



Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Preparation of metal-ligand complex and its effect on germination of maize plant

Archana Dinkar Ingle

Laboratory of Materials Synthesis, Department of Chemistry, ACS College, Amravati, India

ABSTRACT

Synthesis of complexes of 2-hydroxy-5-methyl chalcone and 2-Hydroxy-5-methyl-4-methoxy chalcone with metal $FeSO_4$ and $CaCl_2$. The result of effect of ligand metal ion complex on germination, survival and seedling height clearly reveals that the ligand (Chalcone) shows a significant better performance over the all system. The complexes have been characterized by analytical and IR, 1H NMR

Key words: P-cresyl acetate, methyl acetophenone, glacial acetic acid, benzaldehyde

INTRODUCTION

Greshon et al.[1 to 3] reported that the activity of metal chelate is considerably increased as compared to that of antifungal and antibacterial activities of complexes show that they are more active as compared to free ligand and involved [4,5]

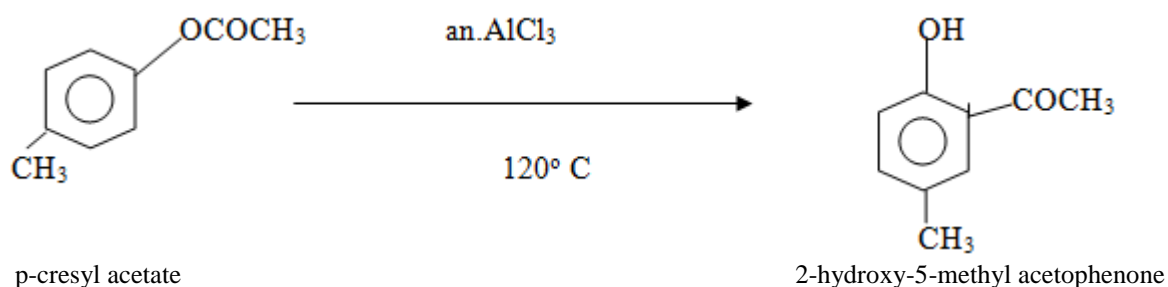
Zielinski et. al.[6] showed that, Lanthanide ion could substitute the calcium ion to produce active enzyme system. Some bivalent metal ion have been reported to be uses of lanthanide necessitate concentrating on the study of lanthanides and ligand for studying the germination pattern. plant growth regulating activity are tested with wheat and cucumbers by Darnall et. al.[7,8] The complex of transition metal with bis-alkyl thiourea are prepared and their herbicidal and Chalcone Synthase Promoters in Petunia Are Active in Pigmented and Unpigmented Cell Types.[9]

Since organic drugs have intense biological activity and since no work is reported on the biological applications of binary complex of Fe(III) with ligand and comparing with pure ligand, metal and control solution doubly distilled water to study the effect of complex, metal, ligand and control solution on germination survival, seedling height, etc on Mohari(Brassica) and Wheat plant in order to make suggestion whether complex, metal and ligand can be used as plant growth regulators.

EXPERIMENTAL SECTION

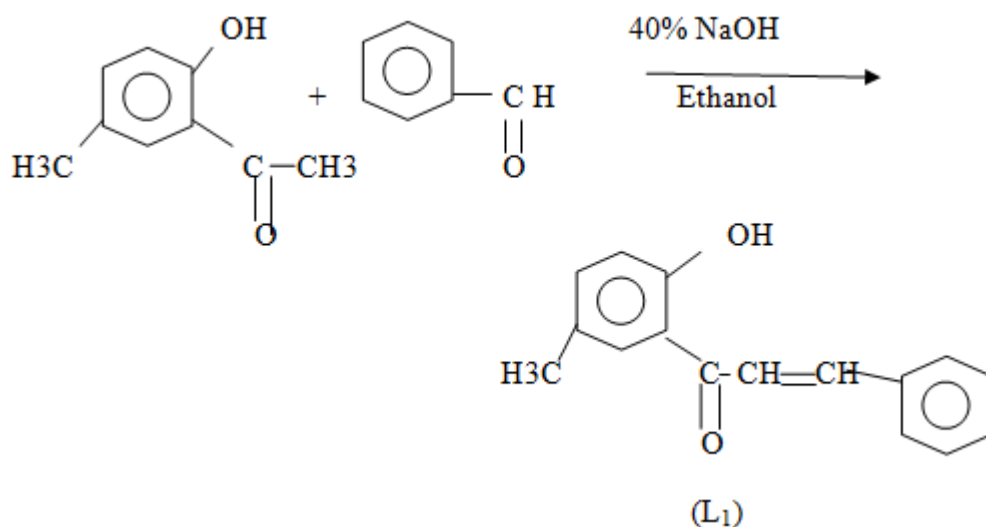
Preparation of 2-hydroxy-5-methyl acetophenone :

p-cresyl acetate was taken in kjeldahl's flask and $AlCl_3$ powdered was added to it in installments. The reaction mixture decomposed in cold dilute hydrochloric acid. Green yellow product 2-hydroxy-5-methyl acetophenone was prepared. For further purification, dissolved in acetic acid and allowing the solution to fall the dropwise into cold water with constant stirring. Solid white solid was obtained, M.P. $50^\circ C$



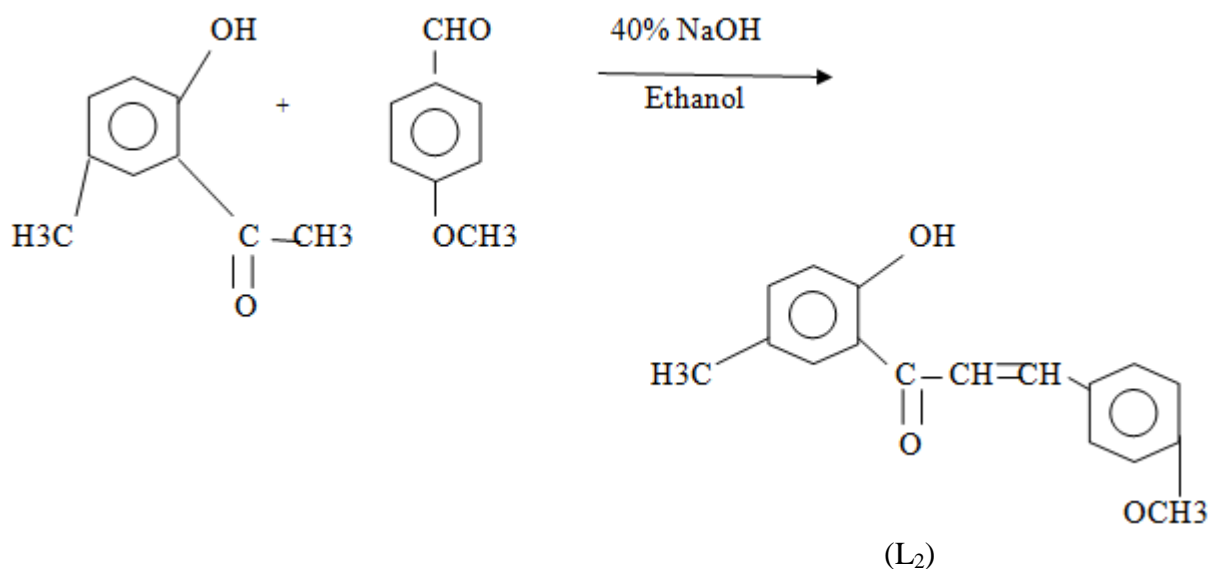
A] Preparation of 2-hydroxy-5-methyl chalcone :

Compound 2-hydroxy-5-methyl acetophenone was dissolved in ethanol. Benzaldehyde was added to this solution and to this hot solution NaOH was added in installment with constant stirring. After some time orange red mass was obtained. Then acidified with ice cold 1:1 HCl then solid washed with NaHCO_3 solution followed by water and crystallized from ethanol-acetic acid mixture, yellow crystals. M.P. 99° C



B] Preparation of 2'-hydroxy-5'-methyl-4-methoxy chalcone :

Compound 2-hydroxy-5-methyl acetophenone and anisaldehyde were dissolved in ethanol by heating. To this hot solution NaOH was added ice cold with constant stirring to yield reddish mass. The it was acidified with ice cold 1:1 HCl then solid washed with NaHCO_3 solution followed by water and crystallized from ethanol-acetic acid mixture, to get an yellow crystals. M.P. 98° C



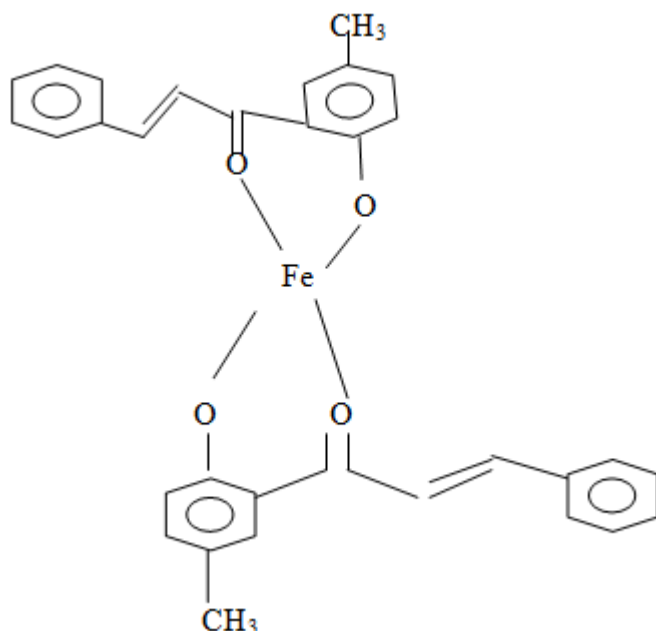
Preparation of complex FeSO₄, CaCl₂ with ligand (L₁) :**Preparation of complex FeSO₄ metal ion with ligand (L₁) :**

A worm ethanolic solution of metal sulphate were added to ethanolic solution of ligand (L₁) in ethanol. resulting solution were refluxd for 6 hours. The complex thus formed was filtered and washed with alcohol and dried in vaccum.

- M.P. 112⁰
- Molecular formula C₃₂H₂₆FeO₄
- Solubility : Soluble in DMSO, ethanol, chloroform.
- IR spectrum of complex (Fe⁺⁺ -L₁) showed the following absorbtion bands.

Sr. No.	Absorption (cm ⁻¹)	Assignment for group	Literature value (cm ⁻¹)
1	530.48, 829.39	Fe-O	450-1000
2	1569.91	(Ali) C=C	1500-1600
3	1638.83	Ar C=C	1600-1650
4	1695.52	C=O gr	1690-1715
5	2920.02	(Ali) C-H	2850-3000

From analysis the chemical properties analytical data and the spectral analysis, the complex Fe⁺⁺ -L₁ was assigned the structure.



Molecular Weight =530.41

Exact Mass =530

Molecular composition = C 72.46%, H 4.94 % , Fe 10.53 % , O 12.07%

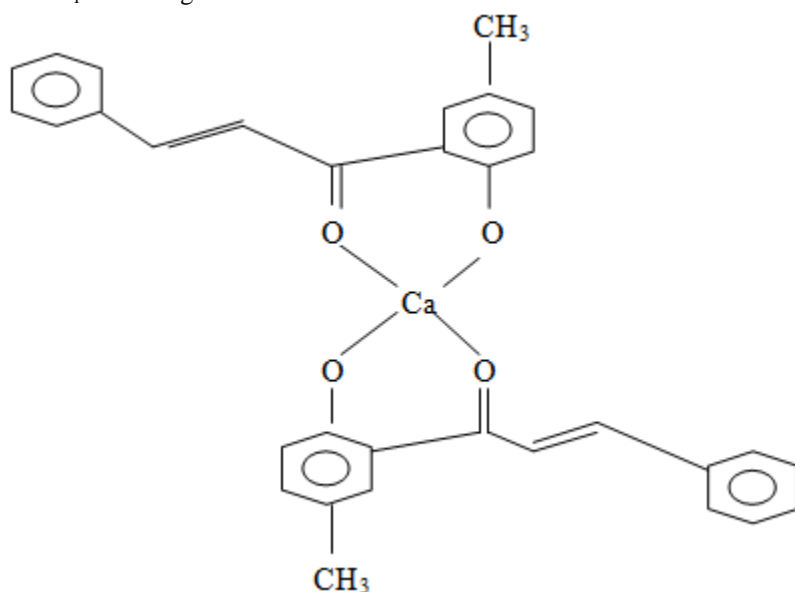
Preparation of complex CaCl₂ metal ion with ligand (L₁) :

A worm ethanolic solution of metal sulphate were added to ethanolic solution of ligand (L₁) in ethanol. resulting solution were refluxd for 6 hours. The complex thus formed was filtered and washed with alcohol and dried in vaccum.

- M.P. 110⁰ C
- Molecular formula C₃₂H₂₆CaO₄
- Solubility : Soluble in DMSO, ethanol, chloroform.
- IR spectrum of complex (Ca⁺⁺ -L₁) showed the following absorbtion bands.

Sr.No.	Absorption (cm ⁻¹)	Assignment for group	Literature value (cm ⁻¹)
1	575.61, 992.55	Ca-O	450-1000
2	1572.87	(Ali) C=C	1500-1600
3	1636.51	Ar C=C	1600-1650
4	1698.92	C=O gr	1690-1715
5	2920	(Ali) C-H	2850-3000

From analysis the chemical properties analytical data and the spectral analysis, the complex $\text{Fe}^{++}-\text{L}_1$ was assigned the structure.



Molecular Weight =514.64

Exact Mass =514

Molecular composition = C 72.68%, H 5.09 % , Ca 7.79 % , O 12.44%

Preparation of complex FeSO_4 , CaCl_2 metal ion with ligand (L_2) :

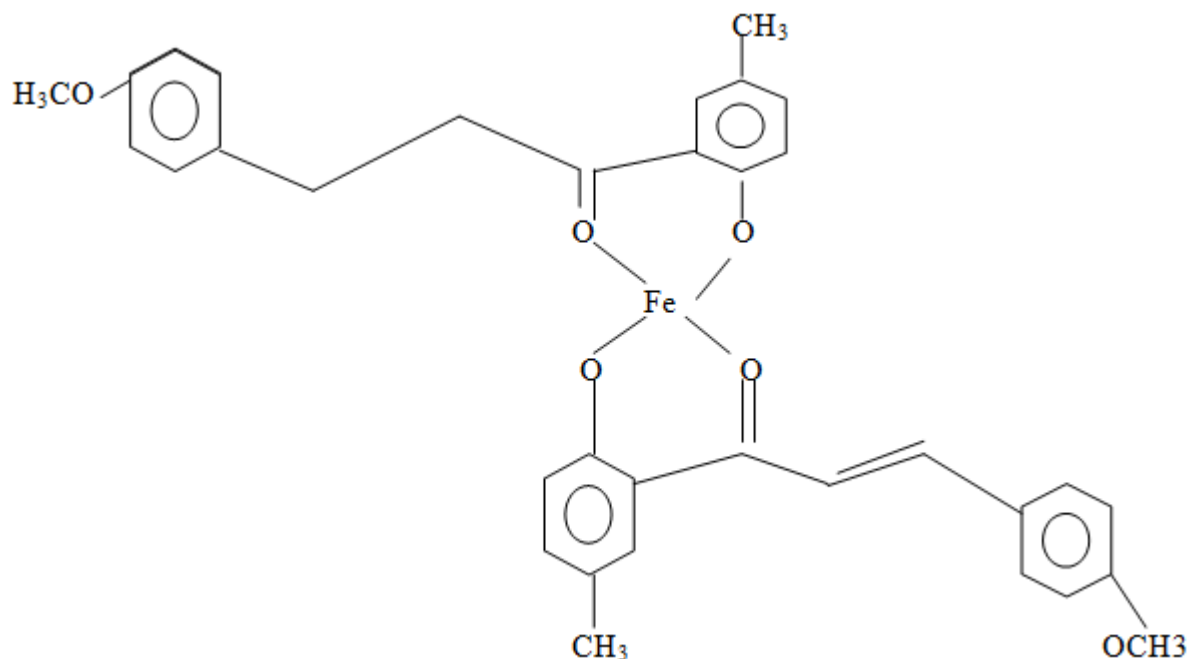
Preparation of complex FeSO_4 metal ion with ligand (L_2) :

A worm ethanolic solution of metal sulphate were added to ethanolic solution of ligand (L_1) in ethanol. resulting solution were refluxd for 6 hours. The complex thus formed was filtered and washed with alcohol and dried in vaccum.

- M.P. 112⁰
- Molecular formula $\text{C}_{34}\text{H}_{30}\text{FeO}_6$
- Solubility : Soluble in DMSO, ethanol, chloroform.
- IR spectrum of complex ($\text{Fe}^{++}-\text{L}_2$) showed the following absorption bands.

Sr. No.	Absorption (cm^{-1})	Assignment for group	Literature value (cm^{-1})
1	540.12, 835.30	Fe-O	450-1000
2	1514.95	(Al) C=C	1500-1600
3	1613.13	Ar C=C	1600-1650
4	1695.22	C=O gr	1690-1715
5	2945.38	(Al) C-H	2850-3000
6	1166.93	C-O	1150-1250

From analysis the chemical properties analytical data and the spectral analysis, the complex $\text{Fe}^{++}-\text{L}_2$ was assigned the structure.



Molecular Weight =590.46

Exact Mass =590

Molecular composition = C 69.16%, H 5.12 % , Fe 9.46 % , O 16.26%

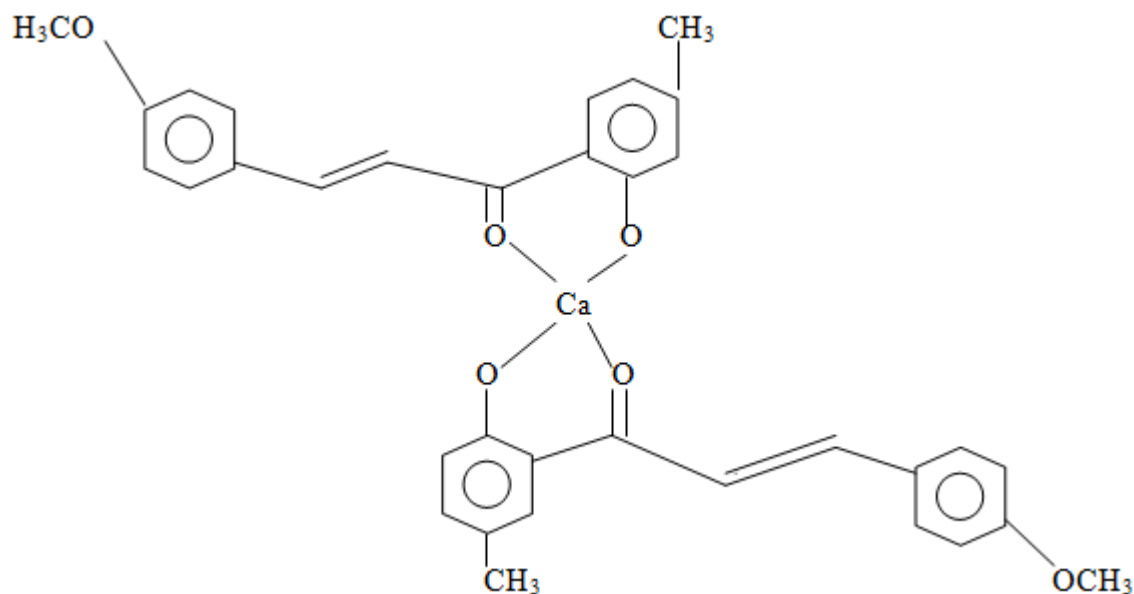
Preparation of complex CaCl_2 metal ion with ligand (L_2) :

A worm ethanolic solution of metal chloride were added to ethanolic solution of ligand (L_1) in ethanol. resulting solution were refluxd for 6 hours. The complex thus formed was filtered and washed with alcohol and dried in vaccum.

- M.P. 110° C.
- Molecular formula $\text{C}_{34}\text{H}_{30}\text{CaO}_6$
- Solubility : Soluble in DMSO, ethanol, chloroform.
- IR spectrum of complex ($\text{Ca}^{++}-\text{L}_2$) showed the following absorption bands.

Sr. No.	Absorption (cm^{-1})	Assignment for group	Literature value (cm^{-1})
1	560.69, 539.08	Ca-O	450-1000
2	1512.28	(Al) C=C	1500-1600
3	1634.49	Ar C=C	1600-1650
4	1697.33	C=O gr	1690-1715
5	2964.99	(Al) C-H	2850-3000
6	1169.55	C-O	1150-1250

From the chemical properties analytical data and spectral analysis, the complex $\text{Ca}^{++}-\text{L}_2$ was assigned the structure as,



Molecular Weight =574.69

Exact Mass =574

Molecular composition = C 71.06%, H 5.26 % , Fe 6.97%, O 16.70%

The result of effect of ligand metal ion complexes on germination :

The root – shoot ratio in all the systems is according to the literature value. The result of effect of ligand metal ion complex on germination, survival and seedling height clearly reveals that the ligand (Chalcone) shows a significant better performance over the all system which is used for comparison in all the parameters which consider for finding out the result

The FeSO₄ alone combination with chalcone , inhibits the germination of as well as development

Of seedling in almost all parameter which are consider here

Table : Effect on Germination of wheat after 4 days.

Sr. No.	Name of complex	Ligand	Root length (cm)	Shoot Length	Shoot /Root Ratio
1	Bis (1-(2-hydroxy-5-methylphenyl)-3-(4-methoxyphenyl)prop-2-en-1-one) Ferrous(II)	L2	4.1	6.8	
2	Bis (1-(2-hydroxy-5-methylphenyl)-3-(4-methoxyphenyl)prop-2-en-1-one) Calcium(II)		3.4	6.5	1.91
3	Bis (1-(2-hydroxy-5-methylphenyl)-3 phenyl prop-2-en-1-one) Ferrous (II)	L1	3.1	6.3	2.03
4	Bis (1-(2-hydroxy-5-methylphenyl)-3 phenyl prop-2-en-1-one) Calcium(II)		2.5	4.2	1.68

Table 2 : Effect on Germination of wheat after 7 days

Sr. No.	Name of complex	Ligand	Root length (cm)	Shoot Length	Shoot /Root Ratio
1	Bis (1-(2-hydroxy-5-methylphenyl)-3-(4-methoxyphenyl)prop-2-en-1-one) Ferrous(II)	L2	5.8	6.7	
2	Bis (1-(2-hydroxy-5-methylphenyl)-3-(4-methoxyphenyl)prop-2-en-1-one) Calcium(II)		5.6	6.3	1.12
3	Bis (1-(2-hydroxy-5-methylphenyl)-3 phenyl prop-2-en-1-one) Ferrous (II)	L1	7.2	9.5	1.31
4	Bis (1-(2-hydroxy-5-methylphenyl)-3 phenyl prop-2-en-1-one) Calcium(II)		5.8	6.9	1.18

REFERENCES

- [1] Greshon. H, Parmegiani, R. and Nicerson. Wed , *J.Appl. Microbiol.*, **1962**, (10),556
- [2] Greshon. H, Parmegiani, R. and Nicerson. Wed , *J.Appl. Microbiol.*, **1963**, (11),62
- [3] Zhiguo, JuChenglian Liu, Yongbing Yuan¹ , *Scientia Horticulturæ*, Volume (63), Issues 3–4, , Pages 175–185
- [4] Shel. A. M. Shariel, E. A. Gharib, A. and Ammar, Y.A.*J.Ind.Chem.Soc.***1968**, (60), 1067
- [5] Shashindharam ,P. and Ramchandra, L.K. *J.Ind.Chem. Soc*, **1985**, (62), 920
- [6] Zielinski, S. Lomosik, L. and Wojciechowska A, *Mh.Chem.* **1970**, (245), 6484
- [7] Darnell, D. W. and Brinhawn , E. R. *J. Bio. Chem*, **1970**, (245), 6484

[8] S Ducki, R Forrest, J A Hadfield, A Kendall, N J Lawrence, A T McGown, D Rennison *J Med Chem.* **2003** Jul 3;46 (14):2813-5

[9] R. E. Koes, R. Van Blokland, F. Quattrocchio, A. J. Van Tunen and JNM. Mol **1990** by American Society of Plant Biologists vol. 2 no. 5 379-392