

# Inhibition of In Vitro TNF- $\alpha$ Production by *Anisomeles malabarica* R.Br. Reinforces Its Anti-Rheumatic and Immunomodulatory Properties

M. Ismail Shareef · S. Leelavathi · Anis Ahmed Shariff

Received: 11 July 2012/Revised: 7 November 2012/Accepted: 13 November 2012/Published online: 5 December 2012  
© The National Academy of Sciences, India 2012

**Abstract** In-vivo studies have suggested the anti-rheumatic and immunomodulatory properties of the methanolic extract of the plant *Anisomeles malabarica* R.Br. However, the mechanism of action of this plant in the modulation of inflammation using the various in vitro models has not been explored earlier. Hence, the current investigation was undertaken to study the anti-rheumatic and immunomodulatory role of aerial parts, leaves and roots in lipopolysaccharide (LPS) mediated signaling in macrophage and mouse connective tissue cell cultures. It was observed from the present study that by employing tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) bioassay, all the three extracts viz., aerial parts, leaves and roots inhibited TNF- $\alpha$  production in LPS (1  $\mu\text{g}/\text{mL}$ ) stimulated RAW-32 cells. 38.75 % inhibition of TNF- $\alpha$  was observed at 200  $\mu\text{g}$  extracts of the aerial parts of the plant followed by 17.64 and 14.94 % by the roots and leaves respectively. Taken together, these findings from the present in vitro studies suggest the anti-rheumatic and immunomodulatory properties of the methanolic extracts of *A. malabarica*.

**Keywords** *Anisomeles malabarica* R.Br. · Anti-rheumatic · Immunomodulatory · Tumor necrosis factor- $\alpha$  · Lipopolysaccharide · Raw-32 cell lines

## Introduction

Identification of suitable drugs and preparations from natural sources for preventing immunological complications of various organs are gaining major attention [1]. It has been observed that such herbal drugs tend to exert effect by modulating both humoral and cellular immune functions. Many herbal drugs have shown the capacity to control the production of proinflammatory mediators thereby managing many inflammatory processes [2]. It is established that activation of macrophage and other immune competent cells play a major role in the manifestation of inflammation [3]. Among different bacterial antigens, LPS is a potent activator of macrophage [4]. LPS is known to evoke wide range of signaling pathways in macrophage and other cell types leading to the production of inflammatory mediators [5, 6]. Such inflammatory mediators consist of proinflammatory cytokines like TNF- $\alpha$ , interleukin 1 (IL-1), IL-6, IL-8 and other mediators like nitric oxide (NO), prostaglandin etc. [7]. Proinflammatory cytokines such as TNF- $\alpha$ , IL-1 $\beta$ , IL-6, IL-8 etc. have been found responsible for the cellular and tissue damage leading to inflammation [8]. Production of such cytokines from macrophage and other cells by the action of exogenous and endogenous antigens can trigger the initiation of inflammation [9]. Therefore, controlling the production of such mediators, herbal drugs have been found promising in managing the inflammatory disorders [10, 11]. In-vivo studies have suggested the anti-rheumatic and immunomodulatory properties of the methanolic extracts of

M. I. Shareef (✉)  
Department of Biotechnology, Acharya Institute of Technology,  
Soldevanahalli, Bangalore 560 090, Karnataka, India  
e-mail: ismailshareef@acharya.ac.in

S. Leelavathi  
Department of Studies in Botany, University of Mysore,  
Manasagangotri, Mysore 570 006, Karnataka, India

A. A. Shariff  
Bioinformatics Centre, Central Sericultural Research & Training  
Institute, Central Silk Board, Srirampura, Mysore 570 008,  
Karnataka, India