

NEW ORGANOTIN(IV) COMPLEXES DERIVED FROM 3,4-DIHYDROXYBENZALDEHYDE(4)-ETHYL-3-SEMICARBAZONE LIGAND : SYNTHESIS, CHARACTERISATION AND BIOLOGICAL ACTIVITY

Baidaa K. Al-Rubaye¹, Nasry Jassim Hussien², Abdul Salam A. Abul Rahman², Siti Fairus M. Yusoff³, Enaam I. Yousif¹ and Mohamad J. Al-Jeboori^{1*}

¹Department of Chemistry, College of Education for Pure Science (Ibn Al-Haitham), University of Baghdad, Baghdad, Iraq.

²Department of Chemistry, College of Education for Pure Science, University of Diyala, Iraq.

³School of Chemical Sciences and Food Technology, Faculty of Science and Technology, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia.

*e-mail: mohamadljeboori@yahoo.com

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ABSTRACT : Two new organotin(IV) complexes Me₂Snesc (C1) and Bu₂Snesc (C2) have been synthesised from the reaction of the corresponding organotin(IV) chloride with the Schiff base ligand 3,4-dihydroxybenzaldehyde-4-ethylsemicarbazone (H₂esc). The ligand was prepared in two steps. The first step includes the formation of 4-ethylsemicarbazide, which then reacted with 3,4-dihydroxybenzaldehyde to give the title ligand. Complex formation between the organotin(IV) moiety and the anionic form of 3,4-dihydroxybenzaldehyde-4-ethylsemicarbazone occurred through the o-dihydroxy positions. The ligand and its complexes were characterised by elemental analysis, FT-IR and NMR (¹H, ¹³C and ¹¹⁹Sn) spectroscopy. Accordingly, the complexes were proposed to have tetrahedral geometry. The ligand and its tin(IV) complexes were screened for their antimicrobial activities against some Gram-positive and Gram-negative bacteria. The studies demonstrated that complexation can increase the antimicrobial activity, compared with the free ligand.

Key words : Semicarbazone ligand, Organotin(IV) complexes, structural study, biological activity.

INTRODUCTION

Carbazone compounds (thiosemicarbazones and semicarbazones) are an interesting class of compounds that played a key role in the development of organic chemistry. These species and their metal complexes have been extensively studied by researchers, mainly because of their potential biological properties (Ho *et al*, 2013; Garbelini *et al*, 2012 and Shih, 2014). It is well known that scientists have worked extensively in the development of synthetic approach to obtain thiosemicarbazone compounds. However, less attention has been devoted to the synthesis of the structurally analogous semicarbazones and their metal complexes. Semicarbazones can coordinate to the metal ion either as neutral or deprotonated ligands through two or three donor atoms. In order to obtain novel ligands containing semicarbazone moieties, appropriate precursors should first be designed and synthesised. Semicarbazones are amongst the most important nitrogen/ oxygen donor ligands. The real steam behind the development of the coordination chemistry of these potential ligands may

probably due to their remarkable biological activity. Further, their antitumor (Dunn *et al*, 1977), antiviral (Jones *et al*, 1965) and antimalarial (Klayman *et al*, 1979 and Klayma *et al*, 1983) activity observed for some of these derivatives may be related to their metal-complexing ability. Literature shows that these type of compounds exhibit several structural arrangements, upon complexation, with transition metal ions. On the other hand, the chemistry of organotin(IV) complexes of Schiff bases has been extensively studied due to their structural diversity, thermal stability, and to possess mild-to-good antitumor (Koch *et al*, 2008; Gielen *et al*, 2005), antimicrobial (Basu Baul *et al*, 2008; Al-Allaf *et al*, 1996), antifungal (Sirajuddin *et al*, 2012; Yenis_ehirli *et al*, 2012), antibacterial (Sirajuddin *et al*, 2012; Yenis_ehirli *et al*, 2012), antioxidant (Gonzalez *et al*, 2009) or antiinflammatory properties (Gonzalez *et al*, 2009; Nath *et al*, 2009). However, the mode of biological activities of the organotin(IV) compounds is not completely known. The structure of the organotin(IV) complexes, coordination number, the extent of alkylation and the