# Universities Research Journal 2008
# Vol. 1, No. 1

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# Study on the Relationship of Plant Resin and Myanmar Society

Shwe Sin Ei

## Abstract

This research was based on scientific analysis of the elemental composition of lacquer resin, growing soil structure and pH, elemental composition in this soil, comparative studies of moisture content and collected months of lacquer resin within a year, collection of lacquer resin ('thitsi') from lacquer plant (*Melanorrhoea usitata* Wall.) were also investigated. Moreover, the present study emphasized the role of lacquer resin on Myanmar society such as religious and ritual affairs, daily used utensils and musical instruments.

**Key words**: Lacquer resin, Elemental composition, Moisture content, Society, Utensils

## Introduction

Human's history would not be complete without a look at the role of plants in human society because plants provide people with food, fuel and medicine, as well as materials for construction and the manufacture of crafts and many other products. Most society is almost entirely dependent on plants for their material needs (Hamiltan 2003). Throughout the world, plants and their natural products such as gum, oil, resin etc., are the basis of human material culture (Balick and Cox 1996).

Resin of lacquer ('thitsi') was obtained from *Melanorrhoea usitata* belonging to the family Anacardiaceae. It is a large deciduous tree with a straight cylindrical stem and spreading crown of green leaves, reaching 15 – 18 m in height with a girth of 2 – 3 m when fully grown (Fig-1, 2). The buds were sometimes used as cook. The wood of the lacquer tree is dark red in colour and it was popular wood for house posts (Fig-5). It was used for making charcoal especially use by goldsmiths. These family include *Mangifera indica* L. (Thayet), *Anacardium occidentale* L. (Thiho-thayet), *Mangifera oppositafolia* Roxb. (Mayan), *Poupartia manggifera* Bl. D. *Sylvestre* Bl. (Nga-bauk), *Spandias dulcia* Willded (Gwe-cho), *Spandias pinnate* L. (Gwe) and others. The distinct character of lacquer resin is that three coloured resins were obtained from a single plant according to seasons.

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The hardness of lacquer resin applied on several materials take place only in damp places with high humidity. In Myanmar lacquer workshops, lacquer resin applied materials were placed in a dark, moist underground cellar ('mye-taik') (Fig-6). These mye-taik' had a humidity of 75–80 % and a temperature of 25°C respectively.

In recent years, lacquerware were exported to Germany, French, Italy, Spain and United States of America. These lacquerware workshops are located in Mandalay, Bagan, Nyaung-U, Kyauk-ka, Inn-wa and Laikha. Lacquer resin have played an important role on human culture especially in Myanmar society for a long time. Thus, role of lacquer resin was recorded within the scope of "plants as basis material culture for human" which is a branch of ethnobotany.

The present study emphasized on the role of lacquer resin in society of Myanmar with the following aims and objectives –

+ to study the different kinds of lacquer resin and their quality
+ to record the artisan's skill of making lacquerware
+ to point out the importance of lacquer resin and its products in Myanmar Society.

## Materials and Methods

### Collection of Lacquer Resin ('Thitsi')

'Thitsi' was collected from the bark of the thitsi tree (*Melanorrhoea usitata* Wall.) by tapping. The plant used was five years old, two diagonal notches of 5-6 inches long was made to form V-shaped incisions and 3cm deep in the trunk of tree (called 'mann'), was made using an iron chisel. The apex of the V points towards the ground and the top of the V are from 4-5 inches apart. Then, the chisel was placed under the apex and pushed upwards to separate bark and wood without removing the bark. A small bamboo cup with a sharpened edge of 1 inches wide and 5 inches long (called 'wah-pauk') was horizontally penetrated into the bark at the base of the V in such a way that the exuding the resin slowly flows into the 'wah-pauk'. Three or four incisions ('mann') were made, one above the other. In some plants, 'mann' was made twelve inches from the base of the plant (called 'laik-taik-khin') up to the first branch by using a bamboo ladder (Fig-3, 4). The time of the collection was from June to March and no collection

was made between April and May. The best time of collection was from 6:00 am to 10:00 am. In hot season, the colour of 'thitsi' was black, the best quality. The moderate quality, brown, was collected in winter and the inferior quality, red, was collected in the rainy season.

**Analysis of Elemental Composition of Lacquer Resin by EDXRF (Energy Dispersive X-ray Fluorescence)**

Elemental composition of lacquer resin was analysed by Energy Dispersive X- ray Fluorescence Spectroscopy (EDXRF - 700) in the Universities' Research Center, Yangon.

**Analysis of Soil Structure, pH and Elemental Composition of Soil**

The soil sample from the lacquer plant was found growing were collected, dry and powdered and analysed for soil structure, pH and elemental composition by the Soil and Water Application Engineering Department, Ministry of Agricultural, Ye-zin, Pyinmanar.

**Determination of Moisture Content in Lacquer Resin by Moisture Analyser**

Moisture contents of red, brown and black colour of lacquer resin were investigated by Moisture Analyser in Ministry of Industry (1), Myanmar Spirulina Factory (MSF), Ye-khar, Sagaing.

**Data Collection**

Data collection was recorded by interviewing museum staffs of Mandalay, Bagan and Sagaing, lacquer-resin collectors, lacquer resin sellers, musical instrument makers and Myanmar handicraft artisans of lacquerware, glass mosaic lacquer (hman-si-shwe-cha), relief-moulded lacquer (thayo) workshops of Mandalay, Inn-wa, Bagan, Nyaung-U, Kyauk-ka, Laikha.

Figure 1. Flowers of *Melanorrhoea usitata* Wall

Figure 2. Lacquer resin collector and lacquer resin plant

Figure 3. Marked to form V-shape incision

Figure 4. Flow of lacquer resin from V-shape incisions

Figure 5. Wood of the lacquer resin plant

Figure 6. Underground cellar ('mye-taik') in Bagan

Figure 7. Pounded 'thayo' (A mixture of red lacquer resin, teak sawdust & loam)

Figure 8. 'thayo-kyo" making in Mandalay

Figure 9. Applied with lacquer resin

Figure 10. Applying 'thayo'

## Results

### Analysis of the Elemental Composition of Lacquer Resin

From this analysis, only sample 2 (Tant-zel ye) lacquer resin was found to contain Zn and Cr, other two regions did not contain these two elements. Fe element was lowest in this region compared to the other regions. Only sample 1 (Moe-meik ye) lacquer resin contained Yb and S elements, the other two regions did not contain them. Resin Tant-zel ye was composed of seven elements. According to EDXRF analysis, all elements observed were metals except sulphur (S) (Table-1).

Table- 1. Analysis of the Elemental Composition of Black Lacquer Resin from Three Different Places

| No | Sample | Instru-ment | Element composition | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ca mg/l | Fe mg/l | S mg/l | Yb mg/l | Cu mg/l | Mn mg/l | Zn mg/l | Cr mg/l | K mg/l | $C_6H_{10}O_5$ mg/cm$^2$ |
| 1. | Sample 1 Moe-meik-ye | EDX-700 | 133.371 | 115.786 | 103.727 | 89.754 | 37.283 | 31.101 | – | – | – | 12.500 |
| 2. | Sample 2 Tant-zel ye | EDX-700 | 129.732 | 77.183 | – | – | 32.062 | 27.522 | 26.218 | 19.706 | 80.995 | 12.500 |
| 3. | Sample 4 Taung-gyi ye | EDX-700 | 160.025 | 117 702 | – | – | 38.562 | 33.757 | – | – | 75.323 | 12.500 |

Sample 1 –Moe-meik ye, Sample 2 – Tant-zel ye, Sample 4 – Taung-gyi ye

### Analysis of the Soil Structure, pH and Elemental Composition

Lacquer resin plants were found growing in pH 5.6 to 8.2 and the soil structure was founded to be sandy silt. Tant-zel ye contained higher N, Fe and sand percentage than in the other two regions. The best N, P, K content was observed near Moe-meik (Table-2).

Table 2. Analysis of the Soil Structure, pH and Elemental Composition

| Sample | Soil Colour | pH | Available | | | Organic matter | Exchange ml/100 gm | | ppm | | | Texture % | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | N % | $P_2O_5$ ppm | $K_2O$ % | % | Ca | Mg | Fe | Cu | Zn | Sand | Silt | Clay |
| Moe-meik | brown | 5.6 | 0.0036 | 14.76 | 0.0188 | 1.61 | 0.65 | 0.56 | 12.50 | 0.35 | 0.63 | 76.80 | 13.80 | 9.40 |
| Taung-gyi | red | 7.0 | 0.0029 | 14.28 | 0.0073 | 0.84 | 1.88 | 0.64 | 8.75 | 0.52 | 1.62 | 42.40 | 35.20 | 22.40 |
| Tant-zel | white | 8.2 | 0.0056 | 8.22 | 0.0079 | 1.34 | 1.66 | 0.43 | 31.25 | 0.30 | 1.02 | 80.40 | 12.00 | 7.60 |

## Comparison of Moisture Contents in Red, Brown and Black Coloured Lacquer Resins

According to this comparison the moisture content in black lacquer was observed to be minimum, the maximum moisture content in red and medium moisture content in brown lacquer resin (Table-3).

Table 3. Comparison of Moisture Content in Red, Brown and Black Coloured Lacquer Resins

| Sample | Colour | | |
|---|---|---|---|
| | Black | Brown | Red |
| Moe-meik ye | 11.37 | 22.65 | 36.83 |
| Taung-gyi ye | 5.52 | 12.19 | 30.83 |
| Tant-zel ye | 10.09 | 13.99 | 31.88 |

## Lacquer Resin in Religious Uses

The uses of lacquer resin in religious materials as shown as follows.

(1) Buddha image with gold leaf (gilding) (Fig-13)
(2) Offering bowl with cover (hsun-ok ) (Fig-14)
(3) Golden umbrella (shwe htee) (Fig-15)
(4) Kammawasa manuscript (Fig-16)
(5) Manuscript chest (sardaik) (Fig-17)
(6) Monk's alms bowl (thabeik) (Fig-18)
(7) Circular tray with stand (kalat) (Fig-19)
(8) Nun's alms tray (thi-la-shin-ban) (Fig-20)
(9) Split bamboo Buddha image (hni - hpaya)
(10) Dry Lacquer Buddha image (man-hpaya)
(11) Pagoda's iron umbrella
(12) Sacred flagstaff (ta-kun-taing)
(13) Glass mosaic shrine for Buddha image
(14) Door leaf of Monasteries
(15) Pillars of Monasteries
(16) Ceiling of Pagoda and Monasteries
(17) Offering vessel (hsun-khwet)
(18) Spoon for offering cooked rice to monks
(19) Prayer beads (seit-pa-tee)
(20) Flower basket (pan-daung)
(21) Lacquer pillow
(22) Letter tube (sar-dauk)
(23) Flower vase (pan-o)

## Lacquer resin in Daily Used Materials

The uses of lacquer resin in dalily used materials as shown as follows.

(1) Tray with stand (daung-lan) (Fig-21)
(2) Bamboo tray with lacquer (Fig-22)
(3) Cover for drinking water pot (Fig-22)
(4) Sale basket for vegetable and sweet food (zay taung) (Fig-23)
(5) Crop-measuring basket (Fig-24)
(6) Palanquin ( used for transporting)
(7) Box for king head dress (crown of king)
(8) Box for scented oil
(9) Frame of mirror
(10) Boxes (yun thit-ta)
(11) Lacquerware cabinet
(12) Lacquerware drawer
(13) Lacquerware table
(14) Lacquerware animal images
(15) Lacquerware painting
(16) Varying shapes and sizes of bowl
(17) Tiffen-box (yun- htamin-jaint)
(18) Lacquerware trays
(19) Lacquerware chop-stick (yun- tu)
(20) Water-cup (yun- yae-khwet)
(21) Betel box (yun-kun-it)
(22) Tea-salad dishes (yun-laphet-ok)
(23) Lacquerware tea pot and cups
(24) Lacquerware cheroot box
(25) Dipper (yun-ye-hmok)
(26) Lacquerware pumpkin-box (shwe-hpa-yo n-thi-it)
(27) Lacquerware bracelet
(28) Lacquerware chessboard

## Lacquer Resin Used in Traditional Musical Instruments

The uses of lacquer resin in traditional musical instruments as shown as follows.

(1) Circular drum (hsaing-waing) (Fig-25)
(2) Circular gong (kyi-naung-waing)
(3) Base drum (pat-ma)

(4) Harp (saung-gauk)
(5) Xylophone (patala)
(6) A kind of wind instrument (hnye)
(7) Drum (si - do)
(8) Drum (bom)

Table 4. Comparison of Products from Different Lacquer Resin Used Workshops

| No. | Myanmar Name | Common Name | Workshops | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Bagan | Kyauk-ka | Laikha | Mandalay | Inn-wa | Remark |
| 1. | hni-hpaya | Bamboo Buddha Image | – | – | – | + | – | |
| 2. | man-hpaya | Lacquer Buddha Image | – | – | – | + | – | |
| 3. | phaya-htee | Pagoda's iron umbrella | – | – | – | + | – | |
| 4. | shwe- cha | Gilding of gold leaf | + | + | + | + | – | |
| 5. | ta-kun-taing | Sacred flagstaff | + | + | + | + | – | |
| 6. | phaya-sin | Shrine for Buddha image | – | – | – | + | – | |
| 7. | tagar-ywet | Door leaf | – | – | – | + | – | |
| 8. | kyun- taing | Pillars of Monastery | – | – | – | + | – | |
| 9. | myet-hnar-kyet | Ceiling of Pagoda | + | – | – | + | – | |
| 10. | kammmawasa | Kammawasa manuscript | – | – | – | + | – | |
| 11. | sardaik | Manuscript chest | – | – | – | + | – | |
| 12. | hsun-ok | Offering bowl with cover | + | + | + | + | – | |
| 13. | hsun-khwet | Offering vessel | + | + | – | – | – | |
| 14. | zun | Spoon for offering cooked rice | + | – | – | – | – | |
| 15. | seit-pa-tee | Prayer beads | – | + | – | + | – | |
| 16. | shwe htee | Golden umbrella | – | – | – | + | – | |
| 17. | kalat | Circular tray with stand | + | + | + | + | – | |
| 18. | pan-daung | Flower basket | – | + | – | – | – | |

| No. | Myanmar Name | Common Name | Workshops | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Bagan | Kyauk-ka | Laikha | Mandalay | Inn-wa | Remark |
| 19. | gaung-ohn | Lacquer pillow | + | – | – | – | – | |
| 20. | sar-dauk | Letter tube | + | – | – | – | – | |
| 21. | thabeik | Monks' alms bowl | – | – | – | – | + | |
| 22. | thi-la-shin-ban | Nun's alms tray | – | + | – | – | – | |
| 23. | pan-o | Flower Vase | + | + | – | – | – | |
| 24. | wall-yin | Palanquin | – | – | – | + | – | |
| 25. | – | Box for king head dress | – | – | – | + | – | |
| 26. | si-o | Box for scented oil | – | + | – | – | – | |
| 27. | hman-baun | Frame of mirror | – | – | – | + | – | |
| 28. | yun-thit-ta | Boxes | + | – | – | – | – | |
| 29. | be-do | Lacquerware cabinet | + | – | – | – | – | |
| 30. | an-zwe | Lacquerware drawer | + | – | – | – | – | |
| 31. | sa-pwe | Lacquerware table | + | – | – | – | – | |
| 32. | a-yoke | Animal-images | + | + | – | – | – | |
| 33. | pan-che-car | Lacquerware painting | + | – | – | – | – | |
| 34. | daung-lan | Tray with stand | – | – | – | – | – | |
| 35. | yun-khwet | Bowl | + | – | + | – | – | |
| 36. | htamin-jaint | Tiffin-box | + | + | – | – | – | |
| 37. | ban | Lacquerware tray | + | – | – | – | – | |
| 38. | yun- tu | Chop-stick | + | – | – | – | – | |
| 39. | zay-taung | Sale basket | – | + | – | – | – | |
| 40. | yae-khwet | Water-cup | + | – | + | – | – | |
| 41. | za-kawl | Tray | + | + | – | – | – | |
| 42. | ye-o-phone | Cover for drinking water pot | + | + | – | – | – | |

| No. | Myanmar Name | Common Name | Workshops | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Bagan | Kyauk-ka | Laikha | Mandalay | Inn-wa | Remark |
| 43. | pyi-daung | Measuring basket | – | + | – | – | – | |
| 44. | kun-it | Betel box | + | + | + | – | – | |
| 45. | kun-daung | – | – | – | – | + | – | |
| 46. | laphet-ok | Tea-salad dishes | + | + | – | – | – | |
| 47. | – | Tea pot and cups | + | – | – | – | – | |
| 48. | say-laik-bu | Cheroot box | + | – | – | – | – | |
| 49. | ye-hmok | Dipper | + | – | – | – | – | |
| 50. | shwe-hpa-yon-thi- it | Pumpkin box | + | + | – | – | – | |
| 51. | let-kauk | Ring for hand | + | – | – | – | – | |
| 52. | sit-tu-yin-khone | Chessboard | + | – | – | – | – | |
| 53. | hsaing-waing | Circular drum | – | – | – | + | – | |
| 54. | kyi-naung-waing | Circular gong | – | – | – | + | – | |
| 55. | pat-ma | base-drum | – | – | – | + | – | |
| 56. | saung-gauk | Harp | – | – | – | + | – | |
| 57. | patala | Xylophone | – | – | – | + | – | |
| 58. | hnye | Wind instrument | – | – | – | + | – | |
| 59. | si - do | Drum | – | – | – | + | – | |
| 60. | bom | Drum | – | – | – | + | – | |

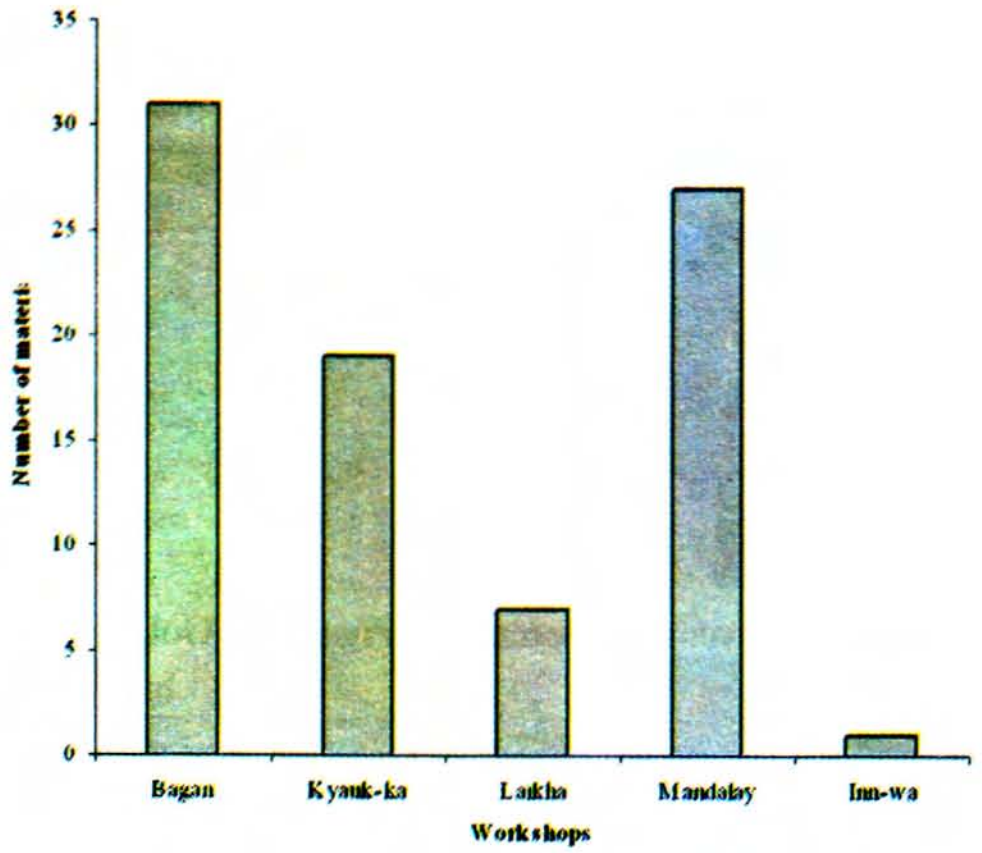


Figure 11. Comparison of Products from Different Lacquer Resin Used Material Workshops

Figure 12. Leather surface of drum with lacquer resin (do-bart)

Figure 13. Gilding with gold-leaf to Buddha image

Figure 14. Offering bowl with cover as a present for special guest

Figure 15. Golden umbrella (shwe-htee)

Figure 16. Kammawasa manuscript with tamarind seed (ma-gyi-zi)

Figure 17. Manuscript chest (sar-daik) and black lacquer resin

Figure 18. Monks carrying monks' alms bowl. to accept donated food from houses

Figure 19. Stand (yun kalat) was used in donation ceremony

Figure 24. Crop measuring basket (pyi-daung) in Kyauk-ka

Figure 25. Within circular drum (hsaing-waing)

Figure 20. Nun's alms tray and Nuns

Figure 21. Lacquerware tray with stand (daung-lan)

Figure 22. Bamboo tray with lacquer resin (za-kol) in Kyauk-ka

Figure 23. Basket applied with lacquer resin used for sale of vegetable and sweet

## Discussion and Conclusion

In Myanmar, the principal source of lacquer resin ('thitsi') is the sap of *Melanorrhoea usitala* Wall., a tree native to southeast Asia including Myanmar. It is found growing in places where the soil components are sandy silt and the pH 5.6 to 8.2 as in Indaing Forests.

Any objects coated with lacquer resin become more durable, resistant to insects and termites. These objects remains well preserved under lacquer coating as observed in 18$^{th}$ century lacquer resin applied materials.

Lacquer resin using materials were found to be waterproof, heat proof and anti-herbivore. Thus, it can widely used in utensils for daily uses, religious and royal- used materials and traditional musical instruments (Fig-7, 8, 9, 10, 12).

Large quantities of daily used materials were produced in Bagan, Nyaung-U and Kyauk-ka. Laikha was observed to produce very low quantity lacquer resin materials. Mandalay produced large quantities of religious materials and the only region to produce traditional musical instruments. Inn-wa only produce monks' alms bowl (Table-4) (Fig-11, 25).

According to elemental analysis of black lacquer resin from Moe-meik ye, Taung-gyi ye and Tant-zel ye showed that calcium (Ca), iron (Fe), sulphur (S), ytterbium (Yb), copper (Cu), manganese (Mn), zinc (Zn), chromium (Cr), potassium (K) were present. All elements were observed metals except sulphur (Table-1). Olmsted and Williams (2006) proposed that metals have certain properties in common. They were observed to be usually shiny. Thus, the lacquer resin was observed as shiny and glossy because of these metallic and silvery properties in the metallic elements. The shiny and glossy texture of lacquer resin cannot be compared with other paint and varnishes.

Soil analysis where the lacquer resin plants were found growing indicated pH 5.6 to 8.2 and the soil structure was observed as sandy silt. The elemental composition of the soil were observed to contain calcium (Ca), magnesium (Mg), iron (Fe), copper (Cu) and zinc (Zn). Iron (Fe) element dominated among other elements present in it (Table-2).

Analysis of moisture contents in lacquer resin from three different places indicated that black colour contained the lowest moisture content compared to brown and red colour. Red colour was observed to contain the highest moisture content. Brown colour was observed as containing medium moisture content between black and red colour (Table-3).

It was observed in this research that Myanmar lacquerware manufacturers used lacquer resin for its anti-herbivore, adhesive, hardening, heat resistance, light weight, shiny and glossy properties. Myanmar, which is endowed with rich resources is also wealthy in cultural heritage. All these culture materials could not be made without plants. Thus, this research is to record a not popular plant product of Myanmar (lacquer-resin) and it's application to valuable materials for Myanmar society.

## Acknowledgements

I would like to express my heartful thanks to Daw Thai Thai Aye, Professor and Head, Department of Botany, Yadanabon University, for allowing me to undertaken this research and for valuable suggestion in this research. All lacquer resin collectors, lacquer resin sellers, lacquerware artisans of Bagan, Nyaung-U, Kyauk-ka, Laikha, Mandalay, Inn-wa and museum staffs of Mandalay Palace, Sagaing, Bagan and all villagers of study areas are greatly acknowledge for giving me accommodation during the course of my research work. I especially wish to express my gratitude to Professor Dr. Maung Thynn, Rector, Meikhtila University, for his suggestions and constant encouragement throughout this research work.

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