

# 59<sup>th</sup> International Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research

**Date/Location:** 4<sup>th</sup>–9<sup>th</sup> September 2011, Antalya, Turkey  
**President:** Prof. Dr. K. Hüsnü Can Başer

Dear Colleagues,

It is my great pleasure and honour to hold the 59th International Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research on September 4–9, 2011 in Antalya, Turkey. This congress series has been organized annually since 1953 and has become the most important and popular congress in Europe in its respected field. It is the first time the congress is organized in Turkey. Turkey is a large peninsula bridging the east and the west at the junction of two continents and has been a passage way between Europe and Asia and even Africa. Due to its geographic location Turkey has been a melting pot of civilizations, cultures and nations, and is full of history and home to diverse traditions. It is a land of many firsts since history starts here. Thanks to its climatically and phytogeographically unique position and its transect ranging from sea level (0 m) to the peak of the Ararat mountain (5137 m) the flora of Turkey is rich and diverse with over 12,000 flowering plant taxa recorded of which 33% are endemic. Anatolia is the land of Galenus of Pergamon and Dioscorides of Anavarza. Pedanius Dioscorides, a physician in the Roman Army had written his famous *Materia Medica* in the 1st century AD. His birthplace Anavarza is in Kozan, Adana in Southern Turkey not too far from Antalya. The 59th Congress has attracted global attention and there are participants from all parts of the world. Its scientific level is high thanks to the efforts of the Scientific Committee. High rate of rejects were due to the meticulous work of the reviewers who gave it time and effort to keep the scientific level as high as possible.

Main topics of the Congress are as follows:

- New Trends in Pharmacognosy
- Traditional and Natural Medicines
- Lead Finding from Nature
- Antimicrobials – What's next?
- Endophytes – Importance in Pharmacognosy
- Natural Immune Enhancers
- Nutraceuticals, Cosmeceuticals, Functional Foods – Prevention of Metabolic Diseases
- Essential Oils – Analysis, Bioactivities, Uses, Therapeutical Potential
- Biotechnology and Nanobiotechnology
- Advances in the Analysis of Natural Products

Ten plenary and two keynote lectures will be presented by distinguished scientists. 73 short lectures will be presented in three parallel sessions. Numerous researchers will be able to report their research findings in 900 poster presentations. In addition, young researchers will be able to present their papers at two parallel Young Researchers Workshops. There will also be three more Permanent Committee Workshops of the GA on regulatory affairs, pharmacology, agriculture and quality of natural products. An additional workshop will be held on Traditional Chinese Medicine (TCM). 31 lectures will be presented in the workshops. All in all over 1100 scientific presentation will be made at the congress.

I would like to thank the Executive and the Advisory Board members of the GA for their help and encouragement during the preparatory stages of the Congress. I wish to extend my grateful thanks to Georg Thieme Verlag KG for processing such a huge number of abstracts in a short time. My special thanks go to the members of the Organizing Committee and to the Congress Organizing Company FTS who have done their utmost to offer you a successful, satisfying and enjoyable congress.

I wish you all a fruitful congress which I hope will strengthen old friendships and develop new ones in a friendly, scientific and cultural atmosphere. I hope everybody enjoys their stay in sunny Antalya, gets the opportunity to discover hidden beauties of the region and Turkey, and takes home new scientific knowledge and unforgettable memories.

Prof. Dr. K. Hüsnü Can Başer  
 President of the 59th International Congress and Annual Meeting of the Society for Medicinal Plant and Natural Product Research

# Planta Medica

Journal of Medicinal Plant and Natural Product Research

## Editor-in-Chief

Luc Pieters, Antwerp, Belgium

## Senior Editor

Adolf Nahrstedt, Münster, Germany

## Review Editor

Matthias Hamburger, Basel, Switzerland

## Editors

Wolfgang Barz, Münster, Germany  
Rudolf Bauer, Graz, Austria  
Veronika Butterweck, Gainesville FL, USA  
João Batista Calixto, Florianopolis, Brazil  
Thomas Efferth, Mainz, Germany  
Jerzy W. Jaroszewski, Copenhagen, Denmark  
Ikhlas Khan, Oxford MS, USA  
Wolfgang Kreis, Erlangen, Germany  
Irmgard Merfort, Freiburg, Germany  
Kurt Schmidt, Graz, Austria  
Thomas Simmet, Ulm, Germany  
Hermann Stuppner, Innsbruck, Austria  
Yang-Chang Wu, Taichung, Taiwan  
Yang Ye, Shanghai, China

## Editorial Offices

Claudia Schäfer, Basel, Switzerland  
Tess De Bruyne, Antwerp, Belgium

## Advisory Board

Giovanni Appendino, Novara, Italy  
John T. Arnason, Ottawa, Canada  
Yoshinori Asakawa, Tokushima, Japan  
Lars Bohlin, Uppsala, Sweden  
Gerhard Bringmann, Würzburg, Germany  
Reto Brun, Basel, Switzerland  
Mark S. Butler, S. Lucia, Australia  
Ihsan Calis, Ankara, Turkey  
Salvador Cañigüeral, Barcelona, Spain  
Hartmut Derendorf, Gainesville, USA  
Verena Dirsch, Vienna, Austria  
Jürgen Drewe, Basel, Switzerland  
Roberto Maffei Facino, Milan, Italy  
Alfonso Garcia-Piñeres, Frederick MD, USA  
Rolf Gebhardt, Leipzig, Germany  
Clarissa Gerhäuser, Heidelberg, Germany  
Jürg Gertsch, Zürich, Switzerland  
Simon Gibbons, London, UK  
De-An Guo, Shanghai, China  
Leslie Gunatilaka, Tucson, USA  
Solomon Habtemariam, London, UK  
Andreas Hensel, Münster, Germany  
Werner Herz, Tallahassee, USA  
Kurt Hostettmann, Geneva, Switzerland  
Peter J. Houghton, London, UK  
Jinwoong Kim, Seoul, Korea  
Gabriele M. König, Bonn, Germany  
Ulrich Matern, Marburg, Germany  
Matthias Melzig, Berlin, Germany  
Dulcie Mulholland, Guildford, UK  
Eduardo Munoz, Cordoba, Spain  
Kirsi-Maria Oksman-Caldentey, Espoo, Finland  
Ana Maria de Oliveira, São Paulo, Brazil  
Nigel B. Perry, Dunedin, New Zealand  
Joseph Pfeilschifter, Frankfurt, Germany  
Peter Proksch, Düsseldorf, Germany  
Thomas Schmidt, Münster, Germany  
Volker Schulz, Berlin, Germany  
Hans-Uwe Simon, Bern, Switzerland  
Leandros Skaltsounis, Athens, Greece  
Han-Dong Sun, Kunming, China  
Benny K. H. Tan, Singapore, R. of Singapore  
Ren Xiang Tan, Nanjing, China  
Deniz Tasdemir, London, UK  
Nunziatina de Tommasi, Salerno, Italy  
Arnold Vlietinck, Antwerp, Belgium  
Angelika M. Vollmar, München, Germany  
Heikki Vuorela, Helsinki, Finland  
Jean-Luc Wolfender, Geneva, Switzerland  
De-Quan Yu, Beijing, China

## Publishers

**Georg Thieme Verlag KG**  
**Stuttgart · New York**  
Rüdigerstraße 14  
D-70469 Stuttgart  
Postfach 30 11 20  
D-70451 Stuttgart

**Thieme Publishers**  
333 Seventh Avenue  
New York, NY 10001, USA  
www.thieme.com

Masthead  
Planta Medica  
Volume 77

#### Editor-in-Chief

Prof. Dr. Luc Pieters  
Department of Pharmaceutical Sciences  
University of Antwerp  
Universiteitsplein 1  
BE-2610 Antwerp, Belgium  
e-mail: luc.pieters@ua.ac.be  
phone: +32 3 265 27 15  
fax: +32 3 265 27 09

#### Editorial Offices

Dr. Claudia Schärer  
Department of Pharmaceutical Sciences  
Institute of Pharmaceutical Biology  
University of Basel  
Klingelbergstrasse 50  
CH-4053 Basel, Switzerland  
e-mail: claudia.schaerer@unibas.ch

#### Dr. Tess De Bruyne

Department of Pharmaceutical Sciences  
University of Antwerp  
Universiteitsplein 1  
BE-2610 Antwerp, Belgium  
e-mail: tess.debruyne@ua.ac.be

#### Publishers

Georg Thieme Verlag KG  
Rüdigerstraße 14, 70469 Stuttgart or  
P.O. Box 30 11 20, 70451 Stuttgart  
phone +49-711-8931-0  
fax +49-711-8931-298  
www.thieme.com  
www.thieme.de/fz/plantamedica  
http://www.thieme-connect.de/ejournals

#### Copyright

This journal, including all individual contributions and illustrations published therein, is legally protected by copyright for the duration of the copyright period. Any use, exploitation or commercialization outside the narrow limits set by copyright legislation, without the publisher's consent, is illegal and liable to criminal prosecution. This applies in particular to photocopy reproduction, copyright, cyclostyle, mimeographing or duplication of any kind, translating, preparation of microfilms, and electronic data processing and storage.

#### Advertising responsibility

Thieme.media  
Pharmedia Anzeigen- und Verlagsservice GmbH  
Ulrike Bradler  
Rüdigerstraße 14, 70469 Stuttgart and  
P.O. Box 30 08 80, 70448 Stuttgart  
phone +49-711-8931-466  
fax +49-711-8931-392  
e-mail: Ulrike.Bradler@thieme.de

Advertisement pricelist No. 36, valid since  
October 1, 2010, is currently applicable.

#### Printed in Germany

AZ Druck und Datentechnik GmbH, 87437 Kempten

#### Typesetting

Hübner EP GmbH, Eltville

#### Production manager

phone +49-711-8931-452  
fax +49-711-8931-392  
e-mail: Daniel.Bauer@thieme.de

#### Subscription information

Planta Medica is available as an institutional subscription only. For information about institutional rates, please contact eproducts@thieme.com

#### General information

*Planta Medica*, ISSN 0032-0943, is published in 18 issues per year.

Subscribers are asked to inform the publisher immediately in case of address changes in order to ensure correct delivery of the journal.

All subscription orders are entered for the calendar year. The rate of subscription is invoiced in advance at the end of the year for the following year and becomes due for payment for the full calendar year. Subscriptions can be started anytime. Subscriptions are automatically extended each year unless notice of cancellation is received from the subscriber prior to September 30 of each year (applies to Germany, Switzerland, Austria only).

#### Subscriptions for Europe, Africa, Asia and Australia (excluding South Asia)

Order from Georg Thieme Verlag KG, Rüdigerstr. 14, 70469 Stuttgart, Germany; P.O. Box 30 11 20, 70451 Stuttgart, Germany; phone +49-711-8931-421; fax +49-711-8931-410; e-mail: customerservice@thieme.de.

#### Subscriptions for South Asia (Bangladesh, Bhutan, India, Nepal, Pakistan & Sri Lanka)

Contact Thieme Medical and Scientific Publishers Private Limited, N-26, II-III Floor, Sector 18, NOIDA-201301, India; phone +91 1204274461 to 64; fax +91 1204 2744 65; e-mail: customerservice@thieme.in. Please contact customer service for information about 2011 subscription rate in INR.

#### Subscriptions for the American Continent

Order from Thieme New York, 333 Seventh Avenue, New York, NY 10001, USA. Order toll free +1-800-782-3488 (US only) or +1-212-760-0888, fax +1-212-947-0108; e-mail: customerservice@thieme.com. Airfreight and mailing in the USA by Publications Expediting Inc., 200 Meacham Ave., Elmont, NY 11003. Periodicals postage paid at Jamaica NY 11431. Postmaster: Send address changes to Planta Medica Publications Expediting Inc., 200 Meacham Ave., Elmont, NY 11003.

For information on special society agreements, please contact Fiona Henderson, Thieme Publishers, phone +49-711- 8931-458, fax +49-711-8931-410, e-mail: Fiona.Henderson@thieme.de

#### For Users in the USA

Authorization of photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Georg Thieme Verlag Stuttgart - New York for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service; www.copyright.com. For reprint information in the US, please contact: International Reprint Corporation, 287 East "H" St., Benicia, CA 94510, USA; phone: +1-707-746-8740, fax +1-707-746-1643; e-mail: irc@intlreprints.com

#### Product names

Product names which are registered trademarks may not have been specifically designated as such in every case. In case that a product has been referred to by its registered trademark it cannot be concluded that the name used is in the public domain. The same applies to labels, names or other signs.

#### Manuscripts

Manuscript submission exclusively via:  
http://mc.manuscriptcentral.com/plamed

For details regarding manuscript submission please refer to "Guidelines for Authors" and the "Sample Manuscript". Download PDF files from http://mc.manuscriptcentral.com/plamed (follow link "Instructions and Forms") or http://www.thieme.de/fz/plantamedica (follow link "For Authors"). In principle only papers will be accepted which have not been published previously, domestically or abroad. Furthermore, manuscripts may not be offered to other

#### Important note

Medicine is an ever-changing science undergoing continual development. Research and clinical experience are continually expanding our knowledge, in particular our knowledge of proper treatment and drug therapy. Insofar as this journal mentions any dosage or application, readers may rest assured that the authors, editors and publishers have made reasonable effort to ensure that such references are in accordance with the state of knowledge at the time of production of the journal.

Nevertheless this does not involve, imply, or express any guarantee or responsibility on the part of the publishers in respect of any dosage instructions and forms of application stated in the journal. Every user is requested to examine carefully the manufacturers' leaflets accompanying each drug and to check, if necessary in consultation with a physician or specialist, whether the dosage schedules mentioned therein or the contraindications stated by the manufacturers differ from the statements made in the present journal. Such examination is particularly important with drugs that are either rarely used or have been newly released on the market. Every dosage schedule or every form of application used is entirely at the users own risk and responsibility. The authors and publishers request every user to report to the publishers any discrepancies or inaccuracies noticed.

publications at the same time as they are under consideration for this journal.

With the acceptance of the manuscript for publication the authors transfer the exclusive, spatial and temporally unrestricted right to the publishing house for all editions updates for the duration of the legal period of protection (§ 64 UrHG) for also excerpt-wise utilization in printed form as well as into electronic media (data bases, online reticulated systems, Internet, CD-ROM, DVD, PDA etc.) also in changed form or in form of an excerpt-wise linkage with other works including the translation into other languages as well as by transmission of rights to use to third.

As far as illustrations are taken out of other publications, the author grants only the not exclusive right to use to the extent of the managing paragraph to the publishing house. The author is responsible for the complete indication of source as well as the obtaining of the written consent of the other publishing house to the managing evacuations of right and proves these to the publishing house.

The corresponding author will receive a PDF-file for private use.

#### Online

The scientific text of this journal is available online through Thieme-connect, http://www.thieme-connect.de/ejournals. Access to Thieme-connect is free of charge for personal subscribers. For information concerning licenses and prices for institutional access, please contact Carmen Krenz, e-mail: sales@thieme-connect.de

Customers from North, Central and South America and Canada please contact Alexandra Williams, e-mail: awilliams@thieme.com

Authors may choose to allow, for a fee, free general access to their papers online. For details, please contact plantamedica@thieme.de

© Georg Thieme Verlag KG  
Stuttgart · New York 2011

which is characterized by the absence of alkaloids [3]. This extract was tested for estrogenic activity in a panel of suitable test models. Besides a significant competitive binding to estrogen receptors alpha (ER alpha) and ER beta, induction of alkaline phosphatase in Ishikawa endometrial adenocarcinoma cell was observed. Unfortunately, the extract did not display any estrogen receptor selectivity and promoted uterine growth in ovariectomized rats. Hence, it was considered inappropriate for the treatment of climacteric complaints and precluded from further product development. Keywords: *Sophora flavescens*, antiestrogenic activity References: 1. Kuang L, Zhang K (2005) Pharmacopoeia of the Peoples Republic of China, Vol. I, People's Medical Publishing House, Beijing. 2. Hillerns PI, Wink M (2005) *Planta Med* 71: 1065. 3. Dr. Willmar Schwabe GmbH & Co., European Patent EP 1294388 B1 (granted 2004)

**PM130** Antibacterial activity of plant extracts highly depends on extraction solvent  
Sperl C, Mader E, Henikl S, Teichmann K, Schatzmayr G  
Biomim Research Center, Tulln, Austria

As an alternative to antibiotic growth promoters in animal nutrition, that have been banned in the EU in 2006, the demand for plant derived substances (phytochemicals) is emerging to counteract bacterial infections in swine and poultry. In contrast to antibiotics, phytochemicals are expected to refrain from causing transmissible bacterial resistances and leaving critical residues in animal tissue. Looking for potential phytochemicals, five different plant raw materials (*Berberis aristata* DC. root, *Sophora flavescens* Aiton root, *Holarrhena antidysenterica* (L.) Wall. bark, *Bridelia ferruginea* Benth. bark and leaves) were selected. Dry extracts were produced of each material using different extraction solvents (ethanol abs., water and 50/50 (v/v) ethanol/water). The antibacterial activity of the extracts on two pathogenic bacteria, *Salmonella typhimurium* and *Clostridium perfringens* Type C, was examined with a turbidimetric microdilution method. The bacterial cultures with defined microbial count were incubated together with different concentrations of the extracts. The change in optical density of the bacterial culture led to a quantitative result, indicated as the MIC<sub>50</sub> value. The lowest MIC<sub>50</sub> values were reached by the ethanol extracts of *B. aristata* (78 mg/l) and *S. flavescens* (156 mg/l) against *C. perfringens*. The ethanol and ethanol/water extract of *H. antidysenterica* showed higher activity against *S. typhimurium*. In fact, the ethanol extracts of all plant materials were most effective, except for the extracts of *B. ferruginea* bark, whereof the water extract was most effective against *C. perfringens* (MIC<sub>50</sub> value 156 – 625 mg/l). Based on these findings about extraction solvent-dependent activity, further investigations towards active substance identification will be accomplished.

**PM131** Phytochemistry and biological activities of the ethanolic extract of *Onosma aucherianum*  
Mašković P<sup>1</sup>, Nicičević N<sup>2</sup>, Solujić S<sup>2</sup>, Manojlović N<sup>3</sup>, Cvijović M<sup>1</sup>, Mladenović J<sup>1</sup>, Acamović Djoković G<sup>1</sup>, Radojković M<sup>4</sup>  
<sup>1</sup>Department of Chemistry and Chemical Engineering, Faculty of Agronomy, University of Kragujevac, Cara Dušana 34, 32 000 Čačak, Serbia; <sup>2</sup>Faculty of Science, University of Kragujevac, Radoja Domanovića 12, 34 000 Kragujevac, Serbia; <sup>3</sup>Department of Pharmacy, Medical Faculty, University of Kragujevac, 34 000 Kragujevac, Serbia; <sup>4</sup>Department of Pharmaceutical Engineering, Faculty of Technology, University of Novi Sad, Novi Sad, Serbia

This study was aimed at evaluating the antioxidant activity and efficacy of the ethanolic extract of the endemic plant species *Onosma aucherianum* DC. in inhibiting the development of selected fungi and bacteria. The highest susceptibility to the ethanolic extract of *O. aucherianum* among the bacteria tested was exhibited by *B. subtilis* and *S. aureus* (MIC = 15.62 µg/ml). Among the fungi, *A. niger* (MIC = 15.62 µg/ml) showed the highest susceptibility. Total phenolic, flavonoid, condensed tannin and gallotannin contents were 90.26 ± 0.69 mg GA/g, 35.24 ± 0.55 mg RU/g, 74.65 ± 0.75 mg GA/g and 31.74 ± 1.05 mg GA/g, respectively. Total antioxidant capacity was 78.45 ± 0.98 µg AA/g. IC<sub>50</sub> values were determined for each measurement: 21.45 ± 1.55 µg/ml for DPPH free radical scavenging activity, 36.46 ± 1.68 µg/ml for inhibitory activity against lipid peroxidation, 99.11 ± 0.23 µg/ml for hydroxyl radical scavenging activity and 45.91 ± 0.88 µg/ml for chelating ability. The rosmarinic acid was found to be the dominant phenolic compound of the extract. Keywords: antimicrobial activity, antioxidant activity, *Onosma aucherianum*, HPLC analysis, phenolic compounds Acknowledgement:

Serbian Ministry of Agriculture, Forestry and Water Management, STAR Project No. 401 – 001972/2010 – 03.

**PM132** Topical anti-inflammatory activity of *Plantago lanceolata* L. leaves: the relevance of triterpenic acids  
Sosa S<sup>1</sup>, Faudale M<sup>1</sup>, Zacchigna M<sup>2</sup>, Cateni F<sup>2</sup>, Del Favero G<sup>1</sup>, Tubaro A<sup>1</sup>, Della Loggia R<sup>1</sup>  
<sup>1</sup>Dipartimento di Ingegneria Industriale e dell'Informazione, Università di Trieste, Via A. Valerio 6, 34127 Trieste, Italia; <sup>2</sup>Dipartimento di Scienze Chimiche e Farmaceutiche, Università di Trieste, P.le Europa 1, 34127 Trieste, Italia

The leaves of *Plantago lanceolata* L. (Plantaginaceae) are used in traditional medicine for the topical treatment of skin inflammatory affections [1]. Although *P. lanceolata* leaf extracts and some of their constituents have been shown to inhibit *in vitro* enzymes involved in inflammation [1, 2], the *in vivo* topical anti-inflammatory properties of the leaves have not been investigated. Therefore, *P. lanceolata* leaves have been studied for their topical anti-inflammatory activity by the Croton oil-induced ear dermatitis assay in mice [3]. *P. lanceolata* leaves were sequentially extracted with *n*-hexane, chloroform and methanol and the relevant extracts were evaluated for their ability to inhibit the mouse ear edema induced by Croton oil. Each extract (300 µg/cm<sup>2</sup>) provoked a significant edema reduction, the chloroform one being the most active. Its potency was only two fold lower than that of the reference non steroidal anti-inflammatory drug indomethacin: their ID<sub>50</sub> (dose inducing 50% edema inhibition) values were 186 and 97 µg/cm<sup>2</sup>, respectively. By column chromatography, the chloroform extract was separated in five fractions (A-E), concentrating its activity into fraction C, which was constituted mainly by ursolic acid (44%) and oleanolic acid (27%). These compounds induced a dose-dependent edema inhibition, and ursolic acid (ID<sub>50</sub> = 56 µg/cm<sup>2</sup>) was more active than oleanolic acid (ID<sub>50</sub> = 132 µg/cm<sup>2</sup>) and indomethacin. The two triterpenes, which give a significant contribution to the anti-inflammatory activity of the parent extract, can be proposed as parameters in the quality control of *P. lanceolata* leaf preparations for the topical use against skin inflammations. References: 1. Beara IN et al. (2010) *J Pharm Biomed Anal* 52: 701 – 706. 2. Vigo E et al. (2005) *J Pharm Pharmacol* 57: 383 – 391. 3. Tubaro A et al. (1985) *Agents Actions* 17: 347 – 349.

**PM133** *Cyathula prostrata* inhibits *in vitro* cancer cell growth via multiple targets  
Van De Venter M<sup>1</sup>, Schnablegger GE<sup>1</sup>, Baatjies L<sup>1</sup>, Koekemoer TC<sup>1</sup>, Sowemimo A<sup>2</sup>  
<sup>1</sup>Department of Biochemistry and Microbiology, PO Box 77000, Nelson Mandela Metropolitan University, Port Elizabeth 6031, South Africa; <sup>2</sup>Department of Pharmacognosy, Faculty of Pharmacy, University of Lagos, Lagos, Nigeria

The *in vitro* anticancer activity of an 80% ethanol extract of *Cyathula prostrata* (L.) Blume, an annual branching shrub used by traditional healers in Nigeria to treat cancer was investigated. IC<sub>50</sub> values were 100.8 µg/ml and 64.4 µg/ml for HeLa (cervical cancer) and U937 (myelo-monocytic) cell lines, respectively. Further experiments were performed using 125 µg/ml *C. prostrata* extract and 50 µM cisplatin as positive control. More than 80% of the cells were arrested in the G1 phase after 48 hours of *C. prostrata* treatment. The annexin V-FITC/PI assay revealed an increase in percentage apoptotic cells from 4.9% to 53.1% at 24 h. Cell cycle arrest was not accompanied by increased levels of the cyclin-CDK inhibitor p21. Increase in caspase-8 activation was observed in response to treatment with the extract with no cyt-c release from the mitochondria. The lack of cyt-c release was due to no change in mitochondrial membrane potential, which was investigated with the aid of fluorescent mitochondrial dyes and flow cytometric techniques. The results therefore show that *C. prostrata* extract induces apoptosis via the extrinsic pathway and this activation is independent of the mitochondria. Levels of hTERT, the catalytic subunit of telomerase, were also shown to decrease upon *C. prostrata* treatment. The findings from this study suggest that the extract acts through multiple targets, by inducing: cell cycle arrest in the G1 phase through an unknown mechanism; apoptosis through an extrinsic death receptor pathway and replicative senescence through inhibition of telomerase. Keywords: *Cyathula prostrata* apoptosis, caspase 8, telomerase, cell cycle arrest Acknowledgement: