

Title	Taxonomic Study on Fagaceous Trees from Upper Chindwin
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Publication Type	Local Publication
Publisher (Journal name, issue no., page no etc.)	Mandalay University Research Journal
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Keywords	Fagaceous Trees, Upper Chindwin, Myanmar.
Citation	
Issue Date	2012

Taxonomic Study on Fagaceous Trees from Upper Chindwin

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Abstract

The Fagaceous trees from Upper Chindwin of Sagaing Region mostly covered by Semievergreen forest, had been collected, recorded and studied. Totally 10 species belonging to 3 genera of the Family Fagaceae occur abundantly. The resulting species can be easily distinguished by the characteristics of the leaves and fruits. Saucer-shaped or cup-shaped cupules bearing the nuts are found in species of *Lithocarpus* and *Quercus* while that is totally enclosing the fruits and spiny or scaly in *Castanopsis*. An artificial key to the species and diagnostic characters are briefly described with figures of the fruits.

Introduction

The study area of Upper Chindwin comprise Homalin Township to Hkamte Township along the Chindwin River, falls within 25°00' to 26°30'N Latitude and 90°00' to 96° 00'E longitude, that reaches between Htamanthi Wildlife Sanctuary and Naga Hills. The many streams drain into the Chindwin River from the western and eastern sides. The topography is low land area of 130 to 230 m above sea level. The natural vegetation pattern consists of the same semievergreen forest patches with wetlands, degraded forest due to shifting cultivation, bamboo and mixed with evergreen and deciduous plant species.

Fagaceae is an important temperate to tropical family of hardwood trees and, more rarely shrubs, which embraces the beeches, oaks and sweet chestnuts. The family is prominent and frequently dominant members of the broad-leaved forest in the middle latitude of northern Hemisphere. In the south East Asia the structure of the mixed mountain forest is largely dominant by evergreen members of the family, particularly oaks (Cronquist 1981).

The members of the genera *Castanea*, *Castaneopsis*, *Lithocarpus* and *Quercus* were recorded in Myanmar. The cupules surrounding one or

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more fruits show the great variety of forms, the unique feature of the family. The naturally distributed Fagaceous trees in natural forests of Upper Chindwin possess many interesting morphological characteristics. The present research work aims to provide valuable evidence of morphological characters in Fagaceous trees, especially from leaves and fruits, for scientific identification.

Literature Review

The family consists of 6 to 8 genera and about 800 species that was cosmopolitan in distribution except for tropical and southern Africa. *Quercus* (oak), *Castanea* (chestnut) and *Fagus* (beech) are well known genera in the northern Hemisphere (Steenis 1976). At least half of the species in the family belong to the genus *Quercus*. Hardwood timber species are the members of the genus *Quercus* and *Fagus*. Edible fruits are getting from the members of the genus *Castanea* (Cronquist 1981).

Although their timber is of good quality, the tropical members of *Castanopsis* and *Lithocarpus* have yet been little exploited. The timber of these genera exhibits a very wide range of uses, from floorboards and furniture to whiskey barrels and formally, sailing ships. Commercial cork is derived from the bark of the cork oak. In Asia Minor the galls on certain oaks are source of tannin. Many species of chestnuts are grown for their large edible nuts in Europe (Heywood 1978).

Hundley and Chit Ko Ko (1987) recorded 84 species of 4 genera – *Castanea*, *Castanopsis*, *Lithocarpus* and *Quercus* – in plant list of Myanmar.

Methodology

Specimens were properly collected during the months of October to September. Plant Collection Technique (Lawrence 1969) and all the materials needed to collecting samples were used to collecting specimens. Species identification was attempted by referring to Hooker (1885), Van Steenis (1976) and Garder *et al.* (2000). A Global Positioning System (GPS) was used to navigate the collection site of species. Local names were received from local inhabitants. The morphological characteristics were

studied, recorded and stated the diagnostic characters. The valid names were confirmed by International Plant name Index.

Results

According to the data collection and identification ten species belonging to 3 genera of Fagaceous trees are distributing in studied area. The list of the species is stated in Table 1. The artificial key to the all collected species were constructed and the diagnostic characters are also described.

Table 1. List of the Fagaceous Trees in Upper Chindwin

No.	Botanical name	Local name
1	<i>Castanopsis argyrophylla</i> King ex Hook.f.	Gon; Thit e
2	<i>C. armata</i> Spach.	Sagat sumar; Thit e
3	<i>C. calathifolia</i> Rehdr & P. Wils	Sagat gyan
4	<i>C. diversifolia</i> (Nees) King ex Hook.f.	Kyanza; Sagat
5	<i>C. foxworthi</i> Schotty	Sagat sugyi
6	<i>C. indica</i> DC.	Gon thit e
7	<i>Lithocarpus elegans</i> (Bl.) Hatus ex Soep.	Sagat
8	<i>L. fenestratus</i> Rhedr	Kamyin thitcha
9	<i>L. sootepensis</i> Craib.	Sagat hteik chyun
10	<i>Quercus kerii</i> Craib.	Sagat u htoke

An artificial key to the studied species

1. Cupules saucer-shaped or cup-shaped, without vertical suture; nuts circular in cross section2.
1. Cupules completely enclosing the fruit, always with vertical suture; nuts angular or 2- or 3-gonus in cross section5.
 2. Cupules solitary, lamellate on the surface **10. *Quercus kerii***
 2. Cupules clustered in dichasial cyme, squamous or muricate on the surface 3.
3. Cupules covering more than three fourth of the fruit at base.....
 - **8. *Lithocarpus fenestratus***

3. Cupules covering less than half of the fruit at base4.
 4. Fruits sessile; nuts shining brown, glabrous
 **7. *Lithocarpus elegans***
 4. Fruits stalked; nuts grey, finely velvety
 **9. *Lithocarpus sootepensis***
 5. Fruits covered with scales in ring **3. *Castanopsis calithiformis***
 5. Fruits covered with sharp spines 6.
 6. Ripe cupules on slender stalk, woody, with sturdy spines
 **5. *Castanopsis foxworthi***
 6. Ripe cupules sessile, non-woody, with soft spines 7.

 7. Spines lax; apical portion of nut exerted8.
 7. Spines dense; nut inserted9.
 8. Cups thick and hard; spines stellate **2. *Castanopsis armata***
 8. Cups thin; spines simple **1. *Castanopsis agrophylla***
 9. Leaves toothed, velvety below; fruits 3.5 to 4.0 cm in diameter
 **6. *Castanopsis indica***
 9. Leaves untoothed, sparsely hairy below; fruits 1.5 to 2.0 cm in diameter
 **4. *Castanopsis diversifolia***

1. *Castanopsis agrophylla* King ex Hook.f., Fl. Brit. Ind. 5:622.1888.
 (Figure A)

Semievergreen tree up to 15 m high; barks grey brown, fairly smooth to quite deeply fissured. Young shoots finely hairy. Leaves simple, spiral, ovate or elliptic-oblong, narrowed at both ends, non-toothed. Mature leaves smooth, dark brown above, pale beneath; lateral nerves 9- to 12-paired, raised above; stipules about 1 mm; petioles 1 to 2 cm; fruits in upright spike, not splitting; cups thinner with tuft of sharp simple spine, close or widely spaced, black when dry, the apical part exerted from cupule.

Fruiting from August to September

Specimen examined: Semievergreen forest near Onbat village, Homalin Township, 25° 12'15'' N and 95° 05'43'' E, 140 m above sea level; 4th Sept. 2006.

2. *Castanopsis armata* Spach, Hist. Veg. Phan. 11. 185. (Figure B)

Evergreen tree up to 25 m high. Young shoots sparsely hairy. Leaves narrowly elliptic to lanceolate; base obtuse; apex acuminate, entire along the margin. Mature leaves smooth; lateral nerves 6- to 12-paired; petioles 1 to 2 cm; fruits in stout spikes of 3 to 8, solitary or paired but not fused. Cupules thick and woody, splitting into 1 to 3 parts when mature; spines 3 to 12 mm, sharp, stalked and stellate, in concentric ridges, not completely concealing the surface. Nuts solitary, ovoid or slightly flattened, 1.0 to 1.5 cm, partly fused to cupules.

Fruiting from August to September

Specimen examined: Semievergreen forest near Nam Ezu creek, 25° 30'49'' N and 95° 31'28'' E, 179 m above sea level; 24th Sept. 2006.

3. *Castanopsis calathiformis* Rehder & P. Wils. in Sarg., Pl. Wils. 3:204. 1916.(Figure C)

Evergreen tree to 20 m high; bark dark brown, deeply cracked; inner barks yellowish brown. Leaves elliptic-oblong, blunt or narrowed at both ends, with widely spaced teeth except near base. Young shoots finely dark-brown-hairy. Mature leaves yellowish green and shiny above, silvery with orange-brown-hairs; lateral veins 15- to 20-paired; petioles 5 to 20 cm. Fruit spikes 9 to 15 cm, individual fruits 1.5 to 3.0 cm, distinctly narrowed at base. Cups covering the nut, splitting irregularly when ripe, red brown hairy outside. Spines short and scale-like, in concentric zones. Nuts 1 to 2 cm, dark brown and glossy, narrowly ellipsoid or ovoid. Scar convex to slightly concave.

Fruiting from August to September

Specimen examined: Semievergreen forest near Onbat village, 25° 12'15'' N and 95° 05'43'' E, 147 m above sea level; 4th Sept. 2006

4. *Castanopsis diversifolia* (Nees)King ex Hook.f., Fl. Brit. Ind. 5: 620. 1888. (Figure D)

Quercus diversifolia Nees, Anal Cienc. Nat. 3: 240. 1801.

Deciduous trees to 20 m high. Barks moderately cracked, the inner bark fibrous, yellow. Leaves ovate to oblong with tapering or almost blunt at tip and rounded or tapered at base, variable in shape, untoothed or with scattered teeth near the top. Young leaves finely pale brown hairy; mature leaves leathery, smooth above, sparsely hairy below; lateral veins 10- to 14-

paired, sunk above; petioles 1 to 2 cm. Fruits sessile, globose, about 3 cm in diameter, splitting into 2 to 4 parts when ripen. Cupules completely covered the fruits, with sharp spines. Nuts softly hairy.

Fruiting from August to September

Specimen examined: Semievergreen forest near Ashe Kauk taug village, 25° 14'19'' N and 95° 14'18'' E, 290 m above sea level; 44th Sept. 2006

5. *Castanopsis foxworthi* Schottry, Bot. Jahrb. 49: 358. 1913. (Figure E)

Deciduous trees up to 20 m high, with buttress; bark grey brown. Leaves lanceolate-oblong, thick, coriaceous, attenuate or rounded acute at base; acute with sharp acuminate apex, glabrous on both surfaces; lateral nerves 9- to 14-paired. Ripe cupules on slender peduncle, obovoid globose, dense with 8 to 10 mm long rather sturdy spines arranged in 4 or 5 concentric bands, densely fulvous tomentose inside. Fruits 3 per cupule, ovoid or conical.

Fruiting from June to September.

Specimen examined: Semievergreen forest near Hmaw-yon-myaing village, 25° 11'38'' N and 95° 11'46'' E, 180 m above sea level; 8th Sept. 2006

6. *Castanopsis indica* A. DC. in Seem., Journ. Bot. 1: 182. 1863. (Figure F)

Large tree up to 20 m high. Branches and Inflorescences rufous tomentose or villous. Leaves oblong or obovate oblong, rusty-red when dry, sinuate-toothed; lateral nerves 15- to 20-paired, acute-cuspidate or acuminate at the apex, attenuate at the base, serrate with straight spinular nerves along the margin. Fruits about 3 cm in diameter, orange brown, densely clustered, completely covered by long slender straight spines of unequal length. Nuts ovoid, reddish hairy near the top.

Fruiting from August to September.

Specimen examined: Semievergreen forest near Tamtoke village, 25° 18'53'' N and 95° 31'51'' E, 200 m above sea level; 17th Sept. 2006

7. *Lithocarpus elegens* (Bl.) Hatus. ex Soep., Reinwardtia 8:236.

1970. (Figure G)

Quercus elegens Bl. in Verh., Batav. Gen 9: 208. 1823.

Evergreen trees up to 20 m. Bark grey brown, cracked in small pieces. Leaves very variable in shape and size, typically elliptic-oblong with pointed tip and base, no teeth along the margin, dark green and glossy above, paler below; lateral nerves 10- to 20-paired. Fruits sessile, fused in groups of 3 to 6, densely clustered along the stout spikes. Cups 1 to 2 cm, saucer-shaped, covering to one third of nut, globose-ovoid, with short point, with large concave scar at base, shining brown, glabrous

Fruiting from August to September.

Specimen examined: Semievergreen forest near Awtaw village, 25° 17'01'' N and 95° 14'19'' E, 194 m above sea level; 11th Sept. 2006

8. *Lithocarpus fenestratus* Rehder, Journ. Arnold. Arb. 1: 126. 1914.

(Figure H)

Evergreen tree to 15 m high. Bark medium grey to dark brown, with whitish patches, shallowly fissured. Leaves narrowly elliptic-oblong to lanceolate with tapering apex and pointed base, untoothed; lateral nerves 10- to 16-paired, parallel. Young leaves pinkish with scattered hairs. Mature leaves dark green and smooth above, minute-hairy below. Fruits densely crowded along upright spikes. Cupules almost completely enclosing the nut, irregularly splitted when ripe, with many curled hook-like scales. Nuts about 1.5 cm, shiny brown, globose.

Fruiting from August to September.

Specimen examined: Semievergreen forest near Naukpe village, 25° 30'49'' N and 95° 05'43'' E, 134 m above sea level; 20th Sept. 2006

9. *Lithocarpus sootepensis* Craib., Kew. Bull. 472. 1911. (Figure I)

Medium-sized tree to 15 m. Bark pale grey. Leaves narrow ovate or elliptic oblong with tapering apex, untoothed. Mature leaves glossy dark brown above, dusk-like-hairy below; lateral nerves 9- to 12-paired. Fruits densely clustered along the spike; individual fruits with distinct stalks. Cupules covering one fourth of nut, saucer-shaped, with many distinct series of triangular scales. Nuts 1 to 2 cm, broadly ovoid, with short pointed tip, white-hairy while young. Scar flat or slightly concave.

Fruiting from August to September.

Specimen examined: Semievergreen forest near Hmaw-yon-myaing village, 25° 11'11'' N and 95° 09'06'' E, 134 m; 9th Sept. 2006.

10. *Quercus kerrii* Craib., Kew. Bull. 471. 1911. (Figure J)

Deciduous trees up to 10 m high. Bark dark brown or grey, deeply cracked, inner bark reddish. Leaves in whorl-like clusters, narrowly ovate, elliptic-oblong or lanceolate with pointed or blunt base, quite sharply toothed in upper half. Young leaves golden brown hairy; mature leaves dull green; lateral nerves 10- to 18-paired, quite prominent below. Fruits in short dense-clustered axis. Cupules saucer-shaped, covering on half of the nut, with 6 to 8 finely toothed concentric rings, small brown hairy outside. Nuts oblong, becoming subglobose, softly hairy when young.

Fruiting from August to September.

Specimen examined: Semievergreen forest near Hmaw-yon-myaing village, 25° 11'33'' N and 95° 11'40'' E, 188 m above sea level; 8th Sept. 2006.

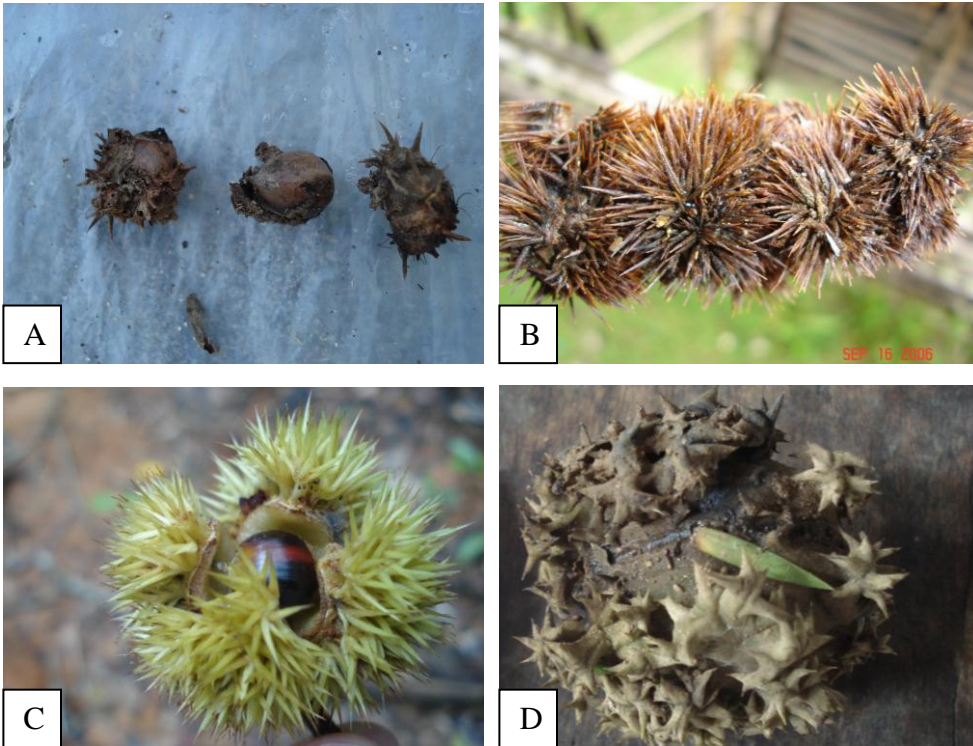


Figure A-Fruits of *Castanopsis agrophylla* Hook.f. ($\times 1X$); B- Fruits of *C. diversifolia* Hook.f. ($\times 1X$); C- A Fruit of *C. armata* Spach. ($\times 1X$); D- A Fruit of *C. foxworthi* Schottky ($\times 1X$)

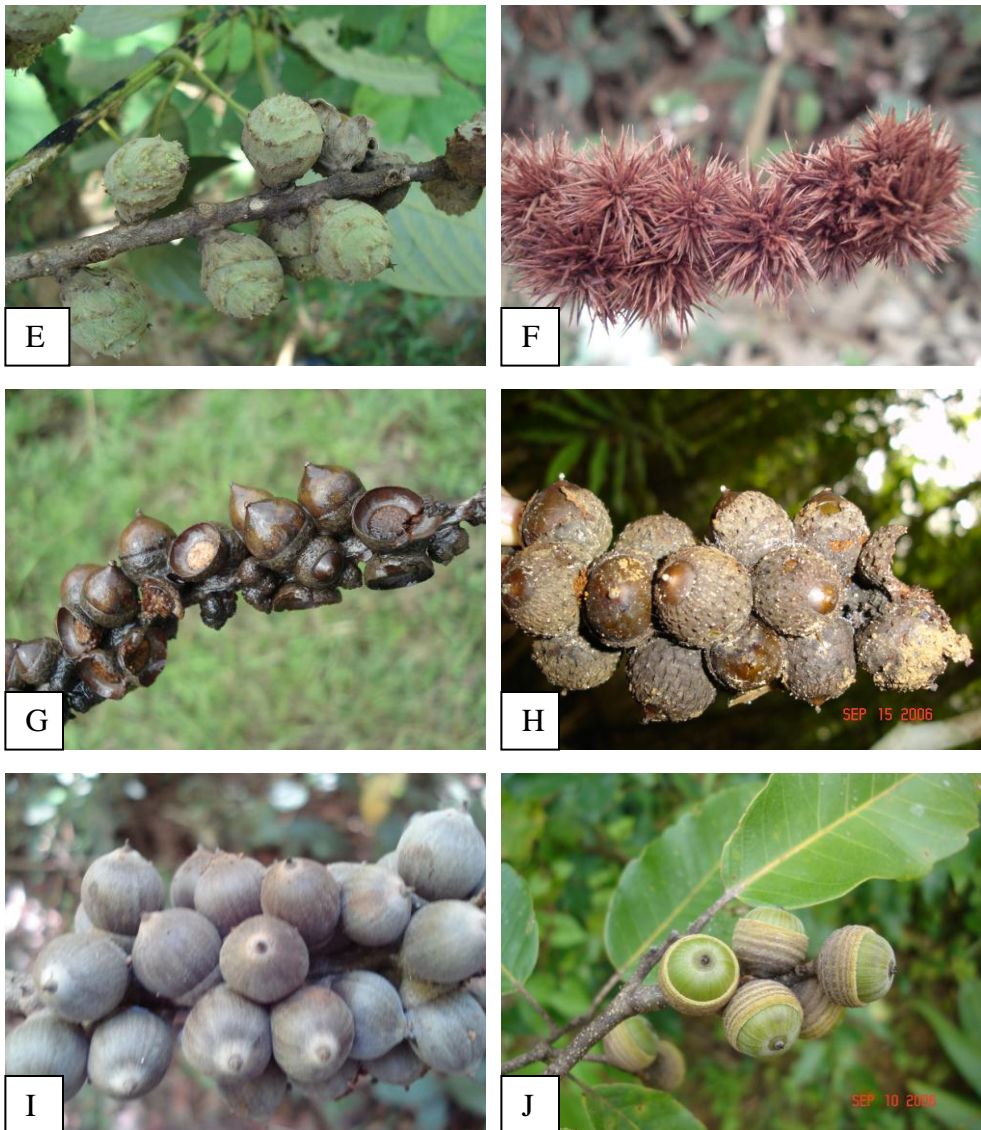


Figure **E**- Fruits of *Castanopsis calithifolia* Rhel & P.Wils ($\times 1X$); **F**- Fruits of *C. indica* DC. ($\times 1X$); **G**- Fruits of *Lithocarpus elegans* (Bl.) Hatus ex Soep. ($\times 1X$); **H**- Fruits of *L. fenestratus* Rhedr. ($\times 1X$); **I**- Fruits of *L. sootepensis* Craib. ($\times 1X$); **J**- Fruits of *Quercus kerii* Crab. ($\times 1X$)

Discussion and Conclusion

Myanmar possesses many wild species of the family Fagaceae. Most of the members are hardwoods and very useful for the local peoples not only for a timber but also for the fuel. Two species of *Castanea*, 19 species of *Castaneopsis*, 28 species of *Lithocarpus*, and 35 species of *Quercus* were recorded in Myanmar by Hundley and Chit Ko Ko. *Castanopsis calathifolia* Rehr & P. Wils, *C. foxworthi* Schott, *Lithocarpus elegans* (Bl.) Hatus ex Soep., *L. sootepensis* Craib. and *Quercus kerii* Craib. were not included in that list among the 10 species of present work.

The cupule with the tremendous diversity of scales and spines are most interested diagnostic characters for individual species. In the members of the genera *Quercus* and *Lithocarpus* cup-shaped cupules do not possess vertical suture and nuts are circular in cross section while the angular nuts are completely enclosing by cupules in genus *Castanopsis*. The height of the cup is one of the characters to be classified. In *Lithocarpus fenestratus* more than three fourth of the nut was covered by it while less than half of the fruit was covered by cupule in *Lithocarpus elegans* and *L. sootepensis*. The nuts are shining brown in *L. elegans* and grey and finely velvety in *L. sootepensis*.

The fruits are covered with rings of scales in *Castanopsis calathiformis*. In the rest members of that genus the sharp spines cover the fruits. The hard sturdy spines covering the woody fruits are distinct characters of *C. foxworthii*. Spines of the cupules are lax in *C. armata* and *C. agrophylla* while it is very dense in *C. indica* and *C. diversifolia*. The latter two species are similar in spine characters of fruits. The fruits of *C. indica* is two times larger than the *C. diversifolia*. Stellate cupule-spines are found in *C. armata* and only the simple spines occur in *C. agrophylla*.

The flowers are small and cannot be collected throughout the year for the members of the family Fagaceae. The leaves and fruits can be easily collected. Because of their peculiar morphological characters that can be used in scientific identification of fagaceous trees.

Acknowledgements

Our sincere thank are due to Professor Dr Nu Nu Yee, Head of the Botany Department of University of Mandalay for her kind suggestion to prepare the research paper. We are gratefully acknowledged to Retired Professor U Nyo Maung, Associate Professor Dr Myint Aung, University of Yangon, and Retired Associate Professor Dr Win Myint, for their invitation in study of plant resources in Upper Chindwin during their research works.

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