



ORIGINAL ARTICLE

Documentation and Ethnomedicinal Importance of Weed Flora in the Rural Areas of Gyanpur, Bhadohi

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ABSTRACT

The present study was conducted in the rural areas of Gyanpur, located in Bhadohi, with the objective of documenting the weed flora and their traditional medicinal uses. Field surveys and interaction with local inhabitants were carried out to collect information regarding the occurrence, vernacular names, plant parts used, and ethnomedicinal importance of weeds growing in agricultural fields, roadsides, wastelands, and surrounding habitats. A total of twenty-five weeds species belonging to different angiospermic families were recorded during the investigations. Among the identified families, Asteraceae was found to be the dominant family represented by the highest number of species, followed by Euphorbiaceae, Acanthaceae, Malvaceae, and Amaranthaceae. Several important medicinal plants recorded in the study include *Acalypha indica*, *Achyranthus aspera*, *Andrographis paniculata*, *Calotropis procera*, *Datura metel*, *Eclipta alba*, *Phyllanthus niruri*, *Solanum nigrum*, *Xanthium strumarium*, and *Vernonia cinerea*. The study revealed that different plant parts such as leaves, roots, stems, seeds, flowers, berries, herbs, and whole plants are utilized in traditional medicine. Leaves were the most frequently used plant part, indicating their easy availability and medicinal importance. These plants are commonly used in folk medicine for the treatment of various ailments due to their therapeutic properties. The findings highlight the rich traditional knowledge possessed by rural communities regarding medicinal plant usage. However, modernization, environmental degradation, and declining interest among younger generations are causing gradual loss of this valuable indigenous knowledge. Therefore, proper documentation, conservation, and scientific validation of medicinal plants are necessary for sustainable utilization and preservation of ethnobotanical heritage.

Keywords: crop plants, ethnomedicinal, phytochemicals, weeds

INTRODUCTION

Weeds are generally considered undesirable plants that compete with crops for nutrients, water, light and space, many weed species possess significant ethnomedicinal value and have been traditionally utilized by local communities for the treatment of various human and animal ailments. In recent years, increasing attention has been given to the documentation and conservation of indigenous knowledge related to medicinal plants, including weed flora, because such knowledge forms an essential part of rural healthcare systems (Anonymous, 1986).

Ethnomedicinal studies play a crucial role in preserving indigenous knowledge and provide a scientific basis for future pharmacological and phytochemical investigations. Documentation of weed flora and their medicinal applications not only contribute to biodiversity conservation but also helps in identifying economically and therapeutically important plant species (Chhabra *et al.*, 1999; eFloras, 2008). Furthermore, several medicinal weeds possess antimicrobial, anti-inflammatory, antioxidant, and antidiabetic properties that may be valuable for the development of novel herbal medicines (Grichar, 2006).

The district of Bhadohi, known primarily for its agricultural activities and rural settlements, offers favorable ecological conditions for the growth of numerous weed species. The rural areas are characterized by diverse agricultural fields, wastelands, roadsides, ponds, and grazing lands that support a rich diversity of weed species (Dash and Mao, 2018). The inhabitants of this region, particularly villagers, traditional healers, and farmers, possess valuable ethnobotanical knowledge regarding the identification and medicinal uses of these weeds. Many commonly occurring weeds are used in the preparation of herbal remedies for treating fever, skin diseases, cough, digestive

disorders, wounds, diabetes etc (Henkel, 1904; Mishra and Tiwari, 2016). Despite their therapeutic importance, such traditional knowledge is gradually declining due to urbanization, modernization, changing lifestyles, and reduced interest among younger generations.

However, systematic studies focusing on the ethnomedicinal importance of weed flora in the rural areas of Gyanpur are limited. Therefore, the present study aims to document the diversity of weed flora and record their traditional medicinal uses among the local communities of the region. This investigation is expected to create awareness regarding the importance of weeds as valuable biological resources rather than merely unwanted plants and to support the conservation of traditional ethnomedicinal knowledge for future generations.

MATERIALS AND METHODS

The weed species have been collected from different parts of Bhadohi district, namely Bhadohi, Suriyawan, Gyanpur, Deegh, Abholi and Aurai covering three seasons, summer, winter and rainy season (Fig. 1). The weed plants were brought to the laboratory for the process of herbaria with standard methods suggested by Lawrance, (1951). Plants were properly dried up by changing a number of newspapers and poisoned with mercuric chloride solution in alcohol. Later on, the dried specimens were mounted on standard herbarium sheets, labelled properly and arranged alphabetically according to their botanical names. For identity of species, digital herbaria (eFloras 2008, and The Plant List 2013,) were thoroughly examined and relevant literature was consulted. All the identified and voucher specimens were deposited in the Department of Botany, K.N. Government P.G. College Gyanpur, Bhadohi.

OBSERVATIONS

A total of 25 weed species belonging to 12 families were collected from various parts of the Bhadohi district, have been enumerated, documented, tabulated. During observations the taxonomical description, family, botanical name was recorded and detailed as follows.

1. *Acalypha indica* L. Euphorbiaceae Juss, Kuppi

Taxonomical description: Erect, annual herb, 30-70cm height, with many spreading or ascending branches, leaves membranous, 5x4cm, ovate or rhomboid ovate, serrate, cuneate at base, arranged in a mosaic; flowers small, greenish, in lax erect, axillary, spikes; male clustered towards the top; females solitary or paired, each enclosed by a foliar, 6x6mm bract, capsular concealed by persistent bracts, seeds ovoid, pale brownish, shining. Flowering and fruiting September – January.

2. *Achyranthes aspera* L. Amaranthaceae Juss Chirchita, Apamarg

Taxonomical description: Erect annual herb, leaves large, ovate, acute or acuminate, glabrous. Flowers greenish white, deflexed, in terminal spikes elongating in fruits, bracts and bracteoles persistent, ending in a spine, utricle oblong, seeds sub cylindrical, brown.

3. *Abutilon indicum* (L.) Sweet, Malvaceae Juss, Kanghi

Taxonomical description: A robust shrub or under shrub, branches many, leaves ovate to orbicular-cordate, soft. Flower buds are drooping. Flowers orange- yellow on long pedicels. Ripe carpels 15-20, black at maturity, reniform, short beaked, seeds black, tubercled. Flowering and Fruiting September – March.

4. *Ageratum conyzoides* L. Asteraceae Dum., Sarhand

Taxonomical description: Erect, branched, hairy herb upto 90cm high, 5.0-8.0x2.5-5.5cm, crenate, ciliate, densely pilose beneath. Corolla purple, infundibuliform, 5 lobed. Style branches slightly exserted. Pappus scales 5.1.5- 3.0 cm long; tipped with scabrous setae. Achenes black, sharply angled. Flowering and fruiting throughout the year.

5. *Amaranthus viridis* L. Amaranthaceae Juss Chaulai

Taxonomical description: Erect or ascending herbs, upto 1.25m high. Stem striate, often purple-tinged, hairy on young parts. Leaves ovate-lanceolate to oblong, acute or decurrent below; petiole

variable in length. Flower clusters dense, lower ones exclusively female. Spikes with upper flowers all male and female flower inter-mixed, green or crimson. Bracts and bracteoles broad or deltoid-ovate, pale, membranous. Tepals elliptic or oblong-elliptic, narrowed above. Stigmas 3, erect or recurved. Capsule ovoid-urceolate, with a neck below style base. Seeds lenticular brown or black, shining. Flowering and fruiting July – November.

6. *Ammania buccifera* L. Lythraceae, jangli mehdi

Taxonomical description: An erect, glabrous herb, stem and branches angular, purplish, leaves opposite, narrowed to the base. Flowers in condensed axillary racemes or cluster, capsules red when ripe, glabrous. Flowering and fruiting February – September.

7. *Andrographis paniculata* (Burm. F) wall. ex. Nees. acanthaceae Juss., Kalmegh

Taxonomical description: An erect annual herb, 40-100cm in height, branches herbaceous, greenish, sharply 4-angled or winged. Leaves 5-10 x 2.0-2.5 cm, ovate, lanceolate, inflorescence a lax, axillary and terminal, unilateral raceme, forming a panicle, flowers whitish, spotted with rose-purple, bracts opposite, paired, capsules tapering at ends. Flowering and fruiting October – March.

8. *Argemone mexicana* L. Papaveraceae Juss., Satyanashi

Taxonomical description: Under shrub, stems, woody, herbaceous, leaves glaucous, prickly, sinuate-pinnatifid, flowers yellow, stigmas red, capsules erect prickly, dehiscing by valves, seeds black. Flowering and fruiting April – September.

9. *Cannabis sativa* L., Cannabinaceae Auctt., Bhang

Taxonomical description: A robust annual herb, leaves 3-8 foliate, long petioled; lobes lanceolate, plants flowers dioecious, male plant flowers are axillary, short paniced cymes, and the female plant flowers crowded with leafy bracts, style arms 2, filiform, nuts crustaceous. Flowering and fruiting November – April.

10. *Calotropis procera* (L.) R.Br. Asclepiadaceae R.Br., Madar

Taxonomical description: Large shrub, reachingsmall tree size. Leaves elliptic to obovate, 10-20 cm long, amplexicaul or cordate at base, with a ring of glandular lateral hairs at the base of lamina. Flowers white, subumbellate cymes. Sepals cottony. Corolla campanulate, divided more than half-way down, lobes revolute and twisted in age. Follicles in pairs, boat shaped, with a hooked tip, cottony pubescent. Seeds with long silky coma. Flowering and fruiting throughout the year.

11. *Chenopodium album* L. Chenopodiaceae Vent., Bathua

Taxonomical description: Erect, branched herb, upto 1m or sometimes taller. Stems angular, ribbed with dark green and red streaks densely covered with powdery vesicles on younger parts. Leaves ovoid rhomboid; coarsely dentate or lobulated in lower parts; upper leaves smaller, elliptic oblong almost entire. Flowers pentamerous, arranged in paniced cluster. Perianth lobesconnate atbase, concave. Stamen slightly exerted. Ovary depressed-globosestigmas 2. Utricle enclosed between perianth lobes, finally pappilose, seed lenticular. Flowering and fruiting: September – May.

12. *Cleome viscosa* L., Cleomaceae Horan, Hurhur

Taxonomical description: Pubescent herb, very variable in size, flowers whitish-yellow, solitary, viscid pubescent, stamens 12 or more. Fruit 1.5-7.5 cm reniform. Flowering and fruiting April – October.

13. *Datura metal* L. Solanaceae Juss Dhatura

Taxonomical description: Erect, perennial, widely branched herb, stem flexuous, nearly glabrous or short hairy; lenticillate. Leaves ovate-triangular to elliptic, obliquely rounded at base, acute or acuminate, repand-dentate to lobed, short hairy and glabrous. Petiole 1-15 cm long, flowers 0.5-1cm long pedicels, calyx subterete, 5-6 cm long; lobes triangular, acuminate, corolla

white or purple; lobes 5, with an acumen of 1-2 cm long; fruit pendulous, globose, glabrous or hairy, with conical prickles. Flowering and fruiting throughout the year.

14. *Eclipta alba* (L.) Hassk. Asteraceae Dum., Bhringraj

Taxonomical description: Prostrate, decumbent-ascending or erect, annual herb, stem often creeping and rooting at the base, appressed-pubescent. Leaves sessile, ovate lanceolate, elliptic-oblong, acute or obtuse, narrowed to the base, entire- faintly serrate, appressed-hispidulous. Heads axillary and terminal, 0.6-1cm across, on 5-7cm long peduncles. Marginal flowers with white, 2-dentate, 0.25cm long ligules. Corolla of disc-flowers 0.2cm long. Achenes oblong-turbinate, tuberculate, with a thickened margin, 0.2-0.25cm long. Flowering and fruiting April- December.

15. *Euphorbia hirta* L. Euphorbiaceae Juss., Badidudhi

Taxonomical description: An annual, prostrate, hispid herb, leaves dark green or reddish, white-villous beneath elliptic or ovate-oblong with oblique bases. Cythia axillary and terminal, clustered in dense, crowded cymes. Involucres stalked, cup shaped, capsule breaking in to 3 cocci, seeds reddish-brown, trigonous. Flowering and fruiting November – April.

16. *Evolvulus nummularis* (L.), Convolvulaceae Juss., Safed sankhpushpi

Taxonomical description: Slender, prostrate herbs, rooting at nodes, leaves glabrous, except the hairy nerves beneath. Pedicels erect first decurved after anthesis, calyx segments oblong-lanceolate, ciliate, corolla deeply lobed, capsule 1-4 seeded. Flowering and fruiting August – September.

17. *Phyllanthus niruri* L. Euphorbiaceae Juss., Bhui-awla

Taxonomical description: Erect, glabrous, branched herb, upto 45 cm high, branchlets compressed trigonous. Leaves are distichous, upto 2cm long, ovate elliptic or acute, cuneate at base. Male flowers fascicled, short stalked; bracts lanceolate; perianth segments 5-6, subequal, 2-seriate; stamens 3; disc lobes 6, glandular yellowish. Female flowers solitary; styles free; capsule globose, glabrous; seeds trigonous, longitudinally ribbed, disc shallowly 5-lobed. Flowering and fruiting June – December.

18. *Rungia pectinata* (L.) Nees. Acanthaceae Juss., Kharmor

Taxonomical description: A much branched, procumbent, annual; leaves elliptic or oblong lanceolate, tapering at ends; flowers very small, bright blue, in one-sided, short spikes, bracts dimorphic, the barren ones lanceolate, fertile ones orbicular, lower anther cells tailed, capsule 3x1mm, ovoid. Flowering and fruiting October – February.

19. *Ruellia tuberosa* L., Acanthaceae Juss., Fever root.

Taxonomical description: Erect, annual herb, 60-70 cm in height, leaves upto 12cm long, shining, narrowed at the base, entire to sub undulate, flowers blue violet, paired in axils of leaves, ephemeral, corolla tube abruptly narrowed below, capsule oblong-mucronate, flattened, black, seeds sub orbicular compressed black brown. Flowering and fruiting July – October.

20. *Sida acuta* L. Malvaceae Juss., Kharenta

Taxonomical description: Branched erect undershrub, upto 60cm; all parts sparsely hairy to glabrous; leaves ovate oblong to lanceolate, rounded or occasionally subacute at base; apex acute; serrate each tooth ending in a simple hair; flowers in a cluster of 2-3. Pedicels are variable in length, calyx as long as corolla, mericarps 2-awned. Flowering and fruiting July – October.

21. *Solanum nigrum* L. Solanaceae Juss., Makoy

Taxonomical description: Diffused much branched herbs upto 1m height; leaves ovate to ovate-lanceolate, sinuate or lobed; flower in umbeliform, extra-axillary cyme; peduncle 1-5cm long, appressed hairy, calyx lobes ovate rounded, corolla pubescent; berries round, smooth up to 7mm across, seeds minutely pitted, yellow. Flowering October – June.

22. *Spilanthus radicans* Jacq., Asteraceae Dum., Acmella

Taxonomical description: Prostrate or decumbent-ascending, aromatic, viscid, annual herbs. Stem branched, with coarsely dentate winged or decurrent leaf bases, glandular pubescent. Leaves obovate-spatulate, with narrowed base, obtuse, mucronate, coarsely double dentate, glandular - villous. Inflorescence globose- ellipsoid, 1cm long, winged, glandular pubescent peduncles. Involucral bracts lanceolate, acute, hairy in the upper half. Corolla pale. Achenes glandular, hairy. Flowering February – October.

23. *Sonchus arvensis* L. Asteraceae Dumort., Dodak

Taxonomical description: A perennial, erect herb, 60-100 cm tall. Stems hollow umbellately branched, glandular hairy above. Heads pale yellow to yellowish-white, umbellately corymbose. Peduncles and bracts glandular hairy. Achenes ribbed, transverse lyrugose, brown. Flowering March – November.

24. *Xanthium strumarium* L. Asteraceae, Chota dhatura, Cocklebur

Taxonomical description: An erect, coarse annual herb covered with rough hairs. Stem stout, branched, green to purplish in colour. Leaves are alternate, broadly triangular or heart-shaped, rough on both surfaces, with toothed margins and long petioles. Flowers small, greenish and unisexual arranged in heads; male flowers occur at the upper part and female flowers below. Fruits are hard, oval burs covered with hooked spines containing two seeds. Flowering & fruiting: August – January.

25. *Vernonia cinerea* (L.) Less. Asteraceae, Sahadevi

Taxonomical description: An erect or diffuse annual herb with slender, branched and slightly hairy stems. Leaves are simple, alternate, narrow-lanceolate to ovate, margins slightly toothed or entire. Flowers small, pinkish-purple or lavender in colour, arranged in terminal clusters or heads. Fruits are small ribbed achenes with white pappus hairs aiding seed dispersal. The whole plant possesses medicinal value. Flowering & fruiting: Throughout the year, mainly August – March.

DISCUSSION

The present study documents 25 weed species belonging to 12 different families traditionally used by local communities for medicinal purposes. The recorded plants represent a rich diversity of herbal resources that play an important role in traditional healthcare systems. Most of the species documented are commonly found in agricultural fields, roadsides, and wastelands, showing that easily available plants are widely utilized in folk medicine.

Among the recorded families, Asteraceae was found to be the dominant family with the highest number of medicinal species, including *Ageratum conyzoides*, *Eclipta alba*, *Spilanthus radicans*, *Sonchus arvensis*, *Xanthium strumarium*, and *Vernonia cinerea*. The dominance of Asteraceae may be due to its wide distribution and high medicinal value (Lawrence, 1951; Mishra and Tiwari, 2017). Other important families represented in the study were Euphorbiaceae, Acanthaceae, Malvaceae, and Amaranthaceae. Similar dominance of these families has been reported in various ethnobotanical studies conducted in different regions of India. Among these, leaves were the most commonly utilized plant part, followed by roots and whole plants. The extensive use of leaves may be because they are easily available, simple to collect, and rich in bioactive compounds (Kuhad *et al.*, 2010). Moreover, harvesting leaves causes less damage to plants compared to uprooting the entire plant or collecting roots.

The study also highlights the medicinal importance of several common weeds such as *Ageratum conyzoides*, *Xanthium strumarium*, *Parthenium hysterophorus*, and *Sonchus arvensis*. Although these plants are often considered harmful agricultural weeds, local communities utilize them for treating various health disorders (Mishra *et al.*, 2016). This reflects the deep traditional knowledge and practical understanding of medicinal plant resources among rural people. Several medicinally important weeds documented in the study show significant therapeutic properties.

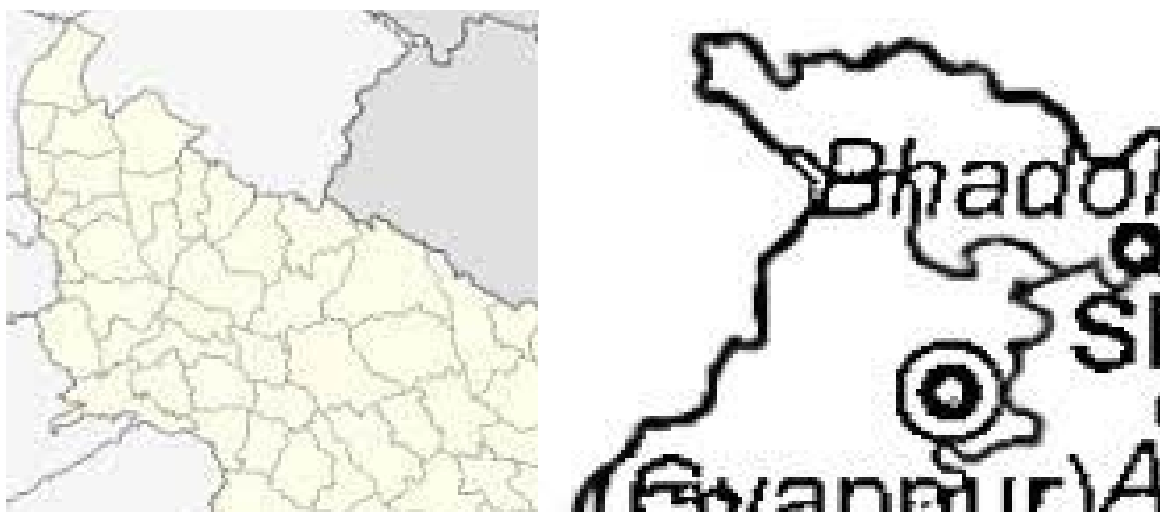


Fig. 1: Map of Study Area Showing District Bhadohi, Uttar Pradesh

Table 1: Importance weed flora collected from the rural areas of Gyanpur, Bhadohi, Uttar Pradesh

S.No.	Common name	Botanical name	Family	Parts used
1	Kuppi	<i>Acalypha indica</i> L.	Euphorbiaceae	Leaves
2	Chirchira, latjira	<i>Achyranthus aspera</i> L.	Amaranthaceae	Leaf, root
3	Kanghi, Atibala	<i>Abutilon indicum</i> (L.)	Malvaceae	Leaves
4	Goat weed	<i>Ageratum conyzoides</i> L.	Asteraceae	Leaves
5	Chaulai	<i>Amaranthus viridis</i> L.	Amaranthaceae	Root
6	Jangli mehdi	<i>Ammania buccifera</i>	Lythraceae	Leaf
7	Kalmegh	<i>Andrographis paniculata</i> (Burm. F) Wall. Ex. Nees	Acanthaceae	Root, leaf
8	Peelikateri, satyanashi	<i>Argemone maxicana</i> L.	Papaveraceae	Leaf
9	Bhang	<i>Cannabis sativa</i> L.	Cannabinaceae,	Leaves
10	Madar	<i>Calotropis procera</i> (Alton)	Asclepiaceae	Root
11	Bathua	<i>Chenopodium album</i> L.	Chenopodiaceae	Herb
12	Hurhur	<i>Cleome viscosa</i> (Linn.)	Cleomaceae	Seed
13	Dhatura	<i>Datura metal</i> L.	Solanaceae	Root, whole plant
14	Bhringraj	<i>Eclipta alba</i> (L.) Hassk	Asteraceae	Leaves, stem
15	Duddhi	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Leaf
16	sankhpushpi	<i>Evolvulus nummularis</i>	Convolvulaceae	Leaves, whole plant
17	Bhui-amlam	<i>Phyllanthus niruri</i> L.	Euphorbiaceae	Leaf, root
18	Kharmor	<i>Rungia pectinata</i> L.	Acanthaceae	Leaves
19	Fever root	<i>Ruellia tuberosa</i> L.	Acanthaceae	Leaf, stem
20	Kharenta/ herb	<i>Sida acuta cordifolia</i> (Linn.)	Malvaceae	Seeds, roots
21	Mokoiya	<i>Solanum nigrum</i> L.	Solanaceae	Berries
22	Acmella	<i>Spilanthus radicans</i>	Asteraceae	Leaves, flowers, whole plant
23	Dodak	<i>Sonchus arvensis</i>	Asteraceae	Leaves, roots, whole plant
24	Chota dhatura	<i>Xanthium strumarium</i> L.	Asteraceae	leaves
25	Sahadevi	<i>Vernonia cinerea</i>	Asteraceae	Whole plant

Andrographis paniculata is well known for its antimicrobial and antipyretic properties, while *Phyllanthus niruri* is traditionally used for liver disorders and urinary problems. *Eclipta alba* is valued for hair and liver-related treatments, whereas *Achyranthus aspera* and *Calotropis procera* are widely used in traditional medicine for inflammatory and skin-related ailments (Morin *et al.*, 2009 and Wang *et al.*, 2010). Plants like *Solanum nigrum*, *Cannabis sativa*, and *Datura metel* are also known for their medicinal importance, although improper use may produce toxic effects.

Whole plant utilization was observed in species such as *Spilanthus radicans*, *Sonchus arvensis*, and *Vernonia cinerea*. Excessive collection of whole plants and roots may negatively affect plant survival and regeneration in natural habitats. Therefore, sustainable harvesting practices and conservation measures are essential for protecting medicinal plant diversity. The traditional ethnomedicinal knowledge is gradually declining due to urbanization, habitat destruction, changing lifestyles, and reduced interest among younger generations. Environmental degradation and loss of biodiversity further threaten the availability of medicinal plant resources. Hence, proper documentation and scientific validation of traditional medicinal plants are necessary for conserving this valuable heritage and promoting sustainable utilization in future healthcare practices.

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REFERENCES

1. Anonymus (1986): Useful Plants of India, CSIR, New Delhi. 1-5
2. Chhabra BR, Kohli JC, Dhillon RS (1999) Three ambrosanolides from *Parthenium hysterophorus*. *Phytochemistry* 52:1331-1334
3. Dash, S. S. and Mao. A.A. 2018: Flowering Plants of India- An annotated Checklist. 3 Vols. Botanical Survey of India, Kolkata.
4. Evans H. 1997. *Parthenium hysterophorus*: a review of its weed status and the possibilities for biological control. *Biocontrol News Inf*; 18:389-398
5. Grichar W.J. Weed control and grain sorghum tolerance to flumioxazin. *Crop Prot.* 2006; 25:174-177
6. Henkel A. 1904. Weeds used in medicine. US department of agriculture. Farmers Bulletin no 188. pp-7-10. Government printing office, Washington DC.
7. Kuhad RC, Gupta R, Khasa YP, Singh 2010 A. Bioethanol production from *Lantanacamura* (red sage): pretreatment, saccharification and fermentation. *Bioresour Technol.*; 101:8348-8354.
8. Lawrence, G.H.M (1951): *Taxonomy of Vascular Plants*, Publ. The Macmillan Company, New York, Pg- 1-823
9. Mishra S, Tiwari S & Mishra D.R 2016: *On Some Pharmaceutical Angiosperms Having Hypoglycemic Properties*. *Journal of the Andaman Science Association*, 21(1): 86-89.
10. Mishra S, Mishra S & Tiwari S. 2017: *Role of Indian women in Agriculture and health care*, Public health in India with special reference to women, children and adolescent, Pgs 113-114.
11. Mishra S. & Tiwari S 2016: *Phytomedicodiversity of Some Plants of Gyanpur Region*. Conservation of Medicinal plants Conventional and Modern Approaches, Omega publications New Delhi. Pgs 174-180.
12. Morin L, Reid AM, Sims-Chilton NM, Buckley YM, Dhileepan K, Hastwell GT, Nordblom TL, Raghu S. Review of approaches to evaluate the effectiveness of weed biological control agents. *Biol Control*. 2009; 5:1-15.
13. The Plant List 2013. Ver. 1.1. - <www.theplantlist.org/>, accessed 1 January 2013.
14. Wang, K.C., Yang, W.Q., Wang, Z.Y. 2000. Chemical weed control of medicinal plant *Bupleurum falcatum* L. *Zhongguo Zhong Yao Za Zhi*. 25(4): 210-213