A Multifunctional Hemidesmus Indicus As Cosmetic Agent: A Review Article

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***ABSTRACT*: Nowadays the herbs are becoming more prevalent in formulations, due to consumer concern about synthetic ingredient and chemical substances. The use of plant for medicinal purpose is as old as humanity and day by day they are coming in the market of new products containing natural oil and herb. One of the important herb from all them is Hemidesmus *indicus*, also popularly known as '*Anantmool'* belonging to family Asclepiasaceae. It is very common herbal plant and is widely distributed throughout the India. *H. indicus* is oldest medicinal plant ever known and used from centuries worldwide as a traditional system of medicine to treat various diseases but is not widely utilized as an herbal cosmetic ingredient. This plant has the ability to synthesize a wide variety of chemical compounds like terpenoids, saponin, glycosides, flavonoids, tannin sterols and volatile oil that are used to perform an important biological function. Several studied are being carried towards its activities like antioxidant, antiacne, antibacterial, and antifungal, antimicrobial activity. With all these potential benefits, this plant should have been widely utilized as an herbal cosmetic ingredient. The current review highlights importance of *Hemidesmusindicus*used in cosmetic and its advantages.**

***Keywords*: Anantmool, sarsaparilla, Hemidesmus indicus, Herbal cosmetics uses, Phytoconstituents, Pharmacological action.**

INTRODUCTION:

The term "natural" is defined as something or an ingredient that is produced by the nature or found in nature and is directly extracted from plant and animal products. Indian herbs are invaluable gift of nature to mankind and their significance is popular worldwide. Herbal formulations always have attracted considerable attention because of their good activity and comparatively lesser or no side effects as compared to synthetic substances. Herbs and spices have been used in maintaining and enhancing human beauty since time immemorial. Indians have long been using herbs such as Sandalwood, Tulsi, Heena, Neem Turmeric etc.for their different beneficial effect on skin and hair. There are numerous herbs with medicinal and cosmetic properties *Hemidesmus indicus* is one of them.

Hemidesmusindicus, commonly known as Indian sarsaparilla, belongs to the family Asclepiadaceous and is a perennial climber and growing widely in upper Gangetic plains and Eastwards of Bengal and in Central SouthIndia.[1]. It is a well-known medicinal plant. It is widely used in Ayurveda, Unani and Siddha system,[2] in preparations used against diseases of biliousness,blood diseases, diarrhea, skin diseases, respiratory diseases, fever, bronchitis, eye diseases, burning sensation and gastric disorders.[3] Also known as sariva false sarsaparilla and Indian sarsaparilla, anantmool is part of the milkweed family which is taxonomically distinct from "true" sarsaparilla (smilax febrifuga, family:smilacaceae) Asides from these names, anantmool has also been referred to as nannari (Tamil, Malayalam), Sugandhipala (Telgu), Magrabu (Hindi), Hindi salsa (Hindi), gopi Sanskrit), ananta(Sanskrit), syama (Sanskrit), namdaberu (Kannada), Sogadaberu (Kannada), and country sarsaparilla (English).[4] It contain various phytoconstituents like glycosides, flavonoids, tannins, sterols, and volatile oil.[5] Most useful part of the *hemidesmusindicus* is root,it has a sweet taste and pleasant smell due to the presence of an essential oil containing p-methoxy salicylic aldehyde as a major constituents. They are regarded as secondary metabolites because the plants that manufacture them may have little need for them. They are naturally synthesized in all part of the plant body; any part of the plant body may contain active components like bark, leaves, root, stem, fruit, flower seeds etc.[2] It shows the different activity like antimicrobial activity, antifungal activity, antiacne activity, anti-inflammatory activity, anti-enterobacterial activity.[6] *Anantmool* is receiving renewed attention as an Ayurvedic medicinal and herbal ingredient.[4] that may have health benefit as well as skin, hair and oral care benefits because of its presence of phytoconstituents and pharmacological action and serve as a herbal cosmetic active ingredient in various products.

MORPHOLOGICAL CHARACTERISTICS:

Root: *Anantmool* is a perennial, slender, twining, undershrub with woody and fragrant rootstock. The roots are mainly used for medicinal purpose.[7] The dried Indian *sarsaparilla* roots are medicinally important and officially included in Indian Pharmacopoeia. Roots occur in pieces, about 30 cm long and 3-8 mm in diameter, cylindrical, thick, hard, somewhat tortuous, sparsely branched, provided with few thick rootlets and secondary roots, external appearance dark brown, sometimes with violet grey tinge, centre yellow, woody, surrounded by a mealy white cortical layer, bark brownish, corky, marked with transverse cracks and longitudinal fissures and easily detachable from the hard central core, odour is characteristic, taste sweetish, slightly acrid and aromatic. The root is harvested in the autumn and dried for the later use. **[8, 9, 10].**

Stem: The stems and branches which twine antclockwise are elongated, narrow, tereteand of a deep purple or purplish brown colour with the surface slightly ridged at the nodes.[11]

Leaves*: Anantmool* leaves are opposite one another, smooth, shiny, and firm, and vary in shape and size according to their age. [4]

Flowers: Greenish yellowish to greenish ourpke to outside dul yellow to light purplish inside, calyx deeply five lobed, corolla gamopetalous, about twice the calyx, stamens five, inserted near base of corolla with a thick coronal scale.

Fruits: Fruits of anantmool are two straight slender narrowly cylindrical widely divergent follicles, seeds many, flat oblong, with a lonfg tuft of white silky hairs.[12]

GEOGRAPHICAL DISTRIBUTION:

Hemidesmus indicus R. Br. (H. indicus) is originated from India where it is still primarily found growing wildly. H. indicus is a prostrate or semi-erect shrub found throughout India from upper Gangetic plains, eastwards to Assam, throughout Central, Western and Southern India upto an elevation of 600 m. It is also known to grow in Malaysia, Indonesia, Pakistan, Bangladesh and Sri Lanka. [13,14,15,16]. The different vernacular names known are Ananta-mula, Ananthamoola, Asclepiaspseudosarsa, Country Sarasaparilla, Durivel, East Indian Sarsaparilla, Eternroot, False Sarsaparilla, Fragrant one, Gadisugandhi, Gopakanya, Hemidesmuspubescens, HemidismusIndica-Radix, Kapuri, Karibandha, Magrabu, Muttavapulagamu, Naga-jihva, Naruninti, Nunnari, Nunnerroot, Onontomulo, Periplocaindica, Sariva, Smilax aspera, Sogade, Sugandhi-pala, Sugandiroot, Upalasari, White Sariva [17].

PHYTOCHEMISTRY:

Phytochemicals are secondary metabolites found in plants which are responsible for colour, organoleptiprovide protection against insect attacks, plant diseases and for its consumers exhibit a number of protective functions [18]. Phytochemical studies have been carried out on roots, stem, leaves and entire plant. Different phytochemicals were found in preliminary chemical tests and same on isolation from the different parts and whole of plant, the studies revealed the presence of steroids, terpenoids, flavonoids, coumarins, aldehydes, pregnane glycosides and others. The root oil constituents were found to be rich with terpenoids, aldehyde and aliphatic acids. The frequently occurring active constituents of H. indicus are benzoids, pregnane glycosides, terpenoids and others [19, 20, 21, 22, 23].

Steroids: Steroids are a class of organic compounds with a chemical structure that contains the core of gonane or a skeleton derived from three cyclohexane rings and one cyclopentanering. Hemidosterol and hemidesmol were isolated from the plant [24]. β-sitosterolwas reported from the roots [25,26] and also from the stem [27], β-sitosterylglucuronate was isolated from the roots [26].

Pregnane glycosides: Pregnanes are steroidal derivatives with carbons present at positions 1 through 21, pregnene with one double bond, pregnadienes with two double bonds and pregnenolone contains ketone and hydroxyl functional groups. Pregnaneoligoglycoside, pregnane ester diglycoside and pregnane glycoside were isolated from the dried stem parts. Pregnaneoligoglycoside isolated are Indicusin is 11α,12β-di-O-acetyl-orgogenin-3-O-β-Dcymaropyranosyl (1→4)-O-β-D-cymaropyranosyl(1→4)-O-β-D-cymaropyranoside, medidesmine is sarcostin-3-O-α-D-glucopyranosyl(1→4)-O-β-D-digitoxopyranosyl(1→4)-O-β-D-oleandropyranoside, hemisine is calogenin-3-O-β-D-cymaropyranosyl(1→4)-O[3-O-methyl]β-D-glucopyranosyl(1→4)-O-β-D-glucopyranosyl(1→4)-O-β-D-cyma ropyranoside and desmisine is calogenin-3-O-β-D-xylopyranosyl(1→4)-O-β-Ddigitoxopyranosyl(1→4)-O-β-D-xylopyranosyl(1→4)-O-β-D-digitoxopyranoside were isolated from CHCl3-EtOH (3:2) fraction of dried stem [28, 29,30]. Pregnane ester diglycoside isolated was desinine is β-3-O-β-D-oleandropyranosyl-(1→4)-βD-oleandropyranoside [31]. Pregnane glycosides isolated are denicunine is calogenin-3-O-3-O-methyl-β-D-fucopyranosyl-(1→4)-O-β-D-oleandropyranosi de , heminine is calogenin-3-O-β-D-cymaropyranosyl-(1→4)-O-β-D-digitoxopyranoside [32], hemindicusin, is calogenin-3-O-methyl-α-Lrhamnopyranoside, hindicusine is 20-O-benzoyl calogenin-3-O-β -D-digitoxopyranosidefrom the CHCl3-EtOH (3:2) fraction of methanolic extract [33], indicine is calogenin-3-O-β-D-digitoxopyranoside and hemidine calogenin-3-O-β-Dboivinopyranoside [34], hemidescine is 20-O-acetyl calogenin 3-O-β-Ddigitoxopyranosyl(1→4)-O-β-D-oleandropyranoside, emidine is calogenin-3-O-β-Ddigitoxopyranosyl(1→4)-O-β-D-digitoxopyranosyl(1→4)-O-β-D-digitox opyranoside[35]. Pregnenolone glycosides isolated from roots are hemidesmosides C and plocoside A [36].

Terpenoids: Terpenes are hydrocarbons resulting from the combination of several isoprene units. Terpenoids are modified terpenes, wherein methyl groups have been moved or removed, or oxygen atoms added. The essential oil of roots that possess many pharmacological activities has been studied and analysed presence of following terpenesusing GCMS are 1,8cineol, camphor, pinocarveol, β-pinenoxide, pinocarvone, borneol, 4terpenenol, bornyl acetate, myrtenal, α-terpineol, verbenone, myrtenol, linalyl acetate, isobornyl acetate, isobornyl acetate, dihydrocarvyl acetate, α-terpinyl acetate, β-elemene, ciscaryophyllene, Isocaryophyllene, β-selinene, nerolidol, ledol [37]. The terpenoids isolated from the H. indicus were lupeol, α-amyrin, β-amyrin from roots and stem [19,38,25, 39]. The derivatives of above reported terpenoid isolated were lupeolacetate , β-amyrin acetate, hexatriacontane, lupeoloctacosonate from roots [19,39,40]. Terpenoid lactone (3-Oxo-12-lupen-28, 21olide) ,terpenoid ketone, lupanone, and derivatives such as Δ12 –dehydrolupanyl-3β-acetate, Δ12 –dehydrolupeol acetate were isolated from hexane soluble portion of ethanolicextract of stem [27]. Six new pentacyclictriterpenes including two oleanenes identified as olean-12-en-21 β-yl acetate, and olean-12-en-3α-yl acetate, three ursenes characterized as 16(17)-seco-urs12,20(30)-dien-18α-H-3β-ylactetate, urs-20(30)-en-18β-H-3β-yl acetate and 16(17)-secours-12,20(30)dien-18-α-H-3β-ol and a lupene formulated as lup-1,12-dien-3-on-21-ol, known compound β-

amyrin acetate from the roots [40]. Acyclic triterpenic acid; acyclic diterpenic ester and monocyclic sesterterpene esters isolated and their structures were established as 2,6,10,14,18,22-hexamethyltetracos-1-oic acid; n-octyl-2,6,10,14-tetramethyl hexadec-7-ol-10-en-13-on-1-octanoate and n-non-2'-en-1'-yl-13(15,19,19-trimethyl-cyclohex -14, 16-dienyl)-2, 6, 10-trimethyl-tetradec-6-ol-13-on-1-oate [26]. Lupeoloctacosanoate is a marker compound that was isolated from petroleum ether extract of roots and designated as a unique compound. The limit of detection & limit of quantitation were 159.5 and 483.5 ng/spot of root powder by HPTLC method and with an average amount of Lupeoloctacosanoate found in the root powder was 36.5 mg/gm [41].

Flavonoids: Flavonoids or bioflavonoids, chemically are 2-phenyl-1,4-benzopyrone.These belong to ubiquitous group of polyphenolic substances that are present in most plants, concentrated in the seeds, fruit skin or peel, bark and flowers fulfilling many functions .Flavonoids isolated from H. indicus wererutin,hyperoside, quercetin , iso-quercitrin from leaves and their glycosides from flowers [42].

Benzoid derivatives: Benzoid derivatives are aromatic compounds that constitute benzene ring as its nucleus. Some of the benzoid derivatives reported from this plant are 2-hydroxy4methoxybenzaldehyde (HMBA), salicylaldehyde, methyl salicylate as constituent of oil from roots [37]. 4-Hydroxy-3-methoxybenzaldehyde (vanillin), benzaldehyde, HMBA, 3-Hydroxy-4-methoxybenzaldehyde are reported from the stem [27].
HMBA is a marker compound in the plant and in roots. Chakraborty et al. 2008 suggested that biosynthesis of HMBA is mediated by phenylalanine ammonia-lyase in roots. By GCMS method of quantification, HMBA was found as a major compound with >90% in their essential volatile oils with variation from 0.03 to 0.54 % [43].

Coumarinolignoids: Coumarin is a phenolic chemical class with benzopyr-2-one as basic skeleton found in many plants. Lignan isalso a phenolic known as phenylpropanoid, that is built up of C6 -C3 basic unit. When both coumarin and lignanphenolics arecondensed they form a Coumarinolignoid. From leaves Hemidesminine was isolated [44]. \Two new coumarinolignoids, hemdesmin-1, hemidesmin-2 were isolated from the roots [45].

Saponins: saponins are sarsasaponin, smilasaponin, sarsaparilloside, and sitosterolglucoside these presence of saponin have beenreported to facilitate the body absorption of other drugsand phytochemicals which accounts for its history of use in herbal formulas as an agent for bioavaibility and herbal enhancement.[11]

Other: Tannins, resins are isolated from leaves [24],dodecanoic acid, hexadeconoicacid from roots [37] and one new condensed phenylpropanoidglucosidefrom roots [36].

Table1. Phytoconstituents reported from different parts of Hemidesmusindicus. [22,33].

Sr. no	Part	Constituents
1.	Root	Pregnane glycoside viz. Hemindicusin. Coumarinolignoids viz. Hemidesmin-1 and Hemidesmin-2. Others - β-amyrin acetate, α-amyrin, β-amyrin, lupeol acetate, β-sitosterol, hexadecanoic acid, hexatriacontane, lupeoloctasonate. Oil contains 80% cryst alline matter, glucose, hemidesmol, hemidesterol, 2-hydroxy-4-methoxy benzaldehyde, resin acid, glucoside, α-amyrintriterpene, β-amyrintriterpene, and benzaldehyde.
2.	Stem	Glycosides such as Indicine and Hemidine. Pregnane glycoside such as Hemidescine and Emidine. Pregnaneoligoglycosides viz. demicunine and heminine. Desinine, Indicusin, M edidesmine, Hemisine and Demicine. Steroidal compounds viz. Calogenin-3-o-β-Ddigitoxopyranosteroid, desminine steroid, hemisine steroid. Triterpenoids viz. 3-keto-lup-12 -ene-21->28 olidetriterpene, lup-12-ene-3-β-ol acetate triterpene
3.	Leaves	Leaves Coumarinolignoids viz. hemidesminine, hemidesmin-1, hemidesmin-2. Flavon oids viz. hyperoside and rutin. 2.50% tannins.
4.	Flower	Flavanoid glycosides viz. Hyperoside, Isoquercetin and Rutin

Pharmacological activity:

Antiacne activity: Most common skin disorder of pilosebaceous unit is Acne vulgaris, which is caused by bacteria Propionibacterium acnes, Staphylococcus epidermis and Malasseziafurfue. Most of antiacne drugs target Propionibacterium acnes, Staphylococcus epidermis as they are the main culprit. In a study conducted by Kumar and coworkers, the roots of Hemidesmusindicus showed strong inhibitory effect on P.acne and S.epidermis. Minimum inhibitory concentration for P.acne and S.epidermis was found to be 0.051mg/ml and 1.25mg/ml. But high concentrations were required to act as bactericidal agent [46]. In another study conducted by Kumar and coworkers, terpenoidal fraction obtained during successive extraction of Hemidesmusindicus was evaluated for antiacne activity. This terpenoidal fraction showed potent antiacne activity and minimum inhibitory concentrations determined by broth dilution assay was found to be 38ug/ml for both P. acne and S. epidermis and minimum bactericidal concentrations were 38ug/ml and 46ug/ml respectively [47].

Wound healing activity : leaves of *hemidesmusindicus* possess marked wound healing activity and play a promising role in treatment of wound, especially chronic wound, formulated as 5% and 10% ointment containing H. indicus extract increase rate of wound contraction and period of epithelisation [48].

Antimicrobial activity:*H.indicus* is traditionally used in India folklore medicine for the treatment of various bacterialand fungal infection. Gayatri&Kannabiran reported aqueous root extract of *Hemidesmusindicus* along with barks of Ficusbengalensis and Pterocarpusmarspiumroxb showed antimicrobial activity against Staphylococcus aureus, Pseudomonas aeruginosa, Klebsiellapneumonia [49].Chloroform extract of H. indicus showed promising activity against the clinical isolates of Helicobacter pylori. *H.indicus* have stronger and broader spectrum of antimicrobial activity against the pathogenic microorganisms and extract may be used to discover bioactive natural products that would serve as a basic source for development of new antimicrobial compounds to overcome the increasing antibiotic resistance. Methanolic and ethanolic root extract of *Hemidesmusindicus*showed maximum zone of inhibition against Escherichia coli and Vibrio cholerae in agar well diffusion test[3]. Chloroform and 95% ethanolic extracts of *Hemidesmus indicus* roots showed ***antifungal activity*** against Aspergillusniger [50]. Das and coworkers reported potent in vitro antimicrobial activity of methanolic extract of *Hemidesmus indicus* roots against Salmonella typhimurium, Escherichia coli and ShigellaFlexneri.[51].Zafar&cowerkers showed that the ***antibacterial activity*** of 3 different extyracts (Hexane, Methanol & Aqueous) and bioactive compound 2-Hydroxy-4-Methoxy benzaldehyde (2H4MB) shos maximum zone of inhibition. The most active extract was found to be hexane against staphylococcus aureus.The significant antimicrobial effect of *Hemidesmusindicus* against all the pathogen conformed that the compound 2H4MB present in the crude extract are responsible for the effective antimicrobial activity [52].Saponin fraction from the roots extract exhibited remarkable antimicrobial activity against Staphylococcus aureus, Salmonella typhi, Klebsiellapneumoniae, Aspergillusflavus, Aspergillusfumigatus and Aspergillusniger.[53].

Anti-oxidant activity: The in vitro and in vivo antioxidant potential of root bark of *Hemidesmusindicus* R.Br. was evaluated for radical scavenging activity by DPPH reduction, superoxide radical scavenging activity in riboflavin/light/NBT system (nitro blue tetrazolium), nitric oxide (NO) radical scavenging activity in sodium nitroprusside/Greiss reagent system and inhibition of lipid peroxidation induced by iron-ADP-ascorbate in liver homogenate and phenyl hydrazine induced haemolysis in erythrocyte membrane stabilization study. The extract was found to have different levels of antioxidant properties in the models tested. In scavenging DPPH and superoxide radicals, its activity was intense, while in scavenging NO radical, it was moderate. It also inhibited lipid peroxidation of liver homogenate and the haemolysis induced by phenylhydrazine confirming the membrane stabilization activity. Phytochemicals like flavonoids, and polyphenols, terpenoids, cumarins and glycosides have antioxidant properties. Evalution of antioxidant activity of methanolic extract of H. indicus root bark in vitro and ex-vivo models is done. 70% methanolic extract of *H. indicus* root, which contain large amout of flavonoids and phenolic compounds, exhibit high antioxidant and free radical scavenging activities. It also chelates iron and has reducing power. These in vitro assays indicate that the extract contains constituents that can be a significant source of natural antioxidant.[54].

ECOFRIENDLY USES: The bark of *H. indicus*, an extensively available plant biomass was used as biomaterial for removal of lead metal (Pb) from aqueous streams [55]. The roots were used to remove the color from synthetic wastes in water. Phenol has been notorious for living being, which is one of the most toxic industrial pollutants; even at low concentration it affects the water quality and is fatal at high concentrations. Activated carbon is generally used to detoxify water by adsorption of phenol. The residue of roots can be used as an alternative to detoxify the phenol in water by adsorption, but when compared to activated carbon it was found that the adsorption capacity of residue was marginal. With respect to economical and ecofriendly point of view, the roots residue justifies its use as it is easily accessible and inexpensive. A special consideration justifies for the use of roots residue for adsorption of phenol as it is a by-product after the extraction of juices with medicinally value from the same [56].

COSMETIC USES: *Anantmool* is a good source of phytochemicals like saponin, glycosides, flavonoids, tannins etc and various pharmacological activities due to which it can be used in various herbal product formulations.

Hemidesmusindicus is good source of " saponin" which are natural carbohydrate found in plants. They have shown in studies to have good antioxidant properties and also have "foaming' properties,so it can be used in herbal shampoo preparation due to its foaming property also it has good cleansing property that helps to remove dirt and impurities.

Hemidesmusindicus also contain flavonoids and nutrients like copper, iron, manganese, vitamins A and D and zinc making it a good anti-aging ingredient for skin around the eyes. [57] Melanin generation inhibitor [58] makes it possible to prevent or control safely development of pigmentation, such as a pigmented spot by aging or sun tanning and freckles. Formulation with roots as one along other is effective in inhibiting elastase, collagenase, tyrosinaseactivity, preventing and improving skin aging, pigmentation due to insolation, senile plaque, freckle, chloasma, facial mottle, etc., [59]Topical creams for alleviating chronic skin disorders as psoriasis, eczema and lichen planus and/or promoting general health comprise mixtures of hydrolyzed ghee (butterfat) and herbal extracts where roots are used as a component [60, 61].Polyherbal formulation with multiple therapeutic uses which provides healthy skin and other health benefits especially as skin nourisher, anti-acne, anti-microbial, anti-oxidant, immune-modulation, anti-inflammatory, cleanser, fairness for skin and protection of skin from UV radiation from sun [62].Plant is used as lipase inhibitor for skin/hair external preparation [63].Polyherbal composition contains the root which is used as anti-inflammatory agent [64]. This prevents redness, swelling and discomfort cause by inflammation.The uncomfortable system of ezema& psoriasis could be alleviated when it is applied to the skin. The smoothening properties of *sarsaparilla* eliminate the dry & itchy skin [65].

H. indicus contains natural antioxidant that help to protect from environmental stressors.[57] The cosmetic formulation has antioxidant effectimprove the appearance and health of the skin by eliminating wrinkles and reducing the appearance of age spots, improving the skin lustre& elasticity when applied or consumed.[66,67] Plant extracts are used as hair growth stimulators and compositions of hair care products [68]. Day-night cosmetic composition functions to impart protection to the skin from the harmful rays of the sun and as a skin lighter. The invention relates to a skin composition having skin-lightening and rough skin-improving effects [69, 70].An herbal composition is reported for relieving pain [71].It contains natural fats that contribute to skin's own moisturizing property. [57]. Aromatic oil in *hemidesmusindicus* plays an important actin on sweet and fall smell, due to this it is use to formulate deodorant talc [72].

Therefore the extracts of *H. indicus* can be used in appropriate cosmetic formulation aiming at prevention of acne, dandruff owing to antibacterial properties. It can also be used in hand sanitizer and medicated talcum powder due to its antimicrobial property. It has a wound healing properties; therefore it can be employed in aftershave products and other foot cosmetics as treatment of chilblain, athlete foot.

CONCLUSION:

Hemidesmusindicus has a long history as a medicinal plant with diverse therapeutic uses. It has been traditionally claimed for a large number of pharmacological actions, ayurvedic uses, documented for medicinal uses. Scientific studies conducted have verified many of the traditional uses of this plant. More recently, the cosmetic industry has shown interest for sunscreen properties and healing many skin diseases. In many of the herbal formulations plant especially roots are used as an ingredient for antiacne, anti-microbial, antioxidant, anti-inflammatory etc.The present review highlights on the uses of *hemidesmusindicus* in varying cosmetic formulations. The phytochemistry of *H. indicus* has been investigated revealing that it contains pregnane glycosides, terpenes, terpenoids, benzoids and other. Its properties can be further exploited in future by cosmetic industries to use in various innovative herbal cosmetics formulations.

REFERENCES:

1.Gediya K. Shweta, Mistry B. Rajan, Patel K. Urvashi, Blessy M. and Jain N. Hitesh. Herbal Plant Used As Cosmetic. Scholars research library.(2011) 1(1):24-32

2.Ch. Mohan, S. Shridhar, B. Mohan, SB. KrishnaveniAnd Karnakar Reddy. Antibacterial Activity And Phytochemical Screening Of HemidesmusIndicus L.B. BR. International Journal Of Pure And Applied Bioscience. (2015).3(2):221-225.

3.Ratha, M, Subah. K, Senthilkumar. G And Paneerselvam. A. Screening Of Phytochemical And Antibacterial Activity Of HemidesmusIndicus; Europian Journal Of Experimental Biology (L.) And VetiveriaZizanoids (L.) (2012) ; 2(2):363-368.

4.Weissner Wendy. (2014). Anantmul(HemidesmusIndicus): A Review Of Biomedical Studies And U.S. Products; Ayurveda Journal Of Health. (2014).7(4).

5. Tabassum, Das Saumaya And MazumderAvijit. Ethanobotnical Review Of Hemidesmus Indicus R.BR. International Journal Of Current Research. 2015);7(12):24251-24256.

6..http:// www.globalherbalsupplies.com/hemidesmus- indicushtm.

7.HemidesmusIndicus R. Br. Asclepiadacea, Pdf. Agro Technique Of Selected Medicinal Plant.(2006/06); 99-102.,

8.Aiyer, K.N. (1951). Pharmacognosy of Ayurvedic Drugs of Travancore, Cochin. Central Research Institute, Trivandrum.

9.Prasad, S. and Wahi, S.P. (1965). Pharmacognostical investigation on Indian SarasaparillaPart II. Root and root-stock of Hemidesmusindicus R. Br. Indian Journal of Pharmacy, 37: 35-39.

10.Warrier, P.K., Nambiar, V.P.K., Ganapathy, P.M.. Some important medicinal plants of the Western Ghats, India-A profile. International Development Research Centre,(2000) 159-174.

11.http://www.pioneerherbs.com/hemidesmus indicus. htm.

12.http://www.herbsforever.com/herb/anatmoo.asp.

13.N.Sasidharan. Biodiversity Documentation for Kerala.Flowering Plants.Kerala Forest Research Institute, Peechi, Kerala, India.(2004).

14.Siddique, N.A., Bari, M.A., Naderuzzaman, N., Khatun, M.H., Rahman. Collection of indigenous knowledge and identification of endangered medicinal plants by questionnaire survey in Barind Tract of Bangladesh. Journal of Biological Science,(2004) 4: 72-80.

15.Anonymous. Quality Standards of Indian Medicinal Plants. Indian Council of Medical Research, New Delhi, 2☹2005); 119-128.

16.Nayar, T.S., Beegam, A.R., Mohanan, N. and Rajkumar, G. Flowering Plants of Kerala: A Handbook of Tropical Botanic Garden and Research Institute, Thiruvanathapuram, Kerala, India.(2006).

17.Satheesh, G., Tushar, K.V., Unnikrishnan, K.P., Hashim, K.M., Indira, B. Hemidesmusindicus (L.) R. Br. A Review. Journal of Plant Sciences, (2006). 3: 146-156.

18.David, O. K. and Emma, L.W. Herbal Extracts and Phytochemicals: Plant Secondary Metabolites and the Enhancement of Human Brain Function. Advances in Nutrition, (2011). 2: 32–50.

19.Murti, P., Bhaskara R. and Seshadri, T.R. Chemical components of roots of Decalepishamiltonii (Makaliveru). III. Comparison with Hemidesmusindicus (Indian sarsaparilla). Proceedings - Indian Academy of Sciences, . (1941). 13A: 399-403.

20.Michael, W. Phytochemical Diversity of Secondary Metabolites.Encyclopedia of Plant and Crop Science, New York, 915.(2004).

21.Kumar, A.R., Rathinam, K.M.S. and Prabhakar, G.. Phytochemical screening of selected medicinal plants of asclepiadaceae family.Asian Journal of Microbiology, Biotechnology & Environmental Sciences, (2007) 9(1): 177-180.

22.Austin, A. A Review on Indian Sarsaparilla, Hemidesmusindicus (L.) R. Br. Journal of Biological Sciences, (2008) 8: 1-12.

23.Aneja, V., Suthar, A., Verma, S. and Kalkunte, S. Phyto-pharmacology of Hemidesmusindicus. Pharmacognosy Reviews,(2008). 2(3): 143-150.

24.Dutta, A.T., Ghosh, S. and Chopra, R.N ChemischeUntersuchung der Wurzeln vonHemidesmusIndicus. I. Teil. Archiv der Pharmazie und Berichte der DeutschenPharmazeutischenGesellschaft, (1938). 276: 333-340.

25.Chatterjee, R.C. and Bhattacharya, B.K. A note on the isolation of (β-sitoserol from Hemidesmusindicus. Journal of Indian Chemical Society, (1955). 32: 485-486.

26.Roy, S.K., Ali, M., Sharma, M.P. and Ramachandram, R. Phytochemical investigation of Hemidesmusindicus R. Br. Roots. Indian Journal of Chemistry, Section B: Organic Chemistry Including Medicinal Chemistry, 41B (2002), (11): 2390-2394.2

27.Gupta, M.M., Verma, R.K. and Misra, L.N. Terpenoids from Hemidesmusindicus.Phytochemistry, (1992). 31(11): 4036-4037.

28.Deepak, D., Srivastava, S. and Khare, A. Indicusin - apregnanediestertriglycosidefrom Hemidesmus indicus R. Br. Natural Product Letters, (1995a). 6(2): 81-86.

29. Deepak, D., Srivastava, S. and Khare, A. Structural studies of oligosaccharide segment of hemisine and desmisine. Trends in Carbohydrate Chemistry developed from a Carbohydrate Conference, 9th, Lucknow, India(1995b)., 69-74.

30.Deepak, D., Srivastava, S. and Khare, A. Pregnane glycosides from Hemidesmusindicus.Phytochemistry, Natural Product Letters, (1995b). 44(1):145-151.

31.Oberai, K., Maheshwari, P. K. and Anakshi, K. A Pregnane Ester Diglycoside from Hemidesmusindicus. Phytochemistry, (1985). 24(10): 2395-2397.

32. Sigler, P., Saksena, R., Deepak, D. and Khare, A. C21 steroidal glycosides from Hemidesmusindicus.Phytochemistry, (2000). 54(8): 983-987.

33. Sethi, A., Srivastava, S.S. and Srivastav, S. Pregnane glycoside from Hemidesmusindicus R. Br. Indian Journal of Heterocyclic Chemistry, (2006). 16(2): 191-192.

34. Prakash, K., Sethi, A., Deepak, D., Khare, A. and Khare, M. P. Two pregnaneglycosides from Hemidesmus indicus.Phytochemistry(1991).30(1): 297-299.

35.Chandra, R., Deepak, D. and Khare, A. Pregnane glycosides from Hemidesmusindicus.Phytochemistry, (1994). 35(6): 1545-1548.

36. Zhao, Z., Matsunami, K., Otsuka, H., Negi, N., Kumar, A. and Negi, D.S. A condensed phenylpropanoidglucoside and pregnanesaponins from the roots of Hemidesmusindicus.Journal of natural medicines, (2012). DOI 10.1007/s11418-012-0659-6.

37. Nagarajan, S., Rao, L.J.M. and Gurudutt, K.N. Chemical composition of the volatiles of Hemidesmusindicus R. Br. Flavour and Fragrance Journal, (2001). 16(3):212-214.

38.Gupta, P.N. Antileprotic action f an extract from "Anantamul' (HemidesmusIndicusR. Br.). Leprosy in India, (1981). 53(3): 354-9.

39.Padhy, S. N., Mahato, S. B. and Dutta, N. L. Triterpenoids from the roots of Hemidesmusindicus.Phytochemistry, . (1973); 12(1): 217-218.

40. Roy, S.K., Ali, M., Sharma, M.P. and Ramachandram, R. New pentacyclictriterpenesfrom the roots of Hemidesmusindicus. Die Pharmazie, (2001).56(3): 244-246.

41.Darekar, R.S., Khetre, A.B., Sinha, P.K., Jeswani, R.M. and Damle, M.C. Quantitation of lupeoloctacosanoate in Hemidesmus indicus R. Br. root powder by HPTLC. Rasayan Journal of Chemistry. (2008). 1(3): 526-531

42.Subramanian, S.S. and Nair, A.G.R. Flavonoids of some asclepiadaceous plants.Phytochemistry, (1968). 7(9): 1703-4.

43.Nagarajan, S. and Rao, L.J.M. Determination of 2-hydroxy-4-methoxybenzaldehyde in roots of Decalepishamiltonii (Wight &Arn.) and Hemidesmusindicus R.Br. Journal of AOAC International(2003)., 86(3): 564-567.

44.Mandal, S., Das, P.C., Joshi, P.C. and Chatterjee, A. Hemidesminine - a new coumarinolignoid from Hemidesmusindicus R. Br. Indian Journal of Chemistry, Section B: Organic Chemistry Including Medicinal Chemistry, (1991); 30B (7): 712-713.

45.Das, P. C., Joshi, P. C., Mandal, S., Das, A., Chatterjee, A. and Banerji, A. New coumarino-lignoids from Hemidesmusindicus R. Br. Indian Journal of Chemistry, Section B: Organic Chemistry Including Medicinal Chemistry, (1992). 31B (6): 342-5.

46.Kumar GS, Jayaveera KN, Ashok Kumar CK, et al.Antimicrobial effects of Indian medicinal plants against acne-inducing bacteria. Trop J Pharm Research journal ; (2007); 6(2):717723.

47. Kumar GS, Jayaveera KN, Kumar Ashok CK, et al. Evaluation of antioxidant and antiacne properties of terpenoidal fraction of Hemidesmusindicus (Indian sarsaparilla). The Internet Journal of Aesthetic and Antiaging Medicine ; (2008) 1 (1)

48.Moideen NM, Varghese R, KUMAR EK, Dhanapal CK wound healin activity of ethanolic extract of hemidesmusindicus (linn) R.Br leaves in rats.RJPBSCS(2011) ; 2:64.

49. M. Gayatri,Kannabiran K. Antimicrobial activity of Hemidesmusindicus, FicusbengalensisandPterocarpusmarsupiumroxb. Indian J Pharm Sci.; (2009), 71(5): 578–58.

50. Hiremath SP, Rudresh K, Badami S. Antimicrobial activity of various extracts of Strigasulphurea and Hemidesmus indicus. Indian J. Pharm.Sci.; (1997); 59(3):145-147

51. Das S, Devaraj SN. Antienterobacterial activity of Hemidesmus indicus R. Br. Root extract. Phytother Res. (2006); 20(5):416-421.

52. MehmoodZafar, Dixit K Arunesh, Singh Ajay, S. Farooq, ChhimwalSumanlata,Indian Herb HemidesmusIndicus –A Potential Source Of New Antimicrobial Compound. Medical chemistry ,(2016);6:12: 734-738.

53. Khanna VG, Kannabiran K. Antimicrobial activity of saponin fraction from the roots of Hemidesmusindicus. Research Journal of Medicinal Plant. (2008) ; 2(1): 39-4253.

54. Ravishankara M.N, Shrivastava N, and Rajani M. Evaluation of antioxidant properties of root bark of Hemidesmusindicus R.Br. (Anantmul). Phytomedicine.International Journal of Phytotherapy and PhytoPharmacology. . (2002) 9(2): 153-160.

55. Chandra, S.K., Kamala, C.T., Chary, N.S., Sastry, A.R.K., Nageswara, R.T. and Vairamani, M. Removal of lead from aqueous solutions using an immobilized biomaterial derived from a plant biomass. Journal of hazardous materials, .(2004); 108(1-2): 111-117.

56. Srihari, V., Das, P., Meera, A. and Devi, G.V. Study on adsorption of phenol from aqueous media using extracted residue of Hemidesmusindicus. Asian Journal of Microbiology, Biotechnology & Environmental Sciences, (2005). ; 7(3): 469-472.

57. https://www.annmariegianni.com/sarsaparilla-in skin care.

58.Hashimoto, H., Tani, K., Yamashita, R. and Ayuzawa, H. Melanin generation inhibitor [machine translation]. Jpn. KokaiTokkyoKoho., . (2010) JP 2010100554 A 20100506.

59.Yaginuma, A., Honda, H., Murata, K., Suzuki, T. and Matsuda, H. Skin whitening external preparation comprising Myricanagihook.f.nonthunb.,Saracaasoca de wilde, Hemidesmusindicus (L.) R.BR. and OnosmabracteatumWall. Used for preventing skin aging and pigmentation. Jpn. KokaiTokkyoKoho., . (2004b) JP 2004182711 A 20040702.

60. Shah, E. Creams useful for treating psoriasis, eczema and lichen planus. Brit. UK Pat. Appl., (1994). GB 2274058 A19940713.

61.Shah, E. Herbal compositions for the treatment of skin disorders such as psoriasis, eczema and lichen planus. U.S.patent, (1997). US 5693327 A 19971202.

62. Singh, R., Katiyar, C.K., Upadhyay, D.J., Saini, K.S., Sharma, N. Polyherbalformulation with multiple therapeutic uses.Indian Pat. Appl., (2008). IN 2006DE02757 A 20080905

63.Takahashi, H., Suzuki, T. and Murata, K. A lipase inhibitor containing extracts of plants such as Bergenialigulata (wall.)Hemidesmusindicus (L.) r. br. and Psoraleacorylifolia L. Jpn. KokaiTokkyoKoho, . (2006); JP 2006257058 A 20060928.

64. Chatterjee, T.K. Polyherbal composition as anti-inflammatory agent.PCT Int. Appl., WO 2005120529 A1 20051222 (2005)

65. https;//www.healthbenifits.com/sarsaparilla-uses.

66. Nanba,T., Hattori, Y., Shimomura, K., Takamatsu, S. Cosmetic containing plant extract. Jpn. KokaiTokkyoKoho., . (1995); JP 07061918 A 19950307.

67. https://www.organifacts.net

68. Ayuzawa, D., Hossain, M.N., Nagano, E., Yamashita, R. Hair matrix cell growth promoters and hair papilla cell growth promoters containing plant extracts, hair growth stimulating compositions containing the agents, and hair care method using the compositions. Jpn. KokaiTokkyoKoho., (2010). JP 2010222273 A 20101007.

69. Narayana, D.B.A., Kattiyar, C.K., Goel, R., Krishnan, K.H.R., Dobriyal, R.M. and Kumar, L. Novel cosmetic compositions comprising herbal extracts. Indian Pat.ApplIN2000DE00997 A 20110624. (2011a).

70. Narayana, D.B.A., Kattiyar, C.K., Goel, R. and Krishnan, K.H.R. Day and Night Cosmetic Composition.Indian Pat. Appl. IN 2000DE00998 A 20110624.Bhawarlal, J.B. (2008).

71. A herbal composition for relieving pain from joints and bones and process thereof. PCT Int. Appl., WO 2008015697 A2 20080207.

72. Dr, M.Archana, Dr.D. Sadanand, & J. Mohan,ayurvedic deodorant talc with hemidesmusindicus and shankhajeerak;thepharma innovation journal; ;(2017);6(9):86-88. from different parts of Hemidesmusindicus. [22,33]