A Short Review on Phytoconstituents from Genus *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 solicititude of the phytoconstituents from some medicinal plants of these genus. 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, 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 studied 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, Cameroon 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 of 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 submediata*, *A. anthelmintica*, *A. inundata*, *Spergularia marginata*, *Manikara rufula*, *A. lebbeck*, *Ainsliaea yunnanensis*, *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 diacetate (8), Burttinol D (9), Burttinol-D diacetae (10), 4-α-O-methylsigmoidin B (11), Abyssinone V (12), Abyssinone V methyl ether (13), Calopocarpin (14), Burttinne (15), Neurautenol (16), Bidwillon (17), Isobavachalcone (18), Erytrinasinate (19), 7-O-methyluteone (20), Burttinonedehydrate (21), 8-Prenylluteone (22), 3-O-methylcalopocarpin (23), and genistein (24) (Figure 1) (Yenesew et al., 2012, 1998, 2003).

![Flavonoids from Erythrina burttii.](image-url)
Isoflavanones

The genus *Erythrina* (Family: Leguminosae) is a renowned source of isoflavonones and alkaloids. Ten isoflavonones 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), Erypeogen D (27), Trihydroxy-8-(3-methylbut-2-enyl)-[6",6"-dimethylpyrano (2",3":4",5")]isoflavone (28), Isolupalbigenin (29), 5,7,2',4'-Tertahydroxy-8,5'-di-(3-methylbut-2-enyl)isoflavone (30), Erypostyrene (31), Phaseollidin (32), Cristacarpin (33), and Erystagallin A (34) (Figure 2) (Bedaneet al., 2017).

![Figure 2. Isoflavanones from *Erythrina droogmansiana*.](image)

Saponins

*Albizia subdimidiata*, *A. anthelmintica*, *A. inundata*, *Spergularia marginata*, and *Manilkara rufula* are the key source of saponins. The reported saponins from these plants are 3-O-D-Xylopyranosyl-(1→2)-L-arab-inopyranosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyranosyl-oleanolic acid (35), 3-O-D-Xylopyranosyl-(1→2)-L-arabinopyranosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyranosyl-oleanolic acid peracetate (36), 3-O-L-Arab-inopyranosyl-(1→2)-L-arabinopyranosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyranosyl-oleanolic acid (37), 3-O-L-Arab-inopyranosyl-(1→2)-L-arabinopyranosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyranosyl-oleanolic acid peracetate (38), 3-O-L-Arab-inopyranosyl-(1→6)-2-acetamido-2-deoxy-D-glucopyranosyl-oleanolic acid (39), 3-O-2-Acetamido-2-deoxy-D-glucopyranosyl-oleanolic acid (40), O-Methyl-cyclitol (41), 3-O-[α-L-Arab-inopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-
D-glucopyranosyl-oleanolic acid (42), 3-O-[α-L-Arabinopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyranosyl-echinocystic acid (43), 3-O-[α-L-Arabinopyranosyl-(1→2)-α-L-Arabinopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyranosyl-oleanolic acid (44), 3-O-[β-D-xylpyranosyl-(1→2)-α-L-Arabinopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyranosyl-acetic acid lactone (45), 3-O-[α-L-Arabinopyranosyl-(1→2)-α-L-Arabinopyranosyl-(1→6)]-β-D-glucopyranosyl-oleanolic acid (46), 3-O-[β-D-xylpyranosyl-(1→2)-α-L-Arabinopyranosyl-(1→6)]-β-D-glucopyranosyl-oleanolic acid (47), 3-O-[β-D-glucopyranosyl-(1→2)]-β-D-glucopyranosyl-oleanolic acid (48), 3-O-[α-L-Arabinopyranosyl-(1→2)-α-L-Arabinopyranosyl-(1→6)]-β-D-glucopyranoside-echinocystic acid (49), 3-O-[β-D-xylpyranosyl-(1→2)-α-L-Arabinopyranosyl-(1→6)]-β-D-glucopyranosyl-oleanolic acid (50), 3-O-[β-D-glucopyranosyl-(1→3)]-[α-L-Arabinopyranosyl-(1→2)-α-L-Arabinopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyranosyl-echinocystic acid (51) 3-O-[α-L-Arabinopyranosyl-(1→2)]-[α-L-arabinopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyranosyl-echinocystic acid (52), 3-O-[α-L-Arabinopyranosyl-(1→6)]-2-acetamido-2-deoxy-β-D-glucopyranosyl-echinocystic acid (53), 3-O-β-D-glucuronopyranosyl-echinocystic acid 28-O-α-L-arabinopyranosyl-(1→2)-α-L-rhamnopyranosyl-(1→3)-β-D-xylpyranosyl-(1→4)-α-L-rhamnopyranosyl-(1→2)-α-L-arabinopyranosyl ester (54), 3-O-β-D-glucopyranosyl-(1→3)-β-D-glucuronopyranosyl echinocystic acid 28-O-α-L-arabinopyranosyl-(1→2)-α-L-rhamnopyranosyl-(1→3)-β-D-xylpyranosyl-(1→4)-α-L-rhamnopyranosyl-(1→2)-α-L-arabinopyranosyl ester (55), 3-O-β-D-glucopyranosyl-(1→4)-3-O-sulfate-β-D-glucuronopyranosyl echinocystic acid 28-O-α-L-arabinopyranosyl-(1→2)-α-L-rhamnopyranosyl-(1→3)-β-D-xylpyranosyl-(1→4)-α-L-rhamnopyranosyl-(1→2)-α-L-arabinopyranosyl ester (56), 3-O-β-D-glucopyranosyl-(1→4)-β-D-glucuronopyranosyl-21-O-acetyl acetic acid (57), and Mi-saponin C (58) (Figure 3) (Kader et al., 2001; Runyoro et al., 2015; Zhanget al., 2011; Carpaniet al., 1989; Pertuinet al., 2017; Vieira et al., 2017).
Figure 3. Saponins from medicinal plants.
Sesquiterpenes

Aromatic medicinal plant *Albizia lebbeck* and *Ainsliaea yunnanensis* 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-arabinopyranosyl-β-D-glucopyranoside (60), Linalyl-β-D-glucopyranoside (61), Linalyl-6-O-α-L-arabinopyranosyl-β-D-glucopyranoside (62), (2E)-3,7-Dimethylocta-2,6-dienoate-6-O-α-L-arabinopyranosyl-β-D-glucopyranoside (63), Glycoside1-O-[6-O-α-L-arabinopyranosyl-β-D-glucopyranoside]-(2E, 6E)-farnesol (64), n-Hexyl-α-L-arabinopyranosyl-(1→6)-β-D-glucopyranoside (65), n-Octyl-α-L-arabinopyranosyl-(1→6)-β-D-glucopyranoside (66), 2,3-Dihydroxy-2,3-dihydroxylicrene (67), Ethyl fructofuranoside (68), Yunnanolides A (69), Yunnanolides B (70), Yunnanolides C (71), Yunnanolides D (72), Yunnanolides E (73), Yunnanolides F (74), Yunnanolides G (75), Yunnanolides H (76), Yunnanolides I (77), Pertyiolide C (78), Diaspanolide A (79), Diaspanolide B (80), 1a-Hydroxy-3-O-isovalerate zaluzanin C (81), Tetrahydrodehydrozaluzanin C (82), Dihydrozaluzanin C (83), Zaluzanin C (84), Isozaluzanin (85), 11b,13-Dihydro-3-epizaluznin C (86), and 4b,15,11b,13-Tetrahydrozaluzanin C (87) (Figures 4 and 5) (Massarani et al., 2016; Fang et al. 2017).

Flavan and Steroids

A bunch of flavan and steroids isolated from the *Albizia 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), Chondrillasterone (92), and Chondrillasterone (93) (Fotso et al. 2017).

Figure 4. Sesquiterpenes from *A. lebbeck*. 
Figure 5. Isolated sesquiterpenes from *Ainsliaea yunnanensis*.

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 J₈ (113), Grandibracteoside A (114), Grandibracteoside B (115) and Grandibracteoside C (116) (Runyoro et al., 2013; Note et al., 2016, 2015; Simo et al., 2017; Krief et al., 2005).
107: \( R_1 = \text{Glc}, R_2 = \text{Glc} \)
108: \( R_1 = \text{H}, R_2 = \text{Glc} \ (1\rightarrow 6) \text{Glc} \)
109: \( R_1 = \text{H}, R_2 = \text{H} \)
110: \( R_1 = \text{Glc}, R_2 = \text{H} \)

111: \( R_1 = \text{Glc}, R_2 = \text{MT-Qui} \)
113: \( R_1 = \text{H}, R_2 = \text{MT-Qui} \)
114: \( R_1 = \text{H}, R_2 = \text{H} \)
Figure 7. Triterpenoids from different plants.
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 *Albizia coriaria* (Figure 7) (Byamukama *et al*., 2015).

Biological properties

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

![Figure 7. Miscellaneous compounds from *A. coriaria*.](image)

**Table 1. Biological properties of the reported phytoconstituents.**

<table>
<thead>
<tr>
<th>Molecules</th>
<th>Biological properties</th>
<th>Ref.</th>
</tr>
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<tbody>
<tr>
<td>25-34</td>
<td>DPPH free radical scavenging</td>
<td>Bedane <em>et al</em>., 2017</td>
</tr>
<tr>
<td>34-57</td>
<td>Cytotoxic</td>
<td>Kader <em>et al</em>., 2001; Runyoro <em>et al</em>., 2015; Zhang <em>et al</em>., 2011; Carpani <em>et al</em>., 1989; Pertuit <em>et al</em>., 2017</td>
</tr>
<tr>
<td>58</td>
<td>Anti-trichomonal</td>
<td>Vieira <em>et al</em>., 2017</td>
</tr>
<tr>
<td>69-87</td>
<td>Inhibitory effect against nitric oxide</td>
<td>Fang <em>et al</em>., 2017</td>
</tr>
<tr>
<td>88-93</td>
<td>Cytotoxic</td>
<td>Fotso <em>et al</em>., 2017</td>
</tr>
<tr>
<td>94-106</td>
<td>Anticandida and cytotoxic</td>
<td>Runyoro <em>et al</em>., 2013; Note <em>et al</em>., 2016</td>
</tr>
<tr>
<td>107-110</td>
<td>Inhibitory effect</td>
<td>Note <em>et al</em>., 2015</td>
</tr>
<tr>
<td>111-113</td>
<td>Pro-apoptotic activity (Cytotoxic)</td>
<td>Simo <em>et al</em>., 2017</td>
</tr>
<tr>
<td>114-116</td>
<td>Inhibitory activity</td>
<td>Krief <em>et al</em>., 2005</td>
</tr>
<tr>
<td>117-121</td>
<td>Antimicrobial</td>
<td>Byamukama <em>et al</em>., 2015</td>
</tr>
</tbody>
</table>
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.

References


