Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 5, Issue, 11, pp. 3419-3421, November, 2013

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

SYNTHESIS AND LARVICIDAL ACTIVITY OF COPPER COMPLEXES CONTAINING AMINO ACID AND PYRIDINE/TRIPHENYLPHOSPHINE

[1,*]Kiruthikajothi, K., [2]Chandramohan, G. and [2]Chandraleka, S.

[1]Department of Chemistry, Bharathiyar University, Coimbatore 641 049, India
[2]Department of Chemistry, A.V.V.M. Sri Pushpam College, Poondi- 613 503, Thanjavur District, Tamilnadu, India

ARTICLE INFO

Article History:
Received 12th September, 2013
Received in revised form
23rd September, 2013
Accepted 13th October, 2013
Published online 19th November, 2013

Key words:
Reduced Schiff base,
Cu(II) complexes,
Larvicidal activity,
Culex and Anopheles

ABSTRACT

Various species of mosquitoes transmit different types of disease like malaria, yellow fever, dengue fever, chikungunya, filariasis and encephalitis to more than 700 million people annually with millions of resultant deaths. The aim of the work is to evaluate larvicidal activity of Cu(II) complex against mosquito. These reduced Schiff base pyridine/ triphenyl phosphine Cu(II) complex were found to have effective against anopheles and Culex mosquito.

INTRODUCTION

Mosquitoes are very wide spread, occurring in all regions of the world. In warm and humid tropical regions, they are active for the entire year. The female mosquitoes are blood eating pests and transmit extremely harmful human and livestock diseases. Some mosquitoes that bite humans routinely act as vectors for a number of infectious diseases causing millions of death every year (Mittal and Subbarao, 2003). Aedes aegypti is known for the transmission of viral diseases such as yellow fever, dengue fever and chikungunya. Anopheles is an important vector, which caused parasitic disease malaria (Fonteuillel *et al*., 1997). Culex and Culiseta are vectors of Bacterial tularemia. The chemicals used in insecticidal sprays will affect the natural environmental conditions (Lokesh *et al*., 2010). Chloro fluro carbon which is released by mosquito coil and liquidators depletes ozone layer. Some insecticides possess a substantial hazard to a variety of animal life and the environment in the form of biomagnifications (Wej Choochote *et al*., 2005). The resistance capacity of mosquitoes increased against insecticides (Kamaraj *et al*., 2011). Thus there is an urgent need for new, effective and eco- friendly mosquito control agents (John odda *et al*., 2008). Schiff base ligand and their copper complexes possess significant antimalarial activities (John *et al*., 1982). It has shown that the presence of 2-pyridylalkylidene essential for antimalarial activities (Vinod *et al*., 2003). Heterocyclic ligands based on ferrocene, pyridine containing transition metal complexes exhibit antimalarial activity (Rishu Katwal *et al*., 2013; Bakir *et al*., 2005). Chanadraleka *et al*. (2011) reported the larvicidal activity of copper (II) complexes of amino acid derived Schiff base with 1,10 Phenanthroline and 2,2' bipyridyl. The aim of the present work is synthesize of copper (II) complexes of amino acid derived Schiff base containing pyridine/ triphenylphosphine and evaluate the larvicidal activity of copper complexes.

Corresponding author: Kiruthikajothi, K.,
Department of Chemistry, Bharathiyar University, Coimbatore 641 049, India

MATERIALS AND METHODS

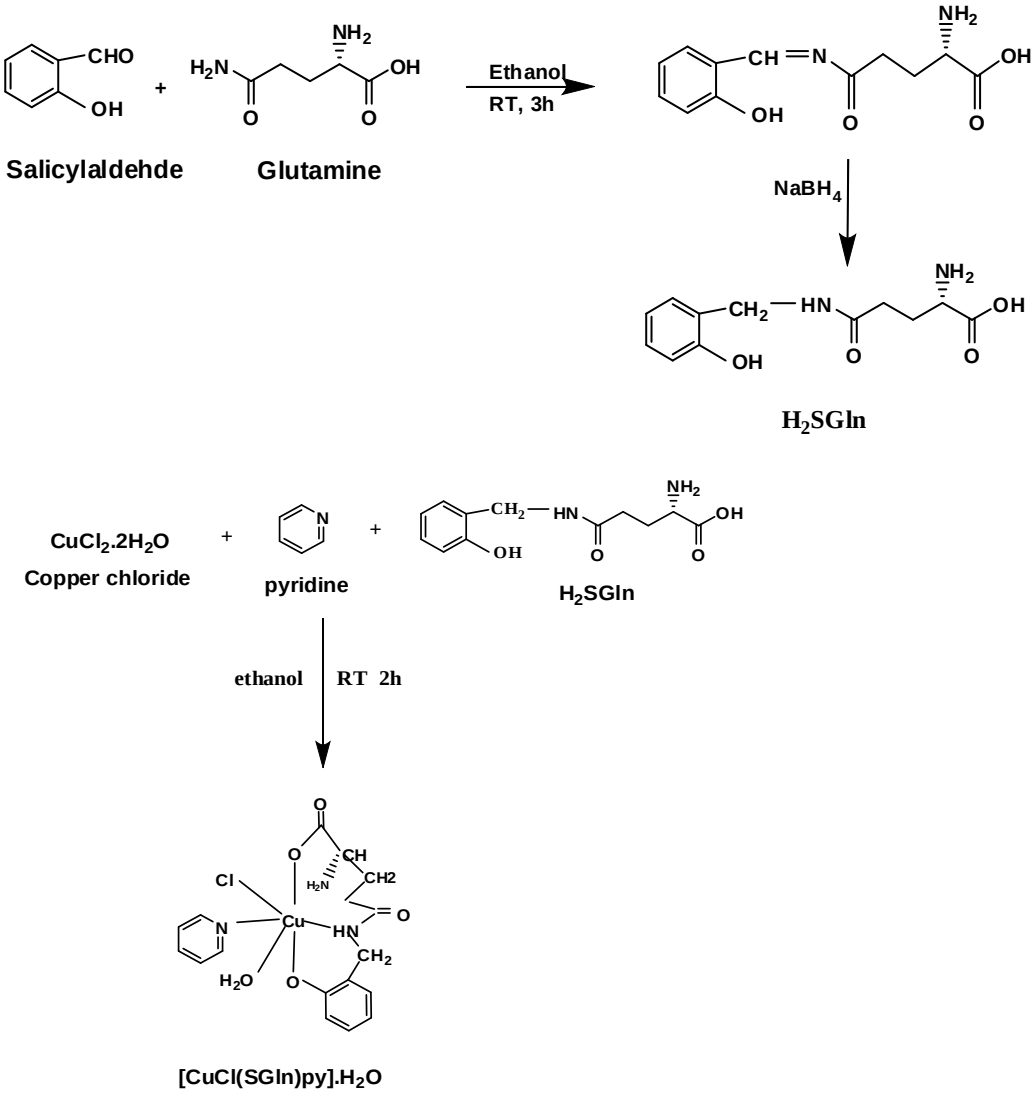
Materials

All the chemicals used were pure and analytical grade. Glutamine, Cysteine, Aspartic acid, Methionine, Salicilaldehyde, Pyridine, Triphenyl phosphine, Cu(II) chloride dihydrate and common reagents such as NaOH, KOH, Sodium boro hydride were purchased from Merck Specialties Private Limited.

Preparation of Ligands

Preparation of H_2SGln from Glutamine

Glutamine (1.462 g, 0.01 M) was dissolved in KOH (0.56 g, 0.01 M) in 10 mL distilled water. Salicilaldehyde (1.221 g, 0.01 M) was dissolved in 10 mL ethanol. Salicylaldehyde solution was added to Glutamine solution and allowed to stir for 3 h. The obtained yellow colour solution was cooled in an ice path. The intermediate Schiff base that had formed was



reduced with 5 mL of Sodium boro hydride (0.378 g, 0.01 M) containing few drops of NaOH solution. The yellow colour slowly discharged and the pH of the solution was adjusted to 3.5 – 6 using few drops of con HCl to obtain the solid precipitate. The obtained precipitate was then filtered and washed with Ethanol and Diethyl ether and allowed to dry completely at room temperature. In a similar manner other ligands H_2SCys from Cysteine, H_2SAsp from Aspartic acid, H_2SMet from Methionine were prepared.

Synthesis of copper (II) complex using pyridine

Copper chloride dihydrate (1.70 g, 0.01 M) was dissolved in 15 mL ethanol. Pyridine (0.791g, 0.01 M) was dissolved in 10 mL ethanol and transferred to copperchloride solution. It was stirred for 10 minutes. The corresponding ligand (0.01M) was dissolved in 10 mL sterile water with KOH (1 mL, 0.01M). The ligand solution was added to it and allowed to stir for 2h at room temperature. The reaction mass was filtered and allowed to evaporate at RT. The resulting solid precipitate was dried in a dessicator for two days.

Synthesis of copper (II) complex using Triphenylphosphine

Copperchloride dihydrate (1.70 g, 0.01 M) was dissolved in 15 mL ethanol. Triphenylphosphine (2.6 g, 0.01 M) was dissolved in 10 mL ethanol and transferred to copperchloride solution. It was stirred for 10 minutes The corresponding ligand was dissolved in 10 mL sterile water with KOH (1mL, 0.001M). The ligand solution was added to it and allowed to stir for 2h at room temperature. The reaction mass was filtered and allowed to evaporate at RT. The resulting solid precipitate was dried in a dessicator for two days. The similar methodology was followed to synthesize copper(II) complexes using four ligands with pyridine and triphenylphosphine. They include copper-salicylaldehyde-Glutamine-pyridine, copper-salicylaldehyde-Glutamine- triphenylphosphine, copper-salicylaldehyde-cysteine-pyridine, copper-salicylaldehyde-cysteine - triphenylphosphine, copper-salicylaldehyde-Aspartic acid-pyridine, copper-salicylaldehyde- Aspartic acid - triphenylphosphine, copper-salicylaldehyde- Methionine - pyridine, copper-salicylaldehyde- Methionine – triphenylphosphine.

Larvicidal assay

The mosquito larvae were collected from stagnant water, open sewage path and pond in Thiruvarur district. In the larvicidal assay, 5 nos of early instar larvae of Culex and Anopheles species were taken in clean sterile test tubes in 1 mL of water. They were exposed to 1 µg/ml concentration of synthesized complex in aqueous and ethanol extracts. Five instar larvae

Table 1. Mosquito larvicidal activity against Culex observed at a concentration of 1 µg/ml (aqueous)

S. No	Name of the complex	Time(hour)						Mortality time in hour	% of larvicidal activity
		1/2	1	1 *1/2*	2	2 *1/2*	3		
1.	[CuCl(SGln)Py]H_2O	2	5					After 1 h	100
2.	[CuCl(SGln)PPh_3]H_2O	0	1	3	4	4	5	After 3 h	100
3.	[CuCl(SCys)Py]H_2O	0	1	2	3	5		After 2 *1/2* h	100
4.	[CuCl(SCys)PPh_3]H_2O	1	3	4	5			After 2 h	100
5.	[CuCl(SAsp)Py]H_2O	0	2	3	4	5		After 2*1/2* h	100
6.	[CuCl(SAsp)PPh_3]H_2O	2	3	4	5			After 2h	100
7.	[CuCl(SMet)Py]H_2O	3	4	5				After 1*1/2* h	100
8.	[CuCl(SMet)PPh_3]H_2O	3	5					After 1h	100

(5 nos) taken in distilled water and ethanol served as control. The tubes were kept for 5 h and observed for mortality of the larvae.

RESULTS AND DISCUSSION

The larvicidal activity of copper complexes in aqueous extract against culex mosquito was tabulated (Table 1) and the percentage mortality of complexes were shown in Fig.1and Fig.2. All copper complexes (aqueous extract) showed 100% mortality after 3 h.

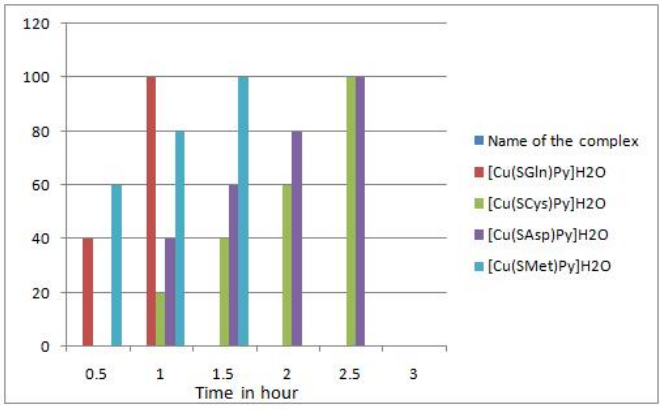


Fig. 1. Percentage mortality of copper pyridine complexes at different time interval

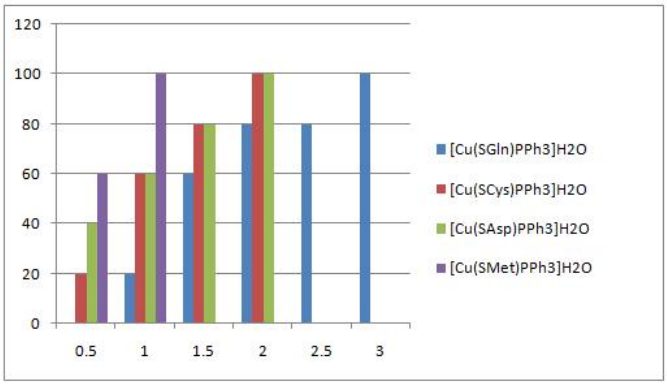


Fig. 2. Percentage mortality of copper triphenylphosphine complexes at different time interval

When compared to pyridine complexes, triphenylphosphine complexes showed effective larvicidal activity. It was found that all copper complexes in ethanol extract showed 100% mortality within 1 h. Table 1:Mosquito larvicidal activity against Culex observed at a concentration of 1 µg/ml (aqueous).

Conclusion

These synthesized copper complexes can be used as a new insecticidal agent for mosquito control.

REFERENCES

Bakir, J. a. Jerash and E. Ali. 2005. J. Coord.Chem.56:1026.

Chandraleka, S., G. Chandramohan, D. Dhanasekaran, P. Meenakumari and A. Panneerselvam 2011. Synthesis and Larvicidal, Haemolytic Activity of Copper(II) Complexes of AminoAcid Derived Schiff Bases. IJPI's Journal of Medicinal Chemistry 2(7).

Fonteuillel. M. D., M. Mondo, M. Ndiays and J. Thonnon 1997. First evidence of natural vertical transmission of yellow fever virus in Aedes aegypfi, its epidemic vector. T. Roy. Soc. Trop. Med. H 91:533-535

John odda, Sibylle Kristensen, John Kabasa and Paul waako 2008. Larvicidal activity of combretum collinum Fresen against Aedes aegypti. J. vector Borne Dis. 45: 321-324

John, P. S., L.K. Daniel and F.F. Charles 1982. J. Med. Chem.24: 1261

Kamaraj, C., A. Bagavan, G. Elango, A. Abduz Zahir, G. Rajakumar, S. Marimuthu, T. Santhoshkumar and A. Abdul Rahuman 2011. Larvicidal activity of medicinal plant extracts against Anopheles subpictus and Culex tritaeniorhynchus. IJMR 134(1): 101-106

Lokesh, R., E. Leonard Barnabas, P. Madhuri, K. Saurav and K. Sundar 2010. Larvicidal Activiy of Trigonella foenum and Nerium Oleander Leaves against Mosquito Larvae Found in Vellore city, India. Current Research Journal of Biological Sciences 2(3): 154-160

Mittal. P. K, Subbarao. S. K. 2003. Prospects of using herbal products in the control of mosquito vectors. ICMR Bull 33: 1-10.

Rishu Katwal, Harpreet kaur and Brij Kishore Kapur 2013. Sci. Revs.Chem. Commun. 3(1): 1-15.

Vinod, K.S., S. Shipra and S. Ankita 2003. J. Bioinorg. Chem.App.13:1

Wej Choochote, Dana chaiyasit, Duangta Kanjanapothi, Eumporn Rattanachanpichai, Atchariya Jitpakdi, Bebjawan Tuetun and Benjawan Pitasawat 2005. Journal of vector Ecology 30(2): 302-309

****