

# Pharmacodynamic Evaluation of *Terminalia bellerica* for Its Antihypertensive Effect

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## ABSTRACT

*Terminalia bellerica* has been used as a folk medicine in a variety of ailments including hypertension. Our aim was to investigate the possible mechanism of its blood pressure (BP)-lowering effect. The crude extract of *Terminalia bellerica* fruit (Tb.Cr) which tested positive for flavonoids, sterols and tannins induced a dose-dependent (10-100 mg/kg) fall in the arterial BP of rats under anaesthesia. In isolated guinea-pig atria, Tb.Cr inhibited the force and rate of atrial contractions. In rabbit thoracic aorta, Tb.Cr relaxed the phenylephrine (PE, 1  $\mu$ M) and K<sup>+</sup> (80 mM)-induced contractions as well as suppressed the PE (1  $\mu$ M) control peaks in the Ca<sup>++</sup>-free medium, similar to that caused by verapamil. The vasodilator effect of Tb.Cr was endothelium-independent as it was not opposed by N<sup>ω</sup>-nitro-L-arginine methyl ester in endothelium-intact rat aortic preparations and it occurred at the similar concentration in the endothelium-denuded tissues. These results indicate that *Terminalia bellerica* lowers BP through Ca<sup>++</sup> antagonist mechanism and thus provides a sound mechanistic background for its medicinal use in hypertension.

Key words: *Terminalia bellerica*, antihypertensive, Ca<sup>++</sup> antagonist

## INTRODUCTION

*Terminalia bellerica* Roxb. (family: Combretaceae), commonly known as belleric myrobalan and locally known as bahera, is an edible plant found throughout Central Asia<sup>(1)</sup>. Its fruit has been used in traditional medial system for anemia, asthma, cancer, colic, constipation, diarrhoea, dysuria, headache, hypertension, inflammations, and rheumatism<sup>(2,3)</sup>. It contains termilignan, thannilignan, 7-hydroxy-3',4'-(methylenedioxy) flavone, anolignan B<sup>(4)</sup>, gallic acid, ellagic acid,  $\beta$ -sitossterol<sup>(5)</sup>, arjungenin, belleric acid, bellericoside<sup>(6)</sup> and cannogenol 3-O- $\beta$ -D-galactopyranosyl-(1 $\rightarrow$ 4)-O- $\alpha$ -L-rhamnopyranoside<sup>(7)</sup>.

*Terminalia bellerica* is known to lower the lipid levels in hypercholesterolemic animals<sup>(8)</sup>. The ethanolic extract of *Terminalia bellerica* was found effective against several pathogens including *Bacillus subtilis*, *Proteus vulgaris*, *Salmonella typhimurium*, *Salmonella typhimurium*, *Escherichia coli*, and *Staphylococcus aureus*<sup>(9)</sup>. *Terminalia bellerica* exhibited inhibitory effect on human immunodeficiency virus-1 reverse transcriptase<sup>(10)</sup>. The leaves and fruits of *Terminalia bellerica* showed antioxidant

activity<sup>(11)</sup>. On the other hand, methanolic extract (75%) of *Terminalia bellerica* reduced the serum glucose level both in normal and alloxan-induced diabetic rats<sup>(12)</sup>, showing preventive effect against the myocardial necrosis in rats<sup>(13)</sup>. A water soluble fraction obtained from the defatted fruits of *Terminalia bellerica* caused hepatoprotection against CCl<sub>4</sub>-induced hepatotoxicity<sup>(14)</sup>.

Srivastava *et al.*<sup>(15)</sup> and Dwivedi *et al.*<sup>(16)</sup> reported that *Terminalia bellerica* lowers blood pressure (BP) but the precise mode of action remains to be elucidated. In this study, we explored the mechanism underlying its hypotensive effect. The present report further supports the previous findings on the use of *Terminalia bellerica* as an antihypertensive agent.

## MATERIALS AND METHODS

### I. Plant Material and Extraction

Fruits of *Terminalia bellerica* were bought at a local market in Dhaka (Bangladesh) and the sample voucher (TB-FR-10-95-30) was submitted to the herbarium of the Department of Biological and Biomedical Sciences, Aga Khan University, Karachi. After cleaning of adulterant material, 432 g of the fruits were crushed and soaked in

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