ISSN (Online): 2091-2609
DOI Prefix: 10.3126/ijasbt

International Journal of Applied Sciences and Biotechnology (IJASBT)
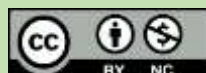
Research Article

Ethnobotanical Survey of Medicinal and Aromatic Plants of Bhagalpur Region

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Abstract

Medicinal and aromatic plants have been used since the time immortal in different parts on the world including India. Ayurveda provides a detailed insight of different medicinal plants and their use. Different regions of India have a array of different types of medicinal and aromatic herbs. Depending upon climate and soil they may have different degree of pharmacological importance. Lower Gangetic plane present at around eastern part of the Bihar has some sort of Medicinal and Aromatic plants common to Bhagalpur and nearby region. These plants were surveyed on non-agricultural fields of four different localities of Bhagalpur by using quardat method. Abundance, Counts, Cover, Frequency and relative importance were calculated as a whole. About 14 plants were recorded having either well known medicinal or aromatic properties in a total survey area of $1000m^2$.

Introduction

Bhagalpur is situated at Gangatic basin and comes in sub-tropical climatic condition. The city of Bhagalpur in eastern Bihar state of Indian subcontinent is mostly famous for products made from silk. After silk production, rice and sugar are two mostly produced end products from this city. Bhagalpur stands on the bank of the banks of the plane of Ganga basin, where the location lies $25^o15'$N latitude and $87^o0'$E longitude. This city is situated at the height of 144 feet above the sea level. The mean temperature ranges around 38^oC in summers and 12^oC during winters. Annual rainfall soil texture revels that Bhagalpur consist reddish alluvial soil in southern part of the district. This alluvial soil has been created by the floodwater of the Ganga River and other tributaries as well (the original, 2011). Likewise, the central part of the district bears light red adhesive soil which is important to produce ricks and tiles. The northern and western part has river sandy soil which is resulted because of annual flood visits. The vegetations of Bhagalpur district are basically sub-tropical or mesophytic type. Common medicinal plants include Sinuar, Sheo, Babul, Kakatia, Kataiya, Behaya and Mirchaiya plants.

Economy of Bihar, dependent almost exclusively upon agriculture is full of potentialities. The state has been

striving to emerge as one among the foremost in improving the produce from fields. However, the technological investment in the development on agriculture dependent on cultivation of traditional crops under recurrent a biotic stress like periodic drought, flooding and increasing salinity etc. have not shown desired results. The dependence of agriculture economy almost entirely on primary output further adds to miseries of the people.

Bhagalpur is divided into two geographical regions due to the bifurcation made by Ganges as- North plains and South plains. North plain is somewhat having more greenery with respect to Southern plains. Southern plain has different soil structure with respect to northern plain. Another river known as Koshi is responsible for the Northern plain formation along with river Ganges. Southern part is solely created by Ganges siltation and rocky series and thus has different plain structure. This leads to the differences in soil fertility, water holding capacity, level of different minerals and soil micro-flora. These differences altogether influence the type of vegetation and their abundance. Both regions have a quite large numbers of medicinal and aromatic plants out of them there are some common plants have almost no difference in their occurrence and distribution across both Northern and Southern plains. Likewise, some plants show more abundance at a particular plain.

The present study was undertaken with a view to make a depository in the form of nursery to conserve and evaluate these medicinal and aromatic plants as a particular ecotype of this particular unique geographical region.

Medicinal Plants
Different plants that are known to human civilization since the time immortal have remarkable medicinal properties. Due to lack of awareness and growing use of allopathic and related medicines the knowledge of traditional medicinal herbs becomes very limited. Different Eco-climatic zones have different endemic medicinal plants having quite different spectrum of phyto-chemicals. Lower Gangetic plains of the Bhagalpur region is impregnated with the frequent floods of river Koshi along with alluvial soil spread by Ganges (Ambastha *et al*., 2016). The traditional indigenous uses of medicinal plants were well known to the aboriginals of different parts of the world and thus helping the present-day treatment of number of ailments and now extensively investigated by modern medicinal scientists for new possible drugs (Jima and Megersa., 2018).

Methodology

Survey Area
The survey of medicinal and aromatic plants was done in 4 different stages incorporating 4 different selected zones, two zones at each Northern and Southern plains.
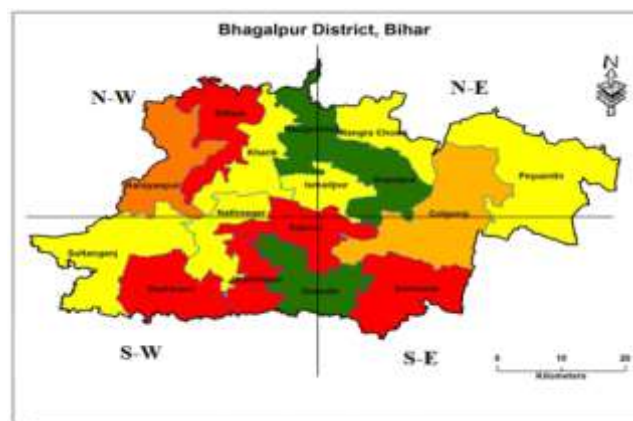

Fig. 1: Map showing location of survey divided in to four zones. [Zone I – North-Eastern Zone; Zone II – North-Western Zone; Zone III – South-Eastern Zone; Zone IV –South-Western Zone]

Collection of Specimen
The specimens were collected as possible for their identification and catalogue preparation. The collection of specimens was done according to standard methods including the use of vasculum and other collecting bags. The photographs were taken at site of collection and at the department for catalogue preparation.

Sampling of Medicinal and Aromatic plants
Plants were sampled according to Quadrat method: in this piece of work square quadrat sampling method was selected for the survey of medicinal and aromatic plants of Bhagalpur region (Aberdeen., 1958).

Results and Discussion
The average number of plants, mean value of quardat and a total area of 1000m2 were considered for the final data compilation. From the Table 1. it is obvious that a total of 14 medicinal plants wildly growing in different regions of Bhagalpur were recorded. Samplings were done randomly from four different regions of Bhagalpur as a strategy divided into 4 zones to minimize data sampling biasing. It was obvious that D. bipinnata were recorded in maximum quardats (08) and present in more frequency in and have maximum relative coverage in comparison to other medicinal plant species identified during survey. Among the common medicinal plants having moderate density and coverage includes *A. racemosum*, *G. Sylvestris*, *A. paniculata*, *R. Serpertina*, *W. Somnifera*, *C. roseus*, *C. asiatica*, *L. Aspera*, *L. Camara* and *C. bonplandianum*. These plants were well known for their medicinal properties and used by the local population in different medicinal practices since past. Species E. alba and P. Oleracea were reported to be less frequent in all the area sampled.

Table 1: Occurrence of different species in Different sampling Zones of Bhagalpur Region

S.N.	Botanical name	Zone-I	Zone-I	Zone-III	Zone-IV
1.	*Desmostachrya bipinnata*	++	++	+++	+++
2.	*Asparagus racemosum*	+	+	+	+
3.	*Gymnema sylvestris*	++	++	+	+
4.	*Andrographis paniculata*	++	++	+++	+++
5.	*Rauwolfia serpertina*	+	+	+	+
6.	*WIthania somnifera*	+	+	++	+
7.	*Catharanthus roseus*	+++	+++	++	++
8.	*Centella asiatica*	++	++	++	+
9.	*Bacopa monnieri*	++	++	++	++
10.	*Leucas aspera*	+++	+++	++	++
11.	*Lantana camara*	++	++	+++	+++
12.	*Eclipta alba*	+++	+++	+++	++
13.	*Croton bonplandianum*	++	++	++	++++
14.	*Portulaca oleracea*	+++	+++	++	++

Table 2: Quadrat wise occurrence of species in Different sampling Zones of Bhagalpur Region.

S.N.	Botanical name	Zone-I			Zone-I			Zone-III			Zone-IV		
		No.	C.	Q	No.	C.	Q	No.	C.	Q	No.	C.	Q
1.	*D.bipinnata*	1115	56.0	08	1215	56.8	08	1327	59.2	07	1368	60.3	06
2.	*A. racemosum*	654	32.0	06	627	31.7	06	569	36.3	06	584	36.2	05
3.	*G. sylvestris*	563	25.2	06	462	29.4	05	438	30.7	06	424	28.4	05
4.	*A. paniculata*	525	27.1	06	481	27.1	05	437	29.1	05	424	26.3	05
5.	*R. serpertina*	389	26.8	05	346	22.1	05	327	28.5	04	325	21.4	05
6.	*W. somnifera*	120	11.9	05	74	09.8	05	42	05.8	05	26	04.8	04
7.	*C. roseus*	216	23.7	04	162	11.2	04	69	08.6	04	72	08.6	04
8.	*C. asiatica*	189	11.7	04	156	10.5	04	132	13.2	04	93	11.6	05
9.	*C. procera*	129	10.7	03	85	09.9	03	61	08.2	03	29	04.9	03
10.	*L. aspera*	89	11.5	04	106	12.6	05	168	15.2	05	184	17.2	05
11.	*L. camara*	76	10.7	05	95	10.8	05	124	11.3	05	141	15.4	05
12.	*E. alba*	179	13.5	02	174	16.7	03	165	14.2	02	162	16.2	03
13.	*C. bonplandianum*	395	32.5	05	361	36.7	05	473	23.1	04	465	27.1	03
14.	*P. oleracea*	131	13.4	02	121	14.3	02	87	10.3	02	64	08.8	04
	$\Sigma =$	4770	306.7	65	4465	299.6	65	4419	293.7	59	4361	287.2	62

Table 3: Overall occurrence of species in different sampling zones of Bhagalpur Region.

S.N.	Botanical name	Ai	%C	R_c	Den	R_D	Freq	R_F	Quadrat

S.N.	Botanical name	Average of Zone-I, II, III and IV Total Area = 10 X (10 m X 10m) = 1000m²							
		Ai	%C	R_c	Den	R_D	Freq	R_F	Quadrat
1.	*D. bipinnata*	1115	13.11	23.3	1.115	0.238	0.13	0.128	08
2.	*A. racemosum*	654	9.83	13.7	0.654	0.134	0.09	0.089	06
3.	*G. sylvestris*	563	9.83	11.8	0.563	0.120	0.09	0.089	06
4.	*A. paniculata*	525	9.83	11.0	0.525	0.112	0.09	0.089	06
5.	*R. serpertina*	389	8.19	8.15	0.389	0.083	0.08	0.079	05
6.	*W. somnifera*	120	8.19	2.51	0.120	0.025	0.08	0.079	05
7.	*C. roseus*	216	6.55	4.52	0.216	0.046	0.06	0.059	04
8.	*C. asiatica*	189	6.55	3.96	0.189	0.040	0.06	0.059	04
9.	*C. procera*	129	4.91	2.70	0.129	0.027	0.05	0.049	03
10.	*L. aspera*	89	6.55	1.86	0.089	0.019	0.06	0.059	04
11.	*L. camara*	76	8.19	1.59	0.076	0.016	0.08	0.079	05
12.	*E. alba*	179	3.27	3.75	0.179	0.030	0.03	0.029	02
13.	*C. bonplandianum*	395	8.19	8.28	0.395	0.084	0.08	0.079	05
14.	*P. oleracea*	131	3.27	2.74	0.131	0.028	0.03	0.029	02
		4770	100	99.86	4.674	1.002	1.01	0.995	65

Ai = No. of plants, %C= Percentage Cover, R_c = Relative cover, Den = Density, R_D = Relative Density, Feq = Frequency & R_F = Relative Frequency.

Total no of Plants $\sum_T$ = 4470 + 4465 + 4419 + 4361 =17715

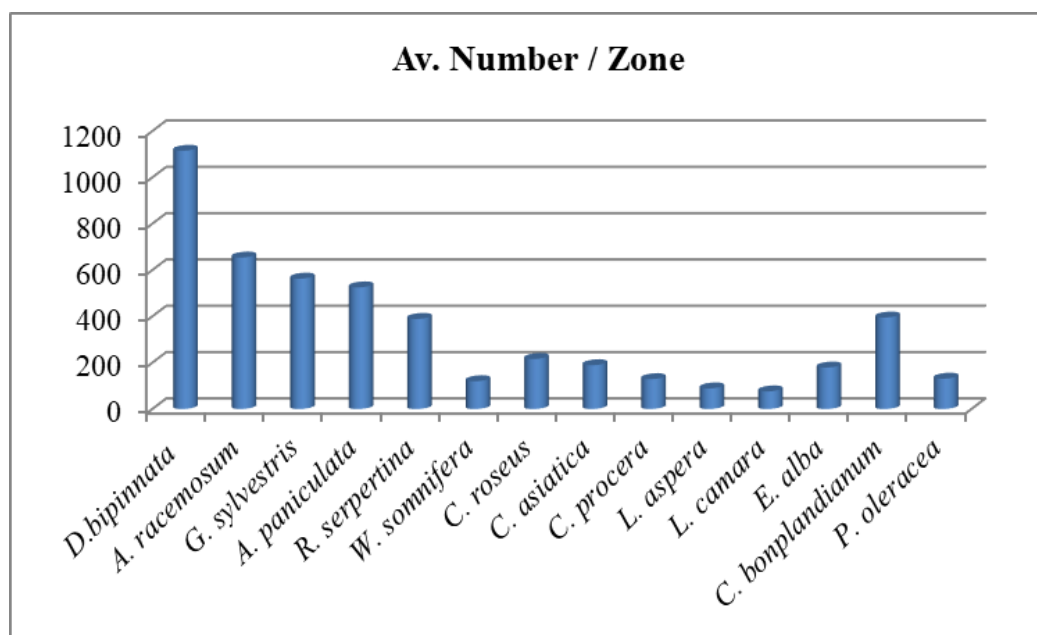Total Area = 10 X (10m x 10m) = 1000m²

Fig. 2: Average no of plant species in sampled quadrats

From the Fig. 2, it was evident that *D. bipinnata* had a maximum density among other plant species identified followed by *A. racemosum*, *G. sylvestris*, *A. paniculata*, *R. serpentina* and *W. somnifera*. Among least frequent group *L. Camara* was found to be most sparse followed by *L. Aspera*, *W. Somnifera*, *P. oleracea* and *C. asiatica*.

From the Fig. 3, it was obvious that *D. bipinnata* has maximum coverage per quadrat sample. In the light of percentage coverage *A. racemosum, G.sylvestris, A. panniculata* has the same coverage percentage as a average. *Lantana camara* and *C. bonplandianum* also have same coverage percentage across the sampling sites. The least percentage coverage was recorded for *E. alba*.
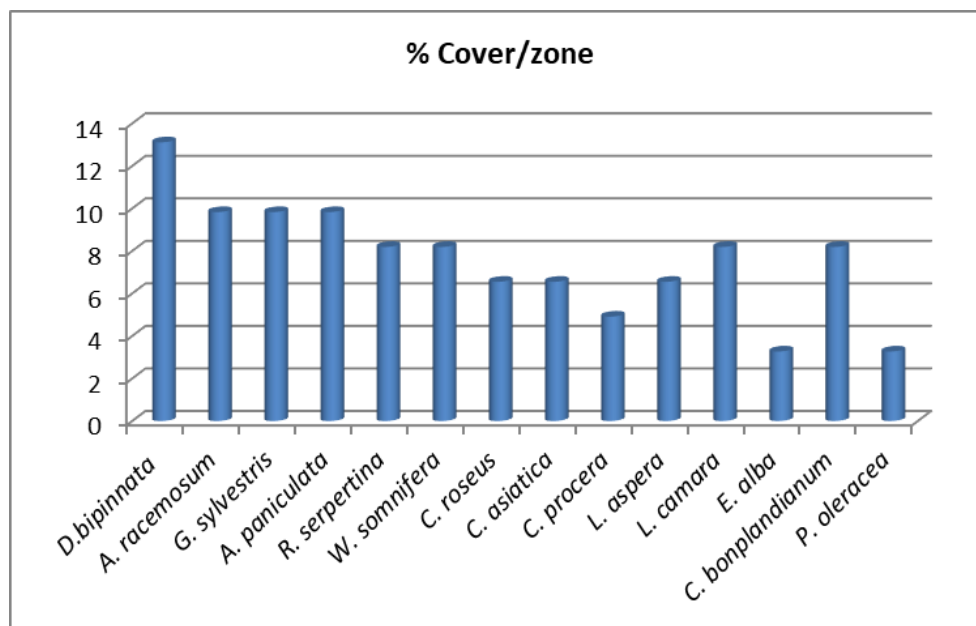
Fig. 3: Percentage cover of Plant Species in sampled quadrats.

Plants Identified

1. Desmostachrya bipinnata (Kusha Grass)

Desmostachya bipinnata is an Ayurvedic herb used for the treatment of diarrhea, skin diseases, renal calculi, dysmenorrhea and improving breast milk during lactation (Rahate *et al*., 2011).

2. E. hirta (Dudhi)

Euphorbia hirta is often used traditionally for female disorders, respiratory ailments (cough, coryza, bronchitis, and asthma), worm infestations in children, dysentery, jaundice, pimples, gonorrhea, digestive problems, and tumors (Pratheepa *et al*., 2014; Dogra *et al*., 2015).

3. G. sylvestris (Gurmar)

In Eastern and Ayurvedic medicine, *Gymnema sylvestre* leaves and extracts have been used to treat eye diseases, allergies, constipation, cough, dental caries, obesity, stomach ailments, and viral infections. *Gymnema sylvestre* has also been used as an antioxidant, antimicrobial, and aphrodisiac (Tiwari et. al., 2014).

4. A. paniculata (Kalamegha)

Andrographis paniculate Wall (family Acanthaceae) is one of the most popular medicinal plants used traditionally for the treatment of array of diseases such as cancer, diabetes, high blood pressure, ulcer, leprosy, bronchitis, skin diseases, flatulence, colic, influenza, dysentery, dyspepsia and malaria for centuries (Tewari *et al*., 2013).

5. R. serpertina (Sarpagandha)

Rauwolfia serpentine has found to be useful in treatment of anxiety, psychosis and epilepsy. It is also quiet efficient herb for colic and cholera. The root of this plant is given in difficult childbirth. Sarpagandha is effectively used in other conditions like rheumatism, edema and intestinal diseases (Gilman et. al., 1990).

6. W. somnifera (Ashwagandha)

Ashwagandha is often referred to as the "Indian ginseng", because it is used in similar way in Ayurvedic (Indian) medicine as Panax ginseng is used in traditional Chinese medicine (TCM). The plant has been used for more than 2500 years to restore overall health and increase longevity. In today's herbal medicine the herb is categorized as an adaptogen and it used to treat fatigue, nervous exhaustion and to enhance memory. The herb also has a reputation as an aphrodisiac both for men and women and is believed to protect against infertility in men (Anand et. al., 1995).

7. C. roseus (Sadabahar)

Vinblastine and vincristine, chemotherapy medications used to treat several types of cancers, are found in the plant and are biosynthesised from the coupling of the alkaloids catharanthine and vindoline. The newer semi-synthetic chemotherapeutic agent vinorelbine, used in the treatment of non-small-cell lung cancer, can be prepared either from vindoline and catharanthine or from the *vinca* alkaloid leurosine, in both cases via anhydrovinblastine. Rosinidin is an anthocyanidin pigment found in the flowers of *Catharanthus roseus* (Sukh *et al*., 2006).

8. C. asiatica (Bramhi)

Bramhi is used to treat bacterial, viral, or parastitic infections such as urinary tract infection (UTI), shingles, leprosy, cholera, dysentery, syphilis, the common cold, influenza, H1N1 (swine) flu, elephantiasis, tuberculosis, and in the treatment of schistosomiasis Used in fatigue,

anxiety, depression, psychiatric disorders, Alzheimer's disease, and improving memory and intelligence. Other uses include wound healing, trauma, and circulation problems (venous insufficiency) including varicose veins, and blood clots in the legs. Some people use gotu kola for sunstroke, tonsillitis, fluid around the lungs (pleurisy), liver disease (hepatitis), jaundice, systemic lupus erythematosus (SLE), stomach pain, diarrhea, indigestion, stomach ulcers, epilepsy, asthma, "tired blood" (anemia), diabetes, and for helping them live longer (*Evid Based Complement Alternate).*

9. C. procera (Aak)

People use the bark and root bark for medicine. Despite serious safety concerns,calotropis is used for digestive disorders including diarrhea, constipation and stomach ulcers; for painful conditions including toothache, cramps, and joint pain; and for parasitic infections including elephantiasis and worms (Abhishek *et al.*, 2010).

10. L. aspera (Thumbai)

Leucas aspera is reported to have antifungal, prostaglandin inhibitory, antioxidant, antimicrobial, antinociceptive and cytotoxic activities. Leucas asperais used in the traditional medicine of the Philippines to treat scorpion bites. It is also an antipyretic, it is a herb that has the ability to help reduce fevers (Srinivasan *et al.*, 2011).

11. Lantana camara (Raimuniya)

*Lantana camar*a has been widely used in the traditional herbal medicine field. To manage and even cure various common diseases. These include asthma, ulcers, cancer, leprosy, skin itches, measles, rabies and chicken pox just to name a few. This informative guide is going to educate you on everything that you will ever need to know about the amazing herb. Below you will find the scientifically proven benefits (Ghosh et.al., 2010).

12. E. alba (Bhringraj)

Eclipta alba is known as Bhringaraja is Ayurveda. It is a medicinal plant and used for treatment of diseases from time immemorial. Its description is available in many ancient Ayurvedic treatises. In Atharva Veda, it is said to affects intelligence and memory, cures bile (pitta) disorders and prevents hair greying and falling of hairs. Bhava Prakasha says it cures problems caused by phlegm and wind, beneficial for hair, skin, teeth and eyes, removes worms, and also effective in jaundice and oedema. Raja Nighantu describes this as one which is beneficial for hairs, eyes, oedema and phlegm (Roy *et al.*, 2013).

13. C. bonplandianum (Ban-Tulsi)

Juice of 3-4 leaves is given for 3-4 days to cure cough. Seed paste is applied locally on eczema and ringworm to cure. Latex is used to heal cuts and wounds. EtOH (50%) extract of plant is hypotensive and spasmolytic (Asolkar *et al.*,

1992). The leaf extract shows antiviral activity against tomato spotted with virus coepia. The plant extract is also effective against green gram leaf curl disease (Aslam *et al.*, 2006).

14. P. oleracea (Purslane)

Purslane is loaded with antioxidants (beta carotene, C, and vitamin E), and it also contains a high amount of the useful omega-3 fatty acids, which helps strengthen the immune system. These substances also help to lower elevated blood fat values and hence reduce the risk of heart attacks and blood clots. The fact that purslane contains a lot of magnesium is also important in this context. For people suffering from high blood pressure (hypertension) it has been recommended to eat plenty of vegetables that contain magnesium such as purslane, spinach and green beans. Magnesium deficiency has become very prevalent, and now there is no doubt within the medical community that magnesium plays a role when it comes to many heart diseases. It has been suggested that the daily intake of a total of 400 mg of magnesium should be sufficient for therapeutic reasons. For those suffering from frequent headaches, many diet experts have recommended a higher dose of 600 mg of magnesium a day. Food containing high levels of magnesium and potassium have been shown to have an anti-depressant effect as well (Mulla et. al., 2010 and Yan *et al.*, 2012).

Author's Contribution

All authors contributed equally in all stages of research work, prepared the manuscript. and finalization the manuscript. Final form of manuscript was approved by all authors.

Conflict of Interest

The authors declare that there is no conflict of interest with present publication.

References

Aberdeen JEC (1958) The effect of quadrat size, plant size, and plant distribution on frequency estimates in plant ecology. *Aust J Bot* **6**(1): 47-58. DOI: 10.1071/BT9580047

Abhishek D, Mohit C, Ashish G & Ameeta A (2010) Medicinal utility of Calotropis procera (Ait.) R. Br. as used by natives of village Sanwer of Indore District, Madhya Pradesh. *IJPLS* 1(**3**): 188-190.

Ambastha SK, Kumari S, Yadav AK, Trivedi I, Prasad B and Sinha UK (2016) Medicinal plants of Bihar and its neighbouring region which needs attention for their conservation. *EJBPS* **3**(4): 544-550.

Anand LV and Kuttan G (1995) Use of *Withania somnifera* as an adjuvant during radiation therapy. *Amla Research Bulletin* **15**: 83-87.

Dogra KS, Chauhan S and Jalal SJ (2015) Assessment of Indian Medicinal Plants for the treatment of asthma. *Journal of Medicinal Plants Research* **9**(32): 851-862. DOI: 10.5897/JMPR2015.5890

Ghosh S, Das and Sarma M, (2010) Anti-inflammatory and anticancer compounds isolated from *Ventilagomadra spatana* Gaertn., *Rubia cordifolia* Linn. And *Lantana camaara* Linn. *Journal of Pharmacy and Pharmacology* **62** (9): 1158-1166. DOI: 10.1111/j.2042-7158.2010.01151.x

Gilman AF, Rall WT, Nies AD, Taylor P, Goodman and Gilman's (1990): "The Pharmacologic Basis of Therapeutics", 8th ed, *Pergamon Press,* New York, 795.

Indian Ministry of Forests and Environment (2011.)*"Protected areas: Bihar".* Archived from *the original* on *September 25, 2011.*

Jima TT, and Megersa M (2018) Ethnobotanical Study of Medicinal Plants Used to Treat Human Diseases in Berbere District, Bale Zone of Oromia Regional State, South East Ethiopia. *Hindawi Evidence-Based Complementary and Alternative Medicine* **2018**: 1-16. DOI: 10.1155/2018/8602945

Khanra K, Roy A and Bhattacharyya N (2013) Evaluation of antibacterial activity and cytotoxicity of green synthesized silver nanoparticles using Hemidesmus indicus R. Br. *American Journals of Nanoscience and Nanotechnology Research* **1**: 1- 6.

Mohandas Rao KG, Muddanna Rao S and Gurumadhva Rao S (2006) *Centella asiatica* (L.) Leaf Extract Treatment During the Growth Spurt Period Enhances Hippocampal CA3 Neuronal Dendritic Arborization in Rats. *Evidence-Based Complementary and Alternative Medicine* 349–357. DOI: 10.1093/ecam/nel024

Mulla S K and Swamy P (2010) Preliminary pharmacognostical and phytochemical evaluation of *Portulaca quadrifida* Linn". *Int J Pharm Tech Res* **2**(3):1699-702.

Rahate KP, Rajasekaran A, Arulkumaran, KSG (2011) Potential of *Desmostachya bipinnata* Stapf. (Poaceae) root extracts in inhibition of cell proliferation of cervical cancer cell lines. *Int J Res Pharm Sci* **3**: 5 - 11.

Srinivasan (2011) *Leucas aspera* - Medicinal Plant: A Review. *International Journal of Pharma and Bio Sciences* **2**(1): 153–159.

Sukh D (2006) A Selection of Prime Ayurvedic Plant drugs, 1 edition, Varanasi- *Choukambha Amarabharati Prakashan* 108-116.

Tewari RC, Kotecha M, Sharma A K, and Sharma P (2013) Ethno-medicinal heritage of Chandi Devi Hills of Haridwar, Uttarakhand. *International Journal of Innovative Research and Development* **2**: 233–241.

Tiwari P, Mishra BN and Sangwan NS (2014) Phytochemical and pharmacological properties of *Gymnema sylvestre*: an important medicinal plant. *BioMed Research International*: 830285. DOI: 10.1155/2014/830285

Yan J, Sun LR, Zhou ZY, Chen YC, Zhang WM, Dai HF and Tan JW (2012) Homoisoflavonoids from the medicinal plant *Portulaca oleracea*. *Phytochemistry*. **80**: 37–41. DOI: 10.1016/j.phytochem.2012.05.014