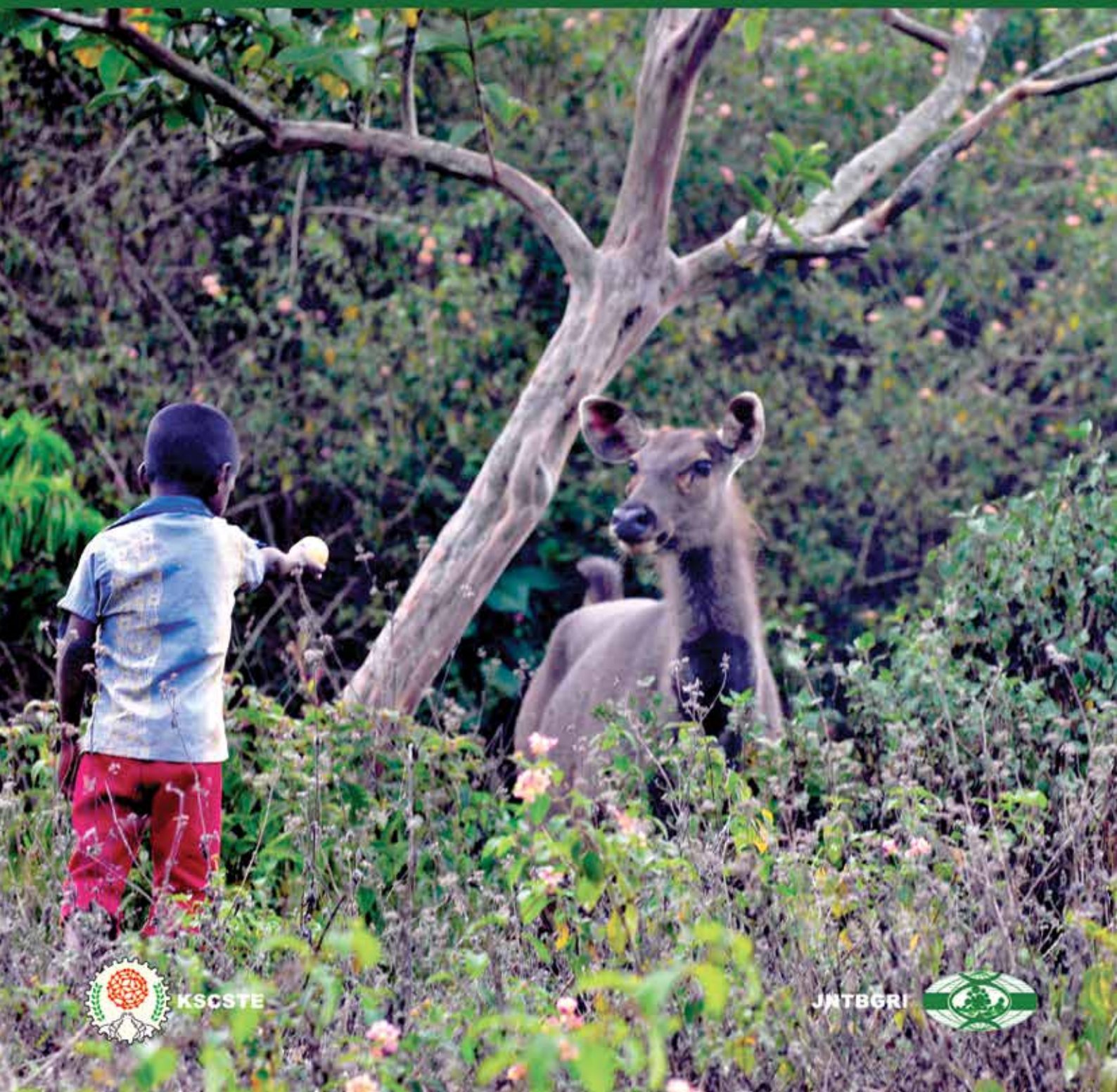
Volume 06 | Number 02 | December 2018

ISSN 2278 - 5906

JOURNAL OF TRADITIONAL AND FOLK PRACTICES



KSCSTE

JNTBGRI

Volume 06 Number 2 December 2018 ISSN 2278 - 5906

JOURNAL OF TRADITIONAL AND FOLK PRACTICES

JTFP online : http://www.jtfp.jntbgri.res.in

KSCSTE JNTBGRI

Volume 06 (2) December 2018, 57-66
ISSN 2278 - 5906
https://doi.org/10.25173/jtfp.2018.6.2.105
http:/www.jtfp.jntbgri.res.in

Journal of Traditional and Folk Practices

Ethnobotanical survey of selected *Impatiens* species (Balsaminaceae) as wonder herbals from Bonacaud regions of Agasthyamala hills, Kerala

R Arathy[1] , K Murugan[2] and G S Manoj[3*]
[1]Department of Botany, Mahathma Gandhi College, Thiruvananthapuram
[2]Department of Botany, University College, Thiruvananthapuram
[3]Department of Botany, NSS College Nilamel, Kollam.
*manojmalackal@gmail.com

Received: 10 Sep 2018 Accepted: 12 Dec 2018

Abstract

Impatiens comprises about 1000 species, widely distributed throughout Africa, North America and Asia. The family Balsaminaceae includes the genera *Hydrocera* and *Impatiens*. *Impatiens* are commonly known as, Jewel weed, touch me-not, snap weed etc. The Latin word 'impatient' means ripe fruits burst open when touched. This genus is known for indoor landscaping due to their colorful blooms in shady environments. Some species are annuals which produce blooms from monsoon to winter, while the perennial species mostly flowers during summer or infrequently throughout the year. Most species are used by the tribals as herbal remedies for curing diverse human disorders. Ethnopharmacologically, the whole plant was used as antidote against bee stings, insect bite, poison ivy, anxiety, itching, fungal and bacterial. It was also used as natural colouring agent for hair. Many phytochemical constituents like phenols and flavanoids were isolated and fractionated from limited number of species. Thus, the aim of this survey is to document the ethnomedicinal traditional knowledge related with pharmacological features of *Impatiens* species from Bonacaud. Coloured floral extracts of most of the *Impatiens* species contain substantial level of anthocyanin and was used as curative agent against many human disorders. Future works are warranted to evaluate and correlate the biological potentialities with anthocyanin profile of the wild *Impatiens*.

Keywords: *Impatiens*, Anthocyanin, Phenols, Folklore knowledge

1. Introduction

Balsaminaceae includes annual and perennial herbs that show prominent and complex floral morphology. *Hydrocera* Wight & Arn., (monotypic genus) and *Impatiens* L.,(high number of species) represent the two genera of the family. *Hydrocera* is identified by its pentamerous, polypetalous nature with capsular berry while *Impatiens* were tetramerous with fused petals into two wing like structure and a 5-valved capsule. *Hydrocera triflora* is a semi-aquatic herb reported from the Indomalesian region. *Impatiens* accounts approximately 1,000 species (Janssens *et al.,* 2009) and distributed along the tropical and subtropical parts of the Old World as well as along the North temperate zones (Mabberly, 2008). The genus is recorded along

the hotspots such as tropical Africa, Madagascar, South India, Sri Lanka, Eastern Himalaya and Southeast Asia (Yuan *et al.,* 2004).

Many *Impatiens* are cultivated as ornamental and selected species are employed in medicine and cosmetics. *Impatiens* species are commonly referred as balsams or jewel weeds. 210 species were reported from the two centres of diversity in India namely Eastern Himalaya and the Western Ghats (Mittermeier *et al*., 2004). Herbals constitute an unique category of bioresources of Kerala. Recent survey revealed that out of the estimated 4600 flowering species of Kerala, about 900 displays medicinal attributes. Among them, 540 species were documented along the natural forest ecosystems. Over 150 herbal species that were indigenous or naturalized in Kerala were used in the Indian Ayurveda and Siddha system of Medicine. Venders, rural populations and tribals make use of about 2,000 species of lesser-known wild plants for various medicinal cares. About 60 to 65% of the herbals needed for Ayurvedic drug and almost 80% of Siddha drugs were reported from the forests of Kerala.

According to the studies of Kerala Forest and Wildlife Department, some species of *Impatiens* are enlisted in the red data book as endangered species in Kerala like *Impatiens aliciae, I. anaimudica, I. cochinica, I. coelotropis, I. concinna, I. johnii, I. leptura, I. macrocarpa, I. munnarensis, I. pandata, I. platyadena, I. pallidiflora, I. rivulicola, I. verecunda* etc. They are notonly rare butalso endemic to this region.In this juncture, the present study aims to document the medicinal balsam used by the locals as magic herbs deserves scientific scrutiny for conservation and sustainable utilization of these resourses.

2. Materials and Methods

2.1 Study area

Bonacaud (Thiruvananthapuram, Kerala) is the base station of Agasthyarkoodam in the Agasthya hills. The Agasthya hill range is luxurious for rare herbs and medicinal species. There is a tea estate for the locals of Bonacaud established by the British people. The hill resort Ponmudi is near to Bonacaud. It is located at 8°45′25″N 77°11′20″E.

Regular field visits were conducted at Bonacaud hills during 2017 January to 2018 March. The plants were collected, specimens were identified and voucher specimens were deposited in the herbarium, department of Botany University College Thiruvananthapuram. The information was collected from the local ethnic people through oral interview after obtaining PIC. Questionnaire was prepared according to the methodology suggested by Jain (1991).

Informers details:

Name.....

Gender.....Age.....

Occupation.....

Location/Residence.....

Data about medicinal plant and its use:

Plant (Local name).....

.....

Habit (Tree/ Herb/ Shrub/Climber/…...)

Plant part used.....

.....

Cultivated/ Wild.....

.....

If cultivated, cultivated for…….....

If wild, availability in natural resources (easy/ difficult/ very difficult).

Conservation needs…….....……

Conservation efforts made by Government and local residents…….....……

Method of collection and orage…….....

Name of the disease(s) treated…….....……

Other uses (if any)….....……

Mode of preparation….....……

Remarks:

Plant identified as ……..…… (Botanical name and family).

2.2. Analysis of data

2.2.1. Informant consensus factor (F_{ic})

It was used to know the level of consensus among the informants or healers on the use of a plant for a

particular ailment category. The F_c was calculated according to the formula of Trotter and Logan (1986):

$$F_{ic} = N_{ur} - N_t/(N_{ur}-1)$$

Where, N_{ur} is the number of use-reports for a particular ailment category, and N_t is the number of species used for that particular ailment category by all healers. F_{ic} value provides a range of 0 to 1, when a high value shows that relatively less number of species is used by higher number of informants or healers. On the other hand, lower value exhibits that the informants have no consensus on the species used for the treatment of diseases within an ailment category.

2.2.2. Use value *(UV)*

The importance of a species in terms of its use in herbal remedy in relation to other species is reported as use value *(UV)*. It was calculated as per the formula of Phillips *et al.,*(1994):

$$UV = \Sigma U/n$$

Where, *U* is the number of use-reports informed by all healers for a given species and *n* is the number of healers interviewed for the given plant. Plants of higher uses in treating the ailment are determined by *UV* factor. Higher *UV* for a species exhibits its several uses and the lower *UV* indicates the less number of uses of the species.

2.2.3. Fidelity level *(FL)*

FL is a tool to determine the most frequently used plant species as per the informants for the treatment of a disease in a particular ailment category. It was calculated according to the formula prposed by Friedman *et al.,* (1986):

$$FL(\%) = (N_p/N) \times 100$$

Where, N_p refers to the number of use-reports of given species for a particular ailment category and *N* is the total number of use-reports of all species for the respective ailment category. Species of higher *FL* are known to be used for the same purpose of treatment and the lower *FL* for a species indicates its multiple uses for the treatment of various ailments.

3. Results and Discussion

Nine *Impatiens* species were documented and identified them by its morphological and floral characters. They are described here with details;

***Impatiens uncinata* Wight.**

Slender, erect branched herb. Leaves alternate, ovate or suborbicular, acute or cordate at base, crenate at margin and acute or acuminate at apex, membraneous, often ciliate at base, glabrous or hairy on nerves above; petioles glanduliferous at apex. Flowers 4-8 in subumbels or short racemes, pinkish in colour. Peduncles axillary, solitary; pedicels 1-2 cm long. Lateral sepals obliquely ovate and acute. Lip subcampanulate; spurinflated in middle, hooked at tip, short and stout. Capsules are ellipsoid, beaked and few seeds which are in globose.

***Impatiens chinensis* Linn.**

Annual herbs about 10-60 cm high; erect stems from a prostrate rooting base, angled, glabrescent or villous. Leaves are opposite,3-7 x 0.5-1.5 cm in size, broad or narrow,coriaceous. Flowers axillary, solitary or in fascicles, rose or pink in colour. subsessile; Lateral sepals linear or falcate, acute with a callous point. Lip cymbiform, slender, incurved; spur to 3.5 cm long. Standard orbicular, acuminate or horned. Wings orbicular or obovate, auricled at base. Capsules ellipsoid, tapering at both ends; seeds oblong, shining and black.

***Impatiens floribunda* Wight.**

Erect herb about 70 cm in height; branched, greenish stem. Leaves alternate, elliptic-lanceolate, serrate or

crenate-serrate at margin, apiculate from apex of teeth, caudate-acuminate at apex, 2-10 x 1.2-4 cm, glaucous beneath; petioles 1.5-3.5 cm long with stipitate glands. Flowers in fascicles, pink. Pedicels to 2.5 cm long. Lateral sepals are ovate and small. Lip cymbiform; spur slender, straight. Wings 2-lobed; lobes subequal or basal lobe larger. Capsules ellipsoid; seeds globose, tubercled.

***Impatiens balsamina* L.**

Erect annual herbs up to 60 cm tall; simple or branched stem. Leaves alternate, lanceolate-elliptic, base narrowed, margins serrate, apex acute to acuminate; petioles 1-4 cm long, glandular. Flowers solitary or 2-3 in axillary fascicles, rose or white in colour; pedicels to 1.5 cm long. Lateral sepals 2-3 mm long, ovate; lip 1-1.6 cm long, cymbiform, petaloid; spur 1.2-2.2 cm long, incurved. Standard petal 1 cm long, ovate; wings are 2 cm long, obovate, deeply notched; auricles ovate-rounded. Capsules 1-1.5 cm long, ellipsoid, tomentose. Seeds globose, incurved and smooth.

***Impatiens auriculata* Heyne.**

Succulent, epiphytic and perennial herb of about 6-30 cm high; short stem, swollen at internodes. Leaves alternate usually fascicled at the ends of branches; petioles stout. Flowers in axillary or few-flowered

fascicles in red colour. Pedicels 2-4 cm long; bracts ovate. Large sepals. Lateral sepals obliquely oblong, acute, larger than wings, scarlet. Lip saccate, large, wrinkled; spur hooked, short. Standard small, concave and in green. Wings 2-lobed, hooded, purple in colour; basal lobe smaller. Capsules ovoid, many-seeded.

***Impatiens henslowiana* Arn.**

A shrub up to 2 m tall. Stems erect, woody at the base and succulent simple or branched, with prominent leaf scars and laticiferous. Leaves alternate or spiral and crowded near shoots or end of branches, lanceolate-elliptic, Flowers bisexual, zygomorphic, white or pale pink, about 2.5-5 cm across, glabrous, about 5-12 cm long, 3 sepals, imbricate, 2 lateral ones flat, ovate, apex acuminate, posterior sepal (Lip) large, petaloid, cymbiform, spurred, spur slender, incurved, stout, about 2.5-3.7 cm long. Standard petal, keeled, suborbicular-obovate. Stamens 5 in number, anthers bi-locular, pollen white. Ovary pentalocular. Fruit indehiscent, capsule, fusiform, about 2-2.5 cm long, swollen in the middle, loculicidally glabrous or pilose. Seeds many, almond shaped, about 3 mm long, reticulately pitted, rusty brown.

***Impatiens cordata* Wight.**

Annual herbs, stem prostrate and rooting at nodes. Leaves alternate and ovate-cordate, acuminate, sparsely hairy along nerves, to 5 cm across; petiole to 3 cm long. Flowers in axillary umbellate and lilac with a purple center, 3-5 flowered racemes, peduncle 5-7 cm long. Flowers 2.5 cm long, pink with purple shade at the centre.Sepals ovate-acuminate. Standard marginate, lateral lobes of wing incurved and terminal lobes orbicular in shape.Lip boat-shaped, spur long and slender, incurved.

***Impatiens tomentosa* Heyne ex W&A.**

Herbs, stem reddish, tomentose. Leaves about 6 x 1.5 cm, oblong or lanceolate, acute at apex, truncate to cordate at base, margin distantly serrate, usually glabrous beneath. Flowers in pink colour, axillary, solitary; pedicels to 1.5 cm, tomentose and pink in colour; sepals pubescent; lip 7 mm and is deeply saccate; spur to 7 mm long and is slender, curved, pubescent. Capsule about 8 mm long, ovoid, seeds glabrous, black and shining.

***Impatiens modesta* Wight.**

Stemless herbs. Leaves about 4-5 x 5 cm in size, broadly ovate, acute at apex, cordate at base, serrate, pubescent below; petiole about to 10 cm long. Flowers are in recemose; bracts ovate, cordate at base; pedicels 1.5 cm long; lip(4 x 2.5 mm)with a short spur, ovate, obtuse; spur 4 mm long, straight, cylindrical and obtuse; Sepals 2 x 1 mm, ovate; Standard petals(3.5 x 4 mm)entire, broadly ovate, obtuse, glabrous,laterals (6.5 mm long) 3 lobed, lobes subequal, oblong and obtuse; seeds very minute clothed with spiral hairs.

Table1. List of Balsam species documented from Bonacaud

Sl. No.	Plant Name	Local name & voucher specimen number	Common name in literature	Availability	Part used	Uses
1	*Impatiens uncinata* Wight.	IU_UCB 1785	Hook-tail balsam	Common	Leaf and flower	Repellent to insect pests, virus and fungi which affect leaves fruits and roots
2	*Impatiens chinensis* Linn.	Paily, Mechinga-m,Oonapoovu IC_UCB 1786	Chinese Balsam	Common	Whole plant	fever and pain reliever, antidote, blood circulation inducer, diarrhoea, urinary infection and to heal carbuncles

3	*Impatiens floribunda* Wight.	IC_UCB 1787	Free-flowering balsam	Common	Leaf and flower	Microbicidal
4	*Impatiens balsamina* L.	Thilam Oonappuu IB_UCB 1788	Garden balsam, garden jewelweed, rosebalsam, spotted snapweed, touch-me-not	Common	Leaf and young shoot Leaf, flower Flower with alcoholic extract Seed Root	Tender parts are edible if cooked. Cathartic, diuretic and emetic, cures joint pain, warts, wounds and skin inflammations. Snakebites, colouring instead of henna for dyeing finger and toenails. Antibiotic power against some pathogenic fungi and bacteria. Antitumour, powdered seeds are given to women for strength during labour To treat irregular menses, wound healer, inflammations of the skin and torn nails
5	*Impatiens auriculata* Heyne.	IA_UCB 1789	Green-lip balsam	Rare	Leaf and root Leaf Whole plant	Taken as abortifacient. Used on swollen parts to relieve pain. Applied twice daily in red eye (Conjunctivitis).
6	*Impatiens henslowiana* Arn.	IH_UCB 1790	Henslow's balsam	Common	Leaf and some-times root. Flower	Used in poultices for wounds, skin diseases, pustules, torn nails. Antimicrobial properties and effective in cases of lumbago, intercostal neuralgia and as haemostatic
7	*Impatiens cordata* Wight.	Thottachinungi IC_UCB 1791	Heart-leaf balsam,	Rare	Whole plant	Pesticidal
8	*Impatiens tomentosa* Heyne ex W&A	IT_UCB 1792	Marsh balsam, tomentose balsam	Common	Leaf	Pesticidal
9	*Impatiens modesta* Wight	IM_UCB 1793	Modest balsam	Rare	Leaf	Microbicidal

Table 2. List of *Impatiens* species used as medicinal by the tribals of Bonacaud

Sl. No.	Name of the plant	Local Name	Part used	Use value	Preparation	Application	Fidelity Level (FL) (%)
1	*Impatiens uncinata* Wight.		Leaf and flower	1.0	Paste Decotion	Tonical/ Spray	42.2
2	*Impatiens chinensis* Linn.	Paily Mechingam, Oonapoovu	Whole plant	1.24	Decotion Paste	Oral/ Tonical	27.5
3	*Impatiens floribunda* Wight.		Leaf and flower	1.32	Paste	Tonical	32.1
4	*Impatiens balsamina* L.	Thilam Oonappuu	Whole plant	2.42	Paste Decotion Fresh leaves	Tonical Oral Food/oral	63.6
5	*Impatiens auriculata* Heyne.		Whole plant	1.10	Decotion Paste	Oral Tonical	17.8
6	*Impatiens henslowiana* Arn.		Leaf, flower and some-times roots.	0.78	Paste	Tonical	9.6
7	*Impatiens cordata* Wight.	Thottachinungi	Whole plant	0.86	Decotion	Spray	17.8
8	*Impatiens tomentosa* Heyne ex W&A.		Leaf	1.34	Decotion	Spray	10.7
9	*Impatiens modesta* Wight.		Leaf	0.761	Paste	Tonical	18.5

Table 3. Ingredients added for the preparation of herbal medicines by the tribals of Bonacaud

Sl. No.	Botanical name	Other plant parts added	Indication
1	*Impatiens uncinata* Wight.	*Cynodon dactylon*	Microbicidal
2	*Impatiens chinensis* Linn.	*Piper nigrum*	Fever, body pain, antidote
3	*Impatiens floribunda* Wight.	*Cleome viscosa*	Microbicidal
4	*Impatiens balsamina L.*	Nil	Diuretic, pain, antidote, fever
5	*Impatiens auriculata* Heyne.	*Streblus asper*	Abortifacient pain
6	*Impatiens henslowiana* Arn.	*Justicia adhatoda*	Conjunctivitis
7	*Impatiens cordata* Wight.	*Terminalia arjuna*	Wound healing
8	*Impatiens tomentosa* Heyne ex W&A.	*Allium sativum* (Bulb)	Pesticide
9	*Impatiens modesta* Wight.	*Piper betle*	Pesticide

Table 4. Ethanobotanical consensus index for traditional medicinal plant use categories

Sl. No.	Ailment categories	Number of use-reports (N_{ur})	Number of taxa (N_t)	Informants' consensus factor (F_{ic})
1	Microbicidal	42	05	0.60
2	Fever	47	02	0.66
3	Body pain	27	03	0.57
4	Antidote	10	03	0.66
5	Wound healing	52	04	0.43
6	Pest repellent	15	06	0.57
7	Inflammation	71	02	0.12
8	Antitumour	5	02	0.50
9	Abortifacient	50	03	0.26
10	Conjunctivitis	7	01	0.50
11	Skin allergy	6	06	0.40
12	Urinary infections	2	03	0.83

The interesting observation noticed in the present study is that all the recorded balsam species are ethnomedically important. Evidently, *I.balsamina* is secured the highest use value of 2.42 followed by *I.tomentosa* (1.34) and *I.floribunda*. the least use value were disp layed by *I.henslowiana* and *I.modesta* (Table 2).

Similarly, the preparation mode and illness cure was also analysed among the balsam species (Table 3). In most of the cases, other proved medicinal species are mixed with the balsam species for getting the required impact. For employing informant consensus factor (F_{ic}), more than 50 use reports were obtained for ailments such as wound healing, inflammation and abortifacient. Meanwhile, for urinary infections a maximum of 2 use reports are noticed. The F_{ic} values were ranged from 0.12 to 0.83 (Table 3).

I. balsamina was found to cure skin issues which suggest that this species was relatively more effective. Interestingly, paste of the fresh leaves of *I. balsamina* was used to cure boils. Plant genetic resources and knowledge of traditional medicine studies in Tamil Nadu substantiates the importance of *I. balsamina* and referred it as as "Poddhapachai by palliyan tribes ,they used its leafy twig as a paste along with grounded onion and applied to boils (Rajendran *et al*.,2000). The colouring components of leaves of Balsam were naphthoquinones, lawsone or hennotannic acid, lawsone methyl ether and methylene-3, 3'-bilawsone the active compounds. It was also noticed that the extract was used as single herbal preparation for oral consumption. Commonly, powder forms of the plant parts from leaves, flowers and roots were also used to cure stomach, skin and gum troubles (Rani *et al*., 2015).

In Ayurveda, Unani and Siddha, *I.balsamina* is used for curing various diseases like jaundice, corns, snake bite, etc. Phytochemical studies reported the presence of naphthoquinones, coumarins, phenolic acids, flavonoids, anthocyanidins and steroids. Similarly, the *Impatiens* species crude extract contain organic acids, anthraquinones and flavonoids. Three types of monoglucosides such as kaempferol, quercetin and pelargonidin were isolated from the stem of *I. balsamina*. Similarly salicylic acid, sinnapic acid, cafeic acid, scopletin, 2-hydroxy, 1,4-naphthoquinone and 2-methoxy 1,4-naphthoquinone have been extracted and purified from the stem of *I. balsamina* including a new biscoumarin and biisofraxidin from the roots.

The different parts of the plants such as leaves, stem and flower possess diverse pharmacological activities like bactericidal, fungicidal, analgesic, anti-inflammatory, antioxidant, antipruritic features. Leaf juice was used to treat warts and snakebite, and the flower to burns. This knowledge was substantiated by the studies of Basha *et al*., (2013). The extracts of *I. balsamina* was also employed as long lasting skin moisturizer and it

prevent dryness, rough skin, dandruff and splitting hair ends, hence used to prepare lotions, creams, hair tonics, cosmetics, bath preparations and detergents. Das *et al*., (2006) reported that root juice and leaf paste of *I. balsamina* was used by Bodos and Rangias tribes to reduce muscular pain. Assam local people claimed the folklore medicinal properties of 65 plant species. The most important among them was also *I. balsamina* i.e., its leaf paste was applied on forehead in fever and the paste possesses antibiotic activity also (Nath *et al*.,2006). Similarly studies focused on the analysis, documentation and interpretation of traditional knowledge and ethno-medicinal wisdom in Chamba, Kangra, Hamirpur and Mandi of Himachal Pradesh revealed the importance of balsams.

Further, in addition to medicinal, the leaves, seeds and stems were also edible if cooked. In Asia *I. balsamina* has been used as indigenous medicine for rheumatism, fractures and fingernail inflammation treatment. Alcoholic extract of the flowers possess antibiotic activity against scleroting, fructicola and other pathogenic fungi and bacteria. It was reported to be useful for joint pain. The seeds of this species were extracted with various solvents and tested for their bactericidal and fungicidal activities. Garden balsam has been used for joint pain, insect bite, promotes regular menstrual cycle and prevents stomach cancer. Contradictory opinion is also suggested by the traditional vendors that is, leaves of garden balsam contain poison that may affect the digestive system (Varghese *et al*., 2015).

An ethnobotanical study on Malayali tribals in various villages of Kollihills, Nammakkal District, Tamilnadu revealed then rich traditional folk knowledge. Out of the 250 species of 81 families Euphorbiaceae and Acanthaceae were prominent. Aqueous extract of the wild balsam was good for labour pain, epilepsy, wounds, dog bite and poisonous insect, snake and scorpion bites (Karthikeyani, 2003; Rajendran, *et al*., 2002). For preparing salad, Irular, Valaya (Visvanathan, 1997) and Malayali tribe, (Alagesaboopathi *et al*., 1999) use the leaves, seeds, and stems of *I. balsamina*. Snake bites form a threat to people of tropical and subtropical countries. For this, the most useful single herbal extract or in combination with others include flowers of *Impatiens glandulifera*. Another study recorded the indigenous knowledge of Gujjar and Bakerwal tribes about traditional medicinal uses of plants. Among various selected plants, *Impatiens glandulifera* was used to treat skin burn and joint pain. Leaves were crushed and tied with a woollen cloth on the joints to reduce joint pain and dried,powdered leaves mixed with warm water then the paste applied on skin to cure skin burn (Bhat *et al*., 2012).

Ethnomedicine play a major role in rural areas and various locally produced drugs as remedies for curing different diseases or ailments. Although the knowledge of medicinal herbal species were under threat because, the traditional healers do not practice any conservation measures to ensure the sustainability of such plant resources. A recent study by Upasani *et al*., (2017) has documented the ethno-medicinal knowledge gathered from the community members revealed the great advantage of balsam species to future generations. The major reasons for the vulnerability of the *Impatiens* flora were habitat degradation, habitat alteration and unsustainable collection of NWFP species and also for other purposes. The alteration of habitats such as grasslands (low, medium and high altitude), monoculture plantations, riparian ecosystems as reservoirs, low lying evergreen forests as agricultural land and homesteads has resulted in to the loss of many species.

4. Conclusion

The anthocyanin content in the flower of balsam species make them unique medicinal herb. The habitat and climatic conditions influence the anthocyanin contents of flowers of different cultivars i.e., an increasing trend of colour of the flower was noticed among temperate grown cultivars. The study presented here provided valuable data with regard to medicinal values of balsam species and flowers as good source of anthocyanin for preparation of natural food colourants.

Many *Impatiens* species are used as colouring agent and herbal remedies for the various treatments by tribals/locals in different parts of the world. This work also gives scope for appropriate scientific studies on the phytochemical and pharmacological activities of *Impatiens balsamina* for its commercial utilization.

Acknowledgments

Acknowledging the local people of Bonacaud for providing valuable information regarding the balsam species.

References

Alagesaboopathi C, Dearakan P, and Balu S 1999. JETB. 23: 391 – 393.

Bhat T A, Nigam G and Majaz M 2012.Traditional use of medicinal plants by Gujjar and Bakerwal Tribes in Pir Panjal Range of the Shopian District, Kashmir (India). IJRDPL. 1(3): 160-166.

Das N J, Saikia S P, Sarkar S and Devi K 2006. Medicinal plants of North-Kamrupm district of Assam used in primary health care system. IJTK. 5(4):489.

Ding Z S, Jiang F S, Chen N P, Zhu C G 2008. Molecules.13: 220-229.

Ghani A 2003. Medicinal plants of Bangladesh: Chemical Constitution and Uses, Secound (ed), J.Asiat., Dhaka.

Henn R L 2008. Wildflowers of Ohio. Indiana University Press, Bloomington.

Ishiguro K, Oku H and Kato T 2000. Testosterone 5 alpha-reductase inhibitor Bisnapthoquinone derivative from Impatiens balsamina. Phytother Res. 14:54-56.

Janssens S, Geuten K, Yuan Y M, Song Y, Kupfer P and Smets E 2006. Phylogenetics of Impatiens and Hydrocera (Balsaminaceae) using Chloroplast atpB-rbcL spacer sequences. Syst. Bot. 31: 171-180

Karthikeyani T P 2003. J Nat Rem. 3(2):159-166

Mabberley D J 2008. Mabberley's Plant-Book: A portable dictionary of plants, their classification and uses. Third edition, Cambridge University Press. 1021.

Manali S U, Sughosh V U, Vishal G B, Chetana G B and Gujarathie P P 2018. Infrequent use of medicinal plants from India in snakebite treatment. Integr Med Res. 7(1): 9–26.

Meenu B, Neeraja E D, Greeshma Rejimon and Alexeyena V 2015. Impatiens balsamina: An overview. J Chem Pharm Res. 7(9):16-21

Mittermeier R A, RoblesGil P, Hoffmann M, Pilgrim J, Brooks T, Mittermeier C G, Lamoreux J, Fonseca 2004. Hotspots Revisited: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions.

Morgan R J 2007. Impatiens – the vibrant World of busy lizzies, balsams and touch-me-nots. Timber Press, Portland, USA. 219.

Narendrakumar Shah K, Verma P , Suhagia B 2017. A phyto-pharmacological overview on Jewel Weed. JAPS .7(8): 246-252.

Purkayastha J, Dutta M and Nath S C 2007. Ethnomedicinal plants from Dibru-Saikhowa biosphere reserve, Assam. IJTK. 6(3): 477-480.

Rajendran R, Manikandan A, Hemalatha K, Prabhavathi P and Karthik Sundaram S 2000. Efficiency Of Impatiens Balsamina Extracts For Antimicrobial Activity. A J Sci Tech. 2(1).

Rajendran S M, Chandrasekar K and Sundaresan V 2002. IJTK 1: 59-71.

Salai Senthilkumar M S, Vaidyanathan D, Sivakumar D and Ghouse Basha M 2014. Diversity of ethnomedicinal plants used by Malayali tribals in Yelagiri hills of Eastern ghats, Tamilnadu, India. Asian J Plant Sci Res. 4(1):69-80.

Savita Rani, Rakesh Kumar Chahot and Tilak Raj Sharma 2015.Ethnobotanical survey and traditional knowledge of some medicinal and aromatic plants of Himachal Pradesh, North - West Himalayas.IJAPSA. 1(12): 2394-5532.

Sakunphueak A, Tansakul P, Umehara K, Noguchi H and Panichayupakaranant P 2012. Effect of methionine on production of naphthoquinones in Impatiens balsamina root cultures and detection of some secondary metabolites. 36-41.

Singh P, Singh R , Sati N , Ahluwalia V and Sati O P 2017. Phytochemical and Pharmacological Significance of Genus: Impatiens. Int. J. Life. Sci. Scienti. Res., 3(1): 868-881

Ueda Y, Oku H, Iinuma M, Ishiguro K 2005. Biol. Pharma. Bull., 28(9):1786-1790.

Vaidyanathan D, Salai Senthilkumar MS and Ghouse Basha M 2013. Studies on ethnomedicinal plants used by malayali tribals in Kolli hills of Eastern ghats, Tamilnadu, India. Asian J Plant Sci Res. 3(6):29-45.

Visvanathan M B 1997. Ethnobotany. 9: 77-79

Yadawa R N, Jain B 1992.Assian J. Chem., 4; 936-938.

Yang X, Summerhurst D K, Koval S F, Ficker C, Smith M L, Bernards M 2001. Phytother. Res., 15, 676-680.

Yuan C G, Shi J B, He B, Liu J F, Liang L N and Jiang N B 2004. Speciation of heavy metals in marine sediments from the East China Sea by ICP-MS with sequential extraction. Environ. Int., 30: 769-783.