Review Article

Antibacterial activity of (E)-2-(2-Hydroxybenzylideneamino)- 3-methylbutanoic acid

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ABSTRACT

The (E)-2-(2-hydroxybenzylideneamino)-3-methylbutanoic acid compound derived from the reaction of salicylaldehyde and valine has been synthesized and investigated by several tools; in terms, CHN elemental analysis, infrared, ultraviolet and mass spectra. The CHN elemental analysis data showed the formation of recommended compound. Infrared spectral data agreed with the functional groups present in the synthesized compound. The obtained ultraviolet spectral data suggested the presence of π- π*(phenyl ring) and n- π* (-HC=N) group transition. The mass spectral results revealed the possible fragmentations in the (E)-2-(2-hydroxybenzylideneamino)-3-methylbutanoic acid. The antibacterial activity of the compound was studied, and the results showed that the (E)-2-(2-hydroxybenzylidene amino)-3-methyl butanoic acid is moderate effect against *Klebsiella Pneumonia* at all concentrations used similarly, (E)-2-(2-hydroxybenzylideneamino)-3-methylbutanoic acid also exhibited an effect against *Escherichia coli* and *Staphylococcus aureus* only at concentration 0.016M. No effect was observed against other bacteria used.

Keywords: Salicylaldehyde, Valine, and antibacterial *activity.*

INTRODUCTION

Salicylaldehyde and valine compounds have sites of –CHO, -OH, -NH_2 and -COOH which are able to form large number of complexes with non-transition and transition metal ions.[1] The Schiff base of salicylaldehyde and 1, 6-hexanediamine was synthesized and characterized[2] by using several physical tools. Seven salicylaldehyde amino acid Schiff bases were synthesized and characterized by means of electronic spectra,[3] which are helpful to investigate the label of radionuclides with seven ligands in water for radiopharmaceutical study. Hepatotoxicity of three Schiff bases of [N-(1-phenyl-2-hydroxy-2-phenylethylidine] -2,4-dinitrophenylhydrazine, [N-(1-phenyl-2-hydroxy-2-phenylethylidine-2-hydroxy phenylimine] and [N-(2-hydroxybenzylidine-2-hydroxtphenylimine] was studied.[4] The parameters selected were serum level of the enzymes alanine trnasaminase , aspartic transaminase, alkalinephosphatase, glucose, blood urea and cholesterol. In mice with no carcinoma there was a modest increase in all the above parameters during the treatment period (10 consecutive days at the dose of 2 mg/kg. After treatment the enhanced values gradually decreased to normal levels. Ben-Gwerif et al.[5] reported that Schiff base chelates derived from salicylaldehyde and tryptophan had a great activity against different pathogenic gram positive and gram negative bacteria.

The present paper aims to synthesis, characterize and study the antibacterial activity of the (E)-2-(2-hydroxybenzylideneamino)-3-methylbutanoic acid compound derived from salicylaldehyde and valine.

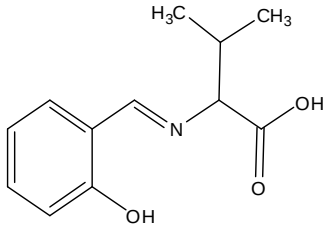
Experimental

Chemicals

All chemicals used in this investigation were reagent pure of BDH or Aldrich and the organic solvents were obtained as pure grade materials from BDH. Water always used as double distilled.

Synthesis of (E)-2-(2-hydroxybenzylideneamino)-3-methylbutanoic acid

The compound was synthesized by mixing an ethanolic solution of salicylaldehyde (0.01 mole; 1.22 g) with Valine (0.01 mole; 1.17 g) in the same solvent. After the condensation for two hours, pale Yellow crystals appeared. The crystals were filtered and washed with hot ethanol, recrystallized from hot ethanol to give pale yellow crystals and dried at ambient temperature with 82 % yield and its purity was confirmed by TLC technique.



(*E*)-2-(2-hydroxybenzylideneamino)-3-methylbutanoic acid

Measurements

The elemental analyses of the synthesized compound estimate the percent of carbon, hydrogen and nitrogen. These elemental analyses have been performed at micro analytical centre, Cairo University, Egypt using per kin –Elmer 2400 CHN elemental analyzer. The infrared spectrum of the compound in the range of 4000-500 cm^{-1} was recorded as KBr disk using IFS-25DPUS/IR spectrometer (Bruker) 1998Y. The ultraviolet spectrum of the compound under investigation was measured in $CHCl_3$ solvent using a per kin–Elmer lambda 4B spectrophotometer. Mass spectrum was carried out using Q 1000 EX GC-MS Schimadzu spectrometer at 70 ev and AM energy using a direct insertion probe at temperature 90-100 ^oC. The TLC technique was used to confirm the purity.

Bacterial culture

The antibacterial activity of the (E)-2-(2-hydroxybenzylideneamino)-3-methylbutanoic acid derived from salicylaldehyde and valine was studied against pathogenic bacteria; *Escherichia coli, pseudomonas aeruginosa, klebsiella pneumoniae, proteus mirabilis, staphylococcus aureus* and *streptococcus pyogens.* All isolates were isolated and confirmed in Al- Jamahiriya hospital. Different weight of the (E)-2-(2-hydroxybenzylidene amino)-3-methylbutanoic acid; 0.02M, 0.016M and $8x10^{3-}$M were placed on the surface of nutrient agar contained the pathogenic bacteria and incubated at 37^OC for 24 hours. The average of inhibition zone (mm) was recorded.

RESULTS AND DISCUSSION

Microanalysis

The obtained elemental analysis data of the (E)-2-(2-hydroxybenzylidene amino)-3-methylbutanoic acid (C% 63.00 , H% 6.78 and N% 6.33) are in good agreement with its theoretical values (C% 65.01 , H% 6. 77 and N% 6.32).

Infrared and ultraviolet spectra

The infrared spectrum of the (E)-2-(2-hydroxybenzylideneamino)-3-methylbutanoic acid under investigation (figure) showed a band at 1612 cm^{-1} due to –HC=N bond.[6] Meanwhile there is a band at 3145 cm^{-1} which could assigned to the formation of hydrogen bond.[7] The $\upsilon_{(C-H)}$ is proved by the band -C-H group at 2941 cm^{-1}, and $\upsilon_{(COOH)}$ vibration is appeared at 1394 cm^{-1}.[8] The ultraviolet spectrum of the compound exhibited several bands corresponding to π- π* (phenyl ring) and by n- π* (-HC=N) transitions.[9]

Mass spectrum

The mass spectrum of the compound (Figure-1) which supports its structure is given in schemes1. The base peak at 197 is corresponding to the loss of OH and 7 hydrogen atoms from the original molecular weight of the compound.[10]

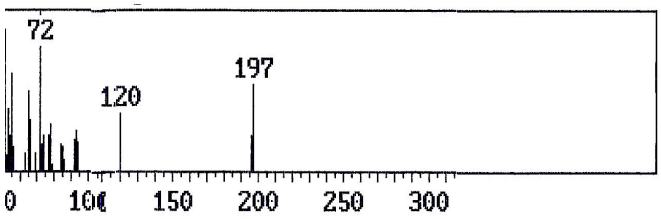
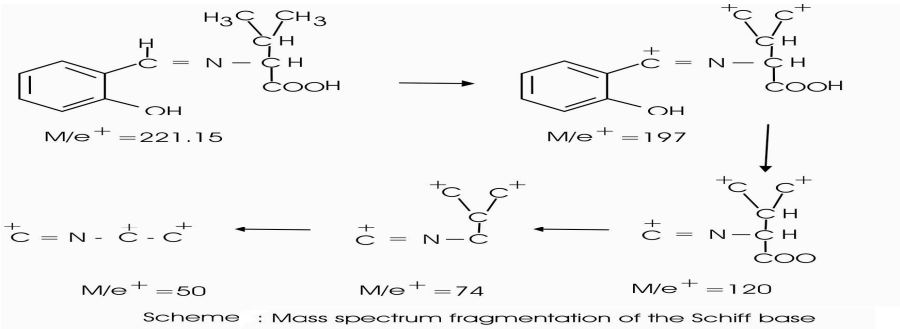


Fig. (1): Mass spectrum of the compound



Scheme : Mass spectrum fragmentation of the Schiff base

Antibacterial activity

The results of the antibacterial activity showed that moderate activity for (E)-2-(2-hydroxybenzylideneamino)-3-methylbutanoicacid against *Escherichia coli* and *staphylococcus aureus* only at concentration 0.016M. Similar effect was observed against klebsiella *pneumonia* at all concentrations used. However, low effect was recorded against *pseudomonas aeruginosa* only at concentration 0.02M. In contrast, no effect was observed against *proteus mirabilis* and *streptococcus pyogens* at all concentrations used. Similar results were observed by El-Ajaily et al. [11] These results suggested that (E)-2-(2-hydroxybenzylideneamino)-3-methylbutanoic acid has a good effect against *Escherichia coli* and *klebsiella pneumonia.*

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