

Eco-Taxonomical Diversity and Forest Significance of Asclepiadaceae Climbing Plants from Amravati District, Maharashtra, India

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Abstract—Asclepiadaceae is the one of the popular families of flowering plants in India because of its ecological as well as economical potential. Climbing habit is also one of the significant feature of family Asclepiadaceae. The present investigation tends to highlight some shadowed angles of Asclepiadaceae members which are the dominant part of forest community in Amravati region. Eco-taxonomical variations and forest significance of Asclepiadaceae members has been worked out through continuous observational study. Each climber was analyzed with respect to their habit, habitat and distribution, seedling growth, climbing mechanism, way of host approach, association and the overall role in the forest community. The investigation summarized that all the naturalized species are well adapted to their community habitats and plays significant role. Some forest management activities will be harmful to their existence.

I. INTRODUCTION

The family Asclepiadaceae comprises a diverse group of plants known for their ecological significance and medicinal properties. The family Asclepiadaceae represent mostly herbs and shrubs with milky latex comprising about 250 genera and 2,000 species distributed mainly in the tropical and subtropical regions of the world. In India, 250 species confined along with 53 genera. Many species of the family are liana and some of which are cactus like succulents with reduced leaves. These plants exhibit a wide range of phytochemical constituents and anatomical adaptations that contribute to their pharmacological activities and ecological roles (Fang and fan, 1993). This family characterized by unique features that contributes to extreme floral complexity and diversity. Their pollination mechanism is exceptional. The

fragrance from the flowers attracts flies easily and leads to pollination.

Climbing habit is also one of the significant feature of family Asclepiadaceae. Northern - Eastern Ghats of India represent about 17 climbing species (Naidu and Malleboyina, 2014), whereas South Eastern Ghats represent 11 species of climbers belongs to family Asclepiadaceae (Muthumperumal and Parthasarathy (2008). However, according to Sarvalingam and Rajendran, (2016) 7 climbing species becomes endangered in the recent past. The liana of the family shows great diversity with respect to their vegetative as well as reproductive features. However, most of the genera represent single species. According to Gentry (1983 a) climbing plants in temperate forests represent on average 7% of the local flora, while in tropical forests this number reaches 20%.The ecological importance of lianas is well documented, since they are of fundamental importance in the functioning of ecosystems as competing with trees either directly or indirectly. They act as key ecological components of whole forest in transpiration, carbon sequestration and forest regeneration (Schnitzer and Bongers, 2002). Lianas play a significant ecological role in different patterns of pollination, dispersal and phenological systems, provide several resources, and play vital roles in the protection of biological diversity (Reddy and Parthasarathy, 2006).

Amravati district is situated in the center of the northern border of Maharashtra State. The district is distinctly divided into two widely different tracts i.e. the plain of fertile black soil and a stretch of mountainous tract extending along the whole northern boundary of the district. There is also a low altitudinal trap of hills rising in the vicinity of Amravati and extending eastwards to some distance. The large

Melghat tract is a hilly terrain of Satpura ranges which is entirely different from the rest of district from climatologically and floristic point of view.

The review of literature related that the flora of the district reveals that, the Melghat area as well as the plains attracted the attention of several workers since the time of British Empire. But R.I. Patel, a Forest officer initiate the significant study and published the 'Forest Flora of Melghat' (1968). Later on M.A. Dhore (1886) explored the flora of overall district and published the flora of Amravati district. The flora described about 1084 species including 75 species of climbing plants from 34 families. The families having diverse climbing species include Papilionaceae, Cucurbitaceae, Vitaceae, Asclepiadaceae and Convolvulaceae. The floristic richness and its ethnobotanical significance of the district are thoroughly explored by most of the workers. But ecological aspects related to overall biodiversity is still waiting.

In the investigated area the family Asclepiadaceae confined 7 species which are diversified with respect to habit, habitat and distribution. The present investigation focused on the shadowed but significant characteristics of the family.

II. REVIEW OF LITERATURE

From the literature cited it was observed that the floristic Survey of Melghat region of Amravati District satisfactorily investigated by Patel (1968) and published the flora of Melghat. The flora described about 600 species including 175 cultivated species in the area. Beside this the extensive work on the floristic of district has been carried out by Dhore (1986) in flora of Amravati District. The flora described about 1084 species from 126 families of the flowering plants including about 75 species belonging to 34 families which exhibit variable climbing habits. Recently Bhogaonkar and Devarkar re-explored Melghat area and added about 67 new species including some climbers. All these works were purely taxonomical and not focused over any ecological aspects.

The potentiality of climbing plants initially investigated by Darwin (1867) in the book, "On the movements and habits of climbing plants". He not only classified this group according to climbing mechanisms but also worked out their approaches to do so. Later on Schenck (1893), Putz and Mooney

(2009), Schnitzer (1995), Carlquist (1988) focused over the pattern of distribution, adaptation in a community, behavior with respect to host, anatomical peculiarities and the forest significance of the climbing plants.

Naidu and Malleboyina, (2014) while working on taxonomic diversity of liana in tropical forest of eastern Ghats stated that, lianas are important in forest ecosystem and strongly influence the forest dynamics and diversity. Lianas are common in the tropical moist deciduous and rain forests, which are competing with other forest trees. Little information is known on the habitat specialization in tropical lianas diversity and the root causes for variation among forests in liana species composition. Sarvalingam and Rajendran, (2016) while working on taxonomic diversity of liana in tropical forest of South Eastern Ghats concluded that, Lianas, the woody vines contribute substantially to the diversity and structure of most tropical forests. Yet, little is known about the importance of habitat specialization in maintaining tropical liana diversity. According Patel (2014) to the members of family Asclepiadaceae characterized by unique features that contributes to extreme floral complexity and diversity. Their pollination mechanism is exceptional. The fragrance from the flowers attracts flies easily and leads to pollination.

In the investigated area Ratnaparkhi (2007) investigated the community ecological studies in Melghat forest with emphasis on Ecotourism. However, the ecological investigation related to listing, distribution, behavior and adaptations in any sort of climbing plant has been not carried out so far

III. MATERIAL AND METHODS

The present investigation pertains to Eco-taxonomical diversity of Asclepiadaceae climbing plant of Amravati District (M.S). The study was based on extensive and intensive field trips made during different seasons of 2011-2013. During the course of field study the authors have explored the entire district including Melghat and different habitats of Asclepiadaceae climbers were selected for the study. Regular field trips were made twice in a month to different selected habitats for the collection of climbing species and important field notes. The study focused on the seedling growth, searching shoots, climbing mode, flowering, fruiting and overall forest

significance of each Asclepiadaceae species. Photographic evidences of each species were shot out with Digital Camera. During this course wet stem samples were collected to analyze the anatomical peculiarities of each species. The specimens were pressed, dried and preserved and properly identified with the help of available literature and expertise. The field data and literature of all the investigated species were finalized and compiled for further procedure.

IV. RESULTS AND DISCUSSION

During the study period the author have reported a total of 7 Asclepiadaceae climbing species belonging to different habitats.

1. *Cryptolepis buehneri* R.Br. Vern. Name: Kawa Vel, Kuranta

Habit, Habitat and Distribution: A large, much branched, woody twiner with milky latex and reaches up to 5-6 m in height. Frequently distributed in plains as well as Melghat forests on bushes, hedges, small and big trees especially on hill slopes and stream banks.

Vegetative Characters: Stem terete, pale, glabrous, 0.5 - 0.7 cm in thickness, which becomes brown, cracked, 1.5 - 2.5 cm in diameter with the maturity. Leaves opposite, elliptic oblong, acuminate, dark green, shining above, whitish beneath, glabrous, base acute, margins entire; petioles 1 - 1.5 cm. long.

Floral Characters: Flowers greenish-yellow, small in axillary paniculate cymes; pedicels glabrous; bracts ovate, acute. Calyx glabrous; lobes ovate sub-acute. Corolla tube short, linear; corona scales clavate. Style - apex not exerted. Follicles paired, divaricated, 8-10 cm long, straight, rigid, gradually tapering to a blunt point. Seeds ovate - oblong, black, comose. Flowering period: Jun. - Aug; Fruiting Period: Dec - Feb.

Reproduction and Dispersal: Follicles dehisce by longitudinal sutures and liberate seeds in the vicinity. Comose seeds dispersed by wind, germinate and gives rise to new plant.

Ecological Status: Plant usually develops in the thickets or in association with small trees and bushes. Seedling develop 1-2 m long leader shoot which twines along hosts of variable diameter. The twining intervals may be of 4 - 10 cm depending upon the host diameter. Plant ascends vigorously through the host, becomes much branched and tries to gather over whole community canopy. The thick canopy more or less

reduces the host photosynthetic ability and develop deep scars over host branches. In the absence of host plant initially becomes much branched which twines along each other and develop cable posture.

Localities: Pohara, Amzari, Amravati

2. *Cryptostegia grandiflora* R.Br. Vern. Name: Vilayati Vakundi, Rubber Vine

Habit, Habitat and Distribution: An extensive, much spreading, glabrous, perennial, woody, lateciferous climber, growing up to 5-6 m in height. Frequently distributed especially in urban area over waste lands, railway lines, electric poles, old buildings, road dividers and bank of sewage lines.

Vegetative Characters: Branches slender, glabrous, 0.5 - 0.7 cm in thickness, becomes grayish-yellow, 1.5 - 2.5 cm in diameter with maturity. Leaves opposite, elliptic-oblong, 6-10 x 3-5 cm, entire, obtuse, shiny above, glabrous beneath; petioles 1-1.5 cm long, glabrous.

Floral characters: Flower showy, in terminal trichotomous cymes; pedicels short, glabrous. Calyx tube divides; teeth oblong - lanceolate, acute, glabrous. Corolla 5-7 cm across; tube purplish, glabrous; petals rosy-purple, outside, whitish within. Follicles divaricated, ovate, 3-angled, narrowed with curved apex, glabrous, 8-12 cm long, woody. Seeds flat, comose. Flowering and Fruiting Period: All most throughout the year.

Reproduction and Dispersal: Follicle dehisces with longitudinal sutures and liberates seeds in the vicinity. Comose seeds dispersed through wind agency. Plant reproduces with the help of seeds.

Ecological Status: The plant is native of Tropical Africa, has been grown as an ornamental plant in Bombay but gets naturalized especially in the urban area. In the study area plants usually grow in escapes, along old buildings, electric poles, road divides and Railway lines. The plant develops 2-3 m long leafless leader shoots which remains straight due to anatomical strength. The shoots twines with the host of variable diameter and ascend with an intervals of 7-10 cm to long distances. The profusely branched nature leads into a tuft and thick canopy at the top. In the absence of host the thick leader shoots can ascend with the help of minor wall or similar supports or shows self-cable formation. **Localities:** Amravati, Paratwada.

3. *Dregea volubilis* E Meyer; Vern. Name: Hirandodi.

Habit, Habitat and Distribution: An extensive, perennial, deciduous, twining shrub grows up to 5-6 m in height. Frequently distributed in plains of district on bushes, small trees and even on electric poles, tree guards of urban area. Not found in Melghat forests.

Vegetative Characters; A young stem slender, twining, smooth, 0.5 - 0.7 cm in diameter and becomes yellowish or grayish. Corolla, glabrous, lenticelled, sometimes black dotted. Leaves opposite, 5-11 x 3-8 cm, broadly ovate or sub orbicular, acuminate, glabrous or softly pubescent, reticulately veined, base rounded or cordate; petioles 1.5 -3 cm long with terminal gland.

Floral Characters: Flowers numerous, green or yellowish-green, in lateral drooping, umbellate cymes; peduncles 3-5 cm long, slender, puberulous. Pedicels 1.5 -2.5 cm long, slender. Calyx divided nearly to the base; sepals ovate, obtuse, ciliate. Corolla deeply divided, glabrous outside; petals broadly ovate, obtuse. Staminal-column arising from the base of corolla. Style-apex dome shaped. Follicles paired, 7-10 cm long, slightly tapering to a blunt end, rugose, glabrous. Seeds broadly ovate, flattened, pale yellow – brown.

Flowering and Fruiting period: Jun. - Aug; Dec. - Jan. Reproduction and Dispersal: Mature capsules dehisce by longitudinal but oblique sutures and comose seeds dispersed in the vanity. The cottony seeds migrated elsewhere through wind agency. Plant reproduced by seeds.

Ecological Status: The seed lings grow diversely along shrubs or trees, fencing and roadside trees or tree guards or electric poles in urban areas. The plant develops long, leafless searching shoots of 1.5 - 2.5 m length. The shoot approaches the nearby host of variable diameter (1-20 cm) and ascends vigorously with the intervals of 6-12 cm. At the top of the host plants becomes much branched and develop thick canopy. The drooping branches also approach the secondary host and enlarge the canopy. It was observed that the tight coiling of *Dregea* often produces deep scars on host stems and retard their growth. Recently the plant becomes more prominent in urban habitats especially over roadside fencings, tree-guards, electric poles and road deviders. Localities: Amravati, Indla, Malhara.

4. *Hemidesmus indicus* R.Br. Vern. Name: Anantmul, Khobarvel.

Habit, Habitat and Distribution: A perennial, glabrous, twining or prostrate-shrub grows up to 2-3 m in height. Commonly distributed in plains along foot hills, hedges, and bushes especially along stream banks.

Vegetative Characters: Rootstock woody, stems numerous, slender, terate, glabrous or pubescent, thickened at the nodes. Leaves opposite, elliptic-oblong or linear - lanceolate, 5-10 x 3-4 cm apiculate or obtuse glabrous, dark green, sometimes variegated above, pale or silvery white, pubescent beneath; petioles very short.

Floral Characters: Flowers small, fleshy, showy, crowded in sub-sessile cymes along leaf axils; pedicels short, clothed with bracts. Calyx glabrous; lobes ovate, acute. Corolla greenish outside, purplish - red inside; tube very short; lobes velvety, fleshy, ovate-oblong, acuminate; corona scales five, short, thick. Stamens inserted. Style apex pentagonous, flat. Follicles paired, linear - lanceolate 10 -15 cm long, pointed at apex, straight or slightly curved. Seeds flat, many, silvery white.

Flowering and Fruiting Period: Sep. - Jan.

Reproduction and Dispersal: Follicles dehisce through longitudinal sutures and liberate seeds in the vicinity. Seeds dispersed through air or in association with any possible agencies. Plant reproduces with the help of seeds. The woody root stock also re-sprouts and develops new plant.

Ecological Status: Plant normally grows in the thickets or on hedges and bushes especially along stream banks. The seedling develops short leader shoot which immediately twins with the associated host or trail over host. Plant ascends with intervals of 6-9 cm and shows branching at the top. The secondary branches run horizontally along host canopy and cover most of the area. In the absence of host, plant trail over the forest floor - and remains un-branched till successful host approach. **Localities:** Masod, Nandgaon- Peth,

5. *Oxystelma secamone* R.Br. Vern. Name: Haranvel, Dudhani

Habit, Habitat and Distribution: A slender, perennial, deciduous, herbaceous twiner grows up to 3 m- in height. Rarely distributed along stream banks in hilly areas of Warud tahsil.

Vegetative Characters: Stems numerous, long, much branched, slender, glabrous 0.3 - 0.7 cm in thickness.

Leaves opposite, linear-lanceolate, 5-9 x 0.5-0.7 cm, acute, thin, pale green, glabrous, base rounded; petioles 1-1.3 cm long, slender, glabrous.

Floral Characters: Flowers large, showy, reddish-white, in drooping peduncled cymes. Peduncles long, 2-4 flowered, slender. Calyx glabrous; sepals 5, oblong - lanceolate. Calyx glabrous; sepals 5, oblong - lanceolate. Corolla pale-rose coloured, glabrous, saucer - shaped 2.5 cm across, lobes deltoid, acute. Fruits not seen. Flowering period: Jul. - Sep.

Reproduction: Plant reproduces by seed as well as nodal rooting.

Ecological Status: Plants usually grow in the thickets or bushes especially near stream banks; develop leader shoots of 1.5 - 2 feet in length. The shoots twine with the distances of 7 - 10 cm and ascend vigorously. With the successful approach plant becomes much branched which approaches in all directions and develop a thick network over host. Localities: Rawala, Hatura.

6. *Pergularia daemia* Forsk.; Vern. Name: Utarni, Utarni

Habit, Habitat and Distribution: A perennial, pubescent, latexiferous, woody twiner, reaches up to 3-4 m in height. Frequently distributed on hedges, bushes, fencings and small trees especially in plains of the district. It is also common along waste lands and fencings of urban area.

Vegetative Characters: Young stem clothed with spreading glandular hairs, brownish, 0.4 - 0.6 cm in thickness, mature stem glabrous, woody, 1 - 1.5 cm in thickness. Leaves opposite, thin, 5 - 10 x 2-7 cm, broadly ovate or sub orbicular, acuminate, glabrous, pubescent on both sides, margin ciliate, base deeply chordate; petioles 4-6 cm long, pubescent.

Floral Characters: Flowers greenish yellow or dull white in dense corymbose cymes; peduncles pubescent; bracts minute, lanceolate, acute. Calyx pubescent, divided to the base; teeth ovate-lanceolate, acute, ciliate. Corolla tube narrow, campanulate, petals spreading, ovate-oblong, acute, ciliate. Outer corona membranous. Follicles reflexed, lanceolate, narrowed into a beak, 6-8 cm long, echinate with soft spines. Seeds ovate, velvety - pubescent on both sides, comose. Flowering and Fruiting periods: July - Feb
Reproduction and Dispersal: Follicle dehisces through longitudinal sutures and liberates seeds in the vicinity. The comose seeds dispersed through wind or any other

agency to long distances and thus plant normally reproduces by seeds.

Ecological Status: Plant adaptively grows in thickets, along bushes, hedges, fencings and small trees, especially in plains. Also grows on wastelands and fencings of urban area. Seedling develop long, 0.5 - 2 m long, slender, leafless leader shoots which searches the possible host and ascend with the intervals of 5-10 cm. With the successful approach plant vigorously grow and becomes much branched. Along hill slopes plant cover entire community especially of *Acacia*, *Lantana* and *Ziziphus*, whereas, along fencings, roadside flora or electric poles, plant try to ascend at the top and then becomes much branched. It was observed that plant is commonly distributed in urban as well as rural area.

Localities: Amravati, Bhankheda, Morshi.

7. *Telosma pallida* Roxb. Vern. Name: Jiwti.

Habit, Habitat and Distribution: A large, glabrous, twining shrub with watery latex, reaches up to 2-3 m in height. Occasionally distributed throughout the plains of the district, mostly around villages; in hedges, thickets and along field borders.

Vegetative Characters: Stems pale, slender, more or less pubescent or glabrous 0.4 - 0.8 cm in diameter. Leaves opposite, 5-10 x 2 - 7 cm, ovate, acuminate, glabrous or slightly pubescent, pale and reticulately veined beneath; petioles 2-5 cm long, pubescent.

Floral Characters: Flowers yellowish, slightly fragrant in dense corymbose cymes; peduncles pubescent; pedicels 1 - 1.5 cm long, pubescent. Calyx pubescent outside, divided to the base; sepals oblong, obtuse, ciliate. Corolla pale-yellow; tube 0.5 - 0.6 cm long, glabrous inside; lobes linear, obtuse, overlapping. Corona-lobes linear. Staminal column arises from the base of the corolla. Style- apex not exerted, stout. Follicles normally single, rarely paired, fusiform, turgid, glabrous, 7-10 cm long. Seeds ovate, strongly margined, flattened, pale brown, comose. Flowering Period: Aug. - Sep; Fruiting Period: Dec. - Feb.

Reproduction and Dispersal: Follicle dehisces by longitudinal sutures and liberate seeds in the vicinity. Comose seeds dispersed through air or other agency over long distances and thus plant propagate through seeds.

Ecological Status: Seedlings usually develop in thickets or along bushes and hedges with 1 - 1.5 feet long leader shoots. The shoot approaches and ascends

the host of variable diameter with intervals of 6 - 9 cm and ascends through the gaps. Over the host plant develop several drooping branches which may

approach the neighboring host or twin along itself.

Localities: Rajura, Kathora, Dhamangaon.



Habit of *Cryptostagia grandiflora*



Cryptolepis buchananii



Hemidesmus indicus



Hemidesmus indicus



Pergularia daemia



Telosma pallida

V. CONCLUSION

The conclusion drawn on the basis of extensive field study and observations is that, the investigated area had great diversity of Asclipadaceae flora with respect to their distributional pattern, seedling development, growth form, tendril orientation and its approach towards host, community interaction and forest significance. The climbers grows them in association with host, sometimes the woody stem may acts as host for herbaceous twines, ascend within their limitations and always try to cover host canopy. The utilized berries by birds or some other agents causes climbers dispersal and provide opportunity to germinate over

the forest gaps. This interaction within community is just seems like natural wound hilling property.

Occasionally such a significant group of forest ecosystem becomes the victim of forest management, under which liana cutting preferred for the welfare of the trees. It's a truly nonsense activity and happened because of lack of knowledge and supervision.

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