

A report on ethnomedicinal plants used for the treatment of Rheumatoid arthritis by the tea tribes of Morigaon district of Assam, India

Research Article

Rakhi Bhattacharyya¹, Selim Mehmud^{2*}, Krishna Kanta Medhi³, Sarat Borkataki⁴

1. Department of Botany, Nowgong Girls' College, Nagaon, Assam, India.

2. Department of Botany, University of Science & Technology Meghalaya, Ri-Bhoi, Meghalaya, India.

3,4. Department of Botany, Nowgong College, Nagaon, Assam, India.

Abstract

The present study deals with the documentation of ethnomedicinal plants used against rheumatoid arthritis by the tea tribes of Morigaon district of Assam. The tea tribes of the district still rely on herbal remedies for curing rheumatoid arthritis. To document the plant species used by tea tribes against rheumatoid arthritis, frequent study field surveys were conducted in different places of the district. A semi-structured questionnaire on traditional knowledge was used to elicit information from the concerned tribe of the study area. The documented data was evaluated using quantitative ethnobotanical indices like Use Value (UV) and Fidelity Level Percentage (FL %). From the study, a total of 33 plants belonging to 32 genera under 24 families were documented. Five species were found having the highest use value and four species showed fidelity levels of 100 %. Further research is required to investigate the pharmacological effects and the chemical constituents present in the plant species that could be the basis for developing some novel product in the future.

Keywords: Ethnomedicine, Plants, Arthritis, Morigaon, Assam.

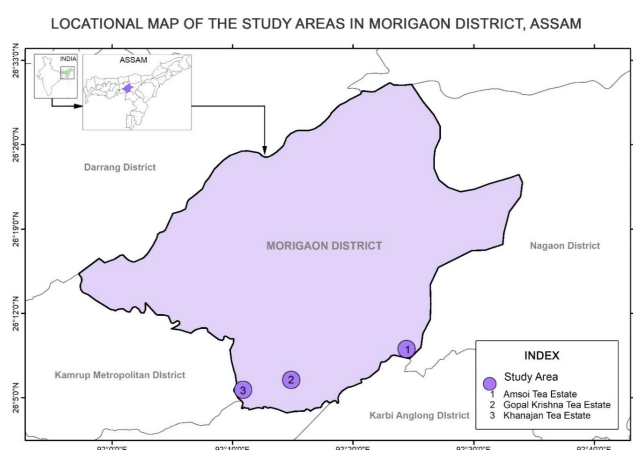
Introduction

Traditionally used medicinal plant systems play a very significant role against diseases in rural as well as urban areas. It has been estimated that about 80 % of the world's population depends on traditional resources for healthcare (1). India is considered the foremost herbal producer (2) and nearly 8,000 species are used for healthcare practices by various ethnic communities throughout the country (3). Arthritis is an inflammatory disease of joint and rheumatoid arthritis is a group of arthritis (4). In India, many medicinal plants in the traditional system for treating rheumatic arthritis were reported by several workers (5-10). The tea tribes of Assam also use a number of herbal therapies and self-remedial medication against rheumatic arthritis. The present study document and measure the richness of indigenous knowledge on medicinal plants used by the tea tribes of Morigaon district of Assam for the treatment of rheumatic arthritis (locally known as *Baat bikh*) so that the enumerated plant species can be shortlisted for phytochemical and pharmacological studies and development of the potent drug in the future.

Materials and methods

Study area: Field surveys were carried out in different tea gardens of the Morigaon district of Assam (Map 1) during January-June, 2019. The district situated in between 26°45' North Latitudes and 93°50' East Longitude with an area of around 1,704 square kilometers, temperature ranges 10°C-24°C with an annual average rainfall 1,753 mm (11).

Map 1: Location map of study area



Data collection, Plant Collection, Identification and herbarium preparation: During the study, medicinal plants used against rheumatoid arthritis were documented from 61 knowledge provider or traditional healers (*Bej*) by using semi-structured questionnaires. Out of 61 respondents, around 65.57% were male and 34.43% female and majority were in between the age of 45–60 years (37.70%) and 35–45 years (34.42%), 60–

* Corresponding Author:

Selim Mehmud

Department of Botany,
University of Science & Technology Meghalaya,
Ri-Bhoi, Meghalaya-793101,
India.

Email Id: mehmudselim@gmail.com

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75 years (18.03%) and others (9.84%). Most of the people in the study area were laborer (63.93%) and traditional health practitioners (24.59%), Service man (11.47%) and others. Out of 61, around 62.29% were found without any primary education. Before proceeding with the interview, prior permission from the concerned authority of the tea gardens and written consent from the respondents were obtained to carry out the study as per standard protocol (12). Plants were collected and were processed for herbarium preparation by using convenient technique (13) and identified based on literature (14-15) as well as herbarium consultations at Gauhati University (GUBH). The vouchers were kept in the herbarium of Nowgong College and one set will be submitted in GUBH.

Quantitative Analysis of the Ethnomedicinal Data: The ethnomedicinal usage of plants was quantitatively accessed using the Use Value (UV) and Fidelity Level Percentage (FL %).

Use Value: The Use Value (UV) determines the relative importance of plants known locally. It was calculated using the following formula (16).

$$UV = \frac{\sum Ui}{N}$$

Where U_i is the number of uses mentioned by each informant for a given species and N is the total number of informants.

Fidelity Level Percentage: The Fidelity Level (FL) was calculated to determine the percentage of informants who mentioned the uses of certain plant

species to treat a particular ailment in the study area (17-18).

$$FL (\%) = \frac{lp \times 100}{lu}$$

Where, lp is the number of informants who independently claimed the utilization of a plant species for the same major ailment, and lu is the number of informants who mentioned the plant for any major ailment.

Results and Discussion

Total 33 plant species belonging to 32 genera of 24 angiosperm families were documented against rheumatoid arthritis and provided in the Table 1 which is represented by scientific name with family, vernacular name, habit, parts used, mode of preparation, mode of administration, use value and fidelity level. Among these species, 33.33 % were herbs followed by shrubs and trees (24.24 %), climbers (9.09 %), undershrub (6.06 %) and parasitic (3.03 %). Plant parts used by the tea tribes against rheumatoid arthritis were mainly leaf (33.33 %), root (27.27 %), seed (18.18 %), bark (15.15 %), whole plant (12.12 %), fruit (9.09 %), rhizome and stem respectively (6.06 %) and bulb (3.03 %). The major modes of preparations were paste (41.48 %) followed by decoction (20.93 %), juice/extract (18.60 %), infusion (13.95 %), crushed leaves and powder (2.33 %). The commonly used route of administration was oral (51.51%) followed by topical (27.27 %) and both oral and topical (21.21 %).

Table 1: Plants used for the treatment of rheumatic arthritis by tea tribes of Morigaon

Sl. No.	Scientific name [Collection number]	Family	Vernacular Name(s)	Habit	Part(s) used (amount)	Mode of preparation (doses)	Mode of administration	Use Value	Fidelity Level Percentage (%)
1	<i>Abrus precatorius</i> L. [RBNG-104] (Fig. 1A)	Fabaceae	Latumani, Gunja	Herb	Root	Paste (10-15 gm)	Orally for 6-7 days in empty stomach.	0.02	42.8%
2	<i>Abutilon indicum</i> (L.) Sweet [RBNG-108] (Fig. 1B)	Malvaceae	Potari	Shrub	Leaf	Juice/Extract (20 ml); Paste (10-15 gm)	Juice is taken orally for 5-8 days and paste for local application.	0.04	75%
3	<i>Acalypha indica</i> L. [RBNG-97] (Fig. 1C)	Euphorbiaceae	Kokhil	Herb	Whole plant	Decoction (20-30 ml)	Orally once daily for 7-10 days.	0.23	30.7%
4	<i>Achyranthes aspera</i> L. [RBNG-003] (Fig. 1D)	Amaranthaceae	Apamargo	Under-shrub	Stem, Root	Juice/Extract (20-30 ml)	Orally twice daily for 7-8 days.	0.11	100%
5	<i>Allium sativum</i> L. [RBNG-054] (Fig. 1E)	Amaryllidaceae	Rasun	Herb	Bulb (5-7 nos.)	Paste	Orally once daily for 7 days in empty stomach.	0.17	73.2%

6	<i>Alpinia galanga</i> (L.) Willd. [RBNG-98]	Zingiberaceae	Karphul	Herb	Rhizome	Paste (30 gm) and infusion (250 ml)	Topical	0.13	84.4%
7	<i>Alstonia scholaris</i> (L.) R.Br. [RBNG-005] (Fig. 1F)	Apocynaceae	Satiana, Rani Gamari	Tree	Bark	Powder (10-15 gm); Paste	Powder is taken orally for 7-8 days and paste for local application.	0.09	70.3%
8	<i>Azadirachta indica</i> A.Juss. [RBNG-020] (Fig. 1G)	Meliaceae	Neem	Tree	Leaf (6-8 nos.)	Paste	Orally once daily in empty stomach for 10 days.	0.09	30.7%
9	<i>Brassica nigra</i> (L.) K. Koch [RBNG-058] (Fig. 1H)	Brassicaceae	Sarisah	Herb	Seed	Juice/Extract (warm)	Massage	0.11	44.5%
10	<i>Calotropis gigantea</i> (L.) W.A.Aiton [RBNG-100] (Fig. 1I)	Apocynaceae	Akon, Akaona	Shrub	Leaf (as required)	Crushed (steam-warmed)	Topical	0.19	42.8%
11	<i>Cleome gynandra</i> L. [RBNG-109] (Fig. 1J)	Cleomaceae	Bhutmula	Herb	Leaf, Fruit	Leaf juice (20 -25 ml)/ Fruit juice (15-20 ml)	Orally taken for 3-4 days.	0.04	67.5%
12	<i>Cleome viscosa</i> L. [RBNG-107] (Fig. 1K)	Cleomaceae	Hurhuria	Herb	Leaf (few)	Paste	Topical	0.08	67.5%
13	<i>Curcuma longa</i> L. [RBNG-013] (Fig. 1L)	Zingiberaceae	Haldhi	Herb	Rhizome	Juice (20-30 ml) and paste (10-15 gm)	Juice is taken orally for 10-15 days in empty stomach and paste for local application.	0.06	75%
14	<i>Cuscuta reflexa</i> Roxb. [RBNG-070] (Fig. 1M)	Convolvulaceae	Akashilot, Indrajal	Parasitic	Whole plant (20-30 gm)	Infusion (200 ml)	Orally taken in empty stomach for 7-8 days.	0.02	26.5%
15	<i>Datura stramonium</i> L. [RBNG-071] (Fig. 1N)	Solanaceae	Dhatura	Shrub	Seed (3-5 gm)	Paste	Locally applied twice daily for 3 days.	0.09	90.9%
16	<i>Houttuynia cordata</i> Thunb. [RBNG-029] (Fig. 1O)	Saururaceae	Masundori	Herb	Whole plant (10-15 nos.)	Decoction (20 ml)	Orally twice daily.	0.04	30.7%
17	<i>Jatropha curcas</i> L. [RBNG-078] (Fig. 2A)	Euphorbiaceae	Bhotura	Shrub	Seed (2-3 gm)	Paste	Seed pasted along with <i>Calotropis gigantea</i> leaf (as required) and seeds of <i>Datura stramonium</i> (3-5 gm) and applied locally for 3 days.	0.04	44.5%

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18	<i>Justicia adhatoda</i> L. [RBNG-004] (Fig. 2B)	Acanthaceae	Vasak	Shrub	Leaf (3-4 nos.)	Paste or Decoction	Orally taken for 6-7 days in early morning.	0.09	100%
19	<i>Momordica charantia</i> L. [RBNG-084] (Fig. 2C)	Cucurbitaceae	Tita korola	Climber	Fruit (2-3 nos.) and leaf (3-4 nos.)	Infusion (200 ml)	Orally in empty stomach for 10-12 days.	0.06	42.8%
20	<i>Moringa oleifera</i> Lam. [RBNG-102] (Fig. 2D)	Moringaceae	Sojina	Tree	Leaf (250 gm)	Decoction (500 ml)	Orally twice daily.	0.15	30.7%
21	<i>Nyctanthes arbor-tristis</i> L. [RBNG-015] (Fig. 2E)	Oleaceae	Sephali	Shrub	Leaf	Juice (10-15 ml)	Orally in empty stomach for 7 days.	0.04	73.2%
22	<i>Oroxylum indicum</i> (L.) Kurz [RBNG-027] (Fig. 2F)	Bignoniaceae	Bonsutli	Tree	Bark (5-10 gm) and Root	Infusion (200 ml) of bark; Root paste (as required)	Infusion is taken orally in empty stomach, and root paste for local application.	0.15	57.1%
23	<i>Peperomia pellucida</i> (L.) Kunth [RBNG-036] (Fig. 2G)	Piperaceae	Pananua	Herb	Whole Plant (50-100 gm)	Paste, Juice/ Extract	Orally for 2 weeks in empty stomach.	0.09	70.3%
24	<i>Piper nigrum</i> L. [RBNG-043] (Fig. 2H)	Piperaceae	Gul-morich	Climber	Fruit (3-4 nos.)	Paste	Oral	0.11	42.8%
25	<i>Plumbago zeylanica</i> L. [RBNG-046] (Fig. 2I)	Plumbaginaceae	Angiboth, Raiputi	Shrub	Leaf (8-10 nos.); Root (as required)	Decoction (300 ml); Root paste	Decoction is taken orally in empty stomach and root paste is applied locally for 1 hour.	0.15	70.3%
26	<i>Pongamia pinnata</i> (L.) Pierre [RBNG-101] (Fig. 2J)	Fabaceae	Koroch, Karanja	Tree	Seed (5-7 gm) or Root (10-15 gm)	Decoction	Taken orally twice daily.	0.02	30.7%
27	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz [RBNG-044] (Fig. 2K)	Apocynaceae	Sarpagandha	Under-shrub	Root (5-10 gm)	Infusion (200 ml)	Orally in empty stomach for 3 days.	0.09	100%
28	<i>Ricinus communis</i> L. [RBNG-093] (Fig. 2L)	Euphorbiaceae	Era gocho	Shrub	Root and seed	Decoction	Decoction of root and seeds is used to take bath.	0.04	66.6%
29	<i>Sida cordifolia</i> L. [RBNG-094] (Fig. 2M)	Malvaceae	Sunboriyal	Herb	Root (15-20 gm); Stem (as require)	Root decoction (500 ml); stem paste	Decoction of root is taken orally in empty stomach and stem paste is applied locally for 1 hour.	0.09	91.6%

30	<i>Smilax ovalifolia</i> Roxb. ex D. Don [RBNG-103]	Smilacaceae	Atkir, Kumarika	Climber	Root	Paste	Topical (1-2 hours.)	0.11	30.7%
31	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn. [RBNG-105] (Fig. 2N)	Combretaceae	Arjun goch	Tree	Stem bark (10-15 gm)	Infusion (200 ml)	Orally taken in the morning and evening for a week.	0.09	93.75%
32	<i>Vitex negundo</i> L. [RBNG-106] (Fig. 2O)	Lamiaceae	Pasotia	Tree	Leaf (500 gm)	Decoction (1 L.)	Topical (to take bath).	0.06	100%
33	<i>Xylosma longifolia</i> Clos [RBNG-051] (Fig. 2P-Q)	Salicaceae	Kataponial	Tree	Leaf (5-6 nos.); Bark (as required)	Juice/Extract; Bark paste	Leaf extract is taken in empty stomach for 3 days; and bark paste is applied locally for 10-15 days.	0.12	26.5%

Conclusion

The ethnomedicinal study undertaken among the tea tribe people of Morigaon district of Assam has resulted in the collection of valuable information on the ethnomedicinal usage of 33 angiospermic plants belonging to 32 genera and 24 families against rheumatoid arthritis. From the above results and discussion, the tea tribes' people of the study area still depend on wild plants to cure rheumatic arthritis. The ethnic tea tribe people prefer natural drugs over modern or allopathic drugs and have developed a good knowledge of herbal therapies. The ethnomedicinal researchers are the baseline for developing novel drug formulations. Rapid urbanization has led to the sinking of traditional knowledge, which is an urgent need to be conserved. These ethnomedicinal studies pave the way for discovering traditional as well as modern drugs for the welfare of society.

Acknowledgement

The authors are sincerely thankful to the Head, Department of Botany, Gauhati University, for constant encouragement and support. The authors sincerely and gratefully acknowledge the respondents of the study area for cooperation during fieldwork and sharing their valuable knowledge on rheumatoid arthritis.

References

- Bhattacharyya R, Medhi K.K, Borkataki S. Plants used traditionally to treat Malaria by tea tribes in Nagaon district of Assam, India. *Pleione*. December, 2016; 10(2); 36-42.
- Nautiyal S, Rao K.S, Maikhuri R.K, Semwal R.L, Saxena K.G. Traditional knowledge related to medicinal and aromatic plants in tribal societies in a part of Himalaya. *Journal of Medicinal and Aromatic Plants Sciences*. September, 2000; 23; 528-441.
- Pushpagadan P, George V. Ethnomedicinal practices of rural and tribal populations of Inida with special reference to the mother and childcare. *Indian Journal of Traditional Knowledge*. January, 2010; 9(1); 9-17.
- Subramoniam A, Madhavachandran V, Gngaprasad A. Medicinal plants in the treatment of arthritis. *Annals of Phytomedicine*. August, 2013; 2(1); 3-36.
- Bhandary M.J, Chandrasekhar K.R. Glimpses of ethnic herbal medicine of coastal Karnataka. *Ethnobotany*. January, 2002; 14; 1-12.
- Dwivedi S.N, Dwivedi S, Patel P.C. Herbal remedies used by the rural people in the treatment of joint diseases. *Ethnobotany*. December, 2005; 17; 193-196.
- Naidu B.V.A.R, Reddi T.V.V.S, Prasanthi S. Folk Herbal remedies for rheumatoid arthritis in Srikakulam district of Andhra Pradesh. *Ethnobotany*. December, 2008; 20; 76-79.
- Biswas A., Bari M.A, Roy M, Bhadra S.K. Inherited folk pharmaceutical knowledge of tribal people in the Chittagong Hill tracts, Bangladesh. *Indian Journal of Traditional Knowledge*. January, 2010; 10; 397-412.
- Nath K.K, Deka P., Borthakur S.K. Traditional remedies of joint diseases in Assam. *Indian Journal of Traditional Knowledge*. July, 2011; 7; 568-571.
- Hari Babu M, Rao J.K, Reddi T.V.V.S. Ethnomedicine for rheumatoid arthritis by the tribes of Visakhapatnam district, Andhra Pradesh. *Ethnobotany*. December, 2018; 29; 57-63.
- Bhattacharyya R. Studies on ethnomedicines used against jaundice and malaria by tea tribes of erstwhile Nagaon district of Assam. Ph.D. Thesis, Gauhati University; November 2019.
- Martin G.J. *Ethnobotany. A "people and plants" conservation manual*. World Wide Fund for Nature; Chapman and Hall; London; 1995.

Figure 1: A. *Abrus precatorius* B. *Abutilon indicum* C. *Acalypha indica* D. *Achyranthes aspera* E. *Allium sativum* F. *Alstonia scholaris* G. *Azadirachta indica* H. *Brassica nigra* I. *Calotropis gigantea* J. *Cleome gynandra* K. *Cleome viscosa* L. *Curcuma longa* M. *Cuscuta reflexa* N. *Datura stramonium* O. *Houttuynia cordata*

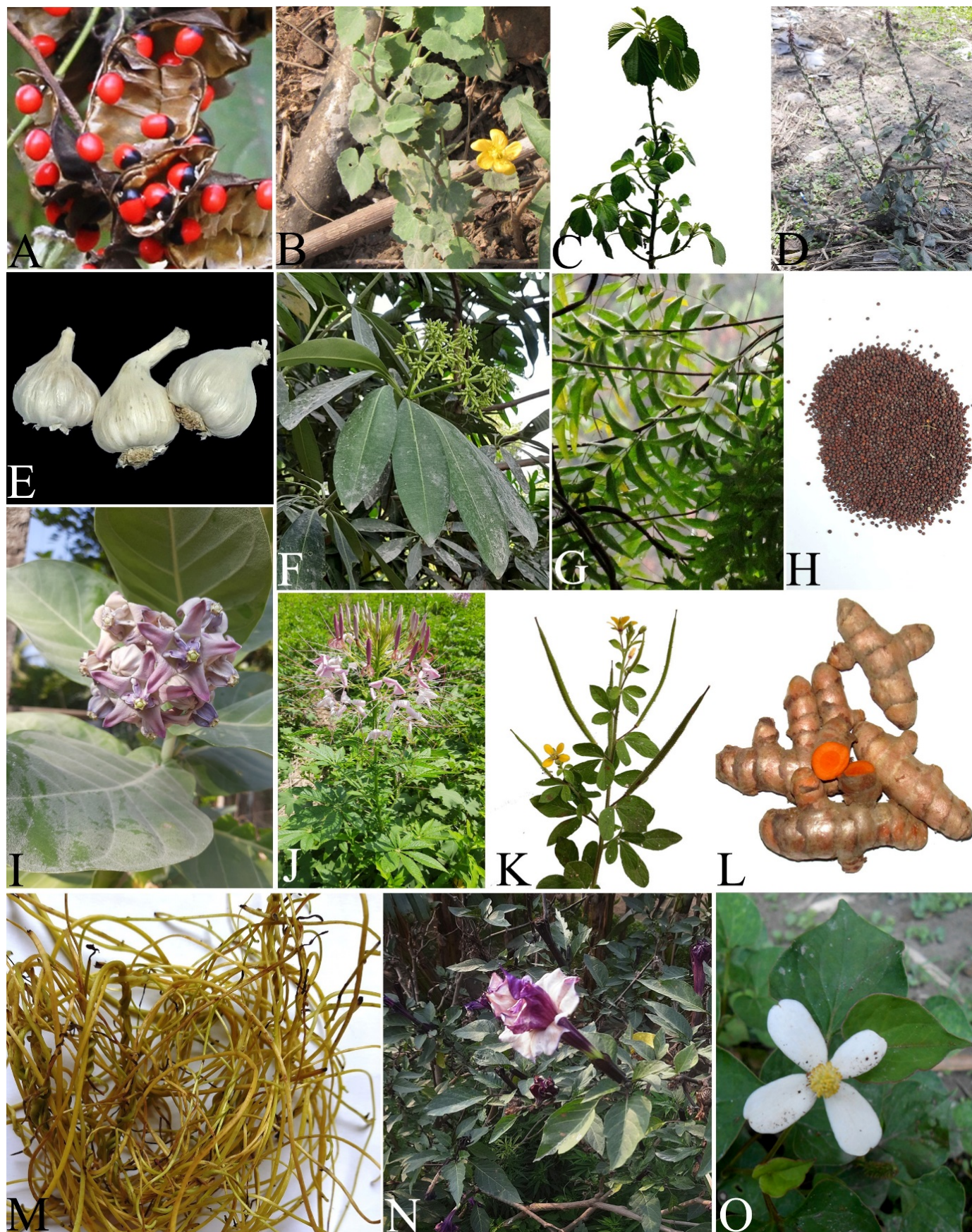
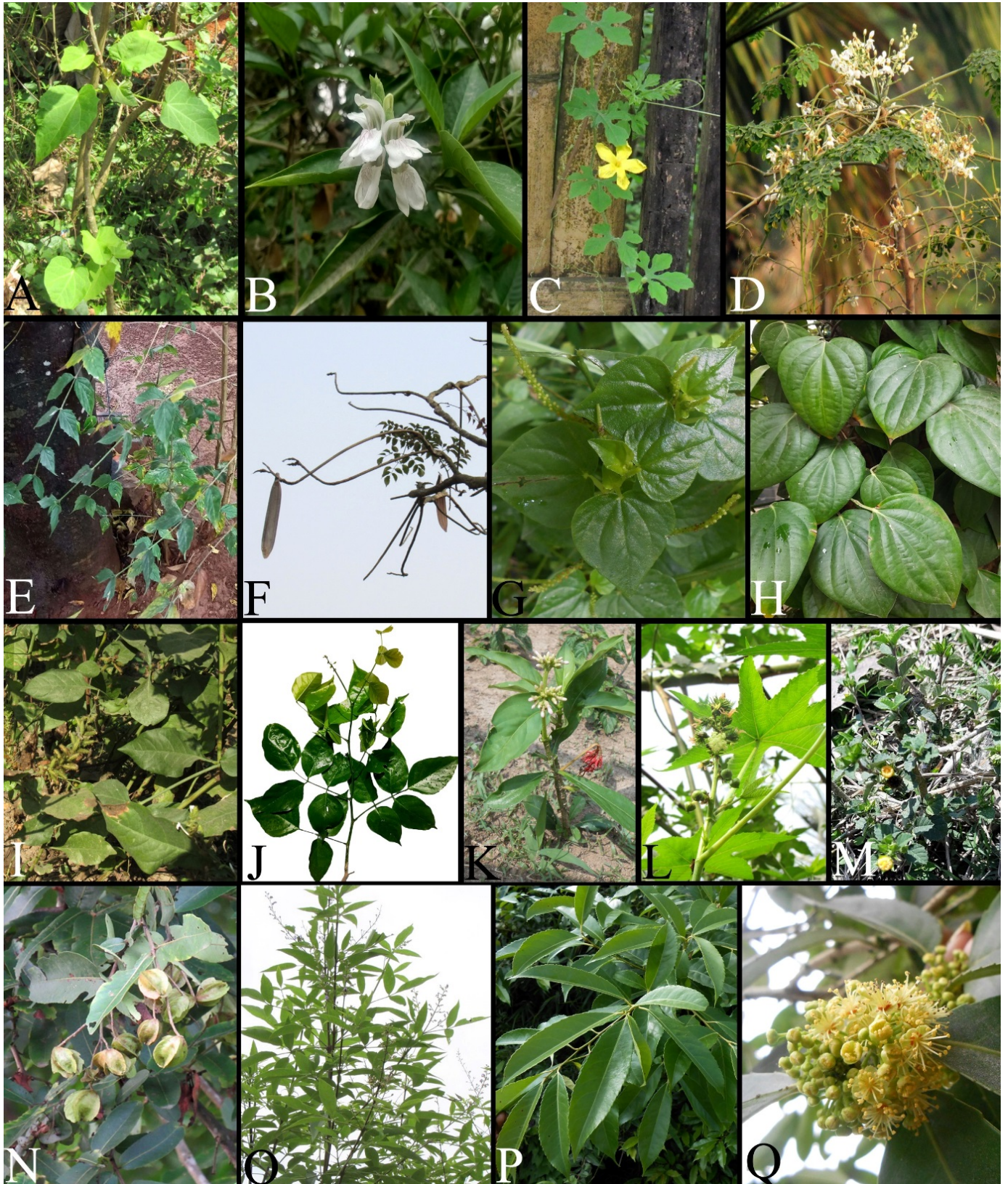


Figure 2: A. *Jatropha curcas* B. *Justicia adhatoda* C. *Momordica charantia* D. *Moringa oleifera* E. *Nyctanthes arbor-tristis* F. *Oroxylum indicum* G. *Peperomia pellucida* H. *Piper nigrum* I. *Plumbago zeylanica* J. *Pongamia pinnata* K. *Rauvolfia serpentina* L. *Ricinus communis* M. *Sida cordifolia* N. *Terminalia arjuna* O. *Vitex negundo* P-Q. *Xylosma longifolia*



13. Jain S.K, Rao R.R. A handbook of field and herbarium technique. Today and Tomorrow Publication; New Delhi; 1977. 157p.
14. Kanjilal U.C, Das A, Kanjilal P.C, De R.N. Flora of Assam, Vol 1-5. Government of Assam, Shillong; 1934-1940.
15. Hooker J.D. Flora of British India. Vol. 1-7; L. Reeve; London; 1872-1896.
16. Tardio J, Pardo-de-Santayana M. Cultural importance indices: a comparative analysis bases on the useful wild plants of southern Cantabria (Northern Spain). Economic Botany. May, 2008; 62; 24-39. <https://doi.org/10.1007/s12231-007-9004-5>.
17. Friedman J, Yaniv Z, Dafni A, Palewitch D. A preliminary classification of the healing potential of medicinal plants, based on the rational analysis of ethnopharmacological field survey among Bedouins in Negev Desert, Israel. Journal of Ethnopharmacology. June, 1986; 16; 275-287. [https://doi.org/10.1016/0378-8741\(86\)90094-2](https://doi.org/10.1016/0378-8741(86)90094-2)
18. Alexiades M.N, Sheldon J.W. Selected guidelines for ethnobotanical research: A field manual. The New York Botanical Garden; Boranx, New York; 1996. 99-133.
