

Synthesis, spectral characterization and biological activities of Organotin(IV) complexes with *ortho*-vanillin-2-hydrazinopyridine (VHP)

Norrihan Sam, Md Abu Affan*, Md Abdus Salam*, Fasihuddin B. Ahmad, Mohd Razip Asaruddin

Department of Chemistry, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, Kota Samarahan, Malaysia.
Email: *maaffan@yahoo.com; *salambpx@yahoo.com

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ABSTRACT

Five new organotin(IV) complexes of *ortho*-vanillin-2-hydrazinopyridine hydrazone with formula $[R_nSnCl_{4-n}(VHP)]$ [$R = Me_2$, $n = 2$ (2); $R = Ph_2$, $n = 2$ (3); $R = nBu_2$, $n = 2$ (4); $R = nBu$, $n = 2$ (5) and $R = 1$, $n = 0$ (6)] have been synthesized by direct reaction of *ortho*-vanillin-2-hydrazinopyridine hydrazone [(VHP), (1)], base and organotin(IV) chloride(s) in absolute methanol. The hydrazone ligand [(VHP), (1)] and its organotin(IV) complexes (2-6) have been characterized by UV-Visible, FT-IR and 1H NMR spectral studies. Spectroscopic data suggested that in the complexes (2-4), the ligand (1) acted as a neutral bidentate ligand and is coordinated to the tin(IV) atom via the azomethine nitrogen and pyridyl nitrogen atoms, whereas the ligand (1) acted as a uninegative tridentate ligand and coordinated to the tin(IV) atom through phenolic-O, azomethine-N and pyridyl-N atoms in complexes (5-6). The toxicity of the ligand (1) and its organotin(IV) complexes (2-6) were determined against *Artemia salina*. Organotin(IV) complexes showed moderate activity against *Artemia salina*. The ligand (1) and its organotin(IV) complexes (2-6) were also tested against four types of bacteria namely *Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli* and *Enterobacter aerogenes*. All organotin(IV) complexes and the free ligand (1) showed better antibacterial activities against bacteria. Among the organotin(IV) complexes (2-6), diphenyltin(IV) complex (3) showed higher activity against the four types of bacteria.

Keywords: Hydrazone; Organotin(IV) Complexes; Spectral Analyses; Toxicity; Antibacterial Activity

1. INTRODUCTION

Ortho-vanillin is an organic compound which can be found

in the extracts and essential oils of many plants (Figure 1) [1]. This type of vanillin is differing from ordinary vanillin (4-hydroxy-3-methoxybenzaldehyde) where the hydroxyl group is in the *para*-position.

Many researches have been used 4-hydroxy-3-methoxybenzaldehyde (vanillin) to synthesize of transition metal complexes with hydrazone ligands but less research using *ortho*-vanillin. The *ortho*-vanillin Schiff base derivative and its Cu(II) complexes were conducted by Nives Galić *et al* [2]. They studied the tautomeric and protonation equilibria of *ortho*-vanillin Schiff base derivative and its Cu(II) complexes. Vanillin-thiosemicarbazone and its organotin(IV) complexes have been synthesized by Singh *et al* [3]. The author found that all organotin(IV) complexes showed higher activity toward tested bacteria (*Bacillus cereus*, *Nocardia sp.* and *Enterobacter aerogenes*) than the free ligand. Thiagarajan *et al* [4] also were synthesized novel hydrazones from piperidine-4-carboxylic acid methyl ester coupled with 2-chloro pyrimidine along with other vanillin derivatives. They stated that the hydrazone derivatives of vanillin possess antibacterial activities.

To the best of our knowledge, no work has been done on the synthesis of organotin(IV) complexes with *ortho*-vanillin-2-hydrazinopyridine ligand. Therefore, the authors are interested to synthesize, characterize and also to study the biological activities of organotin(IV) complexes of *ortho*-vanillin-2-hydrazinopyridine derivatives against *Artemia salina* and different types of bacteria.

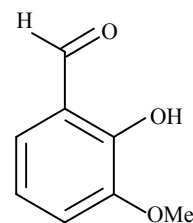


Figure 1. Structure of *ortho*-vanillin (2-hydroxy-3-methoxybenzaldehyde).

*Corresponding author.