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Effect of Ligand and Metal Complexes on Legume Seed Germination

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ABSTRACT

The Complexes of Fe (II), CO (II), Cu (II) with AMCC, DMPS, CPH2, NFSA, were prepared. Seed dressing method is used to see the effect of ligand and its complexes on seed germination. Results suggest that there is alteration in seed germination rate on converting the complexing agent into metal complexes.

Key Words: Fe (II), Co (II), Cu (II) Complexes, seed germination.

INTRODUCTION

Seed germination is a physiological process. There are certain factors which affect the seed germination like quality of the seed, percentage of the moisture around the seed. Some organic compounds they retard the seed germination, also root and shoot length. Literature survey reveals that after the application of some organic compound, rate of seed germination alter. Growth regulating hormones they act on root and shoot growth. Stimulating effect of molybdenum in low concentration has been reported in many crop and horticulture [1, 2]. Seed dressing method is generally used to see the effect of synthesized organic compound on seed germination[3].In seed dressing method the seeds are dressed with paste of a compound[4]. The effect of heavy metal and their role in various plant and metabolic activities are well documented [5-7] and established. There are some research papers in which there is pronounced effect of substances on various cellular systems, at organizational level and regulatory at molecular levels [8].

MATERIALS AND METHODS

All the chemicals used for the preparation of complexes are of BDH and AR grade mark. Metal complexes of Fe (II), CO (II), Cu (II) with AMCC, that N^1-(5,6-dimethoxypyrimidin-4-yl)-sulphanilamide(DMPS),7-(R)-2-amino-2-(4-hydroxy- phenyl)acetamido]-3-methyl-3-cephem-4-carboxylicacid monohydrate (AMCC), (RS)-4-(7-chloro-4-quinolylamino)pentyldiethylamine diphosphate (CPH2) and 4-Chloro-N-furfuryl-5-sulphamoylanthranilic acid (NFSA) were synthesized by adding metal salt solution in appropriate solvent to the solution of the ligand. The mixture was refluxed for 3-4 hours. Then the precipitate of metal complexes was obtained. It is filtered, washed & dried in vacuum desiccators. Preparation method is given in details in earlier papers.

RESULT AND DISCUSSION

Effect of different complexing agent seed germination:

Effects of different complexing agent are given in the Table-1. The result indicates that DMPS have more effect on gram seed germination as compared to urine, water, dung and other complexing agent like AMCC CPH2 and NFSA.Gram seed germination is very low in case of CPH2 (Table-1).

Further the effect of complexing agent on seed germination do not remains same in case of ground nut and pea. Dung and urine soaked seeds are found more germinated. But if only comparision is made between complexing agents, it is found the (NFSA) have good response for the germination. In case of Ground nut the complexing agent (CPH2) retards the seed germination. Also (AMCC) have not good effect on seed germination. Further the comparisons is made between seed germination of pea, it is found that the complexing agent (DMPS) and (AMCC) slightly reduce the rate of seed germination as compared to control.

Effect of different Iron complexes on seed germination

The germination rate is different for different types of seeds. Iron complexes with different complexing agent also have effect on seed germination. It is found that [Fe (II) DMPS] complex is more effective on gram seed germination but is not true to [Fe (II) AMCC] complex. It retards the gram seed germination. [Fe(II)NFSA] complex also retards gram seed germination.[Fe(II)AMCC] increases seed germination in case of ground nut but it is not true in case of [Fe(II)NFSA] complex. During the study of pea seed germination. It is found that [Fe (II)

AMCC], [Fe (II) DMPS] complexes have nearly same effect of seed germination of pea but [Fe (II) CPH2] complex retards the seed germination of pea. (Table-2).

Table-1: Effect of complexing agent on seed germination

Medium	Total seeds	No. of seed germinated		
		G.nut	Gram	Pea
Water	20	11	13	10
Urine	20	17	15	16
Dung	20	18	16	14
(DMPS)	20	15	19	09
(AMCC)	20	06	10	10
(CPH2)	20	02	03	08
(NFSA)	20	12	08	08

Table-2: Effect of different Fe (II) complexes on seed germination

Medium	Total seeds	No. seed of germinated		
		G.nut	Gram	Pea
Water	20	11	13	10
Urine	20	17	15	16
Dung	20	18	16	14
[Fe(II)DMPS]	20	08	20	18
[Fe(II)AMCC]	20	16	05	19
[Fe(II)CPH2]	20	14	11	05
[Fe(II)NFSA]	20	11	05	12

Effect of cobalt metal ion complexes on seed germination

The comparative study indicates that cobalt complexes have a good effect on seed germination .After comparision one can conclude that the [Co(II)DMPS], [Co(II)(AMCC)] and [Co(II)NFSA] complexes shows positive response on the seed germination of gram but [Co(II)CPH2] shows slight less effect on seed germination.The effect of different cobalt complex on ground nut seed germination it is found that [Co(II)DMPS],[Co(II)(AMCC)] and [Co(II)NFSA] increase the rate of seed germinated but [Co(II)CPH2] less effective towards seed germination.

Effect of prepared metal complexes on pea seed germination, found that the seed germination is less as compared to control, urine and dung soaked seeds. But [Co (II) NFSA] complex increases the rate of pea seed germination (Table-3).

Table-3: Effect of cobalt metal complexes on seed germination

Medium	Total No. of seeds	No. seed of germinated		
		G.nut	Gram	Pea
Water	20	11	13	10
Urine	20	17	15	16
Dung	20	18	16	14
[Co(II)DMPS]	20	18	20	11
[Co(II)AMCC]	20	19	20	12
[Co(II)CPH2]	20	14	08	06
[Co(II)NFSA]	20	16	17	13

Figure-a : Effect of Control & Ligand on Seed Germination

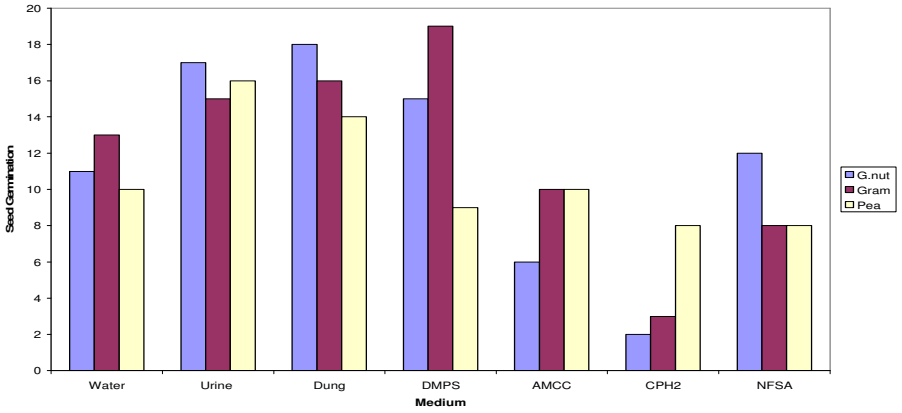

Fig.-1a

Figure-b : Effect of control and Fe (II) Complexes on Seed Germination

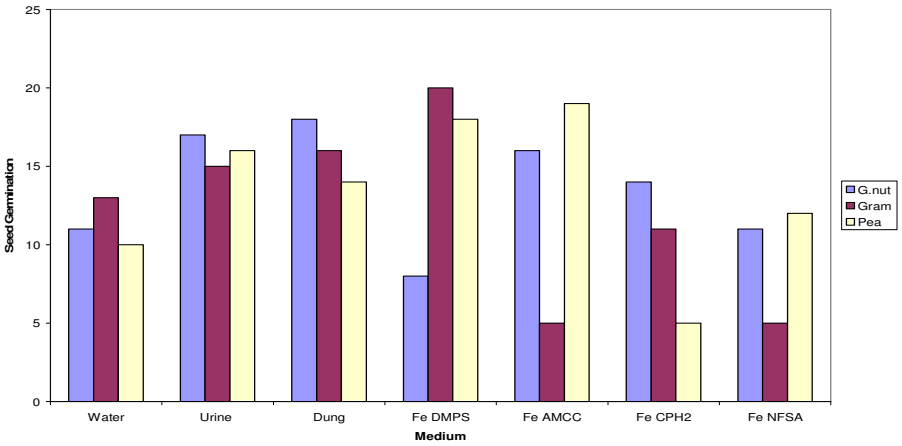

Fig.-1b

Figure-c : Effect of control and Co (II) complexes on Seed Germination

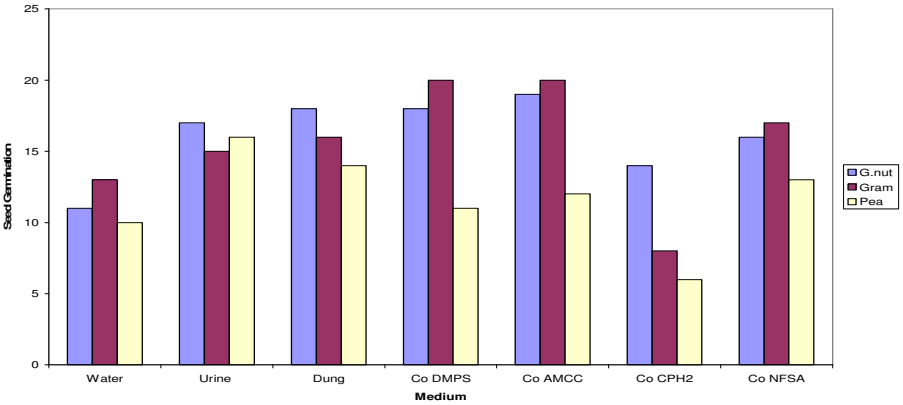

Fig.-1c

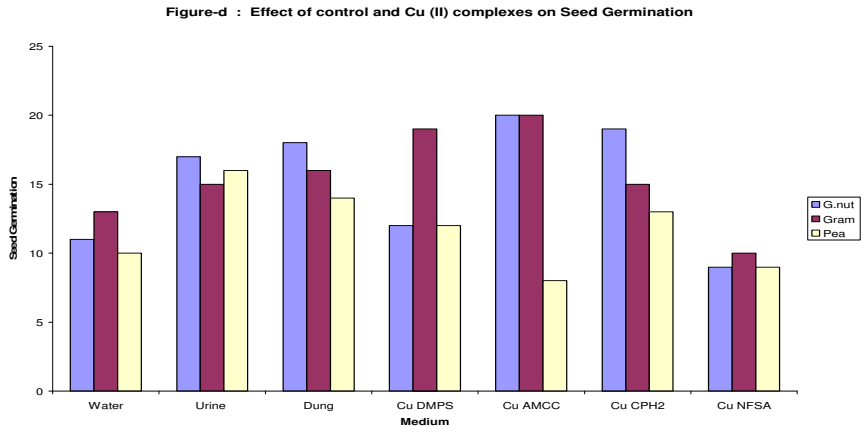

Fig.-1d

Effect of Cu (II) Complexes on seed germination

Experimental results on seed germination are given table-4. The results of copper complexes on the gram seed germination indicates that [Cu(II)AMCC] and [Cu(II)DMPS] complexes increases the seed germination rate as compared to control, urine and dung dressed seeds [Cu(II)CPH2] have nearly some seed germination rate with control.

[Cu (II) NFSA] complex retards the number of seed germinated as compared to urine, dung dressed solution but the results are comparable with the water soaked seeds.

The study of Cu (II) complexes on seed germination of ground nut indicates that [Cu (II) AMCC], [Cu (II) CPH2] have the positive results as compared to control urine and dung. But there is no increase in seed germination rate in case of [Cu (II) NFSA] complex. The seed germination rate of pea is comparatively less, if the seeds are dressed in [Cu (II) AMCC] complex (Table 4).

Table-4: Effect of Cu (II) Complexes on seed germination

Medium	Total No. of seeds	No. of germinated		
		G.nut	Gram	Pea
Water	20	11	13	10
Urine	20	17	15	16
Dung	20	18	16	14
[Cu(II)DMPS]	20	12	19	12
[Cu(II)AMCC]	20	20	20	08
[Cu(II)CPH2]	20	19	15	13
[Cu(II)NFSA]	20	09	10	09

CONCLUSION

If the graphical comparision is made between different metal complexes under study on seed germination, it is found that [Fe (II) DMPS], [Co (II) AMCC] and [Cu (II) AMCC] complexes increases seed germination of gram.

The rate of seed germination of pea is less when these seeds are treated with metal complexes. The seed dressing method is used to study effect of the different chemicals on the seed germination rate indicates that there is alteration in seed germination rate on converting the complexing agent into metal complexes. In some cases metal complexes increases the rate of seed germination and some time they decreases rate of seed germination, one can conclude that after converting the metal ion into metal complex they have some physiological role on the seed germination.

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