

## APPENDIX A

### Chemical Reagent

During the fungal structure examination from boletes specimens, various chemical reagents were used in the present study. Indian ink, potassium hydroxide (KOH), lactoglycerol and Melzer's reagent were prepared.

**Indian ink** was used infrequently, but was found to be useful when observing gelatinous appendages of ascospores that appeared in some species.

**Potassium Hydroxide** 3%, 5% and 10% was routinely used in the rehydration of ascomycetes, especially the apothecial ascomycetes.

**Lactoglycerol** was used routinely in the preparation of semipermanent slides instead of lactophenol. It was prepared as following formula:

|             |    |    |
|-------------|----|----|
| Lactic acid | 10 | ml |
| Glycerol    | 10 | ml |
| Water       | 10 | ml |

**Melzer's reagent** was used in the examination of ascomycetes. Frequently colour-change reactions occur in Melzer's reagent. The amyloid reaction (blue) of apical pore is often of taxonomic importance.

|                  |     |    |
|------------------|-----|----|
| Chloral hydrate  | 100 | g  |
| Potassium Iodide | 5   | g  |
| Iodine           | 1.5 | g  |
| Distilled water  | 100 | ml |

**Media****Potato dextrose agar (PDA)**

|                 |     |   |
|-----------------|-----|---|
| Potatoes        | 200 | g |
| Glucose         | 20  | g |
| Agar            | 15  | g |
| Distilled water | 1   | l |

½ PDA was used for culture collection and sporulation of fungal isolates.

|                 |     |   |
|-----------------|-----|---|
| Potatoes        | 100 | g |
| Glucose         | 10  | g |
| Agar            | 15  | g |
| Distilled water | 1   | l |

**Water agar (WA)**

|                 |    |   |
|-----------------|----|---|
| Agar            | 15 | g |
| Distilled water | 1  | l |

## APPENDIX B

### List of Bolete collection (Mycology) of Science and Research

available ([http://www.sciencebuff.org/1987\\_publications.php](http://www.sciencebuff.org/1987_publications.php)),

Created by Ernst E. Both

#### MYCOTA: BASIDIOMYCETES

**Order:** Boletales Gilbert

**Suborder :** Boletineae Rea: Gilbert

#### BOLETACEAE Chevalier

##### AUREOBOLETUS Pouzar

Aureoboletus auriporus (Peck) Pouzar

Aureoboletus gentilis (Quel.) Pouzar

Aureoboletus innixus (Frost) Binder

##### AUSTROBOLETUS (Corner) Wolfe

Austroboletus gracilis (Peck) Wolfe

Austroboletus gracilis var. flavipes Baroni, Halling & Both (Type)

Austroboletus gracilis var. pulcherripes Both & A.E. Bessette (Type)

Austroboletus subfalvidus (Murrill) Wolfe

##### BOLETELLUS Murrill

Boletellus ananas (Curtis) Murrill

Boletellus chrysenteroides (Snell) Snell

Boletellus projectellus (Murrill) Singer

Boletellus russellii (Frost) Gilbert

Boletellus zelleri (Murrill) Singer, Snell & E.A. Dick

##### BOLETUS Dill. Ex Fr.

Boletus aestivalis (Paulet) Fr.

Boletus albisulphureus (Murrill) Murrill

Boletus alutaceus Morgan

Boletus amygdalinus Thiers

Boletus atkinsonianus Murrill

Boletus atkinsonii Peck

Boletus aurantioruber (E.A. Dick & Snell) Both, A.E. Bessette & Neill

Boletus aureissimus (Murrill) Murrill

Boletus auripes Peck

Boletus bicolor Peck

Boletus billieae Both, A.E. Bessette & Neill (Type)

Boletus calopus Fr.

Boletus campestris A.H. Smith & Thiers

Boletus carminipes A.H. Smith & Thiers

Boletus carminiporus A.E. Bessette, Both, & Dunaway (Type)

Boletus chippewaensis A.H. Smith & Thiers

Boletus citriniporus Halling

Boletus discolor (Quel.) Bigeard & Guillemin

Boletus dupainii Boudier

Boletus edulis Bull.:Fr.

Boletus erythropus (Fr.) Pers.

*Boletus fibrillosus* Thiers  
*Boletus firmus* Frost  
*Boletus flaviporus* Earle  
*Boletus floridanus* (Singer) Singer  
*Boletus fraternus* Peck  
*Boletus frostii* Russell  
*Boletus gertrudiae* Peck  
*Boletus holoxanthus* Both, A.E. Bessette & Chapman (Type)  
*Boletus huronensis* A.H. Smith & Thiers  
*Boletus inedulius* (Murrill) Murrill  
*Boletus junquilleus* (Quel.) Boudier  
*Boletus lewisii* (Singer ex Both) A.E. Bessette, Roody & A.R. Bessette (Type)  
*Boletus longicurvipes* Snell & A.H. Smith  
*Boletus luridus* Schaeff.: Fr.  
*Boletus mahogonicolor* A.E. Bessette, Both & Dunaway (Type)  
*Boletus miniato-olivaceus* Frost  
*Boletus miniatopallescens* A.H. Smith & Thiers  
*Boletus mirabilis* (Murrill) Murrill  
*Boletus nobilis* Peck  
*Boletus nobilissimus* Both & Riedel (Type)  
*Boletus ochraceoluteus* A.E. Bessett, Both & A.R. Bessette (Type)  
*Boletus pallidoroseus* Both (Type)  
*Boletus pallidus* Frost ex Peck  
*Boletus patrioticus* Baroni, A.E. Bessette & Roody (Type)  
*Boletus peckii* Frost ex Peck  
*Boletus pinophilus* Pilat & Dermek  
*Boletus pseudo-olivaceus* A.H. Smith & Thiers  
*Boletus pseudoregius* (Huber) Estades  
*Boletus pseudosensibilis* A.H. Smith & Thiers  
*Boletus pulcherrimus* Thiers & Halling  
*Boletus pulchriceps*, Both, A.E. Bessette & Chapman (Type)  
*Boletus pulverulentus* Opatowski  
*Boletus purpureorubellus* Baroni, Yetter & Norarevian  
*Boletus regius* Krombh.  
*Boletus rhodosanguineus* Both (Type)  
*Boletus roseipes* A.E. Bessett, Both & A.R. Bessette (Type)  
*Boletus roseolateritius* A.E. Bessett, Both & Dunaway (Type)  
*Boletus roseopurpureus* Both, A.E. Bessett, & Roody (Type)  
*Boletus rubripes* Thiers  
*Boletus rubroflammeus* A.H. Smith & Thiers  
*Boletus rubropunctus* Peck  
*Boletus rufomaculatus* Both (Type)  
*Boletus sensibilis* Peck  
*Boletus sensibilis* var. *subviscidus* A.H. Smith & Thiers  
*Boletus smithii* Thiers  
*Boletus speciosus* var. *brunneus* Peck  
*Boletus subcaerulescens* (E.A. Dick & Snell) Both, A.E. Bessett & A.R. Bessette  
*Boletus subdepauperatus* A.H. Smith & Thiers  
*Boletus subglabripes* Peck  
*Boletus subluridellus* A.H. Smith & Thiers  
*Boletus subvelutipes* Peck  
*Boletus tenax* A.H. Smith & Thiers  
*Boletus variipes* Peck  
*Boletus vermiculosus* Peck  
*Boletus vermiculosoides* A.H. Smith & Thiers  
*Boletus viscidocorrugis* Both (Type)  
*Boletus weberi* Singer

#### **BUCHWALDOBOLETUS** Pilat

*Buchwaldoboletus hemichrysus* (Berk. & Curtis) Pilat  
*Buchwaldoboletus lignicola* (Kallenb.) Pilat

**CHALCIPORUS** Bataille

*Chalciporus piperatoides* (A.H. Smith & Thiers) Baroni & Both  
*Chalciporus piperatus* (Bull.) Bataille  
*Chalciporus pseudorubinellus* (A.H. Smith & Thiers) Gomez  
*Chalciporus rubinellus* (Peck) Singer  
*Chalciporus rubritubifer* (Kauffman) Singer

**GASTROBOLETUS** Lohwag

*Gastroboletus laricinus* Singer & Both (Type)

**LECCINUM** Gray

*Leccinum albellum* (Peck) Singer  
*Leccinum arbuticola* Thiers  
*Leccinum arenicola* Redhead & Watling  
*Leccinum atrostopitatum* A.H. Smith & Thiers & Watling  
*Leccinum aurantiacum* (Bull.) Gray  
*Leccinum cinnamomeum* A.H. Smith & Thiers & Watling  
*Leccinum coffeatum* A.H. Smith & Thiers  
*Leccinum corsicum* (Rolland) Singer  
*Leccinum griseum* (Quel.) Singer  
*Leccinum holopus* (Rostk.) Watling  
*Leccinum insigne* A.H. Smith & Thiers & Watling  
*Leccinum luteum* A.H. Smith & Thiers & Watling  
*Leccinum monticola* Halling & Mueller  
*Leccinum scabrum* (Bull.) Gray  
*Leccinum snellii* A.H. Smith & Thiers & Watling  
*Leccinum subgranulosum* A.H. Smith & Thiers  
*Leccinum variicolor* Watling  
*Leccinum vinaceopallidum* A.H. Smith & Thiers & Watling

**PHYLLOPORUS** Quelet

*Phylloporus boletinoides* A.H. Smith & Thiers  
*Phylloporus leucomycelinus* (Singer) Singer  
*Phylloporus rhodoxanthus* (Schwein.) Bresadola

**PSEUDOBOLETUS** Sutara

*Pseudoboletus parasiticus* (Bull.: Fr.) Sutara

**PULVEROBOLETUS** Murrill

*Pulveroboletus auriflammeus* (Berk. & Curtis) Singer  
*Pulveroboletus ravenelii* (Berk. & Curtis) Murrill

**RETIBOLETUS** Binder & Bresinsky

*Retiboletus griseus* (Frost in Peck) Binder & Bresinsky  
*Retiboletus ornatipes* (Peck) Binder & Bresinsky

**TYLOPILUS** Karsten

*Tylopilus alboater* (Schwein.) Murrill  
*Tylopilus appalachiensis* Singer  
*Tylopilus atratus* Both (Type)  
*Tylopilus atronicotianus* Both (Type)  
*Tylopilus badiceps* (Peck) A.H. Smith & Thiers  
*Tylopilus ballouii* (Peck) Singer  
*Tylopilus chromapes* (Frost) A.H. Smith & Thiers  
*Tylopilus eximius* (Peck) Singer  
*Tylopilus felleus* (Bull.: Fr.) Karsten  
*Tylopilus ferrugineus* (Frost) Singer  
*Tylopilus fumosipes* (Peck) A.H. Smith & Thiers  
*Tylopilus indecisis* (Peck) Murrill  
*Tylopilus minor* Singer

*Tylopilus plumbeoviolaceus* (Snell & E.A. Dick) Singer  
*Tylopilus rhoadsia* (Murrill) Murrill *Tylopilus rhodoconius* (Singer) Baroni, Both & A.E. Bessette  
*Tylopilus rubrobrunneus* Mazzer & A.H. Smith  
*Tylopilus tabacinus* (Peck) Singer  
*Tylopilus variobrunneus* Roody, A.R. Bessette & A.E. Bessette (Type)  
*Tylopilus violatinctus* Baroni & Both (Type)

#### **XANTHOCONIUM** Singer

*Xanthoconium affine* (Peck) Singer  
*Xanthoconium affine* var. *maculosus* (Peck) Singer  
*Xanthoconium purpureum* Snell & E.A. Dick  
*Xanthoconium separans* (Peck) Halling & Both  
*Xanthoconium stramineum* (Murrill) Singer

#### **XEROCOMUS** Quelet

*Xerocomus badius* (Fr.) Kuehner  
*Xerocomus castanellus* (Peck) Snell & E.A. Dick  
*Xerocomus chrysenteron* (Bull.) Quel.  
*Xerocomus dryophilus* (Thiers) Singer  
*Xerocomus hortonii* (A.H. Smith & Thiers) Binder & Besl  
*Xerocomus illudens* (Peck) Singer  
*Xerocomus lanatus* (Rostk.) Singer  
*Xerocomus roxanae* (Frost) Snell  
*Xerocomus rubellus* (Krombh.) Quel.  
*Xerocomus spadiceus* (Fr.) Quel.  
*Xerocomus subtomentosus* (L.) Fr.  
*Xerocomus truncatus* (Singer, Snell & E.A. Dick) Pouzar

#### **STROBILOMYCETACEAE** Gilbert

##### **PORPHYRELLUS** Gilbert

*Porphyrellus porphyrosporus* (Fr. & Hoek) Gilbert

##### **STROBILOMYCES** Berkeley

*Strombilomyces confusus* Singer  
*Strombilomyces floccopus* (Vahl: Fr.) Karsten

#### **SUBORDER SCLERODERMATINEAE** Binder & Bresinsky

#### **BOLETINELLACEAE** Kirk, Cannon & David

##### **BOLETINELLUS** Murrill

*Boletinellus merulioides* (Schwein.) Murrill

#### **GYROPORACEAE** Quelet

##### **GYROPORUS** Quelet

*Gyroporus castaneus* (Bull.) Quel.  
*Gyroporus cyanescens* (Bull.) Quel.  
*Gyroporus purpurinus* (Snell) Singer  
*Gyroporus roseialbus* Murrill  
*Gyroporus subalbellus* Murrill  
*Gyroporus umbrinisquamosus* Murrill

#### **SCLERODERMATACEAE** Corda

##### **SCLERODERMA** Persoon

*Scleroderma citrinum* Pers.

**SUBORDER PAXILLINEAE** Feltgen**PAXILLACEAE** R. Maire**PARAGYRODON** (Singer) Singer

*Paragyrodon sphaerosporus* (Peck) Singer

**PAXILLUS** Fries

*Paxillus atrotomentosus* (Batsch: Fr.) Fr.

*Paxillus involutus* (Batsch: Fr.) Fr.

**SUBORDER SUILLINEAE** Besl & Bresinsky

Suillaceae (Singer) Besl & Bresinsky

**BOLETINUS** Kalchbrenner

*Boletinus cavipes* (Opat.) Kalchbr.

*Boletinus paluster* (Peck) Peck

**SUILLUS** Gray

*Suillus americanus* (Peck) Snell

*Suillus bovinus* (L.) Kuntze

*Suillus brevipes* (Peck) Kuntze

*Suillus brunnescens* A.H. Smith & Thiers

*Suillus caerulescens* A.H. Smith & Thiers

*Suillus cothurnatus* Singer

*Suillus flavidus* (Fr.: Fr.) Presl

*Suillus fuscotomentosus* A.H. Smith & Thiers

*Suillus glandulosus* (Peck) Singer

*Suillus granulatus* (L.) Kuntze

*Suillus grevillei* (Klotzsch) Singer

*Suillus grisellus* (Peck) Kretzer & Bruns

*Suillus intermedius* (A.H. Smith & Thiers) A.H. Smith & Thiers

*Suillus lakei* (Murrill) A.H. Smith & Thiers

*Suillus lakei* var. *pseudopictus* A.H. Smith & Thiers

*Suillus laricinus* (Berk. ex. Hook.) Kuntze

*Suillus luteus* (L.:Fr.) Gray

*Suillus placidus* (Bonord.) Singer

*Suillus punctipes* (Peck) Singer

*Suillus serotinus* (Frost) Kretzer & Bruns

*Suillus spectabilis* (Peck) Kuntze

*Suillus spraguei* (Berk. & Curtis) Kuntze

*Suillus subalutaceus* (A.H. Smith & Thiers) A.H. Smith & Thiers

*Suillus subaureus* (Peck) Snell

*Suillus tomentosus* (Kauffman) Singer, Snell & E.A. Dick

## CURRICULUM VITAE

|                                          |                                                                                                                          |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>Name</b>                              | Acting Sub Lt. Sulichet Thongklam                                                                                        |
| <b>Date of Birth</b>                     | April 18, 1974                                                                                                           |
| <b>Place of Birth</b>                    | Bangkok, Thailand                                                                                                        |
| <b>Education Background</b>              |                                                                                                                          |
| 1996                                     | Bachelor of Science (Zoology) Burapha University, Department of Biology, Faculty of Science                              |
| 1999                                     | Master of Science (Biology) Chiang Mai University, Department of Biology, Faculty of Science                             |
| <b>Scholarships</b>                      |                                                                                                                          |
| 2002                                     | Graduated School of Chiang Mai University Fund                                                                           |
| 2004                                     | Bioconservation and the Conservation and Utilization of Biodiversity Resources Program of Faculty of Science             |
| <b>Certificates and Seminar attended</b> |                                                                                                                          |
| 2006                                     | Mycorrhizal. During 7-9 October 2006, at Faculty of Agriculture Technology, King Mongkut Institute.                      |
| 2008                                     | Thai Mycology Association. During 28-29 March 2008, at Department of Biology, Faculty of Science, Chiang Mai University. |

- 2008 The Third Annual Meeting of Thai Mycological Association and Mycology Conference in Thailand. On October 11, 2008, at Khon Kaen University, Khon Kaen.

### Publications

- Thongklam S., Thongkantha S., and Sardsud U. 2008. Morphological and molecular phylogeny of the common edible boletes (*Heimioporus retisporus* and *Phlebopus portentosus*) in Northern Thailand. *International Journal of Agricultural Technology*. Accepted.
- Thongklam S., Thongkantha S., and Sardsud U. 2008. Some new record of boletes in Phuka National Park. *Thai Mushroom*. Accepted.
- Thongklam S., Thongkantha S., and Sardsud U. 2008. Molecular phylogeny of *Phlebopus portentosus* (Hed Har) species in upper northern Thailand. *Thai Mushroom*. Accepted.

### Posters

- Thongklam S., Thongkantha S., and Sardsud U. 2000. Diversity of Boletus in Huay Kok Ma; Doi Suthep-Pui National Park, Chiangmai Province. Extended Abstracts in the 26<sup>th</sup> Congress on Science and Technology of Thailand, Queen Sirikit National Convention Center, Bangkok. p.398.

Thongklam S. and Sardsud U. 2004. Primarily study of boletes diversity in Doi Suthep-Pui National Park, Chiang Mai Province. Extended Abstracts in the 20<sup>th</sup> Biennial Conference of the Asian Association for Biology Education “Roles of Modern Technologies in Biology Education” 27-30 December 2004. Chiang Mai University, Chiang Mai, Thailand.

Thongklam S., Thongkantha S., and Sardsud U. 2008. Morphological and molecular phylogeny of the common edible boletes (*Heimioporus retisporus* and *Phlebopus portentosus*) in Northern Thailand