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MEDICINAL PLANTS AS A SOURCE OF ANTIPYRETIC AGENT IN TERAI REGION OF WESTERN NEPAL

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Abstract

The study was conducted during 2009-2011 using semi-structured, open-ended questionnaires, informal interviews, and group discussions with traditional healers and senior citizens having thorough knowledge about plants and plant based remedies. During present study ten phytotherapeutic practices for management of different types of fever using 50 plant species as antipyretic agent were identified and documented. These species may be used for the development of new, cheap, and effective antipyretic agent of herbal origin. Further investigation of these plant species for herbal antipyretic agents will require safety and efficacy testing. There is an urgent need to formulate suitable conservation strategies for wildy growing medicinal plants to overcome their depletion from natural resources.

Key words: Antipyretic agents, Fever, Medicinal plants, Ethnobotany.

Introduction

Body temperature rises due to derangement of heat regulating mechanism in the brain. The rise in body temperature above 99° F is called fever. As a person's temperature increases, there is, in general, a feeling of cold. Once the new temperature is reached, there is a feeling of warmth. Fever generally occurs due to infection of micro-organisms that produce pyrogens. These pyrogens act on white blood cell (WBC) which in turn produces endogenous toxins. They act on the anterior hypothalamus and the body temperature is elevated causing fever (Chattergee, 1973). Fever leads to the disturbance of metabolism and it increases blood pressure, pulse rate, cardiac output, respiration rate etc. Most traditional medicine system believes that fever is not a disease in itself but, it is the symptom of some other diseases. The antipyretic agents treat these symptoms and completely eliminate fever. Herbal antipyretic agents are favoured over the chemical ones for their compatibility to the human physiological system, easy availability and the rich knowledge about the traditional healing system.

Herbal care or traditional system of medicine are used throughout the world and from centuries herbs have been the original source for most of the drugs (Maurya and Srivastava, 2011). Medicinal plants contain so many chemical compounds which are the major source of therapeutic agents to cure human diseases. The

antipyretic agents are used to eliminate the fever (Chettri, 2004). Though plants are used as a source of antipyretic agent through time immemorial for treating fever, due to discovery of chemical antipyretic agents they were neglected for a long time, but fortunately, due to various reasons peoples are going back to herbal medicines (Graz *et al.*, 2011) including antipyretics.

Perusal of literatures reveals that the focused on the plants used as antipyretic agents are not available in western Nepal. However, the use of various plants for fever has been mentioned in the ethnomedicinal studies in Nepal by various workers (Coburn, 1984; Shrestha, 1985; Manandhar, 1985, 1993, 1998; Mahato, 1998; Dangol and Gurung, 2000; Devkota and Karmacharya, 2003; Shrestha and Dhillion, 2003; Oli, 2003; Rai, 2003; Panthi and Chaudhary, 2003; Rai, 2004; Acharya and Rokaya, 2005; Watanabe *et al.*, 2005; Acharya and Pokhrel, 2006; Baral and Kurmi, 2006; Bhattarai *et al.*, 2006, 2009; Burlakoti and Kunwar, 2008; Dangol, 2008; Joshi, 2008; Dhami, 2008; Sapkota, 2008; Acharya and Acharya, 2009; Ghimire and Bastakoti, 2009; Joshi and Singh, 2010; Kunwar *et al.*, 2010; Rokaya *et al.*, 2010; Uprety *et al.*, 2010; Joshi *et al.*, 2011; Singh *et al.*, 2011 a, b, c and 2012;).

Study area: Rupandehi is botanically rich district in western Nepal which is situated in between 83° 27'.955" to 83° 28'.255" E longitudes and 27° 40'.016" to 27° 40'.252" N latitudes and covers an area of 1360

km² (District Profile of Rupandehi, 2007). The district is bounded by hilly districts (Palpa and Arghakhanchi) in North, by Mahrajganj district of Uttar Pradesh (India) in South, by Nawalparasi district in East and by Kapilvastu district in West (Figure 1). Rupandehi district has a humid tropical climate with maximum temperature beyond 40° C during summer (May-June) and below 10° C during winter (December- January) and annual rainfall is about 1250 mm. Geographically it is divided into Chure region (14.5%); Bhabar region (0.6%) and Terai region (84.9%). The climatic condition of the district is tropical type and Sal (*Shorea robusta*) forest is dominated along with other. The total population of the district was 7, 08,419 (CBS, 2001). The Tharu (total population 74,888) and Magar (total population 62,248) are the ethnic societies of the study area. They live in association with Chhetri (41,164), Thakuri (7329), Brahmin (1, 17,136), Gurung (19,773), Damai (7,562), Yadav (54,486), Kami (18,361), Kurmi (15,912), Teli (11,271), and Majhi (34,479).

Materials and Methods:

Ethnobotanical Survey and data collection: Intensive surveys were made in Rupandehi district of western Nepal during 2009-2011 to collect information regarding usages of medicinal plants and voucher specimens. Field works were conducted in randomly selected 10 villages (Saljhandi, Dudhraksh, Rudrapur, Parroha, Semlar, Motipur, Manpakadi, Sou.

Pharsatikar, P. Amuwa, and Devdaha) in Rupandehi district. Authentic and well-known local healer (Guruwa) and persons having thorough knowledge about plants and plant based remedies were identified with the help of senior citizens and local administrative officers working in tribal areas. Ethnomedicinal data were collected by semi-structured open-ended questionnaires, informal interviews, and group discussion in local language. Questions regarding local name of plant species, growth form and method of collection, storage, conservation needs and efforts; plant parts used, method of crude drug preparation, mode of administration, doses and duration of treatment were included in the questionnaire. Altogether 35 informants were interviewed during the field study.

Preservation of plant specimens: The collected voucher specimens were brought to the laboratory and processed for herbarium specimen preparation (Rao and Sharma, 1990 and Woodland, 1997) and identified with the help of available floras and other potential literatures (Polunin and Stainton, 1984; Stainton, 1988; Noltie, 1994; Rajbhandari, 2001; and Manandhar, 2002) and identified plant names were confirmed through available literatures (Hara *et al.*, 1978, 1982; Hara and Williams, 1979; Press *et al.*, 2000) and submitted in the department of Botany, Butwal Multiple Campus, Tribhuvan University Nepal for future references.

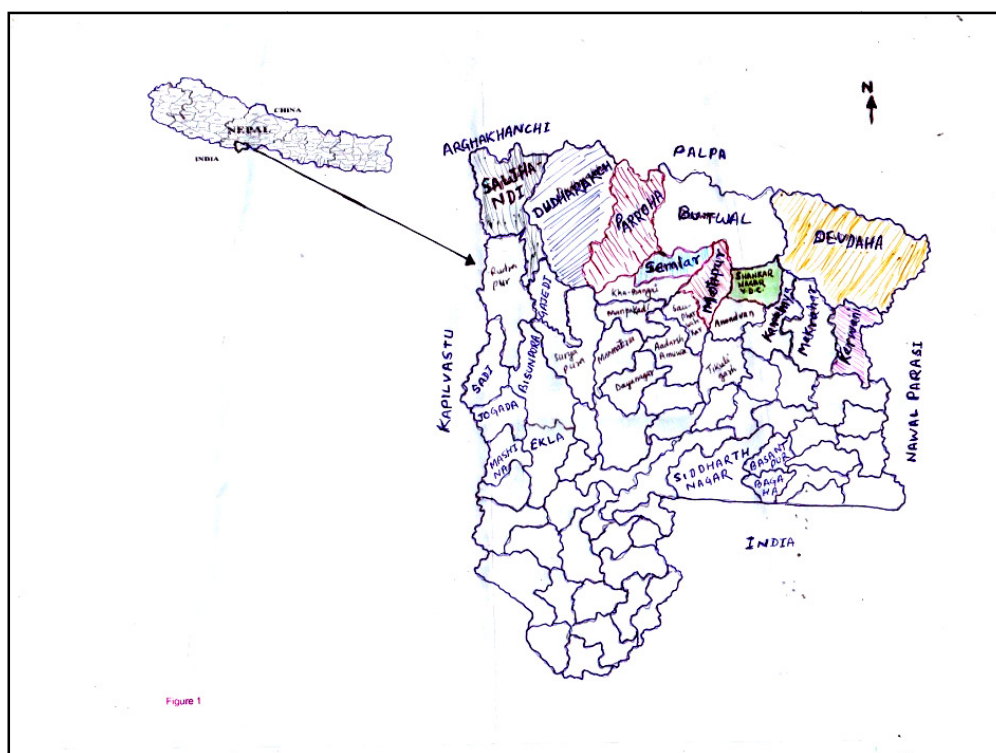


Fig. 1: Location of Study area in the map of Nepal and the area where field study conducted

Results and Discussion

In the present enumeration, data on 50 plant species belonging to 31 families used as antipyretic agents are presented in the Table-1 in the following sequences, scientific name, family, vernacular name in Nepali, Magar, and in Tharu, habit, and voucher number followed by method of crude drug administration. In the present report, decoction means a solution derived from boiling of plant parts with water; infusion means the liquid obtained by soaking the plant parts in hot water; powder means crushing and grinding of shade dried plant parts; paste means crushing of plant parts with water into soft mass; extract denotes the liquid obtained by grinding the plant parts with water and filter them with a fine cloth; while juice signifies the liquid obtained by crushing and pressing the plant parts without water. As for as plant parts used for procurement of ingredients is concerned; leaves are used in majority of cases followed by whole plant (Figure-2). Unsustainable collection of either whole plant or their vegetative and regenerative parts from

natural resources reduce the availability of medicinal plants in wild and pose threat to their existence for future use. There is an urgent need to make suitable strategies for conservation of these valuable plant genetic resources by domestication and cultivation. Majority of the plant species used to obtain ingredients belong to herb, followed by tree, shrub, and climber (Figure-3). Herbs, as a source of medicinal plants are very important as they can be domesticated and cultivated more easily in comparison to other growth forms (Kumar, 2012).

As for as method of processing for crude drug preparation in concerned, majority of the formulations are prepared as decoction followed by juice, infusion, powder, extract and paste (Figure-4). In Majority of cases ingredients are obtained from single plant followed by multiple plant ingredients. Single plant ingredients are very important for further screening leading to identification of new bioactive compounds as antipyretic agents, as it is comparatively easier to isolate phytochemical constituents from single plant ingredient (Saikia et al., 2006).

Table 1: Name of plant species administrated as antipyretics

Scientific name, family, vernacular name, habit, and voucher number	Method of crude drug administration.
<i>Abrus precatorius</i> L., Fabaceae, Ratogedi (N)/ Titihar (Th), Wild, Climber, AGS-92	Decoction of seed is given orally twice a day in fever.
<i>Abutilon indicum</i> (L.) Sweet, Malvaceae, Atibala (N)/ Chipleti (M)/ Kakahi (Th), Wild, Herb, AGS- 73	Infusion of root is given orally thrice a day in fever
<i>Acalypha indica</i> L., Euphorbiaceae, Mukta barshi Jhar (N)/ Kuppi (Th), Wild, Herb, AGS-66	Decoction of whole plant is given orally thrice a day in pneumonia fever.
<i>Achyranthes aspera</i> L., Amaranthaceae, Apamarga (N), Ulta chirchiri (Th), Wild, Herb, AGS-33	Juice of whole plant is given orally twice a day in pneumonia fever.
<i>Acorus calmus</i> L., Araceae, Bojho (N)/ Bojha (M)/ Bach (Th), Wild, Herb, AGS-71	Decoction of rhizome is given orally thrice a day in fever.
<i>Adiantum capillus-veneris</i> L., Adiantaceae, Pakhale Uneu (N/M), Wild, Herb, AGS- 162	Decoction of fresh leaflets is given orally twice a day for seven days in fever.
<i>Aegle marmelos</i> (L.) Correa, Rutaceae,, Beal (N/M), Jogchmunda (Th), Cultivated, Tree, AGS-25	Root juice is given orally twice a day in fever.
<i>Ageratum conyzoides</i> L., Asteraceae, Gandhe Jhar (N)/ Ganaune ghans (M)/ Gandhaura (Th), Wild, Herb, AGS-49	Decoction of leaves and tender twigs is given orally after breakfast for one week to get relief in fever.
<i>Alstonia scholaris</i> (L.) R. Br., Apocynaceae, Chhatiwan (N/Th), Wild, Tree, AGS- 132	Stem bark infusion is given twice a day in malarial fever.

Table 1(Contd.): Name of plant species administrated as antipyretics

Scientific name, family, vernacular name, habit, and voucher number	Method of crude drug administration.
<i>Alternanthera sessilis</i> (L.) R. Br. ex DC. Amaranthaceae, Bhringi Jhar (N), Garri (Th), Wild, Herb, AGS- 106	Decoctions of leaves and twigs are given orally twice a day for one week in malarial fever.
<i>Andrographis paniculata</i> (Burm f.)Wall. ex Nees., Acanthaceae, Kaalmegh (N)/ Kalpnaath, Kalamnaath (Th), Wild, Herb, AGS- 158	Decoction of whole plant along with seed of Kalo marich (<i>Piper nigrum</i> L.) powder is given orally twice a day in chronic fever.
<i>Anthocephalus cadamba</i> (Roxb.) Miq., Rubiaceae, Kadam (N/Th), Wild, Tree, AGS- 89	Stem bark decoction is given orally twice a day in fever
<i>Artemisia indica</i> Willd., Asteraceae, Titepati (N)/ Pati (M/Th), Wild, Herb, AGS- 52	Tender shoot powder is given orally along with luke warm water in pneumonia fever.
<i>Azadirachta indica</i> A. Juss., Meliaceae, Neem (N/M/Th), Wild, Tree, AGS- 8	Leaves powder with luke-warm water is given orally once a day after breakfast in chronic intermittent fever.
<i>Barleria cristata</i> L., Acanthaceae, Bhendekuro (N/Th), Wild, Shrub, AGS- 107	Infusion of whole plant is given orally twice a day in fever.
<i>Berberis aristata</i> DC., Berberidaceae, Chutro (N)/ Chautari (M/Th), Wild, Shrub, AGS- 174	Decoction of root is given orally in malarial fever.
<i>Bergenia ciliata</i> (Hawk.) Sternb., Saxifragaceae, Paakhanved (N/M), Wild, Rhizomatous creeping Herb, AGS-241	Decoction of rhizome is given orally twice a day in pneumonia fever.
<i>Callicarpa macrophylla</i> Vahl., Verbenaceae, Daheechaunle (N)/ Dahigola (Th), Wild, Shrub, AGS- 198	Raw use of flowers and fruits twice a day reduce fever.
<i>Capsella bursa-pastoris</i> (L.) Medikus, Brassicaceae, Chamsure Jhar (N/Th), Tori ghans (M), Wild, Herb, AGS- 74	Juice of fresh leaves is given orally twice a day in malarial fever.
<i>Capparis zeylanica</i> L., Capparaceae, Kukur kande (N)/ Bagh Mukhe (M)/Kareura (Th), Wild, Climbing Shrub, AGS- 176	Infusion of whole plant is given orally twice a day in fever.
<i>Cassia fistula</i> L., Fabaceae, Raajbrikchha (N/M), Amaltash (Th), Wild, Medium Sized Tree, AGS- 127	Decoction of flower is given orally twice a day in chronic fever.
<i>Centella asiatica</i> (L.) Urban, Apiaceae, Ghodtapre (N)/ Tapre jhar (M)/Ghortapya (Th), Wild, Creeping Herb, AGS-36	Juice of leaves along with leaf juice of Tulsi (<i>Ocimum tenuiflorum</i> L.) and seed powder of Kalo marich (<i>Piper nigrum</i> L.) is given orally thrice a day in malarial fever.
<i>Chenopodium murale</i> L., Chenopodiaceae, Kalo Betha (N)/ Chirru Bethuwa (Th), Wild, Herb, AGS- 131	Seed powder boiled in milk and given orally twice a day in fever.
<i>Cissampelos pareira</i> L., Menispermaceae, Batule lahara (N)/ Badal pate (M)/ Ghau patya (Th), Wild, Climber, AGS- 182	Juice of aerial parts is given twice a day in chronic fever.

Table 1(Contd.): Name of plant species administrated as antipyretics

Scientific name, family, vernacular name, habit, and voucher number	Method of crude drug administration.
<i>Cleome viscosa</i> L., Capparaceae, Ban Methi (N)/ Hurhure (M)/ Ban Toriya (Th), Wild, Herb, AGS-115	Decoction of whole plant is given orally twice a day in pneumonia fever.
<i>Clitoria ternatea</i> L., Fabaceae, Sankhpushpi (N/M), Wild, Climber, AGS- 117	Root infusion is given orally thrice a day in malarial fever.
<i>Cucumis sativus</i> L., Cucurbitaceae, Kaankaro (N)/ Nge (M)/ Khiraa (Th), Climber, AGS- 187	Powder of seeds is given along with Luke warm water thrice a day in fever.
<i>Curcuma long</i> L., Zingiberaceae, Besar (N)/ Beswar (M)/ Hardi (Th), Rhizomatous Herb, AGS-149	Juice of fresh rhizome is given orally twice a day in fever.
<i>Cuscuta reflexa</i> Roxb., Convolvulaceae, Aakashbeli(N)/ Akashe lahara (M)/ Baora (Th), Wild, Parasitic Climber, AGS- 65	Juice of whole plant is given orally twice a day in chronic fever.
<i>Cyperus rotundus</i> L., Cyperaceae, Motha (N)/ Bhada (Th), Wild, Herb, AGS-48	Extract of root is given orally twice a day in fever.
<i>Drymaria diandra</i> Blume, Caryophyllaceae, Abijalo (N)/ Sirbire jhar (Th), Wild, Herb, AGS- 64	Root juice is given orally thrice a day in fever.
<i>Eclipta prostrata</i> (L.) L., Asteraceae, Bhringraaj (N)/ Bhangaraila (Th), Wild, Herb, AGS- 22	Juice of leaves along with honey is given twice a day in chronic fever.
<i>Ficus lacor</i> Buch.-Ham., Moraceae, Pakadi (N)/ Kapara(M)/ Kapro (Th), Wild, Tree, AGS- 111	Decoction of whole plant is given orally in typhoid fever.
<i>Ficus semicordata</i> Buch.-Ham. ex Smith, Moraceae, Khaniyu (N)/ Aarkhot (M/ Kurkhuri (Th), Wild, Tree, AGS- 190	Milky sap of aerial parts diluted once in water and given in typhoid fever.
<i>Justicia adhatoda</i> L., Acanthaceae, Asuro (N)/ Bhasak, Roos (Th), Wild, Shrub, AGS- 14	Whole plant is boiled in water and vapor treatment is given to the patient in fever due to cold.
<i>Leucas cephalotes</i> (Roth.) Spreng., Lamiaceae, Dron pushpi (N)/ Gumpati, Gumma (Th), Wild, Herb, AGS- 120	Juice of whole plant along with seed powder of kalo marich (<i>Piper nigrum</i> L.) is given twice a day in chronic fever.
<i>Momordica charantia</i> L., Cucurbitaceae, Tite Karela (N/M/Th), Climbing Herb, AGS- 76	Decoction of leaf is given twice a day in fever.
<i>Nyctanthes arbor-tristis</i> L., Oleaceae, Paarijaat (N), Wild, Shrub, AGS-383	Juice of fresh leaves is given orally in typhoid fever.
<i>Ocimum tenuiflorum</i> L., Lamiaceae, Krishna Tulsi (N)/ Tilsi (Th), Wild, Herb, AGS- 24	Decoction of whole plant is given in fever..
<i>Phyllodium pulchellum</i> (L.) Desv., Fabaceae, Bhatte (N/M), Wild, Shrub, AGS-351	Seed paste along with Luke warm water is given in fever.

Table 1(Contd.): Name of plant species administrated as antipyretics

Scientific name, family, vernacular name, habit, and voucher number	Method of crude drug administration.
<i>Pongamia pinnata</i> (L.)Pierre, Fabaceae, Kaarengae (N)/ Kadaza(Th), Wild, Tree, AGS- 357	Seeds of kaarengae (<i>Pongamia pinnata</i>) and seeds of kalo marich (<i>Piper nigrum</i>) grind together with little amount of water, pellets of gram size are prepared, two pellets are given twice a day in fever.
<i>Premna barbata</i> Wall. ex Schauer, Verbenaceae, Gineri (N/M), Wild, Tree, AGS-233	Stem bark decoction is given twice a day in fever.
<i>Scoparia dulcis</i> L., Scrophulariaceae, Patal misri (N)/ Chini jhar (Th), Wild, Herb, AGS- 360	Root juice is given twice a day in fever.
<i>Solanum surattense</i> Burm f., Solanaceae, Bhatkoeyaa (Th), Wild, Herb, AGS- 317	Decoction of whole plant is given in fever.
<i>Terminalia bellirica</i> (Gaertn.) Roxb., Combretaceae, Barro (N/M)/Baheda (Th), Tree, AGS- 39	Fruit powder is given along with luke-warm water thrice a day in fever.
<i>Tinospora sinensis</i> (Lour.) Merr., Menispermaceae, Gurjo(N)/ Gurjigana (M)/Gurja (Th), Wild, Climber, AGS-55	Extract of root is given thrice a day in fever.
<i>Trigonella foenum-graecum</i> L., Fabaceae, Methi (N/Th), Herb, AGS-105	Infusion of leaves is given orally in rheumatoid fever.
<i>Vitex negundo</i> L., Verbenaceae, Simali (N)/Sewali (M)/ Sewani (Th), Wild, Shrub, AGS-69	Leaf juice is given orally twice a day in fever.
<i>Xanthium strumarium</i> L., Asteraceae, Bhende Kuro (N/M)/ Lapetua (Th), Wild, Herb, AGS-59	Leaf decoction is given twice a day in malarial fever
<i>Zingiber officinale</i> (Willd.) Rosc., Zingiberaceae, Aduwa (N)/ Chhebok (M)/ Sutho (Th), Rhizomatous Herb, AGS- 94	Juice of rhizome is given along with honey four times a day in fever

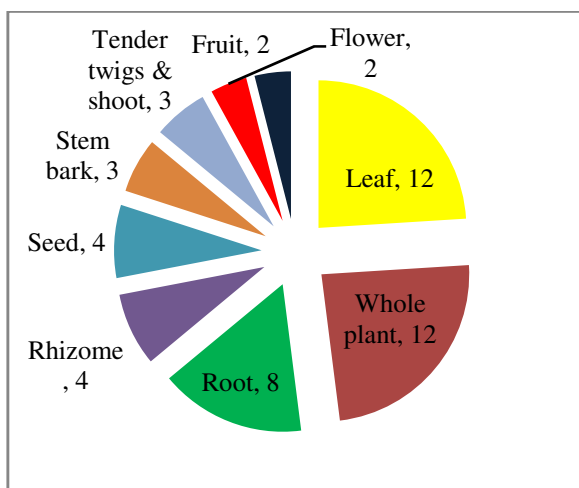


Fig. 2: Plant parts used as antipyretic agents

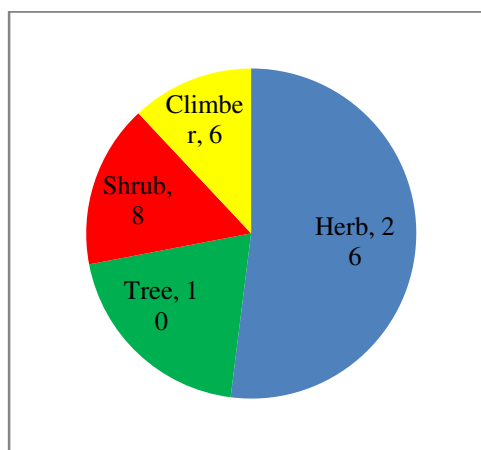


Fig. 3: Growth forms of plants collected from study area

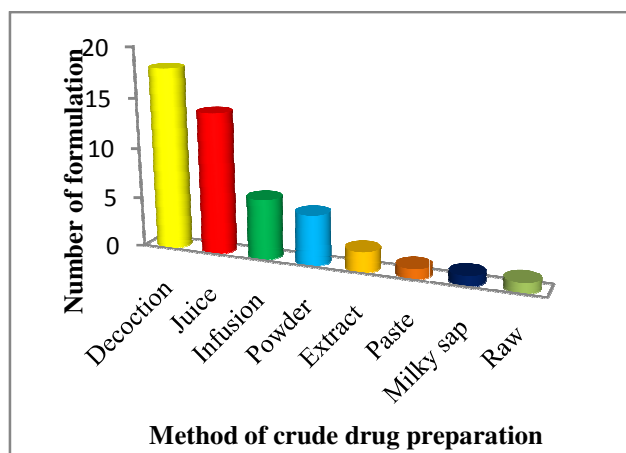


Fig. 4: Methods of processing for crude preparation in the study area

Conclusion

This study revealed that the peoples of study area still used traditional medicinal plants for the treatment of different types of fevers. In the present study it was found that a total of 50 plant species belonging to 31 families are utilized in Rupandehi district of western Nepal as a medicine for fever. Considering the plant parts used, over 50% of the plant collections involve destructive practices because of the use of plant parts like whole plant (24%), root (16%), rhizome (8%), stem bark (6%), and tender shoot (6%). This pattern of use poses a definite threat to the genetic stocks and to the diversity of medicinal plants. Therefore, the herbal heritage of this district must be protected for future which may ultimately lead to the development of new molecules for human health as well as national economy.

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