Towards Securing Geographical Indications Status for Nilambur Teak – The Wood Quality Perspective

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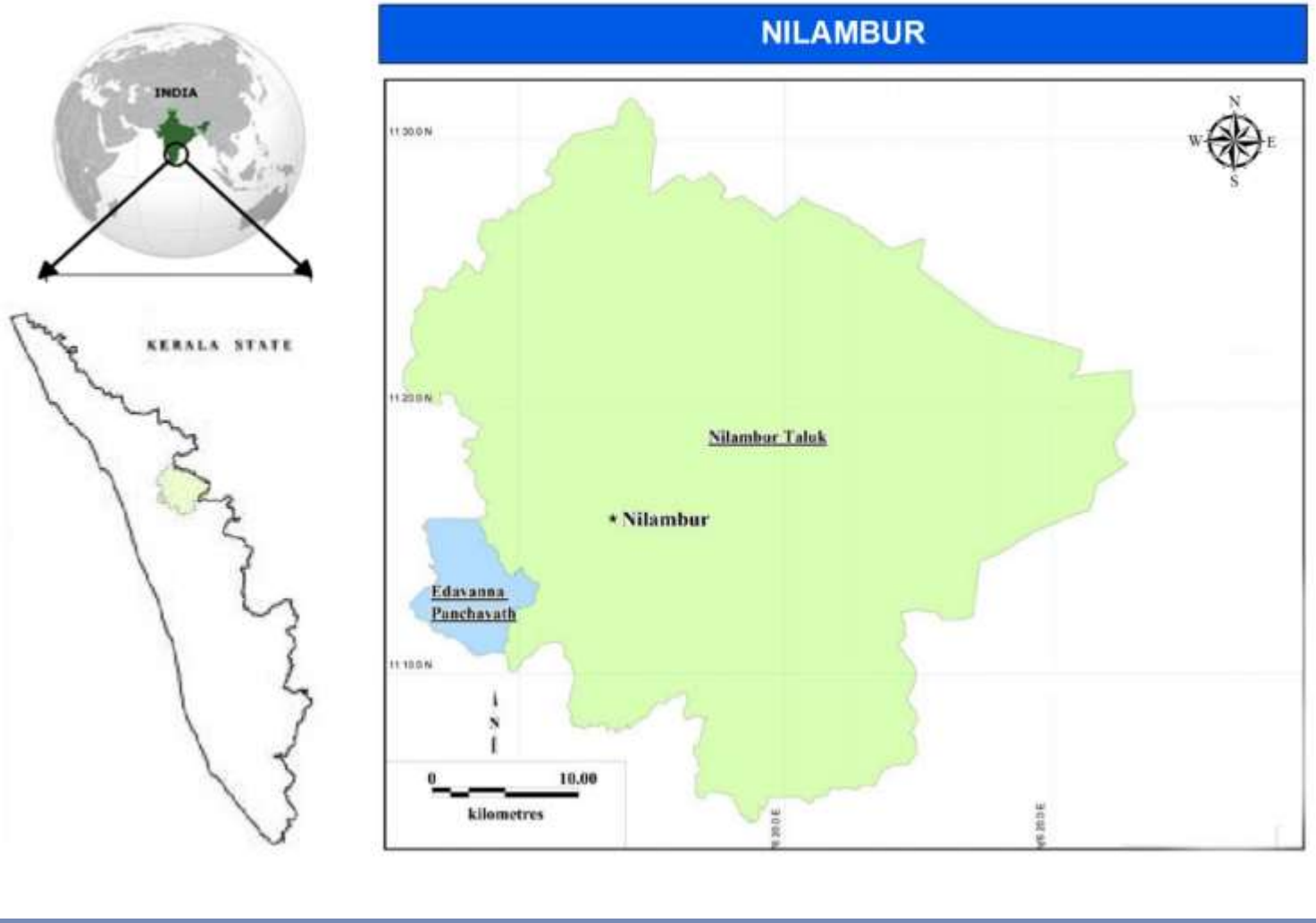
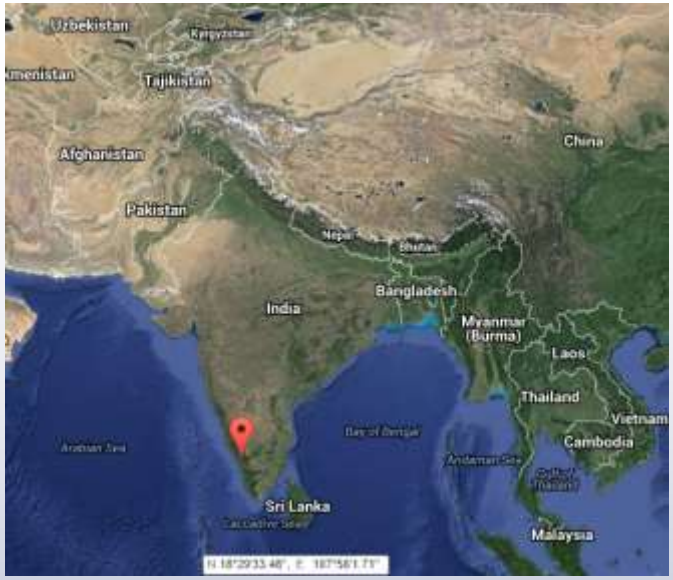
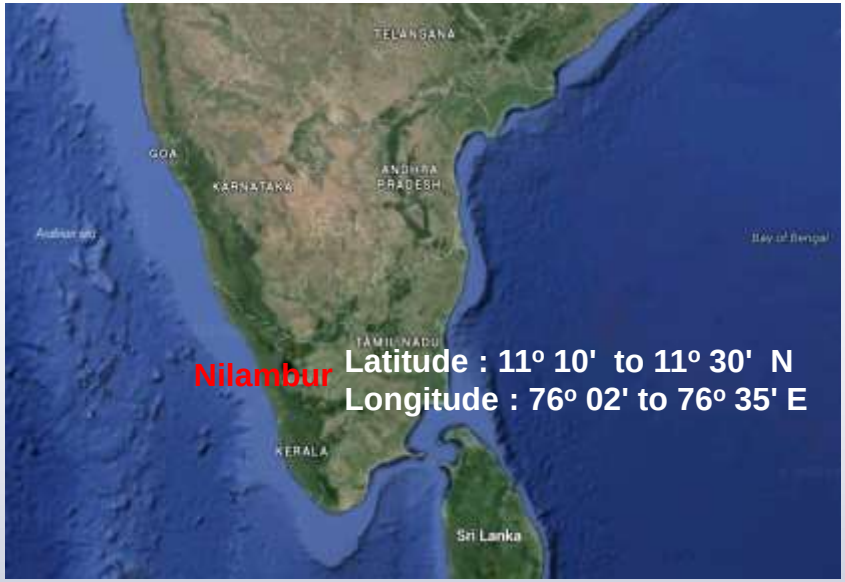
'Nilambur Teak' - a name instantly recognized by connoisseurs of teak around the world.



Nilambur (Malabar) teak wood is obtained from the natural forests, teak plantations and homesteads in Nilambur and nearby areas of Malappuram district, Kerala, South India.





The undulating mid-lands on the West, Nilgiris in the East, Silent valley national park on the South and Wayanad forests on the North, border it.

Nilambur

Nilambur teak – wood quality attributes

Grows fast, yields large diameter logs

Nilambur (Malabar) teak – Wood Quality Attributes

Golden brown colour, often with darker chocolate-brown streaks

Table 1. Gross physical, mechanical and working properties of Nilambur teak.

Sl. No.	Wood Property	Description
	Physical	
1.	Colour	Heartwood golden brown or dark brown occasionally with black streaks with a waxy feel, lustrous, sapwood pale yellow or grey, well defined.
2.	Odour	Distinct aromatic odour with the smell of leather
3.	Weight	Moderately heavy (Air-dry specific gravity 0.55-0.70 with average value of 0.65)
4.	Grain	Straight
5.	Texture	Uneven; Coarse
	Mechanical	
1.	Strength	Strong
	Static Bending	
	Modulus of Rupture (MOR) N/mm^2	106
	Modulus of Elasticity (MOE) N/mm^2	10000
	Compression parallel to grain	
	Maximum Crushing Stress (MCS) N/mm^2	60.4
2.	Drying and shrinkage	Dries well but rather slowly with little or no degrade; Shrinkage- radial (2.3%), tangential (4.8%), volumetric (7.1%). High resistance to water absorption.
	Other properties	
3.	Durability	Very durable; highly resistant to termite damage.
4.	Treatability	Extremely resistant
5.	Working properties	Easily worked with both hand and machine tools. Planing easy; Boring- easy; Turning- rather easy; Nailing- good but pre-boring necessary; Finish-good
		(Source: Several authors)

Antiques

Picture courtesy: KFRI

‘Dhows’ – Sail Boats

Picture courtesy: KFRI

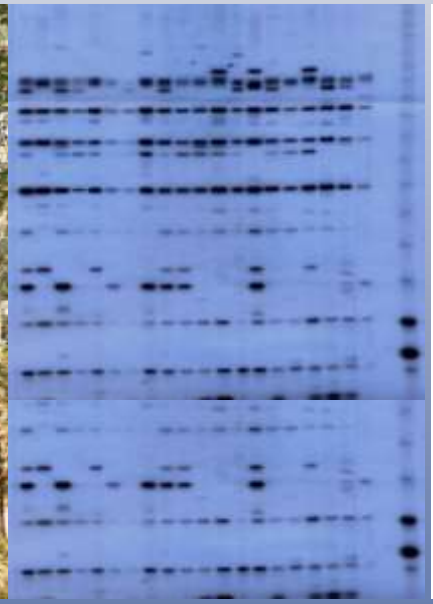
Dhow building units at Beypore

Yacht manufacture in Europe

Rolls-Royce Teak Decking

Nilambur population is unique

Previous studies using AFLP markers indicate that natural teak population of Nilambur has a separate genetic identity among Southern Western Ghats populations matching with its popularly known phenotypic identity and wood quality.



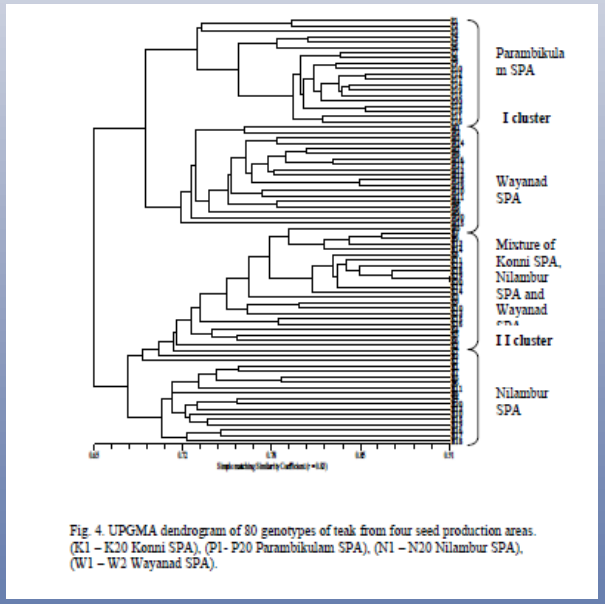


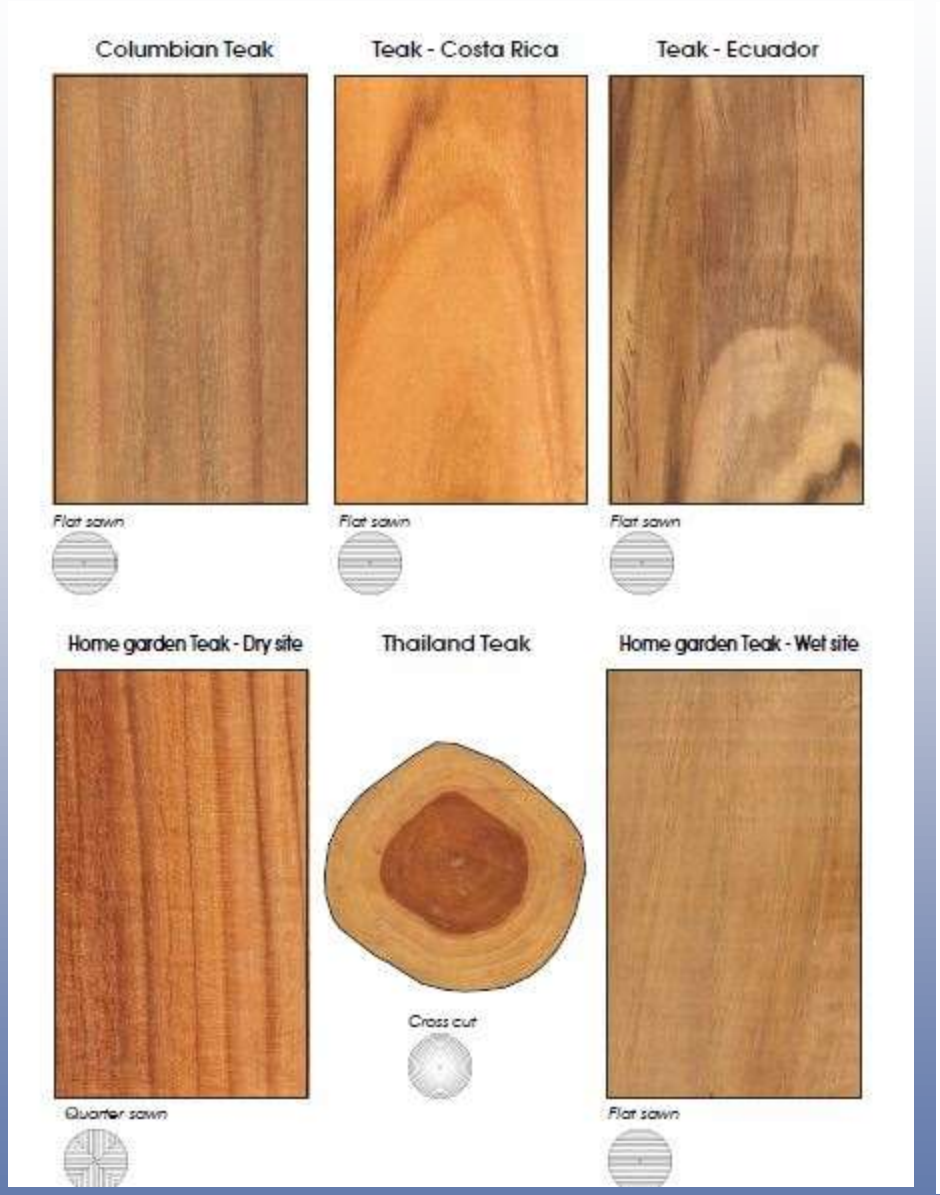
Fig. 4. UPGMA dendrogram of 80 genotypes of teak from four seed production areas. (K1 – K20 Konni SPA), (P1- P20 Parambikulam SPA), (N1 – N20 Nilambur SPA), (W1 – W2 Wayanad SPA).

Source: Balasundaram *et al* (2012)

Quality variation – Teak Museum, Nilambur

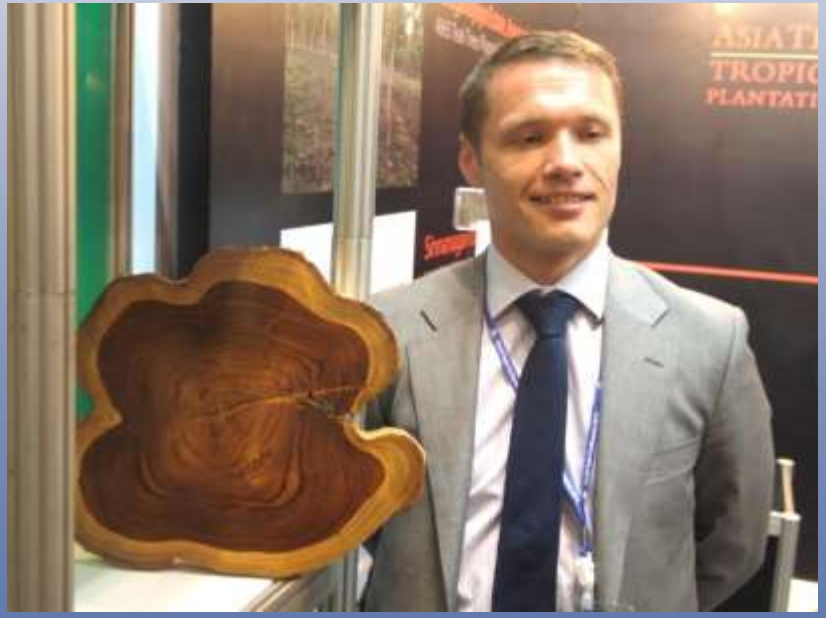
Picture courtesy: KFRI

Wood quality variation in International teak



(Source: Bhat et al 2007)

2nd World Teak Conference (Bangkok, 2013)



Wood Quality from many sources leaves much to be desired

Superior Wood Quality of Nilambur teak reported by several authors

Sl. No.	Title	Authors	Findings
1	Heartwood, Calcium and Silica Content in Five Provenances of Teak (*Tectona grandis* Linn. f)	Kjær et al (1998)	Higher heartwood and silica content (impacting appearance) was more
2	Variation in growth and wood traits among nine populations of teak in peninsular India	Varghese et al 2000	Higher growth rate and moderate density
3	A Note on Heartwood Proportion and Wood Density of 8-year-old Teak	Bhat (2000)	Density value 6% greater than the recorded for 27-year-old teak grown in Nigeria. Faster growth was associated with higher heartwood percentage while wood density was independent of growth rate.
4	Influence of provenance variation on wood properties of teak from the western ghat region in India	Bhat & Priya (2004)	Higher values of static bending (modulus of rupture and modulus of elasticity) and longitudinal compressive stresses for the Malabar provenance (Nilambur).
5	Log Characteristics and Sawn Timber Recovery of Home-Garden Teak from Wet and Dry Localities of Kerala, India	Thulasidas & Bhat (2008)	Grade I logs with higher sawn timber recovery percentage (78.8%)
6	Effect of growth rate on wood quality of teak (*Tectona grandis* Linn.f.) grown under differing site quality conditions.	Anish & Anoop (2015) *In press*	Wood quality parameters like specific gravity, resistance to deformation, heartwood color and total extractive content were found to be superior for Nilambur teak.

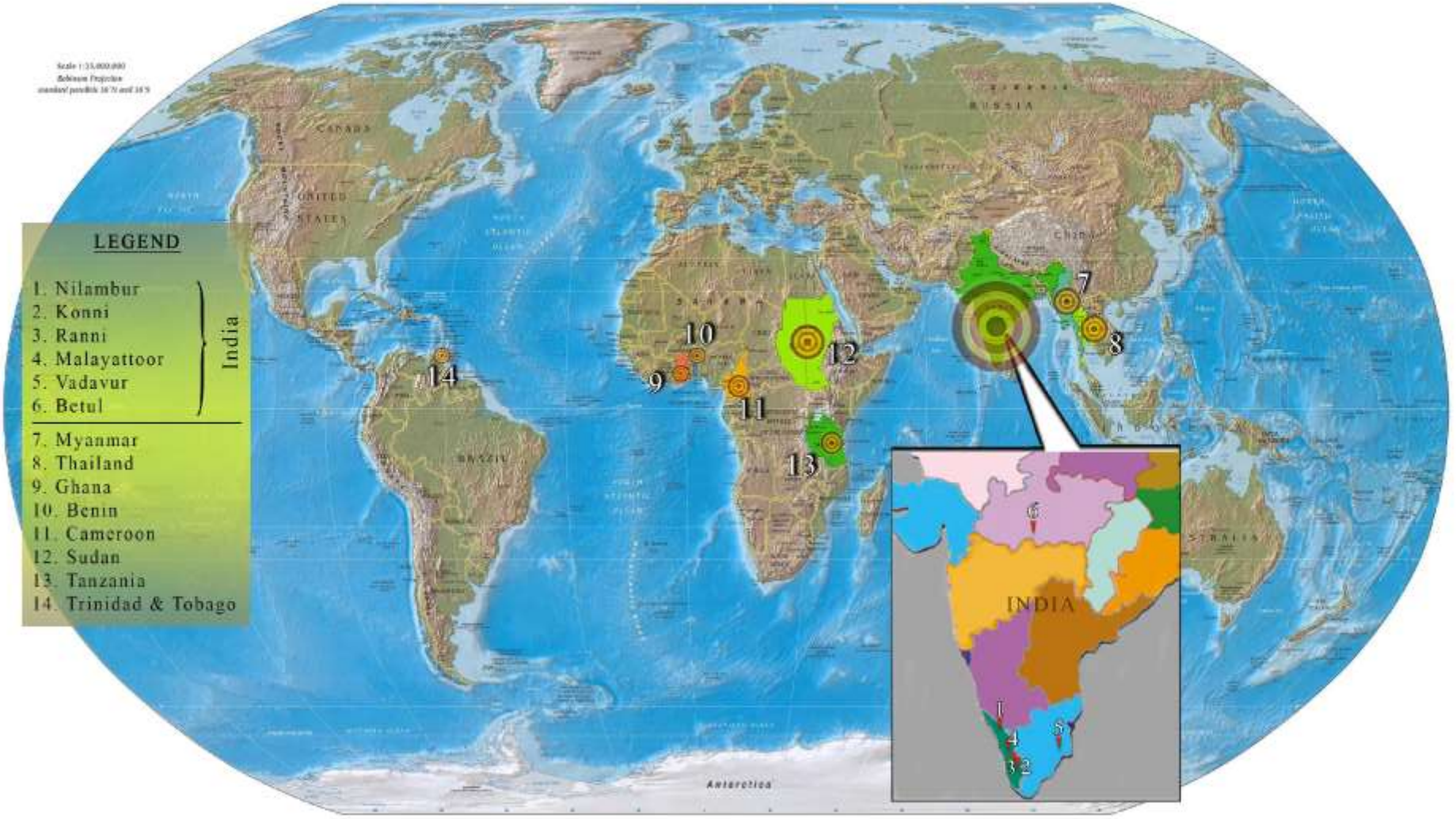
Wood Quality of fast grown and slow teak

Objectives:

(1) Analyse the effect of rate of growth on the wood quality of teak with special reference to the samples collected from important teak growing regions within the country as well as from outside.

(2) Analyse the variation in wood physical, anatomical and biochemical properties between the provenance / geographic sources in the above two categories.

Map showing country of origin of samples studied



Wood quality variation in International teak

Nilambur

Ranni

Myanmar

Thailand

Konni

Malayattoor

Tanzania

Cameroon

Ghana

Benin

Vadavar (Tamil Nadu)

Betul (Madhya Pradesh)

Sudan

Trinidad and Tobago

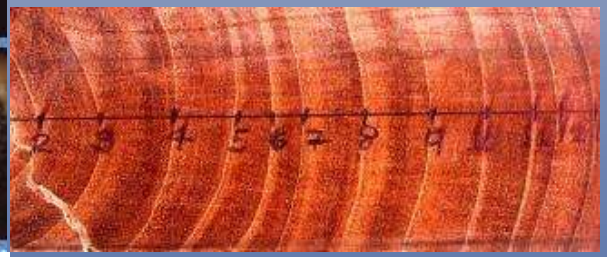
India

Other countries

Table 2 Average girth and ring width of the samples

Sample	Girth (m)	Avg. Ring Width (mm)
Betul (Ind)	1.14	3
Benin	0.62	5
Camaroon	1.32	5
Ghana	0.89	6
Konni (Ind)	1.14	3
Malayatoor (Ind)	0.69	3
Myanmar	1.35	3
Nilambur	1.28	5
Ranni (Ind)	0.71	5
Sudan	0.79	4
Tanzania	1.06	5
Thailand	0.75	4
Trinidad	0.68	4
Vadavar (Ind)	1.69	8

Tree discs with multiple radii cleared for ring width measurement using a ring width measurement station.



Ring width measurement

Determination of wood physical, biochemical and anatomical properties

Determination of heartwood extractive content using Soxhlet apparatus

Determination of heartwood colour using Munsell system

Sliding wood microtome (Leica SM 2000 R) used for wood sectioning

Image Anayser (Labomed Digi-2) used for anatomical quantification

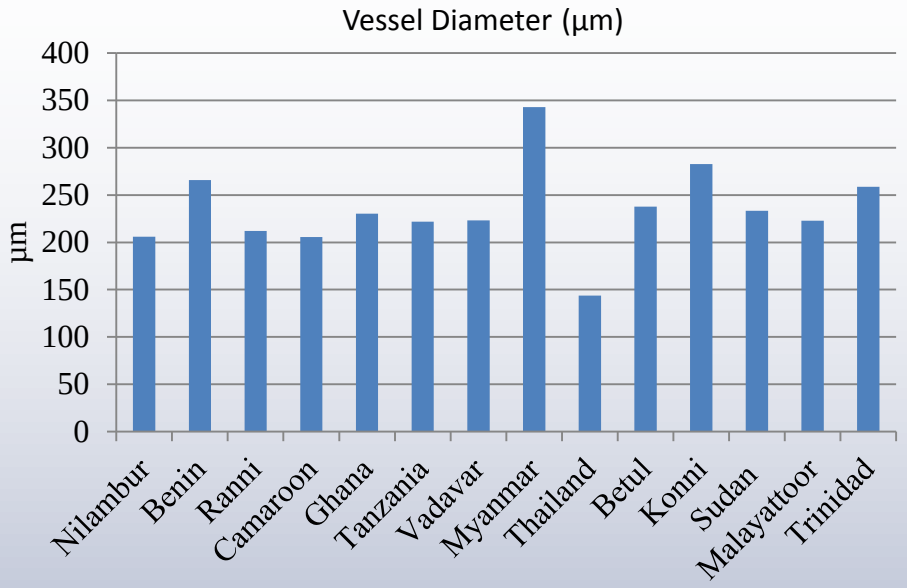
Fig 1. Variation in specific gravity of the collected samples

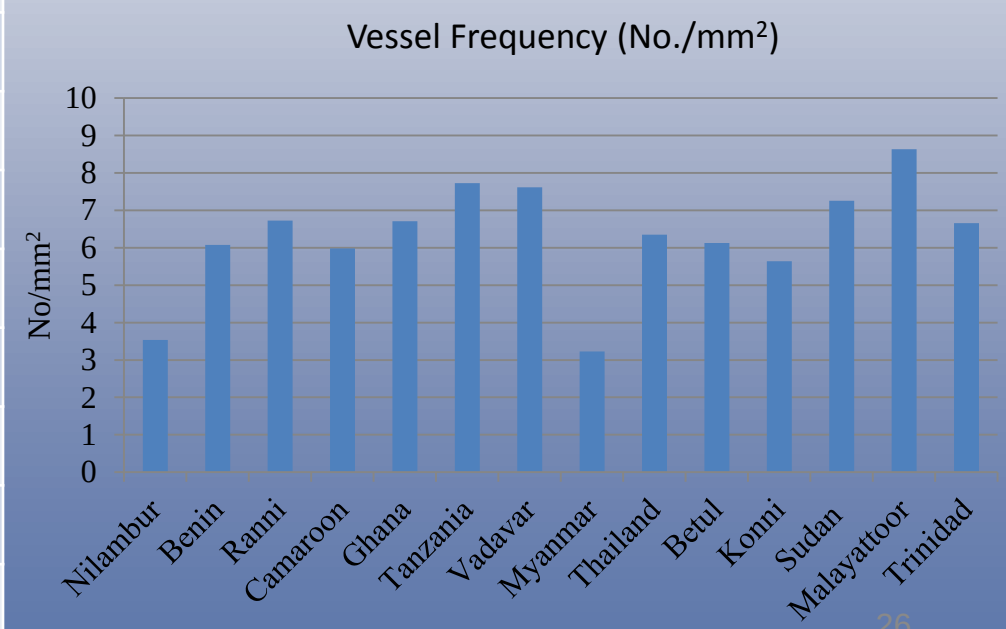
Table 3. Variation in coefficient of anisotropy of fast grown and slow grown teak

Growth Rate	Location	Coefficient of anisotropy *
Fast Grown	Nilambur	1.55^{c} (0.262)
	Benin	2.70^{a} (1.069)
	Ranni	2.20^{abc} (0.940)
	Cameroon	2.42^{ab} (1.318)
	Ghana	2.37^{ab} (1.070)
	Tanzania	1.74^{bc} (0.475)
	Vadavar	1.89^{bc} (0.533)
Slow Grown	Myanmar	2.79^{a} (0.572)
	Thailand	2.16^{abc} (0.274)
	Betul	1.89^{bc} (0.797)
	Konni	2.27^{abc} (0.661)
	Sudan	2.13^{abc} (0.332)
	Malayattoor	2.22^{abc} (0.906)
	Trinidad	2.23^{abc} (0.719)

Table 4. Variation in vessel parameters of the different provenances

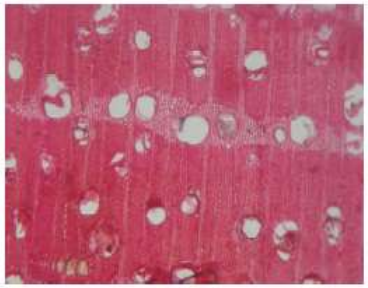
Growth Rate	Location	p value	Vessel Diameter** (µm)	p value	Vessel Area** (logarithmic Transformed ± SD)	Vessel Frequency** (No./mm²)
Fast Grown	Nilambur	< 0.001	206.02^{e} (19.875)	0.018	50746.6^{d} (10.84 ± 0.109)	4^{e} (0.380)
	Benin		265.68^{bc} (17.835)		81446.4^{bc} (11.31 ± 0.059)	6^{cd} (1.354)
	Ranni		212.08^{e} (32.362)		49657.3^{d} (10.81 ± 0.276)	7^{bcd} (1.268)
	Cameroon		205.50^{e} (37.233)		44985.7^{d} (10.71 ± 0.325)	6^{d} (0.809)
	Ghana		230.42^{cde} (28.036)		58226.7^{cd} (10.97 ± 0.287)	7^{bcd} (0.776)
	Tanzania		221.67^{de} (34.512)		58536.2^{cd} (10.98 ± 0.273)	8^{ab} (1.015)
	Vadavar		223.33^{de} (20.201)		58794.3^{cd} (10.98 ± 0.174)	8^{ab} (0.280)
Slow Grown	Myanmar	< 0.001	342.92^{a} (25.651)	0.018	117653.6^{a} (11.68 ± 0.176)	3^{e} (0.710)
	Thailand		143.67^{f} (18.990)		28504.0^{e} (10.26 ± 0.219)	6^{cd} (0.927)
	Betul		237.75^{cde} (22.482)		61932.5^{cd} (11.03 ± 0.227)	6^{cd} (0.843)
	Konni		282.75^{b} (44.251)		88583.4^{ab} (11.39 ± 0.317)	6^{d} (0.581)
	Sudan		233.25^{cde} (20.313)		62112.3^{cd} (11.04 ± 0.217)	7^{bc} (0.699)
	Malayattoor		222.82^{de} (28.889)		57890.0^{cd} (10.97 ± 0.221)	9^{a} (0.576)
	Trinidad		258.67^{bcd} (26.070)		73909.7^{bc} (11.21 ± 0.294)	7^{bcd} (0.941)



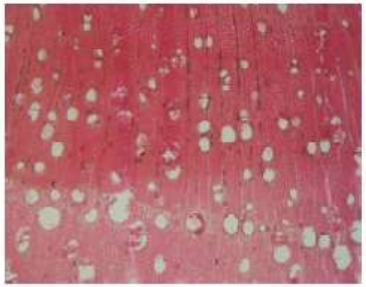


Nil 6

Nil 7



Nil 6 (TS 4X)



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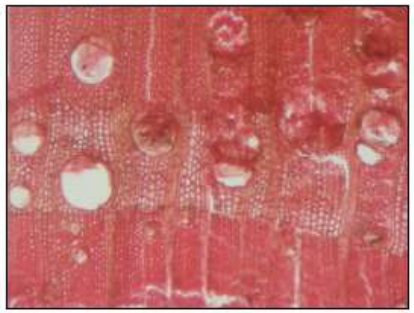
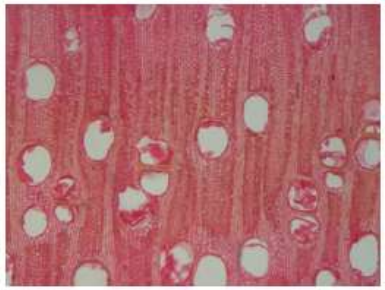


KR 429 TS (4 X)



TN 165 (TS 4X)

Nilambur teak v/s Irrigated Teak (Cauvery canal bank teak, (Vadavar, Tamil Nadu)

Wood quality parameters like specific gravity, resistance to deformation, heartwood color and total extractive content were found to be superior for Nilambur teak.

Sl. No.	Wood Properties	Values
1.	Specific gravity (G)	0.92
2.	Specific gravity (AD)	0.73
3.	Specific gravity (OD)	0.68
4.	Radial shrinkage (G to AD)	1.05
5.	Radial shrinkage (AD to OD)	1.95
6.	Radial shrinkage (G to OD)	3.04
7.	Tangential shrinkage (G to AD)	2.43
8.	Tangential shrinkage (AD to OD)	2.05
9.	Tangential shrinkage (G to OD)	4..60
10.	Moisture content (G)	64.26
11.	Heartwood (%)	69.29
12.	Extractive content (%)	8.053
13.	Heartwood colour	Brown
14.	A. Munsel System Hue	7.5
	Value	5
	Chroma	4
15.	Colour description 7.5YR/5/4	Brown
16.	Vessel diameter (µm)	206.02
17.	Vessel area (µm)	50746.6
18.	Vessel frequency	4 /mm^2
19.	Ray height (µm)	542.75
20.	Ray width (µm)	48.83
21.	Ray frequency	4 / mm

Table 6. Wood physical, biochemical and anatomical properties of Nilambur teak.

About Soils

- **The Nilambur region is traversed by a major river, the Chaliyar, which flows westward and drains into the Arabian Sea at Beypore.**
- **The rich alluvial deposits in the river banks of Chaliyar enhances the soil fertility and thus enhances the quality of Nilambur teak.**
- **Local belief, which is not scientifically validated, is that the unique golden brown color of Nilambur teak is due to the presence of gold ore in the soils of Nilambur.**

Towards GI status for Nilambur teak

Geographical indications are names used to identify the place of origin and quality, reputation or other characteristics of products that are unique to the place.

The GI tag is a mechanism instituted by the World Trade Organization (WTO) of the UN to prevent unfair competition in trade where the public can be mislead about the real origin of goods.

The Kerala Agricultural University (KAU) along with the local self-government at Nilambur, the Kerala Forest Department, Kerala Forest Research Institute and the GI Registry, Chennai recently took an initiative for the registration of the Nilambur Teak, which enjoys a world-wide reputation for the log dimensions and desired wood figure and colour.

While seeking GI status, the following factors will be reckoned with -

- **Historical importance**
- **Unique wood properties**
- **Genetic peculiarities**

GI registration workshops at KAU and Nilambur


THE HINDU

Nilambur teak may get GI tag soon

STAFF REPORTER

Ottakkallan teak, Malayatoor Division, presently the largest teak tree in India is also in Kerala

Kannimara teak, parambikulam- 6.57m gbh , 48.5 m height

Kappayam teak, 7.2m gbh, 38.5 m tall.

TIMBER TRACING

Identification of Timber Product Origin by Analysis of Stable Isotopes

Figure9: Sample sites for teak in Burma

Figure10: Sample sites for teak in India

Figure11: Sample sites for mahogany in the Congo

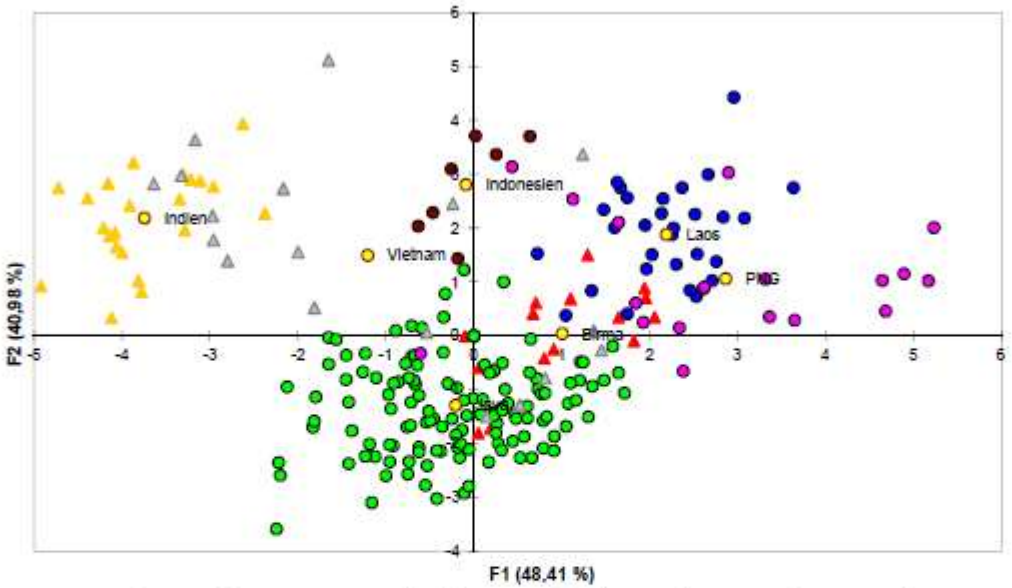
Figure12: Sample sites for mahogany and teak in Ghana

Figure 13: Sample sites for teak and mahogany in Panama

Figure14: Sample sites for teak in Panama

Source: WWF, Germany, 2012

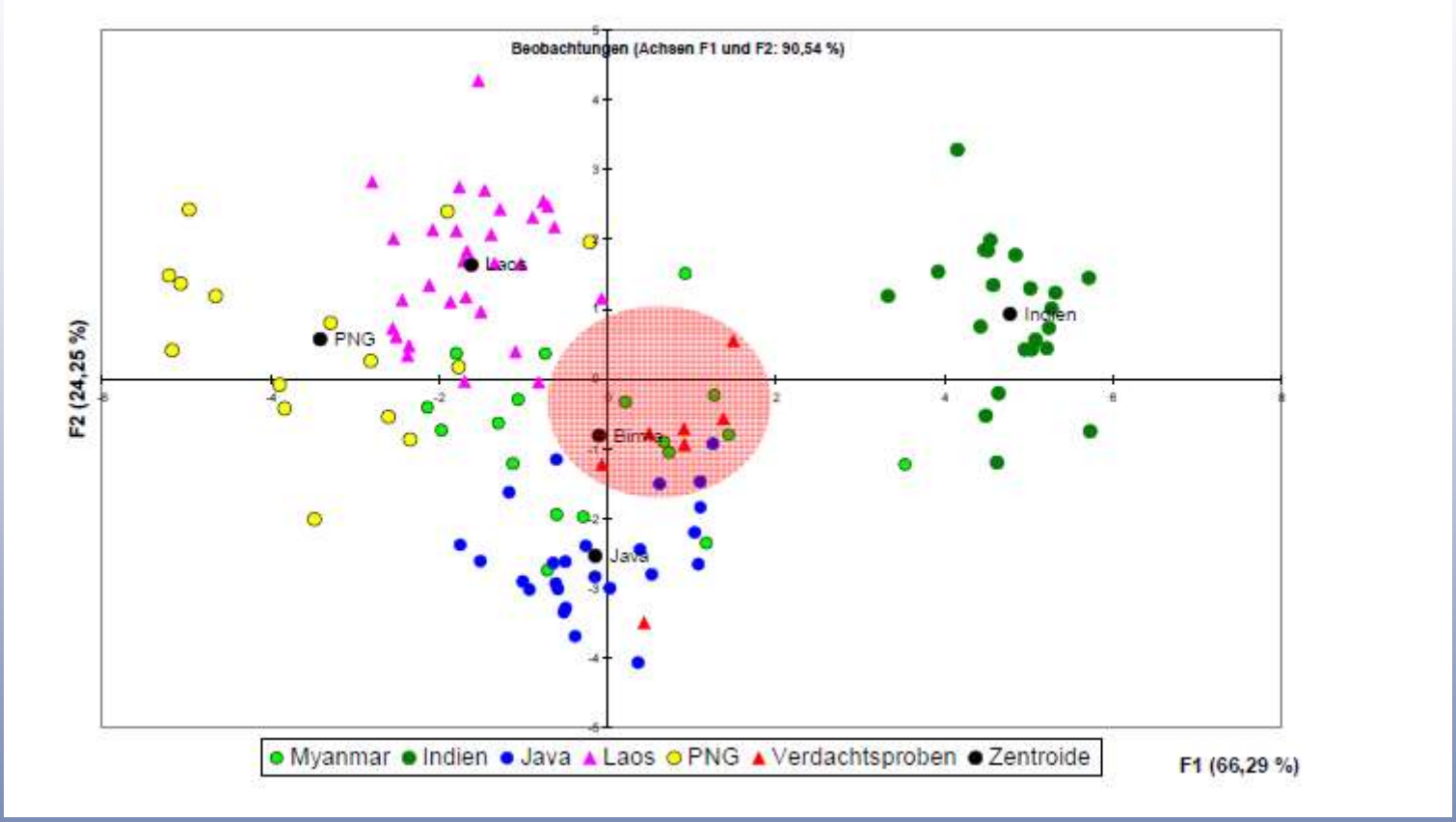
Differentiation (DA) and key statistical data for teak from 7 different Asian regions



von \ nach	Burma	India	Indonesia	Java	Laos	PNG	Vietnam	total	% correct
Burma	6	0	0	6	1	2	0	15	40,00%
India	0	22	0	0	0	0	0	22	100,00%
Indonesia	0	0	6	0	1	0	0	7	85,71%
Java	0	0	0	127	1	0	0	127	99,25%
Laos	0	0	0	0	30	0	0	30	100,00%
PNG	1	0	1	1	1	14	0	18	77,78%
Vietnam	2	4	1	3	0	0	8	18	44,44%
total	9	26	8	142	34	16	8	238	89,50%

Source: WWF, Germany, 2012

Practical test of confiscated teak samples suspected of originating from Burma/Myanmar (inside the red circle)



Source: WWF, Germany, 2012

With the GI registration, Nilambur teak will become the first forest species to secure the status

It is hoped that the initiative will boost the planting of teak and bring prosperity to the region yet again

Acknowledgements:

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