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STUDIES OF CAMELLIA FLOWER BLIGHT
(CIBORINIA CAMELLIAE KOHN)

A thesis presented in partial fulfilment of
the requirements for the degree of
Doctor of Philosophy in Plant Science
(Plant Pathology)
at
Massey University
Palmerston North
New Zealand

Christine Helen Taylor
March 2004
ABSTRACT

Camellias are popular ornamental plants and the most serious pathogen of this plant is camellia flower blight, caused by the fungal pathogen *Ciborinia camelliae* Kohn. Ascospores of this fungus attack the flowers, turning them brown, rendering infected flowers unattractive. Little is known about the pathogen and control measures are not particularly effective.

In this thesis, various aspects of the pathogen’s basic and molecular biology and interaction with host species were studied.

Surveys of the distribution and spread of *C. camelliae* within New Zealand determined that the pathogen was present in most regions of the North Island, and north and east coasts of the South Island. Over the distances and time involved, it appeared that the disease was spreading mainly by windborne ascospores rather than human transfer.

Sclerotia were germinated out of season to increase the period during which ascospores were available for infection work. Greatest germination was achieved at low temperatures (5°C-10°C) in 24 h darkness.

Isolate-specific primers were designed to the ribosomal DNA Internal Transcribed Spacer region to detect the pathogen *in planta* and distinguish between New Zealand isolates of *C. camelliae* and other fungal pathogens. Phylogenetic analysis of the ITS region with other *Ciborinia*, *Sclerotinia* and *Botrytis* species showed that *C. camelliae* was more closely related to *S. sclerotiorum* than other *Ciborinia* species.

Two inoculation techniques for infecting *Camellia* petals with ascospores of *C. camelliae* were developed and tested. Inoculation using airborne ascospores in a settling chamber was a simple and quick method for testing large numbers of species for resistance. Inoculation of ascospores in suspension produced qualitative data, but was more time consuming.
Of the four mechanisms of resistance tested, levels of aluminium hyperaccumulation and the presence of phenolic compounds did not correlate with resistance in *Camellia* species. The large uptake of aluminium, however, did indicate that *Camellia* species would be good plants for phytoremediation of acid soils. Some resistant species were found to have cell wall modifications and/or lignification of cell walls in response to *C. camelliae* infection and chitinase activity was found in most resistant *Camellia* species tested. Further research into these latter two mechanisms is recommended and indicates that the development of resistant *Camellia* cultivars is possible.
ACKNOWLEDGEMENTS

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In Los Angeles, Tim Thibault & Co. (Descanso Gardens) and Ann Richardson & Co. (The Huntington) befriended me and ensured my time there was successful, both research-wise and culture-wise.

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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>ii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iv</td>
</tr>
<tr>
<td>TABLE OF CONTENTS</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>x</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xiii</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>xvii</td>
</tr>
</tbody>
</table>

## CHAPTER ONE – GENERAL INTRODUCTION ..............................................1

1.1 INTRODUCTION .................................................................1

1.2 *CIBORINIA CAMELLIAE* .....................................................2

1.2.1 Distribution ..............................................................2

1.2.2 Taxonomy ........................................................................2

1.2.3 Life Cycle of *C. camelliae* ...........................................3

1.2.4 Molecular Biology of *C. camelliae* ..................................5

1.2.5 Control of *C. camelliae* ................................................5

1.2.6 Review of Literature on Camellia Flower Blight ....................6

1.3 PLANT DEFENCE MECHANISMS .....................................................6

1.3.1 Constitutive Physical Defence Mechanisms ..........................6

1.3.2 Constitutive Chemical Defence Mechanisms ..........................6

1.3.3 Induced Physical Defence Mechanisms ................................7

1.3.4 Induced Chemical Defence Mechanisms ................................7

1.4 THESIS OBJECTIVES ..............................................................8

## CHAPTER TWO – GENERAL MATERIALS & METHODS .................................10

2.1 FUNGAL CULTURES .....................................................................10

2.1.1 *C. camelliae* Isolates used in this Study ............................10

2.1.2 Isolates of other Species used in this Study .........................11

2.1.3 Subculturing .......................................................................11

2.2 FLOWER SPECIES .....................................................................11

2.2.1 *Camellia* Species, Hybrids and Cultivars used in this Study ....11

2.2.2 Non-Camellia Species used in this Study ...............................13
2.2.3 Classification System for *Camellia* Species ............................................. 13
2.2.4 Identification of Flower Species or Varieties ............................................. 13
2.2.5 Origin of Flowers ...................................................................................... 14
2.2.6 Origin of Apothecia .................................................................................. 14
2.3 MEDIA ...................................................................................................... 14
2.4 BUFFERS AND SOLUTIONS ....................................................................... 15
2.5 STAINS ..................................................................................................... 16
2.6 STATISTICAL ANALYSIS ......................................................................... 16

CHAPTER THREE – DISEASE SURVEY ......................................................... 17
3.1 INTRODUCTION ...................................................................................... 17
3.1.1 Distribution within New Zealand ............................................................ 17
3.1.2 Methods of Spread ............................................................................... 20
3.1.3 Rate of Spread ...................................................................................... 21
3.1.4 Objective ............................................................................................... 21
3.2 MATERIALS & METHODS ..................................................................... 21
3.3 RESULTS .................................................................................................. 23
3.4 DISCUSSION ............................................................................................. 27

CHAPTER FOUR – SCLEROTIAL GERMINATION ........................................ 29
4.1 INTRODUCTION ...................................................................................... 29
4.1.1 Fungal Sclerotia .................................................................................... 29
4.1.2 Sclerotial Germination .......................................................................... 32
4.1.3 Apothecia ............................................................................................. 36
4.1.4 Sclerotia and Apothecia of *C. camelliae* ............................................ 36
4.1.5 Previous Sclerotial Germination Trials .................................................... 37
4.1.6 Objectives .............................................................................................. 38
4.2 MATERIALS & METHODS ..................................................................... 38
4.3 RESULTS .................................................................................................. 45
4.4 DISCUSSION ............................................................................................. 55

CHAPTER FIVE – MOLECULAR STUDIES ....................................................... 60
5.1 INTRODUCTION ...................................................................................... 60
5.1.1 Molecular Detection and Identification of Fungal Plant Pathogens using rDNA .................................................................61
5.1.2 Molecular Identification of Fungal Plant Pathogens using β-tubulin ....63
5.1.3 rDNA and β-tubulin in Phylogenetic Studies ..............................................64
5.1.4 Objectives .........................................................................................65

5.2 MATERIALS & METHODS .................................................................65
5.2.1 Preparation of Cultures for DNA Extraction ........................................65
5.2.2 DNA Extraction ..............................................................................67
5.2.3 PCR of Genomic DNA .....................................................................68
5.2.4 Purification and Ligation of PCR Products .........................................69
5.2.5 Transformation and Plasmid Preparation ..........................................70
5.2.6 DNA Sequencing ...........................................................................71
5.2.7 Sequence Alignments ......................................................................71
5.2.8 Phylogenetic Analysis of ITS Sequences ..........................................72

5.3 RESULTS .........................................................................................72
5.3.1 PCR of Genomic DNA ......................................................................72
5.3.2 ITS Sequence Alignment of C. camelliae Isolates ................................72
5.3.3 ITS Sequence Alignment of C. camelliae and S. sclerotiorum Isolates and Location of C. camelliae-specific Primer ..............................................73
5.3.4 Test of C. camelliae-specific Primers ................................................77
5.3.5 β-tubulin Sequence Alignment of C. camelliae and S. sclerotiorum Isolates ........................................................................80
5.3.6 ITS Phylogenetic Analysis .................................................................82

5.4 DISCUSSION ...................................................................................85

CHAPTER SIX – ASCOSPORE INOCULATION TECHNIQUES AND RESISTANCE TESTING ........................................................87

6.1 INTRODUCTION ..............................................................................87
6.1.1 Methods of Inoculation ....................................................................88
6.1.2 Factors Affecting Germination, Penetration and Lesion Development ....90
6.1.3 Objectives .....................................................................................93

6.2 MATERIALS & METHODS ...............................................................93
6.2.1 Inoculation by Ascospore Suspension ..............................................95
6.2.2 Inoculation by Airborne Ascospores ................................................106
CHAPTER SEVEN – RESISTANCE MECHANISMS: ALUMINIUM HYPERACCUMULATION

7.1 INTRODUCTION ................................................................. 157
  7.1.1 Hyperaccumulation and Plant Resistance .......................... 157
  7.1.2 Aluminium ............................................................... 158
  7.1.3 Aluminium Hyperaccumulation .................................... 158
  7.1.4 Aluminium Hyperaccumulation in Camellia .................... 159
  7.1.5 Objectives ............................................................... 159

7.2 MATERIALS & METHODS .................................................. 160
  7.2.1 Sample Collection ..................................................... 160
  7.2.2 Sample Preparation and Aluminium Determination ............. 160

7.3 RESULTS ............................................................................ 161

7.4 DISCUSSION ..................................................................... 165
  7.4.1 Phytoremediation Potential .......................................... 165
  7.4.2 Phytoremediation ....................................................... 166

CHAPTER EIGHT – RESISTANCE MECHANISMS: BASED ON THE PHENYLPROPANOID PATHWAY ........................................ 168

8.1 INTRODUCTION ................................................................. 168
  8.1.1 Phenolic Compounds/Phytoalexins ................................. 168
  8.1.2 Lignification of Existing Cell Walls ................................. 170
  8.1.3 Cell Wall Appositions .................................................. 171
  8.1.4 Objectives ............................................................... 173

8.2 MATERIALS & METHODS .................................................. 173
  8.2.1 Phenolic Compounds .................................................. 173
  8.2.2 Cell Wall Appositions and Lignification of Existing Cell Walls .... 178
CHAPTER NINE – RESISTANCE MECHANISMS: CHITINASE ASSAY 

9.1 INTRODUCTION ......................................................................196
  9.1.1 Role of Chitinase in planta ..................................................196
  9.1.2 Characteristics and Classification .......................................197
  9.1.3 Objectives ...........................................................................200

9.2 MATERIALS & METHOD ........................................................200

9.3 RESULTS ...............................................................................203

9.4 DISCUSSION ...........................................................................209
  9.4.1 Future Directions ...............................................................211

CHAPTER TEN – GENERAL DISCUSSION .....................................214

10.1 SUMMARY OF RESEARCH OUTCOMES AND FUTURE DIRECTIONS .................................................................214

REFERENCES ..............................................................................220

APPENDIX I ..................................................................................A1
APPENDIX II ................................................................................A2
APPENDIX III ...............................................................................A3
APPENDIX IV ................................................................................A4
APPENDIX V ..................................................................................A5
APPENDIX VI ...............................................................................A6
LIST OF TABLES

Table 2.1 .................................................................................................................. 10
  C. camelliae isolates used in this study.

Table 2.2 .................................................................................................................. 11
  Isolates of other fungi used in this study.

Table 2.3 .................................................................................................................. 11
  List of Camellia species, hybrids and cultivars used in this study.

Table 2.4 .................................................................................................................. 13
  Non-Camellia species used in this study.

Table 2.5 .................................................................................................................. 14
  Location of flower collection sites and reference.

Table 2.6 .................................................................................................................. 14
  Location of apothecia collection sites and reference.

Table 4.1 .................................................................................................................. 39
  Summary of factors investigated in sclerotial germination experiments.

Table 4.2 .................................................................................................................. 41
  Treatment factors for sclerotia in Experiment 4.2.

Table 4.3 .................................................................................................................. 42
  Treatment factors for sclerotia in Experiment 4.3.

Table 4.4 .................................................................................................................. 4
  Source and pH of media for sclerotia in Experiment 4.5.

Table 4.5 .................................................................................................................. 46
  Sclerotial germination by treatment for Experiment 4.1.

Table 4.6 .................................................................................................................. 47
  Number of stipes produced by sclerotia in Experiment 4.2.

Table 4.7 .................................................................................................................. 50
  Number of stipes produced by sclerotia in Experiment 4.3.

Table 4.8 .................................................................................................................. 50
  Number of stipes produced by sclerotia in Experiment 4.4.

Table 4.9 .................................................................................................................. 51
  Percent sclerotial germination by incubation temperature and sclerotial size in Experiment 4.4.

Table 5.1 .................................................................................................................. 69
  Summary of ITS Sequences of Ciborinia and Sclerotinia

Table 5.2 .................................................................................................................. 73
  Summary of ITS Sequences of Ciborinia and Sclerotinia spp. obtained from NCBI and this study.

Table 6.1 .................................................................................................................. 88
  Resistance rating summary of camellia species tested by airborne inoculation of ascospores (from Taylor 1999).
Table 6.2 Spec ies, Hybrids and Cultivars tested in Experiment 6.30.

Table 6.3 Spec ies, Hybrids and Cultivars tested in Experiment 6.31.

Table 6.4 Spec ies, Hybrids and Cultivars tested in Experiment 6.32.

Table 6.5 Average lesion area for each plant of ‘Alba Plena’ in Experiment 6.9 (Run 1).

Table 6.6 Average lesion area 72 h after inoculation in Experiment 6.12.

Table 6.7 Disease lesion area at 72 h after inoculation in Experiment 6.16.

Table 6.8 Disease lesion area at 72 or 96 h after inoculation in Experiment 6.17.

Table 6.9 Disease lesion area at 72 or 96 h after inoculation in Experiment 6.18.

Table 6.10 Tukey’s test for significant differences in lesion area between Camellia species at 96 h after inoculation with C. camelliae Ascospore Suspension, Experiment 6.18.

Table 6.11 Lesion area at 72 h after inoculation in Experiment 6.19.

Table 6.12 Lesion area at 72 h after inoculation in Experiment 6.20.

Table 6.13 Tukey’s test for significant differences in lesion area between Camellia species at 72 h after inoculation with C. camelliae ascospore suspension, Experiment 6.20.

Table 6.14 Lesion area at 48 or 72 h after inoculation in Experiment 6.21.

Table 6.15 Lesion area 72 h after inoculation in Experiment 6.22.

Table 6.16 Lesion area at 48 or 72 h after inoculation in Experiment 6.23.

Table 6.17 Tukey’s test for significant differences in lesion area between Camellia species at 72 h after inoculation with C. camelliae ascospore suspension, Experiment 6.23.

Table 6.18 Disease lesion area 72 h after inoculation in Experiment 6.24.

Table 6.19 Browning symptoms on stamens and anthers 72 h after inoculation in Experiment 6.25.

Table 6.20 Colour change at inoculation site in Experiment 6.27.
Table 6.21 .................................................................125
Treatment and control petals of species and cultivars in Experiment 6.28.

Table 6.23 ........................................................................127
Lesion area from combined results for resistance testing of susceptible species.

Table 6.24 ........................................................................130
Response of each species/cultivar by group over time, Experiment 6.30.

Table 6.25 ........................................................................133
Response of each species/cultivar by group over time, Experiment 6.31.

Table 6.26 ........................................................................135
Response of each species/cultivar by group over time, Experiment 6.32.

Table 6.27 ........................................................................137
Infection of flowers by inoculation with airborne ascospores from a hand-held apothecium, Experiment 6.33.

Table 7.1 ........................................................................160
Collection of species and location of sites.

Table 7.2 ........................................................................162
Resistance to C. camelliae and aluminium concentrations (µg g⁻¹) in samples of each species.

Table 7.3 ........................................................................162
Aluminium concentration (µg g⁻¹) in flowers of each species tested.

Table 7.4 ........................................................................163
Soil pH and aluminium concentrations (µg g⁻¹) in samples from the six sites investigated.

Table 7.5 ........................................................................163
Metal concentrations (µg g⁻¹) in leaves and stems of Camellia spp. and poplar (Populus deltoids x P. yunnanensis 'Kawa') grown on the same soil.

Table 8.1 ........................................................................176
Summary of Camellia species and assessment of Fraction II and II phenolic compounds.

Table 8.2 ........................................................................178
Resistance rating of species and cultivars of camellias used in a study of cell wall modifications.

Table 8.3 ........................................................................187
Species and hybrids of camellias with cell wall modifications 72 h after inoculation with ascospores of C. camelliae.

Table 8.4 ........................................................................189
Species and cultivars of camellia in which papillae/lignitubers or lignification were not observed.

Table 9.1 ........................................................................197
Comparison of chitinase nomenclature terminology (from Neuhaus et al 1996).

Table 9.2 ........................................................................201
Flower species tested for endochitinase activity on glycol chitin.

Table 10.1 ........................................................................218
Resistance mechanisms in resistant Camellia species by section.
LIST OF FIGURES

Figure 1.1
Illustrated disease cycle diagram of camellia (Camellia spp.) flower blight caused by the fungal pathogen Ciborinia camelliae.

Figure 3.1
Distribution of C. camelliae in the North Island in 1998.

Figure 3.2
Distribution of C. camelliae in the South Island in 1998.

Figure 3.3
Blight-infected flowers have a characteristic grey-brown rot and the symptoms frequently spread upwards from the base of the flower.

Figure 3.4

Figure 3.5

Figure 3.6
Blight-infected flowers have a characteristic grey-brown rot and the symptoms frequently spread upwards from the base of the flower.

Figure 3.7

Figure 3.8

Figure 3.9
Blight-infected flowers have a characteristic grey-brown rot and the symptoms frequently spread upwards from the base of the flower.

Figure 3.10

Figure 3.11

Figure 4.1
Three wound-sites in a large sclerotium.

Figure 4.2
Three germinated sclerotia from Experiment 4.1.

Figure 4.3
Number of stipes produced by sclerotia soaked in GA for 1 and 8 h.

Figure 4.4
Interaction of GA concentration and light incubation conditions on stipe production.

Figure 4.5
Interaction of length of soak period with light incubation conditions on stipe production.

Figure 4.6
Stipe production by sclerotial size at three incubation temperatures.

Figure 4.7
Apothecial production by media (ranked from low to high pH) at the Agricultural Engineering Building site.

Figure 4.8
Sclerotium with fimbriated edges.

Figure 4.9
Stipe in plant debris.

Figure 4.10
Example of an abnormally-formed disc of a mature apothecium.

Figure 5.1
Schematic of the ribosomal RNA gene unit showing location of the ITS regions.

Figure 5.2
Schematic of the N. crassa partial β-tubulin gene and location of the primer pair.
Figure 5.3
Diagram of camellia stem, showing site of scar left by abhisced flower.

Figure 5.4
Comparison of ITS1, 5.8S and ITS2 sequences from 15 isolates of C. camelliae.

Figure 5.5
Comparison of ITS1, 5.8S and ITS2 sequences from the three C. camelliae sequence variations and the New Zealand isolates of S. sclerotiorum.

Figure 5.6
Petals of ‘E. G. Waterhouse’ 4 d after inoculation with agar plugs of S. sclerotiorum and C. camelliae.

Figure 5.7
Products from PCR at 55° annealing temperature.

Figure 5.8
Products from PCR at 60° annealing temperature.

Figure 5.9
Comparison of the partial β-tubulin sequence of C. camelliae isolates with New Zealand S. sclerotiorum isolates.

Figure 5.10
Phylogenetic relationship based on ITS regions of rDNA of C. camelliae isolates with other Ciborinia and Sclerotinia species.

Figure 6.1
Diagram of the six inoculation sites on the intact flowers.

Figure 6.2
Illustration of inoculation positions on stamens and anthers.

Figure 6.3
Side view of flower showing inoculation sites on petals and stamens.

Figure 6.4
Opposing inoculation sites on a single petal.

Figure 6.5
Ascospore inoculation apparatus developed by Taylor (1999).

Figure 6.6
Layout of the petal chamber for inoculation by airborne ascospores.

Figure 6.7
Effect of ascospore concentration on lesion growth on ‘Nicky Crisp’ in Experiment 6.6.

Figure 6.8
The significant plant*concentration interaction for Experiment 6.7 (Run 2).

Figure 6.9
Petals of ‘Desire’ 48 h after inoculation by Potter Spray Tower.

Figure 6.10
Petals stored for 24 h at 20°C in Experiment 6.9.

Figure 6.11
C. yunnanensis inoculated by airborne ascospores.
Example of colour change on C. x vernalis 'Ginryū' in Experiment 6.21.

Colour change on 'Spring Mist', Experiment 6.28.

Comparison of colour change site on 'Spring Mist' (left) and 'Ginryū' (right) after inoculation with an ascospore suspension.

Responses to infection shown by three species/cultivars in Experiment 6.30.

LS Means of species and cultivars grouped by response to infection over time, Experiment 6.30.

LS Means of species and cultivars grouped by response to infection over time, Experiment 6.31.

LS Means of species and cultivars grouped by response to infection over time, Experiment 6.32.

Forty-eight hours after inoculation, this experiment to determine the effect of ascospore concentration on infection was discarded because of the high number of natural infections.

Close up of two petals from the same experiment. Lesions from the inoculation (arrows) are just visible or beginning to form lesions while natural infections are larger and spreading rapidly.

Resistance rating scale developed through multiple tests of species and cultivars using the airborne ascospore inoculation chamber.

Comparison of resistance/susceptibility ratings of a selection of Camellia species by two inoculation methods.

Aluminium concentration in Camellia spp. flowers (A) and leaves (B) vs soil pH.

Developed chromatograph plate under short-wave ultraviolet light showing the effect of imperfections in the silica gel on bands of the same Rf value.

Developed chromatograph plate under short-wave ultraviolet light comparing Fraction II and III samples from C. fraterna.

Bioassay chromatograph plate showing zones of inhibition where Cladosporium spp. has not colonised the silica gel/PDA.

Developed chromatograph plate in visible light of C. yunnanensis.

Developed chromatograph plate of C. yunnanensis under shortwave ultraviolet light showing multiple banding pattern.
Figure 8.6
Developed chromatograph plates under longwave ultraviolet light showing the two prominent fluorescent bands.

Figure 8.7
Developed chromatograph plate with Prussian Blue reagent comparing the banding patterns.

Figure 8.8
Developed chromatograph plate with the acid vanillin test comparing the banding patterns.

Figure 8.9
*C. yunnanensis* petal showing lignified cell walls 48 h after inoculation with ascospores of *C. camelliae*.

Figure 8.10
*C. lutchuenensis* petal showing lignituber 72 h after inoculation.

Figure 8.11
A *C. yunnanensis* petal showing lignituber 72 h after inoculation.

Figure 8.12
*C. trichocarpa* petal showing lignitubers 24 h after inoculation.

Figure 9.1
Glycol chitin agar plate showing dark zones of degraded chitin.

Figure 9.2
Significant time effects on chitinase production of three species of camellia and one of magnolia after inoculation with airborne ascospores of *C. camelliae*.

Figure 9.3 A-E
*Rhododendron* spp. for which chitinase activity was detected at all four Time samples after inoculation with airborne ascospores of *C. camelliae*.

Figure 9.4 A-B
Chitinase activity of *Tulip* ‘Monsella’ and *M. soulangeana* after inoculation with airborne ascospores of *C. camelliae*.

Figure 9.5
Chitinase activity in two extracts of *C. cuspidata*.

Figure 9.6 A-F
‘Resistant’ *Camellia* species in which chitinase activity was detected.

Figure 9.6 G-J (continued)
‘Resistant’ *Camellia* species in which chitinase activity was detected.

Figure 9.7 A-B
Susceptible *Camellia* species in which chitinase activity was detected.

Figure 10.1
Distribution of resistant and susceptible species with the Genus *Camellia*. 
**LIST OF ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.i.</td>
<td>active ingredient</td>
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<tr>
<td>ANOVA</td>
<td>ANalysis Of VAriance</td>
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<tr>
<td>cc</td>
<td>cubic centimetre(s)</td>
</tr>
<tr>
<td>d</td>
<td>day(s)</td>
</tr>
<tr>
<td>df/DF</td>
<td>Degrees of Freedom</td>
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<td>Gibberellic Acid</td>
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<td>GLB</td>
<td>Gel Loading Buffer</td>
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<td>hour(s)</td>
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<tr>
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<td>kilo Pascals</td>
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<td>LB</td>
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<td>Light/Dark</td>
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<tr>
<td>SS</td>
<td>Sums of Squares</td>
</tr>
<tr>
<td>μF</td>
<td>micro Farad</td>
</tr>
<tr>
<td>μg g⁻¹</td>
<td>micrograms per gram</td>
</tr>
</tbody>
</table>
V     volt
wk    week(s)
w/v   weight/volume
X-gal 5-bromo 4-chloro 2-indolyl-β-D-galactoside