CHAPTER 2

DISCOVERY OF *CRYPHONECTRIA CUBENSIS* ON NATIVE *SYZYGIUM* SPECIES IN SOUTH AFRICA

ABSTRACT

Cryphonectria cubensis is a destructive pathogen on *Eucalyptus* species in South and Central America, South and Central Africa and South-east Asia. It also causes cankers on *Syzygium aromaticum* (clove) in South America, Central Africa and South-east Asia and on *Tibouchina* spp. (glory flower) in South America and South Africa. It has previously been suggested that *C. cubensis* was introduced into South Africa, possibly from South America. During disease surveys in indigenous forests of South Africa, fruiting structures resembling those of *C. cubensis* were found on native *S. cordatum* (water berry) and *S. guineense* (water pear). The fungus from these *Syzygium* spp. was identified based on morphological characteristics and β-tubulin gene sequences. Fruiting structures were identical to those of *C. cubensis* from *Eucalyptus* spp. in South Africa. Analysis of β-tubulin gene sequences of *C. cubensis* isolates confirmed this identification. Pathogenicity trials showed that the fungus is more virulent on exotic *Eucalyptus* spp. than on native *S. cordatum*. Results of this study strongly suggest that the fungus known as *C. cubensis* in South Africa is a native pathogen. This adds convincing evidence to the view that *C. cubensis* in South Africa is a species different to that occurring elsewhere in the world.

INTRODUCTION

Cryphonectria cubensis (Bruner) Hodges is one of the most threatening canker pathogens to *Eucalyptus* plantations in tropical and sub-tropical regions, globally (Boerboom & Maas 1970, Hodges, Geary & Gordell 1979, Sharma, Mohanan & Florance 1985a,b, Wingfield, Swart & Abear 1989). The disease, commonly known as Cryphonectria canker, favours relatively high temperatures, rainfall and humidity (Hodges *et al.* 1979, Sharma *et al.* 1985a,b). Currently, losses due to Cryphonectria canker are minimised by means of breeding and propagation of disease tolerant *Eucalyptus* clones and hybrids (Alfenas, Hodges & Jeng 1984, Conradie, Swart & Wingfield 1992).

Cryphonectria cubensis has been reported on three host genera in two families, residing in the order Myrtales. The fungus was first reported on *Eucalyptus* in Cuba (Bruner 1917). This was followed by reports on a wide range of *Eucalyptus* spp. world-wide, including those from Australia (Davison & Coates 1991), Asia (Sharma *et al.* 1985b, Florence, Sharma & Mohanan 1986), South and Central America (Hodges *et al.* 1979, Hodges *et al.* 1986) and Africa (Gibson 1980, Wingfield *et al.* 1989). *Cryphonectria cubensis* has also been reported as an opportunistic pathogen causing die-back of *Syzygium aromaticum* (L.) Merr. & Perry (clove) in Brazil and Indonesia (Hodges *et al.* 1986).

Until recently, *C. cubensis* was known to occur only on genera in the Myrtaceae. However, in 2001 the fungus was reported on native *Tibouchina urvilleana* (DC.) Logn. and *T. lepidota* Baill. from Colombia, where it causes girdling cankers and die-back of stems and branches of these ornamental trees residing in the Melastomataceae (Wingfield *et al.* 2001). Both these families, however, reside in the Myrtales and have been shown, based on molecular phylogenies, to be closely related (Conti *et al.* 1997). More recently, Cryphonectria canker has also been found on *T. granulosa* Cogn. in northern KwaZulu/Natal, South Africa (Myburg *et al.* 2002a). The discovery of *C. cubensis* on native Melastomataceae in South America has led Wingfield *et al.* (2001) to question the hypothesis that the fungus originated on cloves in Indonesia (Hodges *et al.* 1986). Based on sequence data for the ITS region of the ribosmal DNA operon, Myburg, Wingfield & Wingfield (1999) showed that isolates of *C. cubensis* from South-

east Asia and South America reside in discrete clades, with South African isolates grouping with those from South America. Biological differences between *C. cubensis* isolates from South Africa and the rest of the world (Myburg *et al.* 2002b) prompted subsequent studies using multiple gene trees including the ITS and β–tubulin genes. These studies showed that the South African fungus is distinct from the fungus with the same name occurring in the rest of the world. They also suggested that it probably represents a distinct species, possibly native to South Africa (Myburg *et al.* 2002b).

The aims of this study were to investigate the possible occurrence of *C. cubensis* on native Myrtaceae in South Africa and to compare isolates from native hosts with those from *Eucalyptus* and *Tibouchina* spp. in other parts of the world. This was done based on morphological characteristics, comparison of β–tubulin gene sequences and pathogenicity studies.

MATERIALS AND METHODS

Disease symptoms and collection of samples

Syzygium cordatum Hachst. and *S. guineense* (CD.) Willd. trees showing signs of die-back and the formation of cracks and cankers, were identified in many parts of the KwaZulu-Natal, Tzaneen (Northern province), Hazyview and Sabie (Mpumalanga province) areas of South Africa. Plant material bearing fruiting bodies resembling those of *C. cubensis,* was collected for further analysis. Material was incubated in moist chambers for one day to induce the production of spores. Single conidial and ascopore isolations were made on 2% Malt Extract Agar (MEA) (20g Biolab Malt Extract, 15g Biolab Agar, 1 litre water) and incubated at 25°C. Isolates are maintained in the culture collection (CMW) of the Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, South Africa.

Morphological comparisons

Bark specimens with fruiting structures collected from cankers on *Syzygium* spp. were compared with *C. cubensis* specimens from *Eucalyptus* spp., used in previous studies

(Wingfield *et al.* 1989, Myburg *et al.* 2002a,b) (Table 1). For these comparisons, fruiting structures were embedded in Leica embedding medium and sectioned using a Leica CM1100 cryostat (Setpoint Technologies, Johannesburg, South Africa). Specimens were sectioned at –20 °C to a thickness of 12µm. The sectioned structures were subsequently studied using standard light microscopy. A size range was obtained for the conidiomatal and ascomatal stromata from two of each of these structures. Ten measurements were taken of conidiophores, conidia, asci and ascospores, for each collection. Colour notations used were those described by Rayner (1970). Bark specimens from the *Syzygium* spp. have been deposited in the herbarium of the National Collection of Fungi, Pretoria, South Africa (PREM) (Table 1).

DNA isolation and amplification

Isolates (Table 2) were inoculated into 1.5 ml micro centrifuge tubes containing 750 µl, 30 % Malt Extract Broth and incubated at 25 °C for four days. DNA was isolated as described by Van der Merwe *et al.* (2001). The β-tubulin gene region was amplified using primer pairs Bt1a/Bt1b and Bt2a/Bt2b (Glass & Donaldson 1995). Amplification of the β-tubulin gene regions was done according to Myburg *et al.* (2002b). Amplification reactions were performed on a Perkin Elmer GeneAmp PCR System 9700 thermocycler (Perkin-Elmer Applied Biosystems, Inc. Foster City, California). PCR products were visualised on 2% agarose-ethidium bromide stained gels using ultra violet light.

DNA sequencing

PCR products were purified using a High Pure PCR Product Purification Kit (Roche Diagnostic GmbH, Mannheim, Germany). DNA fragments were sequenced with the same primer pairs used in the PCR amplification reactions. An ABI PRISM™ Dye Terminator Cycle Sequencing Ready Reaction Kit with AmpliTaq® DNA Polymerase, FS (Perkin-Elmer, Warrington, United Kingdom) was used for the sequencing, using an ABI PRISM 3100™ automated sequencer. Sequences were aligned using ClustalX (Thompson *et al.* 1997) and manually adjusted using Sequence Navigator version 1.0.1

(Perkin-Elmer Applied BioSystems Inc., Foster City, California). All sequences obtained in this study have been deposited in Genbank (Table 2).

Data analyses were performed using PAUP* (Phylogenetic Analysis Using Parsimony) version 4.0b (Swofford 1998). Analyses were done using the heuristic search option with TBR (tree-bisection-reconnection) branch swapping. Gaps inserted during sequence alignment, were treated as fifth base (NEWSTATE). A bootstrap analysis (50% majority rule, 1000 replications) was done to determine the confidence levels of the tree branching points (Felsenstein 1995). Previously published sequences for *C. parasitica* (Murr.) Barr (Myburg *et al.* 1999) and *C. eucalypti* (Venter *et al.* 2001, Venter *et al.* 2002) were used for comparative purposes. *Diaporthe ambigua* Nits. was used as an outgroup taxon to root the phylogenetic tree. The stringency of the branch nodes was tested using Markov Chain Monte Carlo Algorithms (MCMC) (Larget & Simon 1999) in Bayesian Analysis (Lutzoni, Pagel & Reeb 2001). Random trees were obtained through 100 000 generations, with every 10th tree sampled. The first 1500 trees were discarded as the burnin period. A general time reversal model was used and four MCMC chains were run simultaneously in the analysis. The sampled trees were summarised in a consensus tree showing posterior probabilities of the branches.

Pathogenicity

In order to determine whether the fungus isolated from the *Syzygium* spp. was the causal agent of the cankers and die-back observed on the trees, and to consider the possible pathogenicity of the fungus on *Eucalyptus* spp., infection studies were performed. The *S. cordatum* and *E. grandis* trees for inoculation had stem diameters ranging from 10 to 23 mm and were arranged in a complete randomised design. All trees were maintained under greenhouse conditions for a two-week acclimatisation period, prior to inoculation. The greenhouse was subjected to natural day/night conditions and a temperature of approximately 25 °C was maintained.

In order to assess the reciprocal pathogenicity of isolates on *S. cordatum* and *Eucalyptus*, the fastest growing isolate from *S. cordatum* (CMW 9364) and an isolate (CMW 2113) from *E. grandis*, previously shown to represent a higher level of

pathogenicity in a population of *C. cubensis* isolates (Van Zyl & Wingfield 1999), were each inoculated into the stems of 20 *S. cordatum* and 20 *E. grandis* (clone ZG14) trees. Ten trees per species were inoculated with sterile MEA plugs to serve as controls. Wounds were made on the stems of trees approximately 150 mm above the soil level, using a 10 mm diameter cork borer. Mycelial plugs of a similar size were taken from the actively growing edges of 7-day-old cultures and placed in the wounds with the mycelium towards the cambium. Wounds were sealed with laboratory film (Parafilm "M", American National Can™ Chicago, IL.) to protect the inoculated fungus and cambium from desiccation.

Lesion lengths associated with the inoculations, were measured after six weeks. To determine the variance between isolates and between trees, inoculation data were subjected to analysis of variance using the General Linear Model procedure of SAS (SAS/STAT Users guide, Version 6, 1989).

RESULTS

Disease symptoms and collection of samples

A number of trees showing branch die-back and cankers, were found in all the areas surveyed. Disease symptoms included branch die-back associated with cracking of the bark, and the development of stem cankers. Fruiting bodies of a fungus, resembling the anamorph of *C. cubensis,* were found between the cracks and on dead areas of the stems, in all the areas surveyed. Teleomorph structures, resembling *C. cubensis,* were also common on trees in the Northern Province (30 % of isolates) and Zululand area (~25% of isolates). No teleomorph structures were found on trees in the Mpumalanga province.

Morphological comparisons

The fungus found on native South African *Syzygium* spp. had a morphology similar to that of *C. cubensis* from South Africa (Wingfield *et al.* 1989, Myburg *et al.* 2002a, b). *Conidiomata* were superficial to slightly immersed, pyriform to clavate (Fig. 1a, 1b), uni- to multilocular (Fig. 1b), blackened with an umber (13m) interior, 300-420(-450)

µm wide, base (280-)330-500 µm long, base above the bark surface (60-)80-320(-370) µm long (Fig. 1b). *Necks* connected to single or separate locules occurred per structure, and these were up to 570 µm long and (110-)120-160(-170) µm wide. *Conidiophores* were hyaline, cylindrical or flask shaped with attenuated apices, frequently septate, with or without branching underneath the septum, (7.5-) 9.5-15.5 µm long, 1-1.5 µm wide (Fig. 1c). *Conidiogenous cells* were enteroblastic, phialidic, determinate. *Conidia* were exuded as bright luteous (19) spore tendrils or droplets, hyaline, non-septate, oblong to oval, 3-3.5 µm long, 1.5 µm wide (Fig. 1d).

Ascomata were characterised by long perithecial necks emerging from the bark with weakly developed, predominantly prosenchymatous, cinnamon (13'') to orange (15) coloured stromatic tissue at the bases of the necks (Figs. 1e, f). *Perithecia* were semi-immersed in the bark, black, base globose, (220-) 230-400 (-490) µm in length and (250-) 270-350 (-380) µm wide (Fig. 1f). *Perithecial necks* were periphysate, up to 1220 µm long as they emerge through the bark, covered in umber (13m) tissue as it extends beyond the stroma giving them a black appearance (Fig. 1f). Extended parts of the perithecial necks were (100-) 106-150 (-155) µm wide, width of the actual perithecial neck (65-) 74-111 (-113) µm. *Asci* contained eight ascospores, were fusoid to ellipsoid, non-stipitate, with non-amyloid refractive rings, (26-) 27-31.5 (-32) µm long, 6-7 (-7.5) µm wide (Fig. 1g). *Ascospores* were hyaline, septate, fusoid to oval, with rounded apices, (5-) 5.5-6.5 (-7) µm long, (1.5-) 2-2.5 (-3) µm wide (Fig. 1g).

DNA sequencing

PCR amplification with the two primer pairs resulted in fragments of 537 bp (Bt1a/Bt1b) and 495 bp (Bt2a/Bt2b), respectively. The fragments were sequenced and resulted in sequences of 464 bp (Bt1a/Bt1b) and 425 bp (Bt2a/Bt2b), before alignment. Aligned sequences of the combined data resulted in a data set of 1016 characters, consisting of 599 constant characters, 317 parsimony-informative characters and 100 variable characters that were parsimony- uninformative. The heuristic search produced three most parsimonious trees with most variation in the clade including the South African strains (Fig. 2). A strict bootstrap consensus tree (length of tree = 684 steps, CI = 0.918, RI = 0.951, RC = 0.806 and HI = 0.139) was generated from the 100 variable characters and most branches were well supported with high bootstrap values (Fig. 2).

Posterior probability values calculated for the branch nodes supported the bootstrap values.

Results of the DNA sequence analysis support the outcome of the morphological comparison, with isolates from *Syzygium* spp. grouping with *Tibouchina* and *Eucalyptus* spp. from South Africa. This confirms the identification of the fungus as the same as the South African strain of *C. cubensis* (Fig. 2). The *Syzygium* isolates grouped within the South African *C. cubensis* clade, and separate from isolates in the South-east Asian and South American clades (bootstrap support 99%, posterior probability 100%), consistent with geographical origins of the isolates. The larger *C. cubensis* clade grouped separately from other *Cryphonectria* spp. (bootstrap support 100%, posterior probability 100%). The bootstrap support for the branch node separating the South American and south-east Asian groups (bootstrap support 51%), with no support using MCMC analysis, suggest that these two groups are closely related.

Pathogenicity

Inoculation of *S. cordatum* and the *E. grandis* clone (ZG14) with *C. cubensis* resulted in the formation of lesions on both hosts, within six weeks (Table 3). Some of the *Eucalyptus* plants showed signs of decline and produced epicormic shoots on the stems within this time period. Epicormic shoots were present on some *S. cordatum* trees, but no signs of die-back were visible. The control inoculations produced no lesions on either host. Isolates from both *Syzygium* and *Eucalyptus* were both more pathogenic on the *E. grandis* than on the *S. cordatum* trees ($P > 0.0001$) (Fig. 3, Table 3).

DISCUSSION

Cryphonectria cubensis has been known in South Africa since 1989, where it caused a serious disease of *Eucalyptus* spp. (Wingfield *et al.* 1989). Because of the common occurrence of this fungus on *Eucalyptus* spp. elsewhere in the world, it has been assumed that *C. cubensis* was accidentally introduced into South Africa (Van Heerden & Wingfield 2001). The discovery of the fungus on native South African trees in this study is intriguing and alters our view on the origin of the fungus. The fungus was found to be common on *S. cordatum* and *S. guineense* in several distantly located areas

of South Africa, discounting the possibility of a chance infection. Analysis of DNA sequence data also confirmed that the fungus on the *Syzygium* spp., is the same as that found on *Eucalyptus* and *Tibouchina* spp. in South Africa.

The survey resulting in the discovery of *C. cubensis* on native *Syzygium* spp. was planned to broadly cover the natural distribution range of these trees in South Africa. *Cryphonectria cubensis* was collected from all three major geographical areas surveyed. The occurrence of the fungus on *Syzygium* spp. in KwaMbonambi on the Zululand coast, a major *Eucalyptus* forestry region where Cryphonectria canker resulted in serious losses during the 1990`s (Van Heerden *et al.* 1997), might have suggested an origin of the fungus on *Eucalyptus*. However, the other regions surveyed on the Zululand coast (Amanzimgwenia, Kosi bay and Kosi mouth) are isolated from *Eucalyptus* plantings. Furthermore, the discovery of the fungus in the northern and eastern regions of the country where Cryphonectria canker is not known on *Eucalyptus,* even though susceptible trees are planted, was surprising. The climatic conditions in the latter areas are generally considered to be unsuitable for the disease. These findings provide strong evidence that the fungus that we have known as *C. cubensis* on *Eucalyptus* and *Tibouchina* in South Africa, represents a native fungus, originating on *Syzygium* spp.

The teleomorph of *C. cubensis* was found frequently on samples collected from native *Syzygium* spp. This is particularly interesting, because teleomorph structures are generally absent on *Eucalyptus* and *Tibouchina* spp. in South Africa. For example, Van Heerden & Wingfield (2001) conducted an extensive survey of Cryphonectria canker in *Eucalyptus* plantations and failed to detect the sexual structures of the causal agent. The teleomorph of the South African fungus has not been found frequently. It has been recorded once on *Eucalyptus*, where it occurred on the roots of *E. grandis* (Wingfield *et al.* 1989) and a limited number of times on *Tibouchina* spp. (Myburg *et al.*, 2002a). If it is true that the fungus is native on *Syzygium* spp., and has adapted to infect *Eucalyptus* spp., recombination may be occurring on native hosts and resulting in new genotypes of the fungus able to infect *Eucalyptus* spp.

Based on sequence data for the ITS region of the ribosomal DNA operon, Myburg *et al.* (1999) showed that isolates of *C. cubensis* from South-east Asia and South America

reside in discrete clades. In that study, South African isolates grouped with those from South America. A subsequent study using multiple gene trees, initiated due to the biological differences of *C. cubensis* in South America and South Africa, showed that the South African fungus is distinct (Myburg *et al.* 2002b). Results of the present study, showing that the fungus occurs on native trees, adds substantial evidence to the view that the South African fungus known as *C. cubensis,* represents a distinct taxon that is in all likelihood, native to Southern Africa.

Pathogenicity trials in this study showed that *S. cordatum* was more tolerant to infection by *C. cubensis* than the *Eucalyptus* clone tested. This result is not surprising, as a native host would be expected to be more resistant to infection than an exotic host of known susceptibility (Leppik 1970, Newhouse 1990). *Syzygium cordatum* trees inoculated in this study were all raised from seed and each plant represented a distinct genotype. In contrast, the *Eucalyptus* trees were all of a single genotype known to be susceptible to *C. cubensis*. Nevertheless, a highly pathogenic isolate from *Eucalyptus* did minimal damage on inoculated *S. cordatum* trees, providing strong evidence for a relatively high level of resistance in the native South African tree. The data also support the view that the fungus is probably native on *S. cordatum*.

Results of this study provide good evidence to suggest that the fungus known as *C. cubensis* in South Africa is native to this country. They also support the previous studies comparing species of *Cryphonectria* and related fungi based on DNA sequence data (Myburg *et al.* 2002a) that have shown that the fungus known as *C. cubensis* should probably reside in a discrete genus. Assigning a name to the South African fungus, prior to completion of phylogenetic studies at the family and generic levels, would be premature. However, we do expect that the fungus will represent a new species, residing in a new genus together with *C. cubensis sensu stricto.*

Discovery of a native host for the fungus known as *C. cubensis* in South Africa, and thus showing that the fungus on *Eucalyptus* probably originated on *Syzygium,* has important implications for forestry internationally. Previous studies have shown that the South African fungus is considerably more pathogenic than *C. cubensis* from elsewhere in the world (Roux *et al.* 1999). In pathogenicity tests, the South African fungus rapidly colonises the cambium and girdles trees (Van Zyl & Wingfield, 1999). This is different

to *C. cubensis* in South-east Asia and South America, which tends to cause stem cankers that develop less rapidly (Van Zyl & Wingfield, 1999). Clearly, the South African fungus is a threat to *Eucalyptus* forestry elsewhere in the world. Furthermore, it is probably not present in Australia and, if it were to enter that country, it could have a devastating effect on native Australian Myrtaceae. Every effort should thus be made to restrict its spread from South Africa.

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Table 1. Specimens used in the morphological comparisons.

Herbarium no.[a]	Identity	Host	Origin	Date	Collector
PREM 49379	*C. cubensis*	*E. grandis*	South Africa	1988	M.J. Wingfield
PREM 49377	*C. cubensis*	*E. grandis*	South Africa	1986	M.J. Wingfield
PREM 49378	*C. cubensis*	*E. grandis*	South Africa	1987	M.J. Wingfield
PREM 57293	*C. cubensis*	*E. grandis*	South Africa	2001	M. Gryzenhout
PREM 57357	*C. cubensis*	*T. granulosa*	South Africa	1999	J. Roux
PREM 57358	*C. cubensis*	*T. granulosa*	South Africa	1999	J. Roux
PREM 57294	*C. cubensis*	*E. grandis*	Colombia	2000	M.J. Wingfield
PREM 57297	*C. cubensis*	*Eucalyptus* sp.	Indonesia	2001	M.J. Wingfield
PREM 57474	*C. cubensis*	*S. cordatum*	South Africa	2001	R.N. Heath
PREM 57475	*C. cubensis*	*S. guineense*	South Africa	2001	M. Gryzenhout
PREM 57476	*C. cubensis*	*S. cordatum*	South Africa	2001	R.N. Heath
PREM 57477	*C. cubensis*	*S. cordatum*	South Africa	2002	R.N. Heath
PREM 57478	*C. cubensis*	*S. cordatum*	South Africa	2002	R.N. Heath
PREM 57479	*C. cubensis*	*S. cordatum*	South Africa	2002	R.N. Heath
PREM 57480	*C. cubensis*	*S. cordatum*	South Africa	2002	R.N. Heath

[a] PREM, National Collection of Fungi, Pretoria, South Africa.

Table 2. Isolates used for molecular comparison and pathogenicity trials.

Culture no.[a]	Isolate identity	Host	Origin	Genbank accession number
CMW 9364	*C. cubensis*	*S. cordatum*	South Africa	AY149284 [c]
CMW 9366	*C. cubensis*	*S. cordatum*	South Africa	AY149285 [c]
CMW 10036	*C. cubensis*	*S. cordatum*	South Africa	AY149286 [c]
CMW 10046	*C. cubensis*	*S. cordatum*	South Africa	AY149287 [c]
CMW 10076	*C. cubensis*	*S. cordatum*	South Africa	AY149288 [c]
CMW 10086	*C. cubensis*	*S. cordatum*	South Africa	AY149289 [c]
CMW 10092	*C. cubensis*	*S. guineense*	South Africa	AY149290 [c]
CMW 62	*C. cubensis*	*Eucalyptus* sp.	South Africa	AF273063 [b]; AF273458 [b]
CMW 2113	*C. cubensis*	*Eucalyptus* sp.	South Africa	AF273067 [b]; AF273462 [b]
CMW 8755	*C. cubensis*	*Eucalyptus* sp.	South Africa	AF273064 [b]; AF273459 [b]
CMW 9327	*C. cubensis*	*Tibouchina* sp.	South Africa	AF273060 [b]; AF 273455 [b]
CMW 9328	*C. cubensis*	*Tibouchina* sp.	South Africa	AF273061 [b]; AF 273456 [b]
CMW 9932	*C. cubensis*	*Tibouchina* sp.	South Africa	AF273062 [b]; AF 273457 [b]
CMW 8758	*C. cubensis*	*Tibouchina* sp.	South America	AF273068 [b]; AF273463 [b]
CMW 1853	*C. cubensis*	*S. aromaticum*	South America	AF273070 [b]; AF273465 [b]
CMW 9927	*C. cubensis*	*Tibouchina* sp.	South America	AF292034 [b]; AF292037 [b]
CMW 9929	*C. cubensis*	*Tibouchina* sp.	South America	AF292035 [b]; AF292038 [b]
CMW 9928	*C. cubensis*	*Tibouchina* sp.	South America	AF292036 [b]; AF292038 [b]
CMW 8756	*C. cubensis*	*Eucalyptus* sp.	South east Asia	AF273077 [b]; AF375606 [b]
CMW 9906	*C. cubensis*	*Eucalyptus* sp.	South east Asia	AF273069 [b]; AF 273464 [b]
CMW9903	*C. cubensis*	*Eucalyptus* sp.	South east Asia	AF273070 [b]; AF273465 [b]
CMW 7036	*C. eucalypti*	*Eucalyptus* sp.	South Africa	AF368341 [d]; AF368340 [d]
CMW 7037	*C. eucalypti*	*Eucalyptus* sp.	Australia	AF368343 [d]; AF368342 [d]
CMW 7038	*C. eucalypti*	*Eucalyptus* sp.	Australia	AF368345 [d]; AF368344 [d]
CMW 7047	*C. parasitica*	*Q. virginiana*	America	AF273469 [d]; AF273073 [d]
CMW 7048	*C. parasitica*	*Q. virginiana*	America	AF273470 [d]; AF273076 [d]
CMW 1651	*C. parasitica*	*C. dentata*	America	AF273074 [d]; AF273467 [d]
CMW 1652	*C. parasitica*	*C. dentata*	America	AF273468 [d]; AF27075 [d]
CMW 5288	*D. ambigua*	*Malus* sp.	South Africa	AF543819;AF543821 [e]

[a] Culture collection of the Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, Pretoria, 0002, South Africa.
[b] β-tubulin 1 and 2 sequence data obtained from Myburg *et al.* (2002a, b).
[c] β-tubulin 1 and 2 sequence data generated in this study.
[d] β-tubulin 1 and 2 sequence data obtained from Venter *et al.* (2002).
[e] β-tubulin 1 and 2 sequence data obtained from Genbank.

Table 3. Lesion lengths on one-year-old *Eucalyptus grandis* (ZG 14 clones) and *Syzygium cordatum* six weeks after inoculation in the greenhouse.

ISOLATE	[a] Lesion length (mm)	
	Syzygium cordatum	*Eucalyptus grandis* (ZG 14)
CMW 2113	49.9	146.5
CMW 9364	108.9	133.0
Control	10	10

[a] Each value is the average of 20 measurements for each isolate

$P > 0.0001$

CV = 43.24

R-Square = 0.81

F = 7.45

Figure 1. Light micrographs of the fruiting structures of *Cryphonectria cubensis* from *Syzygium* spp. in South Africa. (a). Conidioma on bark. (b). Longitudinal section through conidioma. (c). Conidiophores. (d). Conidia. (e). Ascoma on bark. (f). Longitudinal section through ascoma showing limited tissue (arrow). (g). Asci. and ascospores. Bars: a-b, e-f = 100 µm; c-d, g = 10 µm.

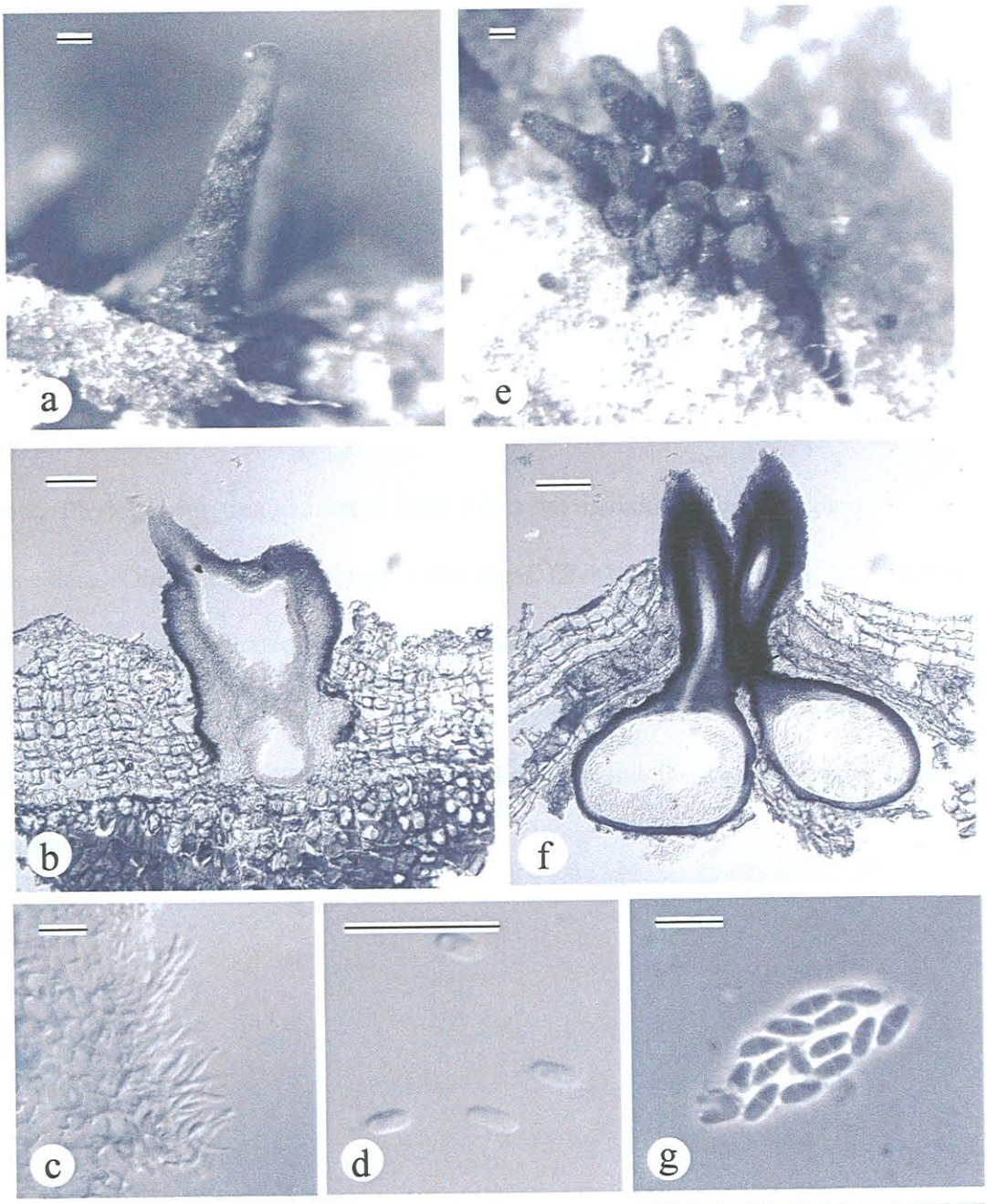


Figure 2. Phylogenetic tree generated from a data set including β-tubulin gene sequence data. One tree (length of tree = 684 steps, CI = 0.918, RI = 0.951, RC = 0.806 and HI = 0.139) was generated from heuristic searches performed on the data set. Bootstrap values (1000 replicates) are indicated above the branches with those lower than 50% are not shown. MCMC values are indicated below the branches. *Diaporthe ambigua* was used to root the tree.

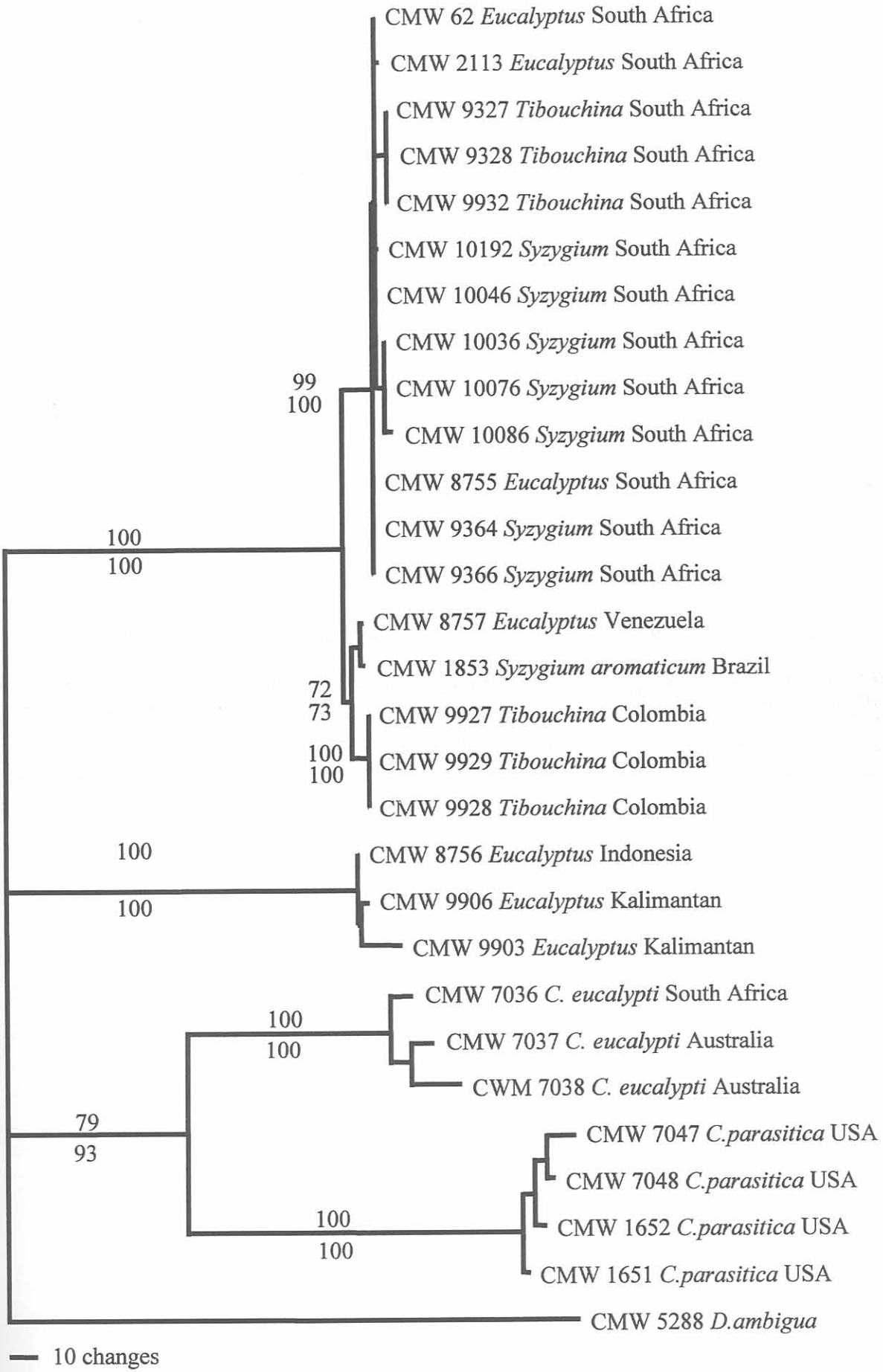
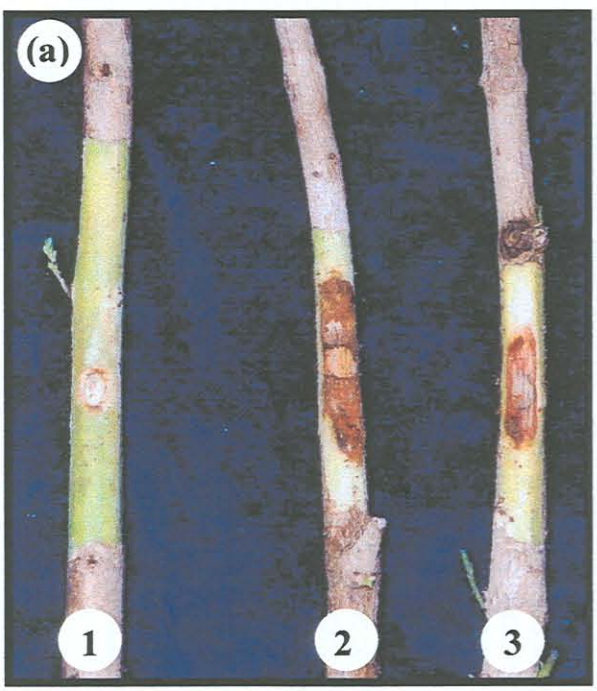
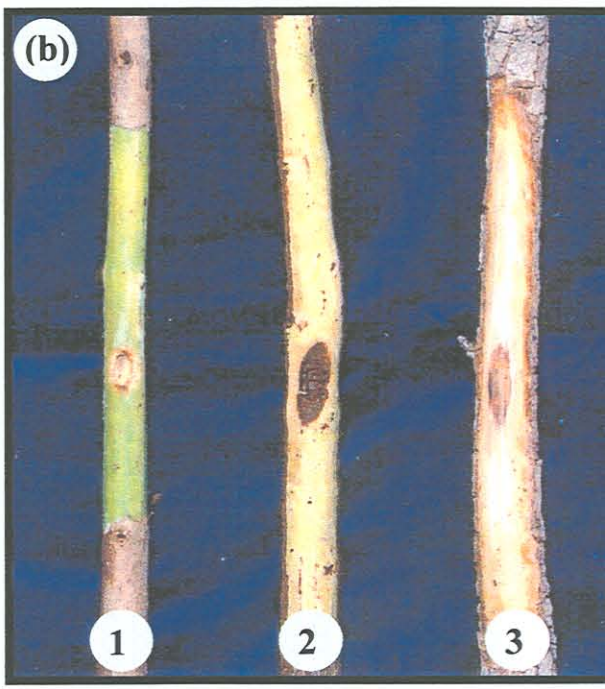


Figure. 3. Lesions resulting from pathogenicity trials. (a) Lesions formed on *Eucalyptus grandis* clones (a2=CMW 2113, a3=CMW 9364) with control inoculation producing no lesions (a1). (b) Lesions formed on *Syzygium cordatum* trees (b2=CMW 2113, b3=CMW 9364) with control inoculation producing no lesions (b1).





APPENDIX 1

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                                        10        20        30        40        50        60        70
CMW 62 Eucalyptus South Africa          TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 2113 Eucalyptus South Africa        TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACGGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 8755 Eucalyptus South Africa        TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9327 Tibouchina South Africa        TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9328 Tibouchina South Africa        TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9932 Tibouchina South Africa        TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9364 Syzygium South Africa          TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9366 Syzygium South Africa          TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 10192 Syzygium South Africa         TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCTAGTTG ACCCAGCAGA TGTTCGACCC
CMW 10046 Syzygium South Africa         TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 10036 Syzygium South Africa         TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 10076 Syzygium South Africa         TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 10086 Syzygium South Africa         TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 8757 Eucalyptus Venezuela           TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 1853 Syzygium aromaticum            TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9927 Tibouchina Colombia            TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9929 Tibouchina Colombia            TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9928 Tibouchina Colombia            TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 8756 Eucalyptus Indonesia           TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9906 Eucalyptus Kalimantan          TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 9903 Eucalyptus Kalimantan          TGACCAGCCG TGGCGCCCAC TCCTTCCGGG CTGTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 7036 C. eucalypti South Africa      TGACCAGCCG TGGCGCCCAC TCTTTCCGCG CCCTCACCGT GCCCGAGTTG ACCCAGCAAA TGTTCGACCC
CMW 7037 C. eucalypti Australia         TGACCAGCCG TGGCGCCCAC TCTTTCCGCG CCCTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CWM 7038 C. eucalypti Australia         TGACCAGCCG TGGCGCCCAC TCTTTCCGCG CCCTCACCGT GCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 7047 C. parasitica USA              TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CCCTCACCGT CCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 7048 C. parasitica USA              TGACCAGCCG TGGCGCCCAC TCTTTCCGCG CCCTCACCGT CCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 1651 C. parasitica USA              TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CCCTCACCGT CCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 1652 C. parasitica USA              TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CCCTAACCGT CCCCGAGTTG ACCCAGCAGA TGTTCGACCC
CMW 5288 D. ambigua                     TGACCAGCCG TGGCGCCCAC TCCTTCCGCG CCGTCACCGT TCCTGAGCTC ACCCAGCAAA TGTTCGACCC
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	80	90	100	110	120	130	140
CMW 62 *Eucalyptus* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 2113 *Eucalyptus* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 8755 *Eucalyptus* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9327 *Tibouchina* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9328 *Tibouchina* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9932 *Tibouchina* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9364 *Syzygium* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9366 *Syzygium* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 10192 *Syzygium* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 10046 *Syzygium* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 10036 *Syzygium* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 10076 *Syzygium* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 10086 *Syzygium* South Africa	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 8757 *Eucalyptus* Venezuela	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 1853 *Syzygium aromaticum*	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9927 *Tibouchina* Colombia	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9929 *Tibouchina* Colombia	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9928 *Tibouchina* Colombia	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 8756 *Eucalyptus* Indonesia	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9906 *Eucalyptus* Kalimantan	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 9903 *Eucalyptus* Kalimantan	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCCGCCAT	CTTGTAAGTC
CMW 7036 *C. eucalypti* South Africa	CAAGAACATG	ATGGCTGCCT	CGGACTTCCG	CAACGGCCGT	TACCTGACGT	GCTCTGCCAT	CTTGTACGTT
CMW 7037 *C. eucalypti* Australia	CAAGAACATG	ATGGCTGCCT	CGGACTTCCG	CAACGGCCGT	TACCTGACGT	GCTCTGCCAT	CTTGTACGTT
CWM 7038 *C. eucalypti* Australia	CAAGAACATG	ATGGCTGCCT	CGGACTTCCG	CAACGGCCGT	TACCTGACGT	GCTCTGCCAT	CTTGTACGTT
CMW 7047 *C. parasitica* USA	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACAT	GCTCTGCCAT	CTTGTAAGTT
CMW 7048 *C. parasitica* USA	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACAT	GCTCTGCCAT	CTTGTAAGTT
CMW 1651 *C. parasitica* USA	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACAT	GCTCTGCCAT	CTTGTAAGTT
CMW 1652 *C. parasitica* USA	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACAT	GCTCTGCCAT	CTTGTAAGTT
CMW 5288 *D. ambigua*	CAAGAACATG	ATGGCTGCCT	CTGACTTCCG	CAACGGTCGC	TACCTGACGT	GCTCTGCCAT	CTTGTAAGTC

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                                        150        160        170        180        190        200        210
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CMW 2113 Eucalyptus South Africa        CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 8755 Eucalyptus South Africa        CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 9327 Tibouchina South Africa        CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 9328 Tibouchina South Africa        CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 9932 Tibouchina South Africa        CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 9364 Syzygium South Africa          CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
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CMW 10192 Syzygium South Africa         CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 10046 Syzygium South Africa         CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 10036 Syzygium South Africa         CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 10076 Syzygium South Africa         CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 10086 Syzygium South Africa         CCCC-G---- CCCCTCGCGC CTCGGGGCGC CTCGGCCGAA GC-------- TCGTC--TGC TAA-------
CMW 8757 Eucalyptus Venezuela           TCCC-G---- CCCCTCGCGC CTCGGAGAGC ATCGGCCGAA GC-------- TTGTC--TGC TAA-------
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CMW 9927 Tibouchina Colombia            CCCC-G---- CCCCTCGCGC CTCGGGGAGC ATCGGCCGAG GC-------- TTGTC--TGC TAA-------
CMW 9929 Tibouchina Colombia            CCCC-G---- CCCCTCGCGC CTCGGGGAGC ATCGGCCGAG GC-------- TTGTC--TGC TAA-------
CMW 9928 Tibouchina Colombia            CCCC-G---- CCCCTCGCGC CTCGGGGAGC ATCGGCCGAG GC-------- TTGTC--TGC TAA-------
CMW 8756 Eucalyptus Indonesia           CCCC-G---- CCCCTCGCGC CTCGGGGAGC ATCGGCCGAA GC-------- TTGTC--TGC TAA-------
CMW 9906 Eucalyptus Kalimantan          CCCC-G---- CCCCTCGCGC CTCGGGGAGC ATCGGCCGAA GC-------- TTGTC--TGC TAA-------
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CMW 7036 C. eucalypti South Africa      TT--TG--TC TT-CTCT-GT CTCACACATC -TCGGATCCA CCTCTCGGGC TTGTTTTTGC TAACCCTG-C
CMW 7037 C. eucalypti Australia         TTC-TGCTTC TTTCTCT-AT CTCACAAATC -TCGGATCCA CCTCTCGGGC TTGTTTTTGC TAACCCTG-C
CWM 7038 C. eucalypti Australia         TT-------- -------TGT CTCACAAATC -TCGGATCCA CCTCTCGGGC TTGTTTTTGC TAACCCTG-C
CMW 7047 C. parasitica USA              TTCTTGTCTT TTCCTCGCAG GTCTAGACAA ACGTTTCGGG CTGTTGG-GC TAA------- ---CCCTGTC
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CMW 1652 C. parasitica USA              TTCTTGTCTT TTCCTCGCAA GTCTCGACGA ACGTCTTGGG CTGTTTG-GC TAA------- ---CCCTGTC
CMW 5288 D. ambigua                     CCCTAAGTCC CCTCGCACAA ATAAAA--TG GTCGCGCGCT GACACTGTGC ---------- ----------
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CMW 2113 Eucalyptus South Africa    ------CCCT CATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAACG
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CMW 9327 Tibouchina South Africa    ------CCCT CATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAACG
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CMW 9364 Syzygium South Africa      ------CCCT CATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAACG
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CMW 8757 Eucalyptus Venezuela       ------CTCT TATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT TGAGGACCAG ATGCGCAATG
CMW 1853 Syzygium aromaticum        ------CTCT TATCG---TC CAGC-GTGGC AAGGTCTCCA TGAAGGAGGT TGAGGACCAG ATGCGCAATG
CMW 9927 Tibouchina Colombia        ------CTCT TATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAATG
CMW 9929 Tibouchina Colombia        ------CTCT TATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAATG
CMW 9928 Tibouchina Colombia        ------CTCT TATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAATG
CMW 8756 Eucalyptus Indonesia       ------CTCT TATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT TGAGGACCAG ATGCGCAACG
CMW 9906 Eucalyptus Kalimantan      ------CTCT TATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT TGAGGACCAG ATGCGCAACG
CMW 9903 Eucalyptus Kalimantan      ------CTCT TATCG---TC CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT TGAGGACCAG ATGCGCAACG
CMW 7036 C. eucalypti South Africa  TTTCCTCTCT -CCCC---TA CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAACG
CMW 7037 C. eucalypti Australia     TTTCCTCTCT -CCCC---TA CAGCCGTGGC AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAACG
CWM 7038 C. eucalypti Australia     TTTCCTCTCT -CCCC---TA CAGCCGGGGC AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAACG
CMW 7047 C. parasitica USA          TTT-CTCTCT TCCCCTTCTC TAGCCGGGGT AAGGTCTCCA TGAAGGAAGT CGAGGACCAG ATGCGCAACG
CMW 7048 C. parasitica USA          TTT-CTCTCT TCCCCTTCTT TAGCCGTGGT AAGGTCTCCA TGAAGGAAGT CGAGGACCAG ATGCGCAACG
CMW 1651 C. parasitica USA          TTT-CTCTCT TCCCCTTCTC AAGCCGTGGT AAGGTCTCCA TGAAGGAAGT CGAGGACCAG ATGCGCAACG
CMW 1652 C. parasitica USA          TTT-CTCTCT TCCCCTTCTC TAGCCGTGGT AAGGTCTCCA TGAAGGAAGT CGAGGACCAG ATGCGCAACG
CMW 5288 D. ambigua                 ---------- --------TC TAGCCGTGGA AAGGTCTCCA TGAAGGAGGT CGAGGACCAG ATGCGCAACG
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	290	300	310	320	330	340	350
CMW 62 *Eucalyptus* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 2113 *Eucalyptus* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 8755 *Eucalyptus* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 9327 *Tibouchina* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 9328 *Tibouchina* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TTTGCTCCAT
CMW 9932 *Tibouchina* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 9364 *Syzygium* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 9366 *Syzygium* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 10192 *Syzygium* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 10046 *Syzygium* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 10036 *Syzygium* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 10076 *Syzygium* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 10086 *Syzygium* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 8757 *Eucalyptus* Venezuela	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 1853 *Syzygium aromaticum*	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 9927 *Tibouchina* Colombia	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 9929 *Tibouchina* Colombia	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 9928 *Tibouchina* Colombia	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 8756 *Eucalyptus* Indonesia	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 9906 *Eucalyptus* Kalimantan	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 9903 *Eucalyptus* Kalimantan	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TTTGCTCCAT
CMW 7036 *C. eucalypti* South Africa	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 7037 *C. eucalypti* Australia	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CWM 7038 *C. eucalypti* Australia	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 7047 *C. parasitica* USA	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATTCC	CAACAACGTC	CAGACCGCCC	TTTGCTCCAT
CMW 7048 *C. parasitica* USA	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATTCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 1651 *C. parasitica* USA	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATTCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 1652 *C. parasitica* USA	TCCAGAGCAA	GAACTCGTCC	TACTTCGTCG	AGTGGATTCC	CAACAACGTC	CAGACCGCCC	TCTGCTCCAT
CMW 5288 *D. ambigua*	TCCAGAGCAA	GAACTCATCC	TACTTCGTCG	AGTGGATCCC	CAACAACGTC	CAGACCGCCC	TCTGCTCGAT

	360	370	380	390	400	410	420
CMW 62 *Eucalyptus* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 2113 *Eucalyptus* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 8755 *Eucalyptus* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9327 *Tibouchina* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9328 *Tibouchina* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9932 *Tibouchina* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9364 *Syzygium* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9366 *Syzygium* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 10192 *Syzygium* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 10046 *Syzygium* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 10036 *Syzygium* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 10076 *Syzygium* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 10086 *Syzygium* South Africa	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 8757 *Eucalyptus* Venezuela	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 1853 *Syzygium aromaticum*	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9927 *Tibouchina* Colombia	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9929 *Tibouchina* Colombia	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9928 *Tibouchina* Colombia	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 8756 *Eucalyptus* Indonesia	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9906 *Eucalyptus* Kalimantan	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACTG	CCATCCAGGA	GCTCTTCAAG
CMW 9903 *Eucalyptus* Kalimantan	CCCCCCCAAG	GGTCTCAAGA	TGTCCTCCAC	CTTTGTTGGC	AACTCCACCG	CCATCCAGGA	GCTCTTCAAG
CMW 7036 *C. eucalypti* South Africa	CCCCCCCAAG	GGCCTCAAGA	TGTCCTCCAC	CTTTGTCGGC	AACTCCACCG	CCATCCAGGA	GCTCTTCAAG
CMW 7037 *C. eucalypti* Australia	CCCCCCCAAG	GGCCTCAAGA	TGTCCTCCAC	CTTTGTCGGC	AACTCCACCG	CCATCCAGGA	GCTCTTCAAG
CWM 7038 *C. eucalypti* Australia	CCCCCCCAAG	GGCCTCAAGA	TGTCCTCCAC	CTTTGTCGGC	AACTCCACCG	CCATCCAGGA	GCTCTTCAAG
CMW 7047 *C. parasitica* USA	TCCCCCCAGG	GGCCTAAAGA	TGTCCTCGAC	CTTTGTCGGC	AACTCCACCG	CCATCCAGGA	GCTCTTAAAG
CMW 7048 *C. parasitica* USA	TCCCCCCAGG	GGCCTCAAGA	TGTCCTCGAC	CTTTGTCGGC	AACTCCACCG	CCATCCAGGA	GCTCTTCAAG
CMW 1651 *C. parasitica* USA	TCCCCCCAAG	GGCCTCAAGA	TGTCCTCGAC	CTTTGTCGGC	AACTCCACCG	CCATCCAGGA	GCTCTTCAAG
CMW 1652 *C. parasitica* USA	TCCCCCCAAG	GGCCTCAAGA	TGTCCTCGAC	CTTTGTCGGC	AACTCCACCG	CCATCCAGGA	GCTCTTCAAG
CMW 5288 *D. ambigua*	CCCTCCCAAG	GGTCTCAAGA	TGTCCTCTAC	CTTCGTGGGT	AACTCGACTG	CTATCCAGGA	GCTGTTCAAG

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                                        430        440        450        460        470        480        490
CMW 62 Eucalyptus South Africa      CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 2113 Eucalyptus South Africa    CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 8755 Eucalyptus South Africa    CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9327 Tibouchina South Africa    CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9328 Tibouchina South Africa    CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9932 Tibouchina South Africa    CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9364 Syzygium South Africa      CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9366 Syzygium South Africa      CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 10192 Syzygium South Africa     CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 10046 Syzygium South Africa     CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 10036 Syzygium South Africa     CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 10076 Syzygium South Africa     CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 10086 Syzygium South Africa     CGTATCGGCG AGCAGTTCAT -----TG-TT ATGTT-CCGT CGCAAGGCTT TCTTGCATTT GTACACTGGG
CMW 8757 Eucalyptus Venezuela       CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 1853 Syzygium aromaticum        CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9927 Tibouchina Colombia        CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9929 Tibouchina Colombia        CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9928 Tibouchina Colombia        CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 8756 Eucalyptus Indonesia       CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9906 Eucalyptus Kalimantan      CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 9903 Eucalyptus Kalimantan      CGTATCGGCG AGCAGTTCAC -----TG-CT ATGTT-CCGT CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 7036 C. eucalypti South Africa  CGTGTTGGCG AGCAGTTCAC CGCCATGTCT ATGTT-CCGG CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 7037 C. eucalypti Australia     CGTGTTGGCG AGCAGTTCAC CGCCATGTCT ATGTT-CCGG CGCAAGGCTT TCTTGCATTG GTACACTGGG
CWM 7038 C. eucalypti Australia     CGTGTTGGCG AGCAGTTCAC CGCCATG-CT ATGTTTCCGG CGCAAGGCTT TCTTGCATTG GTACACTGGG
CMW 7047 C. parasitica USA          CGTGTCGGCG AGCAGTTCAC CGCCA----- -TGTT-CCGG CGCAAGGCTT TCTTGCATTG GTACACTGGT
CMW 7048 C. parasitica USA          CGTGTCGGCG AGCAGTTTAC CGCCA----- -TGTT-CCGG CGCAAGGCTT TCTTGCATTG GTACACTGGT
CMW 1651 C. parasitica USA          CGTGTCGGCG AGCAGTTTAC CGCCA----- -TGTT-CCGG CGCAAGGCTT TCTTGCATTG GTACACTGGT
CMW 1652 C. parasitica USA          CGTGTCGGCG AGCAGTTTAC CGCCA----- -TGTT-CCGG CGCAAGGCTT TCTTGCATTG GTACACTGGT
CMW 5288 D. ambigua                 CGTGTGGGCG AGCAGTTCAC TGCCA----- -TGTT-CCGG CGCAAGGCTT TCTTGCATTG GTACACTGGC
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                                      500        510        520        530        540        550        560
CMW 62 Eucalyptus South Africa        ACGCGACACG GC--GGTCT- CGAGACCGCG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 2113 Eucalyptus South Africa      ACGCGACACG GC--GGTCT- CGAGACCGCG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 8755 Eucalyptus South Africa      ACGCGACACG GC--GGTCT- CGAGACCGTG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 9327 Tibouchina South Africa      ACGCGACACG GC--GGTCTG CGAGACCGAG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCGGACCG
CMW 9328 Tibouchina South Africa      ACGCGACACG GC--GGTCTG CGAGACCGAG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCGGACCG
CMW 9932 Tibouchina South Africa      ACGCGACACG GC--GGTCTG CGAGACCGAG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCGGACCG
CMW 9364 Syzygium South Africa        ACGCGACACG GC--GGTCT- CGAGACCGTG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 9366 Syzygium South Africa        ACGCGACACG GC--GGTCT- CGAGACCGTG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 10192 Syzygium South Africa       ACGCGACACG GC--GGTCT- CGAGACCGCG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 10046 Syzygium South Africa       ACGCGACACG GC--GGTCT- CGAGACCGCG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 10036 Syzygium South Africa       ACGGGACAGG AC--GGTCT- CGAGACCGCG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 10076 Syzygium South Africa       ACGGGACAGG AC--GGTCT- CGAGACCGCG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 10086 Syzygium South Africa       ACGGGACAGG AC--GGTCT- CGAGACCGCG ATGGTAGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 8757 Eucalyptus Venezuela         ACGCGACACG GC--GGTCT- CGAGACCGCG ATGGTGGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 1853 Syzygium aromaticum          ACGCGACACG GC--GGTCT- CGAGACCGTG ATGGTGGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 9927 Tibouchina Colombia          ACGCGACACG GC--GGTCT- CGAGACCGTG ATGGTGGTGG TGGC-----T TTAGTACTGA CCGCG-ACCC
CMW 9929 Tibouchina Colombia          ACGCGACACG GC--GGTCT- CGAGACCGTG ATGGTGGTGG TGGC-----T TTAGTACTGA CCGCG-ACCC
CMW 9928 Tibouchina Colombia          ACGCGACACG GC--GGTCT- CGAGACCGTG ATGGTGGTGG TGGC-----T TTAGTACTGA CCGCG-ACCC
CMW 8756 Eucalyptus Indonesia         ACGCGACACG GC--GGTCT- CGAGACCGTG ATGGTGGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 9906 Eucalyptus Kalimantan        ACGCGACACG GC--GGTCT- CGAGACCGCG ATGGTAGTGG TGGG-----T TCAGTACTGA CCGCG-ACCG
CMW 9903 Eucalyptus Kalimantan        ACGCGACACG GC--GGTCT- CGAGACCGTG ATGGTGGTGG TGGC-----T TCAGTACTGA CCGCG-ACCG
CMW 7036 C. eucalypti South Africa    ACACGATACG GC--GATGT- --CGACC--- -TCGTGCAGC AGAC-----T TGGGTGCTGA CCTCG-ACCG
CMW 7037 C. eucalypti Australia       ACCCGATACG GC--GATGT- --CGACC--- -TCGTGCAGC AGAC-----T TGGGTGCTGA CCTCG-ACGC
CWM 7038 C. eucalypti Australia       ACCCGATACG GC--GATGT- --CGACC--- -TCGTGCAGC AGAC-----T TGGGTGCTGA CCTCG-ACCG
CMW 7047 C. parasitica USA            TTTCGACACG AT--ACAG-- CTACATCGAC ATCGTGCAGC AGAC-----T TGGATGCTGA CCTCG-ACAA
CMW 7048 C. parasitica USA            TTTCGACACG AT--ACAG-- CTACATCGAC ATCGTGCAGC AGAC-----T TGGATGCTGA CCTCG-ACAA
CMW 1651 C. parasitica USA            TTTCGACACG AT--ACAG-- CTACATCGAC ATCGTGCAGC AGAC-----T TGGATGCTGA CCTCG-ACAA
CMW 1652 C. parasitica USA            TTTCGACACG AT--ACAG-- CTACATCGAC ATCGTGCAGC AGAC-----T TGGATGCTGA CCTCG-ACAA
CMW 5288 D. ambigua                   -----ACCGC CGCGAC-G-- CTCGACACGC GACAATACGA CCTCGAAGCA TCGTTGCTGA CCTCG-ACAT
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                                        570        580        590        600        610        620        630
CMW 62 Eucalyptus South Africa          C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 2113 Eucalyptus South Africa        C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 8755 Eucalyptus South Africa        C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 9327 Tibouchina South Africa        C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 9328 Tibouchina South Africa        C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 9932 Tibouchina South Africa        C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 9364 Syzygium South Africa          C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 9366 Syzygium South Africa          C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 10192 Syzygium South Africa         C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 10046 Syzygium South Africa         C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 10036 Syzygium South Africa         C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 10076 Syzygium South Africa         C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 10086 Syzygium South Africa         C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GTTGCACCAG
CMW 8757 Eucalyptus Venezuela           C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GCTGCACCAG
CMW 1853 Syzygium aromaticum            C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GCTGCACCAG
CMW 9927 Tibouchina Colombia            C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GCTGCACCAG
CMW 9929 Tibouchina Colombia            C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GCTGCACCAG
CMW 9928 Tibouchina Colombia            C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GCTGCACCAG
CMW 8756 Eucalyptus Indonesia           C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GCTGCACCAG
CMW 9906 Eucalyptus Kalimantan          C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GCTGCACCAG
CMW 9903 Eucalyptus Kalimantan          C-AGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTCCT GCTGCACCAG
CMW 7036 C. eucalypti South Africa      C-AGGCAAAC CATCTCGGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAT GTACC---AC ACCATA-CCC
CMW 7037 C. eucalypti Australia         C-AGGCAAAC CATTTCGGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAT GTACC---AC ACCATA-CCC
CWM 7038 C. eucalypti Australia         C-AGGCAAAC CATTTCGGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAT GTACC---AC ACCATA-CCC
CMW 7047 C. parasitica USA              T-AGGCAAAC CATCTCCGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTATC TCGGCTTCCC
CMW 7048 C. parasitica USA              T-AGGCAAAC CATCTCCGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTATC TCGGCTTCCC
CMW 1651 C. parasitica USA              T-AGGCAAAC CATCTCCGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTATC TCGGCTTCCC
CMW 1652 C. parasitica USA              T-AGGCAAAC CATCTCCGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAC GTACCCTATC TCGGCTTCCC
CMW 5288 D. ambigua                     TTAGGCAAAC CATCTCTGGC GAGCACGGCC TCGACAGCAA TGGCGTGTAT GCACC----- TCACATTCCC
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                                    640        650        660        670        680        690        700
CMW 62 Eucalyptus South Africa      GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 2113 Eucalyptus South Africa    GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 8755 Eucalyptus South Africa    GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 9327 Tibouchina South Africa    GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 9328 Tibouchina South Africa    GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 9932 Tibouchina South Africa    GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 9364 Syzygium South Africa      GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 9366 Syzygium South Africa      GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 10192 Syzygium South Africa     GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 10046 Syzygium South Africa     GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 10036 Syzygium South Africa     GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 10076 Syzygium South Africa     GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 10086 Syzygium South Africa     GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 8757 Eucalyptus Venezuela       GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 1853 Syzygium aromaticum        GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 9927 Tibouchina Colombia        AC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 9929 Tibouchina Colombia        AC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 9928 Tibouchina Colombia        AC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CTGCACAG CTACAACGGC
CMW 8756 Eucalyptus Indonesia       GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CCGCACAG CTACAACGGC
CMW 9906 Eucalyptus Kalimantan      GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CCGCACAG CTACAACGGC
CMW 9903 Eucalyptus Kalimantan      GC---GGCGC GCC------- ---------- -TCGAGCTTC CC-GCTGACC A-CCGCACAG CTACAACGGC
CMW 7036 C. eucalypti South Africa  TACACGGCGG CCCACGCAAG ATGGACGCGG CTCGGGCTTT CCTGCTAACC ACCCGCGTAG CTACAACGGC
CMW 7037 C. eucalypti Australia     TACACGGCGG CCCACGCAAG ATGGACGCGG CTCGGGCTCT CCTGCTGACC ACCCGCATAG CTACAACGGC
CWM 7038 C. eucalypti Australia     TACACGGCGG CCCACGCAAG ATGGACGCGG CCCGGGCTCT CCTGCTGACC ACCCGCATAG CTACAACGGC
CMW 7047 C. parasitica USA          AAG------- ------CAAG ACAGACGCGA CTTGAGCTTT CCTGCTGACC A-CCACATAG CTACAACGGC
CMW 7048 C. parasitica USA          AAG------- ------CAAG ACAGACGCGA CTTGAGCTTT CCTGCTGACC A-CCACATAG CTACAACGGC
CMW 1651 C. parasitica USA          AAG------- ------CAAG ACAGACGCGA CTTGAGCTTT CCTGCTGACC A-CCACATAG CTACAACGGC
CMW 1652 C. parasitica USA          AAG------- ------CAAG ACAGACGCGA CTTGAGCTTT CCTGCTGACC A-CCACATAG CTACAACGGC
CMW 5288 D. ambigua                 -TGCC----- --CACTGATC TTGGCCTCT- CTTCCGGCTT GGCACTGACA ATCGCA-TAG TTACAACGGC
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                                        710        720        730        740        750        760        770
CMW 62 Eucalyptus South Africa          ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 2113 Eucalyptus South Africa        ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 8755 Eucalyptus South Africa        ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 9327 Tibouchina South Africa        ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 9328 Tibouchina South Africa        ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 9932 Tibouchina South Africa        ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 9364 Syzygium South Africa          ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 9366 Syzygium South Africa          ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 10192 Syzygium South Africa         ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 10046 Syzygium South Africa         ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 10036 Syzygium South Africa         ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 10076 Syzygium South Africa         ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 10086 Syzygium South Africa         ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 8757 Eucalyptus Venezuela           ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 1853 Syzygium aromaticum            ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 9927 Tibouchina Colombia            ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 9929 Tibouchina Colombia            ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 9928 Tibouchina Colombia            ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGG-
CMW 8756 Eucalyptus Indonesia           ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGT-
CMW 9906 Eucalyptus Kalimantan          ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGT-
CMW 9903 Eucalyptus Kalimantan          ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCT-GTCGG- -GAC-CAGT-
CMW 7036 C. eucalypti South Africa      ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCTTGTCGGC TGAC-CAGGC
CMW 7037 C. eucalypti Australia         ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCTTATCGGG TGAC-CAGGC
CWM 7038 C. eucalypti Australia         ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTATG TCTTATCGGG TGAC-CAGGC
CMW 7047 C. parasitica USA              ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTTA ACGAGGTATG TCTTATCGGG TGAT-CAAG-
CMW 7048 C. parasitica USA              ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTTA ACGAGGTATG TCTTATCGGG TGAT-CAAG-
CMW 1651 C. parasitica USA              ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTTA ACGAGGTATG TCTTATCGGG TGATACAAG-
CMW 1652 C. parasitica USA              ACCTCCGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTTA ACGAGGTATG TCTTATCGGG TGAT-CAAG-
CMW 5288 D. ambigua                     ACTTCTGAGC TCCAGCTCGA GCGCATGAAC GTCTACTTCA ACGAGGTAAG TCAACAACTG CACATCATCC
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                                    780        790        800        810        820        830        840
CMW 62 Eucalyptus South Africa      CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 2113 Eucalyptus South Africa    CTGGCGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 8755 Eucalyptus South Africa    CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9327 Tibouchina South Africa    CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9328 Tibouchina South Africa    CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9932 Tibouchina South Africa    CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9364 Syzygium South Africa      CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9366 Syzygium South Africa      CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 10192 Syzygium South Africa     CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 10046 Syzygium South Africa     CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 10036 Syzygium South Africa     CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 10076 Syzygium South Africa     CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 10086 Syzygium South Africa     CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 8757 Eucalyptus Venezuela       CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 1853 Syzygium aromaticum        CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9927 Tibouchina Colombia        CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9929 Tibouchina Colombia        CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9928 Tibouchina Colombia        CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 8756 Eucalyptus Indonesia       CTGGGGC-GT CATCCCGCCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9906 Eucalyptus Kalimantan      CTGGGGC-GT CATCCCGTCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 9903 Eucalyptus Kalimantan      CTGGGGC-GT CATCCCGTCC GCGAACCCCC TGTGCGTGAC CGAGCTCCCG C--------- ----------
CMW 7036 C. eucalypti South Africa  CTCCAGCCAT CATCCTGCCT CCTGCCTCCT CCTTCCA-TC GGGACTTCTG TGGCCTG-AC C---------
CMW 7037 C. eucalypti Australia     CTCGAGCCAT CATCCTGCCT CCTCCCTCCT CATCCCC-TC GGGGCTTTTG TGGCCTG-AC C---------
CWM 7038 C. eucalypti Australia     CTCGAGCCAG CATCCTGCCT CCTGCCTCCT CATCCCC-TC GGGGCTTTTG TGGCCTG-AC C---------
CMW 7047 C. parasitica USA          CTCAAGCTTC CA-CCTCGGC CACCCCCCCC CCCCC-TTTC CGGGG-CCCT C-----G-A- ----------
CMW 7048 C. parasitica USA          CTCAAGCTTC CA-CCTCGGC CAACCCCCCC CCCCCCTTTC CGGGG-CCCT C-----G-A- ----------
CMW 1651 C. parasitica USA          CTCAAGCTTC CA-CCTGGGC CAACCCCCCC CCCCC-TTTC CGGGG-CCTT C----TG-A- ----------
CMW 1652 C. parasitica USA          CTCAAGCTTC -A-CCTCGGC -AACCCCCCC CCCCC-TTTC CGGGG-CCTT ------G-A- ----------
CMW 5288 D. ambigua                 ATCCGACCAT ---CTC--C- AACACGG--- -----TTTAC TG----CC-G TCGCCCGGAC CTCG------
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                                        850        860        870        880        890        900        910
CMW 62 Eucalyptus South Africa          ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 2113 Eucalyptus South Africa        ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 8755 Eucalyptus South Africa        ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9327 Tibouchina South Africa        ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9328 Tibouchina South Africa        ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9932 Tibouchina South Africa        ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9364 Syzygium South Africa          ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9366 Syzygium South Africa          ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 10192 Syzygium South Africa         ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 10046 Syzygium South Africa         ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 10036 Syzygium South Africa         ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 10076 Syzygium South Africa         ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 10086 Syzygium South Africa         ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 8757 Eucalyptus Venezuela           ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 1853 Syzygium aromaticum            ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9927 Tibouchina Colombia            ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9929 Tibouchina Colombia            ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9928 Tibouchina Colombia            ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 8756 Eucalyptus Indonesia           ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9906 Eucalyptus Kalimantan          ---------- ---------- ---------T GACGCGCTCC T-GTCACA-G GCCTCCGGCA ACAAGTATGT
CMW 9903 Eucalyptus Kalimantan          ---------- ---------- ---------T GACGCGCTTC TTGTCACAAG GCTTCGGGCA ACAAGTATGT
CMW 7036 C. eucalypti South Africa      ---------- ------GAGC TTGCCCTTCT GACGCGTTTC TCGTCCA--G GCCTCCGGCA ACAAGTATGT
CMW 7037 C. eucalypti Australia         ---------- ------GAGC TTGCCCTTCT GACGCGTTTC TCGTCCA--G GCCTCCGGCA ACAAGTATGT
CWM 7038 C. eucalypti Australia         ---------- ------GAGC CTGCCCTTCT GACGCGTTTC TCGTCCA--G GCCTCCGGCA ACAAGTATGT
CMW 7047 C. parasitica USA              --CTTCTGGT ATAGGCGAGC TTCCTCTTCT GACGCGCTTC TTGTCCA--G GCCTCCGGCA ACAAGTATGT
CMW 7048 C. parasitica USA              --CTTCTGGT ATAGGCGAGC TTCCTCTTCT GACGCGCTTC TTGTCCA--G GCCTCCGGCA ACAAGTATGT
CMW 1651 C. parasitica USA              --CTTCTGGT ATAGGCGAGC ATCCTCTTCT GACGCGCTTC TTGTCCA--G GCCTCCGGCA ACAAGTATGT
CMW 1652 C. parasitica USA              --CTTCTGGT ATAGGCGAGC TTCCTCTTCT GACGCGCTTC TTGTCCA--G GCCTCCGGCA ACAAGTATGT
CMW 5288 D. ambigua                     ---------- ---------- --------CT AACGTG-TTA TCGCCCA--G GCCTCCGGCA ACAAGTATGT
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                                        920        930        940        950        960        970        980
CMW 62 Eucalyptus South Africa          CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 2113 Eucalyptus South Africa        CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 8755 Eucalyptus South Africa        CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 9327 Tibouchina South Africa        CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 9328 Tibouchina South Africa        CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 9932 Tibouchina South Africa        CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 9364 Syzygium South Africa          CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 9366 Syzygium South Africa          CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 10192 Syzygium South Africa         CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 10046 Syzygium South Africa         CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 10036 Syzygium South Africa         CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 10076 Syzygium South Africa         CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 10086 Syzygium South Africa         CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 8757 Eucalyptus Venezuela           CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 1853 Syzygium aromaticum            CCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 9927 Tibouchina Colombia            CCCCCGCGCC GTCCTCGTCG ACCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAA
CMW 9929 Tibouchina Colombia            CCCCCGCGCC GTCCTCGTCG ACCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAA
CMW 9928 Tibouchina Colombia            CCCCCGCGCC GTCCTCGTCG ACCTCGAGCC CGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAA
CMW 8756 Eucalyptus Indonesia           TCCCCGCGCC GTCCTCGTCG ATCTCGAGCC TGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 9906 Eucalyptus Kalimantan          TCCCCGCGCC GTCCTCGTCG ATCTCGAGCC TGGCACCATG GACGCCGTCC GTGCCGGCCC CTTCGGCCAG
CMW 9903 Eucalyptus Kalimantan          TCCCCGCGCC GTCCTTGTTG ATCTCGAACC TGGCACCATG GACGCCGTTC GTGCCGGCCC CTTCGGCCAG
CMW 7036 C. eucalypti South Africa      TCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGTACCATG GATGCCGTCC GCGCCGGCCC CTTCGGCCAG
CMW 7037 C. eucalypti Australia         TCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGTACCATG GATGCCGTCC GCGCCGGCCC CTTCGGCCAG
CWM 7038 C. eucalypti Australia         TCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGTACCATG GATGCCGTCC GCGCCGGCCC CTTCGGCCAG
CMW 7047 C. parasitica USA              TCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGTACCATG GATGCCGTCC GCGCTGGCCC CTTTGGTCAG
CMW 7048 C. parasitica USA              TCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGTACCATG GATGCCGTCC GCGCTGGCCC CTTTGGTCAG
CMW 1651 C. parasitica USA              TCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGTACCATG GATGCCGTCC GCGCTGGCCC CTTTGGTCAG
CMW 1652 C. parasitica USA              TCCCCGCGCC GTCCTCGTCG ATCTCGAGCC CGGTACCATG GATGCCGTCC GCGCTGGCCC CTTTGGTCAG
CMW 5288 D. ambigua                     TCCTCGCGCC GTCCTCGTCG ATCTCGAGCC CGGTACCATG GACGCCGTCC GTGCCGGTCC CTTTGGCCAG
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	990	1000	1010	
CMW 62 *Eucalyptus* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 2113 *Eucalyptus* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 8755 *Eucalyptus* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 9327 *Tibouchina* South Africa	CTGTTCCGCC	CCGACAACTT	TGTCTTCGGC	CAGTCC
CMW 9328 *Tibouchina* South Africa	CTGTTCCGCC	CCGACAACTT	TGTCTTCGGC	CAGTCC
CMW 9932 *Tibouchina* South Africa	CTGTTCCGCC	CCGACAACTT	TGTCTTCGGC	CAGTCC
CMW 9364 *Syzygium* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 9366 *Syzygium* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 10192 *Syzygium* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 10046 *Syzygium* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 10036 *Syzygium* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 10076 *Syzygium* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 10086 *Syzygium* South Africa	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 8757 *Eucalyptus* Venezuela	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 1853 *Syzygium aromaticum*	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 9927 *Tibouchina* Colombia	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 9929 *Tibouchina* Colombia	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 9928 *Tibouchina* Colombia	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 8756 *Eucalyptus* Indonesia	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 9906 *Eucalyptus* Kalimantan	CTGTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 9903 *Eucalyptus* Kalimantan	CTGTTCCGGC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 7036 *C. eucalypti* South Africa	CTGTTCCGTC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 7037 *C. eucalypti* Australia	CTGTTCCGTC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CWM 7038 *C. eucalypti* Australia	CTGTTCCGTC	CCGACAACTT	CGTCTTCGGC	CAGTCC
CMW 7047 *C. parasitica* USA	CTGTTCCGTC	CCGACAACTT	CGTCTTTGGC	CAGTCC
CMW 7048 *C. parasitica* USA	CTGTTCCGTC	CCGACAACTT	CGTCTTTGGC	CAGTCC
CMW 1651 *C. parasitica* USA	CTGTTCCGTC	CCGACAACTT	CGTCTTTGGC	CAGTCC
CMW 1652 *C. parasitica* USA	CTGTTCCGTC	CCGACAACTT	CGTCTTTGGC	CAGTCC
CMW 5288 *D. ambigua*	CTCTTCCGCC	CCGACAACTT	CGTCTTCGGC	CAGTCC