ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 6, Issue 2, pp: (180-185), Month: April - June 2018, Available at: www.researchpublish.com

DOCUMENTATION OF MEDICINAL PLANTS USED BY THE LOCALS OF KULDIHA WILDLIFE SANCTUARY, ODISHA IN THE TREATMENT OF CHRONIC JOINT PAINS

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Abstract: **An investigation on the utilization of medicinal herbals to treat chronic joint pains, through ethnobotanical approach adapted by the rural communities of Kuldiha Wildlife Sanctuary, Odisha, was undertaken. A total of 15 plant species, comprised 14 genera, included in 13 families were documented in this survey. The work was accomplished through survey, plant specimen collection and interviews done in two years on various seasons. Standard quantitative ethnobotanical techniques and use value index of the herbs were used to quantify the ethnobotanical use. A total of 15 plant species of 14 genera included 13 families were identified to be useful in treating chronic joint pain. Most of the plant components including root, bark, stem, seeds and leaf components were found utilized in the treatment of acute joint pain. The present report of information on the use of plant species such as *Alstonia scholaris* (L.) R. Br., *Cryptolepis dubia* (Burm.f.) M.R. Almeida, *Drimia indica* (Roxb.) Jessop, *Olax scandens* Roxb., *Xantolis tomentosa* (Roxb.) Rafin., for this treatment of this particular disease are relatively new. The results of the present study further emphasize to adapt conservation measures to facilitate sustainable utilization of these plant resources.**

Keywords: **Kuldiha Wildlife Sanctuary, Ethnomedicinal Plants, Chronic Joint Pains, Sustainable Utilization.**

1. INTRODUCTION

Chronic joint pain can be caused by a multitude of factors, with osteoarthritis and rheumatoid arthritis being the most common conditions, particularly in individuals above the age of 55 years (Goldring & Goldring, 2006). Osteoarthritis is a degenerative joint disease characterized by damage to the articular cartilage, changes in subchondral and marginal bone, synovitis and capsular thickening and it usually affects the weight-bearing joints (Bendele, 2001). Rheumatoid arthritis manifests as a systemic autoimmune disorder, with pain, inflammatory reaction and tissue damage in multiple joints (Wood, 2004). About 1% of the population gets affected with this trouble and it is also found that women get affected in higher numbers, when compared with men. Osteoarthritis is a common problem affecting over 60% of all people by the age of 50 years (Wood, 2004; Lawrence *et al.*, 2008). Various kinds of treatment practices are employed for the relief from this ailment including home medicine, application of ethnobotanical knowledge, non-codified medicinal practices including traditional healing; codified medicinal practices such as Siddha, Homeopathy, Unani and Allopathy. In India, application of ethnobotanical knowledge has been done, since time immemorial. Ethnobotanical utilization has multiple benefits as this method is cheap and effective and mostly preferred by the tribal communities and rural population in most parts of India (David *et al.*, 2011; Rasingam *et al.*, 2012). Up to 70% of the rural population still depending up on plant resources in their vicinity for healthcare and other necessities of life. There is increase in the rate of utilization of

ethnobotanical knowledge as it reaches common people of all range of economic groups, renewable, and very useful in healing a variety of human ailments (Kamboj, 2000).

In India, native people are utilizing a variety of herbs for effective curing of various ailments. The plant parts used, preparation and administration of drugs vary from one place to other (Rao & Negi, 1980; Sukumaran *et al.*, 2008). Urbanization and development activities have resulted in the decline of interest in traditional culture as well as natural vegetation in India (Rajkumar & Shivanna, 2010). Forest degradation process adversely affected the resource of medicinal plants. The rural poor, whose dependency on these products is very heavy, and hence, the loss of such diversity directly affecting the rural community adversely. Unfortunately, much of the ancient knowledge and many valuable plants are being lost at an alarming rate and are at the verge of extinction. It is estimated that 10% of all plant species are currently endangered in India (Ignacimuthu *et al.*, 2008). Therefore, it is very essential to document the plants that have been used in the traditional healing systems, from which the management strategy could be developed to preserve the treasure chest of medicinal plants of native habitats, before they become extinct.

Reports are available scantily on the medicinal plants and their uses by the local communities of Kuldiha Wildlife Sanctuary (Pattanaik & Reddy, 2008; Saravanan *et al.*, 2017). About 1000 individuals of tribal communities live in the sanctuary, and they have traditionally been treating joint pains (osteoarthritis and rheumatoid arthritis) using medicinal plants. However, the ethnobotanical knowledge on treating rheumatoid arthritis by the rural population of KWLS has not been documented so far. The present study was initiated to investigate on the ethnomedicinal knowledge of using some medicinal plants by the local communities of KWLS, in the treatment for acute joint pains.

2. MATERIAL AND METHODS

Study area

Kuldiha Wildlife Sanctuary is situated in the southern part of the district of Balasore in the state of Odisha, spreading to a total geographical area of 272.75 km^2. It lies between 21º20'31"–21º29'08" N and 86º25' 23"–86º44'50" E. The forest region of this sanctuary lies on the Nato and Suklupata hills, where the Similipal National Park is also situated. The sanctuary supports dry deciduous forest, dominated by trees of *Salix tetrosperma*. Santhal is the major tribal community, residing in the sanctuary region.

Data collection

Extensive field surveys were undertaken in the sanctuary, covering different seasons between 2014 and 2016. Semi-structured interviews were conducted, based on the knowledge system developed by Martin (1995) among the rural communities of varying groups, including herbal practitioners, elderly persons who have been traditionally using medicinal plants for healing various ailments. All interviews were performed in the local Odiya language. In order to obtain unbiased information, an introductory seminar by key stakeholders and cultural officers preceded for undertaking interview session. Leading questions, technical terms and jargons were avoided when asking the questions. All the questions addressed general medicinal plant usage, especially in the management of chronic joint pains. The gathered information was cross-checked with people in other villages and other individuals practicing in or near the locality from where the plant materials are collected.

Plant collection

During the field surveys specimens of medicinal plants were collected either with flowers or fruits for correct determination of plant names. Collected plant specimens were identified with the help of published regional Floras (Gamble, 1915–1936; Saxena & Brahmam, 1996). Voucher specimens of the collected medicinal plants with accession number have been deposited in the herbarium of the Central Botanical Laboratory, Botanical Survey of India, Howrah.

Statistical Analysis

Standard quantitative ethnobotanical techniques (Byg & Balslev, 2001; Albuquerque *et al.*, 2006) were applied in the comparison of the uses and cultural importance of different plant species. The local importance of each species was measured by a use-value (UV). This technique measures how many medicinal uses for a given species an informant knows relative to the average knowledge among all informants (Phillips & Gentry, 1993; Gomez-Beloz, 2002; Albuquerque *et al.*, 2006). A high use-value indicates a relatively important species.

$$UV = \frac{\sum \text{Number of uses mentioned by each informant for a given species}}{\text{Total number of informants}}$$

The relative frequency of citation (Rfc) for each medicine used in treating a particular ailment is the ratio of the frequency of citation by informants to that with all other medicines cited in the study (Kumar *et al.*, 2012, 2013). The high consensus for a particular medicine demonstrates the use is genuine for that cultural group.

$$Rfc = \frac{\text{Frequency of citation}}{\sum \text{Frequency of citation of all medicines}} \times 100$$

$$\text{Frequency of Citation} = \frac{\text{Number of informants who cited the medicine}}{\text{Total number of informants interviewed}} \times 100$$

3. RESULTS AND DISCUSSION

A total of 15 flowering plant species belonging to 14 genera under 13 families were identified to be useful in treating chronic joint pains (Table 1). Apocynaceae constitute the maximum number of species used for treating chronic joint pains.

Various parts of the plants were utilized in the preparation of medicines for treating chronic joint pains among the locals in this area. In majority of the species (31%) the medicines were obtained from the leaves. Except those plants from which the drugs are obtained from leaves the use of seeds, roots or stems in plants are found to be a destructive means of obtaining the herbal remedies for ailments. The parts utilized show that most of the herbal medicines (56%) for chronic joint pains are obtained from seeds, roots, stems and the bark. This calls for conservation measures to facilitate sustainable utilization of these plant resources (Fig. 1). The results show that 33% of remedies used in the treatment of chronic joint pains are derived from trees (Fig. 2).

Semecarpus anacardium L.f., *Calotropis procera* W.T. Aiton, *Oroxylum indicum* (L.) Benth. ex Kurz, *Celastrus paniculatus* Willd. have been reported to be widely used (Pattanaik *et al.*, 2008; Rout *et al.*, 2009; Singh *et al.*, 2010) as chronic joint pain remedies and hence these species need to be conserved effectively through sustainable utilization for posterity. A comparison of ethnobotanical data gathered in the present study with Indian medicinal plant literature (Kirtikar & Basu, 1951; Jain, 1975; Chopra *et al.*, 1976; Ambastha, 1986) indicated that the information regarding the use of some plants (*Alstonia scholaris* (L.) R. Br., *Cryptolepis dubia* (Burm.f.) M.R. Almeida, *Drimia indica* (Roxb.) Jessop, *Olax scandens* Roxb., *Xantolis tomentosa* (Roxb.) Raf.), for this particular disease are relatively new reports.

Plants with UV of 1.00 (Table 1) or more indicate their high importance and extensive extraction for making medicine, and such plants should be conserved. Relative frequency of citation expresses the consensus of opinion regarding the use of the plant for a particular disease. In this study Rfc values range between 3.70 and 11.11. Rfc values 5.00 or more is more popular among the tribals of KWLS (Table 1).

4. CONCLUSION

This documentation reports the ethnomedicinal uses of plants, used for chronic joint pains by the local communities of KWLS. The outcome of the present study would be immensely helpful in understanding and appreciating the multiple values and potential of native plants and would also contribute considerably to narrowing the gap in literature. Furthermore, this study would create scope to undertake more studies on the plants listed in this study, and the plants can be analyzed further to understand their curing potential on other ailments. Plants with high use value should be protected by adapting proper conservation measures, which are essentially required to design better conservation strategies to preserve and conserve the existing biodiversity.

5. ACKNOWLEDGEMENTS

We are grateful to Dr. Paramjit Singh, Director, Botanical Survey of India, Kolkata, for providing all facilities to undertake research in the KWLS. We are thankful to the PCCF (Wildlife), Odisha, DFO, Balasore and all other forest officials of Balasore Wildlife Division, for granting permission and logistic support during field surveys in the protected forest area. We sincerely thank all the officers and staff of BSI, Kolkata, especially Drs. Harish Singh, Aris Dason, P.A. Dhole and M. Mishra, for their kind cooperation in preparation of the manuscript. We are indebted to field trackers,

elephant watchers of Kuldiha Wildlife Sanctuary, for their excellent assistance in the field.We are also highly grateful to tribal informers and medicine men, who had generously shared their traditional knowledge and wisdom with us.

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APPENDIX – A

List of Figures:

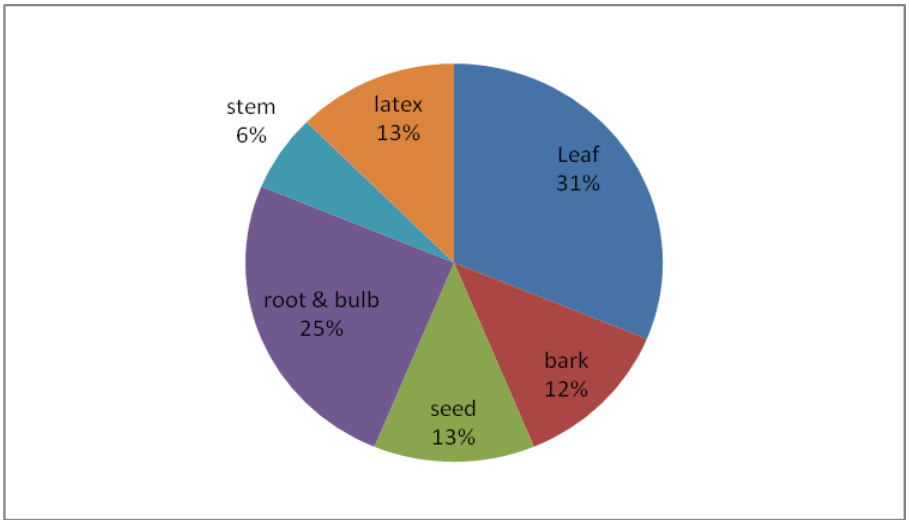

Fig. 1: Utilization of the plant components in treatment of chronic joint pains, by the local communities of Kuldiha Wildlife Sanctuary, Odisha

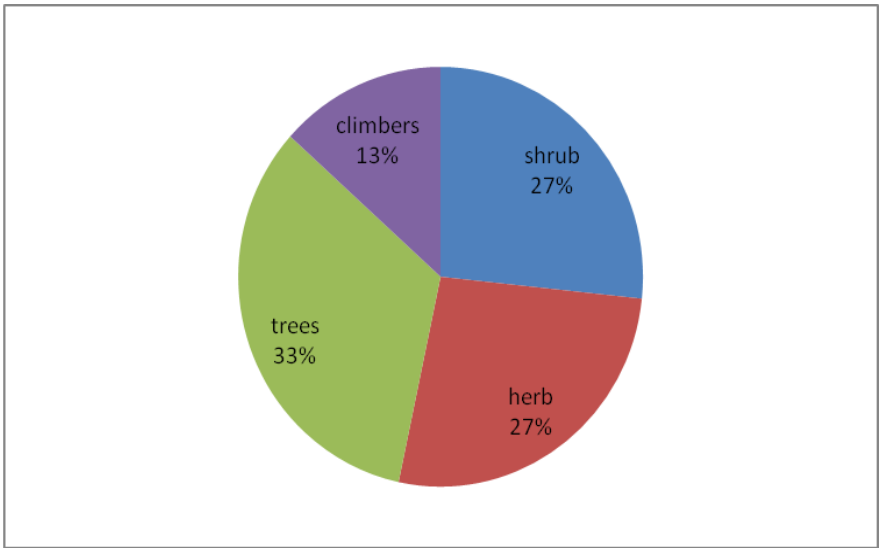

Fig. N: Utilization of plants (in %), growing in various forms, used in the treatment of chronic joint pains by the rural communities of Kuldiha Wildliffe Sanctuary, Odisha

ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 6, Issue 2, pp: (180-185), Month: April - June 2018, Available at: www.researchpublish.com

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TABLE 1. Enumeration of plants used in treatment of chronic joint pains in Kuldiha Wildlife Sanctuary, Odisha

Plant Name (Acc. No.)	Local Name	Family	Habit	Method of Use	UV	Rfc
Acanthus ilicifolius L. (CBL35886, 33634)	Harkach	Acanthaceae	Shrub	Leaf paste is applied on joints with rheumatic pains	1	7.41
Anacardium occidentale L. (CBL35921, 33662)	Bhalia	Anacardiaceae	Tree	Seed oil applied on joints with rheumatic pain	1.25	9.26
Alstonia scholaris (L.) R. Br. (CBL35896, 34574, 33653)	Chhatin	Apocynaceae	Tree	Stem bark with latex is pasted and applied externally on joints with rheumatism	0.67	6.48
Calotropis gigantea (L.) R. Br. (CBL34469, 33591)	Akand	Apocynaceae	Shrub	Leaf paste is applied externally on joints with rheumatic pain	1.33	11.11
Calotropis procera Aiton (CBL35871)	Arakh	Apocynaceae	Shrub	Leaf paste is applied on joints with pain.	1	8.33
Cryptolepis dubia (Burm.f.) M.R. Almeida (CBL33713)	Dudhi	Apocynaceae	Climber	Latex of the plant is applied externally on joints with rheumatic pain.	0.67	5.56
Drimia indica (Roxb.) Jessop (CBL35796)	Banpyoj	Asparagaceae	Herb	The oil boiled with paste of the bulb applied externally on joints for one month to cure rheumatic pain	0.42	3.7
Oroxylum indicum (L.) Benth. ex Kurz (CBL35749, 34453, 33926)	Phemphana	Bignoniaceae	Tree	Stem bark and seed paste is applied on rheumatic pain.	0.92	7.41
Capparis zeylanica L. (CBL36405)	Asadua	Capparaceae	Herb	Root juice taken in rheumatic pain	0.75	6.48
Celastrus paniculatus Willd. (CBL36545, 35687, 34462, 33694)	Karsanao	Celastraceae	Climber	Seed oil is used for skin diseases and applied on joints to relief pain	1	8.33
Caesalpinia bonduc (L.) Roxb. (CBL33654)	Nata-karanjo	Leguminosae/ Caesalpinioideae	Shrub	Leaf paste is applied on joints with rheumatic pain.	0.67	5.56
Olax scandens Roxb. (CBL35611, 34309, 33798)	Badalia	Olacaceae	Herb	Leaf paste applied on joints with rheumatic pain	0.5	4.63
Nyctanthes arbor-tristis L. (CBL34385, 33732)	Gangaseoli	Oleaceae	Herb	Bark paste applied on joints with pains.	0.75	6.48
Mitragyna parvifolia (Roxb.) Korth (CBL35647, 33860, 34356)	Gudikaima	Rubiaceae	Tree	Root paste applied on joints with rheumatic pain	0.83	5.56
Xantolis tomentosa (Roxb.) Raf. (CBL35642, 34540)	Kantaboro	Sapotaceae	Tree	Root bark crushed mixed with rice and given in rheumatism	0.42	3.7