

**Government of the Union of Myanmar**  
**Ministry of Forestry**  
**Forest Department**

**Preliminary Study on the Natural Durability of  
Lesser-Known Wood Species**

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# မြန်မာ့လူသုံးနည်း သစ်အမျိုးမျိုးတို့၏ သဘာဝအတိုင်း ကြာရှည်ခံနိုင်မှုကို ရှေ့ပြေးစမ်းသပ်လေ့လာခြင်း

အောင်စိုး၊ လက်ထောက်သုတေသနအရာရှိ  
ဝင်းကြည် (၂) ၊ အကြံပေးအရာရှိ၊ သစ်တောတက္ကသိုလ်  
ချိုချိုဝင်း၊ သုတေသနလက်ထောက် (၂)  
သစ်တောသုတေသနဌာန

## စာတမ်းအကျဉ်းချုပ်

မြန်မာနိုင်ငံ သဘာဝတောများတွင် ပေါက်ရောက်လျက်ရှိသော လူသုံးနည်း သစ်အမျိုးမျိုးတို့၏ သဘာဝအတိုင်းကြာရှည်ခံနိုင်မှုကို သိရှိနိုင်ရန် ဝဲခူးတိုင်း၊ အုတ်တွင်းမြို့နယ်၊ ဖြူးကွန်းနှင့်ခပေါင်းကြီးဝိုင်းတို့မှ လူသုံးနည်းသစ် (၅၂) မျိုးပါဝင်သော စမ်းသပ်ကွက်ကို ၁၉၉၉ ခုနှစ်၊ မိုးလေဝသစာရင်းအရ တစ်နှစ်ပတ်လုံး မိုးရေချိန် (၁၀၁.၃) လက်မ (သို့) ၂၅၇၃ မီလီမီတာနှင့် ပျမ်းမျှအပူချိန် (၂၇.၁°) စင်တီဂရိတ်ရှိ အုတ်တွင်းမြို့နယ်၊ လက်ပံခုံရှိ သုတေသနစခန်းအမှတ်(၇)၌ မြေကြီးအတွင်း ပန္နက်တိုင်ကဲ့သို့ တိုင်စိုက်ခြင်းကို ကျွန်းသစ်နှင့်နှိုင်းယှဉ်၍ စမ်းသပ်ပြုလုပ်ခဲ့ရာ သစ်မျိုး (၂၀)သည် (၂)နှစ်တာ ကာလအတွင်း ခြစားခြင်း၊ မှိုကြောင့်ဆွေးမြေ့ပျက်စီးခြင်းများ တွေ့ရှိရပြီး (၅)နှစ်တာကာလအတွင်း သစ်ဖယောင်းနှင့် တောင်ပိန္နဲသစ်တို့သည် ပျက်ဆီးခြင်း၊ ခြစားခြင်း၊ မှိုကြောင့် ဆွေးမြေ့ခြင်း မရှိကြောင်း တွေ့ရှိရပါသည်။

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## Preliminary Study on the Natural Durability of Lesser Known Wood Species

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### Abstract

The objective of the research conducted was to investigate the durability of lesser used timber species of Myanmar Natural Forest. 52 timber species collected from Kabaung Reserved Forest of Bago Division were tested in Letpankon research station having annual rainfall of 101.3” or 2573 mm and average temperature of 27.1° C. Stake Test or Graveyard Test was conducted along with Teak as a control species. During (2) years test, 20 species were found to be totally destroyed by decay fungi and termite attack and two species such as Thitpayaug and Tauugpeinne showed no sign of decay and were free from insect attack after (5) years.

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## **1. Introduction**

In Myanmar hundreds of tree species grow together with valuable Teak, Padauk, Pyinkado, Thitya, Ingyin, Tamalan, and also many other lesser used species.

In order to bring the lesser-used species on international market, investigation of Myanmar timber species for durability becomes necessary. In collaboration with International Tropical Timber Organization (ITTO), the Forest Department (FD) has undertaken a project entitled “Introducing Myanmar’s Lesser-Used Timber Species (LUS) to the World Market” under the Project No. 31/96 Rev.2 (MFI).

Under the project, natural durability of 52 LUS has been investigated using two methods viz: laboratory decay test and field graveyard test. Analysis on the results obtained from the two tests for natural durability of each timber specimen was made. Performance of timber in the field is determined by using graveyard test for two years exposure period.

To obtain the complete results, two years exposure period is not adequate and it is required long-term exposure period. Therefore, this research continues. In this paper, the results of natural durability of each timer are based on two years exposure period and five years exposure period.

Development objective of the project was to increase the economic contribution of Myanmar’s forest resources by emphasizing the introduction of underutilized timber species.

The specific objectives of this study were:-

- (i) to investigate the natural durability of 52 LUS
- (ii) to estimate the utilization potential such as construction , and indoor utilities based on the results.

This paper is a progress report on the conditions of the stakes at the time of the 1999 to 2004 (5 years) inspections.

## **2. Literature Reviews**

The natural durability of timber is determined from data obtained through field trials by long-term exposure of timbers to biodegrading organisms in the field (Jackson, 1957). Many research works had been used this procedure for classifying natural durability of timbers.

Such tests give good estimates of the natural durability because timbers are exposed to various types of biodeteriorating agents. This kind of study usually takes a long time to predict the lifetime of species tested in service.

The results of an international termite exposure test (Hunt, et.al.,1930) have indicated that pine sapwood stakes 2 by 4 by 18 inches provide an effective means for testing the protection provide against decay and termite attack by various wood preservatives.

The untreated 2 by 4 inch sapwood of southern pine stakes have had an average life of approximately 1 year in the canal zone, Panama (J, Oscar Blue 1951)

The stakes at Madison, Wis., and Saucier, Miss., were installed in plots by the randomized block design. (Fisher, R.A., and Yates, F.1938). The stakes were set in the ground in an upright position with about half of their length 9 inches in the ground. That area was cleared of trees, mostly scrub oak, gallberry, and a few longleaf and slash pine, before the stakes were installed.

In these inspections, the stakes were removed individually, scraped off the rubbish to facilitate inspection, examined, and then returned to their original place unless their condition indicated removed. (Blew, 1963)

It is usual to classify timber into five classes in respect to their durability. In the following table the corresponding 'life' of a 2 x 2 inch stake, in average soil, is compared with the average loss in dry weight percent suffered in laboratory tests.

Durability refers to the natural durability of the heartwood of the timber. The placement of any timber in any of these four groups is based on its performance in "graveyard" test. This method of testing entails the monitoring of test-sticks measuring 50 x 50 x 600 mm buried in test ground. The number of years that the test sticks can last is the basis for the grouping (Lew, 1986).

<b>Durability class</b>	<b>Life of test stake in the field. England</b>	<b>In the Tropics, Fiji</b>	<b>Average loss in dry weight %</b>
Very durable	Over 25 yr	Over 10 yr	Nil or negligible
Durable	15-20 yr	5-10 yr	up to 5%
Moderately durable	10-15 yr	(not given)	5-10%
Non – durable	5-10 yr	2-5 yr	10-30%
Perishable	Less than 5 yr	Less than 2 yr	Over 30%

The following are a few illustrations of the uses of timber in the various classes:

**Very durable.** Timbers in this class may be used with confidence for permanent structures in contact with the ground or in water, e.g. transmission poles; railway sleepers; bridging timbers: marine piling; foundation timbers; hut poles and fencing;

**Durable.** These woods can be used for the exposed parts of permanent structures which are not in direct contact with the soil. They are suitable for the frames, keels, and decking of boats; for the making of vats; for windowsills, and for domestic draining boards.

**Moderately durable.** Woods in this class should never be used in direct contact with the soil unless given preservation treatment, but for short periods they can withstand exposure to damp conditions. They are suitable for those parts of permanent structures that are given protection against the weather, such as rafters, joists, etc. They can also be used for vehicles and for some parts of boats such as deck beams.

**Non-durable.** Non-durable woods should always receive treatment if there is any risk of their becoming damp in use. They can safely be used for internal joinery and furniture, though, if they carry a high proportion of sapwood, they may require long term protection against insect attack, especially in regions where dry wood termites occur.

**Perishable.** Timbers thus described require rapid extraction, conversion and seasoning, to avoid decay in the log stage and while they are being dried. They should not be used for constructional work even under cover unless they have received through preservative treatment. They are often used in turnery and as veneers in plywood for indoor use, also for tea chests for making matches and chip baskets.

It must be emphasized that as there is considerable variation in durability between different samples of the same species, some samples of certain timbers may fall into a class above or below that in which they are normally classified. Obviously then durability cannot be estimated precisely in the case of many variable timbers which can be placed in more than one of the above classes depending on the quality of the samples examined. (Findlay 1985)

### **3. Materials and Methods**

#### **3.1. Materials**

##### **3.1.1. Choice of Site**

The field stake test consists of inserting specimens of standard size in the ground at sites in different parts of the country, and recording the time taken for the specimens to decay (Purslow, 1975). Initially, the flat area of Research Station No. (7), Letpankon, Oaktwin Township was selected for testing site. The annual rainfall and average temperature of the site were 101.3" or 2573 mm and 27.1°C.

##### **3.1.2. Selection of Specimens**

52 LUS (see Appendix III) were tested. Firstly, 2 - meter length of top, middle and base portions of the selected species were cut. The sapwood was removed as much as possible and only the heartwood was sort out. Again, each portion was divided into three parts according to the distance from pit to exterior heartwood. The final dimension of air-dry wood of (50 mm x 50 mm x 450 mm) for each portion was cut for testing. The samples were free from knots, other abnormalities and visible evidence of infection b mold, stain or decay fungi.

There were 3 replications for each portion and each part for all (52) species.

### **3.2. Method**

#### **3.2.1. Installation of Specimens**

The test yard is divided into three plots. In every plot, there are 13 horizontal rows and 14 vertical columns. The specimens were placed sequentially, as numbered, at uniform spacing of 450 mm. Every row was kept separate from it fellows. The specimens were placed vertically in the ground to a depth of 300 mm (three fourth length of samples) with the number end (approx: 150 mm) up and with the numbers facing in one direction along the row.

#### **3.2.2. Inspection and Recording of Results**

Periodical inspections were made at regular intervals and notes were kept regarding the extent of the damage done by fungi and termites. The inspections are generally carried out by visual observation of the condition of the specimens in regard to termite and fungal attack. The conditions of the samples were evaluated at (6) month interval. The stakes were removed individually, scraped off the rubbish to facilitate inspection, recorded the decay and damages and the tested samples were replaced at original testing site for further evaluation.

Based on service lives obtained, evaluation was recorded as follows.

<b>Grade of natural durability of wood in contact with ground</b>	<b>Average service life of specimens (years)</b>
Very durable	Exceeding 10 years
Durable	5 – 10 years
Moderately durable	2 – 5 years
Non – durable	1-2 years
Perishable	< 1

Source: Yves Fortin ad Jean Poligein (1976).

While evaluating the result by visual observation, 5-10% of attack is considered as slight, 10-25% as moderate, above 25% as bad and 50% as destroyed.



#### 4. Results and Discussions

According to the result obtained from the experiment

- 4 species - Thitpagan, Letpan, Hmyaseik and Gwe after (6) months,
- 7 species - Myaukthaythay, Taungthayet, Taungmeok, Ma-U-Lettan-She, Thapan, Lein and Dwabok after (1) year,
- 7 species - Pyaukseik, Binga, Kuthan, Shaw, Taungpetwun, Didu and Thitsein after (1½) years,
- 2 species - Myaukngo and Tawthayet after (2) years,
- 3 species - Thitswele, Zaungbale and Taungoakshit after (3½) years,
- 3 species - Leza, Nabe and Hnaw after (4) years,
- 2 species - Myaukchaw, Yindaik and Thande after (5) years, were totally destroyed.

(See Table 5)

After (2) years of the test it was found out that (100%) of (20) species were totally damaged, (5) species were destroyed, another (20) species were partially damaged and no damages of (7) species were found for rest of the species. (See Table 1)

After (4) years of the test, it was found that among the rest of the non-damaged species (100%) of (6) species were totally destroyed, (18) species were partially damaged and (2) species were no damages (See Table 2).

After (5) years of the test, it was recorded that among the rest of the non-damaged species (2) species were (100%) damaged, (4) species were destroyed, (18) species were partially damaged and (2) species were no damages. (See Table 3)

After (5) years of experiment, it was found that (8) species of timber were attacked by decay fungi, (9) species were combined-attacked by decay and termite, (33) timber species by termite and (2) species left sound.

Among the remaining species, 4 species were found to be non durable (26-50%), and 4 species, Kokko, Yon, Chinyok and Thitkado were partially damaged. Other 14 species Thitmagyi, Sit, Kyetyo, Pyinma, Taukkyan, Thadi, Thabye, Panga, Gyo, Petthan, Yinma, Yemane, Seikchi and Thingadu were damaged below 25%. Two species, Taungpeinne and Thitpayaug were found to be most durable and they could be safely used among lesser-used species. (See Table 5)

The code of natural durability of Myanmar lesser used wood species could be found in selection treatment schedule of Industrial Timber Preservation (ITP). ( Appendix 1. )

When the (18) tested species of Myanmar lesser used wood species are compared with the data from Appendix (2) they are found to have similar result.

## 5. Conclusions and Recommendations

According to the results of the experiment, it can be concluded that,

- (1) Among the test species, Thitpagan, Letpan, Hmyaseik, Gwe, Myaukthwe-the, Taunghayet, Taungmeok, Ma-u-lettan-she, Thapan, Lein and Dwabok were totally destroyed within one year. Therefore, these species are said to be **perishable**.
- (2) Pyaukseik, Binga, Kuthan, Shaw, Taungpetwun, Didu, Thitsein, Myaukngo and Tawthayet were totally destroyed within two years. So, these species are said to be **non-durable**.
- (3) Thitswele, Zaungbale, Taungokshit, Leza, Nabe, Hnaw, Myaukchaw, Yindaik and Thande were totally destroyed and Dwani, Bomeza, Yinzat, Kokko, Yon, Chinyok and Thitkado were 50% destroyed within five years. Therefore, these species are said to be **moderately durable**.
- (4) Among the rest species, Thitmagyi, Sit, Kyetyo, Pyinma, Taukkyan, Thadi, Thabye, Panga, Gyo, Pettan, Yinma, Yemane, Seikchi and Thingadu can be classified in **durable**.
- (5) Taungpeinne and Thitpayaung were found to be most durable during the test period and it could be safely used for any purpose among the tested Lesser Used Species.

The experiment conducted was a preliminary investigation of some lesser-used timber species for their natural durability. By knowing the durability without treatment, the timber could be used according to their physical and mechanical properties.

The results of the test, which were found out, were the data for just a graveyard test or stake test in the open field. The timber species that were destroyed and decayed in the open could probably be used under roof and cover without direct contact with the soil.

The other similar species which were not yet tested should be tested in the near future.

Effective utilization of wood depends on strength, durability, beauty and availability of a species. Strength and durability are the most important factors for consideration in the choice of species for construction purposes.

These results are only from one locality. The hazard classes cannot be the same from one locality to another. The results can be represented from at least three or more test plots. The replicated test plots which have different localities, topography, soil type and rainfall are necessary to get a sound results. Therefore, further field stake tests are necessary to complete the knowledge of durability of LUS.

**Table 1. Condition of (52) species Stake Test ( 5 cm x 5 cm x 45 cm ) after 2 years of graveyard test placed in research station No (7) at the Oaktwin Township August 1999 and inspected (August 2001.)**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life	
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack					
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
	Kyun	9	9	100															Control	2
1	Thitpayaung	9	9	100																2
2	Taungpeinne	9	9	100																2
3	Thitmagyi	9	9	100																2
4	Gyo	9	9	100																2
5	Panga	9	9	100																2
6	Sit	9	9	100																2
7	Kyetyo	9	8	88.9			1	11.1												2
8	Taukkyan	9	8	88.9	1	11.1														2
9	Pyinma	9	9	100																2
10	Thabye	9	8	88.9								1	11.1					1	11.1	2
11	Yinma	9	8	88.9			1	11.1												2
12	Yemane	9	7	77.8			2	22.2												2
13	Thadi	9	5	55.5			4	44.4												2

**Table (1) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	Yr.
14	Petthan	9	6	66.7			3	33.3										2	
15	Thitkado	9	6	66.7	1	11.1					2	22.2					2	22.2	2
16	Kokko	9	7	77.8			1	11.1					1	11.1			1	11.1	2
17	Thingadu	9	5	55.6			2	22.2					2	22.2			2	22.2	2
18	Seikche	9	4	44.4			5	55.6											2
19	Dwani	9	3	33.3			6	66.7											2
20	Yon	9	3	33.3	4	44.5					2	22.2					2	22.2	2
21	Myaukchaw	9	6	66.7					3	33.3									2
22	Bonmeza	9	1	11.1					7	77.8					1	11.1	1	11.1	2
23	Chinyok	9	5	55.6			1	11.1					3	33.3			3	33.3	2
24	Yinzat	9	1	11.1			2	22.2					6	66.7			6	66.7	2
25	Taungoakshit	9					8	88.9					1	11.1			1	11.1	2
26	Thande	9	1	11.1			5	55.6			3	33.3					3	33.3	2
27	Leza	9					7	77.8					2	22.2			2	22.2	2

**Table (1) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life	
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack					
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
28	Yindaik	9	1	11.1			2	22.2					6	66.7			6	66.7	2	
29	Thitswele	9	1	11.1	3	33.3					5	55.6					5	55.6	2	
30	Zaungbale	9					3	33.3					6	66.7			6	66.7	2	
31	Hnaw	9			2	22.2									7	77.8	7	77.8	2	
32	Nabe	9	1	11.1					2	22.2					6	66.7	6	66.7	2	
33	Binga	9											9	100			9	100	2	
34	Tawtayet	9											9	100			9	100	2	
35	Taungpetwun	9												9	100			9	100	2
36	Thitsein	9									9	100					9	100	2	
37	Myaukngo	9											9	100			9	100	2	
38	Kuthan	9											9	100			9	100	2	
39	Thitpagan	9												9	100			9	100	2
40	Lein	9									9	100					9	100	2	
41	Dwabok	9											9	100			9	100	2	

**Table (1) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.
42	Pyaukseik	9											9	100			9	100	2
43	Didu	9									9	100					9	100	2
44	Shaw	9											9	100			9	100	2
45	Taungtayet	9											9	100			9	100	2
46	Taungmeok	9									9	100					9	100	2
47	Maulettanshe	9											9	100			9	100	2
48	Thapan	9											9	100			9	100	2
49	Hmyaseik	9											9	100			9	100	2
50	Myaukthwethay	9											9	100			9	100	2
51	Letpan	9											9	100			9	100	2
52	Gwe	9													9	100	9	100	2

**Table 2. Condition of (52 ) Species Stake Test ( 5 cm x 5 cm x 45 cm ) after about 4years of graveyard test placed in research station No (7) at the Oaktwin Township , August 1999 to inspected ( August 2003 )**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	Yr.
	Kyun	9	9	100													Control	4	
1	Thitpayaung	9	9	100														4	
2	Taungpeinne	9	9	100														4	
3	Thitmagyi	9	8	88.9			1	11.1										4	
4	Gyo	9	6	66.7			2	22.2			1	11.1					1	11.1	4
5	Panga	9	5	55.6			3	33.3					1	11.1			1	11.1	4
6	Sit	9	5	55.6			4	44.4											4
7	Kyetyo	9	6	66.7			3	33.3											4
8	Taukkyan	9	8	88.9							1	11.1					1	11.1	4
9	Pyinma	9	6	66.7			3	33.3											4
10	Thabye	9	8	88.9									1	11.1			1	11.1	4
11	Yinma	9	3	33.3			5	55.6					1	11.1			1	11.1	4
12	Yemane	9	1	11.1			8	88.9											4

**Table (2) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life		
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack						
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	Yr.		
13	Thadi	9	2	22.2			7	77.8										4			
14	Petthan	9	6	66.7			2	22.2					1	11.1			1	11.1	4		
15	Thitkado	9	2	22.2	4	44.5					3	33.3					3	33.3	4		
16	Kokko	9	2	22.2			6	66.7					1	11.1			1	11.1	4		
17	Thingadu	9	3	33.3			4	44.4					2	22.2			2	22.2	4		
18	Seikche	9	1	11.1			8	88.9											4		
19	Dwani	9	1	11.1			4	44.5					4	44.4			4	44.4	4		
20	Yon	9	2	22.2	3	33.3					4	44.5					4	44.5	4		
21	Myaukchaw	9												9	100			9	100	4	
22	Bonmeza	9							3	33.3					6	66.7			6	66.7	4
23	Chinyok	9	4	44.4									5	55.6			5	55.6	4		
24	Yinzat	9					3	33.3					6	66.7			6	66.7	4		
25	Taungoakshit	9											9	100			9	100	4		



**Table (2) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	Yr.
26	Thande	9												9	100	9	100	4	
27	Leza	9										9	100			9	100	4	
28	Yindaik	9				1	11.1					8	88.9			8	88.9	4	
29	Thitswele	9								9	100					9	100	4	
30	Zaungbale	9										9	100			9	100	4	
31	Hnaw	9												9	100	9	100	4	
32	Nabe	9						2	22.2					7	77.8	7	77.8	4	
33	Binga	9										9	100			9	100	4	
34	Tawtayet	9										9	100			9	100	4	
35	Taungpetwun	9												9	100	9	100	4	
36	Thitsein	9								9	100					9	100	4	
37	Myaukngo	9										9	100			9	100	4	
38	Kuthan	9										9	100			9	100	4	
39	Thitpagan	9												9	100	9	100	4	

**Table (2) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	Yr.
40	Lein	9								9	100					9	100	4	
41	Dwabok	9										9	100			9	100	4	
42	Pyaukseik	9										9	100			9	100	4	
43	Didu	9								9	100					9	100	4	
44	Shaw	9										9	100			9	100	4	
45	Taungtayet	9										9	100			9	100	4	
46	Taungmeok	9								9	100					9	100	4	
47	Maulettanshe	9										9	100			9	100	4	
48	Thapan	9										9	100			9	100	4	
49	Hmyaseik	9										9	100			9	100	4	
50	Myaukthwethay	9										9	100			9	100	4	
51	Letpan	9										9	100			9	100	4	
52	Gwe	9												9	100	9	100	4	

**Table 3. Condition of (52 ) species Stake Test ( 5 cm x 5 cm x 45 cm ) after about 5 years of graveyard test placed in research station No (7) at the Oaktwin Township , August 1999 and inspected August 2004**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life	
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack					
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
	Kyun	9	9	100															Control	5
1	Thitpayaung	9	9	100																5
2	Taungpeinne	9	9	100																5
3	Thitmagyi	9	3	33.3			6	66.7												5
4	Gyo	9	4	44.5			4	44.4			1	11.1						1	11.1	5
5	Panga	9	4	44.5			4	44.4					1	11.1				1	11.1	5
6	Sit	9	4	44.5			5	55.5												5
7	Kyetyo	9	4	44.5			5	55.5												5
8	Taukkyan	9	8	88.9							1	11.1						1	11.1	5
9	Pyinma	9	5	55.6			4	44.4												5
10	Thabye	9	6	66.7			2	22.2					1	11.1				1	11.1	5
11	Yinma	9					9	100												5
12	Yemane	9					9	100												5

**Table (3) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life	
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack					
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
13	Thadi	9					8	88.9					1	11.1			1	11.1	5	
14	Petthan	9	6	66.7			2	22.2					1	11.1			1	11.1	5	
15	Thitkado	9			6	66.7					3	33.3					3	33.3	5	
16	Kokko	9					8	88.9					1	11.1			1	11.1	5	
17	Thingadu	9	1	11.1			6	66.7					2	22.2			2	22.2	5	
18	Seikche	9					9	100											5	
19	Dwani	9					3	33.3					6	66.7			6	66.7	5	
20	Yon	9			5	55.6					4	44.4					4	44.4	5	
21	Myaukchaw	9												9	100			9	100	5
22	Bonmeza	9							2	22.2					7	77.8	7	77.8	5	
23	Chinyok	9	1	11.1			4	44.5					4	44.4			4	44.4	5	
24	Yinzat	9					3	33.3					6	66.7			6	66.7	5	
25	Taungoakshit	9											9	100			9	100	5	
26	Thande	9												9	100			9	100	5

**Table (3) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.
27	Leza	9										9	100			9	100	5	
28	Yindaik	9										9	100			9	100	5	
29	Thitswele	9								9	100					9	100	5	
30	Zaungbale	9										9	100			9	100	5	
31	Hnaw	9												9	100	9	100	5	
32	Nabe	9						1	11.1					8	88.9	8	88.9	5	
33	Binga	9										9	100			9	100	5	
34	Tawtayet	9										9	100			9	100	5	
35	Taungpetwun	9												9	100	9	100	5	
36	Thitsein	9								9	100					9	100	5	
37	Myaukngo	9										9	100			9	100	5	
38	Kuthan	9										9	100			9	100	5	
39	Thitpagan	9												9	100	9	100	5	
40	Lein	9								9	100					9	100	5	

**Table (3) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.
41	Dwabok	9										9	100			9	100	5	
42	Pyaukseik	9										9	100			9	100	5	
43	Didu	9								9	100					9	100	5	
44	Shaw	9										9	100			9	100	5	
45	Taungtayet	9										9	100			9	100	5	
46	Taungmeok	9								9	100					9	100	5	
47	Maulettanshe	9										9	100			9	100	5	
48	Thapan	9										9	100			9	100	5	
49	Hmyaseik	9										9	100			9	100	5	
50	Myaukthwethay	9										9	100			9	100	5	
51	Letpan	9										9	100			9	100	5	
52	Gwe	9												9	100	9	100	5	

**Table 4. Condition of (52 ) species Stake Test ( 5 cm x 5 cm x 45 cm ) after about 3 years of graveyard test placed in research station No (7) at the Oaktwin Township , August 1999 and inspected ( August 2002 )**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	Yr.
	Kyun	9	9	900													Control	3	
1	Thitpayaung	9	9	100														3	
2	Taungpeinne	9	9	100														3	
3	Thitmagyi	9	8	88.9	1	11.1	1	11.1										3	
4	Gyo	9	7	77.8	2	22.2	2	22.2										3	
5	Panga	9	7	77.8			2	22.2										3	
6	Sit	9	8	88.9			1	11.1										3	
7	Kyetyo	9	8	88.9			1	11.1										3	
8	Taukkyan	9	8	88.9	1	11.1												3	
9	Pyinma	9	6	66.7			3	33.3										3	
10	Thabye	9	8	88.9								1	11.1			1	11.1	3	
11	Yinma	9	2	22.2			7	77.8										3	
12	Yemane	9	4	44.4			5	55.5										3	

**Table (4) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life	
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack					
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
13	Thadi	9	3	33.3			6	66.7												3
14	Petthan	9	6	66.7			3	33.3												3
15	Thitkado	9	4	44.5	2	22.2					3	33.3					3	33.3		3
16	Kokko	9	7	77.8			1	11.1					1	11.1			1	11.1		3
17	Thingadu	9	5	55.6			2	22.2					2	22.2			2	22.2		3
18	Seikche	9	2	22.2			7	77.8												3
19	Dwani	9	1	11.1			4	44.5					4	44.4			4	44.4		3
20	Yon	9	3	33.3	2	22.2					4	44.5					4	44.5		3
21	Myaukchaw	9							2	22.2					7	77.8	7	77.8		3
22	Bonmeza	9							6	66.7					3	33.3	3	33.3		3
23	Chinyok	9	5	55.6									4	44.4			4	44.4		3
24	Yinzat	9					3	33.3					6	66.7			6	66.7		3
25	Taungokshit	9					1	11.1					8	88.9			8	88.9		3
26	Thande	9													9	100	9	100		3



**Table (4) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.
27	Leza	9					1	11.1					8	88.9			8	88.9	3
28	Yindaik	9					1	11.1					8	88.9			8	88.9	3
29	Thitswele	9	1	11.1							8	88.9					8	88.9	3
30	Zaungbale	9					1	11.1					8	88.9			8	88.9	3
31	Hnaw	9													9	100	9	100	3
32	Nabe	9							2	22.2					7	77.8	7	77.8	3
33	Binga	9											9	100			9	100	3
34	Tawtayet	9											9	100			9	100	3
35	Taungpetwun	9													9	100	9	100	3
36	Thitsein	9									9	100					9	100	3
37	Myaukngo	9											9	100			9	100	3
38	Kuthan	9											9	100			9	100	3
39	Thitpagan	9													9	100	9	100	3
40	Lein	9									9	100					9	100	3

**Table (4) Continued**

Sr. No.	Species	Number of samples in the test	Good		Serviceable but showing some						Destroyed by						Total removed		Life
					Decay		Termite attack		Decay and Termite attack		Decay Fungi		Termite attack		Decay Fungi and Termite attack				
			No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.
41	Dwabok	9										9	100			9	100	3	
42	Pyaukseik	9										9	100			9	100	3	
43	Didu	9								9	100					9	100	3	
44	Shaw	9										9	100			9	100	3	
45	Taungtayet	9										9	100			9	100	3	
46	Taungmeok	9								9	100					9	100	3	
47	Maulettanshe	9										9	100			9	100	3	
48	Thapan	9										9	100			9	100	3	
49	Hmyaseik	9										9	100			9	100	3	
50	Myaukthwethay	9										9	100			9	100	3	
51	Letpan	9										9	100			9	100	3	
52	Gwe	9												9	100	9	100	3	

**Table (5) Condition Showing the Result of Damages and Durability of (52) Lesser -Used species**

No	Number of Species	Service life (yr)	Good species	Serviceable but showing damages		Destroyed		Destroyed (100%)	Remark
				1 - 25%	26 - 50%	51 - 75%	76 - 99%		
1.	52	0.5	30	7	4	1	6	4	
2.	52	1	16	16	5	1	3	7	
3.	52	1.5	10	15	1	5	3	7	
4	52	2	7	1	7	3	2	2	
5.	52	3	5	12	4	2	9	-	
6.	52	4	2	15	3	3	3	6	
7.	52	5	2	14	4	1	3	2	

### Selection of Myanmar Wood Natural Durability Codes

Sr.No.	Myanmar Name	Common Name	Botanical Name	Natural Durability Code	Remark
1	Kaunghmu	Kaunghmu	<i>Anisoptera glabra</i>	C	
2	Kha-daw-hmi	Grevillea. Silky oak	<i>Grevillea robusta</i>	C	
3	Kyun	Teak. Burma Teak	<i>Tectona grandis</i>	A-B	
4	Myauklok	Lakucha. Lakoocha	<i>Artocarpus lakoocha</i>	B	
5	Padauk	Burma padauk	<i>Pterocarpus macrocarpus</i>	A	
6	Pyinkado	Iron wood. Pyinkado	<i>Xylia dolabriformis</i>	A-C	
7	Sagapyu	Champ	<i>Michelia doltsopa</i>	B-E	
8	Sagawa	Champ	<i>Michelia champaca</i>	B-E	
9	Sha	Cutch	<i>Acacia catechu</i>	A	
10	Subyu	Babul	<i>Acacia arabica</i>	D	
11	Tamalan	African/Bombay black wood	<i>Dalbergia oliveri</i>	A-D	
12	Than		<i>Terminalia oliveri</i>	B	
13	Thanthat	Thanthat	<i>Albizia lucida</i>	D	
14	Thayet	Mango	<i>Mangifera indica</i>	D	
15	Thingan	Marawan. Thingan	<i>Hopea odorata</i>	C	

Sr.No.	Myanmar Name	Common Name	Botanical Name	Natural Durability Code	Remark
16	Thitka	Thitka	<i>Pentace burmanica</i>	B	
17	Zinbyun	Dillenia	<i>Dillenia pentagyna</i>	E	
18	-	Burma mangrove.Longgadai	<i>Bruguiera main species</i>	D-E	

Code of Natural Durability

A = Very durable                  B = Durable                  C = Moderately durable

D = Non-durable                  E = Perishable

**Source :** Industrial timber preservation, selection treatment schedules (Appendix 1), Research & Development Division, Rentokil Limited, Associated Business Press, Landon.

**Comparison of results from Selecting Myanmar Wood Natural Durability Codes and Results from Current Tested Species**

<b>Sr. No.</b>	<b>Myanmar Name</b>	<b>Common Name</b>	<b>Botanical Name</b>	<b>Natural Durability Code</b>	<b>Currently Tested Sp:</b>
1	Binga	Binga	<i>Matragyna diversifolia</i>	D	D
2	Chinyok	Garuga	<i>Garuga pinnata</i>	E	C
3	Hnaw	Haldu	<i>Adina cordifolia</i>	D	C
4	Kokko	Kokko siris	<i>Albizzia lebbek</i>	C	C
5	Kuthan	Kuthan	<i>Hymenodictyon excelsum</i>	E	D
6	Leza	Leza	<i>Lagerstroemia tomentosa</i>	D	C
7	Maulettanshe	Kadam	<i>Anthocephalus cadamba</i>	E	E
8	Myaukchaw	Myaukchaw	<i>Homalium tomentosum</i>	D	C
9	Nabe		<i>Lannea grandis</i>	E	C
10	Pyaukseik	Kanyu	<i>Holoptelea integrifolia</i>	D	D
11	Pyinma	Jaurl. Pyinma	<i>Lagerstroemia flos-regince</i>	B	B
12	Sit	White siris	<i>Albizzia procera</i>	C	B
13	Thaungthayet	Thaungthayet	<i>Swintonia floribunda</i>	E	E
14	Thingadu	Thingadu	<i>Parashorea stellata</i>	C-D	B

<b>Sr. No.</b>	<b>Myanmar Name</b>	<b>Common Name</b>	<b>Botanical Name</b>	<b>Natural Durability Code</b>	<b>Currently Tested Sp:</b>
15	Thitkado	Toon	<i>Cedrela toona</i>	D	C
16	Thitmagyi	Black siris	<i>Albizia odoratissima</i>	B	B
17	Yinma	Chikrassy	<i>Chukrasia tabularis</i>	D	C
18	Yon	Yon	<i>Anogeissus acuminata</i>	C	C

**Source :** Industrial timber preservation, selection treatment schedules (Appendix 1), Research & Development Division, Rentokil Limited, Associated Business Press, Landon.

**Condition of the physical properties of ( 52) lesser used species**

Sr. No	Vernacular Name	Botanical Name	Initial wt. (g)	Volume (Lx W x T)x cm <sup>3</sup>	Oven dry wt. (g)	Density (gcm <sup>-3</sup> )	Sp.Gr (green)	MC% (green)
	<b>Group – II</b>							
1.	Binga	<i>Mitragyna rotundifolia</i>	48.19	64.39	37.59	0.741	0.578	18.01
2.	Hnaw	<i>Adina cordifolia</i>	46.99	63.27	38.53	0.743	0.609	21.91
3.	Kokko	<i>Albizzia lebbek</i>	41.72	63.62	35.88	0.656	0.564	16.19
4.	Sit	<i>Albizzia procera</i>	56.20	65.66	47.31	0.856	0.721	18.73
5.	Thadi	<i>Protium serrata</i>	69.22	61.26	52.20	1.130	0.852	32.64
6.	Thit-magyi	<i>Albizzia odoratissima</i>	55.76	64.91	42.07	0.859	0.648	32.69
7.	Thitkado	<i>Cedrela toona</i>	30.59	66.03	25.55	0.463	0.387	19.71
8.	Yemane	<i>Gmelina arborea</i>	39.61	64.23	33.48	0.617	0.521	18.37
9.	Yindaik	<i>Dalbergia cultrata</i>	61.90	63.84	51.60	0.970	0.808	19.96
	<b>Group – III</b>							
10.	Yinma	<i>Chukrasia tabularis</i>	63.52	64.38	53.82	0.987	0.836	18.04
11.	Panga	<i>Terminalia chebula</i>	69.01	59.65	53.03	1.157	0.889	17.27
12.	Pyinma	<i>Lagerstroemia speciosa</i>	50.42	61.79	39.82	0.816	0.644	26.80
13.	Taukkyan	<i>Terminalia tomentosa</i>	68.03	61.46	55.95	1.106	0.910	21.60
14.	Taung-peinne	<i>Artocarpus calophylla</i>	31.74	66.12	27.61	0.480	0.418	14.88



Sr. No	Vernacular Name	Botanical Name	Initial wt. (g)	Volume (Lx W x T)x cm <sup>3</sup>	Oven dry wt. (g)	Density (gcm <sup>-3</sup> )	Sp.Gr (green)	Mc% (green)
15.	Taung-thayet	<i>Swintonia floribunda</i>	36.65	64.61	32.05	0.567	0.496	14.33
16.	Taw-thayet	<i>Mangifera caloneura</i>	46.42	61.82	39.81	0.751	0.644	16.07
17.	Thabye	<i>Eugenia spp.</i>	66.06	56.43	53.37	1.171	0.946	23.79
18.	Thingadu	<i>Parashorea stellata</i>	53.22	61.03	42.96	0.872	0.704	23.89
19.	Yon	<i>Anogeissus acuminata</i>	64.05	63.39	54.71	1.010	0.863	17.06
	<b>Group – IV</b>							
20.	Chinyok	<i>Garuga pinnata</i>	54.13	62.68	38.58	0.864	0.616	39.88
21	Didu	<i>Salmalia insignis</i>	31.45	64.93	28.26	0.484	0.435	21.49
22.	Gwe	<i>Spondias pinnata</i>	24.49	66.05	20.98	0.371	0.318	16.74
23.	Letpan	<i>Salmalia malabarica</i>	23.38	70.30	19.80	0.333	0.282	18.06
24.	Ma-u-lettan-she	<i>Anthocephalus cadamba</i>	36.49	62.49	31.67	0.584	0.507	15.02
25.	Myaukngo	<i>Duabanga grandiflora</i>	41.48	65.02	25.01	0.638	0.385	67.62
26.	Nabe	<i>Lennea grandis</i>	47.81	63.04	38.43	0.758	0.610	24.37
	<b>Group – V</b>							
27.	Kuthan	<i>Hymenodictyon excelsum</i>	34.24	65.66	29.55	0.522	0.450	15.83
28.	Leza	<i>Lagerstroemia tomentosa</i>	46.92	59.68	38.09	0.786	0.638	23.43
29.	Myaukchaw	<i>Homalium tomentosum</i>	62.07	61.26	53.08	1.013	0.866	16.95
30.	Pyaukseik	<i>Holoptelea integrifolia</i>	48.62	65.09	41.16	0.747	0.632	18.13

Sr. No	Vernacular Name	Botanical Name	Initial wt. (g)	Volume ( cm <sup>3</sup> )	Oven dry wt. (g)	Density (gcm <sup>-3</sup> )	Sp.Gr (green)	Mc% (green)
	<b>Group – VI</b>							
31.	Bonmeza	<i>Albinnia chinensis</i>	27.86	65.57	23.84	0.422	0.364	16.87
32.	Dwabok	<i>Kydia calcina</i>	36.02	64.32	30.22	0.560	0.470	19.25
33.	Dwani	<i>Eriolaena candollei</i>	48.17	63.74	41.78	0.756	0.656	15.52
34.	Gyo	<i>Schleichera oleosa</i>	77.97	59.32	64.03	1.314	1.079	21.77
35.	Hmyaseik	<i>Antiaris toxicaria</i>	25.02	68.20	21.61	0.367	0.317	15.83
36.	Kyetyo	<i>Vitex pubescens</i>	66.57	59.60	56.25	1.117	0.944	18.40
37.	Lein	<i>Terminalia pyrifolia</i>	55.58	58.75	46.32	0.946	0.788	19.96
38.	Myaukthwethay	<i>Myristica angustifolia</i>	37.71	63.85	32.38	0.591	0.507	16.45
39.	Taungoakshit	<i>Aegle marmelos</i>	56.96	61.04	47.44	0.933	0.777	20.07
40.	Petthan	<i>Haplophragma adenophyllum</i>	59.30	62.04	50.56	0.956	0.815	17.28
41.	Seikchi	<i>Bridelia retusa</i>	58.47	61.52	43.33	0.950	0.704	35.39
42.	Shaw	<i>Sterculia spp.</i>	22.95	66.03	19.14	0.348	0.290	19.83
43.	Taung-me-ok	<i>Alstonia scholaris</i>	28.47	66.84	24.33	0.426	0.364	17.03
44.	Taung-petwun	<i>Pterospermum acerifolium</i>	45.65	62.61	31.89	0.729	0.509	19.01
45.	Thande	<i>Stereospermum personatum</i>	55.05	63.94	46.59	0.861	0.729	18.15

<b>Sr. No</b>	<b>Vernacular Name</b>	<b>Botanical Name</b>	<b>Initial wt. (g)</b>	<b>Volume ( cm<sup>3</sup>)</b>	<b>Oven dry wt. (g)</b>	<b>Density (gcm<sup>-3</sup>)</b>	<b>Sp.Gr (green)</b>	<b>Mc% (green)</b>
46.	Thapan	<i>Ficus glomerata</i>	32.11	67.23	27.16	0.478	0.404	18.27
47.	Thit-pagan	<i>Millettia brandisiana</i>	43.59	61.20	34.59	0.702	0.557	26.02
48.	Thit-payaung	<i>Neonauclea excelsa</i>	63.06	58.84	52.09	1.072	0.885	21.04
49.	Thitsein	<i>Terminalia belerica</i>	53.61	61.11	45.41	0.877	0.743	18.10
50.	Thitswele	<i>Schrebera swietenioides</i>	64.69	66.93	55.57	0.967	0.830	16.44
51.	Yinzat	<i>Dalbergia fusca</i>	63.93	60.81	54.51	1.051	0.896	17.28
52.	Zaungbale	<i>Lagerstroemia villosa</i>	49.19	62.02	41.49	0.793	0.669	18.56

**Note :** Findings from the Treatability Test of the ITTO Project PD 31/96 Rev. 2 ( MFI). It may or may not be coincide with the final results published in this paper.

**Table 6. B x S Table of Means for 2 years (%)**

No	Species	BOLTS (B)						S-Mean	
		Bottom		Middle		Top			
1	Thitpayaung	0.002	a	0.003	a	0.006	a	0.004	a
2	Taungpeinne	0.003	a	0.003	a	0.005	a	0.004	a
3	Thitmagyi	0.006	a	0.003	a	0.002	a	0.004	a
4	Gyo	0.005	a	0.004	a	0.002	a	0.004	a
5	Panga	0.002	a	0.004	a	0.005	a	0.004	a
6	Sit	0.004	a	0.002	a	0.004	a	0.004	a
7	Kyetyo	0.002	a	0.002	a	1.668	a	0.557	a
8	Taukkyan	1.668	a	0.003	a	0.002	a	0.558	a
9	Pyinma	0.002	a	0.003	a	0.003	a	0.003	a
10	Thabye	0.004	a	0.002	a	18.336	ab	6.114	a
11	Yinma	0.002	a	3.335	a	0.004	a	1.114	a
12	Yemane	3.335	a	3.335	a	0.006	a	2.225	a
13	Thadi	3.334	a	0.002	a	3.335	a	2.223	a
14	Pettan	13.334	ab	3.336	a	0.003	a	5.558	a
15	Thitkado	20.001	ab	3.335	a	21.667	ab	15.001	abc
16	Kokko	0.003	a	0.012	a	40.001	bcd	13.339	ab
17	Thingadu	30.000	abc	16.668	abc	0.003	a	15.557	a-d
18	Seikche	3.334	a	3.334	a	0.002	a	2.223	a
19	Dwani	15.001	ab	15.000	abc	21.668	ab	17.223	a-d
20	Yon	18.334	ab	36.667	b-e	28.333	abc	27.778	a-d
21	Myaukchaw	0.004	a	10.001	ab	23.334	ab	11.113	ab
22	Bonmeza	26.667	abc	56.667	d-h	20.002	ab	34.445	a-d
23	Chinyok	26.670	abc	41.668	b-f	16.669	ab	28.336	a-d
24	Yinzat	53.333	cde	46.667	c-f	46.667	bcd	48.889	bcd
25	Taungoakchit	40.000	bcd	33.333	a-e	26.667	abc	43.333	a-d
26	Thande	21.667	abc	70.000	fgh	56.667	cde	49.445	de
27	Leza	45.001	bcd	45.000	c-f	40.000	bcd	43.334	b-e
28	Yindaik	100.000	g	23.335	abc	100.000	f	74.445	e
29	Thitswele	100.000	g	26.667	a-d	66.668	de	64.445	b-e
30	Zaungbale	90.000	fg	100.000	h	26.667	abc	72.222	e
31	Hnaw	80.000	efg	83.333	gh	43.333	bcd	68.889	e
32	Nabe	66.667	def	60.000	efg	78.333	ef	68.333	e
33	Binga	100.002	g	100.002	h	100.002	f	100.002	e
34	Tawtayet	100.002	g	100.002	h	100.002	f	100.002	e
35	Taungpetwin	100.002	g	100.002	h	100.002	f	100.002	e
36	Thitsein	100.002	g	100.002	h	100.002	f	100.002	e
37	Myaukngo	100.000	g	100.000	h	100.000	f	100.000	e
38	Kuthan	100.002	g	100.002	h	100.002	f	100.002	e
39	Thitpagan	100.003	g	100.003	h	100.003	f	100.003	e
40	Lein	100.002	g	100.002	h	102.519	f	100.841	e
41	Dwabok	100.002	g	100.002	h	100.002	f	100.002	e

Species		Bottom		Middle		Top		S-Mean	
42	Pyaukseik	100.001	g	100.001	h	100.003	f	100.002	e
43	Didu	100.001	g	100.002	h	100.001	f	100.001	e
44	Shaw	100.002	g	100.001	h	100.001	f	100.001	e
45	Taungtayet	100.002	g	100.002	h	100.003	f	100.002	e
46	Taungmeok	100.003	g	100.002	h	100.003	f	100.003	e
47	Maulettanshe	100.001	g	100.002	h	100.003	f	100.002	e
48	Thanpan	100.003	g	100.002	h	100.001	f	100.002	e
49	Myaukthwethay	100.002	g	100.002	h	100.002	f	100.002	e
50	Letpan	100.002	g	100.002	h	100.001	f	100.002	e
51	Hmyaseik	100.002	g	100.002	h	100.002	f	100.002	e
52	Gwe	100.002	g	100.002	h	100.002	f	100.002	e

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT.

Comparison	S.E.D.	LSD (5%)	LSD (1%)
2-B*S means (3,3)	14.057	27.656	36.420
2-B*S means (3,2)	15.716	30.920	40.719

SV	DF	SS	MS	F
REPLICATION ( R )	2	6067.035	3033.517	10.24**
TREATMENT	155	905138.900	5839.606	19.70**
BOLT (B)	2	223.545	111.773	<1
SPECIES (S)	51	857290.008	16809.608	56.72**
B x S	102	47625.348	466.915	1.58**
ERROR	309	91583.293	296.386	
TOTAL	466	1002789.228		

CV = 33.1%

\*\* = significant at 1% level

**Table 7. B x S Table of Means for 5 years (%) (AVE.OVER 3 REPS)**

No	Species	BOLTS (B)						S-Mean	
		Bottom		Middle		Top			
1	Thitpayaung	0.002	a	0.002	a	0.002	a	0.002	a
2	Taungpeinne	0.002	a	0.002	a	0.002	a	0.002	a
3	Thitmagyi	3.335	a	6.668	a	5.000	a	5.001	ab
4	Gyo	0.005	a	5.002	a	36.667	a-e	13.891	ab
5	Panga	3.335	a	21.668	a	15.001	abc	13.335	ab
6	Sit	21.667	ab	0.002	a	5.001	a	8.890	ab
7	Kyetyo	3.336	a	5.001	a	20.001	a-d	9.446	ab
8	Taukkyan	33.334	a-d	0.004	a	0.005	a	11.114	ab
9	Pyinma	13.335	ab	0.006	a	18.334	a-d	10.558	ab
10	Thabye	0.002	a	1.668	a	35.002	a-e	12.224	ab
11	Yinma	5.000	a	28.333	ab	23.333	a-d	18.889	ab
12	Yemane	6.667	a	40.000	ab	6.667	ab	17.778	ab
13	Thadi	10.000	ab	16.667	a	6.667	ab	11.111	ab
14	Petthan	33.336	a-d	16.670	a	8.334	abc	19.447	ab
15	Thitkado	83.333	ef	15.000	a	50.000	c-f	49.444	e
16	Kokko	20.000	ab	8.333	a	48.333	b-f	25.556	b
17	Thingadu	28.333	abc	35.333	ab	6.667	ab	23.333	ab
18	Seikche	23.333	ab	30.000	ab	11.667	abc	21.667	ab
19	Dwani	70.000	def	33.333	ab	93.333	g	65.556	cd
20	Yon	36.667	a-d	40.000	ab	70.000	efg	48.889	c
21	Myaukchaw	100.000	f	100.000	c	100.000	g	100.000	e
22	Bonmeza	96.667	f	100.000	c	58.333	d-g	85.000	de
23	Chinyok	50.000	b-e	65.000	bc	30.000	a-e	48.333	e
24	Yinzat	66.667	c-f	96.667	c	80.000	fg	81.111	de
25	Taungoakchit	100.002	f	100.002	c	100.003	g	100.003	e
26	Thande	91.667	f	100.000	c	100.000	g	97.222	e
27	Leza	100.002	f	100.001	c	100.004	g	100.002	e
28	Yindaik	100.000	f	100.000	c	100.000	g	100.000	e
29	Thitswele	100.003	f	100.006	c	100.002	g	100.004	e
30	Zaungbale	100.004	f	100.003	c	100.003	g	100.003	e
31	Hnaw	99.999	f	100.005	c	100.005	g	100.003	e
32	Nabe	100.002	f	100.006	c	100.002	g	100.003	e
B-MEAN		46.876		45.783		47.762		46.807	

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT.

Comparison	S.E.D.	LSD (5%)	LSD (1%)
2-B*S means	18.070	35.641	47.004

<b>SV</b>	<b>DF</b>	<b>SS</b>	<b>MS</b>	<b>F</b>
REPLICATION ( R )	2	10768	5384	10.99**
TREATMENT	95	474679	4997	10.20**
BOLT (B)	2	189	94	<1
SPECIES (S)	31	435691	14055	28.69**
B x S	62	38799	626	1.28**
ERROR	190	93063	490	
TOTAL	287	578510		

CV = 47.3%

\*\* = significant at 1% level

ns = not significant

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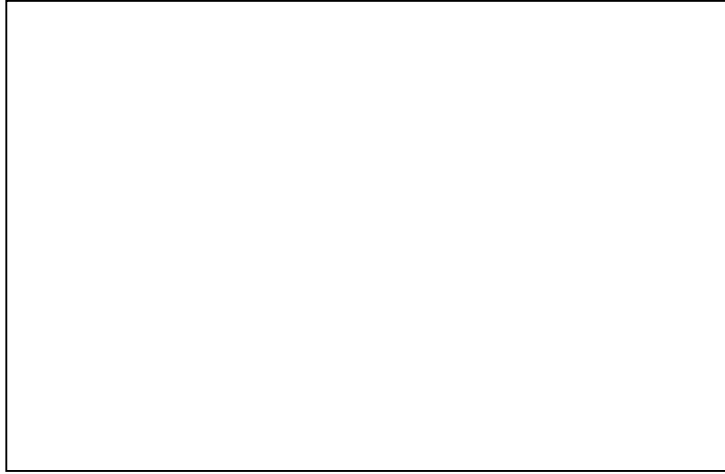


Fig (1) Preparation of Wood Sample

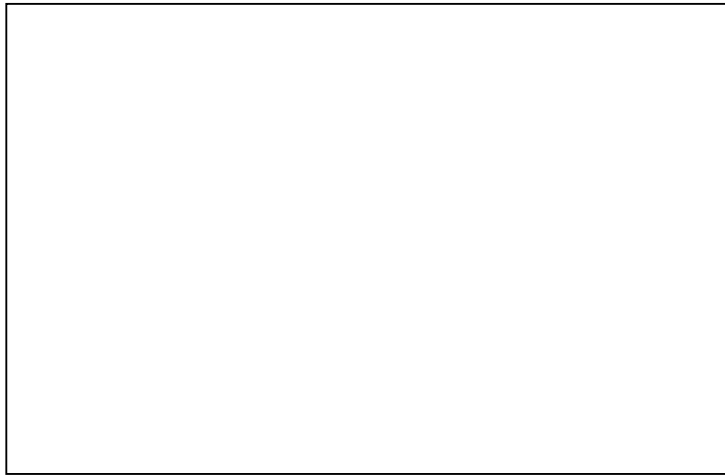


Fig ( 2 ) Stake Test at Letpankon Research Station

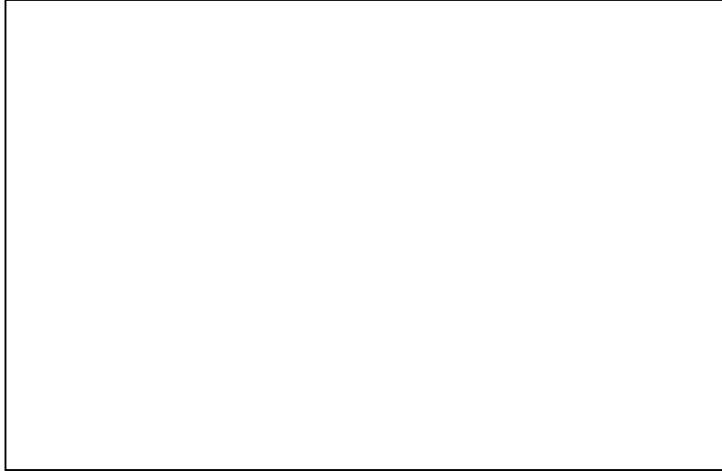


Fig ( 3 ) Stake Test at Letpankon Research Station

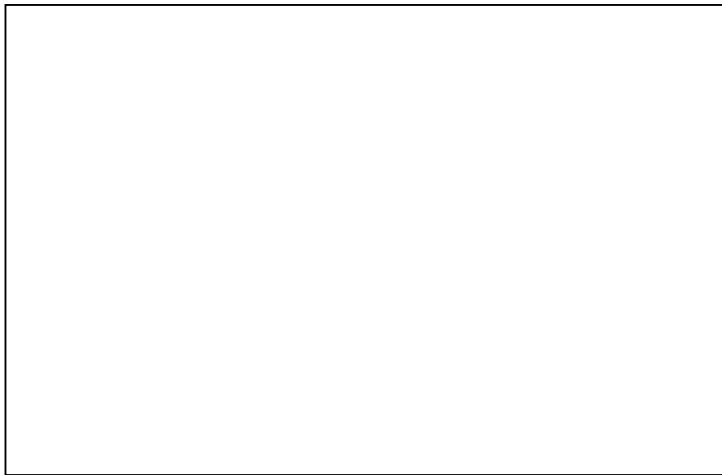


Fig ( 4 ) Unearth of woos sample for data collection

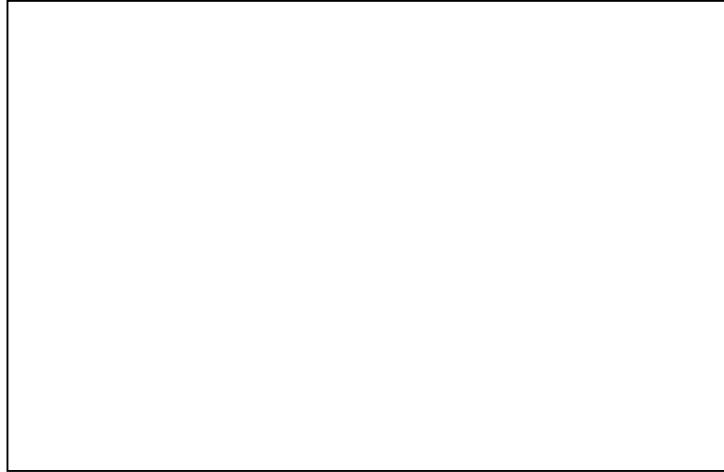


Fig ( 5 ) Condition of the decayed wood sample



Fig ( 6 ) Data collection