



UNIVERSITI KEBANGSAAN MALAYSIA  
*The National University of Malaysia*



الجامعة الإسلامية العالمية ماليزيا  
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA  
يُونَيْتِي اِسْلَامِي اِنْتَرَا اِنجَسَا مِلْدَسِيَا


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Swiss Garden Beach Resort, Pahang, Malaysia

# SYSTEMATIC SIGNIFICANCE OF LEAF EPIDERMAL CHARACTERISTICS IN *SHOREA* ROXB. (DIPTEROCARPACEAE) IN MALAYSIA

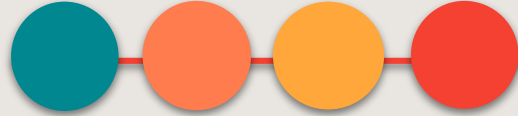
PRESENTED BY  
ASST. PROF. DR CHE NURUL AINI BINTI CHE AMRI



# OUTLINES

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- 01 INTRODUCTION
  - 02 PROBLEMS & OBJECTIVE
  - 03 LITERATURE REVIEW
  - 04 MATERIALS & METHOD
  - 05 RESULTS & DISCUSSION
  - 06 CONCLUSION

# INTRODUCTION



- Dipterocarpaceae – well known plant family (approximately 510-680 species).
- Ashton (1979) classified the Asian Dipterocarpaceae into two tribes; Dipterocarpeae and Shoreae.
- *Shorea* is the largest and economically important genus of Dipterocarpaceae.
- Consists of 194 species in which 163 species occurs in Malesia.



# SHOREA ROXB.

- **Division:** Symington (1943) divided *Shorea* into four wood groups; Balau (Selangan Batu), Red Meranti, White Meranti (Meranti Pa'ang) and Yellow Meranti (Meranti Damar Hitam).
- Ashton (1982) agreed to divide *Shorea* into 11 sections based on androecium, calyx lobes and wood anatomy; *Shorea*, *Pectame*, *Neohopea*, *Richetiodes*, *Anthoshorea*, *Rubella*, *Brachypterae*, *Pachycarpae*, *Mutica*, *Ovalis* and *Doona*
- **Distribution:** *Shorea* occurs from India and Sri Lanka, throughout western Malaysia, to Philippines and Maluku.



- **Morphology:** Species within sections are classified according to leaf morphology and tomentum.
- Balau (Selangan Batu) – section *Shorea* (usually produced harder timber than other groups).
- White Meranti – section *Anthoshorea*.
- Yellow Meranti – section *Richetioides* (distinguished from others by anther characters, wood, bark anatomy and yellow-brown heartwood).
- Red Meranti – sections *Brachypterae*, *Mutica*, *Ovalis* and *Pachycarpae* (pale to dark red or brown heartwood).




# PROBLEM STATEMENT

- It was difficult to identify species of *Shorea* especially when flowerless and fruitless plants in the field.
- The infrequent flowering and fruiting season makes the identification process more complicated.
- The similarities and continuous morphological variation at specific levels of *Shorea* makes the identification difficult.



# OBJECTIVE

- To determine whether leaf anatomical characters in *Shorea* could be of taxonomic value in systematic and diagnostic investigations and possibly applied in the classification.
- 

# MATERIALS

01

## FRESH SPECIMEN

Aboretum and various forest reserves in Peninsular Malaysia

## HERBARIUM SPECIMEN

- Herbarium of Royal Botanic Gardens, Kew, Richmond, UK
- Herbarium of FRIM, Kepong, Malaysia

02

03

## FIXATION

Fresh materials were fixed in A:A (Acetic acid: Alcohol)

## DRIED SPECIMENS

Dried herbarium material was boiled for 10 – 15 minutes and then being fixed

04



# METHODOLOGY

## EPIDERMAL PEELS

- The underside of leaf surface were scraped with a razor blade.
- The samples were then soaked in Jeffrey's solution or bleaching vortex for several days.
- The cleared leaf was stained with safranin, dehydrated, mounted and dried in oven.
- Photographs of sections were taken using Leitz Diaphlan polarizing microscope or Reichert Polyvar 2 Microscope and Digital camera.

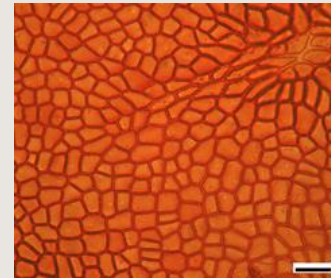
## MICROMORPHOLOGY

- The portion of fixed leaf (3 – 5 mm<sup>2</sup>) were washed in water and dehydrated in alcohol series.
- Dried specimens were mounted surface up on scanning electron microscope stubs using Bostik No. 1 adhesive.
- All stubs were sputter coated with gold palladium.
- The stubs were examined in a 2.7Å field emission of Cambridge Instruments Stereoscan 360 scanning electron microscope.

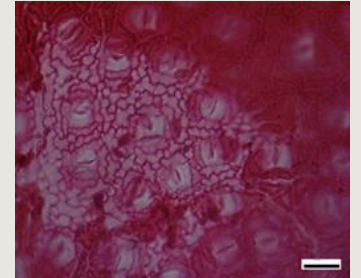
# RESULTS & DISCUSSION

## EPIDERMAL PEELS

- The anticlinal walls of the epidermal cells are straight or curved adaxially and abaxially in all species studied except sinuous in *S. isoptera* and *S. maxwelliana*.



Straight to curved



Sinuous

Species	Adaxial anticlinal cells wall features	Abaxial anticlinal cells wall features
<i>S. isoptera</i>	Sinuous	Sinuous
<i>S. maxwelliana</i>	Sinuous	Sinuous
<i>S. agamii</i> <i>S. atrinervosa</i> <i>S. beccariana</i> <i>S. blumutensis</i> <i>S. bracteolata</i> <i>S. elliptica</i> <i>S. gratissima</i> <i>S. guiso</i> <i>S. hopeifolia</i> <i>S. isoptera</i> <i>S. kunstleri</i> <i>S. laevis</i> <i>S. lepidota</i> <i>S. macroptera</i> <i>S. macrophylla</i> <i>S. maxima</i> <i>S. ovalis</i> <i>S. pauciflora</i> <i>S. paulifolia</i> <i>S. platyclados</i> <i>S. rubella</i> <i>S. seminis</i> <i>S. siamensis</i> <i>S. singkawang</i> <i>S. smithiana</i>	Straight to curved	Straight to curved



Species	Abaxial Epidermal Sculpturing in SEM	Wax in SEM
<i>S. bracteolata</i>	Feature 3	Crustose
<i>S. elliptica</i>	Feature 7 & Feature 2	Crustose
<i>S. rubella</i>	Feature 7 & Feature 2	Crustose
<i>S. parvifolia</i>	Feature 1	Crustose with abundance flakes
<i>S. hopeifolia</i> <i>S. laevis</i> <i>S. maxwelliana</i> <i>S. singkawang</i>	Feature 1	Smooth
<i>S. agamii</i> <i>S. maxima</i>	Feature 4	Smooth
<i>S. platyclados</i> <i>S. siamensis</i>	Feature 5	Smooth
<i>S. isoptera</i> <i>S. smithiana</i>	Feature 6	Smooth
<i>S. atrinervosa</i> <i>S. seminis</i>	Feature 6	Smooth with granules
<i>S. guiso</i>	Feature 5	Smooth with granules
<i>S. blumutensis</i> <i>S. kunstleri</i> <i>S. macroptera</i>	Feature 1	Crustose
<i>S. beccariana</i>	Feature 4	Crustose with flakes
<i>S. pauciflora</i>	Feature 6	Crustose with flakes
<i>S. gratissima</i>	Feature 5	Smooth with flakes
<i>S. lepidota</i>	Feature 1	Smooth with flakes
<i>S. macrophylla</i>	Feature 4	Smooth with flakes
<i>S. ovalis</i>	Feature 6	Smooth with flakes

## FEATURES OF ABAXIAL EPIDERMAL SCULPTURING IN SEM

Feature 1: Epidermal cell outlines indistinguishable in surface view

Feature 2: Epidermal cell outlines obscured by the high density of simple lobed hairs

Feature 3: Epidermal cell outline obscured by the high density of over lapping thick-walled flattened simple lobed hairs; some being elongated and striate

Feature 4: Anticlinal walls raised into broad straight to curved ridges

Feature 5: Anticlinal walls raised into broad swollen ridges that partly obscure the periclinal walls

Feature 6: Periclinal walls raised into irregular domes

Feature 7: Papillose periclinal walls



## MICROMORPHOLOGY

### ADAXIAL

- The adaxial surfaces showed very few taxonomical significant characters.
- The adaxial surfaces are smooth due to the thick cuticle, lack of stomata and have almost no trichomes.

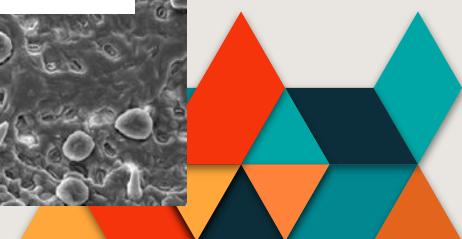
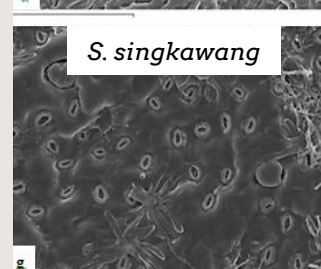
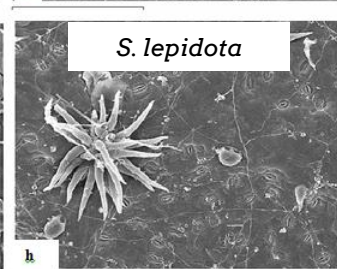
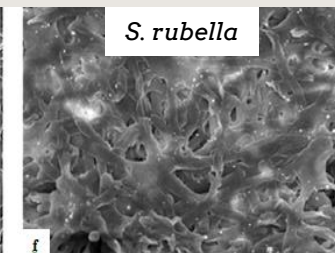
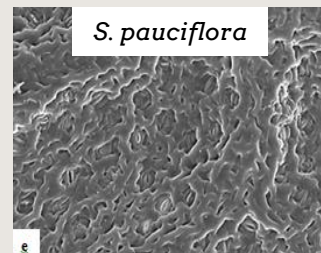
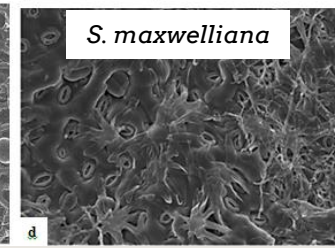
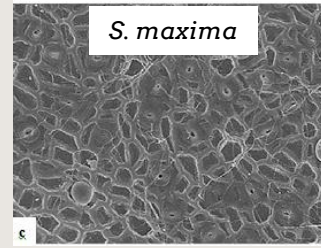
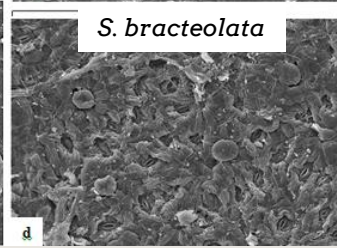
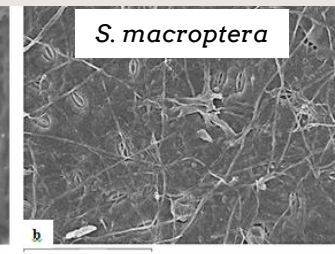
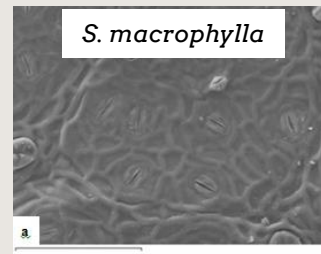
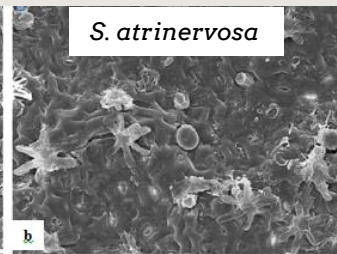
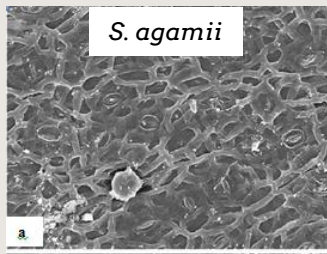
### ABAXIAL

- Type of Feature 3 epidermal sculpturing present only on *S. bracteolata*.
- *S. elliptica* and *S. rubella* showed two types of features; Feature 7 and Feature 2.
- The presence of crustose wax with abundance of flakes only on leaf surface of *S. parvifolia*.
- The presence raised ridges above anticlinal walls of abaxial cuticular sculpturing surface in *S. agamii*, *S. atrinervosa*, *S. beccariana*, *S. macroptera* and *S. maxima* indicate probable close interrelationships between the species.



# ABAXIAL EPIDERMAL

# IN SEM



# CONCLUSION

- Results of the study revealed a number of interesting features which could be taxonomic and diagnostic value.
- Leaf anatomical evidence can be used for identifying certain species in *Shorea*.
- The epidermis of the leaf surface under LM is useful to diagnose two species *S. isoptera* and *S. maxwelliana* from the others.
- The study of epidermal surfaces revealed a number of micromorphological characters that exhibit interspecific variations which significance for identification.
- The presence of crustose wax with flakes on *S. parvifolia* and Feature 3 epidermal sculpturing on *S. bracteolata* considered as diagnostic value.





# ACKNOWLEDGEMENT

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THANK YOU

