derived from natural amino acids, (2-hydroxyethyl)trimethylammonium phenylalaninate [Cho][Phe] and (2-hydroxyethyl)trimethylammonium glycinate [Cho][Gly] and their impact on the incorporation of the caffeic and p-coumaric acids, on oil-in-water (O/W) emulsions [2] and gels was assessed. The incorporation of the ILs into the delivery systems improved their formulation, allowed the incorporation of higher amounts of the two hydroxycinnamic acids and led to more viscous formulations, which may improve the patient acceptance as well as the stability of the delivery systems. Furthermore, ILs also proved to be determinant to improve the stability of the O/W emulsions [2]. Our results showed that these ILs, derived from natural amino acids, may be decisive not only to the increase the incorporation of poorly soluble hydroxycinnamic acids into the delivery systems, but also to facilitate the preparation and improve the performance of topical formulations.

Biomass Accumulation and Phenolic Acid Biosynthesis in *Salvia Austriaca* Jacq. Hairy Root Culture Grown in Erlenmeyer Flasks and In Temporary Immersion Bioreactor RITA

Lukasz Kuzma
Medical University of Łódź, Poland

Abstract

Salvia austriaca Jacq. (austrian sage) (Lamiaceae), is medicinal herbaceous plant native of high altitudes across Russia and eastern Europe [1]. It has been described that the roots of this species produce a medicinal valuable secondary metabolites, like abietane diterpenoids, as well as, phenolic acids [2, 3]. As a result of the genetic transformation of *S. austriaca* shoots with *Rhizobium rhizogenes* A4 strain the hairy root culture was obtained [4]. The roots were cultured in growth regulator-free Schenk and Hildebrandt liquid medium [5] for 35 days under illumination with different wavelenght of light emitting diode (LED) light (red, blue, red/blue and white) and in the dark in Erlenmeyer flasks and temporary immersion bioreactor, Rita®. The root cultures were examined in respect to the biomass accumulation and phenolic acid biosynthesis.

The highest fresh and dry biomasses of 35-day-old hairy roots grown in Erlenmeyer flasks were achieved during red/blue LED light exposure. Cultivated in (white and red/blue LED light) in Rita bioreactor the hairy roots demonstrated the highest values of the biomass.

It was noticed, that *S. austriaca* transformed roots biosynthesize caffeic acid, rosmarinic acid and salvianolic acid. The roots grown in Erlenmeyer flasks in the dark showed the highest total content of phenolic acids (about 19 mg g^{-1} dry weight). Among the cultures grown in Rita bioreactor the maximum phenolic acids content was observed in the roots exposed on blue light and it was near 9 mg g^{-1} dry weight.

Structure-Activity Relationships Reveal A 2'-Furoyloxychalcone as A Potent Cytotoxic and Apoptosis Inducer in Human U-937 Leukaemia Cells

Henoc del Rosario García
Instituto Universitario de Investigaciones Biomédicas y Sanitarias, Spain

Abstract

In the area of cancer, over the last 40 years, approximately 80% of all approved therapeutic agents were natural products or directly derived from these. Chalcones (1,3-diphenyl-2-propen-1-ones) are the biosynthetic precursors of flavonoids and they have attracted attention for their antiproliferative properties against various cancers. In this communication we report the synthesis of a new series of chalcones and their cytotoxicity against several human tumour cells. This series of chalcones was characterized by the absence or the presence of a furoyloxy radical on the A ring of the chalcone and the introduction of one

or three methoxy groups or a methyl and two methoxy groups at positions 2,3,4 and 5 on the B ring of the chalcone skeleton. The results revealed that the most cytotoxic chalcone contained the furoyloxy radical at position 2' of the A ring, with IC_{50} values below 1 μM in human leukaemia cells and it is at least ten-fold more potent than the antitumor etoposide in U-937 cells. Human peripheral blood mononuclear cells were more resistant than leukaemia cells to the cytotoxic effects of the chalcone. This furoyloxychalcone blocked tubulin polymerization and induced G_2-M cell cycle arrest and apoptosis. Cell death was associated with mitochondrial cytochrome *c* release, caspase activation, poly(ADP-ribose) polymerase cleavage and it was dependent on reactive oxygen species generation.

This research was funded by Agencia Canaria de Investigación, Innovación y Sociedad de la Información (CEI2019/05).

Canarian Cyanobacterias as a potential source of Fungicide Natural Products

Carolina P. Reyes
Universidad de La Laguna, Spain

Abstract

Cyanobacteria are emerging candidates in recent years as a valuable resource for the protection of agriculture fields. These are due to the great variety of biologically active compounds extracted from them that exhibit antifungal, antibiotic and insecticidal properties, among others. Also, cyanobacteria acquires niches in agriculture soils which are contributing to with biological nitrogen fixation and solubilization of trace elements thereby improving soil fertility and crop productivity. Cyanobacteria biomass can also be used for the scale production of biofertilizers. Therefore, in the present work, the fungicidal activity of three ethanolic extract prepared from clonal cultures of heterocyst-forming cyanobacteria was evaluated against three species of phytopathogenic fungi responsible for causing important damage in the main crops of the Canary Islands. The cyanobacteria strains were isolated from samples collected from leaves of Laurus novocanariensis Rivas-Mart., Lousa, Fern. Prieto, E. Días, J.C. Costa & C. Aguiar an endemic tree from Macaronesian Laurel forest. This represents a unique starting point for searching a natural products with potential plant fungicide products.

Canarian Cyanobacterias as a potential source of Fungicide Natural Products

Carolina P. Reyes
Universidad de La Laguna, Spain

Abstract

Cyanobacteria are emerging candidates in recent years as a valuable resource for the protection of agriculture fields. These are due to the great variety of biologically active compounds extracted from them that exhibit antifungal, antibiotic and insecticidal properties, among others. Also, cyanobacteria acquires niches in agriculture soils which are contributing to with biological nitrogen fixation and solubilization of trace elements thereby improving soil fertility and crop productivity. Cyanobacteria biomass can also be used for the scale production of biofertilizers. Therefore, in the present work, the fungicidal activity of three ethanolic extract prepared from clonal cultures of heterocyst-forming cyanobacteria was evaluated against three species of phytopathogenic fungi responsible for causing important damage in the main crops of the Canary Islands. The cyanobacteria strains were isolated from samples collected from leaves of Laurus novocanariensis Rivas-Mart., Lousa, Fern. Prieto, E. Días, J.C. Costa & C. Aguiar an endemic tree from Macaronesian Laurel forest. This represents a unique starting point for searching a natural products with potential plant fungicide products.