iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** X **Month of publication:** October 2024

DOI: https://doi.org/10.22214/ijraset.2024.64685

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 12 Issue X Oct 2024- Available at www.ijraset.com

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].

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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 mucle 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 450C 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. Scotrine 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.

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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	*Rhamnus purshiana*	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	*Rheum palmatum, Rheum webbianum, Rheum emodi*	India (Kashmir, Sikkim), Tibet, South east China, Korea, West Germany	Rhein, Aloe-emodin, Chrysophanol, Emodin, Physcion, 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	*Cassia angustifolia, Cassia senna*	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	*Cassia acutifolia*	Tropical Africa, Sudan	Sennosides A, Sennosides B	Purgative
5	Senna Pods [1, 20-21]	Senna fruit	Dried ripe fruits	Leguminosae	*Cassia angustifolia and*	India, Africa	Sennosides A, Sennosides B	Purgative

					Cassia acutifolia			
6	Aloe [1, 22-23]	Kumari	Dried juice of leaves	Liliaceae	*Aloe vera, Aloe barbadensis, Aloe ferox, Aloe Africana, Aloe spicata, Aloe perryi*	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	*Hypericum perforatum*	India, England, Australia, Europe	Hyperoside, Hyperforin, Hypericin	Antidepressant
8	Cochineal [1, 32-33]	Coccus	Dried female (full grown) insects of young larvae	Coccidae	*Coccus cacti*	Central America, Mexico, Caribbean Islands	Carminic acid, Carmine	Coloring agent
9	Thevetia [1, 34-36]	Lucky nut tree	Dried seeds	Apocynaceae	*Thevetia peruviana, Thevetia nerifolia*	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	Scorphulariaceae	*Digitalis purpurea*	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	*Urginea indica*	India, Italy, Spain, France, Greece, Algeria	Scillaren A, Scillaren B	Cardiotonic, expectorant, stimulant, diuretic, emetic, cathartic
12	European Squill	White squill	Dried sliced	Liliaceae	*Urginea maritima*	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 (*Urginea maritima)*	Morocco, Algeria, France, Italy, Spain	Anthocyanin, Scilliroside, Scillirubroside	Rat poison
14	Ouabain [1, 49-50]	G-strophanthin	Dried seeds	Apocynaceae	*Strophanthus gratus, Acokanthera schimperi*	Tropical Africa	Ouabain, G-Strophanthidin, Ouabagenin, Rhamnose	Cardiotonic
15	Strophanthus [1, 51-52]	Arrow poison	Dried ripe seeds	Apocynaceae	*Strophanthus kombe*	Tropical Africa	Strophanthidin, Cymarol, β-cymarin, K-strophanthin	Cardiotonic
16	Mustard [1, 53-54]	Black mustard	Dried ripe seeds	Cruciferae	*Brassica nigra*	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	*Prunus serotina*	USA, Canada, Florida, North Carolina	Prunasin, *p*-coumaric acid	Flavoring agent, mild sedative, expectorant
18	Bitter Almond [1, 57-58]	Aamygdala amara	Dried ripe seeds	Rosaceae	*Prunus amygdalus*	Iran, Italy, Spain, Morocco, France, Portugal	Amygdalin	Sedative, demulcent, flavoring agent
19	Milk-thistle (Silymarin) [1, 59-64]	Marian Thistile	Ripe seeds	Asteraceae (Compositae)	*Silybum marianum*	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	*Fagopyrum esculentum*	USA, Japan, Russia	Rutin	Capillary bleeding and retinal hemorrhages treatment

21	Gingko [1, 67-68]	Kew tree, Maiden hair tree	Drived leaves	Gingkoaceae	*Gingko biloba*	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	*Dipteryx odorata*	Mexico, Brazil, Holland	Coumarin	Flavoring agent
23	Ammi [1, 71-72]	Ammi	Fruits	Umbelliferae	*Ammi majus*	India (Jammu and Kashmir), Egypt, Europe, West Africa	Xanthotoxin, Bergapten, Imperatorin, Isopimpilin	Vitiligo treatment
24	Visnaga [1, 73-74]	Khella, Pick tooth fruit	Dried ripe fruits	Umbelliferae	*Ammi visnaga*	Chile, Egypt	Khelloside, Visnagin, Khellin	Smooth muscle relaxant
25	Psoralea [1, 75-76]	Bavchi	Dried ripe fruits	Leguminosae	*Psoralea corylifolia*	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	*Mylabris pustulata, Mylabris cichorii*	India, China	Cantharidin	Rubefacient, counter irritant
27	Cantharides [1, 79]	Spanish fly	Dried beetles	Meloidae	*Cantharis vasicatoria*	Europe, Russia, Spain, Italy, Romania	Cantharidin, Cantharidic acid	Rubefacient, counter irritant
28	Anantmul [1, 80-82]	Sariva	Dried roots	Asclepiadaceae	*Hemidesmis indicus*	India	Iso-vanillin, Lupeol, Saponins, β sitosterol, a & b amyrins, Hemidesmin I,	Flavoring agent, anti-inflammatory agent, blood purifiers, rheumatism treatment

							p-methoxy salicylic aldehyde, Hemidesminine	
29	Vanilla [1, 83-84]	Baunilha	Unripe fruits	Orchidaceae	*Vanilla planifolia*	India (Kerala), Sri Lanka, Mexico, Madagascar	Gluco-vanillin, Glucovanilic alcohol	Flavoring agent
30	Bearberry [1, 85-86]	Uva ursi	Dried leaves	Ericaceae	*Arctostaphylos uvaursi*	North America, Scotland, Canada, North Europe	Arabutin, Methyl arbutin, Ursolic acid, Quercetin, Quinones, Iriodoids, 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	*Solanum khasianum*	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	*Dioscorea deltoidea, Dioscorea composita*	India (Punjab, Jammu and Kashmir, Tamil Nadu, West Bengal, Himachal Pradesh, Maharashtra), China, Nepal, USA, Mexico	Diosgenin, Sapogenin, Smilagenin, β-isomer yammogenin, Episimilagenin	It is used as starting material for steroidal synthesis
33	Glycyrrhiza [1, 92-94]	Yasti, Liquorice root, Mulethi	Dried roots and stolons	Leguminosae	*Glycyrrhiza glabra*	Spain, England, Iran	Glycyrrhetinic 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	*Chlorophytum borivilianum*	India (Rajasthan, Gujarat, Madhya Pradesh, Maharashtra)	Hecogenin	Aphrodisiac, general tonic
35	Brahmi	Bacopa	Fresh	Scorphulariaceae	*Bacopa*	India	Bacosides A,	Nervine tonic,

	[1, 98-100]		leaves and stems		*moniera*		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	*Asparagus racemosus*	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	*Centella asiatica*	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	*Momordica charantia*	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	*Polygala senega*	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	*Panax ginseng*	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	*Tribulus terrestris*	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	*Quillaja saponaria*	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	*Gentiana lutea*	Europe	Gentiopicroside, Gentianin, Amarogentin, Gentinin, Amaroswerin	Bitter tonic, stomachic, improve appetite
44	Chirata [1, 127-128]	Chirayata	Dried plant	Gentianaceae	*Swertia chirata*	India (Kashmir, Madhya Pradesh), Bhutan, Nepal	Gentiopicrin, 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	Scorphulariaceae	*Picrorrhiza kurroa*	India (Uttar Pradesh, Himachal Pradesh, Punjab, Sikkim, Kashmir), China	Picroside I, Picroside II, Aamarogentin, Kutkoside	Bitter tonic, febrifuge, antiperiodic, hepatoprotective agent, laxative, antibacterial agent
46	Kalmegh [1, 133-134]	Andrographis, Kirayat	Dried leaves and shoots	Acanthaceae	*Andrographis paniculata*	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	*Picrasma excelsa*	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	*Gymnema sylvestre*	India	Gymnemic acid I, Gymnemic acid	Anti-diabetic agent, laxative, diuretic,

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							II, Gymnemic acid III, Gymnemic acid IV, Pentriacontane, Phytin, d-quercitol, Inositol	stomachic, stimulant
49	Stevia [1, 139]	Stevia	Dried roots and leaves	Asteraceae	*Stevia reboundians*	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	*Lawsonia inermis*	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	*Rubia cordifolia*	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	*Garcinia combogia*	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, Tinsopora	Dried leaves and stem	Menispermaceae	*Tinospora cordifolia*	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,

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

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

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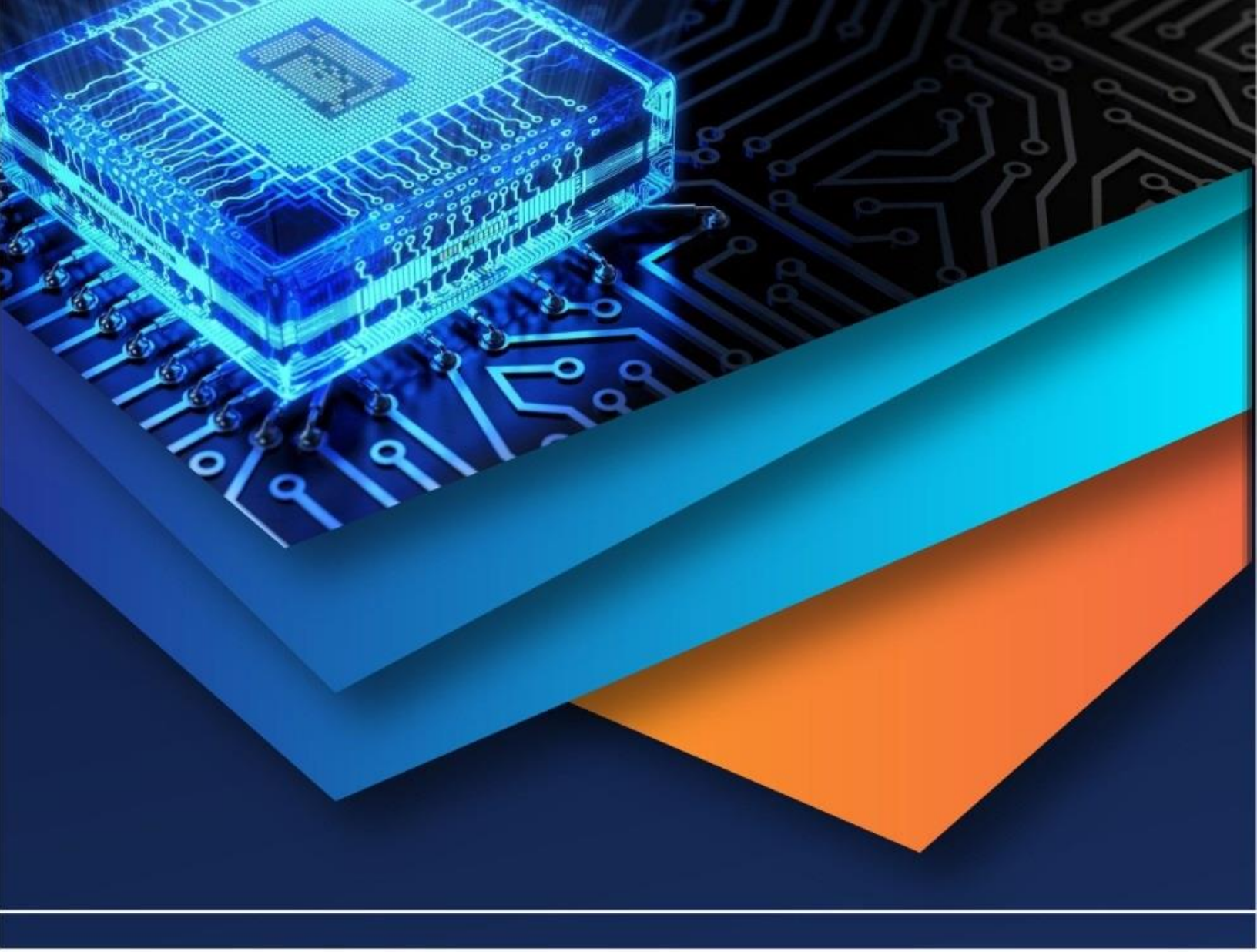
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