

A Short Review on the Bioactive Constituents from Six *Terminalia* Species

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Abstract

Terminalia as a genus has received a great attraction to evaluate and examine the pharmacological potential having their medicinal properties. Different species under *Terminalia* genus have been used as herbal medicine with various formulations in the treatment of abdominal pain, cancer, cough, conjunctivitis, diarrhea, heart problem, leproscopy, urinary tract infection, and sexual related diseases. These properties have been reported to express abundant biological characteristics for example antioxidant, antiparasitic, antibacterial, antifungal, antiviral, and anti-inflammatory. This review has constructed to sollicitude the phytochemicals from the genus *Terminalia*. A total six species belongs to this genus such as *Terminalia chebula*, *T. citrina*, *T. phanerophlebia*, *T. belerica*, *T. catappa*, and *T. arjuna* have been studied and fifty-six phytochemicals with their chemical structures have been reported in this review. *Terminalia chebula* consists of a higher number of phytochemicals as compared to the other species.

Key words: *Terminalia*, Phytochemicals, Tannins, Glucosides, Pyranosides, Triterpenoids, Phenolic compounds.

Introduction

Nature is a significant resource for medicinal plants. The medicinal plants along with elucidated chemical compounds having pharmacological activities are using as traditional medicinal agents in the prevention and management of different diseases for many years (Hussain 2020, 2019a, 2019b, 2018). These medicinal plants having varied curative properties like anti-microbial, anticancer, anti-inflammatory, anti-plasmodial, and anti-oxidant potentials (Hussain *et al.*, 2016, 2011, 2010; Billah *et al.*, 2013; Ismail *et al.*, 2010). *Terminalia* is a second prevalent genus under the family of Combretaceae having 200 species and is distributed in tropical countries especially in Southeast Asia (Fahmy *et al.*, 2015). *T. chebula* is a medium tree, which can go up to 30.0 m in height, with a trunk having diameter up to 1.0 m. This plant also has traditional use as

medicine to treat liver and kidney dysfunction. Dried fruit is also used in Ayurveda as cardiotoxic, antitussive, diuretic, homeostatic, laxative, and diuretic (Tawaril *et al.*, 2017).

Reported bio-active constituents

A total six medicinal plants from *Terminalia* genus for example *Terminalia chebula*, *T. citrina*, *T. phanerophlebia*, *T. belerica*, *T. catappa*, and *T. arjuna*, were reviewed and fifty six (1-56; Figures 1-6) phytoconstituents have been reported along with their chemical structures in this article.

Tannins: Several tannins having hepatitis C inhibitory potentials were isolated from *Terminalia chebula*, which are chebumeinin A (1) and B (2), chebolic acid (3), casuarinin (4), pentagalloyl glucose (5), 5-O-galloylshikimic acid (6), ethyl

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gallate (7), gallic acid (8), corilagin (9), chebulagic acid (10), ellagic acid (11), tetra-o-galloyl- β -D-glucose (12), chebulinic acid (13), and penta-O-galloyl- β -D-glucose (14) (Figure 1) (Ajala *et al.*, 2014; Mahajan *et al.*, 2010; Saleem *et al.*, 2002; Lee *et al.*, 2007; Han *et al.*, 2006).

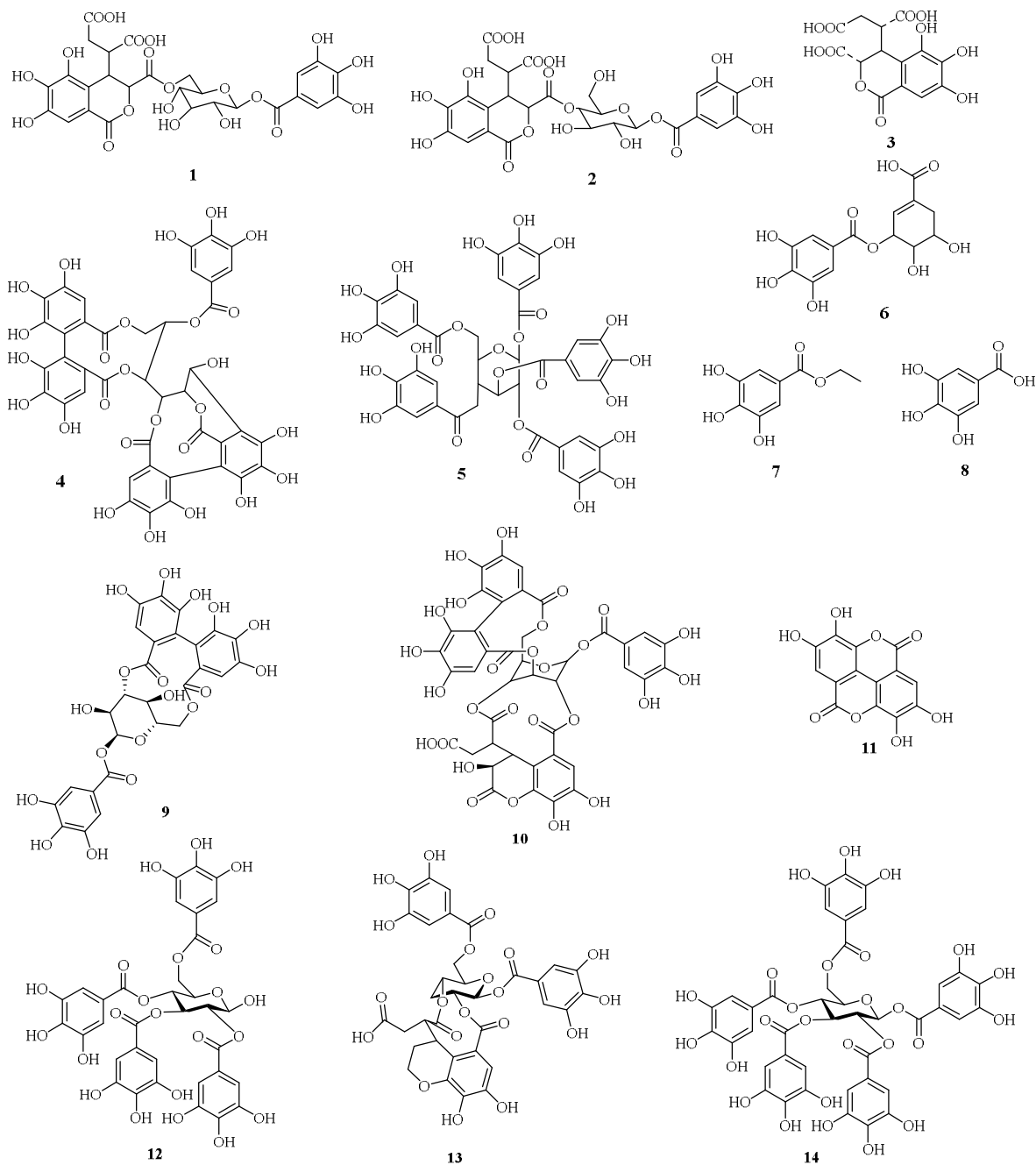


Figure 1. Tannins from *Terminalia chebula*

Glucosides: Six glucosides and one glucosidic ester bearing antiestrogenic and antimicrobial property were elucidated from *Terminalia citrina* and

Terminalia phanerophlebia; for example, terminaloside-L (15), terminaloside-M (16), terminaloside-N (17), terminaloside-O (18),

terminaloside-P (19), methyl-3,4,5-trihydroxybenzoate (20), and 1,6-di-o-coumaroyl glucopyranoside (21). Among all the isolated glucosidic compounds from *Terminalia* genus,

compound 21 was reported to be a lead molecule for the discovery of medicinal agents targeting tuberculosis (Figure 2) (Muhit *et al.*, 2016; Madikizela *et al.*, 2014).

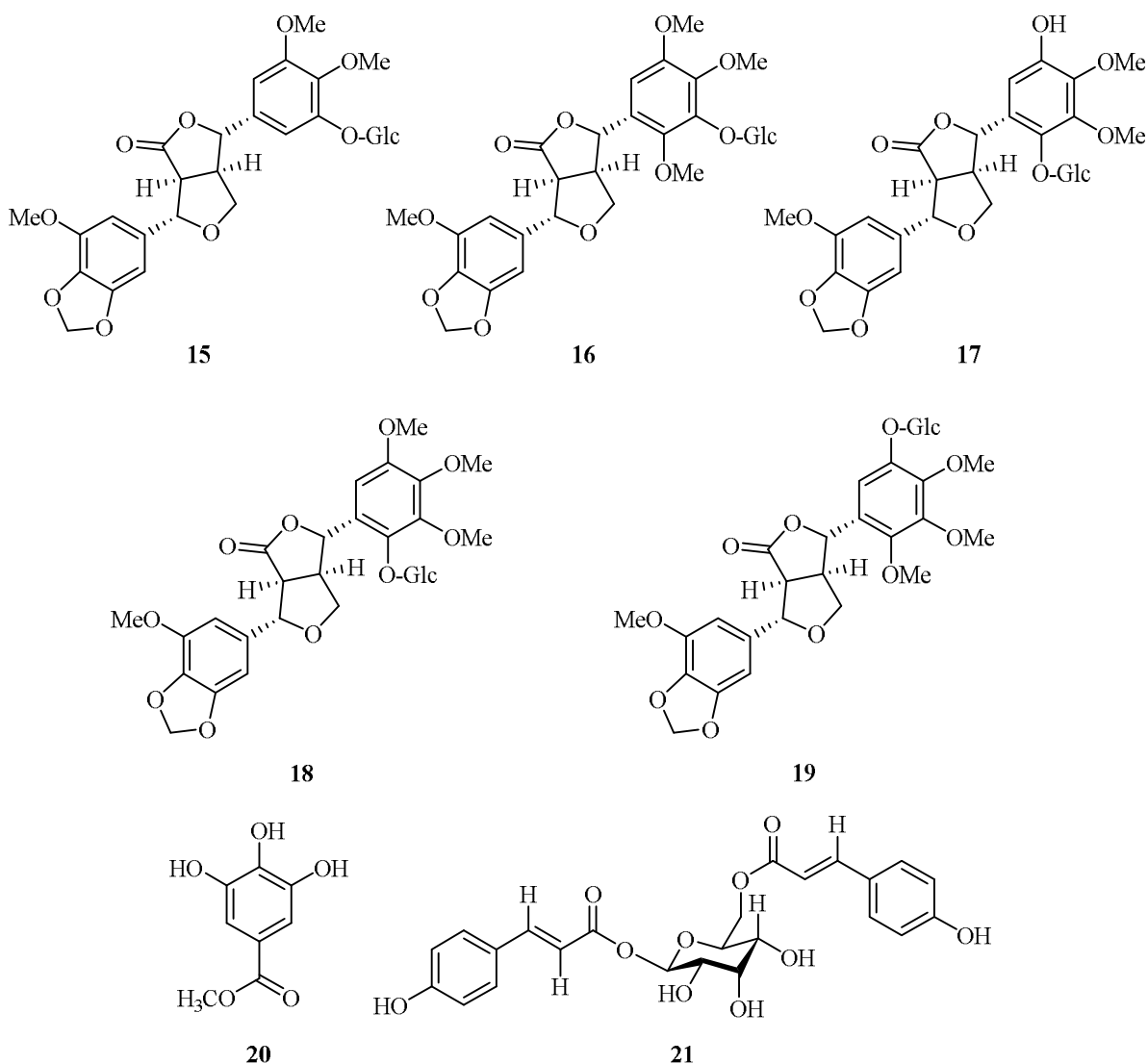


Figure 2. Glucosides from *Terminalia citrina* (15-19) and *Terminalia phanerophlebia* (20, 21)

Pyranoside: Antiplatelet and antioxidant potency containing one pyranoside, benzoyl- β -D-(4'→10''geranilanoxy)-pyranoside (22), has been reported from *Terminalia belerica* (Figure 3) (Ansari *et al.*, 2016).

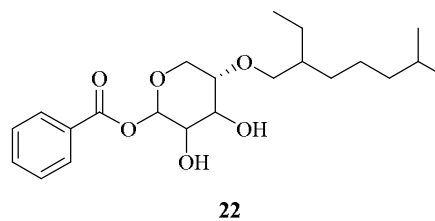
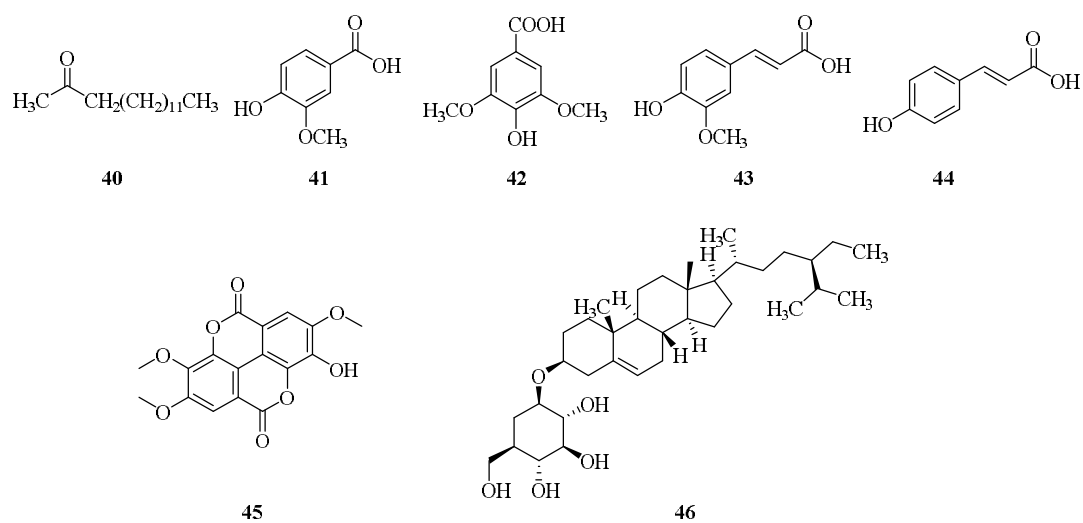
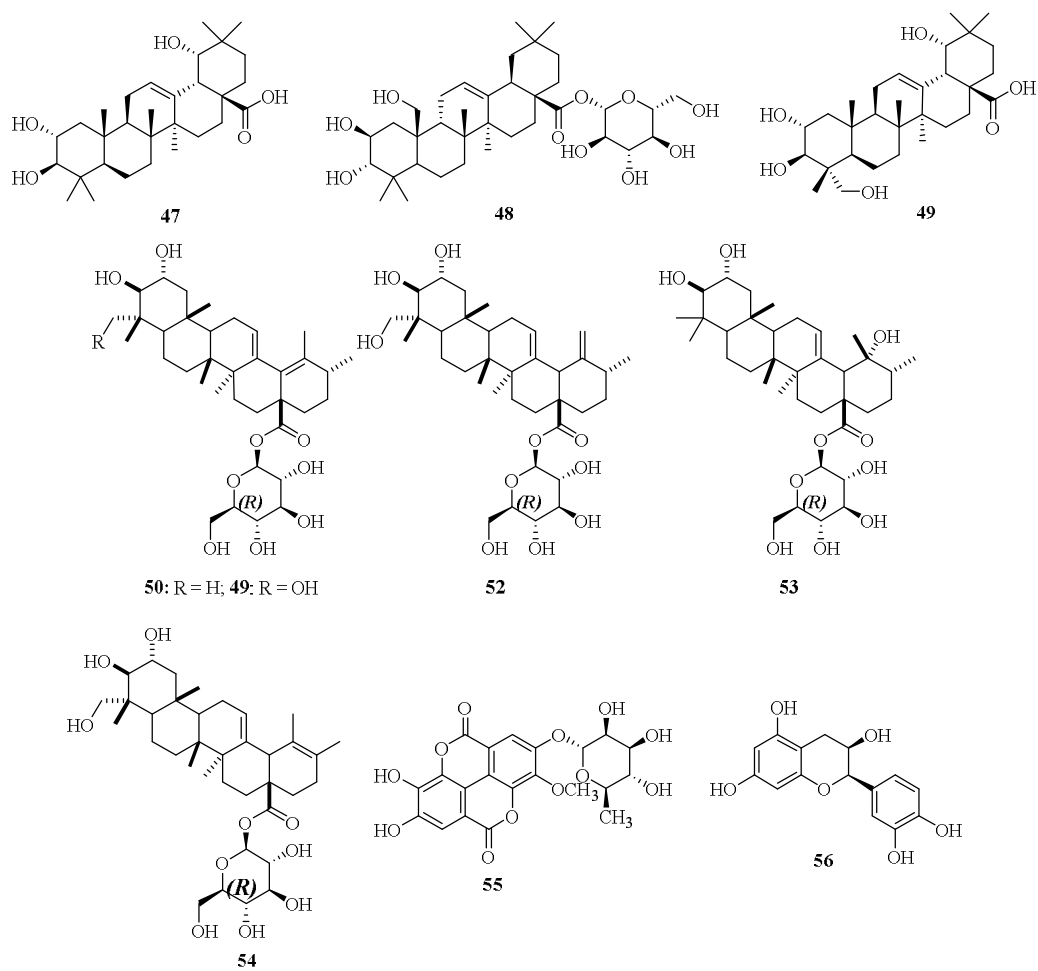


Figure 3. Pyranoside from *Terminalia belerica*

Figure 5. Acidic compounds from *Terminalia catappa*Figure 6. Compounds from *Terminalia arjuna*

phytochemicals such as tannis, glucosides, pyranosides, triterpenoids, and acidic compounds (Fahmy *et al.*, 2015). Six medicinal plants (*Terminalia chebula*, *T. citrina*, *T. phanerophlebia*, *T. belerica*, *T. catappa*, and *T. arjuna*) under the genus *Terminalia* have been studied and fifty six compounds were reported having varied and distinctive chemical structure various bioactivity and pharmacological properties. The current review presents a short perceptive of the chemistry of various *Terminalia* species, that can be helpful in the progress and finding of the novel medicinal moieties for the diagnosis and treatment of different health related problems and diseases.

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