Litsea is a largest genus belongs to family Lauraceae which comprises 52 genera with 2850 species occurs abundantly in the warm temperate regions of Southeast Asia (Mabberley 2008). It is estimated that there are about 300 species of Litsea distributed in tropical Asia and in islands of Australia, New Zealand, North and Central America (Ngernsaengsaruay et al. 2011). In India about 45 species are distributed in evergreen and semi evergreen forests of peninsular India, 40 of which are endemic to peninsular India (Bhuniya et al. 2010). Among which 12 species are found in Karnataka (Saldanha 1996) and some species are also found in Meghalaya, Manipur, Assam and Sikkim states.

The main challenge in classification of Lauraceae is the knowledge of the species are incomplete. As of 1991, approximately 25-30 per cent of neotropical Lauraceae species had not been described. As of 2001, taxonomic and embryological studies had only been completed on individuals from 26 genera yielding some level of knowledge in terms of taxonomy and embryology. For this family additionally the huge amount of variation within the family poses a major challenge for developing a reliable classification. The recently published taxonomic revisions are from Thailand 35 species (Ngernsaengsaruay et al. 2011), Nepal with 11 species (Pendry et al. 2011) and in China with 74 species (Huang et al. 2008). In previous studies, Saldanha (1996) explored and listed botanical names of 12 species of Litsea in Karnataka. However, in most of the parts of Karnataka Litsea is still poorly understood due to large diversity, inadequate morphological characters, lack of information on flowering and fruiting season, lack of investment in basic taxonomic work. Therefore, we present a taxonomic account of the genus Litsea in central Western Ghats area of Karnataka.

MATERIALS AND METHODS

Field survey was conducted from January 2013 to July 2015 in evergreen, semi evergreen and deciduous forests in Western Ghats of Karnataka which included 7 districts namely Shimoga, Chikkamagaluru, Udupi, Dakshina Kannada, Uttara Kannada, Hassan and some little parts of Mysore District. The field survey was carried out in all the three seasons of the year in hilly regions and foothills of Western Ghats were explored for lauraceous flora. This was supplemented with exhaustive literature survey and study of herbarium specimens deposited at west region herbarium centre Pune, Botanical survey of India and herbarium JCB, Centre for Ecological Sciences (CES), Indian institute of Science Bengaluru. Digital images of type specimens were referred from the Royal botanical gardens, Kew London, UK to confirm the identity of the species. The Litsea species collected were identified through standard floras.
Herbarium specimens of all the twelve species were deposited in herbarium JCB, Centre for Ecological Sciences, Indian institute of Science Bengaluru, India.

RESULTS

The genus *Litsea* is distributed abundantly in Western Ghats of India. Most of the species are

![Map of the study area showing distribution of Litsea species in Western Ghats of Karnataka region, India](image)

*Figure 1.* Map of the study area showing distribution of *Litsea* species in Western Ghats of Karnataka region, India

(Gamble, 1998; Saldanha, 1996).
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distributed in high altitudinal regions around 500 -1400 m. Among 45 species found in India 12 species are reported from Western Ghats of Karnataka region (Fig. 2 & 3).

Litsea species are evergreen to semi evergreen, dioecious medium sized trees or occasionally shrubs. Bark usually smooth, leaves simple, alternate or rarely whorled, in some species leaves crowded towards the apex, huge variation in leaf size and shape. Inflorescence sessile or pedunculated, cluster of umbels or corymbose, bracts 4-6. Perianth tube campanulate, flowers unisexual on dioecious trees or shrubs, the flowers are usually 4-10 in each umbel, the pedicels are usually hairy. Stamens 10-14 or more arranged in 3-4 whorls, usually inner whorls glandular, anthers 4 celled. Pistil rudimentary, ovary covered by perianth, style curved, stigma dilated, the fruits are one seeded berries seated on cup shaped perianth tube.

Key to identification of Litsea species in Western Ghats of Karnataka.
1. Umbels pedunculated, simple or compound ................................................................. 2
1a. Umbels sessile, sub sessile or racemose ........................................................................ 3
2. Umbel simple .................................................................................................................. 4
2a. Umbel compound ........................................................................................................... 5
3. Leaves glaucescent beneath .......................................................................................... 6
3a. Leaves glabrous beneath .............................................................................................. 5
4. Leaves whorled at tip ...................................................................................................... 6
4a. Leaves alternate ............................................................................................................. 7

Litsea floribunda, L. stocksii, L. wightiana, L. laevigata species were distributed abundantly when compare to other species. Litsea ghatica is a rare species to Western Ghats of Karnataka. It was observed that the species found in Kodachadri and Sakaleshpur regions. All the 12 species of Litsea are described below

1. Litsea bourdillonii Gamble. (Figure 4)

Trees, 15-18 m tall, petiole 1.5-2 cm long, leaves alternate scattered, 15-20 × 6-10 cm, elliptic ovate to oblong, apex abruptly acuminate, base acute cuneate, entire margin, lateral veins 14-16 pairs, inflorescences umbels in sessile clusters, 4 flowered, sessile or sub sessile, stamens 4-6 arranged in one whorl, introse, ovary ovoid, glabrous, stigma peltate, staminodes 9-12, linear, berry oblong, 1 cm long, seated on sessile fruiting perianth cup.

Flower: July to January Fruit: October to June.
Ecology and Distribution: Occasionally in semi evergreen to evergreen forests of Western Ghats...
at 800 to 1200 m elevation. Endemic to India, distributed in Karnataka, Kerala and Tamil Nadu states.

Specimens examined: INDIA, KARNATAKA. Bababudengiri, Charmadi Ghat, Kemmannugundi \(13°32'25''\ N, 75°45'55''\ E, 1536\) m. Srinivas S.G & Y.L Krishnamurthy, HJCBN 0282.

2. *Litsea coriacea* (Nees) Hook. f. (Figure 5)


Medium sized trees, 10-12 m tall, petiole 1 cm long, leaves simple, alternate, elliptic obovate to elliptic lanceolate, cuneate at base, coriaceous, glaucous beneath, 10-14 × 2-3.5 cm, lateral nerves 6-8 pairs. Inflorescence umbels, arranged in sessile or sub sessile clusters, umbels grey silky, 4 flowered, sub sessile, bracts 4, stamens 10-12 arranged in 4 whorls, introse, 1 and 2 whorls eglandular, ovary half inferior, stigma small, erect, fruit berry, ovoid, seated on thickened perianth tube.

Flower: September to January Fruit: December to June.

Ecology and Distribution: Rare in evergreen to semi evergreen forests of Western Ghats at elevation from 600-1300 m. Endemic to India, distributed in Karnataka, Kerala, Tamil Nadu and Maharashtra states.
Taxonomy and distribution of genus *Litsea* lam (Lauraceae).....

Specimens examined: INDIA, KARNATAKA. Hosanagara, Kavaledurga, Kodachadri, Chakra 13°48'52" N, 74°57'55" E, 601 m. Srinivas S.G & Y.L Krishnamurthy, HJCBN 0283.

3. *Litsea deccanensis* Gamble. (Figure 6)


Trees, 14-18 m tall, petiole 2 cm long, leaves alternate, scattered on stem, leaves are minutely pubescent, hairy, elliptic shape, crowded at the end of the branchlets, base acute or round, 14-16 pairs of lateral nerves, 10-12 × 4-5 cm. peduncle solitary 2.5 cm long bearing a simple umbel, flowers 4-6 in an inflorescence, male inflorescence large in size compare to female, stamens 10-14, filaments long, slender, inner rows glandular, all introse, ovary half inferior enclosed in a perianth tube, stigma dilated, fruit ovoid in shape.

Flower: March to August Fruit: July to September

Ecology and Distribution: Rare in dry deciduous forests. Endemic to India, distributed in Karnataka, Tamil Nadu and Andhra Pradesh states.


4. *Litsea floribunda* (Blume) Gamble. (Figure 7)


Medium sized trees, dioecious, 10-18 m tall, evergreen, branchlets brown to black, pubescent, petiole 2 cm long, leaves simple, alternate, acute apex, cuneate at base, 15-18 × 5-6.5 cm, elliptic ovate or oblong, acute apex, coriaceous, fulvous tomentose beneath, 10-12 pairs of lateral veins, pinnate, prominent, hairy. Inflorescence raceme in umbels, 6-7 flowers in each umbel, number of bracts 6 yellow silky, tepals 6 in 2 whorls, stamens 8-10, filamentous, hairy, anthers introse, ovary half inferior, stigma capitate, fruits berries ovoid seated on cup like perianth tube, pedicels thick, young fruits are green, matured fruits slightly pink in colour.

Flower: June to December Fruit: January to April

Ecology and Distribution: common in evergreen
to semi evergreen forests of Western Ghats at an elevation from 500-1100 m. Endemic to India, distributed in Karnataka, Kerala, Tamil Nadu, Maharashtra states.

5. **Litsea ghatica** C.J. Saldanha. (Figure 8)

Type: C.J. Saldanha, 1979, India, Charmadi Ghat, HJCBKFP9437A.

Small trees or shrubs 4-6 m tall, leaves whorled at young shoots, alternate below, 10-20 × 6-12 cm, obovate, tomentose, petiole short, acute apex, cuneate at base, 12-14 pairs of lateral nerves, greyish pubescent beneath. Umbels solitary, 5-6 flowered, with involucre of tomentose bracts, number of bracts 4, flowers white creamish, 20-24 stamens, introse, juicy glands are present on stamens and glands hairy, ovary ovoid, glabrous, stigma peltata, fruit globose seated on perianth tube.

Flower: July to November Fruit: December to February

Ecology and Distribution: Occasionally in evergreen to semi evergreen

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**Figure 7.** *Litsea floribunda*: A. flowering branch; B. male inflorescence; C. male flower; D. single stamen with gland; E. female inflorescence; F. female flower; G. pistil; H. fruiting branch.

**Figure 8.** *Litsea ghatica*: A. flowering branch; B. male inflorescence; C. single stamen; D. female inflorescence; E. female flower; F. fruiting branch.
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forests of Western Ghats at elevation from 600-1000 m. Endemic to India, distributed in Karnataka.


6. *Litsea glabrata* (Wall. Ex Nees) Hooker. (Figure 9)


Medium sized trees, 10-12 m tall, bark brown smooth, leaves glabrous, simple alternate, 12-16 × 3-4 cm, oblong, linear oblong or elliptic lanceolate, acute apex, entire margin, reddish brown beneath when dry, lateral nerves 10-12 pairs. Inflorescence axillary racemes 3-6 cm long, perianth tube short, lobes 6, stamens 12, arranged in 4 whorls, filamentous, introse, glandular hairy, ovary ovoid, glabrous, style 2-3 mm long, fruit berry, ovoid, glabrous, perianth conical in fruit.

Flower: August to November Fruit: December to January.

Ecology and Distribution: Occasionally in Semi evergreen forests of Western Ghats at 900-1100 m elevation. Endemic to India, distributed in Karnataka, Tamil Nadu states.

Specimens examined: INDIA, KARNATAKA. Pushpagiri Madikeri, Kemmannugundi, Agumbe, Shanthi falls 13°33'00" N, 75°45'93" E, 1424 m. *Srinivas S.G & Y.L Krishnamurthy, HJCBN 0287.

7. *Litsea glutinosa* (Lour.) C.B. Robinson. (Figure 10)


Trees, 20-22 m tall, bark rough, brown, leaves simple, alternate, pilose when young, petiole 1.5 to 2 cm long, leaf blade elliptic or lanceolate, acute at apex, 9-10 pairs of lateral nerves, 8-10 × 4-6 cm, in lower surface of leaf greyish pubescent. Peduncles 3 cm long, grey pubescent, umbels compound, bracteate, pedicillate, crowded at tip of peduncle, 9-10 flowers in each inflorescence, 12-13 stamens arranged in two whorls, intose, filamentous, hairy, ovary half inferior, stigma dilated, irregularly lobed, fruit berry, globose, seated on flat disc.

Flower: March to August Fruit: October to November.
November.

Ecology and Distribution: Rare in dry deciduous and semi evergreen forests of Western Ghats. Distributed in India, China, Thailand.

Specimens examined: INDIA, KARNATAKA. Near Bhadra dam, Udupi, Muthodi 13°22'21" N, 75°39'04" E, 1117 m. Srinivas S.G & Y.L Krishnamurthy, HJCBN 0288.

8. *Litsea laevigata* (Nees) Gamble. (Figure 11)


Small trees, 10-13 m tall, leaves simple, alternate, 14-16 × 3.5 cm leaf lanceolate, oblong, minutely pubescent beneath, petiole shiny 1.5 cm, acute or acuminate apex, glabrous above and pubescent beneath, lateral nerves 6-8 pairs.

Umbels in sessile clusters, 4-5 flowered, greyish white colour, perianth silky, hairy, number of stamens 12, introse, arranged in 4 whorls, inner whorls glandular without hairy, ovary half inferior, enclosed in a perianth tube, style thick, fruit ovoid, fruiting pedicel 1 cm long, yellow.

Flower: September to January Fruit: January to March.

Ecology and Distribution: Evergreen forests of Western Ghats of elevation 700-1100 m. Endemic to India, distributed in Karnataka, Kerala, Tamil Nadu states.

Specimens examined: INDIA, KARNATAKA. Madikeri, Kodachadri, Kuduremukh, near
Hanumanahundi falls, Near Satodi falls Yellapur 14°59’58” N, 74°38’87” E, 1423 m. *Srinivas S.G & Y.L Krishnamurthy*, HJCBN 0289.

9. **Litsea mysorensis** Gamble. (Figure 12)


Shrubs or small trees, 6-8 m tall, leaf blade linear, petiole 0.5 to 1 cm long, leaves simple, alternate, acuminate, cuneate at base, pubescent, lanceolate, oblong, 8-10 × 2-3 cm, lateral nerves 8-10 pairs. Inflorescence umbels in sub sessile clusters, flowers sessile, 4-5 flowered, perianth silky without hairs, stamens 9, introrse, arranged in 3 whorls, inner one row glandular, yellow in colour, ovary half inferior, stigma capitulate, thick, berry subglobose, fruit seated on cup shaped perianth tube, fruiting pedicel 2 mm long thick in nature.

Flower: October to February Fruit: February to March

Ecology and Distribution: Rare in Evergreen to semi evergreen forests of Western Ghats around 600-1000 m elevations. Endemic to India, distributed in Karnataka, Kerala, Tamil Nadu states.


10. **Litsea oleoides** (Meisn.) Hook. (Figure 13)

Hook, Flora of British India 5: 175 (1886).

Figure 12. *Litsea mysorensis*: A. branch let with leaves; B. female inflorescence; C. male flower; D. single stamen with stalked gland; E. fruiting branch

Figure 13. *Litsea oleoides*: A. branch let with leaves; B. female inflorescence; C. male inflorescence; D. single stamen with gland; E. fruiting branch

Trees, 20-25 m tall, leaves simple, alternate, opposite on young shoots, 12-14 × 3-5 cm, elliptic oblong or elliptic lanceolate, acute apex, glabrous, coriaceous, lateral nerves 8-10 pairs. Inflorescences umbels in axillary racemes, bracts orbicular, perianth short, stamens 9-10 in numbers, introrse, filamentous sessile glands at the base, ovary half inferior, fruit berry, seated on perianth tube.

Flower: August to December Fruit: October to June.

Ecology and distribution: Rare in evergreen forests of Western Ghats at 800-1300 m elevation. Endemic to India, distributed in Karnataka, Kerala, Tamil Nadu states.

Specimens examined: INDIA, KARNATAKA. Kemmannugundi, Bababudengiri, Muthodi, Bhadra forest 13°31'48'' N, 75°47'08'' E, 1375 m. Srinivas S.G & Y.L Krishnamurthy, HJCBN 0291.

11. Litsea stocksii (Meisn.) Hook. (Figure 14)


Trees, 14-18 m tall, petiole 2 cm long, leaves alternate, leaf blade oblong lanceolate, acute apex, 8-14 × 3.45 cm, white glabrous beneath, glabrous, lateral nerves 8-13 pairs. Inflorescence umbel, 2.5 cm long, greyish tomentose, 6-8 flowered, arranged in 1 whorl, stamens 8-10, introrse, ovary covered by perianth, ovary straight, half inferior, stigma dilated, berry oblong, 1-1.5 cm long, seated on cup like perianth tube, pedicel thick in nature.

Flower: July to December Fruit: November to April.

Ecology and distribution: Common in semi evergreen and evergreen forests around 700-1300 m. Endemic to India, distributed in Karnataka, Kerala, Tamil Nadu, Maharashtra states.

Specimens examined: INDIA, KARNATAKA. Kodachadri, Kemmannugundi, Bababudengiri, Gangamoola near Kuduremukh, near Belthangadi, Agumbe 13°29'17'' N, 75°06'32'' E, 712 m. Srinivas S.G & Y.L Krishnamurthy, HJCBN 0292.

12. Litsea wightiana (Nees) Hook. (Figure 15)

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Wight, Ic. t. 1833. 1852. Type K: Wight R, India, K000357542.


CONCLUSION

A total of 12 *Litsea* species collected and taxonomically described from Western Ghats of Karnataka. The field survey indicated that all the species showed clumped distribution and seedlings are adapted to grow close to the mother trees, male and female trees are distributed in same region because of pollination and regeneration purpose. *Litsea floribunda* is dominant over all the other species and frequently distributed throughout the Western Ghats region. *Litsea ghatica* is a rare species distributed occasionally in some regions of Karnataka Western Ghats.

The authors are thankful to the Department of Science and Technology (DST) New Delhi, for providing financial assistance as an Inspire Fellowship (IF140097) to Srinivas SG and authors also acknowledge thanks to Dr. Gopalakrishna Bhat, Professor, Department of Botany, Poorna Pragna College Udupi, Karnataka, India for species confirmation. Thanks are also due to Karnataka Forest Department, Bengaluru for permission to conduct the research. We acknowledge herbarium JCB, CES, Indian Institute of Science, Bengaluru for accepting our specimens for deposition. The authors also acknowledges special thanks to Shravan Kumar S., Avinash K.S., Ashwini H.S., for their help during field studies.

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