Extended Abstract Journal of Clinical Research and Pharmacy 2020
Vol.3 No.1

Synthesis, characterization, antibacterial and cytotoxicity activities of eugenol derivatives

Asnuzilawati Asari
Universiti Malaysia Terengganu, Malaysia Universiti Sains Malaysia, Malaysia

Phenylpropanoids have been associated with crop resistance to H. armigera together with flavonoids discussed below and further work may elucidate whether they have a role in the development of resistance in Cicer since similar compounds have been shown to be responsible for resistance to folivorous insects on other legume crops including groundnuts. The phenylpropanoids are a diverse family of organic compounds that are synthesized by plants from the amino acids phenylalanine and tyrosine. Their name is derived from the six-carbon, aromatic phenyl group and the three-carbon propene tail of coumaric acid, which is the central intermediate in phenylpropanoid biosynthesis. From 4-coumaroyl-CoA emanates the biosynthesis of myriad natural products including lignols (precursors to lignin and lignocellulose), flavonoids, isoflavonoids, coumarins, aurones, stilbenes, catechin, and phenylpropanoids. The coumaroyl component is produced from cinnamic acid. 4-Coumaroyl-CoA is the central biosynthetic precursor to phenylpropanoids. Phenylalanine is first converted to cinnamic acid by the action of the enzyme phenylalanine ammonia-lyase (PAL). Some plants, mainly monocotyledonous, use tyrosine to synthesize p-coumaric acid by the action of the bifunctional enzyme Phenylalanine/tyrosine ammonia-lyase (PTAL). A series of enzymatic hydroxylations and methylations leads to coumaric acid, caffeic acid, ferulic acid, 5-hydroxyferulic acid, and sinapic acid. Conversion of these acids to their corresponding esters produces some of the volatile components of herb and flower fragrances, which serve many functions such as attracting pollinators. Ethyl cinnamate is a common example. Phenylpropanoids are found throughout the plant kingdom, where they serve as essential components of a number of structural polymers, provide protection from ultraviolet light, defend against herbivores and pathogens, and mediate plant-pollinator interactions as floral pigments and scent compounds. Eugenol is one of the phenylpropanoids available in nature, which possess a variety of medicinal properties. In this study, a series of eugenol derivatives were synthesized and characterized by normal spectroscopic techniques of FTIR, UV-Vis, NMR and MS. All the synthesized compounds were further evaluated for their anti-bacterial and cytotoxicity activities. The anti-bacterial activity were tested via well-diffusion method against gram-positive (Bacillus subtilis, Staphylococcus aureus and Staphylococcus epidermidis) and gramnegative (Escherichia coli and Staphylococcus typhimurium) bacteria. Eugenol derivatives showed broad spectrum for anti-bacterial activity with compound 67 emerged as the potential anti-bacterial agent since it was susceptible for both gram-positive and negative bacterial strains. Antibacterial activity could be tested by agar diffusion methods, applying a single concentration of the substance in a reservoir on a seeded nutritional agar medium. The diffusion of the substance into the medium will generate a continuous gradient of decreasing concentrations with increasing distance from the reservoir. The AgNPs substance may be applied to the seeded agar medium in different ways: Colloidal solutions could be embedded on filter paper disks and applied on the agar surface, or placed by filling glass or metal cylinders applied to the agar surface or in wells cut on the agar; Creams or gel substances and fabrics could be placed on the agar surface, usually in circular spots of a defined diameter. After the incubation, there should be a zone of inhibited growth around the reservoir, whose size is related to the antimicrobial capacity of the substance (Marslin et al., 2015; Erdogan et al., 2016; Hanumanta et al., 2016; Marianelli et al., 2014; Manikprabhu et al., 2016). The result is the diameter of the inhibition zone expressed in mm, and is related to the minimal inhibitory concentration of the substance for the bacteria.The most important variables that influence the results of diffusion assays are inoculum density, agar depth, concentration of the substance, diameter of the reservoir, and the time intervals between inoculation and application of the substance, and start of incubation. These variables must be controlled to ensure reproducibility of the results. It is not applicable to substances that diffuse poorly or to slow-growing bacteria under the conditions used. Other methods applied to AgNPs involve a bacterial colony count at the surface of a solid culture medium. This is to assess the number of surviving bacteria after the interaction between a defined bacterial inoculum and different concentrations of the nanoparticles, for a defined period of time. After incubation, the number of surviving bacteria in an agar nutrient, free of the antimicrobial, is compared with the count of viable bacteria in a control without the substance (Marslin et al., 2015; Marianelli et al., 2014). The contact between the bacteria and the substance could also be in situ on the surface of the agar; after incubation, the resulting colonies are counted and compared with the number of colonies grown in a control without exposure to the AgNPs (Chen et al., 2016; Pal et al., 2007). The agar dilution method also can be used. In this method, the standardization of the inoculum density is one

This work is partly presented at Joint Event on 4th Pharmaceutical Chemistry Conference & 12th World congress on Future Pharma, June 27-28, 2019 at Amsterdam, Netherlands

of the most important variables and satisfactory results can be obtained with 5×103 to 5×104 viable cells/spot (M07-A9 document CLSI). The result is expressed as the minimal concentration required to inhibit bacterial growth (MIC). The agar dilution technique has the advantage of allowing the assay of multiple bacterial strains at once. Moreover, both nutrient agar techniques allow easy detection of contamination by examining the bacterial growth on the agar surface, the nutrient supplementation for testing of fastidious bacteria, and modifications of the incubation conditions to test particular types of bacteria, as long as control strains are included to demonstrate that the modification does not affect the results.

While all the methods available to demonstrate antibacterial activity in vitro use arbitrary conditions different from those found at a site of infection, the growth of a colony in a solid media resembles more the bacterial growth at a site of infection than liquid medium growth (Lorian, 1989). In this study, the in vitro cytotoxicity was assayed against hepatocellular carcinoma (HepG2) cells using MTS Cell Proliferation Assay Kit (Calorimetric) for selected derivatives (11, 61 and 67); among three tested compounds, 61 exhibited cytotoxicity against targeted cells line with IC50 values of 12.5 µg/ml.

This work is partly presented at Joint Event on 4th Pharmaceutical Chemistry Conference & 12th World congress on Future Pharma, June 27-28, 2019 at Amsterdam, Netherlands