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Foliar Analysis of Ten Commercially Important Burmese Species

Tin Tin Ohn, Than Htun, Sein Thet
Forest Research Institute
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စီးပွားရေးအရ အရေးပါသော မြန်မာသစ်မျိုး (၁၀) မျိုး၏ အရွက်တွင် ပါဝင်သော အဟာရဓါတ်ကို လေ့လာခြင်း။

တင်တင်အုံး၊ သန်းထွန်း၊ စိန်သက်
သစ်တောသုတေသနဌာန၊ရေဆင်း။

စာတမ်းအကျဉ်းချုပ်

မြန်မာနိုင်ငံတွင် လိုအပ်ချက်များကို ဖြည့်တင်းရန်နှင့် ပြည်ပသို့ တင်ပို့ရန် သစ်တောစိုက်ခင်းသစ်များကို တိုးချဲ့စိုက်ပျိုးလျက်ရှိပါသည်။ ထိုသို့ တိုးချဲ့စိုက်ပျိုးရာတွင် တစိတ်တဒေသ အထောက်အကူဖြစ်စေရန် အရေးကြီးသော သစ်မျိုးများတွင် အဟာရလိုအပ်ချက်ကို ဓါတ်ခွဲခန်းတွင် စမ်းသပ်လေ့လာခဲ့ပါသည်။ ဤစာတမ်းတွင် စီးပွားရေးအရ အရေးပါသော သစ်မျိုး(၁၀)မျိုး၏ အရွက်တွင် ပါဝင်သော အဟာရဓါတ်များကို လေ့လာဆွေးနွေးတင်ပြထားပါသည်။

Foliar Analysis of Ten Commercially Important Burmese Species

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Forest Research Institute, Yezin.

Abstract

The Forest Department has been establishing forest plantations intensively for export and local demand. Hence investigation of some chemical composition of ten commercially important species by mean of foliar analysis were carried out to provide information for the establishment of new plantations. This paper describes and discusses foliage nutrient levels of ten commercially important species.

Introduction

Burma possesses wide variation in climatic and geologic conditions, resulting soils with tremendous variation in forest productivity. To increase potential of Burma forests, Burma is launching a large scale planting scheme of Teak and other high value commercial hardwood plantations in the Pegu Yoma; and wider range in soil and site conditions will be encountered by the development of large-block plantations. These species have been noted to grow very poorly over some of the sites and it is possible that this poor growth is due, in part, to a deficiency of nitrogen, phosphorous, potassium or other nutrient elements.

The nutrition of forest trees has aroused much interest because of the shortage of timber and rising prices which justify the application of fertilizers, at least in case of acute deficiency (Oppenherimer and Aliza Halfon-Meiri, 1961.)

The analysis of leaves from fruit trees has been used for many years as a mean of, detecting tree response to various cultural treatments, determination of the nutrient elements associated with apparent nutrient disorders and estimating fertilizer need prior to the occurrence of nutrient disorders (Kenwortty, 1961). Foliar analysis is particularly valuable in assessing the nutrient status of a crop even through the relationship between plant growth and foliar composition is a compex one (Dothie. 1968). The use of foliage analysis to assess the mineral nutrient status of plants growing in various environments has proved to be reasonable effective procedure particularly in the interpretation of field fertilizer trials, in the trace element deficiency and in the establishment of provisional critical levels for the macronutrients (Wilde 1958, Humprey etal 1972).

The optimum sampling time is often a compromise between selecting the period of maximum sensitivity to site difference, the time of year with a maximum between-tree variability, and the need for a stable in period in which to complete a sampling program. For diagnostic purpose, the current year nearterminal foliage conifers and uppermost sun leaves of hardwoods, collected at the end of the active growth period (Prichett, 1974).

The observation of change of plant nutritional status in forest leaves was done in species trial plot, compartment No, 72, Moeswe, Ngalaik Reserve, Yamethin Forest Division, and was also studied at Seinye plantation site South Taungoo Forest Division. The altitude of study area is about 185 m above sea level. The rainfall generally occurred during the period May to October and average annual rainfall is 1135 mm. Average mean daily temperature ranges between 27 °C to 33 °C Soil is apparently derived "insitu" from sand stone and are Reddish Brown Forest Soils.

The object of foliage analysis for ten commercially important Burmese species, is to identify soil areas where nutrients deficiencies exist and to develop tissue threshold levels for diagnosing nutrient deficiencies for these species.

Methods :

Field sampling method.

Fields sampling collections were done in March, June and September 1983 from two years old species trial plots. Ten composite plant samples were taken for each species from both ridge and slop of the following plots.

Table 2. Nutrient concentrations in foliage for ten species.

Sr. No	Species	Nutrient Concentrations (%) N	P	K	Ca	Mg	Na	Fe
1	Teak							
	mean	1.6279	0.1487	0.8610	0.4475	0.1341	0.3194	0.7345
	S.D	0.1599	0.0568	0.0689	0.2744	0.0232	0.0556	0.0876
2.	Pyinkado							
	mean	2.2826	0.1594	0.9260	0.5750	0.1900	0.3026	0.5438
	S.D	0.3883	0.0317	0.3697	0.0264	0.0706	0.0665	0.2443
3.	Padauk							
	mean	2.4670	0.1572	1.2750	0.6630	0.3271	0.2863	0.5450
	S.D	0.2786	0.0193	0.1514	0.2140	0.0457	0.0293	0.3008
4.	Yemane							
	mean	1.5556	0.2474	0.7030	0.5250	0.3363	0.3315	0.9141
	S.D	0.1029	0.0854	0.0368	0.1087	0.0667	0.0519	0.1123
5.	Thinwin							
	mean	2.8019	0.1672	1.3320	0.7060	0.1956	0.2477	0.7303
	S.D	0.4597	0.0100	0.1180	0.0824	0.0257	0.0610	0.4447
6.	Yinma							
	mean	1.5105	0.3325	1.0100	0.7830	0.3491	0.2925	0.8155
	S.D	0.1365	0.0501	0.3247	0.0472	0.0401	0.0400	0.0697
7.	Tamalan							
	mean	1.4680	0.1205	1.2760	0.9000	0.2350	0.2176	0.3580
	S.D	0.2737	0.0260	0.0750	0.0500	0.0150	0.0173	0.0379
8.	Taukkyan							
	mean	1.3770	0.1863	1.2780	0.7220	0.3250	0.3032	0.4513
	S.D	0.2529	0.0228	0.1323	0.0553	0.0288	0.0352	0.3123
9.	Thitkado							
	mean	2.3230	0.1477	1.3690	0.7510	0.2888	0.2813	0.4050
	S.D	0.5594	0.0257	0.11349	0.1061	0.053	0.274	0.0337
10.	Mahogany							
	mean	1.3880	0.1415	0.3830	0.5890	0.2276	0.2987	0.4418
	S.D	0.3029	0.0439	0.0988	0.1437	0.5038	0.0581	0.0668

Table I. Plot numbers and selected species.

Sr. No.	Species		Ridge/Slope	Plot No.
	Burmese Name	Botanical Name		
1.	Teak	*Tectona grandis*	Ridge	1201
			Slope	2301
2.	Pyinkado	*Xylia dolabriformis*	Ridge	1302
			Slope	2102
3.	Padauk	*Pterocarpus macrocarpus*	Ridge	1303
			Slope	2203
4.	Yemane	*Gmelina arborea*	Ridge	1404
			Slope	2104
5.	Thinwin	*Millettia pendula*	Ridge	1205
			Slope	2305
6.	Yinma	*Chukrasia tabularis*	Ridge	1306
			Slope	2406
7.	Tamalan	*Dalbergia oliveri*	Ridge	1107
			Ridge	1408
8.	Taukkyan	*Terminalia tomentosa*	Slope	2208
			Ridge	1409
9.	Thitkado	*Cedrela toona*	Slope	2309
			Ridge	1111
10.	Mahogany	*Swietonia macraphylla*	Slope	2211

Normal healthy leaves; located within upper portion of the crown were selected for analysis. For Teak and Yemane, single leaves were collected and for Pyinkado, Padauk, Thinwin, Yinma, Tamalan, Taukkyan, Thitkado and Mahogany, the whole compound leaves were collected. The composite leaf samples from each ridge and slope were taken for every species. The collected samples were put in the labbled plastic bag and returned to the laboratory.

Laboratory Method:

The leaf samples, collected were dried in oven at 70°C and crushed in a Thomes-Wiley Cutting-Mill: known amount of dried and crushed leaf samples were digested with sulphuric acid and hydrogen peroxide by mean of wet method.

(1) Total Nitrogen (N%)
Total Nitrogen was determined from aliquots by Kjeldhal's method by using Tecator micro kjeldhal's digestion and distillation unit.

(2) Total Phosphorus (P%)
Total phosphorus levels were assessed form aliquots by phosphomolybdenum blue method by using perkin Elmer 55 E Spectrophotometer at 610 mm.

(3) Total Potassium, Calcium, Magnesium, Sodium and Iron.
(K, Ca, Mg, Na, Fe %)

These levels were determined by using atomic absorption spectrophotometer, Peekin Elmed Model 2280.

Results and Discussions:

Soil profile descriptions for study sites were given in Appendix I and soil analysis data regarding physical and chemical characteristics were given in Appendix II. Nutrient concentrations of foliage for ten commercially important species, coliected during the month of March were shown in Table 2.

Although nitrogen concentration in foliage for leguminous species such as Pyindado, Padauk, Thinwin, were higher than Teak, other species such as Yemane, Yinma, Tamalan, Taukkyan ans Mahogany foliage were lower in nitrogen concentration than Teak. In case of phosphorus; Tamalan, Thitkado, Mahogany were lower than Teak and Pyinkado, Padauk Yemane, Thinwin, Yinma and Taukkyan were higher than Teak. It was observed that the potassium concentration of all species were lower than Teak expect Yeamne. Concerning calcium and magnesium content, all expect Yemane. It was found that although the iron concentration of Yemane and Yinma were higher than Teak, other species were lower than Teak.

According to Bengton (1981), the nutrient concentrations in foliage of temperate hardwood species were 1.54 to 1.7 percent of nitrogen, 0.11 to 0.14 percent of phosphorus, 0.62 to 0.86 percent of potassium, 0.22 to 1.38 percent of calcium and 0.08 to 0.42 percent of magnesium respectively. It was found that, nitrogen and magnesium concentrations were almost the same as Burmese species. Higher amount of phosphorus concentration was found in Burmese species then temperate hardwood species, and greater amount of concentration was pronounced in case of potassium and calcium.

Seasonal variation of nutrient concentrations in foliage for the species were shown in Fig I.

All nutrient concentrations of Teak and Padauk were higher in wet season than in dry season. In case of Pyinkado, the concentration of nitrogen, phosphorus and iron were higher in dry season and potassium, calcium, magnesium and sodium were higher in wet season. Although nitrogen concentrations of Yemane, Thinwin, Tamalan were higher in wet season, nitrogen concentration of Yinma, Taukkyan, Thitkado and Mahogany were higher in dry season. The phosphorus concentration of Yemane, Thinwin, and Yinma were higher in dry season and phosphorus concentration of Tamalan, Taukkyan Thikado and Mahogany were higher in wet season. The potassium concentration of Thinwin, Yinma and Taukkyan were higher in wet season and calcium, sodium and magnesium concentration of all species except Teak, Pyinkado and Padauk were also higher in wet season; but mostly iron concentration of all species were higher in dry season.

The relative proportions of nutrients in foliage for ten commercially important Burmese species were found as follow. (in descending order)

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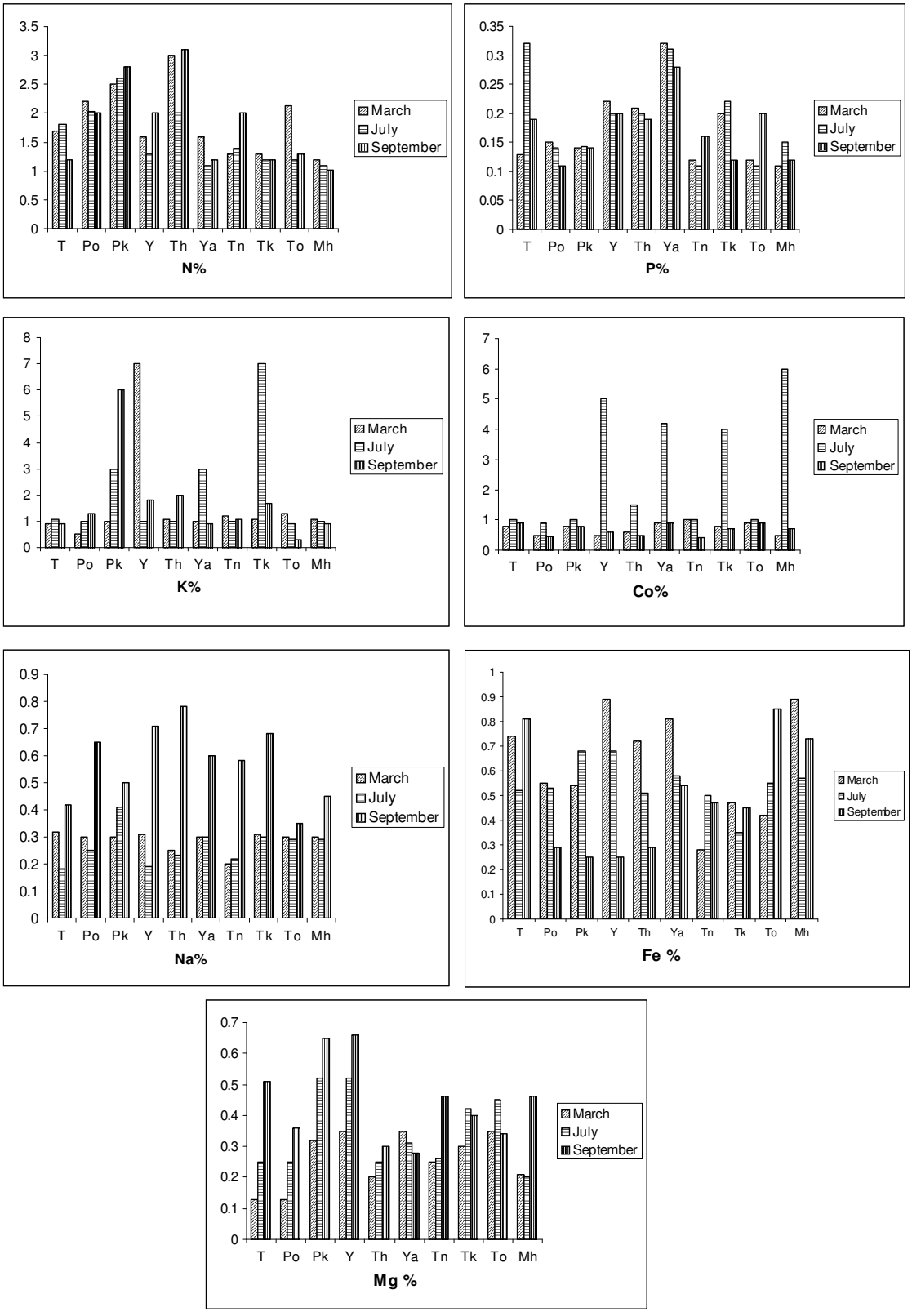
Fig I . Seasonal Variation of Nutrient Concentrations.



T = Teak Po= Pyinkado Pk = Padauk Y= Yemane Th= Thinwin
Ya= Yinma Tn= Tamalan Tk= Thukkyan To= Thitkado Mh= Mohogany

1.	Teak	:	N	>	K	>	Fe	>	Ca	>	Mg	>	Na	>	P
2.	Pyinkado	:	N	>	K	>	Ca	>	Fe	>	Na	>	Mg	>	P
3.	Padauk	:	Ca	>	N	>	K	>	Fe	>	Mg	>	Na	>	P
4.	Yemane	:	K	>	Ca	>	N	>	Fe	>	Mg	>	Na	>	P
5.	Yinma	:	Ca	>	K	>	N	>	Fe	>	Na	>	Mg	>	P
6.	Thinwin	:	K	>	N	>	Ca	>	Fe	>	Na	>	Mg	>	P
7.	Tamalan	:	N	>	K	>	Ca	>	Fe	>	Na	>	Mg	>	P
8.	Taukkyan	:	K	>	Ca	>	N	>	Na	>	Fe	>	Mg	>	P
9.	Thitkado	:	N	>	Ca	>	K	>	Fe	>	Mg	>	Na	>	P
10.	Mahogany	:	Ca	>	N	>	K	>	Fe	>	Na	>	Mg	>	P

It was found that nitrogen, potassium and calcium concentrations were higher, phosphorous and magnesium were lower, while sodium and iron concentrations were intermediate in order.

Conclusion:

Nutrient concentration of ten commercially important Burmese species were studied at plantation sites of East Pegu Yoma, to identify soil areas where nutrients deficiencies exist and to develop tissue threshold levels for diagnosing nutrient deficiencies for these species. The foliage samples were collected from species trial plots. It was found that nitrogen concentrations in foliage for leguminous species were higher than other species. The calcium and magnesium concentrations of all species were higher than Teak. Although nitrogen and magnesium concentrations of Burmese species were almost the same as temperature hardwood species, potassium, calcium and phosphorous concentrations of Burmese species were higher than temperature hardwood species. All nutrient concentrations of Teak and Padauk were higher in wet season than dry season and it was found that nutrient concentrations of other species were differently according to seasonal variation. Nitrogen, potassium and calcium concentrations were higher than other elements, in foliage of all species.

Appendix I

Soil Profile Description

Profile No.1 (2309)	
Soil type:	Reddish Brown Forest soil.
Date of Examination :	15, October 83.
Location:	Ngalike Reserve Forest, Compartment 72, 1981 species Trial Plots (2009), About 1/5 mile from Pyinmana-Taungdwingyi road (1 mile from Moeswe Research Stations).
Map Reference :	Indian Survey map 94/B/1
Terrain:	Steep
Landform :	On Steep convex slope, at about 1/5 to the ridge top. Steeply dissected surrounding with drainage North West to South East .
Slope:	Steep, 31% (17°)
Aspect:	South East (110°)
Elevation:	200 m (600') a.s
Drainage:	Well drained
Forest Type :	Species Trial Plots (1981).
Parent Material	Apparently derived " insitu" from Sand Stone.
Landuse:	Reserved Forest, 1981 species Trial Plots.
Profile	
A 0-30 cm	Black (7.5 Y R N2-) moist and Black (2.5 Y N2-) dry sandy loam, developed fine granular structure, loose when dry and moist, some and diffuse boundary to.
B 30-85 cm	Dark reddish brown (5 YR 3/3) moist and dark reddish brown (5 YR 3/4) dry, sandy loam developed fine, granular structure, hard when dry and firm when moist, sticky, few fine roots and diffuse boundary to.
C 85-175 cm	Yellowish red (5 YR 4/6) moist and reddish brown (5 YR 5/4) dry sandy Loam, developed fine granular structure, hard when moist sticky, trace of few iron accumulation between 85 to 95 cm
Profile No. 2(1303)	
Soil Type :	Reddish Brown Forest Soil.
Date of Examination:	15, October 1983
Location:	Ngalike Reserved Forest, Compartment 72, 1981 Species trial Plot (1303), About 1/4 miles from Pyinmana Taungdwingyi road (one mile from Moeswe Research Station).
Map Reference :	Indian Survey Map 94 B/1
Terrain:	Moderately steep .
Landfrom:	On steep convex slope, at about ½ to the ridge top. Steep dissected surrounding with drainage normally flow North to South .
Slope:-	Moderately steep 25% (14)
Aspect:	West (270 °)
Elevation :	200 m (600') a.s.l
Drainage:	Well drainage
Forest Type:	Species Trial Plots.
Parent material:	Apparently derived " insitu" from sand stone
Landuse :	Trial Plots.

Profile

A 0-35 cm	Block (7.5 YRN 2-) moist and Black (2.5 YN 2-) dry loamy sand, developed fine granular structure, loose when dry and when moist, non-sticky, some roots and diffuse boundary to-
B 35-95 cm	Dark red (2.5 YR 3/6) moist and red (2.5 YR 4/6) dry, hard when dry and firm when moist, sticky , few fine roots, between 55 to 85 cm some gravelly and diffuse boundary t0-
C 95-170 cm	Yellowish red (5 YR 5/6) moist and Reddish yellow (5 YR 6/6 dry, hard when firm when moist sticky, few fine roots between 125-135 cm trace of iron accumulation.

Appendix II

The Soil Nutrient Concentrations of Study Site (Moeswe)

Sr. No	Depth (cm)	P^H	OM%	C.E.C m.e/ 100gm	Nutrient %						
					N	P	K	Ca	Mg	Na	FE
1.	0-30	5.7	2.4	27.2	0.029	0.0001	0.009	0.006	0.025	1.022	0.040
	3-085	5.1	4.8	21.8	0.053	trace	0.020	0.003	0.027	0.007	0.081
	85-175	5.1	2.3	27.5	0.017	trace	0.019	0.003	0.027	0.020	0.052
2.	0-38	5.5	1.4	26.8	0.034	0.0005	0.012	0.002	0.021	0.011	0.058
	35-95	5.1	3.1	21.5	0.049	trace	0.026	0.003	0.028	0.011	0.046
	95.110	4.9	3.5	22.9	0.029	trace	0.025	0.003	0.031	0.008	0.008

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