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Effect of [Cu $(NH_3)_4$] SO_4 on Seed Germination, Root Elongation and Coleoptile Growth in Triticum Aestivum

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Abstract: ***A simple, fast and easy to perform method was carried out for the quantification of the effects of [Cu$(NH_3)_4$]SO_4 on wheat germination. The method uses seed germination, root elongation and coleoptiles growth in wheat as parameters .In present study, increasing the concentration of metal complex shows that decrease in rate of seed germination, shoot and root length.***

Keywords: [Cu $(NH_3)_4$] SO_4, Wheat Seed, Seed Germination, Shoot, Root

1. Introduction

The [Cu $(NH_3)_4$] SO_4 complex have been synthesized and characterised. The deep blue crystalline solid tends to hydrolyse and evolve (release) ammonia upon standing in air. [17]. The correct concentrations of ammonia and copper sulfate solution can be determined by colorimetry. The combination of the correct concentrations will produce the highest absorbance read out on the colorimeter and as a result the formula of the complex can be verified.

In the solid state, the salt contains the $[Cu(NH_3)_4H_2O]^{2+}$ dication, which has a square pyramidal molecular geometry. The Cu-N and Cu-O distances are about 210 and 233 pm.[18]

[Cu $(NH_3)_4$] SO_4complex was used to carry out the germination study. The present experiment was conducted with a view to study the following.

Effect of complex on germination, coleoptile, and root length of wheat Triticum aestivum a member family poaceae. It is cultivated as main crop in India and various parts of world .Under, favorable conditions, the seed begins to germinate and embryonic tissues resume growth, developing into seedling.

2. Related Work

Heterocyclic compounds like indole-3-acetic acid and naphthyl-1-acetic acid are the plant auxins found to affect the growth of plants [1]. Especially benzimidazole-containing heterocyclic moieties have found extensive use in agriculture [2]. The lanthanide complexes of a few selected compounds have exhibited fungicidal and bactericidal activities including regulating the growth of plants [3-7].

It is known that chelation of metal ions with organic ligands acts synergistically to increase its effect [8].Greshon el al.[9-11] reported that the activity of metal chelate is considerably increased as compared to that of antifungal and antibacterial activities of complexs show that they are more active as compared to free ligand and involved [12,13] Zielinski et. al.[14] showed that, Lanthanide ion could substitute the calcium ion to produce active enzyme system. Some bivalent metal ion has been reported to be uses of lanthanide necessitate concentrating on the study of lanthanides and ligand for studying the germination pattern. Plant growth regulating activities are tested with wheat and cucumbers by Darnall et. al.[15,16]

3. Experimental

Material and Methods

For study all chemicals used were AR grade and solutios were prepared in double distill water, mature seeds of wheat.

Preparation of Complex

$2\ CuSO_4(aq) + 2\ NH_4OH(aq) = Cu_2(OH)_2SO4(s) + (NH_4)_2SO_4(aq)$

$Cu_2(OH)_2SO_4(s) + (NH_4)2SO_4(aq) + 6\ NH_4OH(aq) = 2\ [Cu(NH_3)_4]SO_4(aq) + 8\ H_2O(l)$

Grind 6.2g $CuSO_4 \cdot 5H_2O$ in a mortar and add it to the solution of 15 cm^3 concentrated ammoniumhydroxide and 10 cm^3water. In order to decrease the solubility add 15 cm^3 methanol to the solution slowly while stirring. The solution is stored for three hours in a cool place. The formed dark blue crystals are separated on a glass filter and washed with 25 $cm^3$of 1:1 mixture of methanol and cc. NH_4OH. Finally the crystals are rinsed with methanol and dried in air stream .

4. Result and Discussion

Mature seeds of wheat (variety lok-1) were collected and stored in dry place at room temperature after harvesting until use. In this study effect of metal complex [Cu $(NH_3)_4$] SO_4, on seed germination, root length and shoot length of wheat were analyzed.

To study the effect metal complex on seed germination, 10 seeds of wheat were soaked in solution of metal complex solution 200 ppm, 400ppm, 600ppm, 800ppm, 1000ppm for 12 hours, washed with distill water, placed on filter

paper in Petri dish containing 10 ml distill water and allowed to germinated.

Table-1 shows that in day -4, S/R ratio decreases as concentration of metal complex increases from 200 to 1000 ppm also rate of germination decreases as concentration increases.

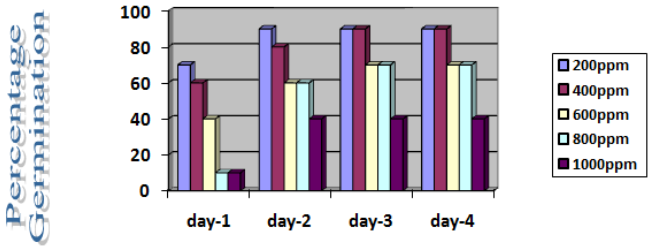
From graph it was seen that as the concentration of metal complex increases rate of germination decreases .In day -4 percent germination was maxmium (90) in 200 ppm concentration, while it found lowest (40) in 1000 ppm.

Table 1: Showing Day wise Percentage of Germination, Shoot And Root Length (mm) of Wheat

Conc Complex Ppm	Day-1				Day-2				Day-3				Day-4			
	G %	S	R	S/R	G %	S	R	S/R	G %	S	R	S/R	G %	S	R	S/R
200	70				90				90	6	1	6	90	20	1.3	15.4
400	60				80				90	4	1	4	90	15	1	15
600	40				60				70	3	1	3	70	10	1	10
800	10				50				60	2	1	2	60	7	1	7
1000	10				40				40	1	0	-	40	6	1	6

G-Germination, R-Root& S-Shoot

Graph 1: Day wise percentage germination of wheat..



5. Conclusion

Study shows that in day -1, with increasing the concentration of metal complex from 200 ppm to 1000 ppm, the rate of germination decreases .In day-2 also same trend were observed. In day-4, it shows maximum germination, coleoptile length decreases, root length also decreases and S/R ratio also decreases with increasing concentration of metal complex (200 to 1000 ppm) Table-1.

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