseases are serious enough to limit their value as cut flowers (Turner 1986). Leaf rust caused by *Puccinia haemodori* P. Henn., previously regarded as a minor problem, has caused major losses in both *Anigozanthos* hybrids and *Macropidia fuliginosa* (Hook.) Druce in Western Australia (Verhoogt and Sivasithamparam 1985). Contrary to Tan (1994), *P. haemodori* has been present in eastern Australia since at least 1984 (Liddell and Lawson 1986). Ink spot or ink disease was attributed to *Drechslera iridis* (Oud.) M.B. Ellis (MacNish 1963 as *Mystrosporium adustum* Massee). This record is now regarded as doubtful (Shivas 1989).

Sivasithamparam and Watkins (1982) showed that ink spot could be caused by *Alternaria alternata* (Fr.) Kiessler, at least on *A. manglesii* D.Don. *A. alternata* has also been recorded in New South Wales associated with ink spot on *A. manglesii* (DAR 52674). Oliver (1992) reported great variability in susceptibility to *A. alternata*, with *A. manglesii* and *A. gabrielae* Domin. being most susceptible, *A.viridis* Endl., *A.pulcherrimus* Hook. and *A.rufus* Labill. less susceptible and *A.flavidus* DC. being highly resistant. *A. flavidus* is regarded as highly resistant to both rust and ink spot disease and is used quite widely as a pollen parent in hybridisation of species to produce ornamentally useful cultivars (Hopper 1987).

With the development and subsequent commercial use of many hybrids of *A. flavidus*, a serious foliar disease appeared which caused extensive leaf blotching and even death in cultivars such as Dwarf Delight (*A. flavidus* x *A. onycis* A.S. George). Turner (1986) noted the susceptibility to this disease of hybrids with *A. flavidus* as one parent and commented on its widespread distribution throughout the eastern states of Australia.

Initial symptoms were similar to those seen in ink spot; however, the development of large blotches was a distinguishing feature of the disease. The two symptoms have often been considered to be expressions of the same disease and Oliver (1992) regarded big blotch as a form of ink spot. The term 'big blotch' was first used by Turner (1986) and the causal agent noted as an undescribed species of *Alternaria*. In their study of ink spot disease in Western Australia, Verhoogt and Sivasithamparam (1986) produced black lesions on *A. manglesii* using a previously undescribed *Alternaria* species.

Big blotch disease was first observed in New South Wales in 1984 (DAR 49755) on the cultivar Dwarf Delight and has since been seen on the cultivars Regal Claw (*A. flavidus* x *A. preisii* Endl.) and Bush Emerald (*A. manglesii* x *A. viridis*) as well as the polyploid *A. flavidus* x (*A. manglesii* x *A. viridis*).

A species of *Alternaria* has been consistently

observed on and isolated from the affected leaf blotches and is regarded as sufficiently different from other species of *Alternaria* to be described below as a new species.

Alternaria anigozanthi Priest sp. nov. Figures 1 and 2.

Maculae nigrae, hyphae septatae, pallide brunneae, laeves. Conidiophora brunnea, solitaria vel caespitosa, simplicia, erecta, septata, laevia, geniculata. Conidia pallide brunnea, plerumque solitaria, cylindrica vel obclavata, transverse 5–10 septata, ad septa constricta, 3–6 septis verticalibus vel obliquis, laevibus vel verruculosis, (24–) 50–65 (–100) x (10–) 12–17 (–24) µm.

In foliis vivis *Anigozanthos flavidus x A.onycis* cv. Dwarf Delight, Biological and Chemical Research Institute, Rydalmere, New South Wales, Australia, 18 Sep. 1986, A.L Bertus, DAR 56243 holotypus.

On leaves Spots circular at first, becoming elongated up to 2 cm long and 0.5 cm wide, initially black but turning grey with a dark margin and sunken central spot. Surrounding tissues become blackened. Mycelium ramifying throughout the leaf tissue, pale brown, septate and smooth walled. Conidiophores arising singly or in small groups through stomata, erect, flexuous or straight, smooth walled, septate, brown, the upper conidium-bearing portion geniculate with several flattened scars, mostly 30–50 x 5–7 µm. Conidia cylindrical to obclavate with little or no apical extension, the apical cell being smoothly rounded or conical but never extended into a filiform beak, smooth walled, pale brown with up to ten transverse septa and up to six oblique or vertical septa, constricted at the septa, measuring mostly (24–) 50–65 (–100) x (10–)12–17(–24) µm, with visible basal scar. Only single conidia observed on host.

In culture Cultures on potato-carrot agar (PCA) and oat agar produce sparse aerial growth, white to grey with no discoloration of the agar. Conidia usually single but some short chains of (two to three) conidia were observed on PCA. On potato-dextrose agar (PDA) aerial mycelium is much more developed and the reverse of the culture becomes black. On carnation-leaf agar (CLA) conidia become much broader (17-24 µm) and some verruculose ornamentation which is restricted to cells or parts of cells is observed (Figure 2). Sporulation was sparse on all media except PCA.

Pathogenicity testing Five cultures were used to test for pathogenicity on three cultivars of Kangaroo Paw. The cultivars tested were Regal Claw, Bush Dawn (*A. pulcherrimus* x *A. flavidus*) and Dwarf Delight. The cultures used were DAR 49755, 52672, 52673 and 56243 (ex Dwarf Delight) and DAR 56244 (ex Regal Claw). Tests were conducted *in vitro* in a manner similar to that described by Verhoogt and Sivasithamparam (1986) using leaf pieces 5–6 cm long, surface sterilised in absolute alcohol for 30–60 sec and placed on tap-water agar in Petri dishes.

Five leaf pieces per cultivar were tested against all five isolates and a control. Conidia and/or mycelial fragments from week-old cultures on PCA were inoculated onto the leaf pieces by placing them on the leaf surface with a sterile scalpel. The controls were inoculated with water and/or plain agar blocks. The Petri dishes were sealed and placed in a black-light box on a 12 h light/dark cycle at approximately 22°C. After 2 weeks symptoms were observed and re-isolations were made from the resulting lesions.

All five isolates produced lesions up to 2 cm long and blackening of the leaf tissues on cultivars Bush Dawn and Dwarf Delight. Isolates DAR 49755 and 52672 produced lesions only, with no blackening of surrounding tissues, on the cultivar Regal Claw. *A. anigozanthi* was readily re-isolated from the leaf lesions.

A. anigozanthi is one of the species of *Alternaria* which reluctantly forms secondary conidia; the conidium has no true beak with the apical cell being only ever slightly extended or indistinguishable from the spore body but never becoming filiform. Other phytopathogenic species of this group are *A. helianthi* (Hansf.) Tubaki and Nishihara on *Helianthus* (Tubaki and Nishihara 1969; Simmons 1981; 1986), *A. leucanthemi* Nelen (Simmons 1986; Simmons 1965 as *A. chrysanthemi* Simmons and Crosier) and *A. obclavoidea* Simmons (Simmons 1993) on *Passiflora*. *A. anigozanthi* differs from *A. helianthi* and *A. leucanthemi* in its essentially obclavate shape and apical extension which is lacking in the latter two species. It can be distin-

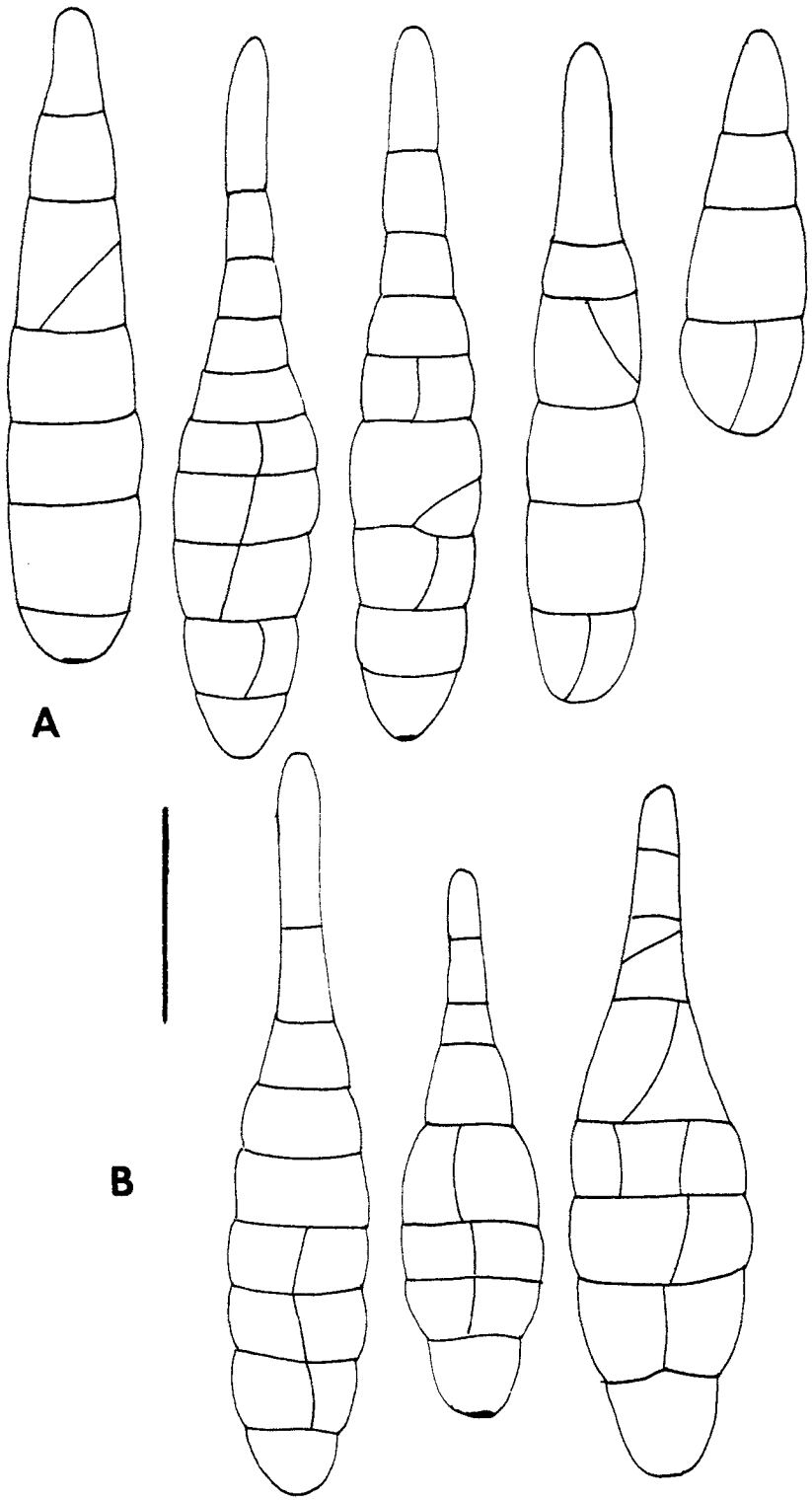

Figure 1 Conidia of *Alternaria anigozanthi* from holotype DAR 56243; (a) conidia ex plant (b) conidia ex PCA Bar = 20 μm.

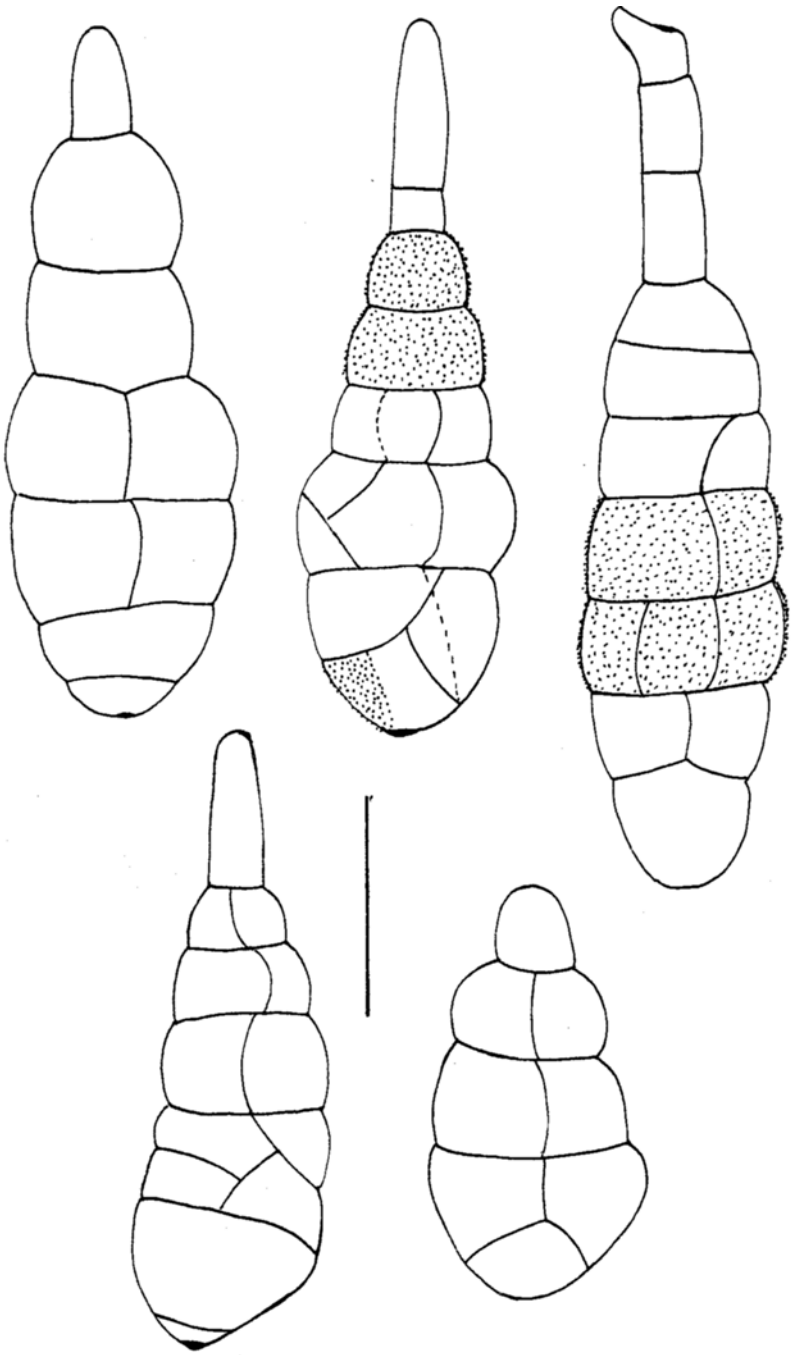

Figure 2 Conidia of *Alternaria anigozanthi* DAR 50222 from CLA. Bar = 20 µm.

guished from *A. obclavoidea* by being much larger in size, *A. obclavoidea* being 45–55 x 8–12 µm. *A. anigozanthi* is a distinctive species occurring as a pathogen on plants in the Haemodoraceae, an endemic plant family. No other species of *Alternaria* has been described from this family.

Specimens examined: on leaves of *Anigozanthos* cultivars; Manly, New South Wales, 30 May 1984 DAR 49755; Gosford, New South Wales, 13 Sep. 1984, A. Stewart DAR 50222 and 50223; Monbulk, Victoria, J. Maughan DAR 52328 (ex VPRI 12001);Balmain, New South Wales, 9 Dec. 1985, A. Stewart DAR 52672; Gosford, New South Wales, 26 June 1985, A. Stewart DAR 52673; Bellbrook, New South Wales, 26 Aug. 1985, G.R. Woodward DAR 54905; Cherrybrook, New South Wales, 9 May 1986 DAR 56230 and DAR 56250; Biological and Chemical Research Institute, Rydalmere, New South Wales, 18 Sep. 1986, A.L Bertus DAR 56243 (holotype) and DAR 56244.

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