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A REVIEW ON PADMAKA (PRUNUS CERASOIDES D. DON): AN EMERGING TRADITIONAL DRUG FOR THERAPEUTIC BENEFITS

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ABSTRACT

Prunus cerasoides D. Don widely known as Himalayan cherry tree is brown large with a smooth bark cracking out in horizontal strips having white pink and crimson colour flowers found in sub mountain and mountain Himalayan regions spending over and above 900 to 2000 m in Kashmir, Garhwali, Sikkim, Bhutan, Assam, Manipur and North eastern parts of India. Phytochemical investigations reveal the presence of Flavonone, Sukuranetin, Prunatin, Isoflavonone and Padmakastin. Apart from phytochemical studies, pharmacological studies provide the presence of anti-microbial, diuretic, BPH protective, antioxidant and cytotoxic properties. This dissertation is an effort to present morphological traditional medicinal and pharmacological aspects of the drug.

KEYWORD: Padmak, ethnomedicinal, morphological.

INTRODUCTION

An ancient medicinal plant belong to Rosaceae family said to have medicinal, therapeutical uses, found over temperate regions of Northern hemisphere[1],[2], chiefly Himalayan regions. It is up to 10 mts high deciduous tree with reddish brown exfoliating bark. Members belonging to this genus have showery flowers[3],[4], thus also have ornamental value. In Indian Himalayan region, among 36 species found so far, only 18 are cultivated because of their different ethno-medicinal and ornamental purposes.[5],[6],[7]

It is beneficial in the treatment of leprosy, hallucination, leukoderma, araciphalus, vomiting, hiccup, thirst, stone and gravel in the kidney. It also act as anti-abortifacients, analgesic, carminative, expectorant, febrifuge, antipyretic and useful in stomach trouble, burning sensations of the body, cold and cough, seminal weakness, asthma, pregnancy and intermittent fever.[8],[9] This genus also include apricot, cherry, plums, peaches and almonds.

MATERIALS AND METHODS

This paper includes the evidence based overview of pharmacological and phytochemical properties and ethno-medicinal uses of prunus cerasoides, which may be helpful to establish a standard natural drug for further research. The present article provides review on Prunus cerasoides D. Don collecting information on the various pharmacological studies conducted till date.

Taxonomic classification[10,11]

Kingdom	: Plantae
Subkingdom	: Tracheobionta (Vascular plants)
Infrakingdom	: Streptophyta (Land plants)
Superdivision	: Spermatophyta (Seed plants)
Division	: Magnoliophyta (Flowering plants)
Subdivision	: Spermatophytina (Spermatophyes)
Class	: Magnoliopsida (Dicotyledons)
Subclass	: Rosidae
Superorder	: Rosanae
Order	: Rosales
Family	: Rosaceae (Rose family)
Subfamily	: Amygdaloideae
Genus	: Prunus
Subgenus	: Cerasus
Species	: P. cerasoides D. Don

Synonyms: Cerasus cerasoides Buch.-Ham. Ex D. Don; Prunus puddum Roxb. Ex Wall, Brandis; Prunus majestica Koehne.[12]

Common Names: Padam, Wild Himalayan Cherry, Dwarf Cherry.[13]

Vernacular Names[14],[15]

Languages	Names
Hindi	: Padam, Padmakashtha
English	: Wild Himalayan Cherry
Assamese	: Dieng-soh-iong-kerm
Bengali	: Padmak, Padmakashtha
Gujrati	: Padmaka thi, Padmaka nu lakadu, Padmakashtha, Padmak
Kannada	: Padmaka
Khasi	: Dieng Kaditusoo
Malayalam	: Pathumukham
Marathi	: Padmaka, Padmakastha
Mizo	: Tlaizawng, Tlaizowng
Nepali	: Painyu
Punjabi	: Paja
Telugu	: Padmakala
Sanskrit	: Charu, Hima, Kaidara, Kedaraja, Malaya, Maleya, Padmagandhi, Padmaka

Parts used :- bark[16], heartwood stem, seed[17]

Botanical description

A middle sized attractive tree ranging up to 10-12 mts characterised by dark- brown smooth bark exfoliating in horizontal circular strips covering copper coloured inner surface.

Sapwood is generally lustrous-white and heart-wood is hard, strong, durable, reddish- brown in colour, resistant to insects and fungus.[18]

Leaves are variable in length and breadth 7.5-12.5cm X 2.5- 5cm, Ovate-lanceolate, sharply Serrate margins one or more glands on petiole.
Stipules are long 3 to 5 parted, fringed and glandular.

Flowers ranging from different shades of white[19], pink or crimson umbellate fascicles of 25mm diameter, rich in nectar and pollen.[20],[21] Flowering season is biannual which starts in Feb-April and July-Oct.

Fruits are red or yellow, ovoid, 1.2-1.5 cm long, about15mm in diameter, glabrous, shining, supported by base of calyx tube and contain one large seed[4],[22] and fruiting season ranges in

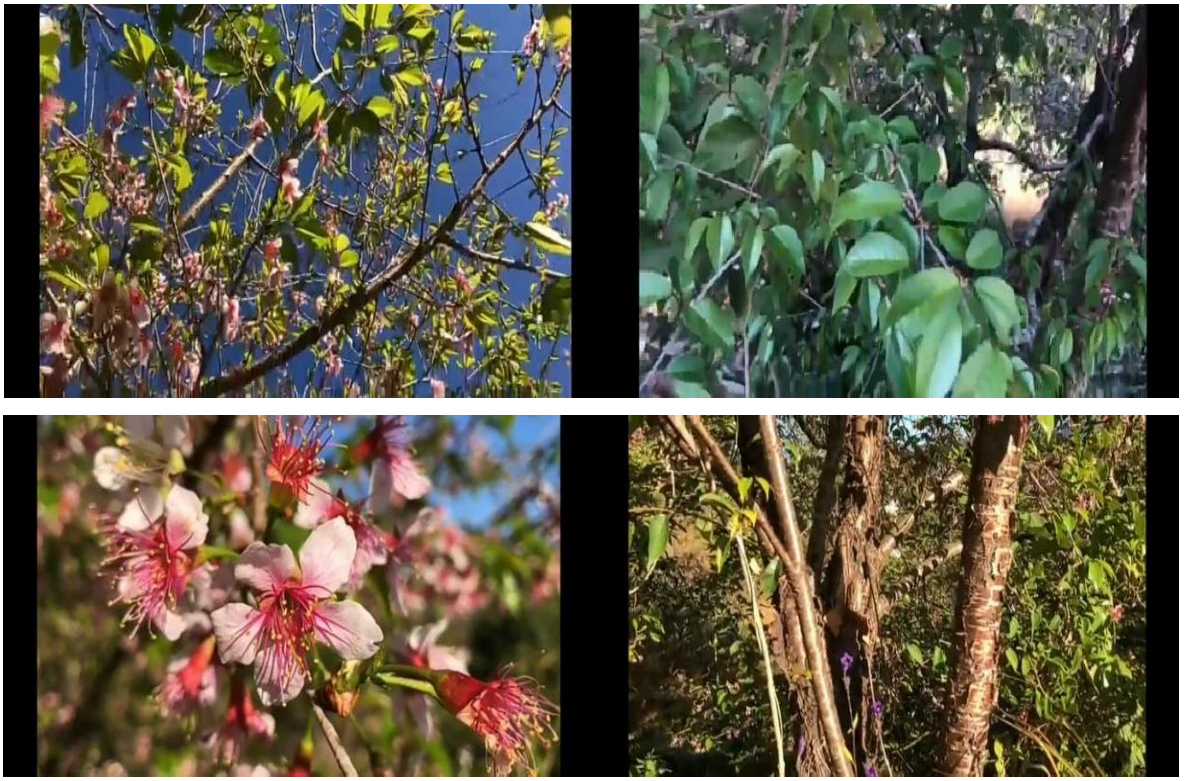
Oct- May.[23][24],[25],[26],[27],[28]

Drupes are 12.5-20mm long Yellow reddish ovoid, oblong, or ellipsoid obtused at both ends. Stone - Rugose, Pony and ovoid shaped, furrow with wrinkled texture with very little pulp.[29]

Pollen - 3 Grains which are zoni colporate, having broad colpus and pointed lip with indistinct endocolpium. Exine surface finely straite and thick straite. Exine 2.5µm thick. In terms of thickness, ecto exine is similiar to endoexine having indistinct columella, circular AMB, triangulate 39x28 µm, Sub-prolate shape.[29]

Geographical Distribution

Factors supporting its growth include presence of temperate forest climate at a height of 3900-7900ft in presence of montane and Sub montane Himalayan regions. Thus, India, Nepal, Bhutan, Myanmar, west China, and Thailand provide optimum growth opportunities. In India, the regions of Kashmir, Garwal, Sikkim, Bhutan, Assam, Manipur and North-Eastern part of India[30],[31],[32], the district of Chamba, Kangda, Bilaspur, Kullu, Sirmour and Shimla of Himachal Pradesh (up to elevation of 1800m. upper Burma[33]). Few spots in Kodai- Kanal, Ooty in Neelgiri hills of Tamil Nadu.



Classical categorisation

Charaka Samhita- In Vednasthapna, Varnya, and Kasaya skandha.[34]

Sushruta Samhita- In Sarivadi[35]., kakoliadi gana

Vagbhata - In Padmakadi gana[36]

Adarsh nighantu- In Padmkadi verga.[37]

Bhavaprakash nighantu- In Karpuradi verga[38]

Kaiyedev nighantu- In Aushahdi varga.[39]

Madanpal nighantu- In Karpuradi varga[40]

Priya nighantu- In Haritkyadi varga[41]

Sodhal nighantu- In Chandanadi varga[42]

Ayurvedic pharmacodynamics[43],[44]

Ras- Kashaya, Tikta Guna-Laghu, SnigdhaVirya - Seeta

Vipaka- Kattu

Doshghnata- kaphapittashamaka, pittashamaka.

Medicinal Qualities[45],[46],[47],[48],[49]

Varnya (enhances complexion), Kandughna (Prevents itching), Kushtaghna (Avoids skin diseases), Dahaprashamana (Pacifies Burning sensation), vedanasthapana (Relieves pain) Raktastambhana (styptic), Mootrala (Diuretic), Garbhasthapana (Anti Abortifacient), jwarghna (relieves fever).

Rogaghnata[45],[46],[47],[48],[49],[50]

Shirashool (Headache), Kandu (Itching), Kushtha (Skin ailments), Visarpa (Herpes), Daha

(Burning Sensation), Nadishool, Vamana (Vomiting), Trishna (Thirst), Raktapitta (Bleeding Disorder), Ashmari (Calculi), Visha (Poisoning), Jwara (Fevers), Prameha (Pittaja) (Diabetes), Rajyakshma (Tuberculosis), Shotha (Swelling), Grahani (Amebiasis), Hikka, Shwasa (Hiccough, dyspnoea), Kasa (Cough), Urusthambha (Stiffness of the muscles of Thigh), Vrana (Wounds), Bhagandar (Fistula in ano), Vasti (Urinary tract disorders), Agada (Antidote of poison), As Dhupan (For fumigation), Netraroga (Eye disorders), Rakta vikara (Blood disorders), Arsha (Hemorrhoids), Urah kshata (Consumptive cough), Swara Kshaya (Decrease in tone in voice), Parshwa shoola (Back pain may be due to respiratory origin), Yakrit (Hepatomegaly), Pleeha (Splenomegaly), Upadamsha (Gonorrhoea), Mutrakrichra (Dysuria), Netra roga (Eye disease), Keetavisha Vrana (Wound due to insect bite), Nadi Vrana (Sinuses), Sadyo vrana (Fresh wound), Unmada (Mania), Apasmara (Epilepsy).

Doses

Powder 1-2 gm (5-15 Ratti[51])

Decoction 50-100 ml[52]

Method of administration

Pharmacological components are retained in the fresh padmak kashtha and keeps decreasing with time. Volatile components are lost during boiling. Hence, padmak kwath should never be used. Its phanta form with lukewarm water[51] should be preferred over kwath.

Traditional uses

Himalayan wild cherry, locally known as “Pannya” being the common name of Prunus Cerasoides has an important place because of its wide variety of uses. Traditionally it was used in various rituals and ceremonies, especially in Garwal Himalayan regions.[53] It is considered sacred and is worshipped during festivals. Its wood is accepted as being holy. Thus forbidden to be used as fuel. Hence, increasing longevity of each plant.

The Apicultural importance is unparalleled as it blooms in the start of winter season, attracting multitude of honeybees from Asian and European regions, in turn creating thriving economic source of honey and an important source of employment for local beekeepers.[29]

Seed

The seed can be cooked or eaten raw fulfilling nutritional needs. They also being used as beads in necklaces and rosaries.[54] They also holds to the Key to greener and brighter future

as Prunus cerasoides been widely accepted as frame work tree species for restoring green forest cover.[55],[56] Thus reducing Carbon foot print. Seed Kernels, together with leaves, twigs, and bark helps preventing abortion and other female reproductive related ailments.

Leaves

Apart from being used as fodder[57] and young twigs as tooth brush.[58] They also find application in extracting organic green dye.

Hardwood

Hard, strong, durable and aromatic trunk finds an important place in the life of local people as its hardwood is used in making ornamental furniture and building materials, walking sticks and umbrella stick few of numerous uses.

Bark

The juice from bark when applied on contusions[59] helps in alleviating pain and swelling. Itis also source of tannin.[60]

Flower

Its flower are pinkish white having ample amount of nectar and pollens[61],[62] which attract bees providing good scope in apiculture.

Fruit

The ripe fruits are edible and have astringent taste because of the presence of tannin in traces amount, concentration is found in bark. They are being traditionally used for making cherry brandy[63] and evolved processes helps make sauces. It is the main food for barking deers found in Nepal region.[64]

Tree

the tree finds its use as root stock for cherry cultivation and also known to exude gums which possess anti-oxidant characteristics and can also be used to replace gum tragacanth. It also being used as honeydew.[65]

Ethano-medicinal claimsSeeds

Seeds are powdered or taken directly to relief from the kidney gravel or stone problem. It is also used in curing bleeding problems, skin disorders[66] it also so then skin burning sensation. They are also used as anti helmintic.

Leaves

They are known for their diuretic properties. There extract is used in prostate and urinary disorders.[67],[68] A study on rats also showed its capabilities to reduce the testosterone induced prostate weight of rat.

Fruit

It is astringent when smelt, known to increase digestion power. The natives of Punjab region believes in using it as an ascaricide. Its honey is slightly bitter but helps in eye ailments.[69]

Stem and branches

Smaller branches helps in preventing abortion[68] when taken internally after being crushed and socked in water. They are also used in case of scorpion stings.[70] Also find uses when mixed and use along with other fragrant drugs as a medicated smoking wick.[71] Its shell charcoal can be used as substitute for tooth powder. They are used in trading kidney disorders such as kidney stones[72] etc. Also helps to cure diseases like leukoderma, leprosy and vomiting. They are known to cure joints pain when low temperature decoction of stem bark concentrate is applied.

Bark

Its paste is used in wound healing neuralgia and checking over sweating of body. Juice of the bark paste when applied externally treats backaches. Bark is also used in hair oil formulations for making massage oils.[73] It is applied in different forms and used for hemi cranias[4] and is also used in plaster in case of bone fractures and dislocation[74],[75], burn indigestion fever, foot and mouth disease.[76]

Heartwood

It is study hard and also aromatic in addition to properties such as astringent, bitter, acrid, refrigerant, antipyrite and toxic. It is used in many ailments such as hallucination leukoderma erysipelas, hiccough, thrust, asthma, burnings, vomiting, cardiac debility[68],[77],[78] and diarrhoea. It is also useful in vitiated conditions of Pitt, stomach troubles, ulcer and seminal weakness. It also cures skin decolouration, burning sensation, sprain, wounds and leprosy.[66]

Pharmacognostical properties[79]

Macroscopic	Heart wood is yellowish brown to orange in colour available in variable sized pieces, to which some whitish portion of sap wood stillattached; Its other characteristics are being heavy, dense, moderately hard and very strong, presence of annual rings distinctly marked by an irregular and not continuous belt of numerous pores; tasteless; very faint odour.
Microscopic	Mature heart wood consists of vessels, fibres, tracheids and xylem parenchyma traversed by xylem rays; lignified vessels, moderately thin walled, reticulate thickening, fairly large with bordered pits having an oval shaped, lateral perforation at each end, measuring upto 220 u in length and upto 68 µ in width; fibres occur mostly in groups. Usually found associated with other xylem elements, moderately thick-walled. lumen narrow. pointed at both ends, 55-137µ long; tracheids usually thick-walled, lignified. elongated cells, xylem parenchyma composed of thick-walled, found associated with vessels and fibres, oval to elongated, polygonal cells, xylem rays uni- to multiseriate, uni-and biseriate more common. multseriate generally 3-5 cells wide, 40- 50 cells high; cut material, when treated with ferric chloride solution turn yellowish, pigments blue or black, indicating tannin in Powder microscopy. Heart wood powder reddish-brown in colour, shows fragments of abundant groups of or single pointed fibres measuring 55-137 u in length, moderately thick-walled, fairly large vessels with reticulate thickening and bordered pits, thick-walled. lignified tracheid cells, pieces of ray cells and xylem parenchyma cells.
Physical constants	Total Ash - Not more than 1%; Acid insoluble ash-Not more than 0.5%; Alcohol soluble extractive - Not less than 3%; water soluble extractive - Not less than 1%.
Thin Layer Chromatography	TLC of the alcoholic extract on silica Gel 'G' plate using Toluene: Ethylacelate (9:1) shows under UV (360nm) a fluorescent zone at Rf. 0.64 (blue). On exposure to lodine vapour seven spots appear at Rf. 0.15, 0.32. 0.42, 0.53, 0.59, 0.64 and 0.76 (all yellow). On spraying with Vanilline- Sulphuric acid reagent and heating the plate for ten minutes at 105°C four spots appear at Rf. 0.15. 0.32, 0.53 and 0.59 (all violet).

Phytochemistry and chemical constituents

Seed	β- sitosterol-3-O-D-galactopyranoside , naringenin-5-O-α-L-rhamnopyranoside, galactopyranoside ,4′-O-methyl-liquiritigenin-7-O-α-L rhamnopyranoside,naringenin 4′-methylether 7-xyloside, β-sitosterol-3-O-D-galactopyranoside[80]
Root Bark	prunetinoside, stigmasterol, glucogenkwanin, ursolic acid.[81]
Branches	Hydrocyanic acid, amygdalin.[82]
Leaves	kaempferol , Quercetin-3-rhamnoglucoside.
Stem Bark	Padmakastein and its derivatives, 4′-glucoside of genkwanin, chrysophenol, emodin, β-sitosterol behenate, tectochrysin, genistein,leucocynidin, 8β-D glucosides, orientalone, physcion, β- sitosterol glucoside[83], amygdalin, prunasetin (isoflavone), sakuranetin, puddumetin, flavanone[84],[85], sakuranetin (5, 4′-dihydroxy-7-methoxyflavone) and its 5-glucoside, neosakuranin (2, 4′-

	dihydroxy-4- methoxy-6- glucosidoxy chalcone), leucocyanidin[86], puddumin B (naringenin-4′-methyl ether-7-O-β-D-galactoside[87]), Taxifolin.[88]
Sapwood	A flavone glycoside puddumin A [7-O-(β-D-glucopyranosyl)-5- O-methylnaringenin], genistein[87],[83], prunetin[84], n-pentacosane, triacontane, noctacosanol, β-sitosterol, ursolic acid, oleic, palmitic and stearic acids, afzelin, kaempteritrin, naringenin, β-sitosterol-β-D-glucoside[87]
Stem	Narigenin, apigenin, β-sitosterol, sakuranetin, prunetin, genkwanin
Heartwood	Dihydrotectochrysin, dihydrowogonin, pinocembrin, chrysin, naringenin, kaempferol, aromadendrin, quercetin, taxifolin, 7-hydroxy-5, 2′, 4′-trimethoxy flavanone (Carasinone), 2′-hydroxy 2, 4, 4′,6'- tetramethoxy chalcone (Carasidin),2′,4′ dihydroxy-2, 4, 6′-trimethoxy-chalcone (carasin)[89]

Pharmacological activities

Traditionally, P. Cerasoides is well known for its therapeutic value. It is well known as for Anti-oxidant, anti-bacterial, its diuretic, anti-abortifacient, Analgesic, Carminative, Conceptive, Expectorant, anti-spasmodic, febrifuge properties.[90],[91]

Anti-oxidant

Traditionally, cherry brandy was made from fruit of Prunes cerasoides. Later evolved for making wines having high concentration of flavonoids and antioxidant compounds. Polyphenol content and Antioxidant activity were also found in wines made from this fruit. Antioxidant property of gum[92] was examined with the help of hydroxyl scavenging and DPPH studies. Total phenolic contents shows the antioxidant properties possessed by the gums. Total flavonoid, total phenol and antioxidant activity were studied on the extracts obtained from a P. cerasoides leaves. Main constituents of extracts of leaves were chloroform, ethyl acetate, acetone and methanol. All of the extracts showed anti-oxidant efficacy in varying degrees, highest total phenolic content (6.26 ± 0.033 mg GAE/g of extract) was recorded from methanol extract also has total flavonoid content (3.86 ± 0.016 mg Qe/g of extract) and free radical scavenging (antioxidant) activity (LC 50, 56.00 ± 0.242 ug/ml).

Antioxidant efficacy has a positive correlation with total phenolic content. The study established that leaves of P. Cerasoides as rich source of phenolic compounds and natural antioxidants.[93],[94]

Antibacterial Activity

Gram +ve Bacteria (Bacillus subtilis & Staphylococcus aureus) and Gram -ve bacteria (Escherichia coli and Salmonella typhi) were examined against ethanoic extracts of leaves of

prunus cerasoides for their anti-bacterial activity. All bacteria are inhibited by the extract.[95] The similar study were carried out on various pathogenic micro-organism, with aqueous extract of stem bark. The results suggested that this aqueous extract can be potential souse new anti-microbial compounds and will be efficient in inhibiting emerging microbial resistance.[96]

Diuretic properties

P. cerasoides, traditionally used for Kidney stony and urinary disorders.[97] Puddumin-A flavonone glucoside exhibit increased di-uretic activity. In modern times, the leaf extracts tends to reduce Prostate and urinary disorder Methanolic extract was evaluated against Prostate disordes on rat. The study was done on III different fractions. The fraction III treated group shows the lessened effect of testosterone on the prostate gland enlargement compairing to that of group I and group II treated group. Testosterone induced prostate weight of rat is reduced by the leaf leaf extract of Prunus cerasoides.[98]

BPH protective activity

The effect of bark of P. Cerasoides was examined in BPH and results showed inhibitoryeffect of testosterone induced BPH.[99]

Cytotoxic activity

The cytotoxic activity is ethanol extract is stem against brine shrimp resulting in LC50 values of less than 200ug/ml 0.75 ug/ml were considered active against brine shrimp thus exhibiting cytotoxicity against brine shrimp.[100]

Toxic effects

Hydro cyanic acid is formed when soluble glucoside, amygdalin and Prunasin is broken down in water. The plant (especially the seed and the young shoots) contains cynogenic glycosides which when ingested forms cyanide in the digestive tract.[101]

Cyanide when used in small quantities stimulate respiration, improve digestion and promote sense of well being but can cause gasping, weakness, excitement, pupil dilation, spasm, convolution and respiratory failure leading to death when taken in large quantities.[102],[103]

Substitutes and adulterants

The main adulterant are var. rubeus Ingram and var. majestical Ingram, grown in Darjeeling hills area.[104]

Propagation and cultivation

Direct showing of seeds and transplanting seedlings from nursery[29] are traditional methods for natural regeneration of plant. Although the tree reproduces from root suckers and can also be grown from cutting with a heel during July/August, during temperate climate. Seed germination prefers temperate climate, require 2-3 months cold stratification, where is best sown in cold frames as soon as it ripe. Stored seed germination may take more than 8 months when sown as early as in the year.[104]

Ayurvedic formulations and preparations[105]

1. Asava and Arista includes (Usirasava, chandanasava, Dash moolarista, Mritasanjivani Sura, Sasivadyasava.
2. Arka includes Karpuradyarka.
3. Kvatha churna includes Draksadi Kvatha churna, Guduchyadi ghana Kvatha Churna.
4. Ghrita includes Kasisadi ghrita, Maha Kalyanaka ghrita, Satavaryadi ghrita, Brhatcchagaladya ghrita, Mahatiktaka ghrita (CS. Ci 7.145), chandanadya ghrita (CS. Ci 15.126) ghaita, Manashiladi gheita(CS. Ci 17.145).
5. Churna includes sudarshana churna, Kirathadya chura(CS. Ci 15.138), Phalatrukadi churna(SS. U. 52.14).
6. Taila includes Arimedade taila Kumkumadi taila, chandanadi taila, Jatyadi taila, Triphaladi taila, Bala taila, bhringaraja taila, Madhuyastyadi taila, ashvagandhan taila, guduchyadi taila, madhuparnyadai taila (CS. Ci 29.93), mahapadma taila(CS. Ci 29.112)
7. Vati and gutika includes khadiradi gutika (Mukharoga).
8. Avaleha includes Padmakadi leha(CS. Ci 18.174).

CONCLUSION AND DISCUSSION

Owning to the adverse effect and high cost of modern synthetic drugs, there has been increasing interest in traditional herbal medicines in the recent times. "Go back to Ayurveda" is the new norm. Hence, there is an increasing competition among pharmaceutical companies and researchers for searching new potent drugs from natural sources. The traditional Himalayan wild cherry, which contain different kinds of phytochemical components distributed all over its parts, which has various medicinal properties has come to lime light. It has potential of curing many diseases of the modern times in addition to solving microbial resistance induced by modern synthetic drug industry. However, there is a huge gap between traditional medicinal knowledge and pharmacological and research activities. This review

article is an effort to collect ethno medicinal, phytochemical and pharmacological knowledge. There might be many unexplored uses which needs to be backed by modern pharmacological studies which may help in recognising true therapeutic potential of this plant.

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