



Research Article

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Complex of 2-amino acetate-6-fluoro benzothiazole with some metal ion, its effect on germination of wheat plant

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ABSTRACT

Certain metal complexes with ligand 2-amino acetate 6-fluoro benzothiazole with metal ions Ni (II), Cd(II), Co(II), Fe(II), Mg(II) were synthesized in protic medium (1:1) mixture of ethanol and water. The complex prepared were characterized by spectral data. The synthesized compounds were screened for their effect on seed germination of wheat plant.

Key words: Amino acetate, benzothiazole, metal complexes, seed germination.

INTRODUCTION

Benzothiazole are bicyclic ring system with multiple applications. It is the potent inhibitor of human immunodeficiency virus type 1 (HIV -1) replication by HIV -1 protease inhibition [1]. The fluoro benzene -2 substituted benzothiazole act as bioactive molecule [2]. The benzothiazole nucleus associate with antihistamine activity [3] act as fungicides [4] and leishmanicides [5].

As the benzothiazole and substituted benzothiazole also its complexes are having biological activity thus they are screened for effect on germination of seed.

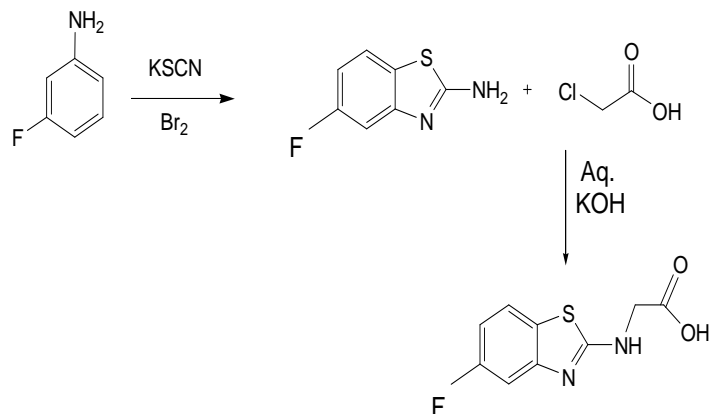
EXPERIMENTAL SECTION

Synthesis of 2-amino 6-fluorobenzothiazole :

A solution of 4-fluoroaniline (0.085 mole) in 95% acetic acid (50 ml) was added to solution of KSCN (0.308 mole) in 95% acetic acid (100 ml). The mixture was cooled to 0 °C & a solution of Br₂ (7.5 ml) in acetic acid (30 ml) was added slowly with stirring, temperature is maintained between 0- 10 °C, the stirring was continued for 1 hour at 5 °C & then mixture was poured into water. The solid was collected, washed with water and recrystallized from ethanol.

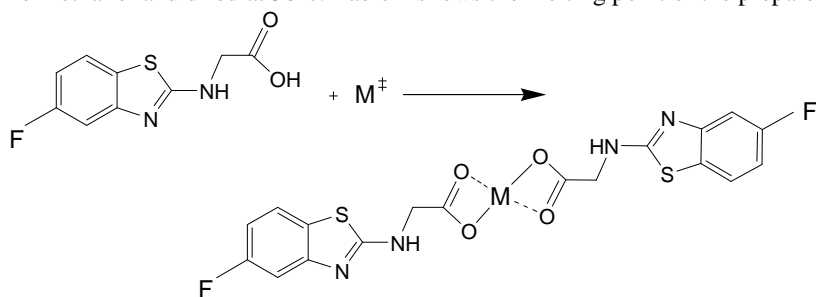
Synthesis of 2-amino acetate, 6-fluorobenzothiazole

A mixture of 2-amino 6-fluoro benzothiazole (0.1 mole) and chloroacetic acid (0.1 mole) in presence of KOH reflux for 3 hours to get 2-amino 6-fluoro acetic acid benzothiazole. The steps of synthesis of 2-amino 6-fluoro acetic acid benzothiazole can be shown below

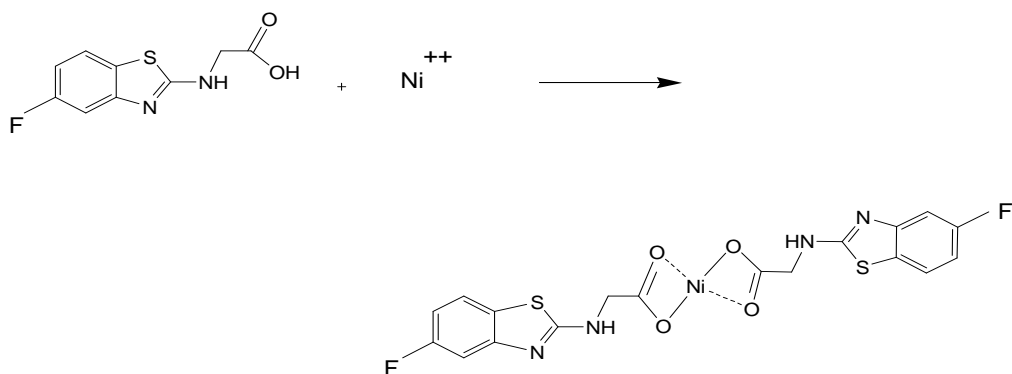


PREPERATION OF COMPLEXES:

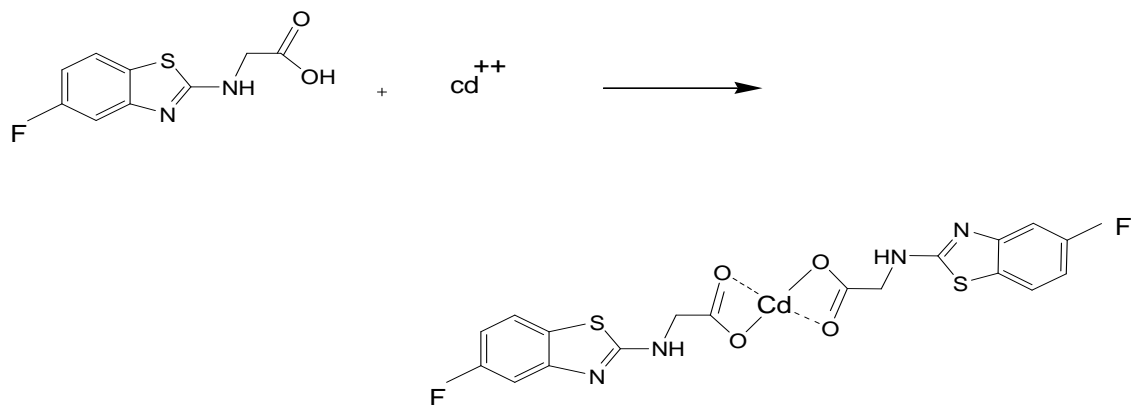
Addition of ethanol solution of the suitable metal salt (Nickel acetate tetrahydrate, Tin chloride, Copper acetate, Cadmium acetate dihydrate and (Zinc acetate dihydrate) to an ethanol solution of 2-thioacetic acid benzothiazole in 2:1 (ligand: metal[6-7] molar ratio) was carried out. After reflux for half an hour, crystalline colored precipitates formed at room temperature. The rustling solids were filtered off, washed with distilled water, dried and recrystallized from ethanol and dried at 50°C. Table 1 shows the melting point of the prepared compounds.



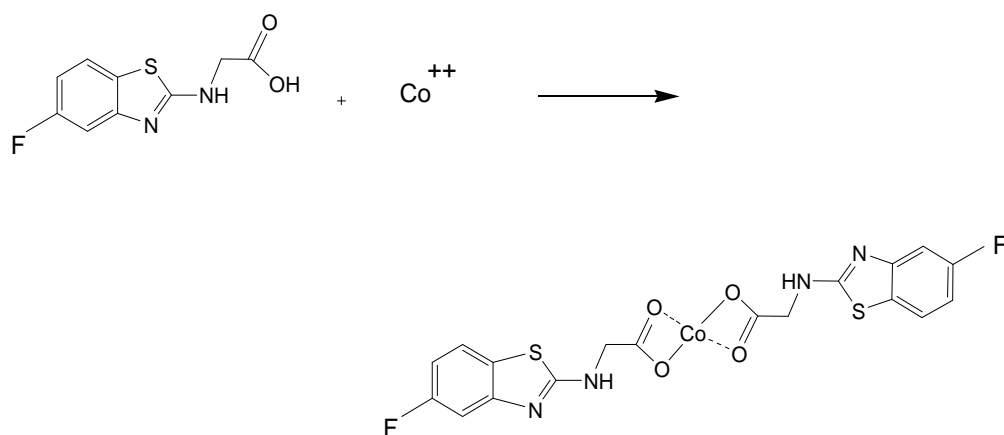
1) Synthesis of Complex with Ni(II)



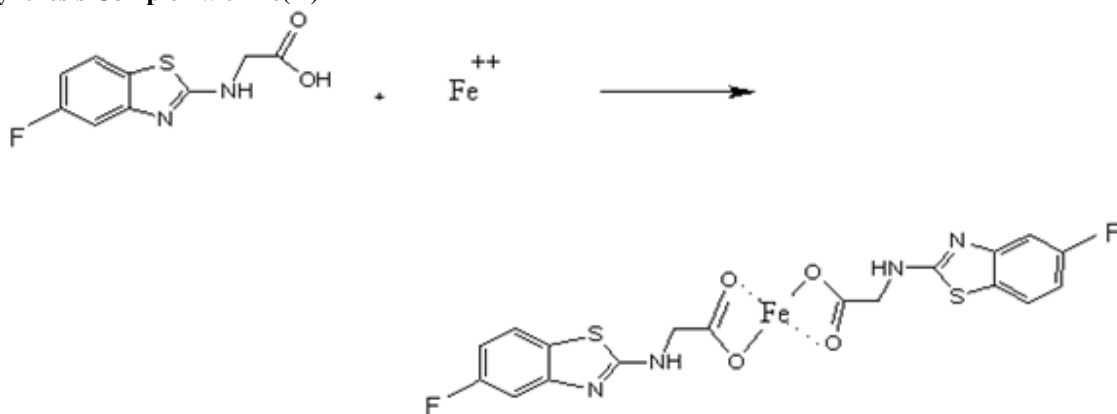
2) Synthesis Complex with Cd(II)



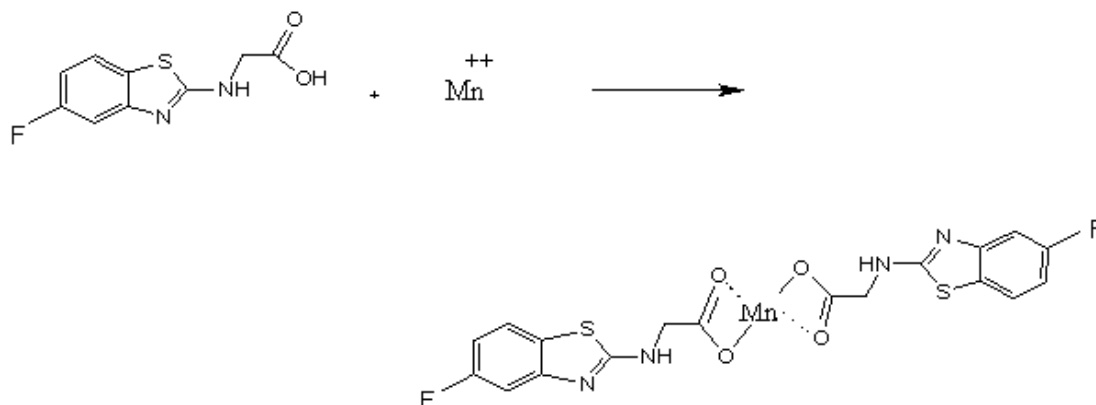
3) Synthesis Complex with Co(II)



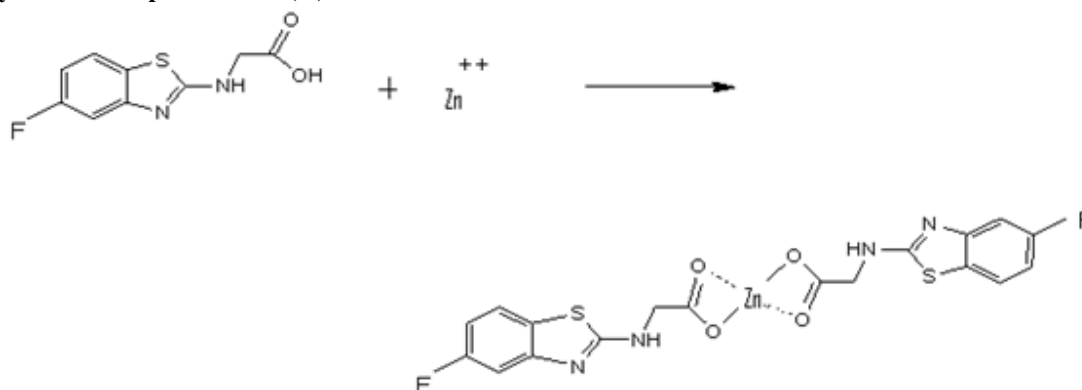
4) Synthesis Complex with Fe(II)



5) Synthesis Complex with Mn(II) :



6) Synthesis Complex with Zn(II) :



Instrumentation :

Table 1: Physical data of the ligand and the metal complexes melting point & colour)

Sr.no	symbol	Compound	Colour	Melting point
1	LH	2 amino 6 fluoro acetic acid benzothiazole	cremish	140 ^o C
2	Ni LH	Nickel 2 amino 6 fluoro acetic acid benzothiazole complex	Greenish	82 ^o C
3	Cd LH	Cadmium 2 amino 6 fluoro acetic acid benzothiazole complex	creamish	80 ^o C
4	Co LH	Cobalt 2 amino 6 fluoro acetic acid benzothiazole complex	Blue	78 ^o C
6	Cu LH	Cu 2 amino 6 fluoro acetic acid benzothiazole complex opper	Yellowish green	234 ^o C
6	Fe LH	Iron 2 amino 6 fluoro acetic acid benzothiazole complex	Yellowish brown	195 ^o C
7	Zn LH	Zinc 2 amino 6 fluoro acetic acid benzothiazole complex c	Whitish	Above 300 ^o C
8	Mg LH	Magnesium 2 amino 6 fluoro acetic acid benzothiazole complex c	cream	230 ^o C

Infra-red spectroscopy :

Table 2: The IR spectral analysis of compound showed the presence of following absorption bands

Sr no	Name of compound	V(C=O)cm ⁻¹	V(C=N)cm ⁻¹	V(M-O) cm ⁻¹	V(C=C)cm ⁻¹ Aliphatic	V(C=C)cm ⁻¹ aromatic
1	LH	1857.74	1464.75	-	1606.88	1641.01
2	Ni LH	1845.32	1484.49	600.23-847.08	1614.57	1646.51
3	Cd LH	1748.89	1475.85	605.10-85027	1604.60	1622.17
4	Co LH	1748.89	1475.85	594.56-849.09	1604.60	1622.17

The reaction between metal and ligand gave different type of complexes in free ligand, 857.74 but on complexation these bands were shifted to a lower frequency region.

The shift is due to complexation of metal to a ligand[8] through oxygen of carbonyl group stretching of metal oxygen bond of a complex appeared in low frequency region.

NMR spectroscopy also show good solubility in DMSO .The proton nuclear magnetic resonance spectral data gave additional support for the composition of the complexes .

Effect of ligand / complexes on the germination of wheat plant seed

As the metal are important constituent for growth and development of plant .the attempt have been made to study the effect of complexes on germination of seed. A simple and fast method is carried out for the quantification of inhibitory effect of metal complexes on germination of wheat plant .the parameter used to study are root elongation , shoot elongation as a varying parameter .the metal ion selected for the study were Ni ,Cd, Co, Mg, Fe, Cu, Zn .

Table 3: Effect on germination after 4 day

Sr.no.	Name of complex	Root length(cm)	Shoot length(cm)	Shoot/root length(cm)
1	Nickel 2 amino 6 fluoro acetic acid benzothiazole complex	3.4	6.5	1.91
2	Cadmium 2 amino 6 fluoro acetic acid benzothiazole complex	No growth	-	-
3	Cobalt 2 amino 6 fluoro acetic acid benzothiazole complex	Only seedling are seen	-	-
4	Cu 2 amino 6 fluoro acetic acid benzothiazole complex opper	2.5	1.6	0.51
5	Iron 2 amino 6 fluoro acetic acid benzothiazole complex	2.7	3.5	1.29
6	Zinc 2 amino 6 fluoro acetic acid benzothiazole complex c	No growth	-	-
7	Magnesium 2 amino 6 fluoro acetic acid benzothiazole complex c	2.6	1.2	0.46

Table 4: effet on germination after 8 days

Sr.no.	Name of complex	Root length(cm)	Shoot length(cm)	Shoot/root length(cm)
1	Nickel 2 amino 6 fluoro acetic acid benzothiazole complex	4.3	17.5	4.06
2	Cadmium 2 amino 6 fluoro acetic acid benzothiazole complex	No growth	-	-
3	Cobalt 2 amino 6 fluoro acetic acid benzothiazole complex	-	-	-
4	Cu 2 amino 6 fluoro acetic acid benzothiazole complex opper	6.5	15.6	2.4
5	Iron 2 amino 6 fluoro acetic acid benzothiazole complex	8.6	22.0	2.55
6	Zinc 2 amino 6 fluoro acetic acid benzothiazole complex c	3.0	8.5	2.83
7	Magnesium 2 amino 6 fluoro acetic acid benzothiazole complex c	8.0	11.7	1.46

RESULTS AND DISCUSSION

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CONCLUSION

The ligand 2 amino 6 fluoro acetic acid benzothiazol were successfully synthesisized and its complexes with various metal salts . nickel complex is considered to be the better complex with the ligand for germination of wheat plant

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