References

Adaskaveg J.E., and Hartin R. J. (1997). Characterization of *Colletotrichum acutatum* isolates causing anthracnose of almond and peach in California. Phytopathology 87: 979- 987.

Albersheim P. and Anderson A. (1971). Host-pathogen interactions. III. Proteins from plant cell walls inhibit polygalacturonases secreted by plant pathogens. Proceedings of the National Academy of Sciences of the United States of America 68: 1815-1819.

Andersen D. C. and Krummen L. (2002). Recombinant protein expression for therapeutic applications. Current Opinion in Biotechnology 13: 117–123.

Arendse M.S. (1999). Molecular cloning and analysis of a polygalacturonase-inhibiting protein (PGIP) gene from apple. MSc Thesis. RAU University.

Arendse M.S. Dubery I.A. and Berger D.K. (1999). Isolation by PCR-based methods of a plant antifungal polygalacturonase inhibiting protein gene. EJB. 2(3): 152-159.

Atkinson R.G., Schröder R., Hallett I.C., Cohen D., and MacRae E.A. (2002). Overexpression of polygalacturonase in transgenic apple trees leads to a range of novel phenotypes involving changes in cell adhesion. Plant Physiology 129: 122-133.

Barash I., Zilberman E., and Marcus L. (1984). Purification of *Geotrichum candidum* endopolygalacturonase from culture and from host tissue by affinity chromatography on cross-linked polypectate. Physiol. Plant. Path. 25: 161-169.

Bonnin E., Le Goff A., Körner R., Vigouroux J., Roepstorff P. and Thibault J.F. (2002). Hydrolysis of pectins with different degrees and patterns of methylation by the endopolygalacturonase of *Fusarium moniliforme*. Biochimica et Biophysica Acta 1596 (2002): 83-94.

Boudart G., Lafitte C., Barthe J.P., Frasez D. and Esquerré-Tugayé M. (1998). Differential elicitation of defense responses by pectic fragments in bean seedlings. Planta 206: 86-94.

Bradford M.M. (1976). A rapid and sensitive method for the quantification of microgram quantities of protein utilizing the principle of protein-dye binding. Analytical Biochemistry 72: 248- 254.

Bussink H.J.D., Kester H.C.M. and Visser J. (1990). Molecular cloning, nucleotide sequence and expression of the gene encoding prepro-polygalacturonaseII of *Aspergillus niger*. FEBS 273 (1,2): 127 – 130.

Bussink H.J.D., Buxton F.P., Fraaye B.A., de Graaff L.H. and Visser J. (1992). The polygalacturonases of *Aspergillus niger* are encoded by a family of diverged genes. Eur. J. Biochem. 208: 83 – 90.

Cabanne C., and Donèche B. (2002). Purification and characterization of two isozymes of polygalacturonase from *Botrytis; cinerea.* Effect of calcium ions on polygalacturonse activity. Microbiol.Res. 157: 1-7.

Caprari C., Richter A., Bergman C., LoCicero S., Salvi G. and Cervone F. (1993). Cloning and characterization of a gene encoding the endopolygalacturonase of *Fusarium moniliforme.* Mycological Research 97: 497- 505.

Centis S., Dumas B., Fournier J., Marolda M. and Esquerrè-Tugayé, M. (1996). Isolation and sequence analysis *Clpg1,* a gene coding for an endopolygalacturonase of the phytopathogenic fungus *Colletotrichum lindemuthianum.* Gene 170: 125-129.

Centis S., Guillas I., Séjalon N., and Esquerrè-Tugayé, M. (1997). Endopolygalacturonase genes from *Colletotrichum lindemuthianum:* cloning of *Clpg2* and comparison of its expression to that of *Clpg1* during saprophytic and parasitic growth of the fungus. Molecular Plant-Microbe Interactions 6: 769-775.

Cereghino J.L. and Cregg J.M. (1999). Heterologous protein expression in the methylotrophic yeast *Pichia pastoris*. FEMS Microbiology Reviews 24: 45-66.

Chomczynski P. and Sacchi N. (1987). Anal Biochem. 162: 156-159.

Collmer A. and Keen N.T. (1986). The role of pectic enzymes in plant pathogenesis. Ann. Rev. Phytipathol. 24: 383 – 409.

Cooper R.M., Wardman P.A. and Skelton J.E.M. (1981). The influence of cell walls from host and non-host plants on the production and activity of polygalacturonide-degrading enzymes from fungal pathogens. Phys. Plant. Path. 18: 239 – 255.

Dal Degan F., Child R., Svendsen I. and Ulvskov P. (2001). The cleavable N-terminal domain of plant endopolygalacturonases from clade B may be involved in a regulated secretion mechanism. J.boil.chem. 276: 35297 – 35304.

De Lorenzo G., D'Ovidio R. and Cervone F. (2001). The role of polygalacturonase-inhibiting proteins (PGIPs) in defense against pathogenic fungi. Annu Rev. Phytopathol. 39: 313- 35.

De Lorenzo G. and Ferrari S. (2002). Polygalacturonase-inhibiting proteins in defense against phytopathogenic fungi. Current Opinion in Plant Biology 5:295-299.

D'Ovidio R., Mattei B., Roberti S. and Bellincampi D. (2004). Polygalacturonases, polygalacturonase-inhibiting proteins and pectic oligomers in plant-pathogen interactions. Biochimica et Biophysica Acta 1696:237-244.

Dugert M. and Ehrlich S.P. (1974). Prolonged incubation in Calcium chloride improves competence of *Escherichia coli* cells. Gene 6:23-28 (Current protocols section 1.8.1).

Dumas B., Centis S., Sarrazin N. and Esquerrè-Tugayé, M. (1999). Use of green fluorescent protein to detect expression of an endopolygalacturonase gene of *Colletotrichum lindemuthianum* during bean infection. Appl. and Environ. Microbiol. 65(4): 1769-1771.

Esquerré-Tugayé M., Boudart G. and Dumas B. (2000). Cell wall degrading enzymes, inhibitory proteins, and oligosaccharides participate in the molecular dialogue between plants andpathogens. Plant Physiol. Biochem. 38 (1/2): 157-163.

Evans, G. I., Lewis, G. K., Ramsay, G., and Bishop, V. M. (1985). Isolation of Monoclonal Antibodies Specific for c-myc Proto-oncogene Product. Mol. Cell. Biol. 5: 3610-3616.

Federici L., Caprari C., Mattei B., Savino C., Di Matteo A., De Lorenzo G., Cervone F. and Tsernoglou D. (2001). Structural requirements of endopolygalacturonase for the interaction with PGIP (polygalacturonase inhibiting protein). PNAS. 98 (23): 13425–13430.

Glass N. L. and Donaldson G. C. (1995). Development of primer sets designed for use with the PCR to amplify conserved genes from filamentous ascomycetes. Appl. Environ. Microbiol. Vol 61 (4): 1323-1330.

Gognies S. and Belarbi A. (2002). Endopolygalacturonase of *Saccharomyces cerevisiae*: involvement in pseudohyphae development of haploids and in pathogenicity on *Vitis Vinifera*. Plant Science. 163: 759 – 769.

Gonzalez-Candelas G.W.L., and Kolattukudy P.E. (1995) Cloning of a novel constitutively expressed pectate lyase gene *pelB* from *Fusarium solani* f. sp. *pisi* (*Nectria haematococca*, mating type VI) and characterization of the gene product expressed in *Pichia pastoris*. J. Bacteriol. 177: 7070-7077.

Gonzalez-Candelas G. W.L., and Kolattukudy P.E. (1996). Cloning of a novel *pelD* gene expressed uniquely in planta by *Fusarium solani* f. sp. *pisi* (*Nectria haematococca*, mating type VI) and characterization of its protein product as an endo-pectate lyase. Arch. Biochem. Biophys. 332: 305-312.

Gurr S. J., Unkles S. E. and Kinghorn J. R. (1987). In Gene Structure in Eukaryotic Microbes (ed. J.R. Kinghorn), pp. 93-139. IRL Press: Oxford, U.K.

Houard S., Heinderyckx M. and Bollen A. (2002). Engineering of non-conventional yeasts for efficient synthesis of macromolecules: the methylotrophic genera. Biochimie. 84: 1089–1093.

Isshiki A., Akimitsu K., Yamamoto M. and Yamamoto H. (2002). Endopolygalacturonase is Essential for citrus black rot caused by *Alternaria citri* but not brown spot caused by *Alternaria alternata*. MPMI. 14: 749–757.

Johnston D.J. and Williamson B. (1992). Purification and characterisaton of four polygalacturonases from *Botrytis cinerea.* Mycol. Res. 5: 343-349.

Koch S.H. (1996). *Colletotrichum* spp. on dry beans and lupins in South Africa. PhD. thesis. University of Pretoria, South Africa.

Koch S.H., Ghebremariam D.S. and Swart W.J. (2002). Susceptibility of lupin cultivars to South African isolates of Colletotrichum gloeosporioides associated with lupin anthracnose. African Plant Protection 8 (1 &2).

Lafitte C., Barthe J.P., Gansel X., Dechamp-Guillaume G., Faucher C., Mazau D. and Esquerré-Tugayé M.T. (1993). Differential induction by endopolygalacturonase of β-1,3-glucanases in Phaseolus vulgaris isoline susceptible and resistant to *Colletotrichum lindemuthianum* race β. MPMI. 6: 628-634.

Li J. and Goodwin P.H. (2002). Expression of *cmpg2*, an endopolygalacturonase gene of *Colletotrichum gloeosporioides* f.sp. *malvae*, in culture and during infection of *Malva pusilla*. J. Phytopathology. 150: 213- 219.

Markovič O. and Janeček Š. (2001). Pectin degrading glycoside hydrolases of family 28: sequence-structural features, specificities and evolution. Protein Engineering. 14: 615-631.

Nakamura M., Suprapta DN., Iwai H. and Arai K. (2001). Comparison of endo-polygalacturonase activities of citrus and non-citrus races of *Geotrichum candidum*, and cloning and expression of the corresponding genes. Molecular Plant Path. 2**:** 265-274.

Nirenberg H.I., Feiler U. and Hagedorn G. Description of *Colletotrichum lupini* comb. nov. in modern terms. (2002). Mycologia 94 (2): 307-320.

Oelofse D. (2003). Molecular strategies towards anthracnose resistance in lupin. PhD thesis. University of Pretoria, South Africa.

Oeser B., Heidrich P.M., Muller U., Tudzynski P. and Ten Berge K.B. (2002). Polygalacturonase is a pathogenicity factor in the *Claviceps purpurea*/rye interaction. Fungal Genetics and Biology. 36**:** 176-186.

Pařenicová L., Benen J.A.E., Kester H.C.M. and Visser J. (2000 a). PgaA and pgaB encode two constitutively expressed endopolygalacturonases of *Aspergillus niger*. Biochem. J. 345**:** 637-644.

Pařenicová L., Kester H.C.M., Benen J.A.E. and Visser J. (2000 b). Characterisation of a noval endopolygalacturonases from *Aspergillus niger* with unique kinetic properties. FEBS Letters. 467 **(2-3):** 333-336.

Poinssot B., Vandelle E., Bentéjac M., Adrian M., Levis C., Brygoo Y., Garin J., Sicillia F., Coutos- Thévenot P. and Pugin A. (2003). The endopolygalacturonase 1 from *Botrytis cinerea* activates grapevine defense reactions unrelated to its enzymatic activity. MPMI 16 (6): 553-564.

Raeder U. and Broda P. (1985). Rapid preparation of DNA from filamentous fungi. Lett Appl. Microbiol. 1**:**17-20.

Rai M. and Harish P. (2001). Expression systems for production of heterologous proteins. Curr. Science. 80 (9): 1121- 1128.

Rayner R.W., A mycological colour chart. (1970). Commonwealth Mycological Institute and British Mycological Society: Kew, England.

Ridley B.L., O'Neill M.A. and Mohnen D. (2001). Pectins: structure, biosynthesis, and oligogalacturonide-related signaling, Phytochemistry.57: 929–967.

Saitou N. and Nei M. (1978). The neighbour joining method: a new method for reconstructing phylogenetic tree. Molecular Biology and Evolution 4: 406- 425.

Sambrook J., Fritsch E.F., and Maniatis T. (1989). Molecular Cloning. A laboratory manual (2nd edition). Cold Spring Harbour Laboratory Press, Cold Spring Harbour, NY, USA.

Scott- Craig J.S., Cheng Y. Cervone F., De Lorenzo G., Pitkin J.W. and Walton J.D. (1998). Targeted Mutants of *Cochliobolus carbonum* Lacking the Two Major Extracellular Polygalacturonases. Appl. Environ. Microbiol. 64 (4): 1497–1503.

Scott- Craig J.S., Panaccione D. G., Cervone F. and J. D. Walton. (1990). Endopolygalacturonase is not required for pathogenicity of *Cochliobolus carbonum* on maize. Plant Cell 2: 1191–1200.

Seideman C. E., Struhl K., Sheen J., Jessen T. (1997). Current protocols in molecular biology. Section 1.8.1.

Shieh M., Brown R. L., Whitehead M. P., Cary J. W., Cotty P.J., Cleveland T. E. and Deani R. A. (1997). Molecular Genetic Evidence for the Involvement of a Specific Polygalacturonase, P2c, in the Invasion and Spreadof *Aspergillus flavus* in Cotton Bolls. Appl. Environ. Microbiol. 63: 3548 – 3552.

Sreenvasaprasad S., Mills P. R. and Brown A. E. (1994). Nucleotide sequence of the rDNA spacer 1 enables identification of isolates of *Colletotrichum* as *C. acutatum.* Mycological Research. 98: 186-188.

Swofford D.L. (1999). Paup*. Phylogenetic analysis using parsimony (*and other methods), version 4. Massachusetts: Sinauer Associates, Sunderland.

Talhinas P., Sreenivasaprasad S., Neves-Martins J., and Oliveira H. (2002). Genetic and morphological characterization of *Colletotrichum acutatum* causing anthracnose of lupins. *Phytopathology.* 92**:** 986-996.

Taylor R.J. and Secor G.A. (1988). An improved diffusion assay for quantifying the polygalacturonase content of *Erwinia* culture filtrates. Phytopathology. 78 (8): 1101-1103.

Ten Have A., Mulder W., Visser J. and van Kan J.A.L. (1998). The endopolygalacturonse gene Bcpg1 is required for full virulence of *Botrytis cinerea.* Molecular Plant Microbe Interactions. 11: 1009-1016.

Ten Have W. A., van Kan J.A.L. and Visser J. (1999). Cloning and partial characterization of endopolygalacturonase genes from *Botrytis cinerea*. Appl. Environ. Microbiol. 65 (4): 1596 – 1602.

Ten Have A., PhD Thesis. (2000) Wageningen University. The Netherlands.

The *Arabidopsis* Genome Initiative. (2002). Analysis of the genome sequence of the flowering plant *Arabidopsis thaliana.* Nature 408: 796 –815.

Torki M., Mandaron P., Mache R. and Falconet D. (2000). Characterization of a ubiquitous expressed gene family encoding polygalacturonase in *Arabidopsis thaliana* Gene 242: 427–436.

Van Santen Y., Benen J.A. E., Schröter K., Kalk K.H., Armand S., Visser J., Bauke W. D. (1999). 1.68-Å Crystal Structure of Endopolygalacturonase II from *Aspergillus niger* and Identification of Active Site Residues by Site-directed Mutagenesis. J. Biol. Chemistry 274 (43): 30474–30480.

Van Wyk M., Roux J., Barnes I., Wingfield B., Liew E., Assa B., Summerell B. and Wingfield M. (2004). *Ceratocystis polychroma* sp. nov., a new species from *Syzygium aromaticum* in Sulawesi. Studies in Mycology 50: 273- 282.

Warrens A. N., Jones M. D., and Lechler R.I. (1997). Splicing by overlap extension by PCR using asymmetric amplification: an improved technique for the generation of hybrid proteins of immunological interest. Gene 186: 29 –35.

Whitehead M.P., Shieh M.T., Cleveland T.E., Cary J.W. and Dean R.A. (1995). Isolation and characterisation of polygalacturonase genes (*pecA* and *pecB*) from *Apergillus flavus*. Appl. Environ. Microbiol. 61(9): 3316-3322.**Wubben J.P., Mulder**

Yakoby N., Kobiler I., Dinoor A. and Prusky D. (1999). pH regulation of pectate lyase secretion modulates the attack of *Colletotrichum gloeosporioides* on avocado fruits. Appl. Environ. Microbiol. 66 (3): 1026-1030.

Yang H.A. and Sweetingham M.W. (1998). The taxonomy of *Colletotrichum* isolates associated with lupin anthracnose. Aust. J. Agric.Res. 49: 1213-23.

Appendix A

TE- buffer

10 mM Tris- HCl
1 mM EDTA
pH 8.0

Genomic DNA extraction buffer

200mM	Tris HCl pH8.5
250 mM	NaCl
25mM	EDTA
0.5 %	SDS

2 × Wash buffer

2 × SSC
0.1% SDS

0.5 × Wash buffer

0.5 × SSC
0.1% SDS

Maleic acid buffer (Southern blot)

0.1 M	Maleic acid
0.15 M	NaCl

Adjust pH to 7.5 with NaOH (solid)

Washing Buffer (Southern blot)

0.1 M Maleic acid
0.15 M NaCl
Adjust pH to 7.5 with NaOH (solid)
0.3 % (v/v) Tween 20

Detection buffer (Southern blot)

0.1 M Tris-HCl
0.15 M NaCl
pH 9.5

Formamide hybridisation buffer (Southern blot)

5 × SSC
50 % formamide, deionised
0.1 % sodium-lauroylsarcosine
0.02 % SDS
2% Blocking agent (fat-free milk powder)

Pectin medium

NH_4NO_3	1g / 500ml
KH_2PO_4	0.5g / 500ml
$MgSO_4$	0.05g / 500ml
Yeast extract	0.25g / 500ml
NaOH	0.5g / 500ml
D-maleic acid	1.5g / 500ml

0.25 g/ 25 ml washed pectin

BMMY (Buffered methanol-complex medium)

1% yeast extract
2% peptone
100mM potassium phosphate, pH 6.0
1.34 % YNB
4 × 10 –5 % biotin
1% glycerol or 0.5% methanol

LSLB (Low Salt Luria Broth) Medium

10 g Tryptone
5 g NaCl
5 g Yeast Extract

Combine the dry reagents above and add deionized, distilled water to 950 ml.
Adjust pH to 7.5 with 1 N NaOH. Bring the volume up to 1 liter. For plates, add 15 g/L agar before autoclaving.
Autoclave on liquid cycle at 15 lbs/sq. in. and 121°C for 20 minutes.
Allow the medium to cool to at least 55°C before adding the Zeocin to 25 μg/ml final concentration.
Store plates at 4°C in the dark. Plates containing Zeocin. are stable for 1-2 weeks.

5× RNA Loading buffer

Saturated bromophenol blue	16µl
500 mM EDTA, pH 8.0	80µl
37% (12.3 M) formaldehyde	700µl
100% glycerol	2ml
Formamide	3.084ml
10×FA gel buffer	4ml
RNase-free water to 10 ml	

10× FA gel buffer

200mM 3-[Morpholino]propanesulfonic acid(MOPS) (free acid)
50mM Sodium acetate
10 mM EDTA
pH to 7.0 with NaOH

1× FA gel buffer

10 × FA gel buffer	100 ml
37% (12.3 M)	20 ml
RNase-free water to 1L	

SDS-PAGE separating gel (10 %)

Acrilamide stock (30%)	1650 µl
Tris- HCl (1.5 M) pH 6.8	620 µl
SDS (10%)	50 µl
APS	25 µl
Temed	8 µl
dH_2O	2020 µl

SDS-PAGE stacking gel

Tris-HCl (0.5M) pH 6.8	620 µl
SDS (10%)	25 µl
Acrilamide stock (30%)	330 µl
APS (10%)	15 µl
Temed	8 µl
dH_2O	1520 µl

Loading Buffer (SDS-PAGE) 3 ×

Tris-HCl pH 6.8 (50mM)	3 ml
Glicerol (8%)	2.4 ml
SDS (20%)	2,4 ml
2-β-mercaptoetanol (4%)	1.2 ml
dH_2O to an end volume of 10 ml	
Bromophenolblue to the desired colour intensity	

Transfer stock solution 10 × (Western Blot)

Tris (base)	96.8 g/l
Glycine	9.74 g/l
pH 9.2	

Transfer Buffer (Western Blot)

Methanol	200 ml
Transfer stock solution 10×	100 ml
dH_2O	700 ml

PBS 10 × Stock

NaCl	1.3 M
Na_2HPO_4 .$12H_2O$	70 mM
NaH_2PO_4. $1H_2O$	30 mM
pH 7.3	

Blocking buffer (Western blot)

1× PBS	
Tween	(0.2%)
Fat free milk powder	(5%)
or BSA	(3%)

Washing buffer (Western blot)

1× PBS	
Tween	(0.2%)
H_2O (ultra pure)	

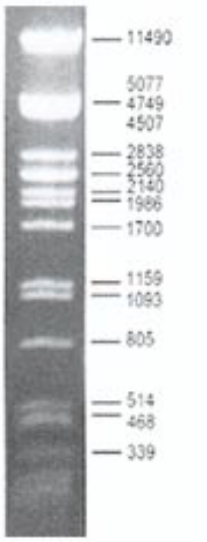
Incubation buffer (Western blot)

1× PBS	
Tween	(0.2%)
BSA	(0.5%)
H_2O (ultra pure)	

1 × TNE Buffer

10 mM Tris-HCl pH 8.0
1 mM EDTA pH 8.0
0.2 M NaCl
pH 7.4

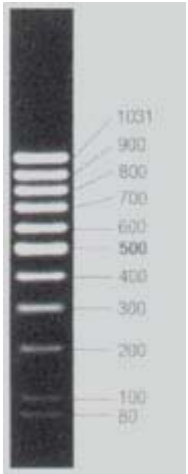
Appendix B



λ *PstI* generated DNA molecular marker

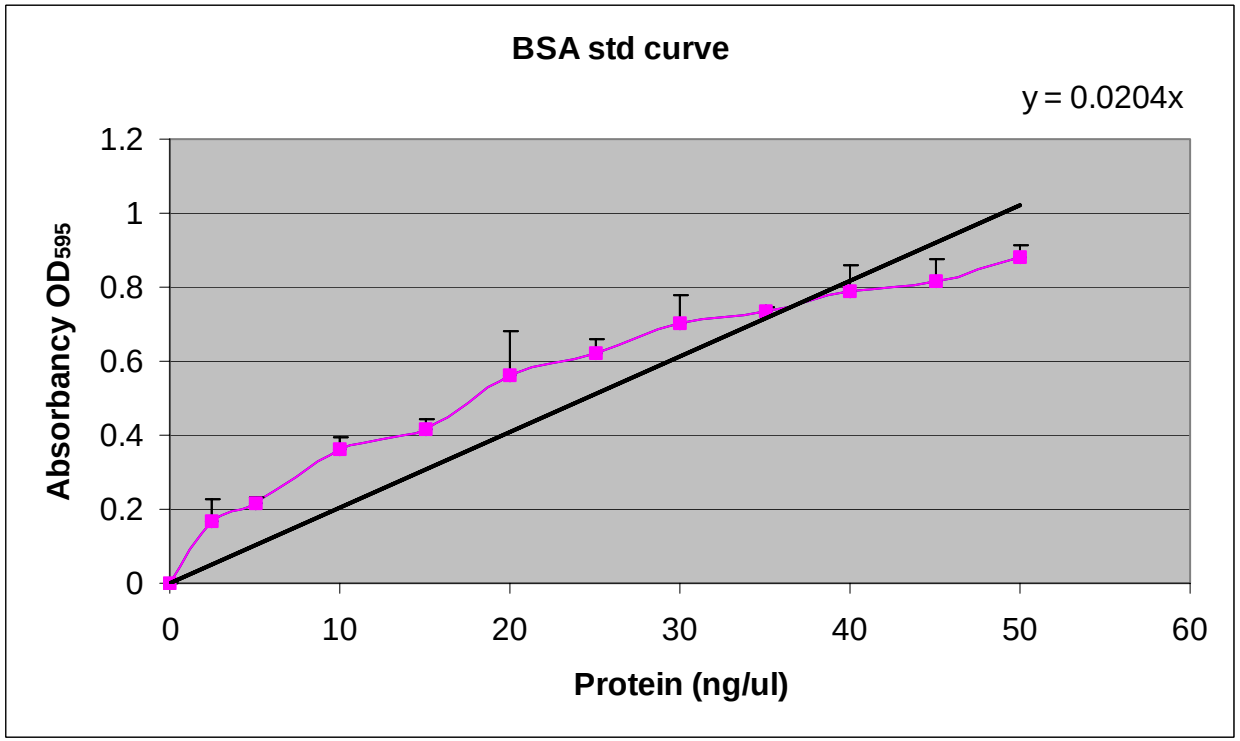
1KB plus DNA molecular marker

SDS protein markers



100 bp molecular marker

Appendix C



BSA standard curve for the Biorad microassay procedure performed in triplicate.

Appendix D

Complete aligned nucleotide sequences of the ITS1, 5.8 S rDNA and ITS2 region for 31 different taxa including *Colletotrichum* SHK 2148

```
                                           111111111122222222223333333333444444444455555555556
Taxon/Node                        123456789012345678901234567890123456789012345678901234567890
---------------------------------------------------------------------------------------------------------
C. gloeosporioides (AF090855)     ---------------TAGGGTCTCCGCGACCCTCCCGGCCTCCC-GCCTCCGGGCGGGTC   [44]
C. gloeosporioides (HO19)         ---------------..................-.C.G.CT..C..............   [44]
C. gloeosporioides (CR45)         -----TAGGGTCTCCGC.A-----.C.TC..GG..TCCG.CT..-.G.---...TC..--   [44]
C. gloeosporioides (CR21)         TAGGG-----TCTCCGC.A-----.C.TC..GG..TC--.CG..-T..GGGC..GTC.--   [45]
C. coccodes (BBA71527)            ---GGACAACCCCCC.C...GGG.G.TCC.....-.C.G.CG.G-C....AC..GC.T--   [53]
C. cf. truncatum (BBA71528)       CGGGCAGAGGTTCCC.C.C.GAA..C.TC..GGTGAC.-.C.T.-A.-----..GC.T--   [51]
C. acutatum (AF081292)            CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...CA..A.G...AC..--   [58]
C. acutatum (AF090853)            CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. acutatum (BBA71292)            CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. acutatum (C2897)               CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. acutatum (CMG12)               CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. lupini var. setosum (BBA70073) CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
Colletotrichum SHK2148            CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. lupini var. setosum (BBA70352) CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. lupini (BBA71330)              CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. lupini var. setosum (BBA71310) CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. lupini var. lupini (BBA63879)  CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. lupini var. lupini (BBA70884)  CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. lupini var. lupini (BBA71249)  CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. acutatum (HY09)                CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
C. acutatum (BBA71370)            CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C..--A..A.G...AC..--   [56]
C. acutatum (BBA71371)            CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C..--A..A.G...AC..--   [56]
C. acutatum (JG05)                CAGGGGAAGCCTCTCGT...CGGA.C.TC..GG.G.C.G.C..--.T.A.G...GC..--   [56]
C. acutatum (TN47)                CAGGGGAAGCCTCTCGT...CGGA.C.TC..GG.G.C.G.C..--.T.A.G...GC..--   [56]
C. acutatum (CR46)                CAGGGGAAGCCTCTCGC...C....C.TC..GG.G.C.G.C...-A..A.G...AC..--   [57]
Neurospora crassa                 CCGGAAAGGCCTT---C...C....CG..T.--.T...GTCT..-----.GCTCGC..C-   [49]
```

```
                                                                        11111111111111111111
                                  666666666677777777778888888888999999999900000000001111111112
Taxon/Node                        123456789012345678901234567890123456789012345678901234567890
----------------------------------------------------------------------------------------------------------
C. gloeosporioides (AF090855)     GGCGCCCGCCGGAGGAT---AACCAAACTCTGATTTAACGACGTTTCTTCTGAGTGGTAC   [101]
C. gloeosporioides (HO19)         .................---........................................   [101]
C. gloeosporioides (CR45)         --...............---........................................   [99]
C. gloeosporioides (CR21)         .-.......G.AG.AT----........................................   [100]
C. coccodes (BBA71527)            ................----T.........AT.......................C..   [109]
C. cf. truncatum (BBA71528)       C...............----T.........AT.......................C..   [107]
C. acutatum (AF081292)            ................----..........AT..AC.......C...........C..   [114]
C. acutatum (AF090853)            ................----..........AT..AC.......C...........C..   [113]
C. acutatum (BBA71292)            ................----..........AT..AC.......C...........C..   [113]
C. acutatum (C2897)               ................----..........AT..AC.......C...........C..   [113]
C. acutatum (CMG12)               ................----..........AT..AC.......C...........C..   [113]
C. lupini var. setosum (BBA70073) ................----..........AT..AC.......C...........C..   [113]
Colletotrichum SHK2148            ................----..........AT..AC.......C...........C..   [113]
C. lupini var. setosum (BBA70352) ................----..........AT..AC.......C...........C..   [113]
C. lupini (BBA71330)              ................----..........AT..AC.......C...........C..   [113]
C. lupini var. setosum (BBA71310) ................----..........AT..AC.......C...........C..   [113]
C. lupini var. lupini (BBA63879)  ................----..........AT..AC.......C...........C..   [113]
C. lupini var. lupini (BBA70884)  ................----..........AT..AC.......C...........C..   [113]
C. lupini var. lupini (BBA71249)  ................----..........AT..AC.......C...........C..   [113]
C. acutatum (HY09)                ................----..........AT..AC.......C...........C..   [113]
C. acutatum (BBA71370)            ................----..........AT..AC.......C...........C..   [112]
C. acutatum (BBA71371)            ................----..........AT..AC.......C...........C..   [112]
C. acutatum (JG05)                A...............----..........AT..AC.......C...........C..   [112]
C. acutatum (TN47)                A...............----..........AT..AC.......C...........C..   [112]
C. acutatum (CR46)                ................----..........AT..AC.......C...........C..   [113]
Neurospora crassa                 --T...........TGCCGA...T.......TGA..TTT-.T..C...-......AA-..   [104]
```

```
                                 1111111111111111111111111111111111111111111111111111111111111111
                                 2222222223333333333444444444455555555556666666666777777777778
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------------
C. gloeosporioides (AF090855)    AAGCAAATAATCAAAACTTTT-AACAACCGGATCTCTTGGTTCTGGCATCGATGAAGAAC   [160]
C. gloeosporioides (HO19)        ....................-......G.-............................   [159]
C. gloeosporioides (CR45)        ....................-......G.-............................   [157]
C. gloeosporioides (CR21)        ..........C.........-......G.-............................   [157]
C. coccodes (BBA71527)           ...........T.........-......G.-............................   [167]
C. cf. truncatum (BBA71528)      ...........T.........-......G.-............................   [165]
C. acutatum (AF081292)           ...........T.........T......G.............................   [174]
C. acutatum (AF090853)           ...........T.........-......G.-............................   [171]
C. acutatum (BBA71292)           ...........T.........-......G.-............................   [171]
C. acutatum (C2897)              ...........T.........-......G.-............................   [171]
C. acutatum (CMG12)              ...........T.........-......G.-............................   [171]
C. lupini var. setosum (BBA70073) ...........T.........-......G.-............................   [171]
Colletotrichum SHK2148           ...........T.........-......G.-............................   [171]
C. lupini var. setosum (BBA70352) ...........T.........-......G.-............................   [171]
C. lupini (BBA71330)             ...........T.........-......G.-............................   [171]
C. lupini var. setosum (BBA71310) ...........T.........-......G.-............................   [171]
C. lupini var. lupini (BBA63879) ...........T.........-......G.-............................   [171]
C. lupini var. lupini (BBA70884) ...........T.........-......G.-............................   [171]
C. lupini var. lupini (BBA71249) ...........T.........-......G.-............................   [171]
C. acutatum (HY09)               ...........T.........-......G.-............................   [171]
C. acutatum (BBA71370)           ...........T.........-......G.-............................   [170]
C. acutatum (BBA71371)           ...........T.........-......G.-............................   [170]
C. acutatum (JG05)               ...........T.........-......G.-............................   [170]
C. acutatum (TN47)               ...........T.........-......G.-............................   [170]
C. acutatum (CR46)               ...........T.........-......G.-............................   [171]
Neurospora crassa                TTTT......GTC...AC...C......G.-............................   [163]


                                 1111111111111111111222222222222222222222222222222222222222222222
                                 8888888889999999999000000000011111111112222222222333333333334
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------------
C. gloeosporioides (AF090855)    GCAGCGAAATGCGATAAGTAATGTGAATTGCAGAATTCAGTGAATCATCGAATCTTTGAA   [220]
C. gloeosporioides (HO19)        ..................................................................   [219]
C. gloeosporioides (CR45)        ..................................................................   [217]
C. gloeosporioides (CR21)        ..................................................................   [217]
C. coccodes (BBA71527)           ..................................................................   [227]
C. cf. truncatum (BBA71528)      ..................................................................   [225]
C. acutatum (AF081292)           ..................................................................   [234]
C. acutatum (AF090853)           ..................................................................   [231]
C. acutatum (BBA71292)           ..................................................................   [231]
C. acutatum (C2897)              ..................................................................   [231]
C. acutatum (CMG12)              ..................................................................   [231]
C. lupini var. setosum (BBA70073) ..................................................................   [231]
Colletotrichum SHK2148           ..................................................................   [231]
C. lupini var. setosum (BBA70352) ..................................................................   [231]
C. lupini (BBA71330)             ..................................................................   [231]
C. lupini var. setosum (BBA71310) ..................................................................   [231]
C. lupini var. lupini (BBA63879) ..................................................................   [231]
C. lupini var. lupini (BBA70884) ..................................................................   [231]
C. lupini var. lupini (BBA71249) ..................................................................   [231]
C. acutatum (HY09)               ..................................................................   [231]
C. acutatum (BBA71370)           ..................................................................   [230]
C. acutatum (BBA71371)           ..................................................................   [230]
C. acutatum (JG05)               ..................................................................   [230]
C. acutatum (TN47)               ..................................................................   [230]
C. acutatum (CR46)               ..................................................................   [231]
Neurospora crassa                ................G.................................................   [223]
```

```
                                 2222222222222222222222222222222222222222222222222222222222223
                                 4444444445555555556666666666777777777788888888899999999990
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. gloeosporioides (AF090855)    CGCACATTGCGCCCGCCAGCATTCTGGCGGGCATGCCTGTTCGAGCGTCATTTCAACCCT   [280]
C. gloeosporioides (HO19)        ..........................................................   [279]
C. gloeosporioides (CR45)        ..........................................................   [277]
C. gloeosporioides (CR21)        ..........................................-...............   [276]
C. coccodes (BBA71527)           ..........................................................   [287]
C. cf. truncatum (BBA71528)      ..........................................................   [285]
C. acutatum (AF081292)           ...........T................A..............................   [294]
C. acutatum (AF090853)           ...........T................A.................A............   [291]
C. acutatum (BBA71292)           ...........T................A..............................   [291]
C. acutatum (C2897)              ...........T................A..............................   [291]
C. acutatum (CMG12)              ...........T................A..............................   [291]
C. lupini var. setosum (BBA70073) ...........T................A..............................   [291]
Colletotrichum SHK2148           ...........T................A..............................   [291]
C. lupini var. setosum (BBA70352) ...........T................A..............................   [291]
C. lupini (BBA71330)             ...........T................A..............................   [291]
C. lupini var. setosum (BBA71310) ...........T................A..............................   [291]
C. lupini var. lupini (BBA63879) ...........T................A..............................   [291]
C. lupini var. lupini (BBA70884) ...........T................A..............................   [291]
C. lupini var. lupini (BBA71249) ...........T................A..............................   [291]
C. acutatum (HY09)               ...........T................A..............................   [291]
C. acutatum (BBA71370)           ...........T................A..............................   [290]
C. acutatum (BBA71371)           ...........T................A..............................   [290]
C. acutatum (JG05)               ...........T................A..............................   [290]
C. acutatum (TN47)               ...........T................A..............................   [290]
C. acutatum (CR46)               ...........T................A..............................   [291]
Neurospora crassa                ...........T......T.........A............................A.   [283]


                                 3333333333333333333333333333333333333333333333333333333333333333
                                 0000000001111111111222222222233333333334444444445555555556
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. gloeosporioides (AF090855)    CAAGCTCTGCTTGGTGTTGGGGCCCTACAGC-CGATGTAGGCCCTCAAAGGTAGTGGCGG   [339]
C. gloeosporioides (HO19)        ..............................-............................   [338]
C. gloeosporioides (CR45)        ..............................-............................   [336]
C. gloeosporioides (CR21)        ..............................-............................   [335]
C. coccodes (BBA71527)           .....C.....................G.T-...C.........T..............   [346]
C. cf. truncatum (BBA71528)      ............................G.TTAA.C.........T..............   [345]
C. acutatum (AF081292)           .....A.C.......T.........C..G..-AC.C..G......T..............   [353]
C. acutatum (AF090853)           .....A.C.......T.........C..G..-AC.C..G......T..............   [350]
C. acutatum (BBA71292)           .....A.C.......T.........C..G..-AC.C..G......T..............   [350]
C. acutatum (C2897)              .....A.C.......T.........C..G..-AC.C..G......T..............   [350]
C. acutatum (CMG12)              .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
C. lupini var. setosum (BBA70073) .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
Colletotrichum SHK2148           .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
C. lupini var. setosum (BBA70352) .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
C. lupini (BBA71330)             .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
C. lupini var. setosum (BBA71310) .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
C. lupini var. lupini (BBA63879) .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
C. lupini var. lupini (BBA70884) .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
C. lupini var. lupini (BBA71249) .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
C. acutatum (HY09)               .....A.C.......T.........C..G..-AC.C..G......TG.............   [350]
C. acutatum (BBA71370)           .....A.C.......T.........C..G..-AC.C..G......T..............   [349]
C. acutatum (BBA71371)           .....A.C.......T.........C..G..-AC.C..G......T..............   [349]
C. acutatum (JG05)               .....A.C.......T.........C..G..-...C..G......T..............   [349]
C. acutatum (TN47)               .....A.C.......T.........C..G..-...C..G......T..............   [349]
C. acutatum (CR46)               .....A.C.......T.........C..G..-...C..G......T..............   [350]
Neurospora crassa                ............-C.......AT.CG.G..-------.GTC.G......ATC........   [336]
```

```
                                 3333333333333333333333333333333333333333444444444444444444444444
                                 6666666667777777777888888888899999999990000000000011111111112
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. gloeosporioides (AF090855)    ACCCTCCCGGAGCCTCCTTTGCGTAGTAACTTTACGTCTCGCACTGGGATCCGGAGGGAC   [399]
C. gloeosporioides (HO19)        ........................................................      [398]
C. gloeosporioides (CR45)        ........................................................      [396]
C. gloeosporioides (CR21)        ........................................................      [395]
C. coccodes (BBA71527)           ..............................A.........................      [406]
C. cf. truncatum (BBA71528)      ......T.......................A-..................T........T   [404]
C. acutatum (AF081292)           ..............................A-..................T.........   [412]
C. acutatum (AF090853)           ...............................A..................T.........   [409]
C. acutatum (BBA71292)           ..............................A-..................T.........   [409]
C. acutatum (C2897)              ..............................A-..................T.........   [409]
C. acutatum (CMG12)              ..............................A-..........................   [409]
C. lupini var. setosum (BBA70073) ..............................A-........................-..   [408]
Colletotrichum SHK2148           ..............................A-..........................   [409]
C. lupini var. setosum (BBA70352) ..............................A-..........................   [409]
C. lupini (BBA71330)             ..............................A-..........................   [409]
C. lupini var. setosum (BBA71310) ..............................A-..........................   [409]
C. lupini var. lupini (BBA63879) ...............................-A...........C..............   [409]
C. lupini var. lupini (BBA70884) ..............................A-...........C..............   [409]
C. lupini var. lupini (BBA71249) ..............................A-...........C..............   [409]
C. acutatum (HY09)               ..............................A-...........C..............   [409]
C. acutatum (BBA71370)           ..............................A-..........................   [408]
C. acutatum (BBA71371)           ..............................A-..........................   [408]
C. acutatum (JG05)               ..............................A-..........................   [408]
C. acutatum (TN47)               ..............................A-..........................   [408]
C. acutatum (CR46)               ..............................A-..........................   [409]
Neurospora crassa                G.T.GT.A.TCA.AC.GA--....G..G...C...A..G.-T.TG.TCG.G...C...-T   [392]
```

```
                                 4444444444444444444
                                 2222222223333333333
Taxon/Node                       1234567890123456789
-----------------------------------------------------------
C. gloeosporioides (AF090855)    TCTTGCCGTAAAACCCCCC   [418]
C. gloeosporioides (HO19)        ...................   [417]
C. gloeosporioides (CR45)        ...................   [415]
C. gloeosporioides (CR21)        ...................   [414]
C. coccodes (BBA71527)           ..................A   [425]
C. cf. truncatum (BBA71528)      ...A..............A   [423]
C. acutatum (AF081292)           ..................A   [431]
C. acutatum (AF090853)           ..................A   [428]
C. acutatum (BBA71292)           ..................A   [428]
C. acutatum (C2897)              ..................A   [428]
C. acutatum (CMG12)              ...................   [428]
C. lupini var. setosum (BBA70073) ...................   [427]
Colletotrichum SHK2148           ...................   [428]
C. lupini var. setosum (BBA70352) ...................   [428]
C. lupini (BBA71330)             ...................   [428]
C. lupini var. setosum (BBA71310) ...................   [428]
C. lupini var. lupini (BBA63879) ...................   [428]
C. lupini var. lupini (BBA70884) ...................   [428]
C. lupini var. lupini (BBA71249) ...................   [428]
C. acutatum (HY09)               ...................   [428]
C. acutatum (BBA71370)           ...................   [427]
C. acutatum (BBA71371)           ...................   [427]
C. acutatum (JG05)               .........T........A   [427]
C. acutatum (TN47)               .........T........A   [427]
C. acutatum (CR46)               .........T........A   [428]
Neurospora crassa                ...................   [411]
```

Appendix E

Complete nucleotide alignment of the β-tubulin region 1 and β-tubulin region2 from several *Colletotrichum* isolates and one *Neurospora crassa* outgroup.

```
                                         1111111111222222222233333333334444444444555555555556
Taxon/Node                      123456789012345678901234567890123456789012345678901234567890
-----------------------------------------------------------------------------------------------
C. acutatum(PT30)               ????????????????????????????????CCTTGATACAGGCAGAACATCTCTGGCG   [60]
C. acutatum(PT29)               ATTTCGATATTTGACACGATCTC--GAACTGA............................   [58]
C. acutatum(JR15)               ATTTCGATATTTGACACGATCTC--GAACTGA............................   [58]
C. acutatum(CR02)               ATTTCGATATTTGACACGATCTC--GAACTGA............................   [58]
C. acutatum(96A4)               ATTTCGATATTTGACACGATCTC--GAACTGA............................   [58]
C.lupini var setosum(CW52)      ATTTCGATATTTGACACGATCTC--GAACTGA............................   [58]
C.lupini var lupini(CW51)       ATTTCGATATTTGACACGATCTC--GAACTGA.....GC.....................   [58]
Colletotrichum SHK2148          ATTTCGATATTTGACACGATCTC--GAACTGA............................   [58]
C. acutatum(JR03)               ATTCCGACATTTGACACGATCTC--GTACTGA.....G........A.............   [58]
C. acutatum(HO01)               ATTCCGACATTTGACACGATCTC--GTACTGA.....G........A.............   [58]
C. acutatum(CR20)               ATTCCGACATTTGACACGATCTC--GTACTGA.....G........A.............   [58]
C. acutatum(C2897)              ATTCCGACATTTGACACGATCTC--GTACTGA.....G........A.............   [58]
C. acutatum(JG05)               ATTTCGACATTTGACACGATCTC--ATACTGA...C..C.......A.............   [58]
C. acutatum(CR46)               ATTTCGACATTTGATACGATTTC--GTACTGA.....G........A.............   [58]
C. gloeosporioides(CR45)        ATATC-ATACTTGCGAGGACGGCAGATGTTGA.GA..GA.T.....A.....T.......   [59]
C. gloeosporioides(CR21)        ATATC-ATACTTGCGAGGACGGCAGATGTTGA.GA..GA.T.....A.....T.......   [59]
C. gloeosporioides(315)         ATAT--ATACTTGCGAGGACGGCAGATGTTGA.GA.AGAGT.....A.....T.......   [58]
C. gloeosporioides (HO19)       AATATCATACTTGCGAGGACGGCAGATGTTGA.GA..GA.T.....A.....T.......   [60]
C. falcatum(CFA12)              AGATCGGTCTCGGAAAGACTAGAT-ATATTGATACGAGC.......A.............   [59]
Neurospora crassa(M13906)       ????????????????????????????????????????????????????????????   [60]

                                                                       111111111111111111111
                                666666666777777777788888888889999999999000000000011111111112
Taxon/Node                      123456789012345678901234567890123456789012345678901234567890
-----------------------------------------------------------------------------------------------
C. acutatum(PT30)               AGCACGGTCTCGACAGCAATGGCGTGTATGTCACTT--GTCCTCCAGTGCGGCATCCTCA   [118]
C. acutatum(PT29)               ....................................--......................   [116]
C. acutatum(JR15)               ....................................--......................   [116]
C. acutatum(CR02)               ....................................--......................   [116]
C. acutatum(96A4)               ....................................--......................   [116]
C.lupini var setosum(CW52)      ....................................--......................   [116]
C.lupini var lupini(CW51)       ....................................--......................   [116]
Colletotrichum SHK2148          ....................................--......................   [116]
C. acutatum(JR03)               ...................................C--...........T...T...C.G   [116]
C. acutatum(HO01)               ...................................C--...........T...T...C.G   [116]
C. acutatum(CR20)               ...................................C--...........T...T...C.G   [116]
C. acutatum(C2897)              ...................................C--...........T...T...C.G   [116]
C. acutatum(JG05)               ................................T...--............A..TA....G   [116]
C. acutatum(CR46)               ....................................T-...............TG..C..   [117]
C. gloeosporioides(CR45)        .......C..A...........A..........TG-----..C.TTA.CT.T.CA.A.TG   [114]
C. gloeosporioides(CR21)        .......C..A...........A..........TG-----..C.TTA.CT.T.CA.A.TG   [114]
C. gloeosporioides(315)         .......C..............A..........TG----C..CTT.TCTG.C..CAT.G.   [114]
C. gloeosporioides (HO19)       .......C..A...........A..........T----.C..CTT.TCTGTC..CAT.GG   [116]
C. falcatum(CFA12)              .......C.......................AG.C---.A..C.AGA.CT..TCA.T.AC   [116]
Neurospora crassa(M13906)       ????????????????????????????????????????????????????????????   [120]

                                111111111111111111111111111111111111111111111111111111111111
                                222222222333333333344444444445555555555666666666677777777778
Taxon/Node                      123456789012345678901234567890123456789012345678901234567890
-----------------------------------------------------------------------------------------------
C. acutatum(PT30)               TGGACCCAG-CAGCTAATCACACCACAGGTACAACGGCACTTCCGAGCTCCAGCTCGAGC   [177]
C. acutatum(PT29)               .........-..................................................   [175]
C. acutatum(JR15)               .........-..................................................   [175]
C. acutatum(CR02)               .........-..................................................   [175]
C. acutatum(96A4)               .........-..................................................   [175]
C.lupini var setosum(CW52)      .........-..................................................   [175]
C.lupini var lupini(CW51)       .........-..........T.......................................   [175]
Colletotrichum SHK2148          .........-..................................................   [175]
C. acutatum(JR03)               .........-..........T....T..................................   [175]
C. acutatum(HO01)               .........-..........T....T..................................   [175]
C. acutatum(CR20)               .........-..........T....T..................................   [175]
C. acutatum(C2897)              .........-..........T....T..................................   [175]
C. acutatum(JG05)               .........-..........T.............T.........................   [175]
C. acutatum(CR46)               ......T..-T.......T.T.......................................   [176]
C. gloeosporioides(CR45)        GT.GTTG.--.C.....A.T.G-A....C...........C..T................   [171]
C. gloeosporioides(CR21)        GT.GTTG.--.C.....A.T.G-A....C...........C..T................   [171]
C. gloeosporioides(315)         ...--TTGA-.C.....A.T.G-A....C...........C..T................   [170]
C. gloeosporioides (HO19)       ...--TTGA-.C.....A.T.GA-....C...........C..T................   [172]
C. falcatum(CFA12)              .CA.GTTTA-.C......TT.T.A....T...........C..T................   [175]
Neurospora crassa(M13906)       ???????????G...TTCGG.C.GGGGTCGG.....A.CACC.AAG..CGG.AAG.T.T.   [180]
```

```
                                1111111111111111111122222222222222222222222222222222222222222222
                                8888888889999999999000000000011111111112222222222333333333334
Taxon/Node                      1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)               GCATGAGCGTCTATTTCAACGAAGTTT--GTTATCCTAGT-CCCCCAGTGTGCAGGC-AA   [233]
C. acutatum(PT29)               ..........................--.........-.................-..   [231]
C. acutatum(JR15)               ..........................--.........-.................-..   [231]
C. acutatum(CR02)               ..........................--.........-.................-..   [231]
C. acutatum(96A4)               ..........................--.........-.................-..   [231]
C.lupini var setosum(CW52)      ..........................--.........-.................-..   [231]
C.lupini var lupini(CW51)       ..........................--.........-.................-..   [231]
Colletotrichum SHK2148          ..........................--.........-.................-..   [231]
C. acutatum(JR03)               ...........C..............--.........-.................-..   [231]
C. acutatum(HO01)               ...........C..............--.........-.................-..   [231]
C. acutatum(CR20)               ...........C..............--.........-.................-..   [231]
C. acutatum(C2897)              ...........C..............--.........-.................-..   [231]
C. acutatum(JG05)               ...........C..............--.........-..T..............-..   [231]
C. acutatum(CR46)               .T.........C..............--.........-.................-..   [232]
C. gloeosporioides(CR45)        ...........C..............-....C.T..TAG....A..A.....A.AT..   [229]
C. gloeosporioides(CR21)        ...........C..............-....C.T..TAG....A..A.....A.AT..   [229]
C. gloeosporioides(315)         ...........C..............-....C.T..TAG.......A.....A.AT..   [228]
C. gloeosporioides (HO19)       ...........C..............-....C.T..TAG....A..A.....A.AT..   [230]
C. falcatum(CFA12)              ...........C..............-.........-......TG.C.......-..   [231]
Neurospora crassa(M13906)       CA.ACTCG...-....AG.G.....AAAA..CG.AAC.AGGT....GT..GTG.AC.--.   [237]

                                2222222222222222222222222222222222222222222222222222222222222223
                                4444444445555555555666666666677777777788888888889999999999990
Taxon/Node                      1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)               TCCTATTGACGAATGCTGACC-TTCTCACCCAACCAGGCCTCCGGCAACAAGTACGTTCC   [292]
C. acutatum(PT29)               ....................-.....................................   [290]
C. acutatum(JR15)               ....................-.....................................   [290]
C. acutatum(CR02)               ....................-.....................................   [290]
C. acutatum(96A4)               ....................-.....................................   [290]
C.lupini var setosum(CW52)      ....................-.....................................   [290]
C.lupini var lupini(CW51)       ....................-.....................................   [290]
Colletotrichum SHK2148          ....................-.....................................   [290]
C. acutatum(JR03)               ....................-.....................................   [290]
C. acutatum(HO01)               ....................-.....................................   [290]
C. acutatum(CR20)               ....................-.....................................   [290]
C. acutatum(C2897)              ....................-.....................................   [290]
C. acutatum(JG05)               ............A.......-.....................................   [290]
C. acutatum(CR46)               ....................-.....................................   [291]
C. gloeosporioides(CR45)        A.A.........G.A......-...G.T..T.C......T................G..   [288]
C. gloeosporioides(CR21)        A.A.........G.A......-...G.T..T.C......T................G..   [288]
C. gloeosporioides(315)         A.A.........G.A......-...G.T..T.C......T................G..   [287]
C. gloeosporioides (HO19)       A.A.........G.A......-...G.T..T.C......T................G..   [289]
C. falcatum(CFA12)              C..C.....T....A......C..T....G..T......T.............T..C..   [291]
Neurospora crassa(M13906)       G.GG.GG..TC.T.A.A..G--.--.--G.A..A.TCC.ACAAAC..T.GC.A.TC..A.   [291]

                                3333333333333333333333333333333333333333333333333333333333333333
                                0000000001111111111222222222233333333334444444445555555556
Taxon/Node                      1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)               TCGCGCCGT--CCTCGTCGACTTGGAGCCCGGTACCATGGACGCCGTCCGTGCCGGTCCC   [350]
C. acutatum(PT29)               .........--.....................................................   [348]
C. acutatum(JR15)               .........--.....................................................   [348]
C. acutatum(CR02)               .........--.....................................................   [348]
C. acutatum(96A4)               .........--.....................................................   [348]
C.lupini var setosum(CW52)      .........--.....................................................   [348]
C.lupini var lupini(CW51)       .........--.....................................................   [348]
Colletotrichum SHK2148          .........--.....................................................   [348]
C. acutatum(JR03)               C........--.....................................................   [348]
C. acutatum(HO01)               C........--.....................................................   [348]
C. acutatum(CR20)               C........--.....................................................   [348]
C. acutatum(C2897)              C........--.....................................................   [348]
C. acutatum(JG05)               C........--.....................................T......T......   [348]
C. acutatum(CR46)               C........--.....................................................   [349]
C. gloeosporioides(CR45)        C..T.....--.........T.....................................T   [346]
C. gloeosporioides(CR21)        C..T.....--.........T.....................................T   [346]
C. gloeosporioides(315)         C..T.....--.........T.....................................T   [345]
C. gloeosporioides (HO19)       C..T.....--.........T.....................................T   [347]
C. falcatum(CFA12)              C........--.............................T..T.....C.........   [349]
Neurospora crassa(M13906)       C..TA.G..TG.....G..-..G.CG.T....A.A----..C.TT..GG.C.C....AT..   [347]
```

```
                                3333333333333333333333333333333333333333444444444444444444444444
                                6666666667777777777888888888899999999990000000000011111111112
Taxon/Node                      1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)               TTTGGCCAGCTTTTCCGCCCCGACAACTTCGTCTTTGGCCAGTCCGGTGCCGGCAACAAC   [410]
C. acutatum(PT29)               ..............................................................   [408]
C. acutatum(JR15)               ..............................................................   [408]
C. acutatum(CR02)               ..............................................................   [408]
C. acutatum(96A4)               ..............................................................   [408]
C.lupini var setosum(CW52)      ..............................................................   [408]
C.lupini var lupini(CW51)       ..............................................................   [408]
Colletotrichum SHK2148          ..............................G..----------------------C.   [386]
C. acutatum(JR03)               ..............................................................   [408]
C. acutatum(HO01)               ..............................................................   [408]
C. acutatum(CR20)               ..............................................................   [408]
C. acutatum(C2897)              ..............................................................   [408]
C. acutatum(JG05)               ..............................G...............................   [408]
C. acutatum(CR46)               ..............................................................   [409]
C. gloeosporioides(CR45)        ..C..T.....C.....................C........T.....................   [406]
C. gloeosporioides(CR21)        ..C..T.....C.....................C........T.....................   [406]
C. gloeosporioides(315)         ..C........C.....................C........T.....................   [405]
C. gloeosporioides (HO19)       ..C..T.....C.....................C........T.....................   [407]
C. falcatum(CFA12)              ..C.....A..C.....................T..............................   [409]
Neurospora crassa(M13906)       .CG..T.TC.CGC..GCGG.T.C.CG.--..GAG.-.C.G.AA.TA--------...TCT   [396]

                                4444444444444444444444444444444444444444444444444444444444444444
                                2222222223333333333444444444455555555556666666666777777777778
Taxon/Node                      1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)               TG-----------------------------------ACCTGCTCTGCCATCTTGT-   [431]
C. acutatum(PT29)               ..-----------------------------------.................-   [429]
C. acutatum(JR15)               ..-----------------------------------.................-   [429]
C. acutatum(CR02)               ..-----------------------------------.................-   [429]
C. acutatum(96A4)               ..-----------------------------------.................-   [429]
C.lupini var setosum(CW52)      ..-----------------------------------.................-   [429]
C.lupini var lupini(CW51)       ..-----------------------------------.................-   [429]
Colletotrichum SHK2148          ..-----------------------------------.................-   [407]
C. acutatum(JR03)               ..-----------------------------------.................-   [429]
C. acutatum(HO01)               ..-----------------------------------.................-   [429]
C. acutatum(CR20)               ..-----------------------------------.................-   [429]
C. acutatum(C2897)              ..-----------------------------------.................-   [429]
C. acutatum(JG05)               ..-----------------------------------........C........-   [429]
C. acutatum(CR46)               ..-----------------------------------.................-   [430]
C. gloeosporioides(CR45)        ..-----------------------------------.................-   [427]
C. gloeosporioides(CR21)        ..-----------------------------------.................-   [427]
C. gloeosporioides(315)         ..-----------------------------------.................-   [426]
C. gloeosporioides (HO19)       ..GGCCAAGGGTCACTACACCGAGGGTGCCGAGCTCGTCG...A.G.TCT.G..G....C   [467]
C. falcatum(CFA12)              ..-----------------------------------.................-   [430]
Neurospora crassa(M13906)       ..-----------------------------------.T.GAA...TTG.A.--.CA   [416]

                                4444444444444444444455555555555555555555555555555555555555555555
                                8888888889999999990000000000111111111122222222233333333334
Taxon/Node                      1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)               ------------AAGTGCCACA----CGACGA-----TGACCCTAG-AATATAA------   [463]
C. acutatum(PT29)               ------------.....-.....-.....-.....-.....------   [461]
C. acutatum(JR15)               ------------.....-.....-.....-.....-.....------   [461]
C. acutatum(CR02)               ------------.....-.....-.....-.....-.....------   [461]
C. acutatum(96A4)               ------------.....-.....-.....-.....-.....------   [461]
C.lupini var setosum(CW52)      ------------.....-.....-.....-.....-.....------   [461]
C.lupini var lupini(CW51)       ------------.....-.....-.....-.....-.....------   [461]
Colletotrichum SHK2148          ------------.....-.....-.....-.....-.....------   [439]
C. acutatum(JR03)               ------------.............T.....-.....-.....G.------   [461]
C. acutatum(HO01)               ------------.............T.....-.....-.....G.------   [461]
C. acutatum(CR20)               ------------.............T.....-.....-.....G.------   [461]
C. acutatum(C2897)              ------------.............T.....-.....-.....G.------   [461]
C. acutatum(JG05)               ------------.....-.....-----ATT..-------....TT.T.G...GCG.------   [459]
C. acutatum(CR46)               ------------....T---G.-----.T..A.-------.C.......-.G.GCG.------   [459]
C. gloeosporioides(CR45)        ------------G...T---G.-----.ACGA.--------...TT.CTT--T.CC.T------   [455]
C. gloeosporioides(CR21)        ------------G...T---G.-----.ACGA.--------...TT.CTT--T.CC.T------   [455]
C. gloeosporioides(315)         ------------G...T----GACCCGA.T..TT-------..T.--TTCCG.G.------   [456]
C. gloeosporioides (HO19)       CGCCGCGAGGCTG..G..TG.GACTG.AG.AGATGTTC.....C.AG..C..G.TGGCTG   [527]
C. falcatum(CFA12)              ------------.....T.--.TTTC.AG.C.----------.....T-...GACT------   [461]
Neurospora crassa(M13906)       ------------C.T..----------..CTCG----------..-..T.T.C.GG------   [439]
```

```
                                 5555555555555555555555555555555555555555555555555555555555555556
                                 4444444445555555556666666666777777777788888888889999999990
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)                ----------------------------------------------------------GCAA   [467]
C. acutatum(PT29)                ----------------------------------------------------------....   [465]
C. acutatum(JR15)                ----------------------------------------------------------....   [465]
C. acutatum(CR02)                ----------------------------------------------------------....   [465]
C. acutatum(96A4)                ----------------------------------------------------------....   [465]
C.lupini var setosum(CW52)       ----------------------------------------------------------....   [465]
C.lupini var lupini(CW51)        ----------------------------------------------------------....   [465]
Colletotrichum SHK2148           ----------------------------------------------------------....   [443]
C. acutatum(JR03)                ----------------------------------------------------------....   [465]
C. acutatum(HO01)                ----------------------------------------------------------....   [465]
C. acutatum(CR20)                ----------------------------------------------------------....   [465]
C. acutatum(C2897)               ----------------------------------------------------------....   [465]
C. acutatum(JG05)                ----------------------------------------------------------A..C   [463]
C. acutatum(CR46)                ----------------------------------------------------------ATG.   [463]
C. gloeosporioides(CR45)         ----------------------------------------------------------.ATT   [459]
C. gloeosporioides(CR21)         ----------------------------------------------------------.ATT   [459]
C. gloeosporioides(315)          ----------------------------------------------------------TT   [458]
C. gloeosporioides (HO19)        CCTCTGACTTCCGCAACGGTCGCTACTTGACCTGCTCTGCCATCTTGTGAGTTGACA.G.   [587]
C. falcatum(CFA12)               ----------------------------------------------------------AT.T   [465]
Neurospora crassa(M13906)        ----------------------------------------------------------C.AGC   [444]

                                 6666666666666666666666666666666666666666666666666666666666666666
                                 0000000001111111111222222222233333333334444444445555555556
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)                ATGCTAACTTTGTCGT----------------TCCCAGCCGTGGTAAGGTCGCCATGAA   [510]
C. acutatum(PT29)                ................----------.....................................   [508]
C. acutatum(JR15)                ................----------.....................................   [508]
C. acutatum(CR02)                ................----------.....................................   [508]
C. acutatum(96A4)                ................----------.....................................   [508]
C.lupini var setosum(CW52)       ................----------.....................................   [508]
C.lupini var lupini(CW51)        ................----------.....................................   [508]
Colletotrichum SHK2148           ................----------.....................................   [486]
C. acutatum(JR03)                .........G.A....----------..T.....................................   [508]
C. acutatum(HO01)                .........G.A....----------..T.....................................   [508]
C. acutatum(CR20)                .........G.A....----------..T.....................................   [508]
C. acutatum(C2897)               .........G.A....----------..T.....................................   [508]
C. acutatum(JG05)                ..A.......GT.T..----------.T.T....................................   [506]
C. acutatum(CR46)                ............T..----------.....................................   [506]
C. gloeosporioides(CR45)         T........CC---CC----------.T.T........C.............................   [499]
C. gloeosporioides(CR21)         T........CC---CC----------.T.T........C.............................   [499]
C. gloeosporioides(315)          T........CA---T.----------.T..........C........T.....   [498]
C. gloeosporioides (HO19)        ...A.TC....TC.A.GATTTTGCTAACTCCCC.T.T........C.............   [647]
C. falcatum(CFA12)               T.A.....AGC-.GCC----------..T.....................................   [507]
Neurospora crassa(M13906)        ....CTGT.CGAG..----------CA.TT..A..A.--C...C..TG.T...--   [485]

                                 6666666666666666666666666666666666666666777777777777777777777777
                                 6666666667777777777888888888899999999900000000011111111112
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)                GGATGTTGAGGACCAGATGCGCAACGTTCAGAACAAGAACTCGTCCTACTTCGTCGAGTG   [570]
C. acutatum(PT29)                ..........................................................   [568]
C. acutatum(JR15)                ..........................................................   [568]
C. acutatum(CR02)                ..........................................................   [568]
C. acutatum(96A4)                ..........................................................   [568]
C.lupini var setosum(CW52)       ..........................................................   [568]
C.lupini var lupini(CW51)        ..........................................................   [568]
Colletotrichum SHK2148           ..........................................................   [546]
C. acutatum(JR03)                ......C...................................................   [568]
C. acutatum(HO01)                ......C...................................................   [568]
C. acutatum(CR20)                ......C...................................................   [568]
C. acutatum(C2897)               ......C...................................................   [568]
C. acutatum(JG05)                ......C.....................C.............................   [566]
C. acutatum(CR46)                ......C.................T..C.............................   [566]
C. gloeosporioides(CR45)         ......C.....................C.............C...............   [559]
C. gloeosporioides(CR21)         ......C.....................C.............C...............   [559]
C. gloeosporioides(315)          ......C.....................C.............C..........T.....   [558]
C. gloeosporioides (HO19)        ......C.....................C.............C...............   [707]
C. falcatum(CFA12)               ...C......................................................   [567]
Neurospora crassa(M13906)        ---C....G...T.C.CG..TGTC..C...A..TC..TGGCG.G.-----.....-----   [532]
```

```
                                 7777777777777777777777777777777777777777777777777777777777777777
                                 2222222223333333333444444444455555555566666666667777777778
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)                GATTCCCAACAA-CGTCCAGACCGCCCTTTGCTCCATTCCTCCCCGCGGCCTCAAGATGT   [629]
C. acutatum(PT29)                ...........-.....................................................   [627]
C. acutatum(JR15)                ...........-.....................................................   [627]
C. acutatum(CR02)                ...........-.....................................................   [627]
C. acutatum(96A4)                ...........-.....................................................   [627]
C.lupini var setosum(CW52)       ...........-.....................................................   [627]
C.lupini var lupini(CW51)        ...........-.....................................................   [627]
Colletotrichum SHK2148           ...........-.....................................................   [605]
C. acutatum(JR03)                ...........-.....................................................   [627]
C. acutatum(HO01)                ...........-.....................................................   [627]
C. acutatum(CR20)                ...........-.....................................................   [627]
C. acutatum(C2897)               ...........-.....................................................   [627]
C. acutatum(JG05)                ...........-.....................................................   [625]
C. acutatum(CR46)                ...........-.....................C..C............................   [625]
C. gloeosporioides(CR45)         ...C........-.............C.....T..............................   [618]
C. gloeosporioides(CR21)         ...C........-.............C.....T..............................   [618]
C. gloeosporioides(315)          ...C........-.............C......................................   [617]
C. gloeosporioides (HO19)        ...C........-.............C.....T..............................   [766]
C. falcatum(CFA12)               ...C........-.............C.....T..............................   [626]
Neurospora crassa(M13906)        -.G..A..C.G.G...GGT...TCTA.A.C...ATGG..G.G.G-....GT..TT.CC..   [590]

                                 7777777777777777777888888888888888888888888888888888888888888888
                                 8888888889999999999000000000011111111112222222222333333333334
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)                CTTCCACCTTTGTCGGTAACTCTACCGCCATCCAGG-AGCTCTTCAAGCGTGTCGGTGAG   [688]
C. acutatum(PT29)                ..........................................-....................   [686]
C. acutatum(JR15)                ..........................................-....................   [686]
C. acutatum(CR02)                ..........................................-....................   [686]
C. acutatum(96A4)                ..........................................-....................   [686]
C.lupini var setosum(CW52)       ..........................................-....................   [686]
C.lupini var lupini(CW51)        ..........................................-....................   [686]
Colletotrichum SHK2148           ..........................................-....................   [664]
C. acutatum(JR03)                ......................C...........-....................   [686]
C. acutatum(HO01)                ......................C...........-....................   [686]
C. acutatum(CR20)                ......................C...........-....................   [686]
C. acutatum(C2897)               ......................C...........-....................   [686]
C. acutatum(JG05)                .C..........................................-....................   [684]
C. acutatum(CR46)                .C..................C.......................-....................   [684]
C. gloeosporioides(CR45)         .C........C...........C.........T....-....G..................   [677]
C. gloeosporioides(CR21)         .C........C...........C.........T....-....G..................   [677]
C. gloeosporioides(315)          .C........C...........C.............-....G..................   [676]
C. gloeosporioides (HO19)        .C........C...........C.........T....-....G..................   [825]
C. falcatum(CFA12)               .C..T.....................................-..................C...   [685]
Neurospora crassa(M13906)        AAAA.C..CCAT.TCTA.GG.TG...T.GGAT....T..GAA.A.CC..-..AACT.A..   [649]

                                 8888888888888888888888888888888888888888888888888888888888888889
                                 4444444445555555555666666666677777777778888888888999999999990
Taxon/Node                       1234567890123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------------
C. acutatum(PT30)                CAGTTCACT--GCC-ATGTTCCGTCGCAAGGCTTTCTTGCATTGGTACACTGGTGAGGGT   [745]
C. acutatum(PT29)                .........--...-.....................................................   [743]
C. acutatum(JR15)                .........--...-.....................................................   [743]
C. acutatum(CR02)                .........--...-.....................................................   [743]
C. acutatum(96A4)                .........--...-.....................................................   [743]
C.lupini var setosum(CW52)       .........--...-.....................................................   [743]
C.lupini var lupini(CW51)        .........--...-.....................................................   [743]
Colletotrichum SHK2148           .........--...-.....................................................   [721]
C. acutatum(JR03)                .........--...-.....................................................   [743]
C. acutatum(HO01)                .........--...-.....................................................   [743]
C. acutatum(CR20)                .........--...-.....................................................   [743]
C. acutatum(C2897)               .........--...-.....................................................   [743]
C. acutatum(JG05)                .........--...-.....................................................   [741]
C. acutatum(CR46)                ..........--..T-..................................C.........   [741]
C. gloeosporioides(CR45)         .........--...-.....................................................   [734]
C. gloeosporioides(CR21)         .........--...-.....................................................   [734]
C. gloeosporioides(315)          .........--...-.....................................................   [733]
C. gloeosporioides (HO19)        .........--...-.....................................................   [882]
C. falcatum(CFA12)               .........--..T-...........T.......................C......   [742]
Neurospora crassa(M13906)        ..TA...A.AA..GG.G.AAAA.AAA.C.ACAGGGA....CC.A...-..-..C...T.A   [707]
```

```
                                 999999999999999999999999999999999999999999999999999999999999999999
                                 000000000111111111122222222223333333333444444444455555555556
Taxon/Node                       123456789012345678901234567890123456789012345678901234567890
-------------------------------------------------------------------------------------------------
C. acutatum(PT30)                ATGGACGAGATGGAGTTCACTGAGGCTGAGTCCAACATGAACGATCTCGTCTCCGAGTAC   [805]
C. acutatum(PT29)                ............................................................   [803]
C. acutatum(JR15)                ............................................................   [803]
C. acutatum(CR02)                ............................................................   [803]
C. acutatum(96A4)                ............................................................   [803]
C.lupini var setosum(CW52)       ..................??????????????????????????????????????????   [803]
C.lupini var lupini(CW51)        ........................C.T......A...C........A????????   [803]
Colletotrichum SHK2148           ..................??????????????????????????????????????????   [781]
C. acutatum(JR03)                ............................................................   [803]
C. acutatum(HO01)                ............................................................   [803]
C. acutatum(CR20)                ............................................................   [803]
C. acutatum(C2897)               ............................................................   [803]
C. acutatum(JG05)                .....T......................................................   [801]
C. acutatum(CR46)                ...........................................................A...   [801]
C. gloeosporioides(CR45)         ................T.......................CT.G..T.........   [794]
C. gloeosporioides(CR21)         ................T.......................CT.G..T.........   [794]
C. gloeosporioides(315)          ..........................................T.G............   [793]
C. gloeosporioides (HO19)        ................T.......................CT.G..T.........   [942]
C. falcatum(CFA12)               .....T............C..........T..........CT.G.....T......   [802]
Neurospora crassa(M13906)        .GC.G.A.C.GCTCAAATTTGA.AT...GC.T.GG.CC..G??????????????????   [767]

                                 99999999999999999999999999999999
                                 66666666677777777788888888889999
Taxon/Node                       12345678901234567901234567890123
-------------------------------------------------------------------------
C. acutatum(PT30)                CAGCAATACCAGGACGCTGGTGTTGACGAGGAG   [838]
C. acutatum(PT29)                ................................   [836]
C. acutatum(JR15)                ................................   [836]
C. acutatum(CR02)                ................................   [836]
C. acutatum(96A4)                ................................   [836]
C.lupini var setosum(CW52)       ????????????????????????????????   [836]
C.lupini var lupini(CW51)        ????????????????????????????????   [836]
Colletotrichum SHK2148           ????????????????????????????????   [814]
C. acutatum(JR03)                ................................   [836]
C. acutatum(HO01)                ................................   [836]
C. acutatum(CR20)                ................................   [836]
C. acutatum(C2897)               ................................   [836]
C. acutatum(JG05)                ................................   [834]
C. acutatum(CR46)                ................................   [834]
C. gloeosporioides(CR45)         ................................   [827]
C. gloeosporioides(CR21)         ................................   [827]
C. gloeosporioides(315)          ................................   [826]
C. gloeosporioides (HO19)        ................................   [975]
C. falcatum(CFA12)               .....G..........................   [835]
Neurospora crassa(M13906)        ????????????????????????????????   [800]
```