Volume 2 (2), 2014, Page-185-190
e-ISSN: 2348-6465

Pharma Health Sciences

International Journal of Pharma Research and Health Sciences

Available online at www.pharmahealthsciences.net

Original Article

Ethnopharmacological survey on bone healing plants with special references to *Pholidota articulata* and *Coelogyne cristata* (Orchidaceae) used in folk tradition of Kumaon, Uttarakhand, India

Chetan Sharma, Tejaswita Kumari, K R Arya *

Botany Division, CSIR-Central Drug Research Institute, Lucknow, 226031, Uttar Pradesh, India.

ARTICLE INFO

Received: 13 Apr 2014
Accepted: 24 Apr 2014

ABSTRACT

Aim: This study was aimed to conduct an ethnopharmacological survey and document the medicinal plant used for healing fractures in folk tradition of Kumaon, Uttarakhand, India. *Materials and methods*: The Ethnopharmacological survey study was conducted during March 2011 to November 20-12 by interviewing 60 informants including common villagers (VG) and herbal practitioners (HP) of Almora, Nainital, Bageshwar and Pithoragarh districts of Kumaon, Uttarakhand, India. Recorded information was further cross checked and verified through published literature *Results and Discussion*: The study provides a list of 15 genera belonging to 13 families used for the treatment of fractured bone in folk tradition of Kumaon, Uttarakhand, India, pertaining with detail ethnopharmacological data of *Pholidota articulata* Lindley and *Coelogyne cristata* Lindley (Orchidaceae), the most popular plants for healing fractures. *Conclusion*: Ethnobotany has led to identification of novel pharmacological agents and highlights the potential uses of indigenous knowledge as a research tool for identification of bioactive molecules. Finding of this study highlighted the medicinal plants used in folk medicine during the treatment of fractures in Kumaon region, Uttarakhand, India. could be useful for rapid screening of folklore medicinal plants for determining their medicinal uses and further pharmacological examination for long term studies.

Key words: Bone healing, *Pholidota articulata*,*Coelogyne cristata*, Kumaon, Folk medicine

1. INTRODUCTION

Kumaon region of Uttarakhand, India extended from the latitudes 28^0 44' and 30^0 49'N and longitude 78^0 45' and 81^0 1'E surrounded by the international boundaries, Nepal in the East, China in the North. Geographically Kumaon has four longitudinal

Corresponding author *

E-mailaddress: kr_arya@cdri.res.in (Dr.K.R. Arya)

CDRI communication no. 8672

Botany Division, CSIR-Central Drug Research Institute, Lucknow, 226031, Uttar Pradesh, India.

physiographic subdivisions namely the outer Himalaya with Tarai and Bhabar belt and Shivalik ranges, the lesser Himalayas and the Trans-Himalaya domain of Bhotland. The remote belts of these localities are inhabited by several ethnic groups, mainly Bhotia, Raji, Jounsari, Tharu, etc. Their folklore knowledge is a good illustration passing their wealth of knowledge from generation to generations. They are fighting even number of chronic diseases like tuberculosis, cancer, jaundice, arthritis, rheumatisms malaria etc. with the traditional medicinal plants. [1-4] Religious inspiration, unavoidable factors of inaccessibility and lack of medicinal facilities in remote hilly areas seem to be the main causative factors of depending on the traditional herbal practitioners (*Vaidyas*) and the medicinal plants for their healthcare. Chemical and pharmacological investigations of these traditional medicines have very often provided novel bioactive compounds for modern therapeutics. Prostratin, an HIV therapeutic that activates latently infected T-cell pool [5] has been discovered from ethnobotanical work in Somoa. [5, 6] Unusual rains, mild to heavy snow fall, slippery habitats and natural calamities in high mountain areas of Uttarakhand Himalayas always invite with a high risk of fractures in animals as well as human beings. On the basis of our previous ethnobotanical studies [7, 8] we have been isolated four bioactive compounds including one novel compounds for rapid fracture healing [9, 10] from *Ulmus wallichiana*, a folk traditional plant used for healing fractures in Kumaon and Garhwal Himalaya. This study was also aimed to document another plants used for the treatment of fractured bones to search more natural occurring bio-molecules as a potential source for pharmaceutical applications. A brief ethnopharmacological and chemical data on *Pholidota articulata* and *Coelogyne cristata* the most popular folk medicine used for healing fractures in Kumaon region, Uttarakhand, was also described. However, the detail studies on phytochemical identification and pharmacological action for bone healing activity is under progress.

2. MATERIALS AND METHODS

Study sites (Fig. 1) i.e Nainital, Almora, Bageshwar and Pithoragarh districts of Kumaon region, Uttarakhand were selected for the present study. These sites varied in altitude from 800 msl to 1098 msl and geomorphologic characters, substrate and ecological conditions. Ethnopharmacological data were collected from March 2011 to November 2012 from 60 informants aged between 45-75 involving common villagers (VG) and recognized traditional herbal practitioners (HP) known as *Vaidyas*. In each locality, all the informants (VG and HP) were interviewed directly in Kumauni and Hindi languages. Interviews were arranged by village level health workers familiar with local languages and the medicinal plants used for the treatment. Interviews were documented with notebooks. Information provided by them was cross verified from the informants of other localities as well as through literature. Plant species (Table 2) were identified with local names by respondents and then identified taxonomically according to the Flora of District Garhwal, North West Himalaya, India [11]. Herbarium specimens were housed in the Departmental Herbarium CSIR-Central Drug Research Institute, Lucknow, India. The species were listed in alphabetical order by scientific name, local name of the region, family, voucher specimen number and percent popularity of use. The percent of citation (PC) of the plant species being utilised was evaluated using the formula: (number of respondents mentioned the use of particular species/total number of respondents interviewed) x 100. Chemical profiling was done through quadrupole time of flight (QTOF) mass spectrometry using Agilent (6520) 1200 HPLC system

equipped with a G1311A quat. pump, G1329A auto sampler and G1315D diode array detector (DAD).

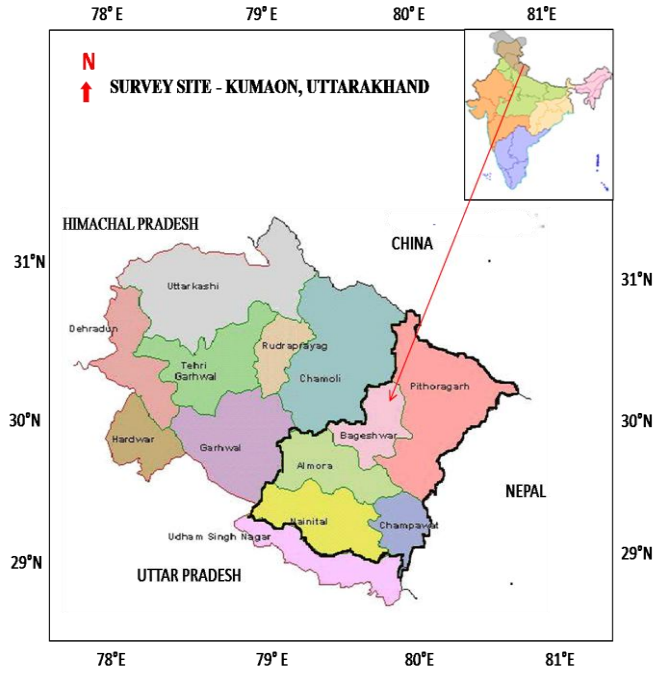

Fig 1: Site map of surveyed areas of Kumaon Himalaya, Uttarakhand

3. RESULTS AND DISCUSSION

The main objective of this study was to inventories the folk traditional plants used during the treatment of fractured bone in remote hilly areas of Kumaon, Uttarakhand, India and to validate these traditional claims through scientific investigations as a future source for identification of potential molecules for clinical drugs. A total number of 15 plant species belonging to 13 families were recorded during the survey by interviewing 60 informants to whom 77 percent were male at the age of about 45 to 75 years followed by 23 percent female between 60-75 years. Among them, 74 percent were common villagers (VG) and 26 percent traditional herbal practitioners (HP) known as *Vaidyas*. During field study, the maximum number of respondents (VG, HP) were participated in Bageshwar district (30%) followed by (20%) in Pithoragarh (Table 1). The ratio of male respondents (VG) at individual survey sites was higher than the female. However, a hundred percent dominance of male traditional herbal practitioners (HP) was recorded at all the survey sites. During treatment, bark, px (whole parts of the plant), root, leaves, seed and resin were used. But altogether 15 plants, bark was preferred in highest number (6) followed by PX (4) and the other parts were lastly preferred (Table-2). Mode of administration for all the plants was based by single means of treatment i.e. application of paste around the fractured parts of the body followed by proper setting of bones with the help of expert bone setters. The fractured part was then tightened with thin cloth by giving a gentle support with cardboard. Length of treatment was varied (3-6 weeks) depending upon the severity of the fractures.

In the cited list of plants, family Orchidaceae contains maximum three plant species *Pholidota articulata*, *Coelogyne cristata* and *Vanda cristata*. *Pholidota articulata* known as bone jointing plant in Kumaon region, Uttarakhand [12] preferred by 82 % followed by *Ulmus wallichiana* 73 % and *Coelogyne cristata* 50 % respectively (Table 2). Chemical profiling of these two epiphytes (Table 3) showed the presence of 13 known chemical moieties (flavonoids) known for the treatment of bone related disorders [13-15] and validate the medicinal uses for bone healing. Literature review on these recorded plants showed, most of the listed plants are also used for the treatment of fractured bones in other regions of India [1,11,12,16-18] and attest the efficacy of these plants for bone healing properties. Indigenous knowledge of medicinal plants and their use offers great opportunities as a unique source for identification of novel pharmacological agents and shows a strong relationship between ethnopharmacological use and medicinal properties of chemical compounds identified from them. Among the listed plants (Table 2) the bark of *Ulmus wallichiana* reported earlier [7, 8] has been investigated for the novelty of its phytochemical composition[10, 19] and pharmacological action for bone healing activities [9, 20]. These earlier published data by

our group were also proving the reliability of this gathered information during the survey.

Table 1: Field data recorded during the interviews of the respondents for traditional bone healing plants at survey sites of Kumaon, Uttarakhand, India

Survey sites	Respondents (%)		Gender ratio			
	VG	HP	VG		HP	
			M	F	M	F
Nainital	10	3.3	9.97	3.33	100	0
Almora	13.3	6.7	20	0	100	0
Bageshwar	30	10	23.33	6.67	100	0
Pithoragarh	20	6.6	13.33	6.67	100	0

Total number of respondents interviewed (VG & HP) were 60; Overall ratio of male (M) and female (F) respondents at survey sites was 77:23 % age between (M) 45-75 and (F) 60-75.

Table 2: Plant species, vernacular name and % popularity of individual species use for bone healing

Scientific name & part used	Vernacular name (Kumauni)*	Families	Voucher number	PC%
Betula utilis D. Don (Bark)	Bhoj	Betulaceae	KRA 24471	25.0
Boehmeria rugulosa Wedd (Bark)	Gheti	Urticaceae	KRA 24487	18.0
Cassia tora L.(Seed & leaves)	Chakunda	Caesalpiniaceae	KRA 24472	22.0
Coelogyne cristata Lindley (PX)	Hadiojen	Orchidaceaen	KRA 24462	50.0
Cryptolepis buchanani Roemer & Schultes (PX)	Dhdhi bel	Asclepiadaceae	KRA 23883	30.0
Cuscuta reflexa Roxb (PX)	Aakashi-bel	Cuscutacea	KRA 24402	20.0
Juglans regia L. (Bark)	Akhrot	Juglandaceae	KRA 23841	18.0
Neolitsea pallens D.Don (Bark)	Chirar	Lauraceae	KRA 22276	13.30
Pholidota articulata Lindley (PX)	Hadiojen	Orchidaceae	KRA 24460	81.66
Pinus roxburghii Sargent (Resin)	Chir	Pinaceae	KRA 23862	33.0
Rheum austral D. Don. (RT)	Dolu	Polygonaceae	KRA 23878	58.33
Sinarundinaria falcata (Leaves)	Ringal	Poaceae	KRA 24489	23.33
Taxus baccata L. (Bark)	Thuner	Taxaceae	KRA 22268	30.0
Ulmus wallichiana Planchon (Bark)	Chamormou	Ulmaceae	KRA 24443	73.33
Vanda cristata Lindley (PX)	Rasna	Orchidaceae	KRA 24490	25.0

*Kumauni is the local languages spoken in Kumaon regin, Uttarakhand, India
*PX-Whole plant without root

Table 3: Chemical profiling of *C. Cristata* and *P. articulata* generated through ESI & QTOF MS with a list of identified compounds

Retention Time	Exact molecular weight	Molecular formula	Error (ppm)	*C. cristata*	*P. articulata*	identified chemical moities
21.964	298.0845	$C_{17}H_{14}O_5$	-1.32	+	-	Cladrin
22.089	284.0698	$C_{16}H_{12}O_5$	-4.66	-	+	7-Hydroxy-5,6-dimethoxy-1,4-phenanthrenequinone, Acacetin, Genkwanin, Wogonin, Prunetin, 5-O-Methylgenistein, Glycitein, Calycosin, Biochanin A
22.267	254.0595	$C_{15}H_{10}O_4$	-6.15	-	+	Chrysin, Ochrone A, 3,4-Dihydroxyflavone, 3,7-Dihydroxyflavone, Crisina, Densiflorol B, Daidzein
23.09	242.0944	$C_{15}H_{14}O_3$	-0.6	+	-	Hircinol
24.31	304.1325	$C_{17}H_{20}O_5$	-4.76	-	+	Dendrocandin A
24.904	300.1001	$C_{17}H_{16}O_5$	-1.25	+	+	Fimbriol A, Gymnopusin
24.948	274.122	$C_{16}H_{18}O_4$	-5.37	-	+	Gigantol
26.934	318.1479	$C_{18}H_{22}O_5$	-3.67	-	+	Chrysotoxin
26.959	240.0795	$C_{15}H_{12}O_3$	-3.76	-	+	Plicatol B, Lusianthrin, Moscatin,Flavidin
16.62, 17.73	594.1599	$C_{27}H_{30}O_{15}$	-2.43	-	+	Scutellarein
23.35, 24.65	270.0903	$C_{16}H_{14}O_4$	-4.19	-	+	Erianthridin, Medicarpin
25.27, 26.64	268.0745	$C_{16}H_{12}O_4$	-3.48	-	+	Formononetin

4. ACKNOWLEDGEMENT

Authors are thankful to Director CSIR-CDRI for encouragement, Chetan Sharma thanks to ICMR for Fellowship and department of SAIF, CDRI for providing facilities. Local informants of survey sites are duly acknowledged for cooperation and help rendered during this study.

5. REFERENCES

1. Maikhuri RK, Nautiyal S, Rao KS & Semwal RL. Indigenous knowledge of medicinal and wild edibles among three tribal sub-communities of the central Himalayas, India. Indigenous Knowledge & Development Monitor 2000; 8: 7-13.
2. Kala CP. Indigenous uses, population density and conservation of threatened medicinal plants in protected areas of the Indian Himalayas. Conservation Biology. 2005; 19: 368-378.
3. Tandon S. Traditional medicinal plants in the management of cancer, Current R & D Highlights, 2006; 15-25.
4. Arya KR, Mishra DK. Anti-arthritic and anti-rheumatic plants of Almora and Bageshwar

districts in Kumaon region of Uttarakhand, India. J Med Aroma Plant Sci 2010; 3: 262-267.

5. Korin YD, Brook DG, Brown S. Korotzer A, Zack JA. Effect of prostratin on T-cell activation and human immunodeficiency virus latency. J Virology 2002; 76: 811-812.
6. Cox PA. Saving the ethnopharmacological heritage of Somoa. J Ethnopharmacol 1993; 38: 181-188.
7. Arya KR, Agarwal SC. Folk therapy for eczema, bone fracture, boils and gingivitis in Taragtal province of Uttaranchal. Indian J Trad Know 2008; 7: 443-445.
8. Arya KR, Sharma D, Kumar B. Validation & quality determination of an ethanobotanical lead for osteogenic activity isolated from *Ulmus wallichiana* Planch: A traditional plant for healing fractured bones. J Sci Ind Res 2011;70: 360-364.
9. Sharan K, Siddiqui JA, Swarnkar G, Tyagi AM, Kumar A, Rawat P, Kumar M, Nagar GK & Arya KR. Extract and fraction from *Ulmus wallichiana* Planchon promotes peak bone achievement and have a nonestrogenic osteoprotective effect. Menopause 2010; 17: 393-402.
10. Maurya R, Rawat P, Sharan K, Siddiqui JA, Swarnkar G, Mishra G, Manickavasagam L, Arya KR & Chattopadhya N. Novel flavonol compounds, A bioactive extract/ fraction from *Ulmus wallichiana* and its compounds for prevention for treatment of osteo-health related disorder. U S Pat Application No. 110003 2009.
11. Gaur RD. *Flora of District Garhwal, North West Himalaya*, (Trans Media Srinagar, Garhwal, India) 1999, 84.
12. Jalal JS, Tiwari LM, Pangtey YPS. *Pholidota articulata* Limdl., An Orchid used in bone jointing in Kumaon region, Western Himalaya. Ethnobotanical Leaflets 2009; 13: 147-150.
13. Beck V, Rohr U & Junqbauer A. Phytoestrogens derived from red clover: An alternative to estrogen replacement therapy. J Steroid Biochem Molecular Bio 2005 ; 94 : 499-518.
14. Rassi CM, Lieberherr M, Chaumaz G, Pointillart A, Cournot G. Down regulation of osteoclast differentiation by daidzein via caspase 3. J Bone Miner Res 2002; 17: 630-638.
15. Tyagi AM, Gautam AK, Kumar A, Srivastava K, Bhargavan B, Trivedi R, Saravanan S, Yadav DK, Singh N, Pollet C, Brazier M, Mentaverri R, Maurya R, Chattopadhyay N, Goel A & Singh D. Medicarpin inhibits osteoclastogenesis and has nonestrogenic bone conserving effect in ovariectomized mice. Molecular & Cellular Endocrinology 2010; 325: 101.
16. Ballabha R, Singh D, Tiwari JK, Tiwari P. Diversity and availability status of ethno-medicinal plants in the Lohba range of Kedarnath forest of Division, KFDI, Garhwal Himalaya. Global J Res on Med Plants & Indig Medicine 2013; 2: 198-212.
17. Tayung K, Saikia N. *Cryptolepis buchanani* –A less-known medicinal plant used in bone fracture. Ind J Trad Knowledge 2003; 2: 371-374.
18. Negi VS, Maikhuri RK, Vashishtha DP. Traditional healthcare practices among the villages of Rawain valley, Uttarkashi, Uttarakhand, India. Ind J Trad Knowledge 2011; 10: 533-537.
19. Rawat P, Kumar M, Sharan K, Chattopadhyay N & Maurya R. Ulmoside A and B: Flavanoids 6-C glucosides from *Ulmus wallichiana*, stimulating osteoblast differentiation assessed by alkaline phosphitage. Bioorganic & Medicinal Chemtry Letters 2009; 19 : 4684-4686.
20. Swarnkar G, Sharan K, Siddiqui JA, Chakravarti B, Rawat P, Kumar M, Arya KR, Maurya R, Chattopadhyay N. A novel flavonoid isolated from the stem-bark of *Ulmus Wallichaiana* Planchon

stimulates osteoblast function and inhibits osteoclast and adipocyte differentiation. Eur J Pharmacol 2011; 658: 65-73.