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Synthesis Of Transition Metal Complexes With Newly Synthsised Chelates And Its Effect On Seed Germination

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Abstract:
Newly synthesized heterocyclic compound act as a chelating agent. It is also proved, the metal chelates have drug activity and some metal chelates acts as plant growth regulator. Hence we have synthesizes 2-(2'-hydroxy-3'-methoxy phenyl)-4- nitro-6-chloro benzothiazolyl hydrazones and check the chelating tendency of newly synthesized heterocyclic compound. 2-(2'-hydroxy-3'-methoxy phenyl)-4- nitro-6-chloro benzothiazolyl hydrazones were treated with metal ions like Ni++, Cu++, Zn++ at different PH and different laboratory conditions, the metal chelates are formed. The synthesized complexes were purified and characterized by analytical and spectral parameters.

Keywords: benzothiazole, hydrazone, Metal Chelates

Introduction:

d-block metal ion have a tendency to form the complexes. A series of transition metal ions forms complexes with Schiff bases[1], aromatic hydrazones[2-5] like o-hydroxy 5-methyl salicylidine hydrazone,2hydroxy-4-methylacetophenone phenyl hydrazone, o-hydroxy 5-methyl acetophenone phenyl hydrazone, o-hydroxy 4-methoxy salicylicdine phenyl hydrazone, o-hydroxy 5-methyl salicylic dine phenyl hydrazone, hydroxamic acid, α-mercapto-2-amino phenyl acetohydroxamic acid[6] etc.

Some macrocyclic polyether and dibenzo 18-crown-6 also used to prepare Cd^{++}, Ti^{++} and Zn^{++} cation complexes. It indicates that they have a good ability to form the metal complexes[7]. Schiff bases derived from an amine and aldehyde are important class of ligand that co-ordinate metal ion through azo methane nitrogen[8-10]. Recently some polymers are also used to synthesize metal complexes with some toxic metal ions[11].

Several scientists have prepared binuclear polymer complexes, which contains different co-ordinating atom capable of holding two metal ions in close proximity[12]. Homobinuclear polymer complexes are of interest in field of bio-organic chemistry[13]. Thiocarbohydrazides, thiosemicarbazide, thiosemicarbazone and their metal complexes have attracted interest from their industrial application[14-15] and biomedical response[16-17]. They drawn particular interest due to their antibacterial, antiviral[18-19] and antitumor agent[20-21].

As the nickel has the ability to bind soft and hard donar ligand, it leads to variety of geometries and oxidation states with different reactivity in biological system and in organometllic chemistry[22]. The chelation of ligands with transition metals is expected to form complexes with different structural geometry and may enhance their biological activity after chelation[23].

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Experimental:

1. **Synthesis of 2-Amino-4-nitro-6-Cholro benzothiazole:** 2-nitro-6-Chloro aniline and sodium thiocynate were dissolved in glacial acetic acid

The solution was cooled in freezing mixture. Bromine (4ml,) in glacial acetic acid was added with stirring and maintaining temperature below 25°C. The mixture was allowed to stand for one hour at room temp. The resulting hydrobromide was dissolved in hot water and neutralized with 10 % NaOH to obtain base. The amine thus obtained was filtered, washed with water and recrystallized in aq. Alcohol to get the product. Melting point of product is 97-98 °C.

IR (KBr): 3440 cm^{-1} (Asymmetric stretching of -NH_2), 3340 cm^{-1}(N-H Symmetrical stretching of -NH_2),3052cm^{-1}(Ar-Hstretching), 1630 cm^{-1} (-C=N stretching), 1HNMR ($CDCl_3$) :δ 6.0 (broad, 2H, NH_2), 7.0-7.5 (two singlet, 2H, Ar-H)

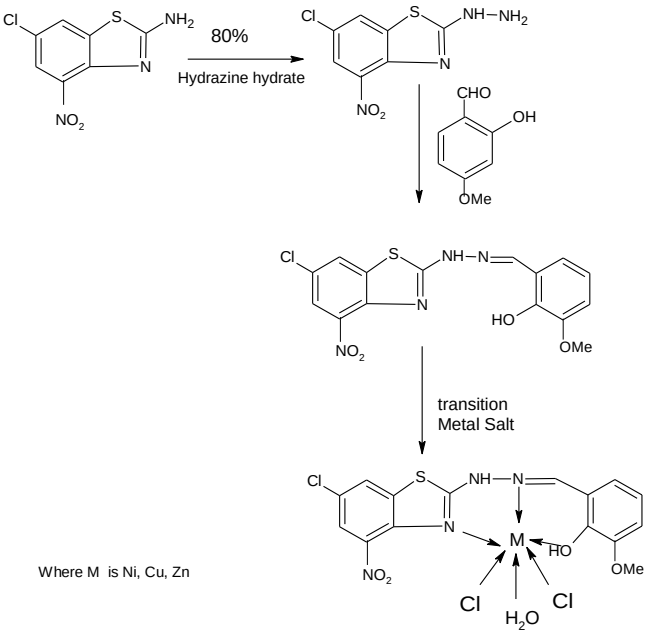
2. **2-hydrazino-4-nitro-6-Chloro benzothiazole:** Hydrazine hydrate (80%) was taken in a flask, cooled to 5°C and concentrated HCl (6 ml) was added to it with stirring. The flask was kept at room temperature for few minutes and then 2-amino-4-bromo-6-ethoxy benzothiazole (2) was ethylene glycol was added into the flask. The contents of the flask were heated at 140-160 °C on an oil bath for three hours and then cooled. The separated product, 2-hydrazino-4-nitro-6-Chloro benzothiazole was filtered, washed with cold water and crystallized from ethyl alcohol. Melting point is 90°C

IR (KBr) : 3320 cm^{-1} (asymmetric N-H stretching of –NH_2), 3203 cm^{-1} (symmetric N-H

3 **Synthesis of hydrazone With O-Vaniline:** The mixture of 2-hydrazino-4-nitro-6-Chloro benzothiazole (2.30gm,) was dissolved in ethanol (20ml) and O-Vaniline in ethanol (20ml) was refluxed on water bath for one and half hours. The reaction mixture was cooled, the solid product obtained. Melting point is 33°C.

4 **General Method for preparation of metal chelates f transition metal:** Take 0.5 gm of hydrazone of 2-hydrazine and O-Vaniline and dissolve in 10 ml Ethanol. And 0.7gm of Metal Chloride ($NiCl_2$ $CuCl_2$ and $ZnCl_2$) dissolve in 10 ml of Ethanol and both pour in 50 ml Round bottle flask and by using water condenser reflux for 1-1.5 hours. Then filter in hot condition and evaporate. Crystal are formed. Decomposition point is 35°C

Scheme



Where M is Ni, Cu, Zn

Seed Germination:

The nitrogen is one of the important nutrients for plant growth. Several references indicate that, if the seed are soaked in solution containing nitrogen in organic form, they effect the seed germination, root and shoot elongation.

The soaking method is widely used for the application for micronutrients carrier to the seed. In soaking method, the solution of micro nutrients carrier is prepared and seeds are put in the solution. Later on these seeds are sown

Table : 1 Seed germination, Root and Shoot Elongation

Sr. No.	Compound	% of germination			Average length of root in cm			Average length of shoot in cm		
Time in days		2	4	6	2	4	6	2	4	6
1	Chelating agent	90	90	100	2.3	5.1	8.3	0.8	1.8	4.3
2	Ni-Complex	100	100	100	1.3	2.3	4.1	0.5	1.2	3.4
3	Cu-Complex	100	100	100	2.1	3.8	4.9	0.8	1.7	4.8
4	Zn-Complex	70	80	100	1.6	2.5	3.4	0.6	1.4	3.6
5	Control	90	100	100	1.6	3.7	7.6	00	0.9	3.2

Result and Discussion:

The above table regarding the percentage of seed germination, average length of root and shoot gives the following information about root and shoot length on groundnut and gram seeds. In general it is observe that seed germination is fast in complexes as compare to chelating agent and control but root and shoot elongation is fast in chelating agent as comare to control and transition metal complexes

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