2.1 Research Envisaged

Non-sterile products such as pharmaceuticals, cosmetics, food items etc. with a high degree of water availability may be contaminated with microorganisms which may cause spoilage of the product with loss of therapeutic properties and, if they are pathogenic, serious infections can arise (Zani et al., 1997). To inhibit the growth of contaminating microorganism, antimicrobial preservative systems have been developed and introduced into the pharmaceutical, cosmetic or food products during manufacturing process and/or throughout its use by consumers (Denyer et al., 1988).

The commonly used chemical preservatives are reported to have serious side effects. For example, benzalkonium chloride may cause mucosal damage and was also reported as genotoxic and cytotoxic (Deutschle et al., 2006 and Graf, 2006). Thiomerosal used in ocular and nasal preparations was reported to be cytotoxic by Liao et al. (2011). The use of parabens may cause skin cancer, genotoxicity and breast cancer as reported by the study of Dabre and Harvey (2008).

In several cases, the microorganisms became resistant to antimicrobials and are able to degrade many commonly used preservatives especially p-hydroxybenzoates (Close and Nielsen, 1976). Microbial resistance has been reported to some of the commonly used chemical preservatives like benzalkonium chloride, dibromodicyanobutane, chloramine, chlorhexidine, chlorophenol, benzoic acid, dimethyl oxazolidine, dimethyl dithiocarbamate, dimethoxy dimethyl hydantoin, formaldehyde, glutaraldehyde, hydrogen peroxide, iodine, methylene bischlorophenol, methylparaben, propylparaben, phenylmercuric acetate, mercuric salts, povidine-iodine, sorbic acid and quaternary ammonium compounds (Chapman, 1998). The preservative potential of natural organic acids is well established in the literature viz. caprylic acid (Chaudhary et al., 2008), veratric acid (Ohlan et al., 2008), 2,4-hexadienoic acid (Judge et al., 2008) and anacardic acid (Narasimhan et al., 2008).

Literature reports reveals that the ferulic acid possesses antimicrobial, antioxidant and preservative activities (Proestos et al., 2006 and Ou et al., 2006). The gallic acid and its derivatives possess wide spectrum of biological activities like antimicrobial, anticancer, antiviral, anti-inflammatory, analgesic and anti-HIV activities (Chanwitheesuk et al., 2007; Saxena et al., 2008; Thapa et al., 2012; Arunkumar et al., 2009; Krogh et al.,...
Chapter 2. Research envisaged

Development and evaluation of novel preservatives from simple organic acids

2000 and Kratz et al., 2008). Also, the \( p \)-coumaric acid and its derivatives possess wide spectrum of biological activities like antimicrobial and antioxidant (Proestos et al., 2006 and Caia et al., 2004).

Recently, QSAR has gained importance in the field of medicinal chemistry. Quantitative structure activity relationship (QSAR) is a predictive tool for preliminary evaluation of the activity of chemical compounds by using computer-aided models. Quantitative structure–activity relationship (QSAR) technique has increased the probability of success and reduced time and cost involvement in drug discovery process (Pasha et al., 2006). In light of above, the present study was undertaken with the following objective and plan of work:

2.2 Objective of the study
Development and evaluation of novel preservatives from simple organic acids.

2.3 Plan of work

a) Synthesis of amide, anilide and ester derivatives of simple organic acids such as ferulic acid, gallic acid and \( p \)-coumaric acid.

b) Characterization of synthesized compounds by physicochemical and spectral means.

c) Determination of \textit{in vitro} antimicrobial activity of synthesized compounds against representative bacterial and fungal strains by tube dilution method.

d) Determination of minimum bactericidal concentration (MBC) and fungicidal concentration (MFC) of the synthesized compounds.

e) Evaluation of the selected amide, anilide and ester derivatives of ferulic, gallic and \( p \)-coumaric acids for their preservative efficacy in pharmaceutical products as per USP guidelines.

f) Stability Studies of pharmaceutical products prepared with the selected preservatives as per ICH guidelines.

2.4 References


Caia Y, Luob Q, Sunc M, Corkea H. Antioxidant activity and phenolic compounds of Development and evaluation of novel preservatives from simple organic acids

39


