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A Short Review on Phytoconstituents from the Genera *Albizzia* and *Erythrina*

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Abstract

The genus *Albizzia* and *Erythrina* are the leading sources of phytoconstituents. The aim of this review is to solicitude of the phytoconstituents from some medicinal plants. A total nine medicinal plants were studied and 121 chemical constituents along with structures have been reported here. *Erythrina burttii* consists of highest number of constituents.

Key words: Medicinal plant, Phytoconstituents, Flavonoids, Isoflavanones, Saponins, Sesquiterpenes, Flavan, Steroid, and Triterpenoids.

Introduction

Nature is a great source of medicinal plants and these plants are used as a traditional medicine for many years (Hussain *et al*., 2010). One hundred and ten species are present as trees and shrubs in the genus *Erythrina* (Hussain *et al*., 2016a, 2011). Among them, two species have been reviewed comprehensively in this review. *E. burttii* is a flowering and flat-topped tree (height: 3.5-18 m) growing in Ethiopia, Kenya, and Tanzania. *E. droogmansiana* is a single straight stem, soft wood and rounded crown tree (height: 20 m) extensively grown in Congo, Cameron and Gabon, and used in the treatment of fever, hemorrhoids, and wound infection in locally. The genus *Albizzia* consists of 150 species extensively distributed in Africa, Asia, and South America. *Albizzia* species were used as traditional medicine in the treatment of anthelmintic, cough, diarrhea, insomnia, irritability, injuries, poor memories, rheumatism, scabies, stomach trouble, and wounds in Africa and China (Hussain *et al*., 2016b). *A. anthelmintica* is a medium canopied tree (height: 8 m) with soft bark and unwrap spine. *A. lebbeck* (Leguminosae) is an exposed deciduous tree (height: 12-21 m) that grows in over Bangladesh (Hussain *et al*., 2008). *A. inundata* is a perennial tree and found in Argentina. *A. glaberrima* is a big tree having few flattened crown and used as a folk medicine in the treatment of anemia, blenorrhagia, bilharzias, epilepsy, and liver complications in Cameroon and Nigeria. *A. coriaria* is a medicinal plant found in Uganda and used in the treatment eye diseases, jaundice, skin disease, sore throats, and syphilis. *C. zeyheri* (Family: Combretaceae) is a Tanzanian medicinal plant and applied for the management of different health consequences such as cancer, cough diarrhea, hypertension, and snakebite.

Reported phytoconstituents

A total nine medicinal plants have been studied and one hundred and twenty one (**1-121**) compounds were reported in this review as phytoconstituents. The studied medicinal plants are *Erythrina burttii*, *E. droogmansiana*, *Albizzia submidiata*, *A. anthelmintica*, *A. inundata*, *Spergularia marginata*, *Manikara rufula*, *A. lebbeck*, *Ainsliaea yunnanenssi*, *A. glaberrima*, *Combretum zeyheri*, *A. boromoensis*, *A. grandibracteata*, and *A. coriaria*.

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Flavonoids

Erythrina genus is a pioneer source of flavonoids. There are twenty four phytoconstituents have been reported as flavonoids and pilocarpin from *Erythrina burttii* such as Burttinol A (**1**), Burttinol-A diacetate (**2**), Burttinol B (**3**), Burttinol-B acetate (**4**), Burttinol C (**5**), Burttinol-C diacetate (**6**), Eryvarin H (**7**), Eryvarin-H diaceate (**8**), Burttinol D (**9**), Burttinol-D diacetae (**10**), 4′-O-methylsigmoidin B (**11**), Abyssinone V (**12**), Abyssinone V methyl ether (**13**), Calopocarpin (**14**), Burttinne (**15**), Neurautenol (**16**), Bidwillon (**17**), Isobavachalcone (**18**), Erythrinasinate (**19**), 7-O-methylluteone (**20**), Burttinonedehydrate (**21**), 8-Prenylluteone (**22**), 3-O-methylcalopocarpin (**23**), and genistein (**24**) (Figure 1) (Yenesew *et al*., 2012, 1998, 2003).

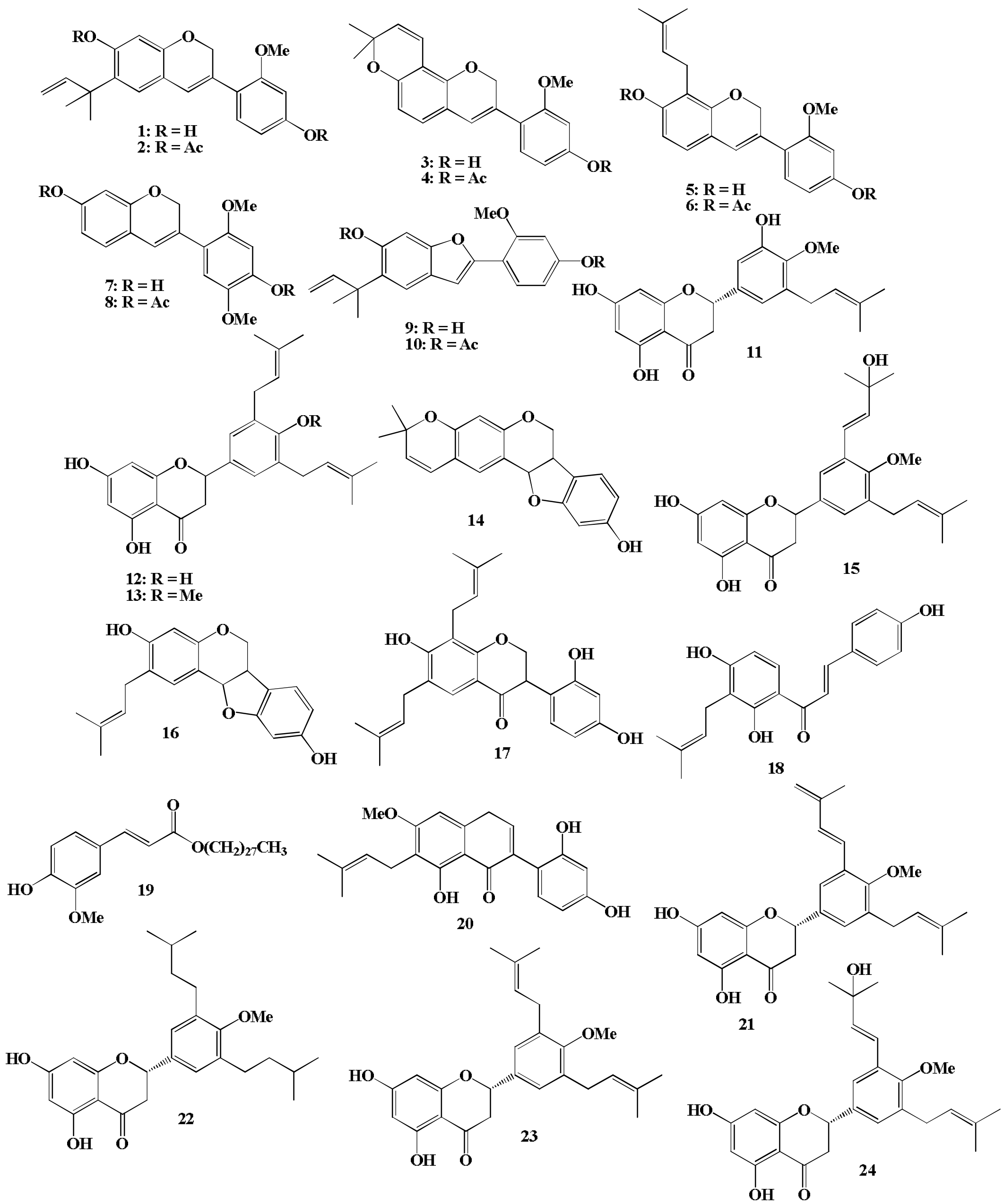


Figure 1**.** Flavonoids from *Erythrina burttii.*

Isoflavanones

The genus *Erythrina* (Family: Leguminosae) is a renown source of isoflavanones and alkaloids. Ten isoflavanones were reported from the root bark of *Erythrina droogmansiana* for example 7,4′-Dihydroxy-2′-methoxy-3′-(3-methylbut-2-enyl)-isoflavanone (**25**), Sophoraisoflavanone A (**26**), Erypoegin D (**27**), Trihydroxy-8-(3-methylbut-2-enyl)-[6″,6″-dimethyl-pyrano(2″,3″, 4′,5′)]-isoflavone (**28**), Isolupalbigenin (**29**), 5,7,2′,4′-Tertahydroxy-8,5′-di-(3-metylbut-2-enyl)-isoflavone (**30**), Erypostyrene (**31**), Phaseollidin (**32**), Cristacarpin (**33**), and Erystagallin A (**34**) (Figure 2) (Bedane *et al*., 2017).

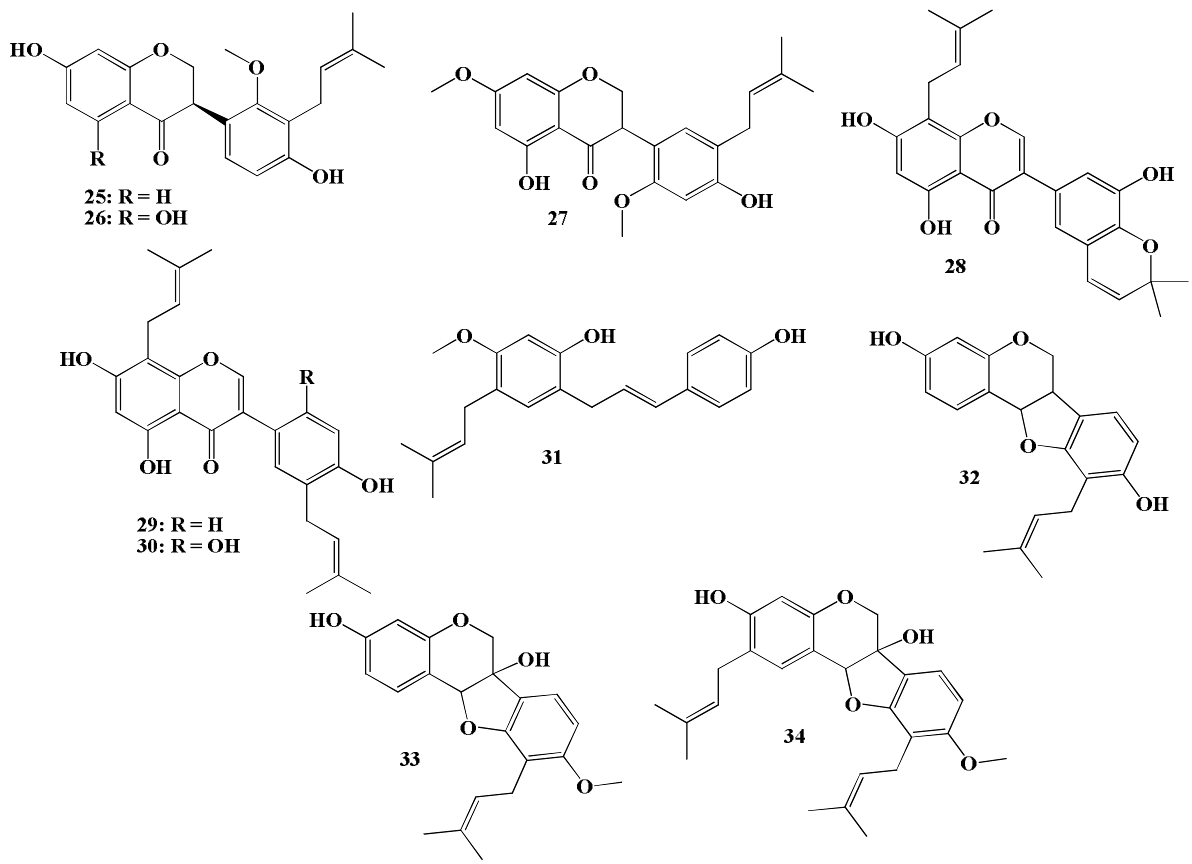
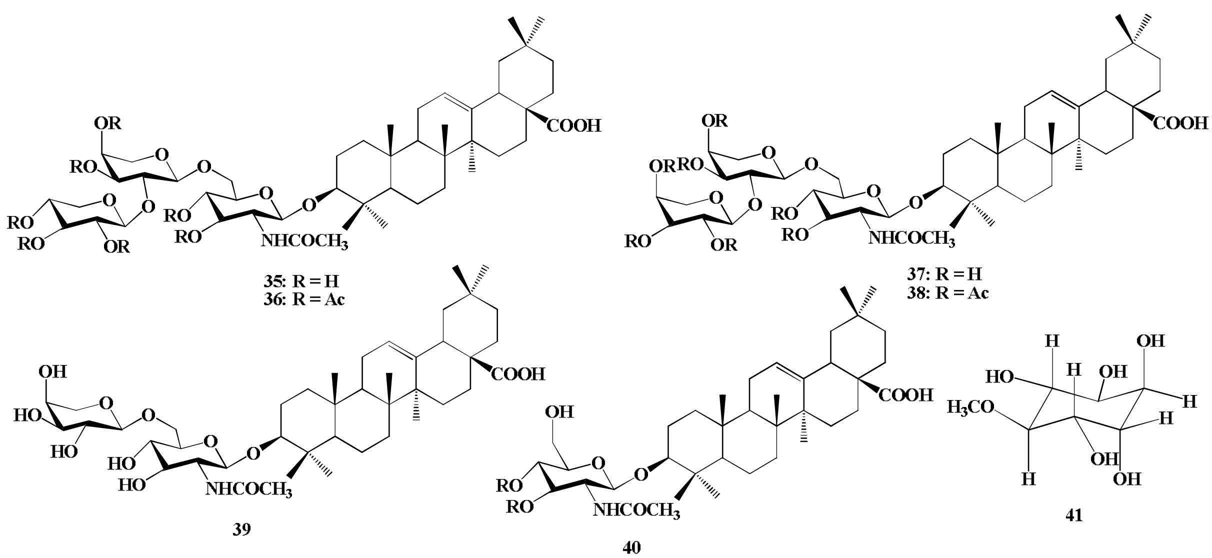


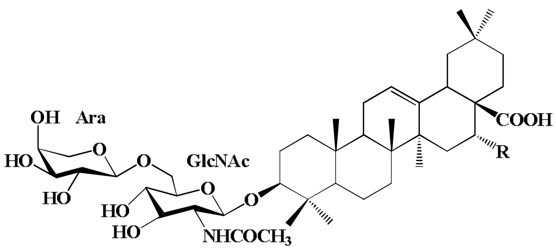
Figure 2. Isoflavanones from *Erythrina droogmansiana.*

Saponins

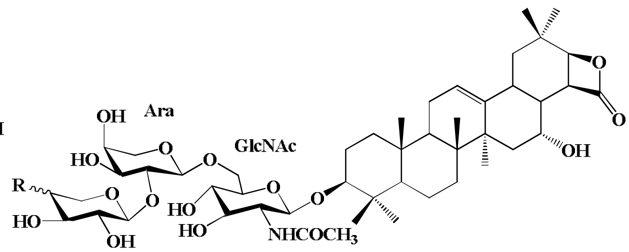
*Albizzia subdimidiata, A. anthelmintica, A. inundata, Spergularia marginata, and Manilkara rufula*are are the key source of saponins. The reported saponins from these plants are 3-O-D-Xylopyranosyl-(1→2)-L-arabinopyranosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyra-nosyl-oleanolic acid (**35**), 3-O-D-Xylopyra-nosyl-(1→2)-L-arabinopyra-nosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyra-nosyl oleanolic acid peracetate (**36**), 3-O-L-Arabinopyra-nosyl-(1→2)-L-arabinopyr-anosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyra-nosyloleanolic acid (**37**), 3-O-L-Arabinopyra-nosyl-(1→2)-L-arabinopyra-nosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyra-nosyl-oleanolic acid peracetate (**38**), 3-O-L-Arabinopyra-nosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyra-nosyl-oleanolic acid (**39**), 3-O-2-Acetamido-2-deoxy-D-glucopyra-nosyl-oleanolic acid (**40**), O-Methyl-cyclitol (**41**), 3-O-[α-L-Arabinopyra-nosyl-(1→6)]-2-acetamido-2-deoxy-β-

D-glucopyra-nosyl-oleanolic acid (**42**), 3-O-[α-L-Arabinopyra-nosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyra-nosyl-echinocystic acid (**43**), 3-O-[α-L-Arabinopyra-nosyl-(1→2)-α-L-arabinopyra-nosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyra-nosyl-acacic acid lactone (**44**), 3-O-[β-D-xylopyranosyl-(1→2)-α-L-arabinopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyranosyl-acacic acid lactone (**45**), 3-O-[α-L-arabinopyranosyl-(1→2)-α-L-arabinopyra-nosyl-(1→6)]-β-D-glucopyra-nosyl-oleanolic acid (**46**), 3-O-[β-D-xylopyra-nosyl-(1→2)-α-L-arabinopyra-nosyl-(1→6)]-β-D-glucopyra-nosyl-oleanolic acid (**47**), 3-O-[β-D-glucopyra-nosyl-(1→2)]-β-D-glucopyra-nosyl-oleanolic acid (**48**), 3-O-[α-L-arabinopyra-nosyl-(1→2)-α-L-arabinopyra-nosyl-(1→6)-[β-D-glucopyra-nosyl-(1→2)]-β-D-glucopyra-noside-echinocystic acid (**49**), 3-O-[β-D-xylopyra-nosyl-(1→2)-α-L-arabinopyra-nosyl-(1→6)-[β-D-glucopyra-nosyl-(1→2)]-β-Dglucopyra-noside-echinocystic acid (**50**), 3-O-[β-D-glucopyra-nosyl-(1→3)]-[α-L-arabinopyra-nosyl-(1→2)-[α-L-arabinopyra-nosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyra-nosyl-echinocystic acid (**51**) 3-O-[α-L-arabinopyra-nosyl-(1→2)]-[α-L-arabinopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyra-nosyl-echinocystic acid (**52**), 3-O-[α-L-Arabinopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyra-nosyl-echinocystic acid (**53**), 3-O-β-D-glucuronopyra-nosyl-echinocystic acid 28-O-α-L-arabinopyra-nosyl-(1→2)-α-L-rhamnopyra-nosyl-(1→3)-β-D-xylopyra-nosyl-(1→4)-α-L-rhamnopyranosyl-(1→2)-α-L-arabinopyra-nosyl ester (**54**), 3-O-β-D-glucopyra-nosyl-(1→3)-β-D-glucuronopyra-nosyl echinocystic acid 28-O-α-L-arabinopyra-nosyl-(1→2)-α-L-rhamnopyra-nosyl-(1→3)-β-D-xylopyra-nosyl-(1→4)-α-L-rhamnopyra-nosyl-(1→2)-α-L-arabinopyra-nosyl ester (**55**), 3-O-β-D-glucopyra-nosyl-(1→4)-3-O-sulfate-β-D-glucuronopyra-nosyl echinocystic acid 28-O-α-L-arabinopyra-nosyl-(1→2)-α-L-rhamnopyra-nosyl-(1→3)-β-D-xylopyra-nosyl-(1→4)-α-L-rhamnopyra-nosyl-(1→2)-α-Larabinopyra-nosyl ester (**56**), 3-O-β-D-glucopyra-nosyl-(1→4)-β-D-glucuronopyra-nosyl-21-O-acetyl acacic acid (**57**), and Mi-saponin C (**58**) (Figure 3) (Kader *et al*., 2001; Runyoro *et al*., 2015; Zhang *et al*., 2011; Carpani *et al*., 1989; Pertuit *et al*., 2017; Vieira *et al*., 2017).

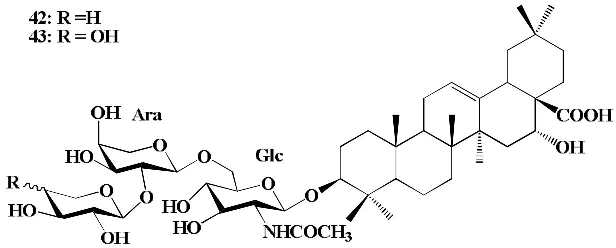




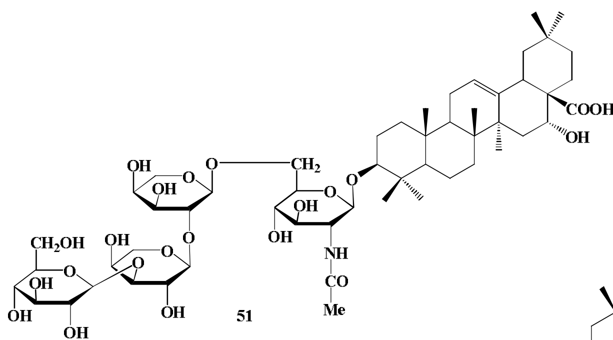
42: R =H
43: R = OH



44: R = beta-OH
45: R = alpha-OH



46: R = alpha-OH
47: R = beta-OH



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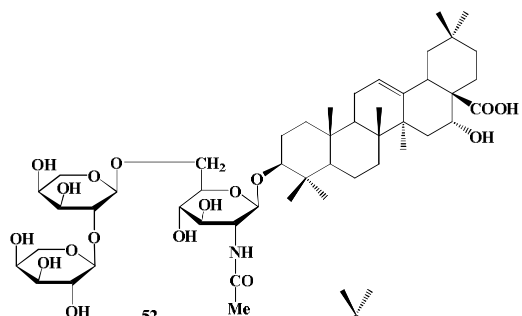

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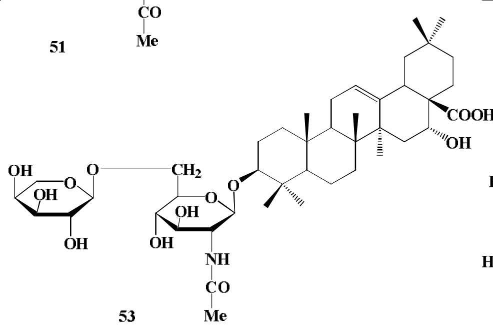

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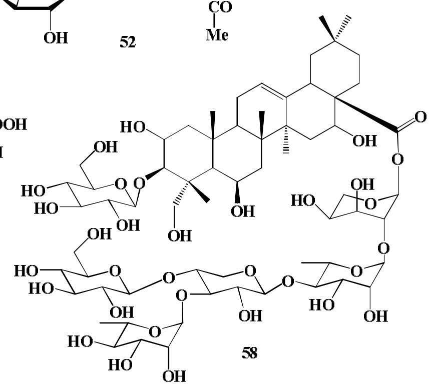

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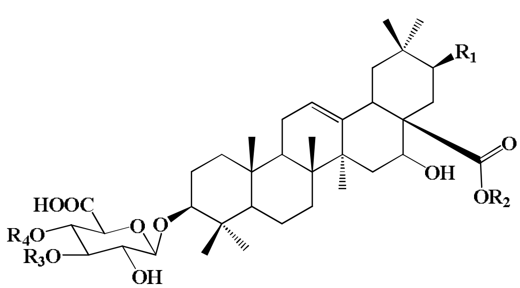
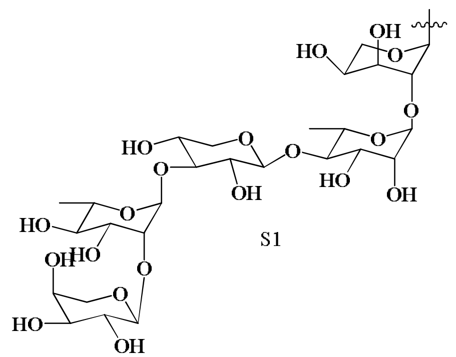
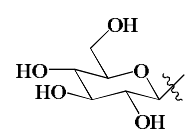


54: R_1 = H, R_2 = S1, R_3 = H, R_4 = H
55: R_1 = H, R_2 = S1, R_3 = Glc, R_4 = H
56: R_1 = H, R_2 = S1, R_3 = SO_3H, R_4 = Glc
57: R_1 = OAc, R_2 = H, R_3 = H, R_4 = Glc



S1



Glc

Figure 3. Reported saponins from medicinal plants.

Sesquiterpenes

Aromatic medicinal plant *Albizzai lebbeck* and *Ainsliaea yunnanenssi* are the principle source of sesquiterpenes. The elucidated sesquiterpenes from these plant are Benzyl-1-O-β-D-glucopyranosidem (**59**), Benzyl-6-O-α-L-arabinopyra-nosyl-β-D-glucopyranoside (**60**), Linalyl-β-D-glucopyranoside (**61**), Linalyl-6-O-α-L-arabinopyranosyl-β-D-glucopyra-noside (**62**), (2E)-3,7-Dimethylocta-2,6-dienoate-6-O-α-L-arabinopyranosyl-β-D-glucopyra-noside (**63**), Glycoside1-O-[6-O-α-L-arabinopyra-nosyl-β-D-glucopyranoside]-(2E, 6E-)-farnesol (**64**), *n*-Hexyl-*α*-L-arabinopyranosyl-(1→6)-*β*-D-gluco-pyranoside (**65**), *n*-Octyl-*α*-L-arabinopyranosyl-(1→6)-*β*-D-glucopyranoside (**66**), 2,3-Dihydroxy-2,3-dihydrosqualene (**67**), Ethyl fructofuranoside (**68**), Yunnanolides A (**69**), Yunnanolides B (**70**), Yunnanolides C (**71**), Yunnanolides D (**72**), Yunnanolides E (**73**), Yunnanolides F (**74**), Yunnanolide G (**75**), Yunnanolides H (**76**), Yunnanolides I (**77**), Pertyolide C (**78**), Diaspanolide A (**79**), Diaspanolide B (**80**), 1a-Hydroxy-3-O-isovalerate zaluzanin C (**81**), Tetrahydro-dehydrozaluzanin C (**82**), Dihydrozaluzanin C (**83**), Zaluzanin C (**84**), Isoamberboin (**85**), 11b,13-Dihydro-3-epizaluznin C (**86**), and 4b,15,11b,13-Tetrahydrozaluzanin C (**87**) (Figure 4 and 5) (Massarani *et al*., 2016; Fang *et al*. 2017).

Flavan and Steroids

A bunch of flavan and steroids were isolated from the *Albizzia glaberrima* such as (+)-(2R,3S,4R)-3′,4′,7-trihydroxy-4-methoxy-2,3-trans-flavan-3,4-trans-diol (**88**), (+)-Mollisacacidin (**89**), (+)-Fustin (**90**), Butin (**91**), Chondrillasterol (**92**), and Chondrillasterone (**93**) (Figure 6) (Fotso *et al*., 2017).

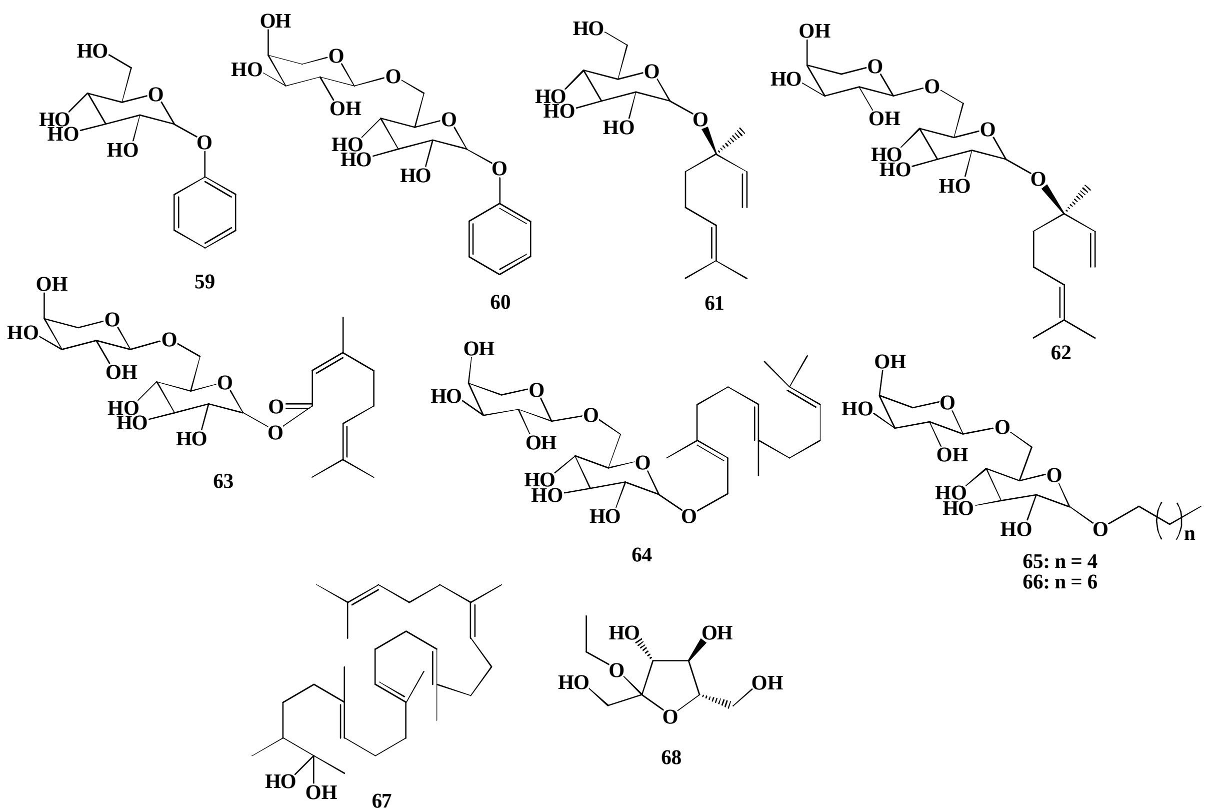


Figure 4. Sesquiterpenes from *A. lebbeck.*

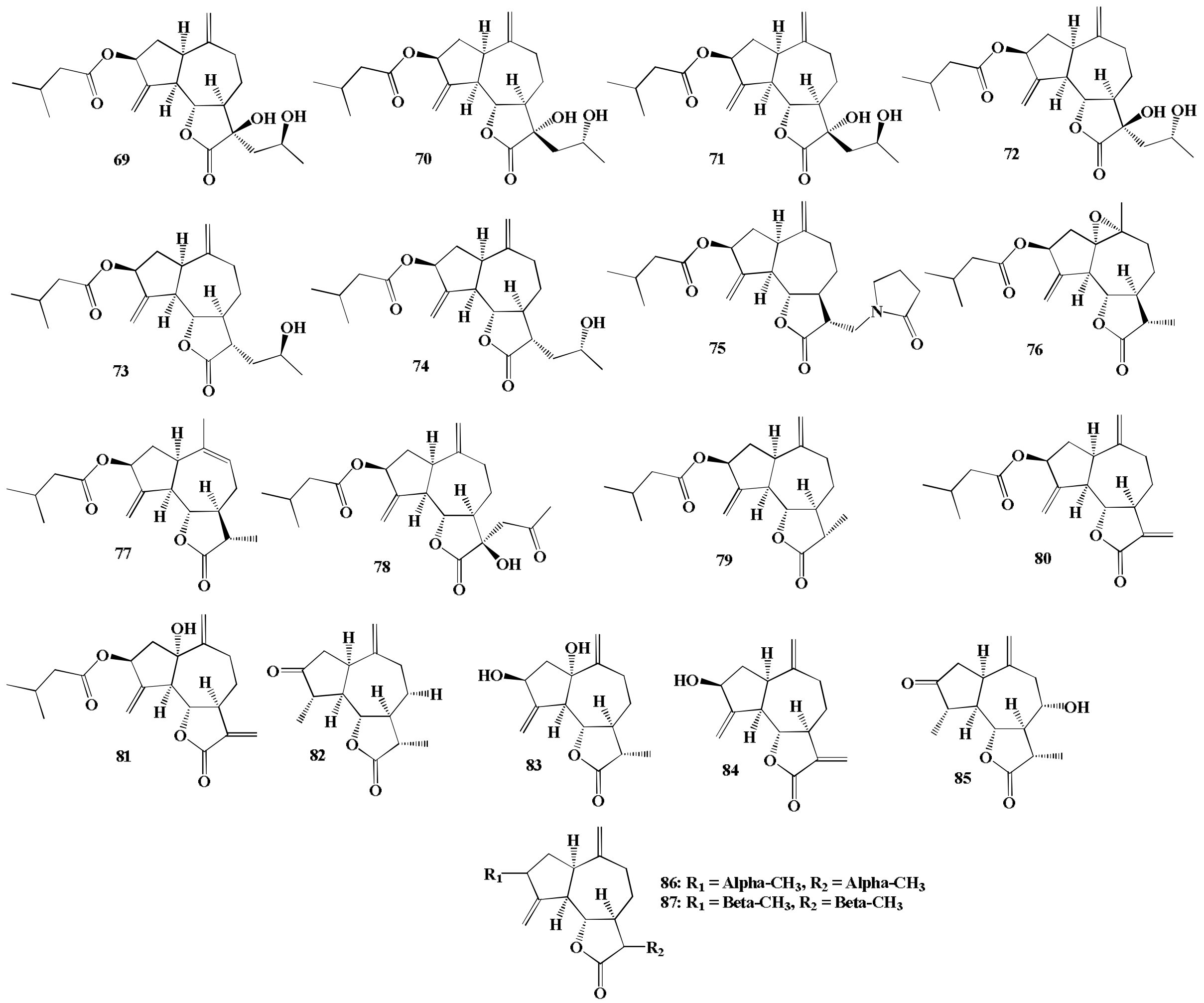


Figure 5.Isolated sesquiterpenes

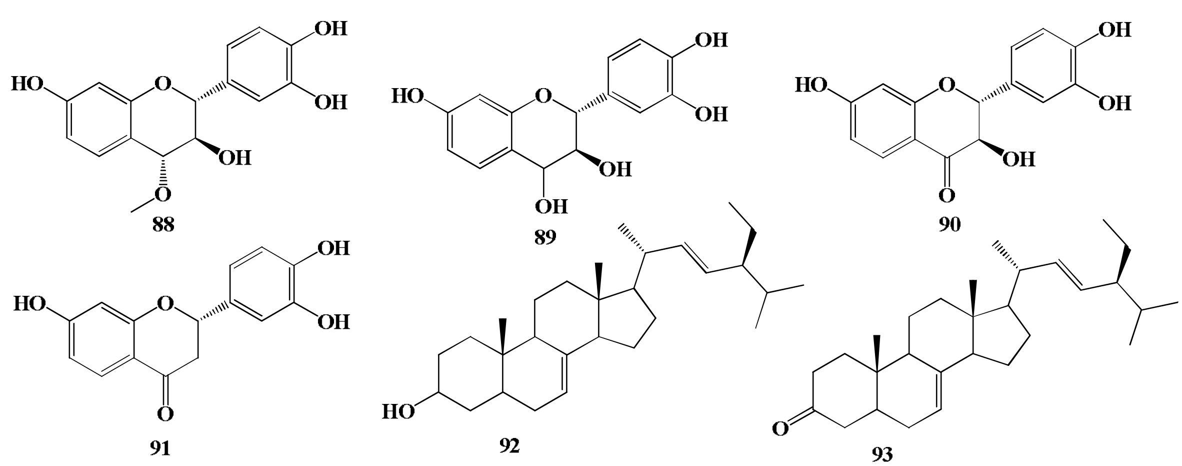
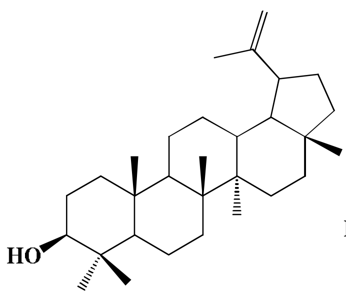


Figure 6. Flavan and steroids from *Albizzia glaberrima.*

Triterpenoids

A lots of triterpenoids have been derived from *Combretum zeyheri, A. glaberrima, A. boromoensis, and A. grandibracteata* for example Lupeol (**94**), Ursolic acid (**95**), Oleanolic acid (**96**), Maslinic acid (**97**), 2α,3β-Dihydroxy-urs-12-en-28-oic acid (**98**), 6β-Hydroxymaslinic acid (**99**), Terminolic acid (**100**), Methylsumaresinolate (**101**), Arjunolic acid (**102**), Asiatic cid (**103**), Glaberrimoside A (**104**), Glaberrimoside B (**105**), Glaberrimoside C (**106**), Boromoenoside A (**107**), Boromoenoside B (**108**), Boromoenoside C (**109**), Boromoenoside D (**110**), Gummiferaosides D (**111**), Gummiferaosides E (**112**), Julibroside J_8 (**113**), Grandibracteoside A (**114**), Grandibracteoside B (**115**), and Grandibracteoside C (**116**) (Figure 7) (Runyoro *et al*., 2013; Note *et al*., 2016, 2015; Simo *et al*., 2017; Krief *et al*., 2005).



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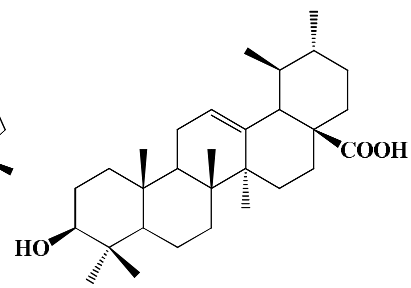

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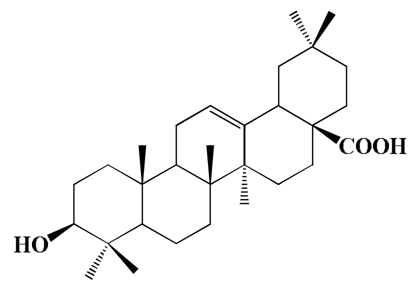

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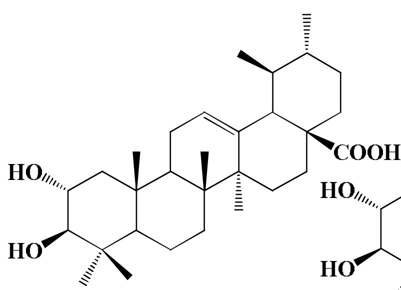

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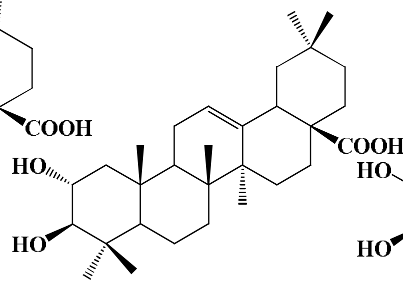

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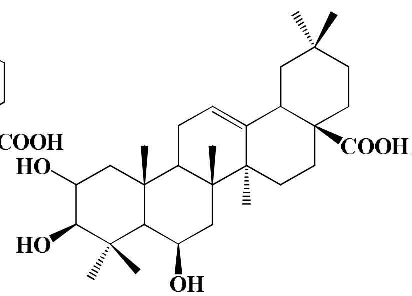

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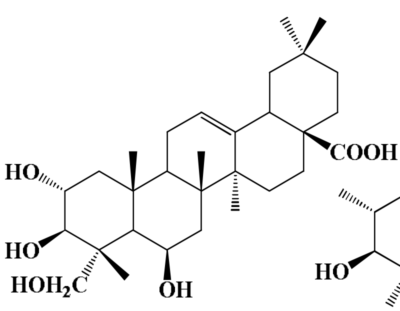

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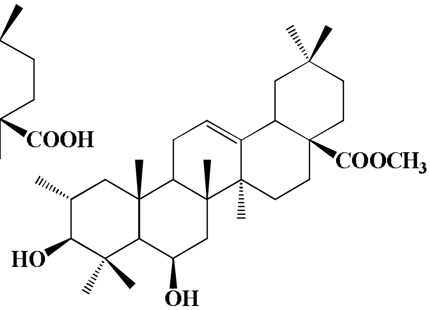

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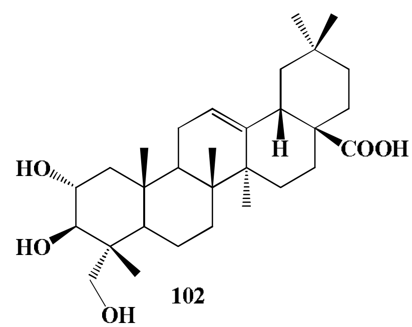

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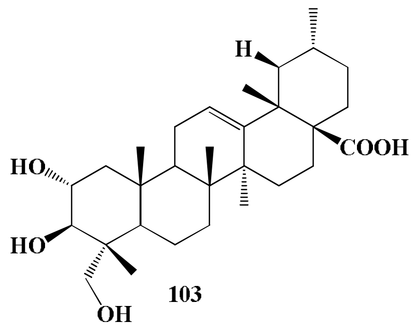

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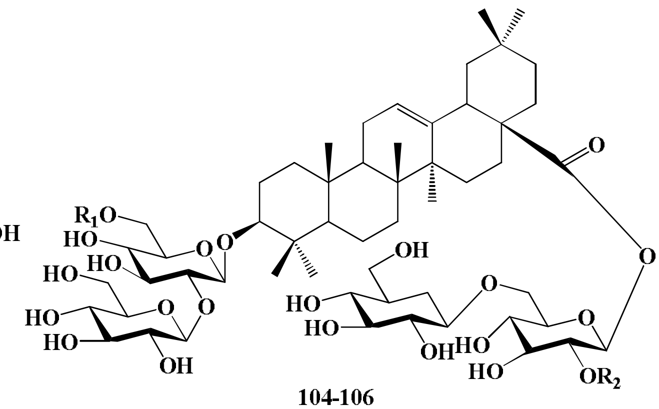

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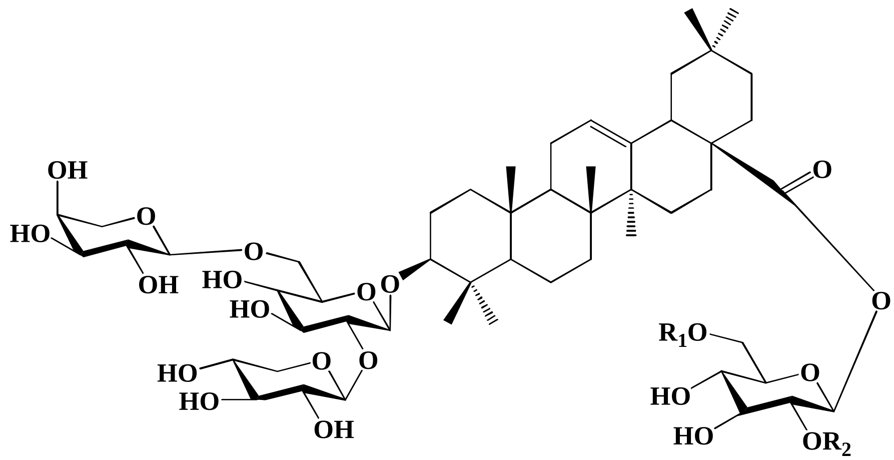
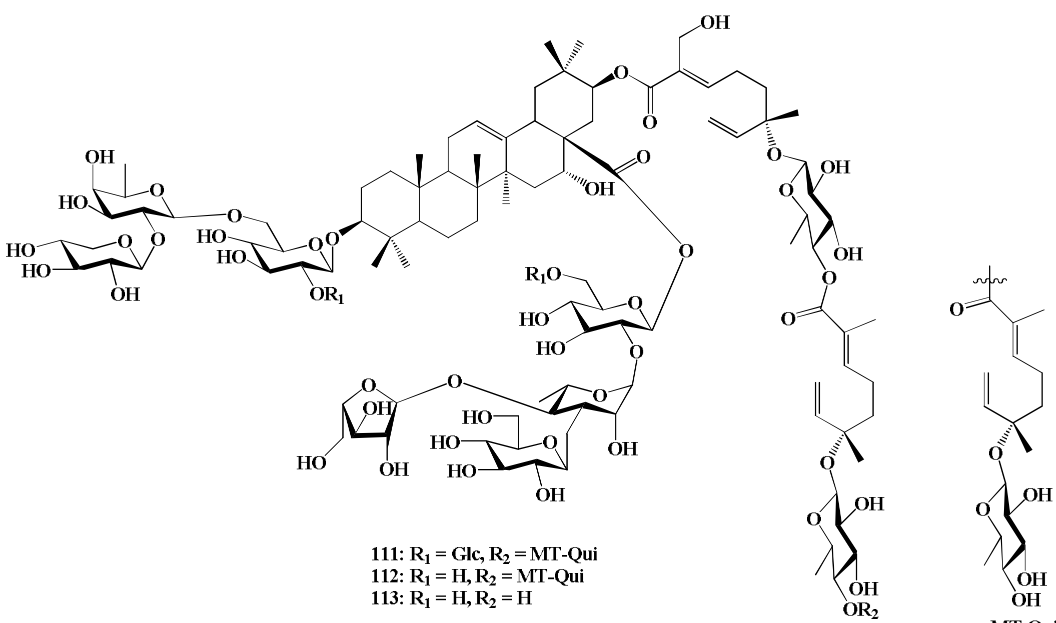
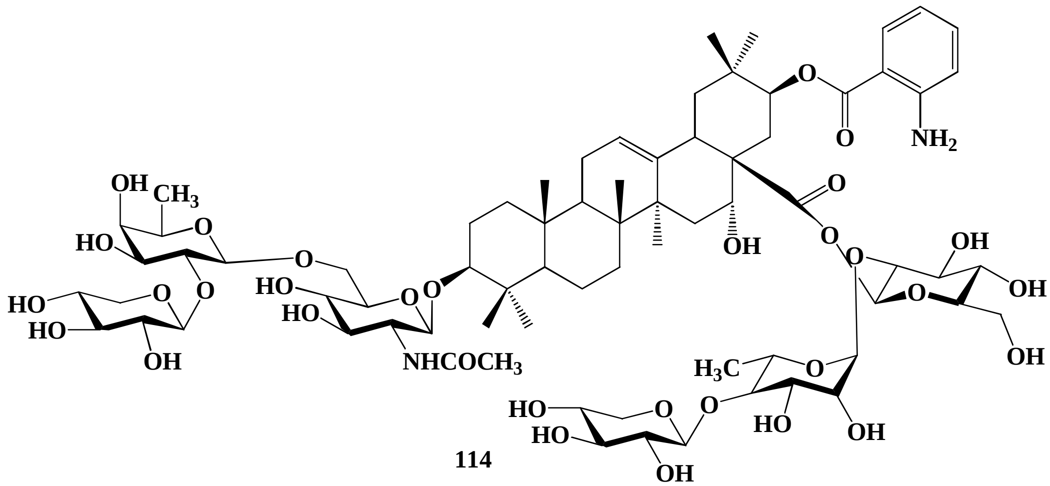


107: R_1 = Glc, R_2 = Glc
108: R_1 = H, R_2 = Glc (1→ 6) Glc
109: R_1 = H, R_2 = H
110: R_1 = Glc, R_2 = H



111: R_1 = Glc, R_2 = MT-Qui
112: R_1 = H, R_2 = MT-Qui
113: R_1 = H, R_2 = H

MT-Qui



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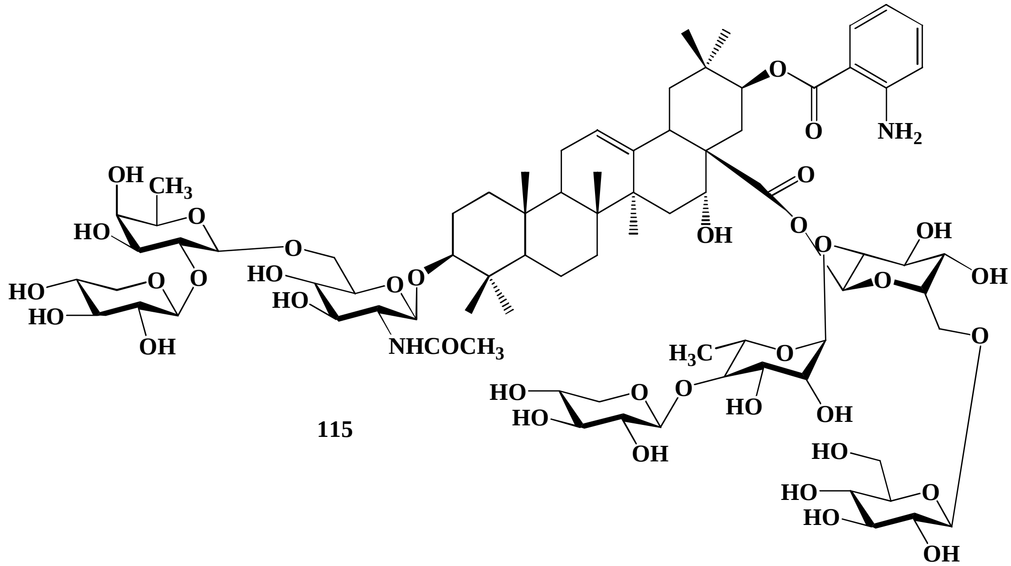

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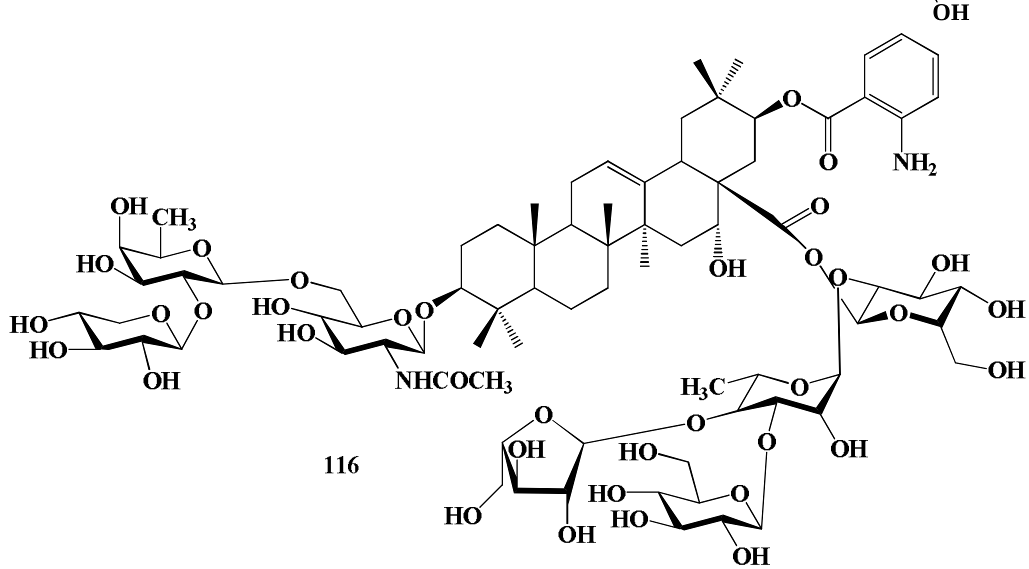

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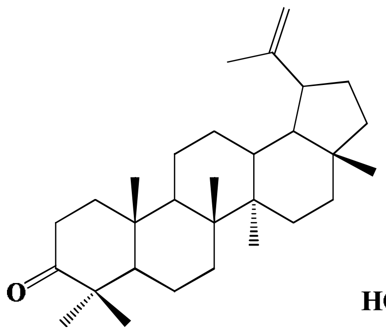
Figure 7. Reported triterpenoids.

Miscellaneous

A total six molecules for examples Lupeol (**94**), Lupenone (**117**), Betulinic acid (**118**), Acacic acid lactone (**119**), (+)-Catechin (**120**), and Benzyl alcohol (**121**) were isolated with chemical structures from *Albizzia coriaria* (Figure 8) (Byamukama *et al*., 2015).

Biological properties

The reported phytoconstituents showed lots of biological properties that are given in table 1.



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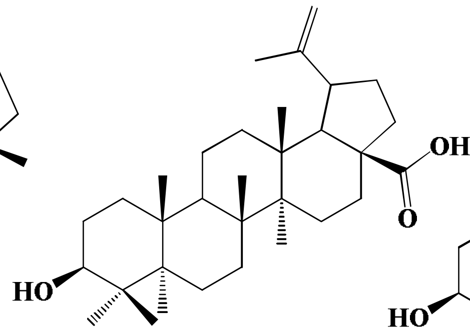

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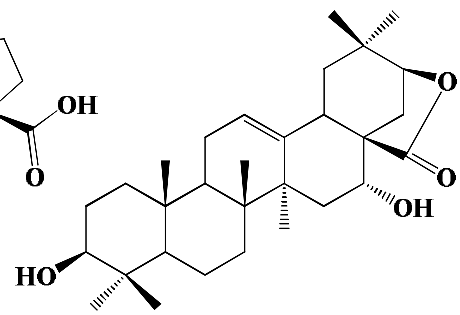

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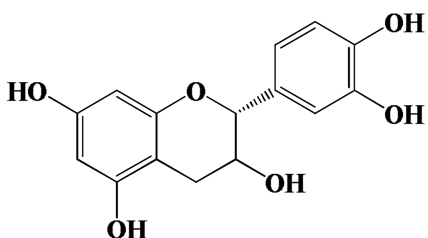

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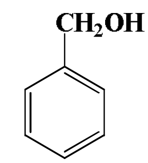

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Figure 8. Miscellaneous compounds from *Albizzia coriaria.*

Table 1. Biological properties of the reported phytoconstituents.

Molecules	Biological properties	Ref.
1-24	Antiplasmodial and DPPH free radical scavenging	Yenesew *et al*., 2012, 1998, 2003
25-34	DPPH free radical scavenging	Bedane *et al*., 2017
34-57	Cytotoxic	Kader *et al*., 2001; Runyoro *et al*., 2015; Zhang *et al*., 2011; Carpani *et al*., 1989; Pertuit *et al*., 2017
58	Anti-trichomonal	Vieira *et al*., 2017
69-87	Inhibitory effect against nitric oxide	Fang *et al*. 2017
88-93	Cytotoxic	Fotso *et al*., 2017
94-106	Anticandida and cytotoxic	Runyoro *et al*., 2013; Note *et al*., 2016
107-110	Inhibitory effect	Note *et al*., 2015
111-113	Pro-apoptotic activity (Cytotoxic)	Simo *et al*., 2017
114-116	Inhibitory activity	Krief *et al*., 2005
117-121	Antimicrobial	Byamukama *et al*., 2015

Conclusion

The molecules from nine medicinal plants have been reviewed. Structurally distinctive different compounds were obtained from these plants. Our study showed that medicinal plants can be a principle source of phytoconstituents as well as medicinal moieties.

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