

Original Research Article

Synthesis and evaluation of insecticide efficiency of copper complexes against eriophyid mite, *Aceria guerreronis*

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ABSTRACT

Keywords

Euriophite mite;
salicylaldehyde;
copperchloride;
pyridine;

Mixed coordination Cu complexes have been prepared by reacting CuCl and pyridine/ triphenyl phosphine with reduced Schiff base derived from salicylaldehyde and amino acid. The complexes were evaluated against euriophite mite. The complexes $[CuCl(SMet)PPh_3].H_2O$ and $[CuCl(SGln)PPh_3].H_2O$ show significant activity against mite.

Introduction

Eriophyid mites, *Aceria guerreronis* keifer belonging to family of Eriophyidae are plant parasites. These are one of the most important pest in agriculture¹. These mites are about 200 – 250 long and 36 – 52 in width. The life cycle consists of egg, two larval instars and an adult stage. The total life cycle is completed in 7 – 10 days²⁻³. Eriophyid mite attack coconut plantation and result in both qualitative and quantitative losses in yield. These mites penetrate plant cells, suck up the sap from the coconut tissues. This feeding injures the tender portion tissues. This type of deformation is called a gall⁴. The level of peroxidal is three times greater in infested nuts. Eriophyid mites are dispersed by wind, birds and flying insects. Copper complexes used as herbicides, insecticides,

nematocides and redenticides. Schiff base derived from salicylaldehyde, 2-amino phenol and their copper complexes showed higher pesticidal rates when compared with commercial pesticides⁹⁻¹¹. In the present work copper complexes derived from copper chloride and pyridine/triphenyl phosphine react with reduced Schiff base is reported.

Materials and Methods

All the chemicals used were pure A.R. grade samples. Glutamine, cysteine, aspartic acid, methionine, salicylaldehyde, pyridine, triphenyl phosphine, Cu (II) chloride dihydrate and common reagents such as NaOH, KOH, sodium boro

hydride were purchased from Merck Specialities Private Limited.

Preparation of Ligands

Preparation of Glutamine

Glutamine (1.462 g, 0.01 M) was dissolved in KOH (0.56 g, 0.01 M) in 10 mL distilled water. Salicylaldehyde (1.221 g, 0.01 M) was dissolved in 10 mL ethanol. Salicylaldehyde solution was added to glutamine solution and stirred for 3 h. The obtained yellow colour solution was cooled in an ice path. The intermediate Schiff base formed was reduced with 5 mL of sodiumborohydride (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 H₂SCys from Cysteine, H₂SAsp from Aspartic acid, H₂SMet 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 distilled water with KOH (1mL, 0.01M). The ligand solution was added to it and allowed to stir for 2 h 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 - Asparticacid - triphenylphosphine, copper-salicylaldehyde - Methionine -pyridine, copper - salicylaldehyde - Methionine – triphenylphosphine.

Pesticidal Assay

These mites are so small, the affected trees are identified by plant symptoms. Eight nuts were collected from infected trees.

Figure.1 Preparation of Glutamine

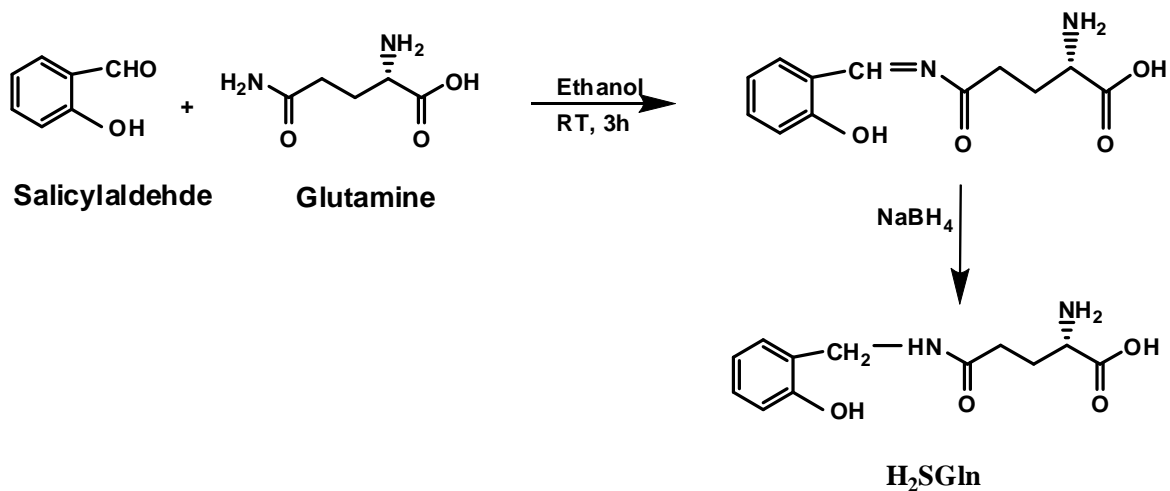


Figure.2 Synthesis of copper (II) complex using pyridine

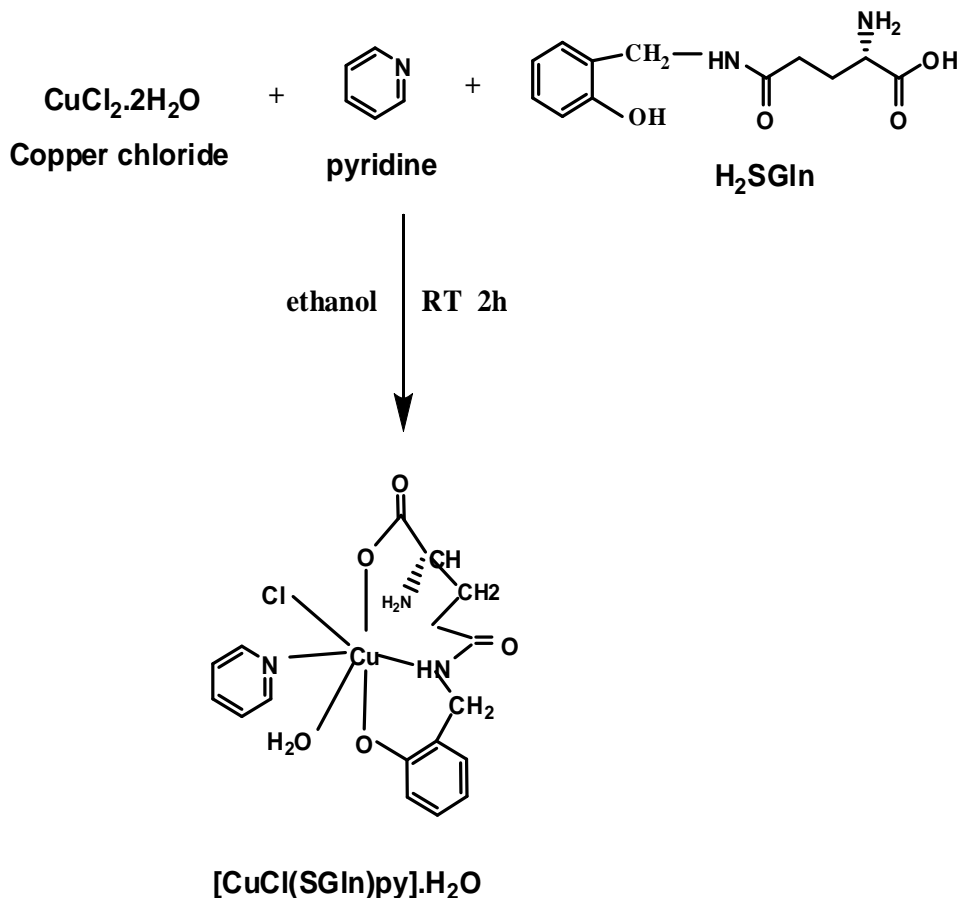
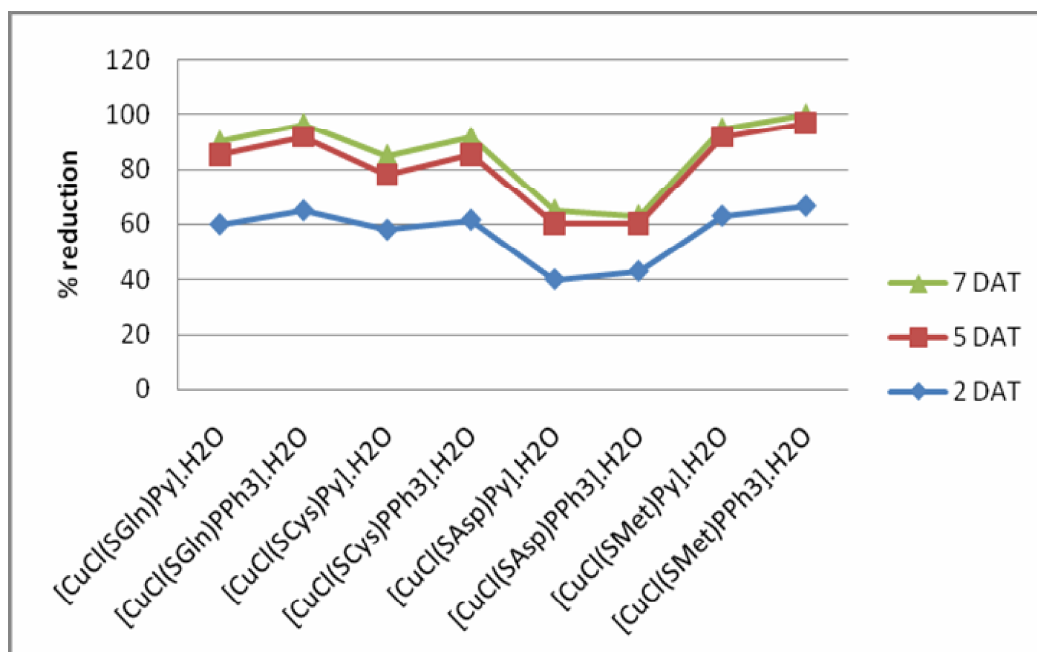


Table.1 Insecticide activity of synthetic Cu(II) complexes

S. No	Name of the complexes	1 DBS	2 DAT	5 DAT	7 DAT	% reduction
1	[CuCl(SGln)Py].H ₂ O	60	36	15	3	90
2	[CuCl(SGln)PPh ₃].H ₂ O	60	39	16	3	96.6
3	[CuCl(SCys)Py].H ₂ O	60	35	12	4	85
4	[CuCl(SCys)PPh ₃].H ₂ O	60	37	14	4	91.6
5	[CuCl(SAsp)Py].H ₂ O	60	24	12	3	65
6	[CuCl(SAsp)PPh ₃].H ₂ O	60	26	10	2	63
7	[CuCl(SMet)Py].H ₂ O	60	38	17	2	95
8	[CuCl(SMet)PPh ₃].H ₂ O	60	40	18	2	100

Figure.1 Percentage reduction of mite 2, 5 & 7 days after spray



They placed in a tray containing sand which was moistened regularly. The copper complexes were made to 0.001M concentration solution. It was sprayed on infected nuts. In each nut 4 sq.mm. was taken for observation. Observations were recorded at 1 day before, 2 , 5 and 7 days after spray.

Results and Discussion

The percent reduction of mite and efficiency of pesticides were calculated and tabulated. The analysis of results was shown in graph-1. The complex $[\text{CuCl}(\text{SMet})\text{PPh}_3]\cdot\text{H}_2\text{O}$ show 100 % mite reduction. The complexes $[\text{CuCl}(\text{SGln})\text{PPh}_3]\cdot\text{H}_2\text{O}$, $[\text{CuCl}(\text{SMet})\text{Py}]\cdot\text{H}_2\text{O}$ showed 96.6 % , 95% mite reduction respectively. These three metal complexes exhibit higher insecticide activity compared to commercial insecticide.

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