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Research Article

Glycosidase Inhibitors

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Study on Plant Phytoconstituents of Glycosidase Inhibitors in Diabetes

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Diabetes is an oldest metabolic life treating disease caused by abnormally high blood glucose levels, it is the largest population disease in worldwide based on their pathology its two types one is Type 1 diabetes insulin dependents beta-cell are responsible for this type whereas type 2 its non-insulin depended the actual cause is not known Now a day's combination therapy is most widely used for their treatments that are mostly synthetic compounds. There is some medicinal plant have an antidiabetic activity we know that herbs are the good friend for us from ancient time as compare to synthetic drug herbal drugs have less toxicity. This review studied the structure of chemical constituents of some glycosidase inhibitors medicinal plants like flavonoids, Alkaloids, terpenoids etc. Glycosidase enzyme plays a key role in the breakdown of the carbohydrate molecules.

Keywords: Glycosidase Inhibitors, Flavonoids, Terpenoids, Alkaloids

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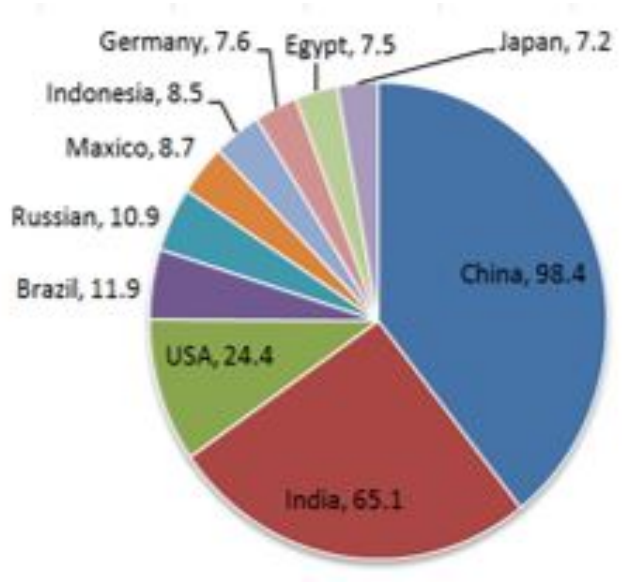
Nil	Nil	Yes	18%	

Introduction

Diabetes is a very oldest disorder it discovered by the Egypt physician approximately 3500 year ago. [1] The term diabetes is coming from the Greek word siphonmeansis that people with diabetes "passed water. [2] In all over the world there are many number of peoples suffering from this disorder it is a life treating disorder it cannot be cure only can be prevent.[3]The number of peoples with diabetes has increased from 108 million in 1980 to 422 million in 2014.The global prevalence of diabetes between adults over 18 years of age has increased from 4.7% in 1980 to 8.5% in 2014 [4].A group of metabolic ailments give you an idea about through hyperglycemia termed as diabetes mellitus it is deficiency in insulin discharge, insulin attainment, or equally [5],[6].Pancreas is the organ of digestive system it located in the abdomen and behind of stomach. In the pancreas pancreatic islets are present in which beta cell produces insulin and glucagon Hormones to control blood glucose level in the body. [7], [8] Even though classification of diabetes is important task because for their treatment is not a simple task in the modern life style number of patients is not fit on a single type [9] from the total number of patients 74.75% suffered from Diabetes Mellitus 1 and 25.25% suffered from Diabetes Mellitus 2. 10% of patients had a successive change in classification. [10] In the 1997 American diabetes association classified Type 1 and Type 2 other types Gastro-intestinal diabetes. [11] Type 1 diabetes, is autoimmune disorder insulin dependent Type 2 diabetes, cause by long term damaged by some other disorders whereas Gastro-intestinal diabetes cause during the pregnancy it create serious health risk in mother andinfants it also increases the risk to develop Type 2 diabetes [12].

Table 1: Top 10 Countries total number of peoples in the age of 20 to 79 years with diabetes [12]

S.No.	Name of Country	Total number of peoples with diabetes (In %)
1	China	98.4
2	India	65.1
3	USA	24.4
4	Brazil	11.9
5	Russian	10.9
6	Mexico	8.7
7	Indonesia	8.5
8	Germany	7.6
9	Egypt	7.5
10	Japan	7.2



Data extracted from International Diabetes Federation Diabetes Atlas, 6th ed, 2013.

Table 2

Region	Type 1 diabetes in children (0-14 yr)		Diabetes in adults (20-79 yr)				Hyperglycemia in pregnancy (20-49 yr)	
	2013		2013		2035		2013	
	Number in thousandth	Newly diagnosed in thousands	Number in millions	Comparative prevalence	Number in millions	Comparative prevalence	Cases in live births in millions	Comparative prevalence
Africa	39.1	6.4	19.8	5.7%	41.5	6.0%	4.6	14.4%
Europe	129.4	20.0	56.3	6.8%	68.9	7.1%	1.7	12.6%
Middle East and North Africa	64.0	10.7	34.6	10.9%	67.9	11.3%	3.4	17.5%
North America Caribbean	108.6	16.7	36.8	9.6%	50.4	9.9%	0.9	10.4%
South and Central America	45.6	7.3	24.1	8.2%	38.5	8.2%	0.9	11.4%
South East Asia	77.9	12.5	72.1	8.7%	123.0	9.4%	6.3	25.0%
Western Pacific	32.5	5.3	138.2	8.1%	201.8	8.4%	3.7	11.9%
World	497.1	78.9	381.8	8.3%	592.0	8.8%	21.4	14.8%

Number of subjects with type 1 diabetes in children (0-14 years), with diabetes in adults (20-79 years) and with hyperglycemia (type 2 or gestational diabetes) in pregnancy (20-49 years) [11], [12]. Data extracted from International Diabetes Federation Diabetes Atlas, 6th ed, 2013.

Glucosidase inhibitors: Alpha glucosidase is a glucosidase situated in the brush outskirt of the small digestive tract that follows up on α bonds. This is as opposed to beta-glucosidase. Alpha-glucosidase separates starch and disaccharides to glucose. Maltase, a comparative compound that severs maltose, is almost practically equal. [13], [14]

1. Flavonoids

Table 3: Phytoconstituents having α-glucosidase inhibition activity in flavonoids

Plant Name with Family	Part of Plant	Active constituent	References
AdhatodavasicaNees (Acanthaceae)	Leaves	VasicineVasicinl	14
Alstoniascholaris (Apocynaceae)	Leaves	quercetin 3-O-β-d-xylopyranosyl(1→2″dv galactopyranoside (-)-lyoniresinol 3-O-β-d-glucopyranoside	15
Bergenia ciliate (Saxifragaceae)	Rhizome	(-)-3-O-galloylepicatechin (-)-3-O-galloylcatechin	16
Cassia auriculata (Cecropiaceae)	Flowers	Methanolic extract	17
Cecropiaobtusifolia (Cecropiaceae)	Leaves	Butanolic extract	18
Chinese aloe (Asphodelaceae)	Leaves	Aloeresin A	19
Cleistocalyxoperculatus (Myrtaceae)	Flower buds	Aqueous extract	20
Commelinacommunis (Commelinaceae)	Aerial parts	Isoquercitrin Isorhamnetin-3-O-rutinoside Isorhamnetin-3-O-β-d-glucosideGlucoluteolin Chrysoriol-7-O-β-d-glucosideOrientin Vitexin IsoorientinIsovitexin SwertisinFlavocommelin 1-Deoxynojirimycin DMDP	21
Crataegusoxyacantha (Rosaceae)	Leaves	Apigenin VitexinIsovitexinLuteolin OrientinIsoorientin	22
Cuscutareflexa (Convolvulaceae)	Leaves	7′-(3′,4′-dihydroxyphenyl)-N-[(4methoxyphenyl ethyl] propenamide 7′-(4′-hydroxy,3′-methoxyphenyl)-N-[(4-butylphenyl) ethyl] propenamide 6,7-dimethoxy-2H-1-benzopyran-2-one 2-(3-hydroxy-4-methoxyphenyl)-3,5-dihydroxy-7-O- β-d-glucopyranoside-4H-1-benzopyrane-4-one	23
Derris indica(Fabaceae)	Root	30,40-dihydroxy-4H-furo[2,3-h]chromen-4-one 3,30,40-trihydroxy- 4H-furo[2,3-h]chromen-4-one Karanjin PongapinPongaglabronePongamol OvalitenonePongachrome Fisetin Pinnatin Pongapinone-B Piperonylicacid	24
Derris scandens (Fabaceae)		ScandeninA ScandenoneScandinone 4, 5,7-Trihydroxybiprenylisoflavone	25
Dorsteniapsilurus (Moraceae)	Roots	Dorsilurin F Dorsilurin G Dorsilurin H Dorsilurin I Dorsilurin J Dorsilurin K Dorsilurin C	26
Durantarepens (Verbenaceae)	Whole plant	7-O-d-glucopyranosyl-3,5-dihydroxy-3′-(4″-acetoxy- 3″-methylbutyl)-6,4′ dimethoxyflavone 3,7,4′-trihydroxy-3′-(8″-acetoxy-7″-methyloctyl)-5,6-dimethoxyflavone (-)-6β-hydroxy-5β ,8β ,9β ,10α-cleroda-3,13-dien-16,15-olid-18-oic acid	27
Fagaratessmannii (Rutaceae)	Stem bark	vanillic acid 2,6-dimethoxy-1,4-benzoquinone 3β-acetoxy-16β-hydroxybetulinic acid	28
Ferula mongolica (Umbelliferae)	Roots	Baigene A Baigene B BaigeneC 7′-MethoxybaigeneC Mongolin B 4′-Methoxydshamirone Baigene B Dshamirone Mongolin C Mongolin D	29
Grateloupiaelliptica (Halymeniaceae)	Algae	2,4,6-tribromophenol (S) 2,4,6-tribromophenol (B) 2,4-dibromophenol (S) 2,4-dibromophenol (B)	30
Gypsophila oldhamiana (Caryophyllaceae)	Root	Segetalic acid 28-O-α-1-arabinopyranosyl-(1→4)-α-1- arabinopyranosyl-(1→3)-β-d-xylopyranosyl-(1→4)- A-1-rhamnopyranosyl-(1→2)-β-d-fucopyranosylester 3-keto,16α-hydroxy, 24-noroleanolic acid	31
Hyssopusofficinalis (Lamiaceae)	Leaves	1-O-beta-d-6′-O-cinnamoylglucopyranosyl-3-(3", 5"-dimethoxy-4"-hydroxyphenyl)-1,2,3-propanetriol 1-O-beta-d-glucopranosyl-3-(3",5"-dimethoxy-4"- hydroxyphenyl)-1,2,3-propanetriol	32
Ipomoea batatas (Convolvulaceae)	Roots	Peonidin (m) 6-O-Caffeoylsophorose (m)	33
Lobelia chinensis (Campanulaceae)		Radicamines A Radicamines B	34
Machilusphilippinensis (Lauraceae)	Leaves	Kaempferol-3-O-α-1-rhamnopyranoside 3″,4″-di-E-p- coumaroic acid ester Quercetin-3-O-α-L-(3″-Z,4″-E-di-p-coumaroyl)- rhamnopyranoside	35
Malpighiaemarginata	Fruit	Aceronidin (leucocyanidin-3-O-β-d-glucoside)	36
Morus alba (Moraceae)	Leaves	1-deoxynojirimycin (s) 1-deoxynojirimycin (m)	37
Origanummajorana (Labiatae)	Leaves	6-hydroxyapigenin. 6-hydroxyapigenin-7-O-β-d-glucopyranoside 6-hydroxyluteolin-7-O-β-d-glucopyranoside 6-hydroxyapigenin-7-O-(6-O-feruloyl)-β-d- glucopyranoside. 6-hydroxyluteolin-7-O-(6-O-feruloyl)-β-d-Glucopyranoside.	38
Penaresschulzei	Bark	Schulzeines A Schulzeines B Schulzeines C	39
Pharbitis nil (Convolvulaceae)		Pelargonidin	40
Pine (Pinaceae)	Bark	Pycnogenol	41

Piper longum(Piperaceae)	Fruit	PipatalinePellitorine SesamineBrachystamide B Guineensine Deoxynojirimycin (std)	42
Piper umbellatum (Piperaceae)	Branches	PiperumbellactamsA Piperumbellactams B Piperumbellactams C	43
Salacia reticulate (Hippocrateaceae)	Roots	Mangiferin (s) (-)-epicatechin (s) (-)-epigallocatechin (s) (-)-4′-O-Methylepigallocatechin (s) Salacinol (s) Kotalanol (s).	44
Scutellariabaicalensis (Lamiaceae)	Root	Baicalein	45
Sophoraflavescens (Fabaceae)	Roots	Kushenol A Kurarinone Sophoraflavanone G 2′-methoxykurarinone Kurarinol Isoxanthohumol Kuraridin Maackian	46
Spiraeacantoniensis (Rosaceae)	Flower	Quercetin 3-O-(6-O-caffeoyl)-β-galactosideKaempferol 3-O-(6-O-caffeoyl)-β-galactoside Kaempferol 3-O-(6-O-caffeoyl)-β-glucoside	47
Syagrusromanzoffiana (Arecaceae)	Seed	13-hydroxykompasinol A scirpusin C	48
Syzygiummalaccense (Myrtaceae)	Bark	Casuarine 6-O-β-glucoside	49
Terminaliachebula (Combretacea)	Fruit	Chebulanin,Chebulagic acid, Chebulinic acid	50
Terminaliasuperb (Combretacea)	Stem bark	Gallic acid Methyl gallateEllagic acid Ellagic acid 3,30-dimethyl ether Ellagic acid-4-o-b-Dxylopyranoside-3,30-dimethyl ether	51
Tussilagofarfara (Asteracerae)	Flower buds	3,4-Dicaffeoylquinicacid 3,5-Dicaffeoylquinicacid 4,5-Dicaffeoylquinicacid 1,2,3,4,6-Penta-O-galloyl-b-d-glucopyranose	52
Viburnum dilatatum (Caprifoliaceae)	Fruits	Cyanidin 3-sambubioside 5-Caffeoyl quinic acid Cyanidin 3-glucoside 5-Caffeoyl-4-methoxy quinicacid Cyaniding Quercetin	53
Plant Name with Family	Part of Plant	Active constituent	References
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Chinese aloe (Asphodelaceae)	Leaves	Aloeresin A	19
Cleistocalyxoperculatus (Myrtaceae)	Flower buds	Aqueous extract	20
Commelinacommunis (Commelinaceae)	Aerial parts	Isoquercitrin Isorhamnetin-3-O-rutinoside Isorhamnetin-3-O-β-d-glucosideGlucoluteolin Chrysoriol-7-O-β-d-glucosideOrientin Vitexin IsoorientinIsovitexin SwertisinFlavocommelin 1-Deoxynojirimycin DMDP	21
Crataegusoxyacantha (Rosaceae)	Leaves	Apigenin VitexinIsovitexinLuteolin OrientinIsoorientin	22
Cuscutareflexa (Convolvulaceae)	Leaves	7′-(3′,4′-dihydroxyphenyl)-N-[(4methoxyphenyl ethyl] propenamide 7′-(4′-hydroxy,3′-methoxyphenyl)-N-[(4-butylphenyl) ethyl] propenamide 6,7-dimethoxy-2H-1-benzopyran-2-one 2-(3-hydroxy-4-methoxyphenyl)-3,5-dihydroxy-7-O- β-d-glucopyranoside-4H-1-benzopyrane-4-one	23
Derris indica(Fabaceae)	Root	30,40-dihydroxy-4H-furo[2,3- h]chromen-4-one 3,30,40-trihydroxy- 4H-furo[2,3-h]chromen-4-one Karanjin PongapinPongaglabronePongamolOvalitenonePongachrome Fisetin Pinnatin Pongapinone-B Piperonylicacid	24
Derris scandens(Fabaceae)		ScandeninA ScandenoneScandinone 4, 5,7-Trihydroxybiprenylisoflavone	25
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Durantarepens (Verbenaceae)	Whole plant	7-O-d-glucopyranosyl-3,5-dihydroxy-3′-(4″-acetoxy- 3″-methylbutyl)-6,4′ dimethoxyflavone 3,7,4′-trihydroxy-3′-(8″-acetoxy-7″-methyloctyl)-5,6-dimethoxyflavone (-)-6β-hydroxy-5β ,8β ,9β ,10α-cleroda-3,13-dien-16,15-olid-18-oic acid	27
Fagaratessmannii (Rutaceae)	Stem bark	vanillic acid 2,6-dimethoxy-1,4-benzoquinone 3β-acetoxy-16β-hydroxybetulinic acid	28
Ferula mongolica (Umbelliferae)	Roots	Baigene A Baigene B BaigeneC 7′-MethoxybaigeneC Mongolin B 4′-Methoxydshamirone Baigene B Dshamirone Mongolin C Mongolin D	29
Grateloupiaelliptica (Halymeniaceae)	Algae	2,4,6-tribromophenol (S) 2,4,6-tribromophenol (B) 2,4-dibromophenol (S) 2,4-dibromophenol (B)	30
Gypsophila oldhamiana (Caryophyllaceae)	Root	Segetalic acid 28-O-α-1-arabinopyranosyl-(1→4)-α-1- arabinopyranosyl-(1→3)-β-d-xylopyranosyl-(1→4)- A-1-rhamnopyranosyl-(1→2)-β-d-fucopyranosylester 3-keto,16α-hydroxy, 24-noroleanolic acid	31

Hyssopusofficinalis (Lamiaceae)	Leaves	1-O-beta-d-6′-O-cinnamoylglucopyranosyl-3-(3", 5"-dimethoxy-4"-hydroxyphenyl)-1,2,3-propanetriol 1-O-beta-d-glucopranosyl-3-(3",5"-dimethoxy-4"-hydroxyphenyl)-1,2,3-propanetriol	32
Ipomoea batatas (Convolvulaceae)	Roots	Peonidin (m) 6-O-Caffeoylsophorose (m)	33
Lobelia chinensis (Campanulaceae)		Radicamines A Radicamines B	34
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Malpighiaemarginata	Fruit	Aceronidin (leucocyanidin-3-O-β-d-glucoside)	36
Morus alba (Moraceae)	Leaves	1-deoxynojirimycin (s) 1-deoxynojirimycin (m)	37
Origanummajorana (Labiatae)	Leaves	6-hydroxyapigenin. 6-hydroxyapigenin-7-O-β-d-glucopyranoside 6-hydroxyluteolin-7-O-β-d-glucopyranoside 6-hydroxyapigenin-7-O-(6-O-feruloyl)-β-d-glucopyranoside. 6-hydroxyluteolin-7-O-(6-O-feruloyl)-β-d- Glucopyranoside.	38
Penaresschulzei	Bark	Schulzeines A Schulzeines B Schulzeines C	39
Pharbitis nil (Convolvulaceae)		Pelargonidin	40
Pine (Pinaceae)	Bark	Pycnogenol	41
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Piper umbellatum (Piperaceae)	Branches	PiperumbellactamsA Piperumbellactams B Piperumbellactams C	43
Salacia reticulate (Hippocrateaceae)	Roots	Mangiferin (s) (-)-epicatechin (s) (-)-epigallocatechin (s) (-)-4′-O-Methylepigallocatechin (s) Salacinol (s) Kotalanol (s).	44
Scutellariabaicalensis (Lamiaceae)	Root	Baicalein	45
Sophoraflavescens (Fabaceae)	Roots	Kushenol A Kurarinone Sophoraflavanone G 2′-methoxykurarinone Kurarinol Isoxanthohumol Kuraridin Maackian	46
Spiraeacantoniensis (Rosaceae)	Flower	Quercetin 3-O-(6-O-caffeoyl)-β-galactosideKaempferol 3-O-(6-O-caffeoyl)-β-galactoside Kaempferol 3-O-(6-O-caffeoyl)-β-glucoside	47
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Syzygiummalaccense (Myrtaceae)	Bark	Casuarine 6-O-β-glucoside	49
Terminaliachebula (Combretacea)	Fruit	Chebulanin,Chebulagic acid, Chebulinic acid	50
Terminaliasuperb (Combretacea)	Stem bark	Gallic acid Methyl gallateEllagic acid Ellagic acid 3,30-dimethyl ether Ellagic acid-4-o-b-Dxylopyranoside-3,30-dimethyl ether	51
Tussilagofarfara (Asteracerae)	Flower buds	3,4-Dicaffeoylquinicacid 3,5-Dicaffeoylquinicacid 4,5-Dicaffeoylquinicacid 1,2,3,4,6-Penta-O-galloyl-b-d-glucopyranose	52
Viburnum dilatatum (Caprifoliaceae)	Fruits	Cyanidin 3-sambubioside 5-Caffeoyl quinic acid Cyanidin 3-glucoside 5-Caffeoyl-4-methoxy quinicacid Cyaniding Quercetin	53

2. Alkaloids

Table 4: Phytoconstituents having α-glucosidase inhibition activity in Alkaloids

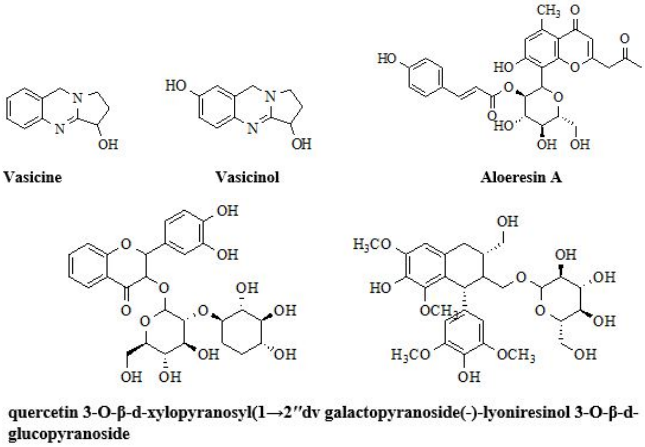
Plant Name with Family	Part of Plant	Active constituent	References
Adhatodavasica		Vasicine Vasicinol	54,55
Piper umbellatum	Branches	Piperumbellactam A Piperumbellactam B Piperumbellactam C	55,56,57
Tussilagofarfara	Flower Buds	3,4-dicaffeoylquinic acid 3,5-dicaffeoylquinic acid 4,5-dicaffeoylquinic acid Chlorogenic acid Quinic acid Caffeic acid	58,59,60,61, 62,63,64
Terminaliachebula (Combretaceae)		Chebulanin, Chebulagic acid, Chebulinic acid	64,65,66

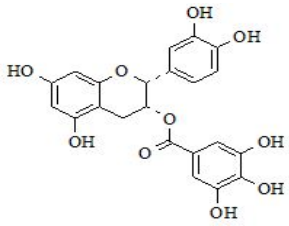
3. Terpenoids

Table 5: Phytoconstituents having α-glucosidase inhibition activity in Terpenoids

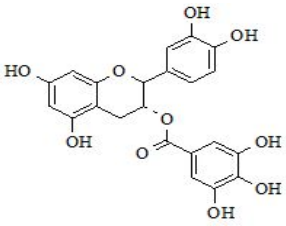
Plant Name with Family	Part of Plant	Active constituent	References
Fagaratessmanni		3b-Acetoxy-16b-hydroxybetulinic acid	67,68
Gypsophila oldhamiana		saponin Segetalic acid 28-O-α-larabinopyranosyl-(1→4)-α-l-arabinopyranosyl-(1→3)-βd-xylopyranosyl-(1→4)-α-l-rhamnopyranosyl-(1→2)-β-dfucopyranosyl ester	69,70

Chemical Structures of Phytocontituents





(-)-3-O-galloylepicatechin



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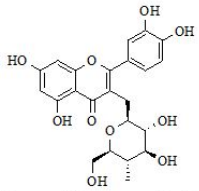

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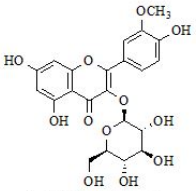
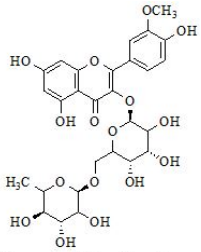
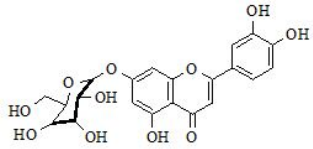


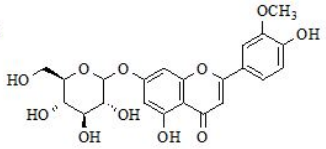
Isorhamnetin-3-O-β-d-glucoside



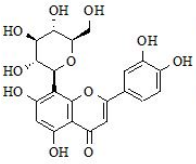
Isorhamnetin-3-O-rutinoside



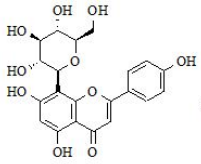
Glucoluteolin



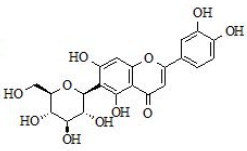
Chrysoriol-7-O-β-d-glucoside



Orientin



Vitexin



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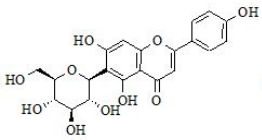

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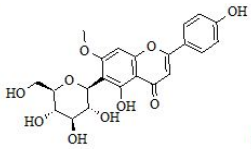
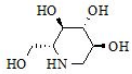
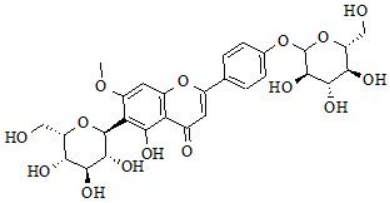


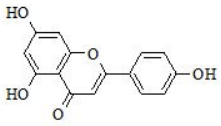
Swertisin



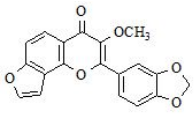
1-Deoxynojirimycin



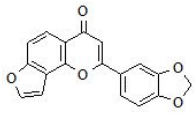
Flavocommelin



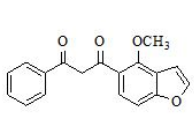
Apigenin



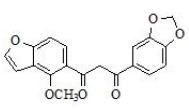
Pongapin



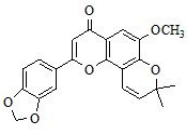
Pongaglabrone



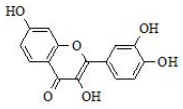
Pongamol



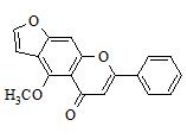
Ovalitenone



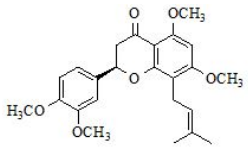
Pongachrome



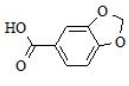
Fisetin



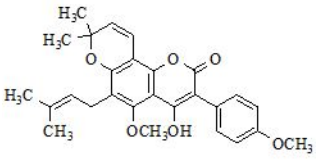
Pinnatin



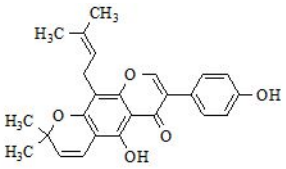
Pongapinone-B



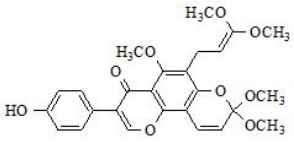
Piperonylicacid



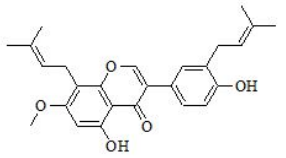
ScandeninA



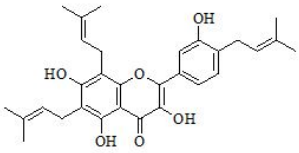
Scandenone



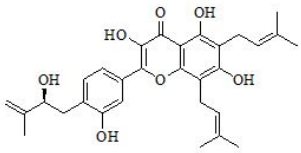
Scandinone



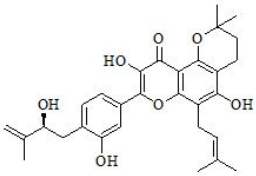
4,5,7-Trihydroxybiprenylisoflavone



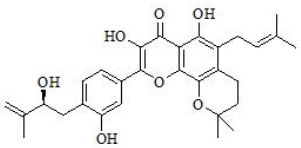
Dorsilurin F



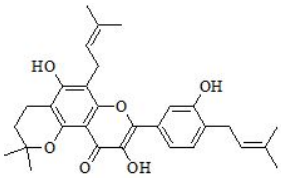
Dorsilurin G



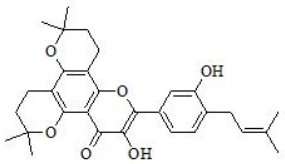
Dorsilurin H



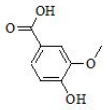
Dorsilurin I



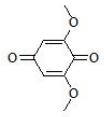
Dorsilurin J



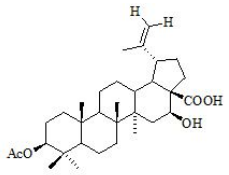
Dorsilurin K



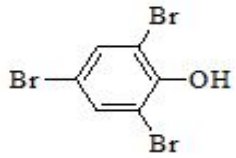
Vanillic acid acid

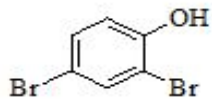


2,6-dimethoxy-1,4-benzoquinone

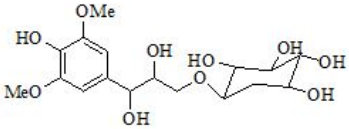


3β-acetoxy-16β-hydroxybetulinic



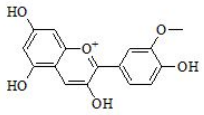


2,4,6-tribromophenol 2,4-dibromophenol

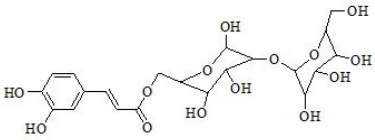


1-O-beta-d-glucopranosyl-3-(3",5"dimethoxy-4"-hydroxyphenyl)-1,2,3-propanetriol

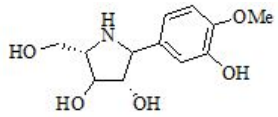
1-O-beta-d-6′-O-cinnamoylglucopyranosyl-3-(3", 5"-dimethoxy-4"-hydroxyphenyl)-1,2,3-propanetriol



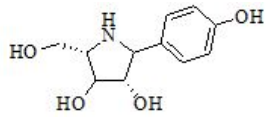
Peonidin



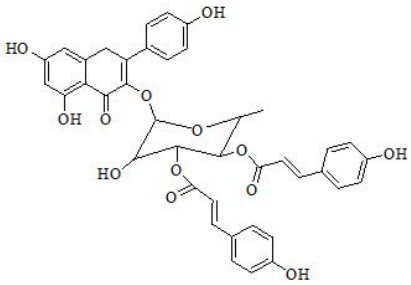
6-O-Caffeoylsophorose



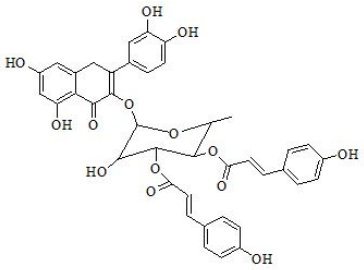
Radicamines A

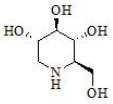


Radicamines B

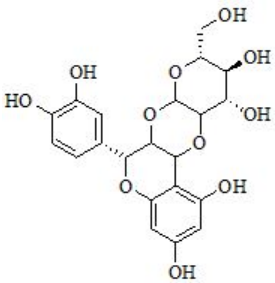


Kaempferol-3-O-α-l-rhamnopyranoside 3″,4″-di-E-p- coumaroic acid ester

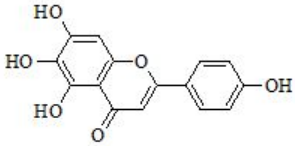




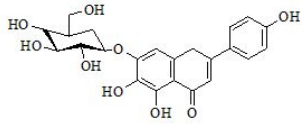
Quercetin-3-O-α-L-(3″-Z,4″-E-di-p-coumaroyl)- rhamnopyranoside 1-deoxynojirimycin



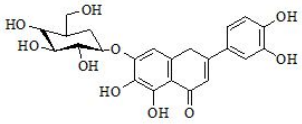
Aceronidin



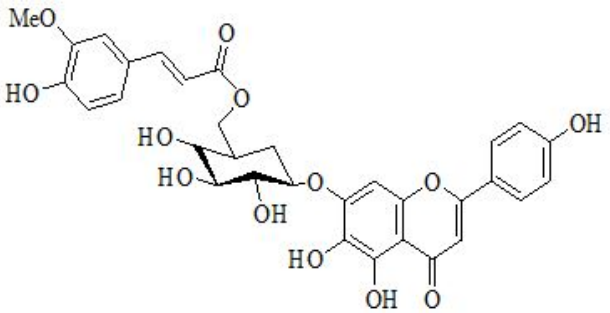
6-hydroxyapigenin



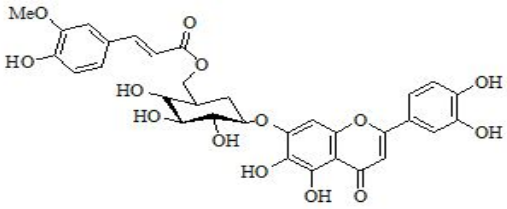
6-hydroxyapigenin-7-O-β-d-glucopyranoside



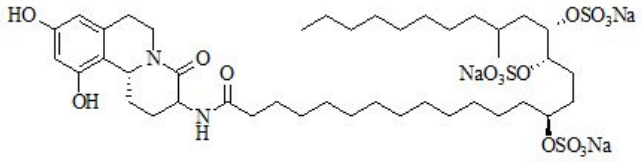
6-hydroxyluteolin-7-O-β-d-glucopyranoside



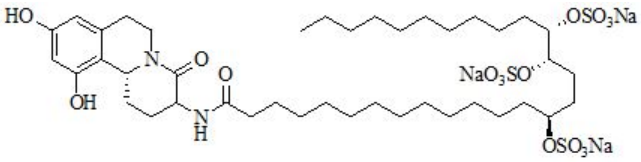
6-hydroxyapigenin-7-O-(6-O-feruloyl)-β-d- glucopyranoside



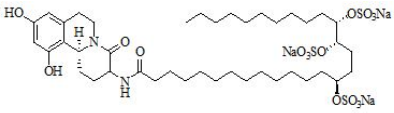
6-hydroxyluteolin-7-O-(6-O-feruloyl)-β-d-Glucopyranoside



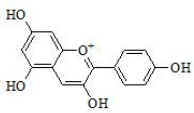
Schulzeines A



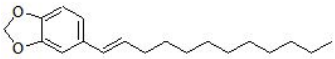
Schulzeines B



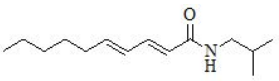
Schulzeines C



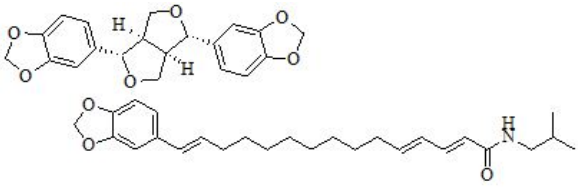
Pelargonidin



Pipataline

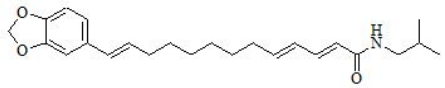


Pellitorine

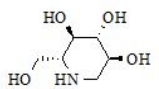


Sesamine

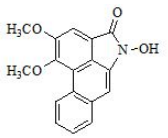
Brachystamide B



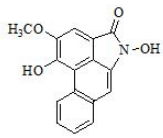
Guineensine



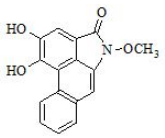
Deoxynojirimycin



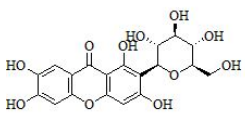
Piperumbellactams A



Piperumbellactams B



Piperumbellactams C



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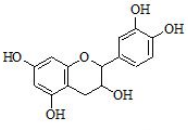

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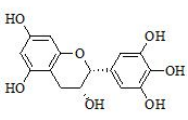

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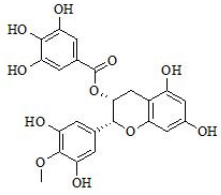

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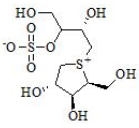

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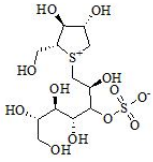

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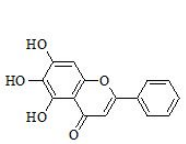
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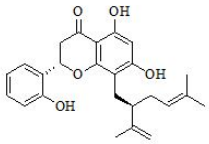
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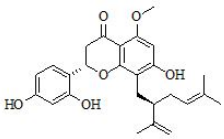
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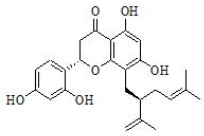
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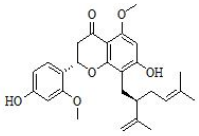
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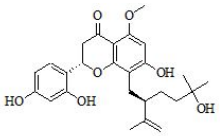
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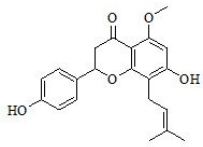
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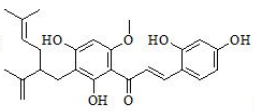
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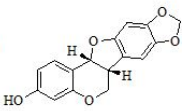
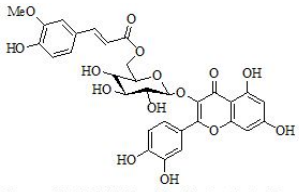
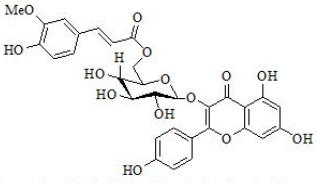
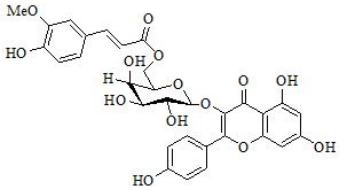

Maackian


Quercetin 3-*O*-(6-*O*-caffeoyl)-*β*-galactoside


Kaempferol 3-*O*-(6-*O*-caffeoyl)-*β*-galactoside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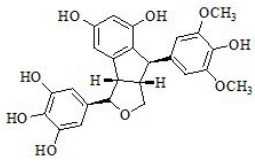
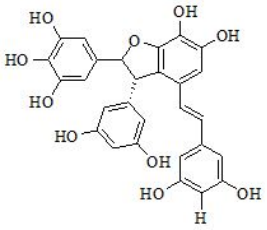
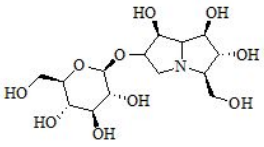
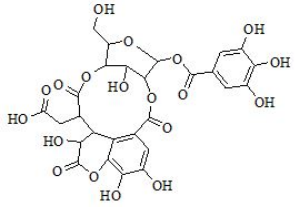
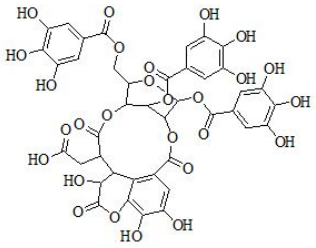
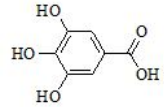

13-hydroxykompasinol A

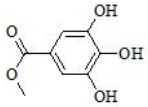

Scirpusin C

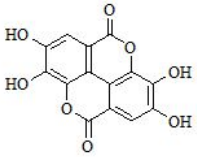

Casuarine 6-O-β-glucoside


Chebulanin


Chebulinic acid


Gallic acid


Methyl gallate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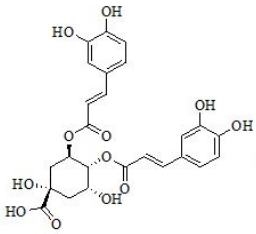
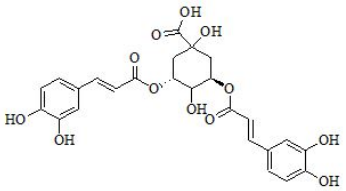

3,4-Dicaffeoylquinicacid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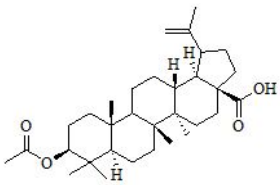
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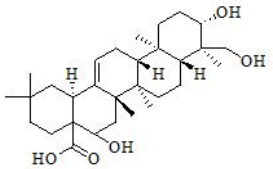
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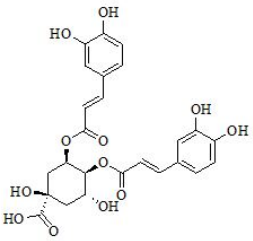
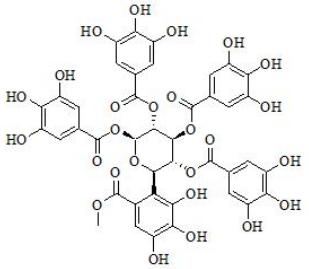
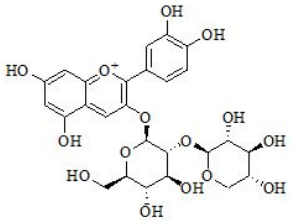
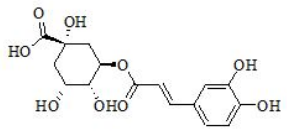
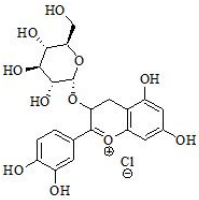
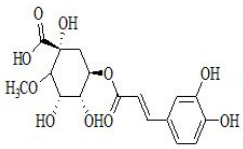

4,5-Dicaffeoylquinicacid glucopyranose

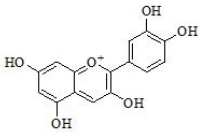

1,2,3,4,6-Penta-O-galloyl-b-d-


Cyanidin 3-sambubioside


5-Caffeoyl quinic acid


Cyanidin 3-glucoside


5-Caffeoyl-4-methoxy quinicacid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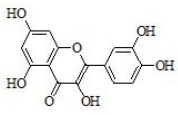
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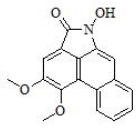
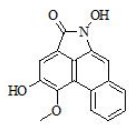

Piperumbellactam A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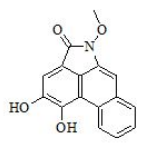
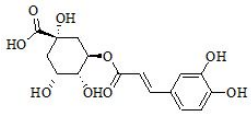
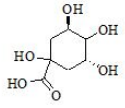
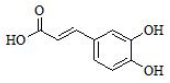
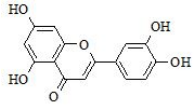
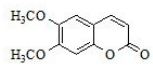

BPiperumbellactam C


Chlorogenic acid


Quinic acid


Caffeic acid


Luteolin


6,7-dimethoxy-2*H*-1-benzopyran-2-one

Karanjin

Conclusion

In this review discussed about phytocontituents of Alpha glycosidase inhibitors developments of Alpha glycosidase inhibitors is a good approach for treatment of diabetes whereas Alpha-glucosidase inhibitors from plants sources a natural approach for treatment of diabetes Alpha Glucosidase is the key chemical catalyzing the last advance in the stomach related procedure of starches. Consequently, Alpha glucosidase inhibitors can impede the freedom of d-glucose from dietary complex starches and defer glucose assimilation, bringing about decreased postprandial plasma glucose levels and concealment of postprandial hyperglycemia.

Reference

1. Ahmed AM. History of diabetes mellitus. Saudi medical journal. 2002 Apr 1;23(4):373-8.

2. Lakhtakia R. The history of diabetes mellitus. Sultan Qaboos University Medical Journal. 2013 Aug;13(3):368.

3. Piero MN, Nzaro GM, Njagi JM (2015) Diabetes mellitus-a devastating metabolic disorder. Asian Journal of Biomedical and Pharmaceutical Sciences 5: 1.

4. Sarwar N, Gao P, Seshasai SR, Gobin R, Kaptoge S, Di Angelantonio et al. Lancet. 2010; 26;375:2215-2222.

5. Paramanick D, Sharma N. A review on herbs which are used in diabetes mellitus. International Journal of Drug Development and Research. 2017;9:12-7.

6. Diagnosis and Classification of Diabetes Mellitus (2004) American Diabetes Association Diabetes Care 27: S1.

7. Causes of Diabetes, National Institute of Diabetes and Digestive and Kidney Diseases.

8. Tripathi KD. Essentials of medical pharmacology. JP Medical Ltd; 2013 Sep 30.

9. Kharroubi AT, Darwish HM. Diabetes mellitus: The epidemic of the century. World journal of diabetes. 2015 Jun 25;6(6):850.

10. Cakan N, Kizilbash S, Kamat D. Changing spectrum of diabetes mellitus in Children: challenges with initial classification. Clinical pediatrics. 2012 Oct;51(10):939-44.

11. Kharroubi AT, Darwish HM. Diabetes mellitus: The epidemic of the century. World journal of diabetes. 2015 Jun 25;6(6):850.

12. Aguiree F, Brown A, Cho NH, Dahlquist G, Dodd S, Dunning T, Hirst M, Hwang C, Magliano D, Patterson C, Scott C. IDF diabetes atlas.

13. Bruni, C.B.; Sica, V.; Auricchio, F.; Covelli, I. (1970). "Further kinetic and structural characterization of the lysosomal α-D-glucoside glucohydrolase from cattle liver". Biochim. Biophys. Acta. 212 (3): 470–477

14. Mehrani H, Storey KB (October 1993). "Characterization of alpha-glucosidases from rainbow trout liver". Arch. Biochem. Biophys. 306 (1): 188–94.

15. Gao H, Huang YN, Gao B, Li P, Inagaki C, Kawabata J. Inhibitory effect on α-glucosidase by AdhatodavasicaNees. Food Chem 2008;108:965-72.

16. Tabopda TK, Ngoupayo J, Liu J, Mitaine-Offer AC, Tanoli SA, Khan SN, et al. Bioactive aristolactams from Piper umbellatum. Phytochem 2008;69:1726-31.

17. Bhandari MR, Anurakkun NJ, Hong G, Kawabata J. α-Glucosidase and α-amylase inhibitory activities of Nepalese medicinal herb Pakhanbhed (Bergeniaciliata, Haw.). Food Chem 2008;106: 247-52.

18. Abesundara KJ, Matsui T, Matsumoto K. Alpha-Glucosidase inhibitory activity of some Sri Lanka plant extracts, one of which, Cassia auriculata, exerts a strong antihyperglycemic effect in rats comparable to the therapeutic drug acarbose. J Agric Food Chem 2004;52:2541-5.

19. Cetto AA, Jim´enez JB, V´azquez RC. Alfa-glucosidase-inhibiting activity of some Mexican plants used in the treatment of type 2 diabetes. J Ethnopharmacol 2008;116:27-32.

20. Anurakkun NJ, Bhandari MR, Hong G, Kawabata J. α-Glucosidase inhibitor from Chinese aloes. Fitoterapia 2008;79:456-7

21. Mai TT, Chuyen NV. Anti-Hyperglycemic Activity of an Aqueous Extract from Flower Buds of Cleistocalyxoperculatus (Roxb.) Merr and Perry. BiosciBiotechnolBiochem 2007;71:69-76.

22. Shibano M, Kakutani K, Taniguchi M, Yasuda M, Baba K. Antioxidant constituents in the dayflower (Commelinacommunis L.) and their a-glucosidase-inhibitory activity. J Nat Med 2008;62:349-53.

23. Li H, Song F, Xing J, Tsao R, Liu Z, Liu S. Screening and Structural Characterization of α-Glucosidase Inhibitors from Hawthorn Leaf Flavonoids Extract by Ultrafiltration LC-DAD-MSn and SORI-CID FTICR MS. J Am Soc Mass Spectrom 2009;20:1496-503.

24. Anis E, Anis I, Ahmed S, Mustafa G, Malik A, Afja N, et al. α-Glucosidase Inhibitory Constituents from Cuscutareflexa. Chem Pharm Bull 2002;50:112-4.

25. Rao RR, Tiwari AK, Reddy PP, Babu SK, Ali AZ, Madhusudana K, et al. New furanoflavanoids, intestinal a-glucosidase inhibitory and free-radical (DPPH) scavenging, activity from antihyperglycemic root extract of Derris indica (Lam.). Bioorg Med Chem 2009;17:5170-5.

26. Rao RV, DasariKR, Rao MJ. Isolation, characterization and chemobiological quantification of α-glucosidase enzyme inhibitory and free radical scavenging constituents from Derris scandensBenth. J ChromatogrB2007;855:166-72.

27. TabopdaTK, NgoupayoJ, AwoussongPK, Mitaine-Offer AC, Ali MS, NgadjuiBT, et al. TriprenylatedFlavonoids from Dorsteniapsilurusand Their α-Glucosidase Inhibition Properties. J Nat Prod 2008;71:2068-72.

28. Iqbal K, Malik A, MukhtarN, AnisI, Khan SN, Choudhary MI. α-Glucosidase Inhibitory Constituents from Durantarepens. Chem Pharm Bull2004;52:785-9.

29. Mbaze LM, Poumale HM, Wansi JD, Lado JA, Khan SN, Iqbal MC, et al. α-Glucosidase inhibitory pentacyclictriterpenes from the stem bark of Fagaratessmannii (Rutaceae). Phytochem 2007;68:591-5

30. IrfanBaig. Phytochemical studies on Ferula mongolica and other mongolian medicinal plants. Ph.D. Thesis, International Centre for Chemical Sciences, University of Karachi (2002).

31. Kim KY, Nam KA, Kurihara H, Kim SM. Potent α-glucosidase inhibitors purified from the red alga Grateloupiaelliptica. Phytochem 2008;69:2820-5.

32. Luo JG, Ma L, Kong LY. New triterpenoidsaponins with strong α- glucosidase inhibitory activity from the roots of Gypsophila oldhamiana. Bioorg Med Chem 2008;16:2912-20.

33. Miyazaki H, Matsuura H, Yanagiya C, Mizutani J, Tsuji M, Ishihara C. Inhibitory effects of hyssop (Hyssopusofficinalis) extracts on intestinal alpha-glucosidase activity and postprandial hyperglycemia. J NutrSciVitaminol (Tokyo) 2003;49:3 46-9.

34. Matsui T, Ebuchi S, Kobayashi M, Fukui K, Sugita K, Terahara N, et al. Anti-hyperglycemic Effect of Diacylated Anthocyanin Derived from Ipomoea batatas Cultivar Ayamurasaki Can Be Achieved through the α-Glucosidase Inhibitory Action. J Agric Food Chem 2002;50:7244-8.

35. Shibano M, Tsukamoto D, Masuda A, Tanaka Y, Kusano G. Two New Pyrrolidine Alkaloids, Radicamines A and B, as Inhibitors of α-Glucosidase from Lobelia chinensis LOUR. Chem Pharm Bull 2001;49:1362-5.

36. Lee SS, Lin HC, Chen CK. Acylatedflavonolmonorhamnosides, α-glucosidase inhibitors, from Machilusphilippinensis. Phytochem 2008;69:2347-53.

37. Kawaguchi M, Tanabe H, Nagamine K. Isolation and Characterization of a Novel Flavonoids Possessing a 4,2”-Glycosidic Linkage from Green Mature Acerola (Malpighiaemarginata DC.) Fruit. BiosciBiotechnolBiochem 2007;71: 1130-5. 49. Prashanth

38. Hansawasdi C, Kawabata J. α-Glucosidase inhibitory effect of mulberry (Morusalba) leaves on Caco-2. Fitoterapia 2006;77: 568-73.

39. Kawabata J, Mizuhata K, Sato E, Nishioka T, Aoyama Y, Kasai T. 6-Hydroxyflavanoids as α-Glucosidase Inhibitors from Marjoram (Origanummajorana) Leaves. BiosciBiotechnolBiochem 2003;67:445-7.

40. Takada K, Uehara T, Nakao Y, Matsunaga S, van Soest RW, Fusetani N. Schulzeines A-C, New α-Glucosidase Inhibitors from the Marine Sponge Penaresschulzei. J Am ChemSoc 2004;126:187-93.

41. Matsui T, Ueda T, Oki T, Sugita K, Terahara N, Matsumoto K. α-Glucosidase Inhibitory Action of Natural AcylatedAnthocyanins. 2. α-Glucosidase Inhibition by Isolated AcylatedAnthocyanins. J Agric Food Chem 2001;49:1952-6.

42. Schafer A, Hogger P. Oligomericprocyanidins of French maritime pine bark extract (Pycnogenol1) effectively inhibit a-glucosidase. Diabetes Res ClinPract 2007;77:41-6.

43. Pullela SV, Tiwari AK, Vanka UM, Vummenthula A, Tatipaka HB, Dasari KR, et al. HPLC assisted chemobiological standardization of α-glucosidase-I enzyme inhibitory constituents from Piper longum. Linn. An Indian medicinal plant. J Ethnopharmacol 2006;108:445-9.

44. Tabopda TK, Ngoupayo J, Liu J, Mitaine-Offer AC, Tanoli SA, Khan SN, et al. Bioactive aristolactams from Piper umbellatum. Phytochem 2008;69:1726-31.

45. 59. Yoshikawa M, Nishida N, Shimoda H, Takada M, Kawahara Y, Matsuda H. Polyphenol Constituents from Salacia Species: Quantitative Analysis of Mangiferin with α-Glucosidase and Aldose Reductase Inhibitory Activities. YakugakuZasshi 2001;121:371-8.

46. Nishioka T, Kawabata J, Aoyama Y. Baicalein, an α-Glucosidase Inhibitor from Scutellariabaicalensis. J Nat Prod 1998;61: 1413-5.

47. Kim JH, Ryu YB, Kang NS, Lee BW, Heo JS, Jeong IY, et al. Glycosidase Inhibitory Flavonoids from Sophoraflavescens. Biol Pharm Bull 2006;29:302-5.

48. Yoshida K, Hishida A, Iida O, Hosokawa K, Kawabata J. FlavonolCaffeoylglycosides as α-Glucosidase Inhibitors from Spiraeacantoniensis Flower. J Agric Food Chem 2008;56:4367-71.

49. . Lam SH, Chen JM, Kang CJ, Chen CH, Lee SS. α-Glucosidase inhibitors from the seeds of Syagrusromanzoffiana. Phytochem 2008;69:1173-8.

50. Jung M, Park M, Lee HC, Kang YH, Kang ES, Kim SK. Antidiabetic agents from medicinal plants. Curr Med Chem 2006;13:1203-18.

51. Gao H, Huang YN, Xu PY, Kawabata J. Inhibitory effect on α-glucosidase by the fruits of Terminaliachebula Retz. Food Chem 2007;105:628-34.

52. Wansi JD, Lallemand MC, Chiozem DD, Toze FA, Mbaze LM, Naharkhan S. α-Glucosidase inhibitory constituents from stem bark of Terminaliasuperba (Combretaceae). Phytochem 2007;68: 2096-100.

53. Gao H, Huang YN, Gao B, Xu PY, Inagaki C, Kawabata J. α-Glucosidase inhibitory effect by the flower buds of Tussilagofarfara L. Food Chem 2008;106:1195-201.

54. Iwai K, Kim MY, Onodera A, Matsue H. α-Glucosidase Inhibitory and Antihyperglycemic Effects of Polyphenols in the Fruit of Viburnum dilatatumThunb. J Agric Food Chem 2006;54:4588-

55. Luo H, Imoto T, Hiji Y. Inhibitory effect of voglibose and gymnemic acid on maltose absorption in vivo. World J Gastroentero 2001;7:270-4.

56. Inouye S, Tsuruoka T, Ito T, Niida T. Structure and synthesis of nojirimycin. Tetrahedron 1968;23:2125-44.

57. Reese ET, Parrish FW. Nojirimycin and d-glucose-1, 5-lactone as inhibitors of carbohydrases. Carbohydr Res 1971;18:381-8

58. Asano N, Tomioka E, Kizu H, Matsui K. Sugars with nitrogen in the ring isolated from the leaves of Morusbombycis. Carbohydr Res 1994;253:235-45.

59. Maeda K, Kakabayashi S, Matsubara H. Complete amino acid sequence of an alpha-amylase inhibitor in wheat kernel (0.19-inhibitor). BiochimBiophysActa 1985;828:213-2

60. Tadera K, Minami Y, Takamastu K, Matsuoka T. Inhibition of α-Glucosidase and α-Amylase by Flavonoids. J NutrSciVitaminol 2006;52:149-53.

61. Anurakkun NJ, Bhandari MR, Kawabata J. α-Glucosidase inhibitors from Devil tree (Alstoniascholaris). Food Chem 2007;103:1319-23.

62. Gao H, Huang YN, Gao B, Li P, Inagaki C, Kawabata J. Inhibitory effect on α-glucosidase by AdhatodavasicaNees. Food Chem 2008;108:965-72.

63. Tabopda TK, Ngoupayo J, Liu J, Mitaine-Offer AC, Tanoli SA, Khan SN, et al. Bioactive aristolactams from Piper umbellatum. Phytochem 2008;69:1726-31.

64. Gao H, Huang YN, Gao B, Xu PY, Inagaki C, Kawabata J. α-Glucosidase inhibitory effect by the flower buds of Tussilagofarfara L. Food Chem 2008;106:1195-201.

65. Gao H, Huang YN, Xu PY, Kawabata J. Inhibitory effect on α-glucosidase by the fruits of Terminaliachebula Retz. Food Chem 2007;105:628-34.

66. Bhandari MR, Anurakkun NJ, Hong G, Kawabata J. α-Glucosidase and α-amylase inhibitory activities of Nepalese medicinal herb Pakhanbhed (Bergeniaciliata, Haw.). Food Chem 2008;106: 247-52.

67. Kurihara H, Mitani T, Kawabata J, Takahashi K. Inhibitory potencies of bromophenols from Rhodomelaceae algae against α-glucosidase activity. Fish Sci 1999;65:300-3.

68. Haslam E. Polyphenol-protein interactions. J ChemEcol 1974;139:285-8.

69. Rao RR, Tiwari AK, Reddy PP, Babu SK, Ali AZ, Madhusudana K, et al. New furanoflavanoids, intestinal a-glucosidase inhibitory and free-radical (DPPH) scavenging, activity from antihyperglycemic root extract of Derris indica (Lam.). Bioorg Med Chem 2009;17:5170-5.

70. Rao RV, Dasari KR, Rao MJ. Isolation, characterization and chemobiological quantification of α-glucosidase enzyme inhibitory and free radical scavenging constituents from Derris scandensBenth. J Chromatogr B 2007;855:166-72