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A Review on Medicinal Plants and its Importance from Glycosides

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Abstract: Glycosides are one of the important constituents in medicinal plants worldwide. According to chemical classification, Glycosides are having different types like Anthraquinones, Saponins, Flavonoids, Flavonols, Coumarins, Furanocoumarins, etc. Various plants like Digitalis, Thevetia, Senna, Senega, Brahmi, Rhuberb, Aloe, Cascara, etc fall into this category. Glycosides are basically used Purgative, Cardiotonic, anti-depressant, coloring agent, diuretic, flavoring agent, antifungal, antidiabetic, antipyretic, stomachic, anthelmintic, antirheumatic agent, etc. Different parts of these plants like rhizomes, seeds, bark, leaves, etc are used as the potent sources of glycosides. These plants are grown in worldwide. In this review article, we focussed that the basic introduction and importance of glycosides, classification, their tests, distribution of different plants and their significance.

Keywords: Glycosides, Senna, Digitalis, Thevetia, Aloe, Rhuberb, Cascara, Cochineal, Dioscorea, Squill, Brahmi, Senega.

I. INTRODUCTION

Glycosides maintain important roles in medicinal and pharmaceutical world. Many medicinal plants contain a large amount of sugar like monosaccharides, disaccharides, trisaccharides, polysaccharides, etc. Glycoside is one of the organic conjugated moieties in where sugar part linked to non sugar part. The sugar part is known as glycone and the non sugar part is known as aglycon via glycoside linkage. On acid or enzymatic hydrolysis the glycosides break down into glycon and aglycon. Various medicinal plants like Thevetia, Digitalis, Squill, Cascara, Rhuberb, Brahmi, Senega, Aloe, Senna, etc. Pharmaceutically glycosides are used for the treatment of many disorders like diabetic, rheumatism, inflammation, fever, liver protection, different fungal diseases, etc. These plants are grown and cultivated in several countries as their different plant parts are also used for the sources of various glycosides [1-3].

II. TYPES OF GLYCOSIDES

Various types of glycosides are classified as followed [1, 4-5]:

- 1) *C-Glycosides*: In this glycoside, sugar part is bounded to carbon atom. Cascara and Aloe fall in this category. Aloin is found from Aloe and Cascarosides are obtained from Cascara.
- 2) *O-glycosides*: In this glycoside, sugar part is bounded to oxygen atom. Senna and Rhuberb fall in this category. Glucogallin (O-glycoside) is obtained from Rhuberb.
- 3) *S-glycosides*: In this glycoside, sugar part is bounded to sulphur atom. Sinigrin from black mustard fall in this category.
- 4) *N-glycosides*: In this glycoside, sugar part is bounded to nitrogen atom. This glycoside is hydrolysed by enzymes, water, mineral acids, etc. They are crystalline. These are amorphous. These are soluble in water but insoluble in ether and chloroform. The aglycon part is soluble in ether or benzene. These glycosides produce optical activity. These glycosides are not able to reduce Fehling's solution. These glycosides are used in the plant growth, protection and development.

III. ACTIVE CONSTITUENTS

Glycosides contain lots of active constituents in different plants. An active constituent like Rhein is obtained from Rhuberb whereas Sennosides A and B are obtained from Indian senna and Alexandrian senna. Another one important constituent is Aloe-emodin found from Aloe. Besides, Cascarosides A, B, C and D are found from Cascara. Like another active constituents Barbaloin, Carminic acid, Digoxin, Scillaren A, Diosgenin, Ouabain, Sinigrin, Hesperidin, Coumarin, Khellin, Xanthotoxin, Psoralen, Bacosides A, Hicogenin, Arbutin, Solasodine, Gentiopicrin, Iso-vanillin, Cantharidin, Amarogentin etc are observed under the glycosides [1, 6-7].

IV. IMPORTANCE IN PHARMACEUTICAL WORLD

Glycosides are used to cure different diseases in pharmaceutically. Like as Senna is used as purgative whereas Digitalis is used as cardiotonic. Glycyrrhiza is used as expectorant and treatment of peptic ulcer. Brahmi is followed for nervine tonic. Henna is used as antifungal. Garcinia is very useful for the treatment of rheumatism. Picrorrhiza is used as hepatoprotective agent. Gymnema is maintaining its antidiabetic property. Another one example is the treatment of leucoderma followed by Psoralea. Ammi is used for the treatment of vitiligo. Visnaga is smooth muscle relaxant [1, 8-10].

V. ISOLATION OF GLYCOSIDES

Glycosides are extracted via several methods. One of the useful methods is Sta-otto method. The drug is powdered and extracted with solvent like as alcohol by using Soxhlet through the application of percolation below 45°C for extraction of thermolabile glycosides. The extract is mixed with lead acetate to precipitate out tannins and impurities. Lead sulphide is added to lead acetate precipitate by using hydrogen sulphide gas. The extract is then filtered and concentrated to precipitate crude glycosides. The pure glycosides are obtained from crude glycosides by using different techniques like column chromatography, thin layer chromatography, etc. The pure isolated glycosides are then characterized by UV, IR, NMR and mass spectrometry [1, 3, 11].

VI. CHEMICAL TESTS

Various types of tests for different types of glycosides are followed [1, 3, 12]:

- 1) *Borntrager's test*: It is used for the detection of anthraquinones in Indian senna leaves. The drug is treated with dilute sulphuric acid and boiled. The drug is then filtered and benzene or chloroform or ether is used to the filtrate. After shaking the layer is separated. Ammonia is added into it. Pink to red color formed due to the confirmation of anthraquinone glycosides in Indian senna leaves.
- 2) *Borax Test*: It is also known as Schoenteten's reaction. It is used for the identification of specific varieties of aloes. Aloe is powdered and boiled with water. The mixture is then filtered and collects the filtrate with kieselguhr. Borax is added to the filtrate and shaken. After shaking the borax is dissolved. One test tube is used and the clear, dry it. Then little amount of the mixture is added to this test tube with water. Green fluorescence is observed.
- 3) *Bromine Test*: It is used for the detection of tetrabromalin in aloe. Aloe is powdered and boiled with water. The mixture is then filtered and collects the filtrate with kieselguhr. Bromine solution (freshly prepared) is added to the filtrate. Pale yellow color is precipitated with the confirmation of tetrabromalin in aloe.
- 4) *Nitric acid test*: It is very useful for detection and identification of aloe. Aqueous solution of the drug is treated with nitric acid and observes the color change of the solution. Dark brown or red color follows the confirmation of curacao aloes whereas brown color to green color conversion confirms the presence of cape aloes. Changing of brown color to yellow color indicates the presence of socotrine aloes and yellow color confirms the presence of Zanzibar aloes.
- 5) *Nitrous acid test*: It is very useful for detection and identification of isobarbaloin in aloe. Aqueous solution of aloe is treated with sodium nitrite crystals with few amount of acetic acid. If pink color forms then the curacao aloe is confirmed whereas light pink color forms confirmed the presence of cape aloes.
- 6) *Cupraloin test*: It is also known as Klunge's isobarbaloin test. Aqueous solution of drug is treated with copper sulphate solution, sodium chloride and 90% alcohol. Curacao aloes show red color whereas cape aloe produces faint color to yellow. Socotrine and Zanzibar aloes show no color in this test.
- 7) *Modified anthraquinone test*: It is very useful for detection and identification of C-glycosides (aloe-emodin) in aloe. Aqueous solution of aloe is mixed with ferric chloride and dilute hydrochloric acid for hydrolysis. After hydrolysis the solution is mixed with carbon tetrachloride or ether. One layer is separated. The layer is shaken with dilute ammonia solution. Cherry red color shows the confirmation of C-glycosides (aloe-emodin) in aloe.
- 8) *Legal test*: It is very useful for detection and identification of cardiac glycosides. The extract of drug is added with pyridine and sodium nitroprusside solution. Red color shows the confirmation of cardiac glycosides.
- 9) *Baljet test*: It is very useful for detection and identification of cardiac glycosides. The drug is treated with sodium picrate. Yellow to orange color show the confirmation of cardiac glycosides.
- 10) *Keller-kiliani test*: It is very useful for detection and identification of cardiac glycosides specially digitoxose. The drug is powdered, boiled and filtered with 70% alcohol for few minutes. Few amounts of water and lead acetate solution are added into the filtrate. The filtrate and shaken well and separated. The filtrate is added and evaporated with chloroform. The extract is dissolved and cooled in glacial acetic acid. Few drops of ferric chloride solution is added into the extract. The extract is taken into a fresh test tube. Few amounts of concentrated sulphuric acid is added into it. Primarily red brownish layer is formed. Later greenish blue color formed for the confirmation of digitoxose as cardiac glycoside.

VII. DISTRIBUTION OF GLYCOSIDES

Table: Plant and Drug Description under Glycosides

Sl. No.	Name of Drug	Synonym	Parts Used	Family	Scientific Name	Geographical Source	Active Constituents	Uses
1	Cascara [1, 13-14]	Sacred Bark	Dried bark	Rhamnaceae	<i>Rhamnus purshiana</i>	North Carolina, Washington, West Canada, Kenya	Cascarosides A, Cascarosides B, Cascarosides C, Cascarosides D, Aloe-emodin, Emodin, Chrysophanol	Mild purgative, tonic, bitter stomachic
2	Rhuberb [1, 15-16]	Revandchini	Dried rhizomes	Polygonaceae	<i>Rheum palmatum, Rheum webbianum, Rheum emodi</i>	India (Kashmir, Sikkim), Tibet, South east China, Korea, West Germany	Rhein, Aloe-emodin, Chrysophanol, Emodin, Phycion, Palmidin A, Palmidin B, Palmidin C, Glucogallin, Tannin, Catechin, Rheinolic caid, Pectin, Epicatechin	Purgative, bitter stomachic
3	Indian Senna [1, 17-18]	Senna leaf	Dried leaflets	Leguminosae	<i>Cassia angustifolia, Cassia senna</i>	India (Tamil Nadu, Andra Pradesh, Gujarat, Rajasthan)	Sennosides A, Sennosides B, Sennosides C, Sennosides D, Aloe-emodin, Rhein, Kaempferol, Isorhamnetin, Phytosterol, Myricyl alcohol, Chrysophanic acid, Rhein 8 – glucoside, Rhein 8- diglucoside, 8- glucoside	Purgative
4	Alexandrian Senna [1, 19-20]	Egyptian senna	Dried leaflets	Leguminosae	<i>Cassia acutifolia</i>	Tropical Africa, Sudan	Sennosides A, Sennosides B	Purgative
5	Senna Pods [1, 20-21]	Senna fruit	Dried ripe fruits	Leguminosae	<i>Cassia angustifolia and</i>	India, Africa	Sennosides A, Sennosides B	Purgative

					<i>Cassia acutifolia</i>			
6	Aloe [1, 22-23]	Kumari	Dried juice of leaves	Liliaceae	<i>Aloe vera</i> , <i>Aloe barbadensis</i> , <i>Aloe ferox</i> , <i>Aloe Africana</i> , <i>Aloe spicata</i> , <i>Aloe perryi</i>	India, Europe, Caribbean Islands, South and east Africa	Aloe-emodin, Barbaloin, Aloesin, Aloin,	Purgative
7	Hypericum [1, 24-31]	St. John's wort, Goat weed, Millepertuis	Dried aerial parts	Hypericaceae	<i>Hypericum perforatum</i>	India, England, Australia, Europe	Hyperoside, Hyperforin, Hypericin	Antidepressant
8	Cochineal [1, 32-33]	Coccus	Dried female (full grown) insects of young larvae	Coccidae	<i>Coccus cacti</i>	Central America, Mexico, Caribbean Islands	Carminic acid, Carmine	Coloring agent
9	Thevetia [1, 34-36]	Lucky nut tree	Dried seeds	Apocynaceae	<i>Thevetia peruviana</i> , <i>Thevetia nerifolia</i>	India, Florida, Hawaii, America, West Indies	Thevetin A, Thevetin B, Peruvoside, Thevenerin, Neriifolin, Cerberin, Peruvosidic acid	Cardiotonic
10	Digitalis [1, 37-42]	Foxglove leaves	Dried leaves	Scrophulariaceae	<i>Digitalis purpurea</i>	India, England, Europe, USA	Digitoxigenin, Digitoxin, Gitoxin, Gitaloxin, Verodoxin, Digoxin, Purpurea glycoside A, Purpurea glycoside B, Lanatosides A, Lanatosides B, Lanatosides C, Glucoverodoxin	Cardiotonic
11	Indian Squill [1, 43-44]	Jangli pyaz, Urginea, Sea onion	Dried sliced bulbs	Liliaceae	<i>Urginea indica</i>	India, Italy, Spain, France, Greece, Algeria	Scillaren A, Scillaren B	Cardiotonic, expectorant, stimulant, diuretic, emetic, cathartic
12	European Squill	White squill	Dried sliced	Liliaceae	<i>Urginea maritima</i>	Morocco, Algeria,	Scillaren A, Scillaren B	Cardiotonic

	[1, 45-46]		bulbs			France, Italy, Spain		
13	Red Squill [1, 47-48]	Red variety of European squill	Dried sliced bulbs	Liliaceae	Red variety (<i>Urginea maritima</i>)	Morocco, Algeria, France, Italy, Spain	Anthocyanin, Scilliroside, Scillirubroside	Rat poison
14	Ouabain [1, 49-50]	G-strophanthin	Dried seeds	Apocynaceae	<i>Strophanthus gratus</i> , <i>Acokanthera schimperi</i>	Tropical Africa	Ouabain, G-Strophanthin, Ouabagenin, Rhamnose	Cardiotonic
15	Strophanthus [1, 51-52]	Arrow poison	Dried ripe seeds	Apocynaceae	<i>Strophanthus kombe</i>	Tropical Africa	Strophanthin, Cymarol, β -cymarin, K-strophanthin	Cardiotonic
16	Mustard [1, 53-54]	Black mustard	Dried ripe seeds	Cruciferae	<i>Brassica nigra</i>	India (West bengal, Uttar Pradesh, Bihar), USA	Sinigrin	Rubefacient, emetic, counter irritant
17	White Cherry Bark [1, 55-56]	Wild back cherry, Virginian prune bark, Cortex pruni	Dried bark	Rosaceae	<i>Prunus serotina</i>	USA, Canada, Florida, North Carolina	Prunasin, <i>p</i> -coumaric acid	Flavoring agent, mild sedative, expectorant
18	Bitter Almond [1, 57-58]	Aamygdala amara	Dried ripe seeds	Rosaceae	<i>Prunus amygdalus</i>	Iran, Italy, Spain, Morocco, France, Portugal	Amygdalin	Sedative, demulcent, flavoring agent
19	Milk-thistle (Silymarin) [1, 59-64]	Marian Thistle	Ripe seeds	Asteraceae (Compositae)	<i>Silybum marianum</i>	India (Kashmir), Canada, Europe, South America	Silybin, Silydianin, Silyhermin, Silydianin, Silybinome, Silandrin, Neosilyhermin, Dehydrosilybin, Silycrystin, Deoxy silydianin, Desocysilycristin	Liver disorders treatment, anti-depressant, bitter tonic
20	Buck wheat [1, 65-66]	Buck wheat	Dried fruits	Polygonaceae	<i>Fagopyrum esculentum</i>	USA, Japan, Russia	Rutin	Capillary bleeding and retinal hemorrhages treatment

21	Gingko [1, 67-68]	Kew tree, Maiden hair tree	Drived leaves	Gingkoaceae	<i>Gingko biloba</i>	East Asia, Europe, North America	Gingkolides A, Gingkolides B, Gingkolides C, Ginkgetin, Kaempferol, Isorhamnetin, Quercetin, Isoginkgetin, Gingkolic acid, Bilobetin, Anthocyanins, Catechins, Sitosterol, Shikimic acid	Vascular disorders treatment
22	Tonka bean [1, 69-70]	Tonco seeds	Dried seeds	Leguminosae	<i>Dipteryx odorata</i>	Mexico, Brazil, Holland	Coumarin	Flavoring agent
23	Ammi [1, 71-72]	Ammi	Fruits	Umbelliferae	<i>Ammi majus</i>	India (Jammu and Kashmir), Egypt, Europe, West Africa	Xanthotoxin, Bergapten, Imperatorin, Isopimpinlin	Vitiligo treatment
24	Visnaga [1, 73-74]	Khella, Pick tooth fruit	Dried ripe fruits	Umbelliferae	<i>Ammi visnaga</i>	Chile, Egypt	Khelloside, Visnagin, Khellin	Smooth muscle relaxant
25	Psoralea [1, 75-76]	Bavchi	Dried ripe fruits	Leguminosae	<i>Psoralea corylifolia</i>	India (Mahya Pradesh and Maharashtra), Sri Lanka	Corylifolin, Isopsoralidin, Psoralenol, Bavachromanol, Psoralen, Coumarin, Raffinose, Psoralidin	Leucoderma, leprosy, psoriasis and inflammatory treatment
26	Mylabris [1, 77-78]	Mylabris	Dried beetles	Meloidae	<i>Mylabris pustulata, Mylabris cichorii</i>	India, China	Cantharidin	Rubefacient, counter irritant
27	Cantharides [1, 79]	Spanish fly	Dried beetles	Meloidae	<i>Cantharis vasicatoria</i>	Europe, Russia, Spain, Italy, Romania	Cantharidin, Cantharidic acid	Rubefacient, counter irritant
28	Anantmul [1, 80-82]	Sariva	Dried roots	Asclepiadaceae	<i>Hemidesmis indicus</i>	India	Iso-vanillin, Lupeol, Saponins, β sitosterol, a & b amyrrins, Hemidesmin I,	Flavoring agent, anti-inflammatory agent, blood purifiers, rheumatism treatment

							<i>p</i> -methoxy salicylic aldehyde, Hemidesminine	
29	Vanilla [1, 83-84]	Baunilha	Unripe fruits	Orchidaceae	<i>Vanilla planifolia</i>	India (Kerala), Sri Lanka, Mexico, Madagascar	Gluco-vanillin, Glucovanilic alcohol	Flavoring agent
30	Bearberry [1, 85-86]	Uva ursi	Dried leaves	Ericaceae	<i>Arctostaphylos uvaursi</i>	North America, Scotland, Canada, North Europe	Arbutin, Methyl arbutin, Ursolic acid, Quercetin, Quinones, Iridoids, Ursone, Terpenoids, α -amyrin, β -amyrin	Diuretic, astringent, Urethritis and cystitis treatment
31	Solanum [1, 87-89]	Solanum	Dried fruits as well as berries	Solanaceae	<i>Solanum khasianum</i>	India (Assam, Sikkim, Maharashtra), China, Myanmar	Solasodine	It is used as starting material for steroidal synthesis
32	Dioscorea [1, 90-91]	Yam	Dried tubers	Dioscoreaceae	<i>Dioscorea deltoidea</i> , <i>Dioscorea composita</i>	India (Punjab, Jammu and Kashmir, Tamil Nadu, West Bengal, Himachal Pradesh, Maharashtra), China, Nepal, USA, Mexico	Diosgenin, Sapogenin, Smilagenin, β -isomer yammogenin, Epismilagenin	It is used as starting material for steroidal synthesis
33	Glycyrrhiza [1, 92-94]	Yasti, Liquorice root, Mulethi	Dried roots and stolons	Leguminosae	<i>Glycyrrhiza glabra</i>	Spain, England, Iran	Glycyrrhetic acid, Carbenoxolone, Glycyrrhizin, Glycyramarin, Asparagin,	Demulcent, expectorant, flavoring agent, antispasmodic agent, antiulcer agent, anti-inflammatory agent
34	Safed Musali [1, 95-97]	Safed musali	Dried peeled tuberous roots	Liliaceae	<i>Chlorophytum borivilianum</i>	India (Rajasthan, Gujarat, Madhya Pradesh, Maharashtra)	Hecogenin	Aphrodisiac, general tonic
35	Brahmi	Bacopa	Fresh	Scrophulariaceae	<i>Bacopa</i>	India	Bacosides A,	Nervine tonic,

	[1, 98-100]		leaves and stems		<i>moniera</i>		Bacosides B, Brahmic acid, Asiatic acid, Herpestine, Brahmine	antiasthmatic agent, antiepileptic agent, diuretic, anticancer agent
36	Shataveri [1, 101-104]	Shutmuli	Dried roots and leaves	Liliaceae	<i>Asparagus racemosus</i>	India (Maharashtra), Africa, Australia	Shatavarin I, Shataverin II, Shataverin III, Shataverin IV, Rutin, Diosgenin, Quercetin	Galactogogue, diuretic, tonic
37	Jalbrahmi [1, 105-108]	Mandukparni	Dried herb	Umbelliferae	<i>Centella asiatica</i>	India, Srilanka, Indonesia, Madagascar, Australia, Africa, Vietnam, China	Asiaticoside, Madecassoside	Nervine tonic, sedative, antistress agent, spasmolytic agent, leprosy and syphilis treatment
38	Momordica [1, 109-110]	Karela, Bitter gourd	Fresh and dried green fruits	Cucurbitaceae	<i>Momordica charantia</i>	India	Mmomordicin, Charantin, Saponins	Hypoglycemic agent, stomachic, tonic, carminative, cooling agent, antirheumatic agent, disorders of spleen and liver treatment, gout treatment, antidiabetic agent
39	Senega [1, 111-112]	Rattlesnake root	Dried root and rootstock	Polygalaceae	<i>Polygala senega</i>	USA, Japan, East Canada	Polygallic acid, Senegin, Senegenic acid, Presenegenin	Expectorant, stimulant, gastritis and bronchitis treatment
40	Ginseng [1, 113-120]	Panax, Pannag, Ninjin	Dried root	Araliaceae	<i>Panax ginseng</i>	USA, Canada, Russia, Korea, China, Japan	Ginsenosides, Panaxosides, Panaxatriol, Panaxadiol, Oleanolic acid	Stimulant, tonic, demulcent, gastritis and anaemia treatment, sedative, aphrodisiac, immunomodulatory agent
41	Gokhru [1, 121-122]	Tribulus	Dried ripe fruits	Zygophyllaceae	<i>Tribulus terrestris</i>	India, Tibet, Sri Lanka	Harmine, Harman, Teresterosin A, Teresterosin E,	Aphrodisiac, diuretic, tonic, gout treatment,

							Tribulosin, Gitogenin, Diosgenin, Ruscogenin, Chlorogenin	ingredient of ayurvedic products
42	Quillaia [1, 123-124]	Soap bark	Dried inner part of bark	Rosaceae	<i>Quillaja saponaria</i>	India (Uttar Pradesh and Punjab), Peru, Chile	Quillaia- sapotoxin, Quillaic acid, Tannin, Sucrose	Emulsifying agent, detergent, Shampoo preparation, reflex expectorant
43	Gentian [1, 125-126]	Gentiana	Dried root and rhizome	Gentianaceae	<i>Gentiana lutea</i>	Europe	Gentiopicroside, Gentianin, Amarogentin, Gentinin, Amaroswerin	Bitter tonic, stomachic, improve appetite
44	Chirata [1, 127-128]	Chirayata	Dried plant	Gentianaceae	<i>Swertia chirata</i>	India (Kashmir, Madhya Pradesh), Bhutan, Nepal	Gentiopicrocin, Sweroside, Chiratin, Amarogentin, Ophelic acid, Gentianine, Gentiocrucine	Antipyretic, bitter stomachic, febrifuge, bitter tonic, dyspepsia treatment
45	Picrorrhiza [1, 129-132]	Indian gentian, Kutki	Dried rhizome	Scrophulariaceae	<i>Picrorrhiza kurroa</i>	India (Uttar Pradesh, Himachal Pradesh, Punjab, Sikkim, Kashmir), China	Picroside I, Picroside II, Amarogentin, Kutkoside	Bitter tonic, febrifuge, antiperiodic, hepatoprotective agent, laxative, antibacterial agent
46	Kalmegh [1, 133-134]	Andrographis, Kirayat	Dried leaves and shoots	Acanthaceae	<i>Andrographis paniculata</i>	India (Karnataka, West Bengal, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Uttar Pradesh, Maharashtra), Sri Lanka	Andrographolide, Kalmeghin	Bitter tonic, anthelmintic agent, stomachic, hepatoprotective agent, anti-dysentery agent, dyspepsia treatment, anti-typhoid agent
47	Quassia [1, 135]	Bitter wood	Dried stem wood	Simarubaceae	<i>Picrasma excelsa</i>	Caribbean Islands (Barbados and Jamaica)	Quassin, Neoquassin, Isoquassin, 18 hydroxy quassin	Bitter tonic, anti-insecticidal agent
48	Gudmar [1, 136-138]	Gymnema, Madhunashini	Dried leaves	Asclepiadaceae	<i>Gymnema sylvestre</i>	India	Gymnemic acid I, Gymnemic acid	Anti-diabetic agent, laxative, diuretic,

							II, Gymnemic acid III, Gymnemic acid IV, Pentriacontane, Phytin, d-quercitol, Inositol	stomachic, stimulant
49	Stevia [1, 139]	Stevia	Dried roots and leaves	Asteraceae	<i>Stevia rebovians</i>	India, Brazil, Japan, Mexico, USA, China, Canada, Korea, Indonesia	Rebandioside A, Rebandioside C, Sterioside, Stevioside, Dulcoside A	Sweetening agent, anti-diabetic agent, anti-inflammatory agent, anti-bacterial agent, antiseptic agent, digestive tonic, different skin problems like acne, dermatitis, eczema treatment
50	Henna [1, 140-146]	Egyptian privet	Dried or fresh leaves	Lythraceae	<i>Lawsonia inermis</i>	India, Africa, Sudan, Egypt, Caribbean Islands, China, Florida	Lawson, Hennoside A, Hennoside B, Hennoside C	Anti-fungal agent, anti-bacterial agent, Hair dye
51	Manjishta [1, 147-151]	Indian maddar	Dried stems	Rubaceae	<i>Rubia cordifolia</i>	India, Nepal, Iran	Rubiadin, Purpurin, Manjisthin	Used in leucoderma, different skin problems and arthritis treatment, blood purifying agent
52	Garcinia [1, 152-153]	Vilayati imli	Dried de-seeded fruits	Guttiferae	<i>Garcinia combogia</i>	India, Sri Lanka	Hydroxy citric acid, Tartaric acid	Anti-rheumatic agent, flavoring agent, condiment, antiseptic, used in digestive disorders
53	Guduchi [1, 154-162]	Amrita, Giloe, Gulvel, Tinospora	Dried leaves and stem	Menispermaceae	<i>Tinospora cordifolia</i>	India (Assam, Bihar), Sri Lanka, Indonesia	Tinosporine, Tinosporidine, Tinosporaside, Tinosporoside, Berberine, Gilonin, Giloin,	Anti-diabetic agent, anti-rheumatic agent, anti-hepatitis agent, used in jaundice, skin and arthritis treatment,

							Syringin, Cordifolioside A, Palmarin, Chasmanthin, Columbin, Tinosporic acid, Tinosporol	immunostimulant agent, bitter tonic
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VIII. CONCLUSION

Glycosides are having very important role in medicinal world for treating different types of diseases. These are also much signified for their various function in maintaining the plant growth, development and protection. Glycosides content various plants like Brahmi, Senega, Aloe, Senna, Digitalis, Thevetia, etc are cultivated in different parts of world. Different parts of the plants are followed traditionally for the rich sources of various glycosides like C-glycosides, N-glycosides, O-glycosides and S-glycosides. Lots of extraction techniques and chemical tests are present to show the extraction of glycosides. Different types of pharmaceutical formulations like aloe gel, henna shampoo, Brahmi tonic, etc are available to cure various problems.

Conflicts of Interest: Nil

REFERENCES

- [1] Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. Nirali Prakashan. 2012; 47: 8.1-8.108.
- [2] Kren V, Martínková L. Glycosides in medicine: "The role of glycosidic residue in biological activity". Current medicinal chemistry. 2001; 8(11):1303-28.
- [3] Wu L, Georgiev MI, Cao H, Nahar L, El-Seedi HR, Sarker SD, Xiao J, Lu B. Therapeutic potential of phenylethanoid glycosides: A systematic review. Medicinal Research Reviews. 2020; 40(6): 2605-49.
- [4] Yang Y, Yu B. Recent advances in the chemical synthesis of C-glycosides. Chemical reviews. 2017; 117(19): 12281-356.
- [5] Vetter J. Plant cyanogenic glycosides. Toxicon. 2000; 38(1):11-36.
- [6] Dembitsky VM. Astonishing diversity of natural surfactants: 5. Biologically active glycosides of aromatic metabolites. Lipids. 2005; 40(9): 869-900.
- [7] Cheng CS, Wang J, Chen J, Kuo KT, Tang J, Gao H, Chen L, Chen Z, Meng Z. New therapeutic aspects of steroidal cardiac glycosides: the anticancer properties of Huachansu and its main active constituent Bufalin. Cancer Cell International. 2019; 19: 1-27.
- [8] Patel DK. Medicinal importance, pharmacological activities and analytical aspects of a flavonoid glycoside 'Nicotiflorin' in the medicine. Drug Metabolism and Bioanalysis Letters Formerly: Drug Metabolism Letters. 2022; 15(1): 2-11.
- [9] Kytidou K, Artola M, Overkleeft HS, Aerts JM. Plant glycosides and glycosidases: a treasure-trove for therapeutics. Frontiers in plant science. 2020; 11: 357.
- [10] Khattak S, Khan H. Phyto-glycosides as therapeutic target in the treatment of diabetes. Mini Reviews in Medicinal Chemistry. 2018; 18(3): 208-15.
- [11] Jimenez C, Riguera R. Phenylethanoid glycosides in plants: structure and biological activity. Natural Product Reports. 1994; 11(6): 591-606.
- [12] Lindroth RL, Pajutee MS. Chemical analysis of phenolic glycosides: art, facts, and artifacts. Oecologia. 1987; 74: 144-8.
- [13] Betts TJ, Fairbairn JW. The significance of anthracene derivatives to the living plant of Rhamnus purshiana DC. Planta Medica. 1964; 12(01): 64-70.
- [14] Cirillo C, Capasso R. Constipation and botanical medicines: an overview. Phytotherapy Research. 2015; 29(10): 1488-93.
- [15] Xiang H, Zuo J, Guo F, Dong D. What we already know about rhubarb: a comprehensive review. Chinese medicine. 2020; 15: 1-22.
- [16] Singh P, Rawat MS. Phytochemistry and biological activity perspectives of Rheum species. The natural products journal. 2016; 6(2): 84-93.
- [17] Jalwal P, Middha A. Recent advances on senna as a laxative: a comprehensive review. Journal of Pharmacognosy and Phytochemistry. 2017; 6(2): 349-53.
- [18] Tripathi YC. Cassia angustifolia, a versatile medicinal crop. International tree crops journal. 1999; 10(2): 121-9.
- [19] Abbas SR, Rani G. Medicinal significance of Alexandrian senna. Journal of natural sciences. 2020; 8: 24-9.
- [20] Singh S, Singh SK, Yadav A. A review on Cassia species: Pharmacological, traditional and medicinal aspects in various countries. American Journal of Phytomedicine and Clinical Therapeutics. 2013; 1(3): 291-312.
- [21] Oladeji OS, Adelowo FE, Oluyori AP. The genus Senna (Fabaceae): A review on its traditional uses, botany, phytochemistry, pharmacology and toxicology. South African Journal of Botany. 2021; 138: 1-32.
- [22] Vogler BK, Ernst E. Aloe vera: a systematic review of its clinical effectiveness. British journal of general practice. 1999; 49(447): 823-8.
- [23] Sharma P, Kharkwal AC, Kharkwal H, Abdin MZ, Varma A. A review on pharmacological properties of Aloe vera. Int J Pharm Sci Rev Res. 2014; 29(2): 31-7.
- [24] Saddiqe Z, Naeem I, Maimoona A. A review of the antibacterial activity of Hypericum perforatum L. Journal of ethnopharmacology. 2010; 131(3): 511-21.
- [25] Greeson JM, Sanford B, Monti DA. St. John's wort (Hypericum perforatum): a review of the current pharmacological, toxicological, and clinical literature. Psychopharmacology. 2001; 153: 402-14.
- [26] Barnes J, Anderson LA, Phillipson JD. St John's wort (Hypericum perforatum L.): a review of its chemistry, pharmacology and clinical properties. Journal of pharmacy and pharmacology. 2001; 53(5): 583-600.
- [27] Whiskey E, Werneke U, Taylor D. A systematic review and meta-analysis of Hypericum perforatum in depression: a comprehensive clinical review. International clinical psychopharmacology. 2001; 16(5): 239-52.
- [28] Bennett Jr DA, Phun L, Polk JF, Vogliano SA, Zlotnik V, Raffa RB. Neuropharmacology of St. John's wort (hypericum). Annals of Pharmacotherapy. 1998; 32(11): 1201-8.
- [29] Shrivastava M, Dwivedi L. Therapeutic potential of Hypericum perforatum: a review. Int J Pharm Sci Res. 2015; 6(12): 4982-8.

- [30] Marrelli M, Statti G, Conforti F, Menichini F. New potential pharmaceutical applications of hypericum species. *Mini reviews in medicinal chemistry*. 2016; 16(9): 710-20.
- [31] Budantsev AL, Prikhodko VA, Varganova IV, Okovityi SV. Biological activity of *Hypericum perforatum* L.(Hypericaceae): a review. *Pharmacy & Pharmacology*. 2021; 9(1): 17-31.
- [32] Galappaththi M, Patabendige N. Cochineal chemistry, related applications and problems: A mini review. *Academia Letters*. 2021; 1792: 1-2.
- [33] Stintzing FC, Carle R. Cactus stems (*Opuntia* spp.): A review on their chemistry, technology, and uses. *Molecular nutrition & food research*. 2005; 49(2): 175-94.
- [34] Kumar C, Shukla SS, Pandey RK. A Review on *Thevetia peruviana*. *Research Journal of Pharmacology and Pharmacodynamics*. 2017; 9(2): 93-6.
- [35] Koushik M, Arkendu C, Somenath B, Raj B, Sonia A, Injamul H. A review on various biological and pharmacological properties of *Thevetia peruviana*. *Int J Adv Res Biol Sci*. 2016; 3(9): 178-82.
- [36] Kumar GP, Atreya A, Kanchan T. *Thevetia peruviana*. *Wilderness & environmental medicine*. 2015; 26(4): 590-1.
- [37] Hauptman PJ, Kelly RA. *Digitalis*. *Circulation*. 1999; 99(9): 1265-70.
- [38] Wayne Jr TF. Clinical use of digitalis: a state of the art review. *American journal of cardiovascular drugs*. 2018; 18(6): 427-40.
- [39] Zahid H, Rizwani GH. *Digitalis purpurea* L.: A concise drug review with probable clinical uses. *Hamdard Medicus*. 2016; 59(2): 25-32.
- [40] Jograna MB, Patil DS, Kotwal SV. *Digitalis* species a potent herbal drug: A review on their pharmacognosy and pharmacological activities. *Journal of Current Pharma Research*. 2020; 10(4): 3821-31.
- [41] Reddy BA. *Digitalis* therapy in patients with congestive heart failure. *International Journal of Pharmaceutical Sciences Review and Research*. 2010; 3(2): 90-5.
- [42] Gurel E, Karvar S, Yucesan B, Eker I, Sameullah M. An overview of cardenolides in digitalis-more than a cardiotonic compound. *Current Pharmaceutical Design*. 2017; 23(34): 5104-14.
- [43] Saket K, Afshari JT, Saburi E, Yousefi M, Salari R. Therapeutic aspects of Squill; an evidence-based review. *Current Drug Discovery Technologies*. 2020; 17(3): 318-24.
- [44] Bala R, Kaul V. URGINEA INDICA—IMPORTANCE AND NEED FOR AWARENESS. *Journal of Plant Development Sciences*. 2014; 6(4): 593-7.
- [45] Trávníček B, Duchoslav M, Šarhanová P, Šafařová L. Squills (*Scilla* s. lat., Hyacinthaceae) in the flora of the Czech Republic, with taxonomical notes on Central-European squill populations. *Acta Musei Moraviae, Scientiae biologicae (Brno)*. 2009; 94: 157-205.
- [46] El-Seedi HR, Burman R, Mansour A, Turki Z, Boulos L, Gullbo J, Göransson U. The traditional medical uses and cytotoxic activities of sixty-one Egyptian plants: discovery of an active cardiac glycoside from *Urginea maritima*. *Journal of Ethnopharmacology*. 2013; 145(3): 746-57.
- [47] Verbiscar AJ, Patel J, Banigan TF, Schatz RA. Scilliroside and other scilla compounds in red squill. *Journal of agricultural and food chemistry*. 1986; 34(6): 973-9.
- [48] Gentry HS, Verbiscar AJ, Banigan TF. Red squill (*Urginea maritima*, Liliaceae). *Economic botany*. 1987; 41: 267-82.
- [49] Hamlyn JM, Blaustein MP. Endogenous ouabain: recent advances and controversies. *Hypertension*. 2016; 68(3): 526-32.
- [50] Manunta P, Ferrandi M, Bianchi G, Hamlyn JM. Endogenous ouabain in cardiovascular function and disease. *Journal of hypertension*. 2009; 27(1): 9-18.
- [51] Hokkanen M. Imperial Networks, Colonial Bioprospecting and Burroughs Wellcome & Co.: The Case of *Strophanthus Kombe* from Malawi (1859–1915). *Social History of Medicine*. 2012; 25(3): 589-607.
- [52] Hatcher RA, Bailey HC. The clinical use of strophanthus. *Journal of the American Medical Association*. 1910; 55(20): 1697-701.
- [53] Nguyen T, Nandasiri R, Fadaïro O, Eskin NM. Phenolics of mustard seeds: A review on composition, processing effect and their bioactivities. *Journal of the American Oil Chemists' Society*. 2024; 101(1): 5-21.
- [54] Agrawal S, Yallatkar T, Gurjar P. *Brassica Nigra*: Ethnopharmacological review of a routinely Used condiment. *Current Drug Discovery Technologies*. 2019; 16(1): 40-7.
- [55] Segura S, Guzmán-Díaz F, López-Upton J, Mathuriau C, López-Medina J. Distribution of *Prunus serotina* Ehrh. in North America and its invasion in Europe. *Journal of Geoscience and Environment Protection*. 2018; 6(9): 111-24.
- [56] Das B, Ahmed N, Singh P. *Prunus* diversity-early and present development: A review. *Int J Biodivers Conserv*. 2011; 3(14): 721-34.
- [57] Moradi B, Heidari-Soureshjani S, Asadi-Samani M, Yang Q. A systematic review of phytochemical and phytotherapeutic characteristics of bitter almond. *International Journal of Pharmaceutical and Phytopharmacological Research*. 2017; 7: 1-9.
- [58] Esfahlan AJ, Jamei R, Esfahlan RJ. The importance of almond (*Prunus amygdalus* L.) and its by-products. *Food chemistry*. 2010; 120(2): 349-60.
- [59] Khazaei R, Seidavi A, Bouyeh M. A review on the mechanisms of the effect of silymarin in milk thistle (*Silybum marianum*) on some laboratory animals. *Veterinary Medicine and Science*. 2022; 8(1): 289-301.
- [60] Bahmani M, Shirzad H, Rafieian S, Rafieian-Kopaei M. *Silybum marianum*: beyond hepatoprotection. *Journal of evidence-based complementary & alternative medicine*. 2015; 20(4): 292-301.
- [61] Tajmohammadi A, Razavi BM, Hosseinzadeh H. *Silybum marianum* (milk thistle) and its main constituent, silymarin, as a potential therapeutic plant in metabolic syndrome: A review. *Phytotherapy research*. 2018; 32(10): 1933-49.
- [62] Sidhu MC, Saini P, Sidhu C, Saini P. *Silybum marianum*: a plant of high medicinal importance—a review. *World J Pharm Res*. 2012; 1(2): 72-86.
- [63] Fallah Huseini H, Hemati AR, Alavian SM. A review of herbal medicine: *Silybum marianum*. *Journal of Medicinal Plants*. 2004; 3(11): 14-24.
- [64] Abenavoli L, Izzo AA, Milić N, Cicala C, Santini A, Capasso R. Milk thistle (*Silybum marianum*): A concise overview on its chemistry, pharmacological, and nutraceutical uses in liver diseases. *Phytotherapy research*. 2018; 32(11): 2202-13.
- [65] Christa K, Soral-Šmietana M. Buckwheat grains and buckwheat products—nutritional and prophylactic value of their components—a review. *Czech J. Food Sci*. 2008; 26(3): 153-62.
- [66] Al-Snafi AE. A review on *Fagopyrum esculentum*: A potential medicinal plant. *IOSR Journal of Pharmacy*. 2017; 7(3): 21-32.
- [67] Toghueo RM. Endophytes from *Ginkgo biloba*: the current status. *Phytochemistry Reviews*. 2020; 19(4): 743-59.
- [68] Mahady GB. *Ginkgo biloba*: a review of quality, safety, and efficacy. *Nutrition in Clinical Care*. 2001; 4(3): 140-7.
- [69] Da Cunha CP, Godoy RL, Braz FR. Isolation of flavonoids from *Dipteryx odorata* by high-performance liquid chromatography. *Revista Virtual de Química*. 2016; 8: 43-56.

- [70] Bajer T, Surmová S, Eisner A, Ventura K, Bajerová P. Use of simultaneous distillation-extraction, supercritical fluid extraction and solid-phase microextraction for characterisation of the volatile profile of *Dipteryx odorata* (Aubl.) Willd. *Industrial Crops and Products*. 2018; 119: 313-21.
- [71] Hossain MA, Al Touby S. Ammi majus an endemic medicinal plant: a review of the medicinal uses, pharmacological and phytochemicals. *Annual toxicology*. 2020; 2: 9-14.
- [72] Kaboodi PS, Moghadamnia AA, Bakhshi D, Sefidgar AA. A study of phytochemical properties of various extracts of Ammi majus fruit using GC-MS technique. *Ecology, Environment and Conservation*. 2017; 23(1): 150-5.
- [73] Alam S, Anjum N, Akhtar J, Bashir F. Pharmacological investigation on Khella (*Ammi vinaga* L.). *World Journal of Pharmaceutical Research*. 2018; 7(13): 212-24.
- [74] Travaini ML, Sosa GM, Ceccarelli EA, Walter H, Cantrell CL, Carrillo NJ, Dayan FE, Meepagala KM, Duke SO. Khellin and visnagin, furanochromones from *Ammi visnaga* (L.) Lam., as potential bioherbicides. *Journal of agricultural and food chemistry*. 2016; 64(50): 9475-87.
- [75] Alam F, Khan GN, Asad MH. *Psoralea corylifolia* L: Ethnobotanical, biological, and chemical aspects: A review. *Phytotherapy Research*. 2018; 32(4): 597-615.
- [76] Uikey SK, Yadav AS, Sharma AK, Rai AK, Raghuvanshi DK, Badkhane Y. The botany, chemistry, pharmacological and therapeutic application of *psoralea corylifolia* L.—A review. *Int J Phytomed*. 2010; 2(2): 100-7.
- [77] Wang GS. Medical uses of mylabris in ancient China and recent studies. *Journal of ethnopharmacology*. 1989; 26(2): 147-62.
- [78] Pan Z, Bologna MA. Taxonomy, Bionomics and Faunistics of the Nominata Subgenus of *Mylabris* Fabricius, 1775, with the description of five new species (Coleoptera: Meloidae: Mylabrini). *Zootaxa*. 2014; 3806(1): 1-78.
- [79] Young DK. Cantharidin and insects: an historical review. *The Great Lakes Entomologist*. 1984; 17(4): 1.
- [80] Moorthy H, Kumar V. *Hemidesmus indicus* (L.) R. BR.: an overview. *Plant Archives*. 2021; 21(1): 2132-43.
- [81] Banerjee A, Ganguly S. Medicinal importance of *Hemidesmus indicus*: a review on its utilities from ancient Ayurveda to 20th Century. *Adv Biores*. 2014; 5(3): 208-13.
- [82] Kulkarni DV, Pawar RS, Kudale RR. Efficacy of Anantmool as *Medhya Dravya*. *International Research Journal of Pharmacy and Medical Sciences*. 2018; 2(1): 29-31.
- [83] Baqueiro-Peña I, Guerrero-Beltrán JÁ. Vanilla (*Vanilla planifolia* Andr.), its residues and other industrial by-products for recovering high value flavor molecules: A review. *Journal of Applied Research on Medicinal and Aromatic Plants*. 2017; 6: 1-9.
- [84] Sinha AK, Sharma UK, Sharma N. A comprehensive review on vanilla flavor: extraction, isolation and quantification of vanillin and others constituents. *International journal of food sciences and nutrition*. 2008; 59(4): 299-326.
- [85] Shamilov AA, Bubenchikova VN, Chernikov MV, Pozdnyakov DI, Garsiya ER, Larsky MV. Bearberry (*Arctostaphylos uva-ursi* (L.) Spreng.): chemical content and pharmacological activity. *International Journal of Pharmaceutical Excipients*. 2021; 12(3): 49-66.
- [86] de Arriba SG, Naser B, Nolte KU. Risk assessment of free hydroquinone derived from *Arctostaphylos Uva-ursi* folium herbal preparations. *International journal of toxicology*. 2013; 32(6): 442-53.
- [87] Bhattacharya S, Chakraborty S, Roy A, Bhattacharjee A. Solanaceae Containing Medicinal Plants and Its Importance: An Overview. *International Journal of Pharmaceutical Sciences Review and Research*. 2023; 83(2): 106-112.
- [88] Kaunda JS, Zhang YJ. The genus *solanum*: an ethnopharmacological, phytochemical and biological properties review. *Natural products and bioprospecting*. 2019; 9(2): 77-137.
- [89] Shah VV, Shah ND, Patrekar PV. Medicinal plants from Solanaceae family. *Research journal of pharmacy and technology*. 2013; 6(2): 143-51.
- [90] Sautour M, Mitaine-Offer AC, Lacaille-Dubois MA. The *Dioscorea* genus: a review of bioactive steroid saponins. *Journal of natural medicines*. 2007; 61: 91-101.
- [91] Das SU, Choudhury MD, Mazumder PB. In vitro propagation of genus *Dioscorea*—a critical review. *Asian J Pharm Clin Res*. 2013; 6(3): 26-30.
- [92] Al-Snafi AE. *Glycyrrhiza glabra*: A phytochemical and pharmacological review. *IOSR Journal of Pharmacy*. 2018; 8(6): 1-7.
- [93] Pastorino G, Cornara L, Soares S, Rodrigues F, Oliveira MB. Licorice (*Glycyrrhiza glabra*): A phytochemical and pharmacological review. *Phytotherapy research*. 2018; 32(12): 2323-39.
- [94] Hosseinzadeh H, Nassiri-Asl M. Pharmacological effects of *Glycyrrhiza* spp. and its bioactive constituents: update and review. *Phytotherapy Research*. 2015; 29(12): 1868-86.
- [95] Khanam Z, Singh O, Singh R, Bhat IU. Safed musli (*Chlorophytum borivilianum*): A review of its botany, ethnopharmacology and phytochemistry. *Journal of Ethnopharmacology*. 2013; 150(2): 421-41.
- [96] Haque R, Saha S, Bera T. A peer reviewed of general literature on *Chlorophytum borivilianum* commercial medicinal plant. *Int J Drug Dev Res*. 2011; 3(1): 165-77.
- [97] Sharma VK, Mazumdar B. Versatility of safed musali (Indian viagra) in human ailments. *Proteins*. 2012; 8: 8-5.
- [98] Russo A, Borrelli F. *Bacopa monniera*, a reputed nootropic plant: an overview. *Phytomedicine*. 2005; 12(4): 305-17.
- [99] Banerjee M, Shrivastava S. An improved protocol for in vitro multiplication of *Bacopa monnieri* (L.). *World Journal of Microbiology and Biotechnology*. 2008; 24: 1355-9.
- [100] Kak SC. Indus and Brahmi further connections. *Cryptologia*. 1990; 14(2): 169-83.
- [101] Alok S, Jain SK, Verma A, Kumar M, Mahor A, Sabharwal M. Plant profile, phytochemistry and pharmacology of *Asparagus racemosus* (Shatavari): A review. *Asian Pacific journal of tropical disease*. 2013; 3(3): 242-51.
- [102] Bopana N, Saxena S. *Asparagus racemosus*—Ethnopharmacological evaluation and conservation needs. *Journal of ethnopharmacology*. 2007; 110(1): 1-5.
- [103] Gautam M, Diwanay S, Gairola S, Shinde Y, Patki P, Patwardhan B. Immunoadjuvant potential of *Asparagus racemosus* aqueous extract in experimental system. *Journal of ethnopharmacology*. 2004; 91(2-3): 251-5.
- [104] Sharma M, Sharma A, Kumar A. Vital medicine *Asparagus racemosus* willd. *Current Trends in Biotechnology and Pharmacy*. 2012; 6(2): 210-21.
- [105] Biswas D, Mandal S, Chatterjee Saha S, Tudu CK, Nandy S, Batiha GE, Shekhawat MS, Pandey DK, Dey A. Ethnobotany, phytochemistry, pharmacology, and toxicity of *Centella asiatica* (L.) Urban: A comprehensive review. *Phytotherapy Research*. 2021; 35(12): 6624-54.

- [106] Seevaratnam V, Banumathi P, Premalatha MR, Sundaram SP, Arumugam T. Functional properties of *Centella asiatica* (L.): A review. *Int J Pharm Pharm Sci*. 2012; 4(5): 8-14.
- [107] Prakash V, Jaiswal NI, Srivastava MR. A review on medicinal properties of *Centella asiatica*. *Asian J Pharm Clin Res*. 2017; 10(10): 69-74.
- [108] Tiwari S, Gehlot S, Gambhir IS. *Centella asiatica*: A concise drug review with probable clinical uses. *Journal of Stress Physiology & Biochemistry*. 2011; 7(1): 38-44.
- [109] Grover JK, Yadav SP. Pharmacological actions and potential uses of *Momordica charantia*: a review. *Journal of ethnopharmacology*. 2004; 93(1): 123-32.
- [110] Upadhyay A, Agrahari P, Singh DK. A review on salient pharmacological features of *Momordica charantia*. *Int J Pharmacol*. 2015; 11(5): 405-13.
- [111] Lacaille-Dubois MA, Mitaine-Offer AC. Triterpene saponins from Polygalaceae. *Phytochemistry Reviews*. 2005; 4: 139-49.
- [112] Pastore JF, Abbott JR, Neubig KM, Van Den Berg C, Mota MC, Cabral A, Whitten WM. Phylogeny and biogeography of Polygala (Polygalaceae). *Taxon*. 2019; 68(4): 673-91.
- [113] Coon JT, Ernst E. *Panax ginseng*. *Drug safety*. 2002; 25(5): 323-44.
- [114] Kiefer D, Pantuso T. *Panax ginseng*. *American family physician*. 2003; 68(8): 1539-42.
- [115] Shergis JL, Zhang AL, Zhou W, Xue CC. *Panax ginseng* in randomised controlled trials: a systematic review. *Phytotherapy Research*. 2013 Jul;27(7):949-65.
- [116] Nuri TH, Yee JC, Gupta M, Khan MA, Ming LC. A review of *Panax ginseng* as an herbal medicine. *Archives of Pharmacy Practice*. 2016; 7(5): 61-5.
- [117] Majid A. *Panax ginseng*—a review. *University of Thi-Qar Journal of Science*. 2019; 7(1): 96-102.
- [118] Mishra JN, Verma NK. An overview on *Panax ginseng*. *International Journal of Pharma and Chemical Research*. 2017; 3(3): 516-22.
- [119] Vogler BK, Pittler MH, Ernst E. The efficacy of ginseng. A systematic review of randomised clinical trials. *European journal of clinical pharmacology*. 1999; 55: 567-75.
- [120] Coleman CI, Hebert JH, Reddy P. The effects of *Panax ginseng* on quality of life. *Journal of clinical pharmacy and therapeutics*. 2003; 28(1): 5-15.
- [121] Zhu W, Du Y, Meng H, Dong Y, Li L. A review of traditional pharmacological uses, phytochemistry, and pharmacological activities of *Tribulus terrestris*. *Chemistry Central Journal*. 2017; 11: 1-6.
- [122] Deshpande P, Shrivastava S, Daharwal SJ. A Review on Plant Profile, Standardization Method and Pharmacological Activities of *Tribulus Terrestris* (Gokhru). *Journal of Ravishankar University*. 2018; 31(1): 40-5.
- [123] Reichert CL, Salminen H, Weiss J. Quillaja saponin characteristics and functional properties. *Annual review of food science and technology*. 2019; 10(1): 43-73.
- [124] Nasri S, Salem HB, Vasta V, Abidi S, Makkar HP, Priolo A. Effect of increasing levels of *Quillaja saponaria* on digestion, growth and meat quality of Barbarine lamb. *Animal Feed Science and Technology*. 2011; 164(1-2): 71-8.
- [125] Prakash O, Singh R, Kumar S, Srivastava S, Ved A. *Gentiana lutea* Linn.(yellow gentian): a comprehensive. *J Ayurvedic Herb Med*. 2017; 3: 175-81.
- [126] Mirzaee F, Hosseini A, Jouybari HB, Davoodi A, Azadbakht M. Medicinal, biological and phytochemical properties of *Gentiana* species. *Journal of traditional and complementary medicine*. 2017; 7(4): 400-8.
- [127] Patil K, Dhande S, Kadam V. Therapeutic *Swertia chirata*-an overview. *Research Journal of Pharmacognosy and Phytochemistry*. 2013; 5(4): 199-207.
- [128] Jauhari N, Bharadvaja N, Sharma N. *Swertia chirata*: A comprehensive review with recent advances. *Current Pharmaceutical Biotechnology*. 2017; 18(9): 730-9.
- [129] Thani PR. A comprehensive review on *Picrorhiza kurroa* Royle ex Benth. *Journal of Pharmacognosy and Phytochemistry*. 2021; 10(3): 307-13.
- [130] Bhatnagar AN. A review on chemical constituents and biological activities of the genus *Picrorhiza* (Scrophulariace). *Int J Curr Pharm Res*. 2021; 13(5): 18-27.
- [131] Sah JN, Varshney VK. Chemical constituents of *Picrorhiza* genus. *Am J Essent Oil*. 2013; 1(2): 22-37.
- [132] Prakash V, Kumari A, Kaur H, Kumar M, Gupta S, Bala R. Chemical constituents and biological activities of genus *picrorhiza*: an update. *Indian J Pharm Sci*. 2020; 82(4): 562-77.
- [133] Mishra SK, Sangwan NS, Sangwan RS. Phcog rev.: Plant review *Andrographis paniculata* (Kalmegh): A review. *Pharmacognosy Reviews*. 2007; 1(2): 283-98.
- [134] Niranjana A, Tewari SK, Lehri A. Biological activities of Kalmegh (*Andrographis paniculata* Nees) and its active principles-A review. *Indian Journal of Natural Products and Resources*. 2010; 1(2): 125-35.
- [135] Zhang J, Yang J, Wang CX, Gao H, Yao XS. The progress in the chemical constituents of the genus *Picrasma* during 2007-2017. *TMR Modern Herbal Medicine*. 2018; 1(4): 220-32.
- [136] Pothuraju R, Sharma RK, Chagalamarri J, Jangra S, Kumar Kavadi P. A systematic review of *Gymnema sylvestre* in obesity and diabetes management. *Journal of the Science of Food and Agriculture*. 2014; 94(5): 834-40.
- [137] Yaseen G, Shahid S. Comprehensive review on phytopharmacological potential of *Gymnema sylvestre*. *Asian Journal of Pharmacy and Technology*. 2020; 10(3): 217-20.
- [138] Kishore L, Kaur N, Singh R. Role of *Gymnema sylvestre* as alternative medicine. *J Homeop Ayurv Med*. 2014; 3(4): 172-80.
- [139] Arumugam B, Subramaniam A, Alagaraj P. *Stevia* as a natural sweetener: A review. *Cardiovascular & Hematological Agents in Medicinal Chemistry (Formerly Current Medicinal Chemistry-Cardiovascular & Hematological Agents)*. 2020; 18(2): 94-103.
- [140] Al-Snafi AE. A review on *Lawsonia inermis*: A potential medicinal plant. *International Journal of Current Pharmaceutical Research*. 2019; 11(5): 1-3.
- [141] Borade AS, Kale BN, Shete RV. A phytopharmacological review on *Lawsonia inermis* (Linn.). *Int J Pharm Life Sci*. 2011; 2(1): 536-41.
- [142] Sahu L, Roy A, Satapathy T. A phytopharmacological review on *Lawsonia inermis* L. *Research Journal of Science and Technology*. 2012; 4(3): 93-107.
- [143] Singam T, Marsi NB, Abdul Rashid AH, Nasir SH, Ibrahim SA, Roslan MN, Huzaisham NA, Mohd Fodzi MH. A review on characteristics and potential applications of henna leaves (*Lawsonia inermis*). *Journal of Computational and Theoretical Nanoscience*. 2020; 17(2-3): 603-12.
- [144] Batiha GE, Teibo JO, Shaheen HM, Babalola BA, Teibo TK, Al-Kuraishy HM, Al-Garbeeb AI, Alexiou A, Papadakis M. Therapeutic potential of *Lawsonia inermis* Linn: a comprehensive overview. *Naunyn-schmiedeberg's Archives of Pharmacology*. 2024; 397(6): 3525-40.
- [145] Kothavale SD, Patil AK, Kumbhar RP, Mohite SK. A Review on Henna. *Asian Journal of Pharmaceutical Research*. 2023; 13(1): 47-50.
- [146] Semwal RB, Semwal DK, Combrinck S, Cartwright-Jones C, Viljoen A. *Lawsonia inermis* L.(henna): Ethnobotanical, phytochemical and pharmacological aspects. *Journal of ethnopharmacology*. 2014; 155(1): 80-103.
- [147] Deshkar N, Tilloo S, Pande V. A comprehensive review of *Rubia cordifolia* Linn. *Pharmacognosy Reviews*. 2008; 2(3): 124.
- [148] Patil R, Mohan M, Kasture V, Kasture S. *Rubia cordifolia*: a review. *Advances in Traditional Medicine*. 2009; 9(1): 1-3.



- [149]Devi Priya M, Siril EA. Traditional and modern use of indian madder (*Rubia cordifolia* L.): an overview. *Int. J. Pharm. Sci. Rev. Res.* 2014; 25(1): 154-64.
- [150]Kumari I, Kaurav H, Choudhary G. *Rubia cordifolia* (Manjishtha): A review based upon its Ayurvedic and Medicinal uses. *Himalayan Journal of Health Sciences.* 2021; 6: 17-28.
- [151]Nyeem MA, Mannan MA. *Rubia cordifolia*-phytochemical and Pharmacological evaluation of indigenous medicinal plant: A review. *Intern J Physiol Nut Phys Edu.* 2018; 3(1): 766-71.
- [152]Semwal RB, Semwal DK, Vermaak I, Viljoen A. A comprehensive scientific overview of *Garcinia cambogia*. *Fitoterapia.* 2015; 102: 134-48.
- [153]Hemshekhar M, Sunitha K, Santhosh MS, Devaraja S, Kemparaju K, Vishwanath BS, Niranjana SR, Girish KS. An overview on genus *Garcinia*: phytochemical and therapeutical aspects. *Phytochemistry Reviews.* 2011; 10: 325-51.
- [154]Saha S, Ghosh S. *Tinospora cordifolia*: One plant, many roles. *Ancient science of life.* 2012; 31(4): 151-9.
- [155]Tiwari P, Nayak P, Prusty SK, Sahu PK. Phytochemistry and pharmacology of *Tinospora cordifolia*: A review. *Systematic Reviews in Pharmacy.* 2018; 9(1): 70-8.
- [156]Krishna K, Jigar B, Jagruti PJ. *Guduchi* (*Tinospora cordifolia*): Biological and Medicinal properties, a review. *The Internet Journal of Alternative Medicine.* 2009; 6(2): 1-10.
- [157]Baghel P. Plant of versatile properties: A review of *Tinospora Cordifolia* (*Guduchi*). *International Journal of Agriculture Innovations and Research.* 2017; 5(5): 2319-1473.
- [158]Acharya RN, Buha MM, Sojitra NH. *Guduchi* [*tinospora cordifolia* (willd.) Miers]: a comprehensive review of its internal administration. *Journal of Drug Research in Ayurvedic Sciences.* 2020; 5(2): 98-120.
- [159]Rawat N, Roushan R. *Guduchi*: A potential drug in Ayurveda. *World J Pharm Res.* 2018; 7(12): 355-61.
- [160]Ninama R, Verma A, Mishra M, Nagle A, Pati RK, Meshram R. An exploration of physiological, medicinal and safety aspects of *Guduchi* (*Tinospora cordifolia*): A complete Ayurvedic and modern review. *Journal of Ayurveda and Integrated Medical Sciences.* 2022; 7(4): 62-74.
- [161]Singh SK, Rajoria K. A Critical Review on *Guduchi* (*Tinospora cordifolia* [willd.] miers) and its Medicinal Properties. *International Research Journal of Ayurveda and Yoga.* 2024; 7(6): 34-43.
- [162]Joy A, Mansukhbhai BM, Sojeetra NH, Acharya RN. *Guduchi* (*Tinospora Cordifolia* [Wild.] Miers) and its Therapeutic External Applications: A Comprehensive Review. *Indian Journal of Ayurveda and Integrative Medicine KLEU.* 2021; 2(2): 56-63.



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