Traditional herbal medicine in Far-west Nepal: a pharmacological appraisal

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Abstract

Background: Plant species have long been used as principal ingredients of traditional medicine in far-west Nepal. The medicinal plants with ethnomedicinal values are currently being screened for their therapeutic potential but their data and information are inadequately compared and analyzed with the Ayurveda and the phytochemical findings.

Methods: The present study evaluated ethnomedicinal plants and their uses following literature review, comparison, field observations, and analysis. Comparison was made against earlier standard literature of medicinal plants and ethnomedicine of the same area, the common uses of the Ayurveda and the latest common phytochemical findings. The field study for primary data collection was carried out from 2006-2008.

Results: The herbal medicine in far-west Nepal is the basis of treatment of most illness through traditional knowledge. The medicine is made available via ancient, natural health care practices such as tribal lore, home herbal remedy, and the Baidhya, Ayurveda and Amchi systems. The traditional herbal medicine has not only survived but also thrived in the trans-cultural environment with its intermixture of ethnic traditions and beliefs. The present assessment showed that traditional herbal medicine has flourished in rural areas where modern medicine is parsimoniously accessed because of the high cost and long travel time to health center. Of the 48 Nepalese medicinal plants assessed in the present communication, about half of the species showed affinity with the common uses of the Ayurveda, earlier studies and the latest phytochemical findings. The folk uses of Acacia catechu for cold and cough, Aconitum spicatum as an analgesic, Aesculus indica for joint pain, Andrographis paniculata for fever, Anisomeles indica for urinary affections, Azadirachta indica for fever, Euphorbia hirta for asthma, Taxus wallichiana for tumor control, and Tinospora sinensis for diabetes are consistent with the latest pharmacological findings, common Ayurvedic and earlier uses.

Conclusions: Although traditional herbal medicine is only a primary means of health care in far-west Nepal, the medicine has been pursued indigenously with complementing pharmacology and the Ayurveda. Therefore, further pharmacological evaluation of traditional herbal medicine deserves more attention.

Background

Current estimates suggest that, in many developing countries, about two thirds of the population relies heavily on traditional practitioners and medicinal plants to meet primary health care needs [1]. Although modern medicine may be available in these countries, traditional herbal medicine is often used for historical, cultural, and ecological reasons, in particular this is due to continued availability [2], better compatibility [3] and high acceptance [4]. Traditional herbal medicine possesses greater significance in Nepal Himalaya hence interest in herbal medicine has gradually increased in recent years [5]. As a result, the medicine all over the world is nowadays revalued by extensive researches on base materials plant species and their therapeutic principles, however to date only about five percent of the total plant species have been thoroughly investigated [6-8] to ascertain safety and efficacy of traditional medicines.

Plant species have long been the principal ingredients of traditional medicine [9] and their use dates back to the beginning of human civilization [10]. Herbal medicine has clearly recognizable therapeutic effects [11] as...
well as some toxic side-effects [12]. Thus, Nepalese medicinal plants with ethnomedicinal properties are being screened for their active pharmacological effects [13]. The present study therefore evaluated the ethnomedicinal uses of the selected 48 second priority medicinal plants of Baitadi, Dadeldhura and Darchula districts of far-west Nepal and comparatively assessed their uses against earlier standard literature on medicinal plants of the same area, the common uses of the Ayurveda (an ancient traditional system of herbal medicine in the Himalaya) and the latest phytochemical findings.

Materials and methods
The field study for primary data collection was carried out in the Baitadi, Dadeldhura, and Darchula districts of far-west Nepal from 2006-2008. The districts stretch between 29°01’ and 30°15’N latitude, 80°03’ and 81°09’E longitude and 357 m - 7132 m altitude. The study sites were Anarkhola, Dasharathchand, Jhulaghat, Khodpe, Kulau, Pancheswor, Patan, Salena, and Sera (Baitadi); Brikham, Jakh, Jogbudha, Patram, and Rupal (Dadeldhura), and Dumling, Gokule, Joljibi, Khalanga, Khar (Figure 1), Lali, and Uku (Darchula). All three districts are situated along the western borders of the country and lie adjacent to India. Due to variations in altitude, topography, and bio-climate within the districts, the diversity of medicinal plants and knowledge of utilization are vast. The subsistence use is profound particularly for home herbal healing [5,14]. There are a number of diverse ethnic groups in the area. The largest ethnic group is the Chhetri (more than 50%), followed by Brahmin (about 20%), Dalits (about 10%), Thakuri (7%), Magar (2 %), and a few other groups. The first two groups are considered privileged and the rest are considered ethnic (Janajati) and disadvantaged (Dalits). Ethnic and disadvantaged groups have easy access opportunities provided by the government.

Field surveys and data collection
Four field surveys were carried out during different seasons of the year (May, December 2006, February 2007, March-April 2008). Each survey lasted over 20 days in the field. Primary data collection, after establishing oral
informed consent with the participating communities, consisted of group discussions, informal meetings, schedule surveys, key informant surveys, cross-checking, and field observations. In all surveys, four group discussions and six informal meetings were held; in total 172 individuals were consulted. Informal meetings were held in villages while staying with them. The traditional healers (Baidhyas) and women representing major ethnic groups, castes, and occupations were encouraged to participate. Baidhyas are traditional medicinal practitioners particularly of the western Nepal mid-hills [15] and adjoining areas of India [16]. Women were active participants of the informal meetings. Among the respondents, 3% were traditional healers, 12% were ethnic groups, and 21% were women.

All plant species encountered during field observations were recorded. Medicinal plant species were collected during the day and displayed during evening meetings for discussion. Both the collections and surveys/discussions were facilitated by local assistants, and the information was sought about vernacular dialects, indigenous uses of the species and participants’ priority on species. Ranking was followed to categorize the first, second and third priority medicinal plant species. The species enumerated in the present study were the second priority medicinal plants of the local communities with informant consensus factor less than 0.85. The first priority medicinal plants with quantitative ethnomedicine were already discussed [14,17].

Matching information from at least three respondents (mentions) was counted as a common response for the analysis. The single most common folk use of each species was valued for further discussion. Common species and mono specific genera which were well known by their dialect names were used only for discussion and not managed as voucher specimen for further identification. Voucher specimens were collected, and vernacular names and folk uses were recorded for each specimen. Specimen collection was made following Cunningham [18], and plants were identified to species level. Most of the species were identified in the field using literature [19,20]. The remaining unidentified species were identified and housed in Kathmandu at Tribhuvan University Central Herbarium (TUCH), Department of Botany, Tribhuvan University, Nepal.

The observations of the present survey were compared to earlier observations, latest common phytochemical findings and common uses of the Ayurveda. The common uses of the Ayurveda were taken from the following literature [21-27]. Literature [28-33] of Nepal were used as reference for earlier ethnomedical information of the same area. Pharmacological information was retrieved from internet sources (available till June, 2010) and relevant journals; most of them were accessed from USA. About 240 research papers and articles were reviewed for analysis.

Results and Discussion
Traditional herbal medicine
Traditional herbal medicine has been used since ancient time in many parts of the world where access to formal and modern healthcare is limited. Nepal is not exempt and in mid-hills, mountainous and rural areas of the country where access and services are limited, herbal medicine is the basis of treatment of most illness through traditional knowledge. It is estimated that approximately 90% of the Nepalese people reside in rural areas where access to government health care facilities is lacking [30]. These people rely predominantly on traditional herbal medicine. Traditional medicine is made available via ancient, natural health care practices such as tribal lore, home herbal remedy, and the Baidhya, Ayurveda and Amchi (traditional healing system of Tibet and mountain areas of Nepal) systems. The former one is innate to the tribal group (i.e. Rauti in study area) [34]. Home herbal remedy and the Baidhya system are indigenous to far-west Nepal [14,15] and are partly influenced by the Ayurveda [35]. Extant of home herbal remedy in far-west Nepal is also due to relatively homogenous resource users and less encroachment from immigrants. Home herbal remedy and Baidhya system, yet transformations of the Ayurveda, are well established and practiced in the study area. The Amchi system is widely accepted and practiced throughout high altitude areas of Nepal [10] and is important in Darchula district, albeit with some modifications [29].

As communicated by Kunwar et al. [17], the knowledge base for traditional herbal medicine stems from spirituality, customs, livelihood strategies and available nearby resources. Medicinal herbs are main ingredients of traditional herbal medicine, and the traditional herbal medicine is considered as the main lifeline [36], the first choice [37], fewer side-effects, better patience tolerance, relatively less expense, and cultural acceptance and long history of use, in comparison to western medicine. Thus, the traditional herbal medicine has not only survived but also thrived in the trans-cultural environment with its intermixture of ethnic traditions and beliefs. Most of the time, this knowledge is passed on orally and therefore is endangered. Particularly the Amchi knowledge is passed down through dedicated apprenticeships under the tutelage of senior Amchi [38]. Although traditional herbal medicine is effective in treatment of various ailments with considering ritual and socio-cultural customs [39], very often the medicine is used indigenously with indifference to the scientific knowledge and their possible side effects were overlooked. The dearth of reports of adverse effects and interactions probably
reflect a combination of under-reporting and the benign nature of most herbs used [40]. Therefore, the traditional herbal medicine deserves a great scope of research in the light of modern science.

The present assessment showed that traditional herbal medicine has flourished in rural areas where modern medicine is parsimoniously accessed as a result of the high cost and long travel time to health center. Moreover, inadequate modern medical resources/facilities and government subsidies also made traditional herbal medicine pertinent in Nepal. It is estimated that there is one physician for every 20,000 people whereas there is more than one healer for every 100 people in Nepal [41,42]. Herbal medicine prescribed by healers is either preparation based on single plant part or a combination of several plant parts. However, we dealt only the primary one for further discussion in the present study. Many of the plants most often used in study area to treat ailments are also commonly used all over Nepal. Particularly the ethnic groups and scheduled caste are the major stakeholders of the traditional herbal medicine [43], so, traditional medicine is still the mainstay of health care in the rural areas of Nepal where the majorities of the denizens are from ethnic groups and scheduled castes.

**Medicinal plants and their uses**

Of the 48 species from 46 genera and 40 families (Table 1) discussed in the present study, indigenous uses of about 70% species resembled to the earlier ethnomedicinal reports. The indigenous uses of about 50% species had affinity to the *Ayurveda*, and about 40% species were found to have efficacy in pharmacology. Fabaceae, Moraceae and Rosaceae were represented by the greatest number of species (3 each), followed by Euphorbiaceae and Lamiaceae (2 each) for herbal medicine in study area. A total of 30 ailments were reported in the present study, and among these inflammation, cuts & wounds, diarrhea & dysentery and fever were considered as common, and the maximum number of medicinal plant species were used against, six species to each category and four for the latter. Similar observation of maximum number of species used for fever and cuts & wounds was reported by Manda-n达尔 [34]. The plant parts used for herbal remedies were bark, flower, fruit, leaf, milk/latex, root/rhizome, seed, shoot, wood, and the whole plant. Plant parts root/rhi-zome, leaf, and fruits, etc. were most frequently utilized.

**Pharmacology**

The results obtained support prior observations, pharmacology and Ayurvedic uses concerning the following species: the crude extracts of *Acacia catechu* for cold and cough, *Aconitum spicatum* as analgesic, *Aesculus indica* for joint pain, *Andrographis paniculata* for fever, *Anisomeles indica* for urinary affections, *Azadirachta indica* for fever, *Euphorbia hirta* for asthma, *Taxus wallichiana* for tumor control, and *Tinospora sinensis* for diabetes. This probably explains the use of these plants by indigenous people against a number of infections as transcend from transcultural environment with following home herbal remedy, *Ayurveda* and *Baidhya* systems. It is known that the families Rutaceae and Meliaceae are among the richest and most diverse sources of secondary metabolites among the angiosperms [44], and the species of Meliaceae are known to have intense antimalarial characters due to highly oxygenated terpenoids [45]. Use of leaves of *Azadirachta indica* (Meliaceae) as antipyretic is widely used in study area (Table 1) and throughout Nepal [46] was substantiated by the nimbudin flavonoids [47,48]. Oleic acid and gedunin of *A. indica* are also reported to be an *in vitro* antimalarial [49-51]. Other species contributed as anti-pyretic in home herbal remedy in study area were *Andrographis paniculata* (Acanthaceae), *Aconitum spicatum* (Ranunculaceae) and *Osmanthes fragrans* (Oleaceae).

Andrographolide and neoandrographolide from *Andrographis paniculata* own anti-inflammatory activity [52,53]. Its diterpene exhibits antioxidant and hepatoprotective properties [54-57]. Immunostimulant [58], antibacterial [59], analgesic [60] and antiprotozoal [61] characteristics of *A. paniculata* extract have also been demonstrated. These values probably explain the use of *A. paniculata* by the indigenous people against a number of infections and fever. Crude root extract of *Podophyllum hexandrum* (Berberidaceae) was used as hepatoprotective, despite the hepatotoxic character reported due to its lignans [62]. Podophyllotoxin has manifested antimitotic activity and capability of inhibiting DNA, RNA and protein synthesis [63]. There were seven species in study area exhibiting hepatoprotective effects. Among them, six were pharmacology based and three were folkloric. Plant extracts of *P. hexandrum* and *Andrographis paniculata* showed hepato-protective characters consistent with the folk use and pharmacology.

Alkaloids are most common in flowering plants, especially in Fabaceae, Ranunculaceae and Solanaceae [64]. Some alkaloids (aconitine, anisodamine, berberine, charantaine, leurosine) show antidiabetic effects [65]. Berberine of *Tinospora sinensis* (Menispermaceae) is antidiabetic [66-68], but higher doses may be antagonistic [69], which strongly support the folkloric use of the plant extract. According to Marles and Farnsworth [70], there are about 1,000 species of plants that can act as an antidiabetic and approximately 80% of these are used in folk herbal medicine. Antidiabetic reports of *Azadirachta indica*, *Carum carvi*, *Tinospora sinensis* and *Vitex negundo* stated in the present communication were
### Table 1: Major uses of the medicinal plants, their chemical constituents, and latest common pharmacological findings (species are in order of references)

| SN | Scientific name, local name, family and voucher code | Folk use found in present survey | Major folk uses in previous studies | Major uses in the Ayurveda | Selected major chemical constituents | Latest common pharmacological findings |
|----|------------------------------------------------------|---------------------------------|-----------------------------------|---------------------------|-------------------------------------|---------------------------------------|
| 1. | Lobelia pyramidalis Wall. Campanulaceae Lobelia (E), Aklebir (N), Eklebir (S), 569/00. Syn. L. nicotianaefolia Roth | Juice of leaves and flowers is rubbed on body parts during body ache | Leaves and inflorescence are antispasmodic and they are used as an expectorant. Plant is used for sciatica and back pain | Leaves and flowers are antispasmodic [30] and used for asthma, bronchitis and fever [31]. | Lobeline, radicamine. | Lobeline may cause nausea, vomiting and diarrhea [38]. |
| 2. | Cannabis sativa L. Cannabaceae Hemp (E), Ganja (N), Bhang (S). Syn. C. indica Lam. | Leaf juice is applied to control bleeding. | Leaf juice is useful for healing wounds, control bleeding and stomachache [32]. | Plant is efficacious for diarrhoea. It is also used as antispasmodic [21] and sedative [25]. | Cannabigerol, cannabidiol, friedelin, lectins [32]. | Leaves are used as snuff for smoking and are given internally to relieve pain and swelling [27]. Lectins possess haemaglutinating properties [38]. |
| 3. | Scutellaria discolor Colebr. Lamiaceae Ratpatya (L), Dampate (N) KU 07263. Syn. S. indica Blume | Whole plant and leaf paste is useful for cuts and wounds. | Plant juice is useful for headache and fever [28] and wounds healing [30]. | Plant juice is used for rheumatism [147]. | Wogonin | Root juice is given in indigestion and wogonin exerts antispasmodic effects [135]. Plant and root extract is used for rheumatism [136]. |
| 4. | Ficus palmata Forssk. Moraceae Bedu (N). Syn. F. virgata Wall. | Plant milk is useful for taking out the thorns from wounds. | Plant latex is used to expel the spines [30]. Fruits are used for constipation, lungs and bladders diseases [33]. | Fruits are taken for lungs disorders [147]. | Friedelin, tannins. | Fruits act as demulcent and laxative and are useful for lungs, spleen and bladders [136]. |
| 5. | Grewia disperma Rottb. Tiliaceae Viywal (L), Syalpuchre (N). Syn. G. semiplata DC. | Root juice is taken as expectorant. Wood paste is applied for skin diseases (no other information given). | Root juice is taken during cough and cold. Bark paste is expectorant and used for boils [33]. | Root juice is used for controlling bleeding and bronchitis [147]. | – | Plant is applied in bleedings and bronchitis. Fruits are valued as cardiotonic [136]. |
| 6. | Podophyllum hexandrum Reyle Berberidaceae Podophyllum, May apple (E), Laghupatra (N), Hatakuo (L), Hansapadi, Laghupatra (S), 583/00. Syn. P. emodi Wall. ex Hook. f. & Thomson | Root juice is taken for liver complaints (no other information given). | Plant is hepatostimulant and purgative [15,31]. Root paste is applied on ulcer, cuts and wounds [32]. | Root extract is purgative [147]. | Arylteratins, astragalin, lignan, picropodophyllin, podophyllotoxin, quercetin [27]. | Plant lignan is hepatotoxic [62], arylteratins is antifungal [148], and podophyllotoxin is antitumour. Aqueous extract of plant has antitumor effects [149]. |
| 7. | Potentilla fulgens Wall. Ex Hook. Rosaceae Himalayan Cinquefoil (E), Phosre (L), Bajradanti (N), Kanthamun (S), 93/00. Syn. P. semirugosa Lehm. | Dried roots are eaten as dentifrice. | Root powder is used for toothache [25]. | – | Carotene, coumarins, flavonoids, polyphenols, steroids [25]. | Aqueous extract of the plant reduced germination of food crops [150]. |
Table 1: Major uses of the medicinal plants, their chemical constituents, and latest common pharmacological findings (species are in order of references) (Continued)

8. ♥Carum carvi L. Apiaceae Caraway (E), Jangali jira (L), Kalo jira (N). Syn. Apium carvi L. Fruits are applied against swelling of breast and testicles. Plant fruit juice is useful for muscular swellings [30]. Raw fruits are stomachic and carminative [31]. Plant seeds are useful in uterinal complaints [22], and used as antisyphilitic, astringent, antihelmintic and carminative [151]. Camphene, carvone, carophyllene, limonene, myrcene, pinene, sabine, scopoletin, umbelliferone [100]. Fruits are good for painful swelling [152]. Carvone is antihelmintic [153] and antioxidative [154]. Essential oil is antibacterial [155] and antitumuric [156]. Aquous fruit extract is used against hypertension, gonorrhoea [157] and diabetes [158].

9. ♥Aconitum spicatum (Bruhl) Stapf. Ranunculaceae Nepalese Aconite (E), Bikh (N), Bish (S), KU 07233. Syn. A. ferox var. spicata Bruhl Root juice is antipyretic and analgesic. Tubers are used after detoxification [31] as antipyretic and analgesic [32]. Plant tuber is antipyretic and analgesic [25]. Plant root is used for tonsillitis, sore throat, gastritis, and debility [152]. Bikhaconitine, caffeic acid, diterpenoids, lupenoic acid, pseudaconitine. Caffeic acid of Aconitum species is antioxidative and anti-inflammatory [138].

10. ♥Taxus wallichiana (Zucc.) Pilger Taxaceae Himalayan Yew (E), Kandeloto (L), Lothsalla (N), Madhuparni (S), 99/00. Syn. T. baccata auct. non. Leaf juice is used for cancer and bronchitis. Bark and leaf juice is useful for asthma, bronchitis and cancer [30,32]. Dried leaves are considered to be useful for asthma, bronchitis, hiccough, epilepsy, diarrhea and headache [151]. Abeotaxane, baccatin, cephalomannin, docetaxol, paclitaxel, taxol [159]. Fractions of extract of leaves inhibited pregnancy in 60% female rats [22]. It cures vitiation of blood [100] and inhibits tumor growth [101].

11. ♥Acacia catechu (L. f) Willd. Fabaceae Cutch tree (E), Khair (N), Khadirah (S). Syn. A. catechoides (Roxb.) Wood is used as local tea for cough and cold. Wood decoction is applied on nosebleeds, skin eruptions and toothache [30] and for cough and bodyache [32]. Plant decoction is used for skin diseases and mouth and mucous defects [21]. Wood is useful for cough and diarrhea [25]. Acacatechin, afzelchin, catechuchanic acid, cyanidanol, dimeric procyanidine, epicatechin, isorhamnetin, phlebotanin, quercetin, taxifolin, tryptamine, vernolic acid [160]. Cyanidanol, an active ingredient of Acacia catechu, is claimed to be effective for treating liver diseases [95]. Catechu has hypoglycaemic [161], antipyretic [162] and digestive properties [163]. Taxifolin has antioxidant and anti-inflammatory activities [164]. Catechic acid is valued for expectoration for chest infection [165].

12. ♥Engelhardtia spicata Leschen, ex Blume Juglandaceae Mahua (N). Syn. E. colebrookeana Lindl. ex Wall. Flowers are drunk for abdominal pain. Flower juice is useful for abdominal pain [5], cough and cold [166]. Bark is used as piscidal [147]. Engelhardtione, oleanolic acid. Engelhardtione possesses antitubercular activities [167].

13. ♥Spondias pinnata (L.) f) Kurtz Anacardiaceae Bile tree, Wild mango (E), Amaro (L), Pitavakraha (S). Syn. S. mangifera Willd. Plant latex is applied for wounds and cuts. Plant juice is useful for dysentery and rheumatism [30] plant latex is used for bilious dyspepsia [33]. Latex is demulcent [27]. Alamine, amyrin, cystine, lignoceric acid, oleanolic acid, serine [27,100]. Flavonoids of the plant have been known to inhibit intestinal motility and hydroelectrolytic secretion, which are known to be altered for diarrhoeal conditions [168].
Table 1: Major uses of the medicinal plants, their chemical constituents, and latest common pharmacological findings (species are in order of references) (Continued)

| No. | Species                                                                 | Fruits/Roots                                                                 | Flower(s)                                                                 | Seed/latex/fruit juice/leaf extract/other parts | Pharmacological findings                                                                 |
|-----|-------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------|----------------------------------------------------------------------------------------|
| 14. | **Schleicheria oleosa** (Lour.) Oken                                    | Fruits are eaten as an anthelmintic.                                          | -                                                                      | Seed oil is used for skin diseases [27].                                               | Fruit juice stimulates hair growth [169].                                               |
|     | Sapindaceae                                                            | Fruits are used for heat stroke, and valued as appetite stimulant [30].       |                                                                        |                                               |                                                                                        |
|     | Macassar tree, Honey tree, Lac host tree (E), Kusum (N).                | Anthelmintic and tonic [33].                                                  |                                                                        |                                               |                                                                                        |
|     | Syn. S. trijuga Willd                                                    |                                                                              |                                                                        |                                               |                                                                                        |
| 15. | **Rhododendron campanulatum** D.Don                                     | Flowers are used in body ache and throat pain. Seeds aid digestion.          | Flowers are useful for skin diseases [33].                            | Leaf extract is used for rheumatism and syphilis [147].                               | Amryn, andromedotoxin is poisonous to the livestock [136]. Good amount of phenols and  |
|     | **Ericaceae** Chimal (N) 89/00.                                         |                                                                              |                                                                        |                                               | urolsic acid in the plant help to reduce risk of cardiovascular diseases [129,171] and  |
|     | Syn. R. wallchii Hook.f.                                               |                                                                              |                                                                        |                                               | cancer [172,173].                                                                      |
|     |                                                                         |                                                                              |                                                                        |                                               |                                                                                        |
| 16. | **Boehmeria platyplylla** D.Don                                       | Root paste is applied on control bleeding.                                   | Plant juice is poisonous to fish [147].                               | Plant juice is applied on cuts and wounds [174].                                       |                                                                                        |
|     | **Urticaceae**                                                         |                                                                              |                                                                        |                                               |                                                                                        |
|     | Chinese grass (E), Kamle (L), Gargalo (N).                              |                                                                              |                                                                        |                                               |                                                                                        |
|     | Syn. B. macrostachya Wedd.                                             |                                                                              |                                                                        |                                               |                                                                                        |
| 17. | **Andrographis paniculata** (Burm. f.) Wall. ex Nees                    | Raw plant root juice is considered as antipyretic and effective against infections. | Plant is useful for curing malarial and intermittent fever, dysentery and liver disorders [32]. | Plant is effective for dermatological diseases [27]. It is useful in malarial and intermittent fevers [175]. | Andrographolide, caffeic acid, kalmeghin, neandrographolide, panicolide. Plant is immunostimulant [58], anti-inflammatory [53], antibacterial [59], analgesic [60] and antiprotozoal [61]; Kalmeghin increases biliary flow and liver weight [175] and aids intestinal digestion [176] and liver protection [177,178]. |
|     | **Acanthaceae**                                                         |                                                                              |                                                                        |                                               |                                                                                        |
|     | Cret (E), Kitakita, Kalmegh (N), Bhunimbah (S).                        |                                                                              |                                                                        |                                               |                                                                                        |
|     | Syn. A. subspathulata Clarke.                                          |                                                                              |                                                                        |                                               |                                                                                        |
| 18. | **Sapium insigne** (Royle) Benth. ex Nees                              | Milky latex is skin irritant and sprayed as fish poison in stream and tributaries. | Bark latex is used to dispel works and germs for livestock [33].       | Latex is vesicant [147].                                                                 | Conilagin, guijaverin, nicotiflorin, phorbol esters, quinic acid, rutin, scopolin [179]. |
|     | **Euphorbiaceae**                                                      |                                                                              |                                                                        |                                               |                                                                                        |
|     | Tallow tree (E), Khirro (N).                                            |                                                                              |                                                                        |                                               |                                                                                        |
| 19. | **Vitex negundo L.**                                                   | Leaf juice is useful in stomachache.                                         | Plant juice is used for fever and nerve defects [21].                  | Plant is used for fever and nerve defects [21].                                         | Aegusid, aucubin, castician, hentriacontane, luteolin nishidine, peduncularisid, vanillic acid, vitexin [100,181]. Plant extract shows antibacterial [103] and weak antifungal properties [104] and it is good for lowering blood glucose levels [105], cancer treatment [106] and acne control [107]. It is useful for inhibition of edema [108,109] and tracheal contraction [110]. |
|     | **Verbenaceae**                                                        |                                                                              |                                                                        |                                               |                                                                                        |
|     | Negunda Chaste tree (E), Simall (N), Nirgundhi (L), Shephall (S).       |                                                                              |                                                                        |                                               |                                                                                        |
|     | Syn. V. cannabifololia Sieb. & Zucc.                                    |                                                                              |                                                                        |                                               |                                                                                        |
| 20. | **Skimmia anquetilla** N.P. Taylor & Atyr Shaw                         | Leaf infusion is taken for headache and for freshness.                      | Leaves are aromatic and used for headache and general fever [15,33].   | –                                             | Linalool could possess antiseptic effect [137].                                         |
|     | **Rutaceae**                                                           |                                                                              |                                                                        |                                               |                                                                                        |
|     | Chillo pate (L), Narpati (N).                                          |                                                                              |                                                                        |                                               |                                                                                        |
| 21. | **Penicaria barbata** (L) Hara Polygonaceae Pirhe (N).                 | Stem juice is useful for boils and pimples.                                 | Root paste is applied on the scabies, wounds and swollen parts [28,30]. | Stem decoction is useful for ulcers [147].                                               | Leaves are astringent, rubifacient and vermifuge [183]. Plant decoction is used to relieve pain and rheumatism [184]. |
|     | **Polygonaceae**                                                       |                                                                              |                                                                        |                                               |                                                                                        |
|     | Pirrhe                                                                  |                                                                              |                                                                        |                                               |                                                                                        |
|     | Syn. Polygonum barbatis Linn.                                          |                                                                              |                                                                        |                                               |                                                                                        |
Table 1: Major uses of the medicinal plants, their chemical constituents, and latest common pharmacological findings (species are in order of references)  (Continued)

| No. | Scientific Name | Common Name | Part Used | Uses | Chemical Constituents | Pharmacological Findings |
|-----|----------------|-------------|-----------|------|-----------------------|--------------------------|
| 22. | Bauhinia variegata L. Fabaceae | Mountain ebony (E), Koiralo (N), Kachnar, Kovidarah (S). Syn. B. candida Ait. | | Flower and floral buds are eaten regularly to cure leucorrhoea and mumps. | | Flower juice is taken for dysentery and diarrhea [30]. Dried flowers are given for diarrhea, dysentery and piles [31]. Fresh flowers are used as laxative [32]. | Butein, hesperidin, lupeol, nicotiflorin, octacosanol, rhaponticoside. |
| 23. | Ficus religiosa | Peepal tree (E), Pipal (N), Aswatha (S). | Bark juice is applied for paralysis. | | | Phytosterolin, vitamin K, tannins. |
| 24. | Equisetum diffusum | Spreading horsetail (E), Ankhle jhar (L), Kurkure (N), Kaidaryama (S), Banko (N), Pipal (N), Aswatha (E), Ankhle jhar (L), Pipal (N), Aswatha (S). | Root paste is applied for eye inflammation. | | | Methanolic plant extract shows good free radical scavenging activity [191]. |
| 25. | Parnassia nubicola | Mamira (N), 205/00. | Root paste is applied for eye inflammation. | | | Methanolic root extract showed moderate anti-inflammatory effect [182]. |
| 26. | Myrica esculenta | Box myrtle Bay berry (E), Kafal (N), Kumhri, Kairdayana (S), 567/00. Syn. M. fraquhariana Wall. | Fruits are eaten for dysentery and bark decoction is given for bronchitis. | | | Friedelin, myricanone, myricadiol, myricanol, myricadine, myricanone, myricanol, stearic acid [195]. |
| 27. | Arisaema flavum | Neem tree, Margosa tree (E), Neem (N), Arishta, Nimba (S). Syn. Melia azadirachta L. | Rhizome juice is applied on earache and skin diseases. Young shoots are cooked as vegetable. | | | | |
| 28. | Azadirachta indica | A. Juss. Meliaceae | Both raw and dried leaves are used for fever and blood disorders (no other information given). | | | | |

Leaves are used for skin diseases and blood circulatory defects [21] and useful for ulcers, sores, swellings and wounds [25]. | Azadirachtin, gedunin, limonoids, linoleic acid, nimbin, nimbidin, oleic acid, stearic acid [195]. | Nimbidin possesses anti-inflammatory [170], analgesic [196], antipyretic [49], antitumor, anticholinergic, antihistaminic and antinociceptive effects [197]. Bark extract is useful as antibacterial [198] and antiprostaglandinal [199]. Leaf extract promotes wound healing, ulcer protective [200] and hypoglycaemic [201]. |
Table 1: Major uses of the medicinal plants, their chemical constituents, and latest common pharmacological findings (species are in order of references) (Continued)

| Plant Name | Chemical Constituents | Pharmacological Findings |
|------------|-----------------------|-------------------------|
| 29. ▼♥Anisomeles indica (L.) Kunze Lamiaeceae Malabar camphire (E), Ratocharpate (N), 167/00. Syn. A. ovata R.Br. | Leaf extract is useful for urinary complaints (no other information given). | Plant is astringent, tonic and its juice is useful for urinary affections [30,33]. |
|            |                       | Plant is taken for uterine affections [147]. | Alanine, anisomelic acid, apigenin, amyrin, β sitosterol, behemic acid, betulin, ceroctic acid, malabaric acid, ovatodiolide, pedallitin, stearic acid, stigmastanol [27,181]. |
|            |                       | Ovatodiolide and pedallitin of Anisomeles indica is good anti-inflammatory [202]. Pre-flowering plant water extract is analgesic [203]. Ethanolic leaf extract is strong antiviral [204] and anti HIV potential [205]. |
| 30. ♥▼Lichen species | Lichen extract and decoction is applied to treat moles. | Paste is used as ointment and antibiotic for cuts and wounds [31]. | Lichen is cardiac tonic [147]. | Atranolin, barbatic acid, norstictic acid, usnic acid, vulpinic acid [112]. |
|            |                       |                                          | Parmelia species are antimicrobial and used to treat warts [118,119] and cranial diseases [206]. |
| 31. ▼⊗Abies spectabilis (D. Don) Mirb. Pinaceae Himalayan Silver Fir (E), Gobre Salla (L,N), Talispatra (N.S). Syn. Pinus tinctoria Wallich ex D. Don | Leaves are snifed for cough and cold | Plant needle oil is valued for colds and nasal congestions [30]. Leaf decoction is used for cough and bronchitis [32]. | Plant is considered to be used for asthma, bronchitis, cough, rheumatism, anorexia, abdominal lump, indigestion and tuberculosis [22]. | β pinene, camphene, carvone, catechin, catechutaminic acid, ephedrine, taxine, taxinine [24,32]. |
|            |                       |                                          | Pinene of Abies leaves is anti-inflammatory and antidepressant [207]. Plant extract with the ephedrine should always be used with caution in patients with hypertension [38,208]. |
| 32. ▼♥Quercus lanata Sm. Fagaceae] Wooly oak (E), Lathyaz (L), Baanh (N). Syn. Q. lanuginosa D. Don | Heart wood is taken as tea and it is laxative in nature. | Resin is useful for soothing body ache [30]. Dry resin is taken to treat dysentery [33]. | – | Cyclobalanone, friedelin, pelagonodin, sitosterol, tannins [100]. |
|            |                       |                                          | Resin and bark tannin is anti-inflammatory [122,209]. |
| 33. Solena heterophylla Lour. Cucurbitaceae Ban Kankri (N) KU 07255. Syn. Melothria heterophylla L. | Fruits are eaten for common cold and pneumonia of child. | Fruits are useful for throat pain and fever [28]. | Root juice is useful for dysuria and spermatorrhoea [147]. | Behemic acid, columbin, lignoceric acid [210]. |
|            |                       |                                          | Plant extract is hepto-protective and plant coumarin and flavonoids inhibit platelet aggregation [211]. |
| 34. ▼⊗Ornithes fragrans Lour. Oleaceae] Tree Jasmine (E), Sininge (N), KU 07244. Syn. O. acuminateus (Wall) Nakai | Leaf juice is taken for fever and cold. | Stem bark is valued for boils, cough and retinitis [30,33]. | Leaf juice is tonic [147]. | Caffeic acid, catechin, gallic acid, leuropin, luteolin, oleancenic acid, phyllyrin, succinic acid [100]. |
|            |                       |                                          | Plant extract has antioxidant and melanogenesis inhibitory effects [212,213] and neuroprotective property [214]. |
| 35. ▼♥Fragaria nubicola Lindl. Rosaceae Alpine strawberry (E), Bhulikafal (N), KU 07242. Syn. F. vesca L. | Fruit paste heals skin diseases and wounds. | Plant juice is useful for inflammation of the nerves and lungs [29]. Root juice is taken for fever [33]. | Fruits are astringent and diuretic [147]. | Carotenoids, ellagic acid, flavonoids [215]. |
|            |                       |                                          | Ellagic acid of the plant is responsible for antioxidant activity [128]. Plant extract is antimicrobial and anti-inflammatory [101,131]. |
| 36. ▼♥Curcuma angustifolia Roxb. Zingiberaceae Zeodory, Turmeric (E), Sathi, Kachur (L), Haldi (N) Ban haldi, Haridra, Harta (S) KU 07259. Syn. C. longa L. | Rhizome paste heals skin diseases and wounds. | Rhizome paste is externally applied for paralysis. | Tuber is used for skin diseases and urinary complaints [21]. Fresh tuber juice is antiparasitic and useful for skin affections [25]. | Anthraquinone, borneol, camphero, camphere, caryophyllene, cineole, curcumin cudrone, curzevenone, curfrone, eugenol, limonine, linool, terpinene [100,210]. |
|            |                       |                                          | Curcumin is anti-inflammatory [78-80], antiviral [82], antifungal [83], antispasmodic [86] and hepatoprotective [87]. It is also useful for AIDS [90,91] control blood pressure [93]. Plant extract is antimutagenic [216]. |
Table 1: Major uses of the medicinal plants, their chemical constituents, and latest common pharmacological findings (species are in order of references) (Continued)

| No. | Species                                      | Common Name                     | Chemical Constituents                                                                 | Pharmacological Findings                                                                 | Notes                                                                                     |
|-----|----------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| 37  | *Evolvulus alsinoides* L. Linn.              | Fabaceae                         | Decoction of plant is taken for increase memory.                                       | Ash of the plant is spread on boils and pimples [30]. Plant paste is applied on scorpion sting, burns and scabies [33]. | Plant is brain stimulant, aphrodisiac, anthelmintic and antidysenteric [217].               |
|     |                                              |                                  | –                                                                                      | –                                                                                         | Plant extract is analgesic, CNS depressant [218] and has anthelmintic, wound healing [219,220] and antibacterial properties [221]. |
| 38  | *Sterculia villosa* Roxb.                    | Sterculia, Odaal tree (E), Odaal (N), Syn. *Firmiana fulgens* (Wall. Ex Master) Corner | Stem bark is considered as an astringent. It is used for cooking breads.              | White exudates of the tree is used for throat infection. Root infusion is taken as food adjunct [33]. | –                                                                                         |
|     |                                              |                                  | –                                                                                      | –                                                                                         | Plant extract is useful for skin disease [222].                                          |
| 39  | *Pyracantha crenulata* (D. Don) M. Roem.     | Rosaceae                         | Fruits are eaten for dysentery.                                                       | Fruit powder is used for blood dysentery [30,33].                                        | Pyracrenic acid, sorbitol, tannin [223].                                                  |
|     |                                              |                                  | –                                                                                      | –                                                                                         | Pyracrenic acid is anti-inflammatory [223].                                               |
| 40  | *Phytolacca acinosa*                        | Phytolaccae                      | Vegetable is consumed for body ache (no other information given).                    | Plant is narcotic and purgative in properties [30].                                      | Acinosolic acid, jalligonc acid, lectins, oleanolic acid, myricadol, phytolaccagenin, spargulagenic acid, zonarol [32,100]. |
|     |                                              |                                  | –                                                                                      | –                                                                                         | Root extract shows weak tricosinase inhibitory activity i.e. Skin whitening [224]. Saponin extracts from Phytolacca demonstrated anti-inflammatory [225], antifungal [226] and anti-viral effects [227]. |
| 41  | *Smilax aspera* Wall.                        | Smilacaceae                      | Root decoction is used for venerale disease.                                          | Root extract cures scabies [30] and purifies blood [33].                                  | Asparagenin, engelitin, parallin, pseudogenin, rutinoside, sarsapogenin, smilogenin, tannin [126,228]. |
|     |                                              |                                  | –                                                                                      | –                                                                                         | Stem juice is used for dropsy and gout [229]. Rutinoside is cancer inhibitory [230].         |
| 42  | *Ficus auriculata* Lour.                    | Moraceae                         | Stem juice is considered effective against diarrhea and fruits are consumed for dysentery. | Bark juice and roasted figs are useful for diarrhea and dysentery [28,30].                | –                                                                                         |
|     |                                              |                                  | –                                                                                      | –                                                                                         | –                                                                                         |
| 43  | *Euphorbia hirta* L.                        | Euphorbiaceae                     | Plant latex is applied for cuts. Plant juice is applied in asthma and diarrhea.      | Plant juice is useful for boils, cuts and wounds [30] and is considered to be used in treatment of asthma and cough [32]. | It is useful for cardiovascular complaints, asthma and spleen disorders [27].             |
|     |                                              |                                  | –                                                                                      | –                                                                                         | Galloyquinic acid, Phorbol acid, leucocyanidol, quercetol, camphol, quercetin, chlorophenolic acid, shikimic acid [100]. |
| 44  | *Juniperus chinensis* L.                    | Pinaceae                         | Root decoction is taken in stomachache and diarrhea.                                  | Root is used for stomachache and diarrhea [29]. Root juice is taken for cough and cold [30]. | –                                                                                         |
|     |                                              |                                  | –                                                                                      | –                                                                                         | Vasicine.                                                                                 |
|     |                                              |                                  | –                                                                                      | –                                                                                         | Vasicine exhibited strong respiratory stimulant, moderate hypnotic, cardiac-depressant and abortifacient [233]. |
Table 1: Major uses of the medicinal plants, their chemical constituents, and latest common pharmacological findings (species are in order of references) (Continued)

| No. | Species | Part Used | Uses | Constituents | Pharmacological Findings |
|-----|---------|-----------|------|--------------|--------------------------|
| 45. | Tinospora sinensis (Lour.) Merr. | Root, leaf, fruit | Antipyretic, antihypertensive, anthelmintic, and anti-inflammatory. | Alkaloids (berberine, b-hydroryzapyrrole, tinosporin, and tinosporide), flavonoids (kaempferol, quercetin, rutin), sterols (β-sitosterol), fatty acids (oleic, linoleic), and saponins (acetylactin). | Treats gonorrhoea, dysentery, diabetes, and respiratory complaints. |
| 46. | Betula utilis DC. | Bark, leaf, leaflet, twig, root | Antidiabetic, antiviral, and anthelmintic. | Betulin, betulonic acid, lupeol, oleanolic acid. | Treats diabetes, jaundice, and respiratory complaints. |
| 47. | Aesculus indica (Coke. ex Camb.) Hook. | Seed, fruit, bark, leaf | Alterative, antispasmodic, and antipyretic. | Aescin, aesculuside, sitosterol, and saponins. | Treats diabetes, dysentery, and skin diseases. |
| 48. | Daphne bholua Buch.-Ham. ex D.Don | Leaf, root, stem | Antipyretic, antispasmodic, and anthelmintic. | Daphnoids, daphnetin, leucocyanidin, lupenone, and lupenone. | Treats fever, dysentery, and skin diseases. |

E = English, L = Local, N = Nepali, S = Sanskrit, Syn. = Synonymous
⊗ = Species’s use resembled with the common uses of Ayurveda, + = Species’s use resembled with earlier reports, ♥ = Species’s use resembled with latest common phytochemical findings

pharmacologically rationale and that of A. indica and T. sinensis was folk-based.

Euphorbiaceae species are generally characterized by milky latex [71], and sticky saps are co-carcinogenic, and can cause severe skin irritation and are toxic to livestock and humans [72]. They are rich in active compounds including terpenoids, alkaloids, phenolics and fatty acids, having ethnopharmaceutical uses [73]. Sapium insigne (Euphorbiaceae) is skin irritant, and commonly used as fish poison in study area and throughout Nepal [28]. Both the water and methanol extracts of Euphorbia hirta (Euphorbiaceae) are antibacterial [74,75] and effective as expectorant [76,77] and broncho-dilator [27], which is consistent with the folkloric use in treatment of respiratory complaints.

Pharmacologically, curcumin of Curcuma species (Zingiberaceae) acts as an anti-inflammatory [78-80], antibacterial [81], antiviral [82], antifungal [83], antitumor [84,85], antispasmodic [86], and hepato-protective [87]. The oxygen radical scavenging activity of curcumin has been implicated in its anti-inflammatory effects [88,89] thus curcumin may prove useful as a drug for arthritis, cancer, HIV [90-92] and high blood pressure [93]. Wide range of pharmacological reports including antibacterial and antiviral complements the folk use to treat paralysis. Rhizome extract of the plant was widely used for skin diseases (bruises, injuries, etc.) in west Nepal [15] and in the Ayurveda [21].

The folk use of Acacia catechu (Fabaceae) wood tea as an expectorant fairly corroborated the pharmacological properties because the tannin and cyanidanol [94,95] of the plant impart astringent activity which helps to recuperate diarrhea. Tannins are also known as antimicrobial [96] and triterpenoids are beneficial for inflammation and cancer [97]. The hepato-protective and hypoglycemic properties of A. catechu could be
attributed to the quercetin [98] and epicatechin [99] respectively. Leaf extracts of *Taxus wallichiana* (Taxaceae) inhibit pregnancy in rats [22], vitiate blood disorders [100] and control tumor growth [101]. In the study area, *Taxus* leaf juice is used for treatment of cancer and bronchitis.

Lectins of *Cannabis sativa* (Cannabaceae) possess haema-glutinating properties [38] which corroborate the indigenous use of the leaf extract to control bleeding. Crude leaf extract of *Vitex negundo* (Verbenaceae) is recommended as antitussive and anti-asthma [102], antibacterial [103], antifungal [104], hypoglycemic [105], anti-cancer [106], acne control [107], inhibitor of edema [108,109] to tracheal contraction [110]. However, it did not corroborate the folk use for stomachache but was partially complemented by earlier observations [30,111].

The unlike uses of the species after thorough scrutiny, under different medical systems and comparisons pose more research scopes. Several instances are rational behind a certain function of a phytomolecule sometimes inconsistent to the pharmacology and ethnopharmacology. Moreover, while advocating herbal medicine as alternative therapy, toxicity of plants should be borne in mind.

Lichens and their metabolites have manifold biological activity: antiviral, antibiotic [112], antitumor, allergenic, plant growth inhibitory, antiherbivore, ecological roles and enzyme inhibitory [113,114], Usnic acid and vulpuvic acid (produced by mycobiont) of lichens are mitotic regulators [115] and own antibiotic properties [116]. *Parmelia sulcata* lichen manifests antibacterial and antifungal activities [117,118]. Use of *Parmelia* species to treat warts [119] is analogous to its folk use. Folk use of wood tea of *Quercus lanata* (Fagaceae) as a laxative may verify the actions of tannin. Tannins reveal activities against central nervous system disorders [120] and inflammation [121,122]. Further pharmacological evaluation of the extracts of those species which reveal weak pharmacological validities are needed before they can be used as therapeutic potentials.

The compounds which contribute to the antioxidative properties are polyphenols [123], vitamin C [124], β carotene [125], anthocyanins [126], and flavonoids [127]. Ellagic acid of *Fragaria nubicola* (Rosaceae) is also responsible for antioxidant activity [128]. Antioxidants are associated with reduced risk of cancer and cardiovascular diseases [129] and many other ailments [130]. Antimicrobial and anti-inflammatory properties of *Fragaria* fruit extracts [101,131] are consistent with the folkloric use as remedy for skin diseases and wounds. The usage of root powder of *Potentilla fulgens* (Rosaceae) as a dentifrice is common in the study area and throughout Nepal [132,133] and it is in accord to the Ayurvedic uses. However, the usage is yet to be verified pharmacologically.

Wogonin of *Scutellaria discolor* (Lamiaceae) is considered as a most potent antiviral [134] and anxiolytic [135] compound. Plant root extract is also useful for rheumatism [136]. Whole plant and leaf paste is useful for cuts & wounds, which probably rationalize the activities of wogonin. Linalool also possesses an anxiolytic effect [137], and this effect probably substantiates the folk uses of *Skimmia anquetilia* (Rutaceae) leaves as medicine for headache and freshness. Linalool is the main constituent of *Skimmia* root. The indigenous uses of six species *Arisaema flavum*, *Ficus religiosa*, *Rhododendron campanulatum* (Figure 2), *Smilax aspera*, *Solena heterophylla* and *Sterculia villosa* repudiated to any of the comparables, since these uses were additional to the Nepalese ethnomedicinal vault and these addition demands further research.

*Aconitum spicatum* (Ranunculaceae), taken alone is poisonous, so it is never used alone by the local communities. A paste made from its roots is applied as antipyretic and analgesic after mixing with *Terminalia chebula* (Combretaceae). Folk use of root extract of *A. spicatum* as an analgesic is consistent to the anti-inflammatory activity of caffeic acid found in the plant extract [138]. About 80% of plant alkaloids possesses anti-inflammatory properties and among them isoquinoline (berbamine, berberine, cepharanthine and tetrandine) was the most active [139,140]. Diterpenoid alkaloids, commonly isolated from the plants of Ranunculaceae family, are commonly found to have antimicrobial properties [141]. Folk uses as antipyretic and analgesic of *A. spicatum* root extract are validated by the in vitro antimicrobial properties. In some cases, multi-component therapy has been practiced and considered as effective

Figure 2: *Rhododendron campanulatum* D.Don (Chimal): Flowers are used in body ache and throat pain.
as Kareru et al. [142] observed in Kenya, but the present assessment considered only the primary one to discuss. We believe that the associate plants must also be considered as excellent candidates for future studies to determine the mechanisms of their activity, as well as for the isolation and identification of active constituents [143,144]. Thus, traditional herbal medicine renders primary health care needs of two thirds of the rural population of the Nepalese, represents a largely unexplored source for potential development of new drugs [145,146].

Conclusions
Validation of the ethnomedicinal uses of 48 Nepalese medicinal plants using comparative assessment with the common uses of the Ayurveda, earlier studies and the latest phytochemical findings showed that the folk uses of only about 50%, 70% and 40% of plant species respectively exhibited affinity. The folk uses of Acacia catechu for cold and cough, Aconitum spicatum as an analgesic, Aesculus indica for joint pain, Andrographis paniculata for fever, Anisomeles indica for urinary affections, Azadirachta indica for fever, Euphorbia hirta for asthma, Taxus wallichiana for tumor control, and Tinospora sinensis for diabetes are consistent with the latest pharmacological findings, as well as common Ayurvedic and earlier uses. However, the frequent folk uses of Arisaina flavum, Ficus religiosa, Rhododendron campanulatum, Smilax aspera, Solena heterophylla and Sterculia villosa of study area repudiated at all. The preliminary results obtained from the present assessment indicate that further investigation of ethnopharmacology is worthwhile. The validity assessment from the present research provided the potential to identify, research, and use which plants and their ingredients are the most significant for treatment of particular diseases.

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Authors’ contributions
All authors share the contributions to this manuscript. RMK carried out field research, analyzed the data, and wrote the manuscript, and KPS and RWB designed the study, supervised the work, collected the literature, and revised the manuscript. All authors approved the final version of this manuscript.

Competing interests
The authors declare that they have no competing interests.

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