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Ethnobotanical uses of Gesneriaceae members by the indigenous tribal communities in Arunachal Pradesh (India)

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Abstract

The present ethnobotanical investigation reports 21 species of Gesneriaceae used by the indigenous tribal communities namely Adi, Galo, Nyishi, Tagin, Tangsa and Lisu of Arunachal Pradesh. *Rhynchocheum parviflorum*, *Rhynchocheum ellipticum* and *Boeica fulva* were found abundant and widely used as both food and medicinal purposes. However, *Rhynchocheum nirjuliense*, *Rhynchocheum ellipticum*, *Rhynchocheum parviflorum* and *Rhynchocheum obovatum* have showed highest use value (UV) indicating their ethnobotanical and cultural significance to the tribal communities while Importance value (IVs) of all the Gesneriaceae members were found ranging between 0.16 - 0.88. *Boeica fulva* and *Rhynchocheum ellipticum* has showed highest importance value (0.88 each) indicating their economic and cultural importance while the genera *Lysionotus* and *Loxostigma* are reported as ethnobotanical novelties.

Key words: Gesneriaceae, Ethnobotany, Indigenous tribes, Arunachal Pradesh

INTRODUCTION

Gesneriaceae is a medium sized plant family of the order Lamiales which comprises of around 3400 species and roughly a third of its total species are distributed in the Neotropics and two-third in Paleotropics region of the world (Scaferhoff *et al.* 2010; Weber *et al.* 2013). They are found distributed in the tropical and subtropical moist forests of Indian subcontinent (Wang *et al.* 1998; Hilliard 2001; Sinha & Dutta 2016; Roy 2017). It shows maximum diversity of Genera in the North East India while maximum species diversity has been recorded from the state of Assam and Arunachal Pradesh (Roy 2017). Although economically less important, but some Gesneriaceae species are reported as ethnobotanically significant for some tribal communities (Roy 2017). Their traditional uses are numerous; however, no significant ethnobotanical uses of Gesneriaceae can be quoted to date owing to lack of literature evidences (<https://gesneriads.info/articles/gesneriaceae/ethnobot>). However, the first detailed ethnobotanical studies on Gesneriaceae was carried out by Kvist and Holm-Nielsen (1987) from Ecuador.

Arunachal Pradesh is blessed with the most diverse and richest biodiversity in India, which harbors around 50 % of Indian flora (Borah *et al.* 2019). State is inhabited by 26 major tribes and 110 sub-tribes with rich traditional knowledge related to sustainable utilization of ethnobotanical species (Tag 2007; Taram *et al.* 2018). Recently, Roy (2017) and Taram *et al.* (2020) have reported some ethno-botanically significant species of Gesneriaceae like *Rhynchocheum ellipticum*, *Rhynchocheum parviflorum* and *Boeica fulva* from North East India. However, detail ethnobotanical studies are required for conservation and sustainable utilization. Therefore, the present study is intended to document the unique ethnobotanical knowledge associated with some species of Gesneriaceae used by the different tribal communities of Arunachal Pradesh.

MATERIALS AND METHODS

Study area

The Indian state of Arunachal Pradesh is located inside the Himalaya Biodiversity Hotspot and is exceptionally rich in plant diversity (Mittermeier *et al.* 2005). Gesneriaceae members are predominantly found in tropical and sub-tropical regions of Siang, Subansiri, Papum Pare, Changlang and Lower Dibang Valley Districts of Arunachal Pradesh (Figure 1) while the Adi, Galo, Nyishi, Tagin, Tangsa, and Lisu are the major indigenous tribal communities found in the above-mentioned districts (Anonymous 2011).

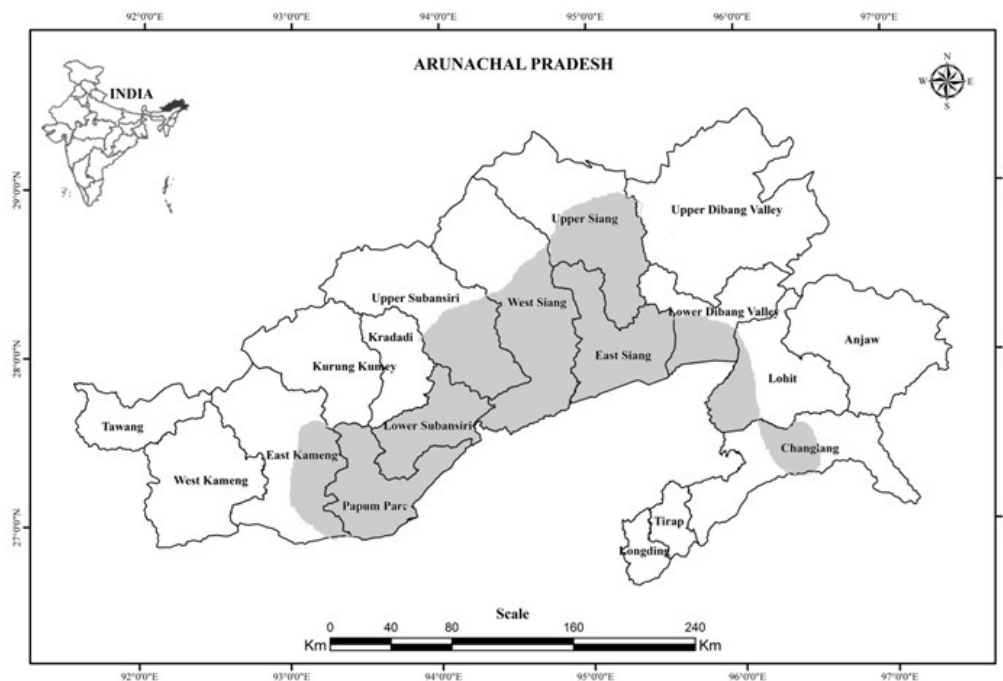


Figure 1. Map showing study area for ethnobotanical investigation on Gesneriaceae members in eight districts of Arunachal Pradesh

Ethnobotanical data collection

Ethnobotanical survey on Gesneriaceae members in eight districts of Arunachal Pradesh were conducted during 2017 – 2021 as per the method suggested by Martin (1995). A total of 90 respondents were randomly interviewed from different households of indigenous tribes namely Adi, Galo, Nyishi, Tagin, Tangsa, and Lisu residing in Subansiri, Siang, Papum Pare, Lower Dibang Valley and Changlang district of Arunachal Pradesh. Both the gender with age group ranging between 15-35 years, 35-60 years and above 60 years were selected and interviewed during field visit. Ethnobotanical data were collected from the key informants using participatory rural appraisal method using semi-structured questionnaires, personal interviews and focused group discussions. The mandatory Prior Information Consents (PIC) was taken from the key informants. Voucher specimens were collected and identified using relevant literature of Gesneriaceae (Giri *et al.* 2008; Sinha & Dutta 2016) and authenticated at ARUN and ASSAM Herbaria and in different digital Herbaria such as PE, RBGE, KEW and CAL. For updated nomenclature, www.plantsoftheworldonline.org have been consulted. The voucher specimens

were deposited in the Herbarium of Arunachal University (HAU), Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh for future references.

Data analysis

Ethnobotanical data was analyzed using two quantitative indices namely (i) Use value (UV), (ii) Importance Value (IV_s) suggested by Sharma *et al.* (2012) for UV and Byg & Balslev (2001) for IV_s.

UV is calculated using the following formula: $UV = U/n$

Where, U is the number of use reports cited by every respondent for a given species and n is the total number of respondents interviewed. The UV is high when there are many useful reports for a given species, which implies that the taxa are important. When there are few reports related to its use, the UV decreases.

Importance Value (IV_s) is calculated using the following formula: $IV_s = n_{is}/n$

n_{is} = number of informants who consider species as most important, n = total number of informant. It measures the proportion of informants who regard the species as most important. Value range from 0-1

RESULTS AND DISCUSSION

The present study has reported a total of ethnobotanically significant 21 species (Table 1) from 7 genera of Gesneriaceae used by the indigenous tribal communities of Arunachal Pradesh, namely, the Adi, Galo, Lisu, Nyishi, Tagin & Tangsa tribes. A highest number of species (17 spp.) were reported to be used by Adi tribe, which is followed Nyishi (10 spp.), Galo (7 spp.), Tagin (5 spp.), Tangsa (2 spp.) and Lisu tribe (1 sp.) (Figure 2). Dependency on plants for livelihood has been a tradition since time immemorial and the knowledge on particular wild plant is their intrinsic ability (Lungphi *et al.* 2018). In India, the Gesneriaceae family has demonstrated maximum species diversity in the Eastern Himalaya and highest number of species are reported from Arunachal Pradesh (Roy 2017).

Table 1. Checklist of ethnobotanically significant Gesneriaceae members used by tribal communities of Arunachal Pradesh, India

[Tribe names: A = Adi; G = Galo; N = Nyishi; T = Tagin; TN = Tangsa; L = Lisu. Mode of use: MRB = Magico-religious beliefs; F = Food; M = Medicine; O = Ornamental; Habit groups: Epiphytic Herb = EH; SS = Sub Shrub; Perennial Herb = PH]

Botanical name	Traditional Uses	Vernacular name	Uses mode	Habit
<i>Aeschynanthus parasiticus</i> (Roxb.) Wall.	Considered as the product of jungle spirit (Epom; Yepom) (A), ornamental	Epom marsi (A)	MRB, O	EH
<i>Aeschynanthus parviflorus</i> (D.Don) Spreng.	Considered as the product of jungle spirit (Epom; Yepom) (A), ornamental	Epom marsi (A)	MRB, O	EH
<i>Aeschynanthus monetarius</i> Dunn	Considered as the product of jungle spirit (Epom; Yepom) (A)	Epom marsi (A)	MRB, O	EH

Botanical name	Traditional Uses	Vernacular name	Uses mode	Habit
<i>Aeschynanthus micranthus</i> C.B.Clarke	Considered as the product of jungle spirit (Epom; Yepom) (A)	Epom marsi (A)	MRB, O	EH
<i>Aeschynanthus gracilis</i> C.S.P.Parish ex C.B.Clarke	Considered as the product of jungle spirit (Epom; Yepom) (A), ornamental	Epom marsi (A)	MRB, O	EH
<i>Boeica arunachalensis</i> D.Borah, R.Kr.Singh, Taram & A.P.Das	Tender shoot serve as vegetables (N)	Jongkot, Byongkot (A); Joko (G, N); Joku (T); Jok (N)	F	SS
<i>Boeica fulva</i> C.B.Clarke	Tender shoot serve as vegetables(A,G,N,T,TA)	Jongkot, Byongkot (A); Joko (G, N); Joku (T); Jok (N); Wupoi Naam (TA)	F	SS
<i>Boeica filiformis</i> C.B. Clarke	Tender shoot serve as vegetables (N)	Jongkot, Byongkot (A); Joko (G, N); Joku (T); Jok, (N)	F	SS
<i>Henckelia adenocalyx</i> (Chatterjee) D.J. Middleton & Mich. Möller	Flower serve as vegetable (A, T, G)	Tantuk golo, Tasok (A)	F	PH
<i>Henckelia pumila</i> (D.Don) A.Dietr.	Flower serve as vegetable (A)	Tantuk golo, Tasok (A)	F	PH
<i>Loxostigma griffithii</i> (Wight) C.B.Clarke	Warm leaves placed over the infected area to pull out the poisonous hairs like spines of <i>Spilosoma</i> sp. stuck on to the skin (A)	Rakat karlor (A)	M	PH
<i>Lysionotus serratus</i> D.Don	Leaves paste are orally taken for stomachache (N)	Litak-huj (N)	M	EH
<i>Lysionotus gamosepalus</i> W.T.Wang	Leaves paste are orally taken for stomachache (N)	Litak-huj (N)	M	EH
<i>Rhynchotechum alternifolium</i> C.B.Clarke	Tender shoot serve as vegetable (L)	Jongkot, Byongkot (A); Joko	F	SS

Botanical name	Traditional Uses	Vernacular name	Uses mode	Habit
<i>Rhyncholechum calycinum</i> C.B.Clarke	1. Tender shoot serve as vegetable and addictives (A, G) 2. In rituals perform during funeral (G)	Jongkot, Byongkot (A); Joku (G, N); Joku (T); Jok, (N)	F, MRB	SS
<i>Rhyncholechum ellipticum</i> (Wall. ex D.Dietr.) A.DC.	1. Tender shoot serve as vegetable and addictives (A,N,T,TA) 2. In rituals perform during funeral (G)	Jongkot, Byongkot (A); Joku (G, N); Joku (T); Jok, (N); Wupoi Naam (TA)	F, MRB	SS
<i>Rhyncholechum nirijuliense</i> Taram & D.Borah	1. Tender shoot serve as vegetable and addictives(A, N) 2. In rituals perform during funeral (G)	Jongkot, Byongkot (A); Joku (G, N); Joku (T); Jok, (N)	F, MRB	SS
<i>Rhyncholechum obovatum</i> (Griff.) B.L. Burt	Tender shoot serve as vegetable (A, N, T, G)	Jongkot, Byongkot (A); Joku (G, N); Joku (T); Jok, (N)	F	SS
<i>Rhyncholechum parviflorum</i> Blume	1. Tender shoot serve as vegetable and addictive (A, N) 2. In rituals perform during funeral (G)	Jongkot, Byongkot (A); Joku (G, N); Joku (T); Jok, (N)	F; MRB	SS
<i>Rhyncholechum vestitum</i> Wall. ex C.B.Clarke	1. Leaves are mixed with fermented food like soya bean and <i>Perilla</i> seed (A). 2. Ripe fruits eaten raw (T)	Jongkot, Byongkot (A); Joku (G, N); Joku (T); Jok, (N)	F	SS
<i>Stauranthera umbrosa</i> (Griff.) C.B.Clarke	Pounded leaf-paste is packed on <i>Phrynium pubinerve</i> leaf then warmed on fire and applied on bruises and wounds (N)	Beeh; Mite-pile (N)	M	PH

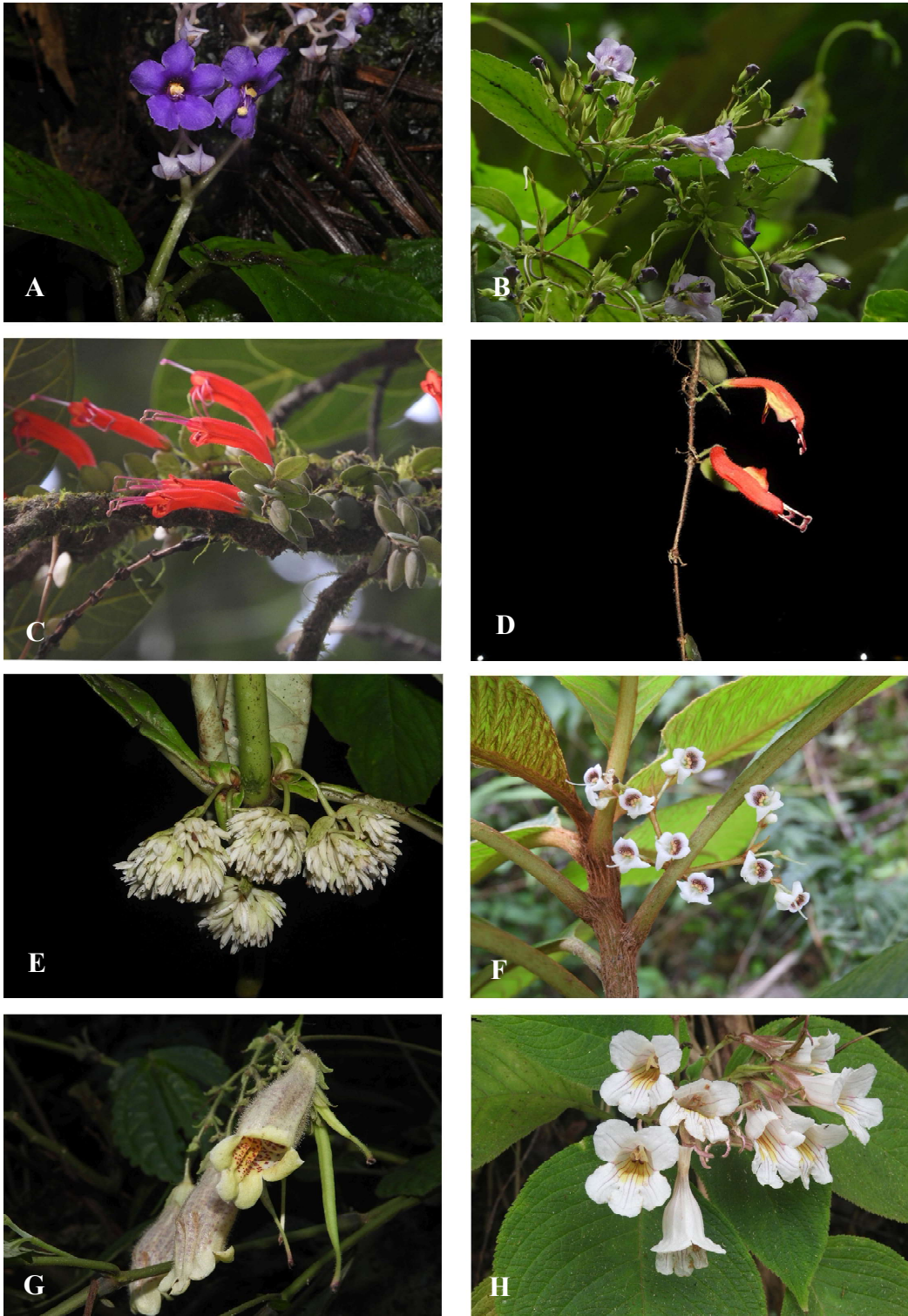


PLATE – I. Ethnobotanically important members of Gesneriaceae: **A.** *Stauranthera umbrosa*; **B.** *Lysionotus serratus*; **C.** *Aeschynanthus monetarius*; **D.** *Aeschynanthus gracilis*; **E.** *Rhynchotechum calycinum*; **F.** *Boeica fulva*; **G.** *Loxostigma griffithii*; **H.** *Henckelia adenocalyx*

In the present study, *Rhynchocheum* was the most dominant genus (7 spp.) reported with highest number of ethnobotanically significant species, which is followed by *Aeschynanthus* (5 spp.), *Boeica* (3 spp.), *Lysionotus* and *Henckelia* (2 spp. each) and *Loxostigma* and *Stauranthera* with 1 species each. Their habit ranging from perennial herb, sub-shrub to epiphytic herbs or shrubs

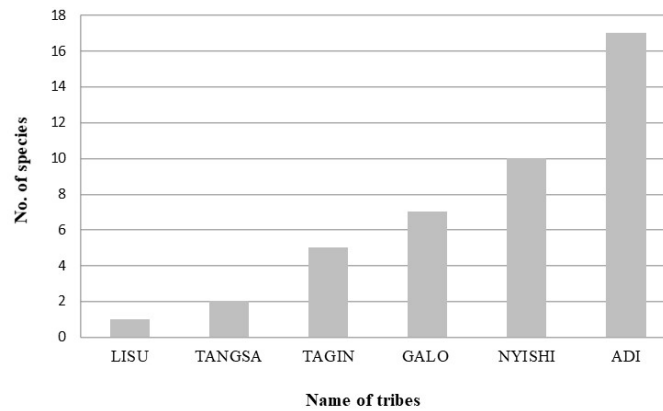


Figure 2. Number of Gesneriaceae species used among the indigenous tribal communities of Arunachal Pradesh

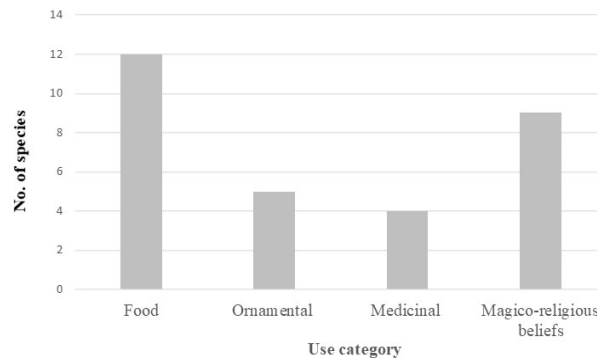


Figure 3. Number of Gesneriaceae species under different use-groups as used by the indigenous tribal communities of Arunachal Pradesh

(Table 1). Although the number of species under *Boeica* is less than *Aeschynanthus* but it has more ethnobotanical and cultural significance. It was also found that majority of the Gesneriaceae species reported have fallen under food category (12 spp., 40%) which is followed by magico-religious belief (9 spp., 30%), ornamental (5 spp., 16.6%) and medicine (4 spp., 13.3%) which is presented in Figure 3. Almost all the species of *Rhynchocheum* found in India are reported to be consumed by different ethnic communities as vegetable sources.

Use value (UV) of all the reported species of Gesneriaceae ranges between 0.01 and 0.03 (Table 2). The plants with the highest UV indicating the species as economically most significant among the Gesneriaceae members. *Rhynchocheum ellipticum*, *Rhynchocheum nirijuliense*, *Rhynchocheum obovatum* and *Rhynchocheum parvijlorum* have demonstrated highest use value (UV) among all the species reported under Gesneriaceae. Importance value (IVs) of all the Gesneriaceae members were found ranging between 0.16 - 0.88 (Table 2). *Boeica fulva* and *Rhynchocheum ellipticum* has demonstrated highest Importance Value (0.88 each) which indicates their deep ethnobotanical and cultural values to the tribal communities while *Lysionotus serratus* and *Lysionotus gamosepalus* has showed least importance value (0.16 each).

Table 2. Evaluation of ethnobotanically useful species of Gesneriaceae from Arunachal Pradesh analyzed using Importance value (IVs) and Use value (UV) indices

Botanical name	IVs	UV	Commercial value
<i>Aeschynanthus parasiticus</i>	0.22	0.02	Grown as ornamental
<i>Aeschynanthus parviflorus</i>	0.22	0.02	Grown as ornamental
<i>Aeschynanthus monetarius</i>	0.22	0.02	-
<i>Aeschynanthus micranthus</i>	0.22	0.02	-
<i>Aeschynanthus gracilis</i>	0.22	0.01	Grown as ornamental
<i>Boeica arunachalensis</i>	0.33	0.01	Rs. 20 per bundle (10 - 12 shoots)
<i>Boeica fulva</i>	0.88	0.02	Rs. 20 per bundle (10 -12 shoots)
<i>Boeica filiformis</i>	0.22	0.01	-
<i>Henckelia adenocalyx</i>	0.44	0.01	-
<i>Henckelia pumila</i>	0.33	0.01	-
<i>Loxostigma griffithii</i>	0.33	0.01	-
<i>Lysionotus serratus</i>	0.16	0.01	-
<i>Lysionotus gamosepalus</i>	0.16	0.01	-
<i>Rhynchosyche alternifolium</i>	0.33	0.01	-
<i>Rhynchosyche calycinum</i>	0.55	0.02	-
<i>Rhynchosyche ellipticum</i>	0.88	0.03	-
<i>Rhynchosyche nirijuliense</i>	0.44	0.03	-
<i>Rhynchosyche obovatum</i>	0.66	0.03	Rs. 20 per bundle (10 -12 shoots)
<i>Rhynchosyche parviflorum</i>	0.66	0.03	-
<i>Rhynchosyche vestitum</i>	0.38	0.01	-
<i>Stauranthera umbrosa</i>	0.27	0.01	-

CONCLUSION

Gesneriaceae is one important plant family which is widely distributed in North East India. The present study has reported 21 species of ethnobotanically significant members of Gesneriaceae used by the indigenous tribal communities of Arunachal Pradesh. *Rhynchosyche ellipticum*, *Rhynchosyche nirijuliense*, *Rhynchosyche obovatum* and *Rhynchosyche parviflorum* have demonstrated highest use value (UV) while *Lysionotus* and *Loxostigma* genera are reported as ethnobotanical novelties in the present investigation. Habitat protection is needed for effective conservation and sustainable utilization of economically significant Gesneriaceae members of Arunachal Pradesh.

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