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NORTHERNMOST DISTRIBUTION OF FIVE TREE SPECIES TO THE WESTERN GHATS FROM THE SACRED GROVES OF PUNE DISTRICT, MAHARASHTRA, INDIA

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Abstract: Sacred Groves are the forest patches dedicated to a local deity, which have been conserved since centuries and play a very important role in conserving many threatened plants as well as animal species. In the present work, we have studied fifteen Sacred Groves in Pune District for their floristic diversity. A total of 296 species were recorded of which five species show their northernmost distribution to the Western Ghats in the Sacred Groves of Pune District. The present paper highlights this unique feature of sacred groves as the abodes of rare species having their northernmost distribution recorded in the grove.

Keywords: Northernmost records, Pune, Sacred Groves.

India has a rich cultural heritage of dedicating groves, ponds, and rivers to God. These are the patches of forests dedicated to a local deity and significant not only from cultural but also from a conservation point of view. The religious beliefs prohibit cutting, or lopping in sacred groves. Sacred groves exist in various sizes from a few trees to a few square kilometers. They have been preserved for the last 2500 years, since the time agriculture was first introduced in northern Western Ghats (Gadgil & Vartak 1975). This tradition dates back to the pre-agricultural, hunting gathering stage of the society. These groves are abodes of many rare and endemic plants and animal species. They harbor plants

of various utilities like timber, medicinal plants, NTFP, etc. Many species of birds, animals and plants might have become extinct on the nonexistence of these groves (Gadgil & Vartak 1973).

In India, sacred groves are found almost in all states with differing numbers and areas. Maharashtra has 2800 sacred groves covering approximately 35,700km² of area, most of which are located in the Western Ghats or Konkan and harbor about 800 species of plants (Deshmukh 1999). Sacred groves are locally known as Devrai, Devpan, Devrahat, Devara kadu, Kavus, Orans, Than etc. The Western Ghats of Maharashtra is spread from river Tapti to Tilari ghat in the south. This stretch has many vegetation types including evergreen, semi-evergreen, moist deciduous forests (Champion & Seth 1968) interspersed with rocky outcrops (Watve 2013). The forest patches in the Western Ghats of Maharashtra are not continuous as that of the southern Western Ghats. Many tree species that are common in southern Western Ghats are rare in northern Western Ghats. Presently, the forest patches of northern Western Ghats are confined to protected areas like Bhimashankar, Koyna, Chandoli and Radhanagari (Gadgil et al. 2011). Sacred Groves gain immense importance as they

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maintain pristine but fragile patches of forest in addition to these inadequately protected areas. As these forests are not continuous, the species distribution throughout northern Western Ghats is also fragmented. There are many trees species restricted only to the sacred groves.

Sacred groves shelter rare and endemic flora and fauna and are refugia and breeding grounds of many animals. They are also abodes of wild relatives of cultivated plants, repositories of medicinal plants, source of perennial water, etc. (Ghate et al. 2004). This short communication highlights an additional significance of sacred groves as remnants of forest patches which shelter rare species, as the sacred groves themselves are the northernmost known locations of five arboreal species documented during this study.

MATERIALS AND METHODS

Fifteen sacred groves spread across Pune District were studied for their plant diversity. Surveys were conducted from March 2012 to September 2013. A comprehensive checklist of all the plants present in the groves was prepared. The specimens were identified using local floras (Cooke 1901–1908; Sharma et al. 1996; Singh & Karthikeyan 2000; Singh et al. 2001). Plants were collected and processed using conventional

collection methods (Jain & Rao 1977). Identities of plants were confirmed by comparing them with authentic specimens deposited at Agharkar Research Institute herbarium (AHMA) and Herbarium of Botanical Survey of India, Western Regional Station, Pune (BSI). The herbarium specimens collected during the present work are deposited in AHMA. A total of 296 species of angiosperms were reported from these sacred groves. Available literature on plant diversity of northern Western Ghats were referred to (Santapau 1953, 1958; Kulkarni 1988; Almeida 1990; Lakshminarasimhan & Sharma 1991; Deshpande et al. 1993–1995; Kothari & Moorthy 1994; Pradhan & Singh 1999; Yadav & Sardesai 2002; Patil 2003) for distribution of these species. During this documentation it was found that five species show their northernmost distribution to three groves in Pune District (Image 1). A brief citation, description, notes on distribution and ecology of these five species in the Western Ghats are provided herewith.

ENUMERATION OF SPECIES

Agrostistachys indica Dalzell in Hooker's J. Bot. Kew Gard. Misc.2:41.1850; Hook. f., Fl. Brit. India 5:406.1887; T. Cooke, Fl. Bombay 2:102. 1967 (Repr.); Airy Shaw in Kew Bull. 26:210.1972; N. P. Balakr. & Chakrab., Family

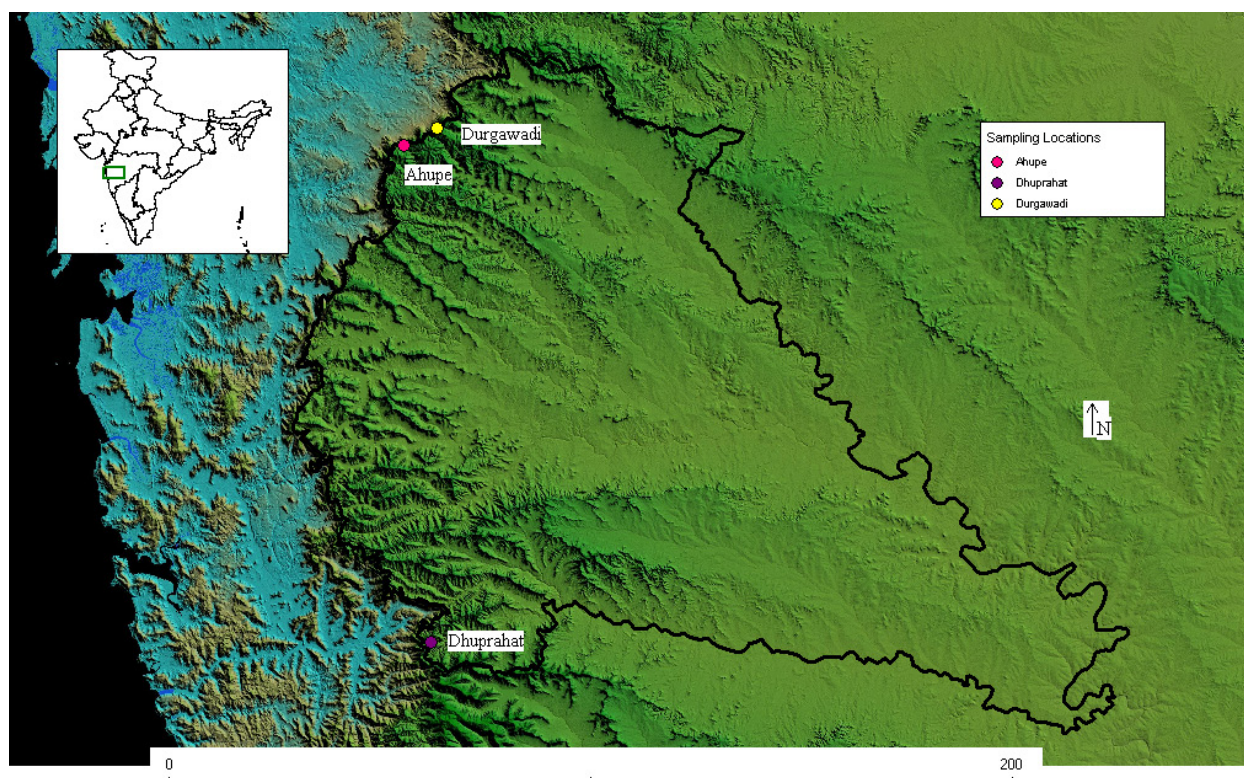


Image 1. Location of the sacred groves for northernmost records (Map was prepared using Diva GIS, version 5.2)

Euphorb. India 157. 2007. (Euphorbiaceae).

Small trees, up to 5m tall. Leaves alternate, 10–25x4–8 cm, oblong-lanceolate, apex and base acute, margins coarsely and sharply serrate with incurved spinulose teeth, coriaceous. Male flowers minute, solitary in axils of small imbricating bracts, arranged in axillary or supra axillary clusters. Female flowers solitary, pedicellate. Capsules 3-lobed, 1–1.2 cm across, glabrous, red. Seeds globose, pale brown.

Flowering and Fruiting: October–March.

Distribution: Indo-Malayan Region. Western Ghats of India. In Maharashtra this species was earlier reported from Kolhapur & Ratnagiri (Singh et al. 2001). Dhuprahat (Bhor Taluka of Pune District) forms the northernmost distribution of the species.

Exsiccata: 28353 & 28630 (AHMA), 07.ii.2013, Dhuprahat (Images 2–4).

Occurrence: Very rare in thick evergreen forests.

Canarium strictum Roxb., Fl. Ind. [Ed. Carey] 3:138.1832; A.W. Benn. in Hook. f., Fl. Brit. India 1:534. 1875; T. Cooke, Fl. Bombay 1:214.1967(Repr.); Chithra



Image 2. *Agrostistachys indica* male flowers

& A.N. Henry in Hajra et al., Fl. India 4: 440. 1997. (Burseraceae).

Trees up to 20m tall; branches velvety tomentose. Leaves imparipinnate, 5–10x2–4 cm, elliptic or oblanceolate, acuminate at apex, obtuse or subcordate

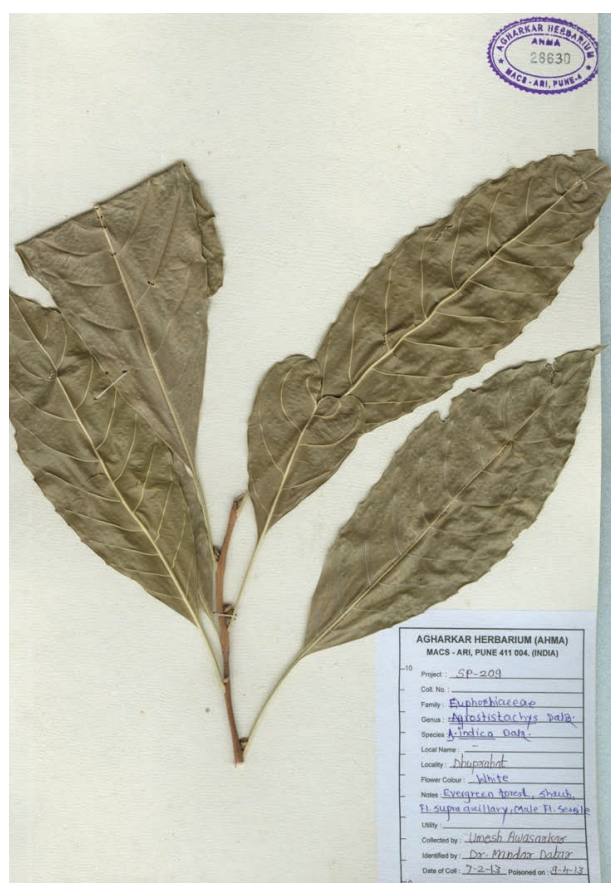


Image 3–4. Herbarium of *Agrostistachys indica* [28353 & 28630 (AHMA)]



Image 5. Two *Canarium strictum* trees on the background of Dhuprahat SG

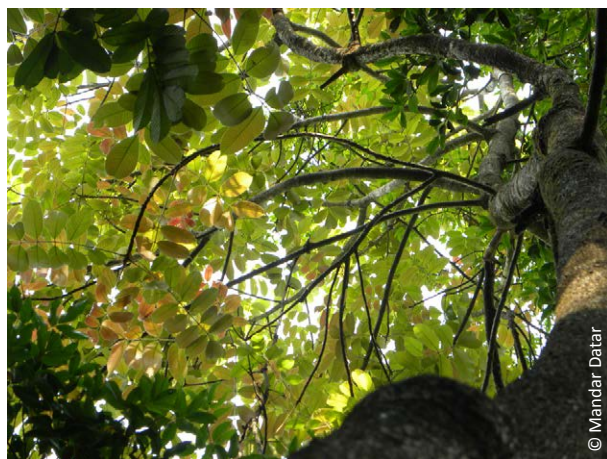


Image 6. *Canarium strictum* tree

at base, margins serrate or crenate, rusty villous below, young leaves reddish. Inflorescence of axillary panicles. Flowers pale yellow or white, 3-merous, c. 8mm across; calyx tube campanulate, pubescent; stamens 6, free from disc. Drupes c. 3.7–5 cm long, ellipsoid or ovoid, tapering at both ends, stony, hard, bony.

Flowering and Fruiting: February–May.

Distribution: Western Ghats and Myanmar. In Maharashtra the species is distributed in Kolhapur, Pune and Raigad districts (Singh & Karthikeyan 2000). The Dhuprahat Sacred Grove (Bhor Taluka of Pune District) is its northernmost known location in northern Western Ghats.

Exsiccata: 17364 (AHMA), 18.iv.1987, Dhuprahat (Images 5–7).

Occurrence: Rare in thick evergreen forests.



Image 7. Herbarium of *Canarium strictum* [17364 (AHMA)]

Chukrasia tabularis var. *velutina* (M. Roem.) King in J. Asiat. Soc. Bengal. 64:88.1895. Hiern in Hook. f., Fl. Brit. India 1:568.1875 (as '*Chickrassia*'); T. Cooke, Fl. Bombay 1:230.1967 (Repr.); S.S. Jain & Bennet in Hajra et al., Fl. India 4:482.1997. (Meliaceae).

Tall trees, 5–8 m tall; bark dark greyish, lenticellate. Leaves alternate, abruptly pinnate; leaflets 5–12 pairs, 3–10 x 2–4 cm, ovate or oblong, apex acute or acuminate, base inequilateral, tomentose above, velvety beneath. Inflorescence of terminal panicles, shorter than leaves. Flowers dirty white; calyx short, 5-toothed; petals linear-oblong; staminal tube cylindric, glabrous, with 10 short teeth. Capsules 4–6 x 2.5 cm, ovoid, 3-valved, splitting at tips during dehiscence. Seeds numerous, flat, closely packed, broadly winged.

Flowering and Fruiting: February–September.

Distribution: Andaman and Nicobar Islands, Western Ghats of Karnataka and Maharashtra, Sri Lanka and Myanmar. In Maharashtra this variety is distributed in Pune, Satara, Raigad and Sindhudurg districts (Singh & Karthikeyan 2000). In Pune District it was earlier reported from Khandala (Santapau 1953). The



Image 8. *Chukrasia tabularia* var. *velutina* tree (inset fruit)

present distribution of this species from Ahupe Sacred Grove (Ambegaon taluka of Pune District) forms the northernmost record in the Western Ghats.

Exsiccata: 28356 & 28653 (AHMA), 14.iii.2013,

Ahupe SG (Images 8–10)

Occurrence: In patches of semi-evergreen forest.

Myristica dactyloides Gaertn., Fruct. 1: 195, t. 41, f. 2a-d. 1788; *M. beddomei* King in Ann. Roy. Bot. Gard. Calcutta 3: 291, t. 118, f. 1-18. 1891. *M. laurifolia* Bedd., Fl. Sylv. t. 267. 1872; Hook. f., Fl. Brit. India 5: 103. 1886. (Myristicaceae).

Trees, up to 20m high; branchlets glabrous. Leaves 12.5–22 x 5.5–9 cm, elliptic or oblanceolate, bluntly acute at apex, rounded at base, coriaceous, glaucous beneath. Flowers cream-coloured; male flowers in pedunculate cymes; perianth ovoid, rusty tomentose; female flowers few-flowered, in axillary cymes; perianth cuneate. Drupes c. 6.5x3.8 cm, broadly ovoid, yellow-tomentose. Seeds with red aril.

Flowering and Fruiting: October–May.

Distribution: Western Ghats and Sri Lanka. In Maharashtra this species is reported from Raigad, Satara, Sindhudurg (Singh et al. 2001). Durgawadi

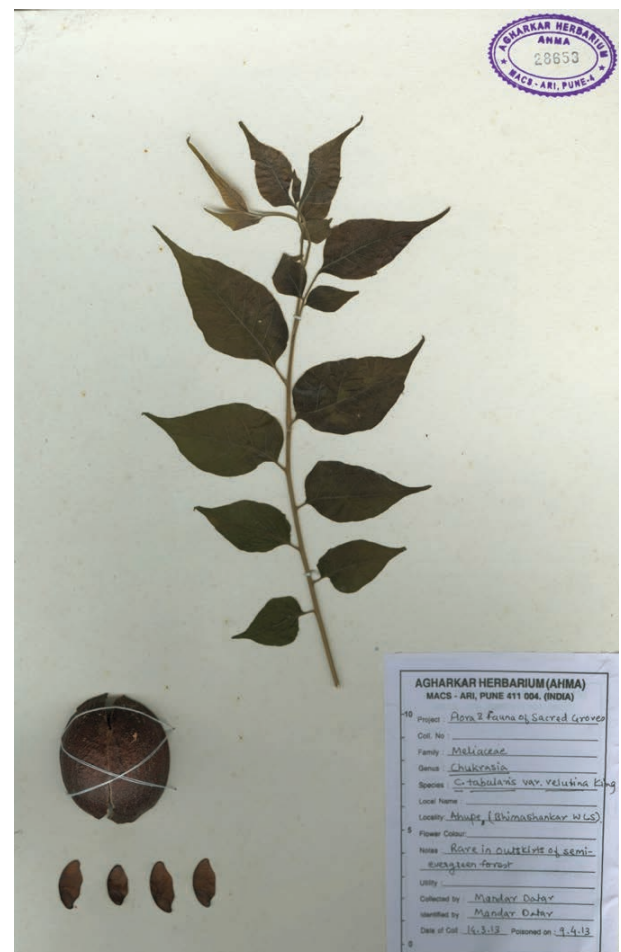
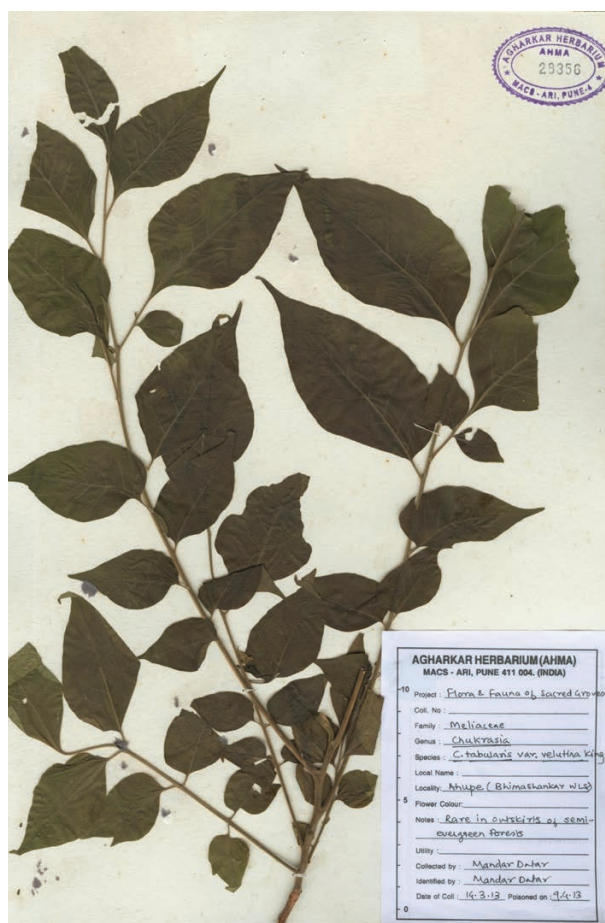
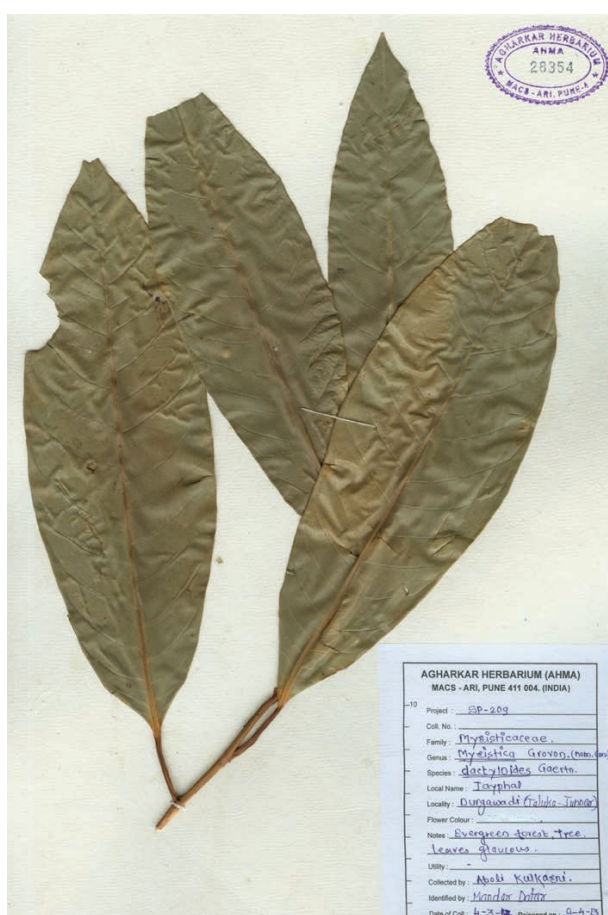


Image 9–10. *Chukrasia tabularia* var. *velutina* [28356 & 28653 (AHMA)]

Image 11. *Myristica dactyloides*Image 12. Herbarium of *Myristica dactyloides* [28354 (AHMA)]

(Junnar Taluka of Pune District) forms its northernmost record.

Exsiccata: 28354 (AHMA), 04.iii.2013, Durgawadi (Images 11–12).

Occurrence: Common in semi-evergreen forests.

Tabernaemontana alternifolia L., Sp., Pl. 211.1753; Nicolson et al. in Regnum Veg. 119 (Interpr. Rheede's Hort. Malab.):57.1988. *Ervatamia alternifolia* (L.) S. M. Almeida, Fl Savantwadi 1:251.1990. *Tabernaemontana heyneana* Wall. in Edwards's Bot. Reg. 15: t. 1273.1829; Hook. f., Fl. Brit. India 3:646.1882; Karthik. et al., Fl. Pl. India-Dicot. 1:138.2009. *Ervatamia heyneana* (Wall.) T. Cooke, Fl. Bombay 2:134.1904 [2:196.1967(Repr.)] (Apocynaceae).

Large shrubs or small trees, up to 5m tall. Leaves 10–20 x 3.5–5.5 cm, oblong-lanceolate or elliptic-lanceolate, apex shortly acuminate, base acute, glabrous; main nerves 12–16 pairs. Inflorescence in many flowered cymes. Calyx c. 5mm long, lobes 2, rounded at apex; corolla tube 1.5–2.5 cm long, inflated, lobes crisped, boat shaped. Follicles 2.5 – 3 x 1 – 1.2 cm, orange when ripe, curved. Seeds 8–10 mm long, surrounded by red pulp.

Flowering and Fruiting: February–September.

Distribution: Endemic to western and southern India (Andhra Pradesh, Goa, Gujarat, Karnataka, Kerala, Maharashtra and Tamil Nadu). In northern Western Ghats the species is distributed upto Satara District (Singh et al. 2001), but not reported in Khandala (Sanatapau 1953). In Konkan region the northernmost record of the species is Raigad District (Kothari & Moorthy 1993). In the present work the species is reported from Ahupe Sacred Grove (Ambegaon Taluka of Pune District) which forms its northernmost record.

Exsiccata: 28357 (AHMA), 14.iii.2013, Ahupe (Images 13–14).

Occurrence: Common in moist deciduous forests.

Image 13. *Tabernaemontana heyneana* flower

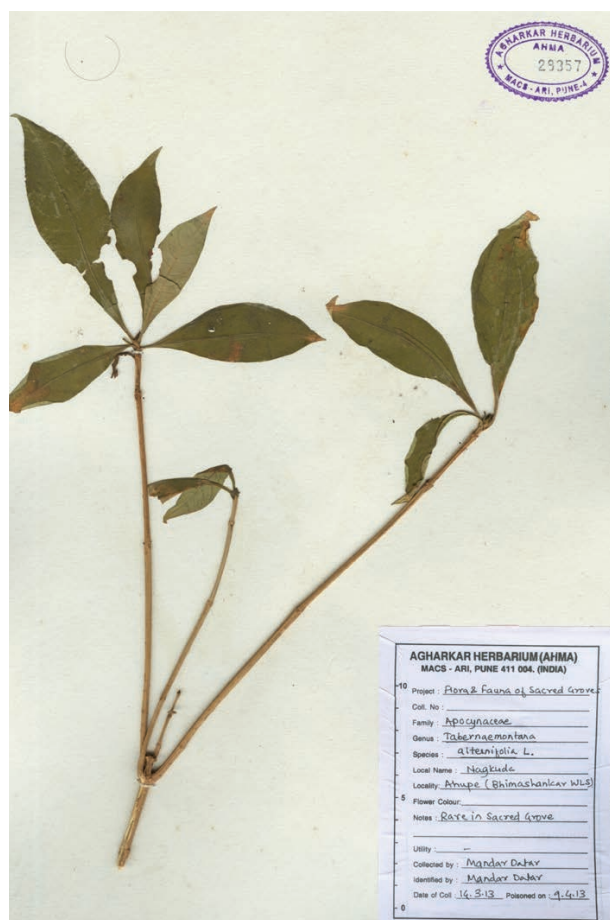


Image 14. *Tabernaemontana heyneana* [28357 (AHMA)]

DISCUSSION

Due to a rapid growth of human population and increased urbanization, forest fragments in the tropics are under severe threat. Anthropogenic pressures on forests have resulted in severe degradation of the ecosystems and have a serious impact on the biodiversity of the region. They not only reduce the biodiversity of the region but change the species composition of the region over time. Wagh & Ghate (2002) report loss of 60% of fish fauna from Mula-Mutha in the past 60 years. Recently, Kulkarni & Subramanian (2013) reported a loss of 31% odonate fauna from the region. Loss of species at such a rate is alarming and demand dedicated efforts for conservation of this natural wealth. Sacred Groves, that have conserved these forests for ages, are also subjected to this impact. The northern Western Ghats in Maharashtra have patchy distribution of many tree species due to a lack of continuous forest patches. Sacred groves provide suitable habitats to many such species. The present work reports the northernmost distribution of five species of angiosperms to the

Western Ghats of Maharashtra, recorded from these sacred patches of forests.

Sacred Groves are relics of the primary forests of the Western Ghats and are centers of endemism for both plants and animals. A casual approach to managing these forest fragments has led to the destruction of these forest fragments. Weakening of religious beliefs is one more concern for sacred groves. In regions like northern Western Ghats, where there is a limited scope of declaring new protected areas due to social, economic and political constraints, protection of the sacred grove is of immense importance.

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