Studies of Heavy Metal Ion, Ligand And Their Complex on Acutangula Plant System

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ABSTRACT

Present investigation deals with the impact of heavy metal, ligand and their complex on to improve the yield of economically important plant Acutangula. The seeds were immersed in ligand Prochlorperazine Maleate, its complexes and Pr (III) ions to study the germination and growth pattern and certain physiological processes. Effect of ligand, complex and metal ion solution on growth, determination of percentage of Nitrogen, proteins, and chlorophyll in the leaves of plants were studied. The changes in growth pattern of seedling height and root- shoot ratio in the leaves of experimental plant were observed. The data harvested indicates increased germinations in all seed treatments. However the average root and shoot length in ligand, complex and metal at all pH increased over control for Acutangula plant system.

Key words : *Prochlorperazine Maleate, Pr (III) and Acutangula*

INTRODUCTION:

The evolution of life on the earth has gone hand in hand with the evolution of environment. The growth and yield of plants depend on the availability of nutrients and water in the soil where they grow and on the maintenance within certain ranges of such environmental factors as temperature, moisture and light. Anything that affects the health of plant is likely to affect their growth and yield and may seriously reduce their usefulness to human being. The demands of plant physiologists not only to supply basic information regarding how plants grow and develop but also to undertake research program which designed specifically to increase yield of plant products. Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing countries throughout the world during the past sixty years and more could not be possible. The nitrogen is one of the important nutrients for plant growth. Several references indicate that, if the seeds are soaked in solution containing nitrogen in organic form, they affect the seed germination, i.e. root and shoot elongation.

Oxines and Gibberlines are the growth promoting harmones.[1-3] Very dilute solution of these growths promoting hormone solutions, if sprayed over the plant, chlorophyll synthesis is accelerated and consequently vegetative growth has been observed. Experimental results indicate that, if the hormonal solution sprayed over crop plants, the crop yield increases to a considerable extent. The use of rare earth elements in agriculture to promote the growth of plants is well known.[4-5] Huo et al.[6] have studied the effect of auxine hormone lanthanide complexes on growth of *wheat coleoptiles.* Since *Prochlorperazine Maleate* has intense biological activities and since no work is reported on the biological application of binary complexes of *Pr* (III) with *Prochlorperazine Maleate* and comparing with pure ligand, metal and control solution (double distilled water) to study the effect of ligand, complex, metal and control solution on germination, survival seedlings height etc, on *Acutangula* plant in order to make suggestion whether ligand, complex and metal can be used as a plant growth regulator.

Also biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of fruity vegetables are carried out at room temperature.

MATERIAL AND EXPERIMENTAL METHODS:

The solution of Pr (III) in the form of nitrate and *Prochlorperazine Maleate* of the concentration of 0.01 M was prepared in double distilled water. The applications of Ligand, complex and metal solution were studied by dissolving it in proper solvent at 3.5 and 7.00 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then grind and filtered. This soil was filled in wooden tray and tray was moistened with water. Sowing of seeds was done in the soil after one hour.

EXPERIMENTS PERFORMED:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc, to improve the crop yield. Amongst several economical important plants *Acutangula* are selected as a plant system.

1. 100 healthy seeds of equal size were chosen and immersed in tested solution of 3.5, 7.00 and 10.00 pH for about 2 hour. These seeds soaked were taken out of each solution. The seeds were sowed in the wooden trays in a row. The wooden trays were kept under the atmospheric pressure at room temperature.

2. Effect of ligand, metal ion, complex solution on growth of *Acutangula* species plant was studied at different pH (3.5, 7.00 and 10. 00)

3. Effect of ligand, metal *Pr* (III), complex on percentage of Nitrogen, Proteins and Chlorophyll in the leave of *Acutangula* plant was studied.

PARAMETERS :

Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after $4^{1/2}$ days and survival was noted after 10 days.

After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived plants were measure.

Table 1

Effect of Ligand, Complex and Metal ion on Germination, Survival, Seedling height etc. on Acutangula Test System.

Test System	Effect of	pH	Parameters						
			% Germination after $4^{1/2}$ days	% Survival after 10 days	Seedling height(cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	Width of young leaf (cm)
Acutangula Test System	Water (Control)	3.5	75.00	83.33	245.9	58.7	187.2	0.3135	28.70
		7.0	60.00	60.00	230.72	86.21	144.50	0.590	16.5
		10.00	66.66	66.66	235.2	68.4	147.8	0.462	16.21
	Ligand	3.5	83.33	91.66	261.5	66.4	194.1	0.3425	29.90
		7.0	73.33	70.33	229.84	83.81	146.03	0.570	17.6
		10.00	80	86.66	252.4	86.4	160.8	0.537	18.41
	Complex	3.5	1.66	88.33	260.8	68.7	192.1	0.3576	30.16
		7.0	68.00	71.00	235.14	87.12	147.02	0.600	14.1
		10.00	83.33	87.66	284.9	91.7	154.1	0.595	18.90
	Metal	3.5	82.22	89.66	261.10	61.2	191.5	0.3195	29.40
		7.0	80.00	73.33	238.81	88.04	150.77	0.584	18.5
		10.00	80.33	87.33	277.1	89.8	144.4	0.569	18.432

Table 2
Estimation of Chlorophyll for *Dhodaka* species plant system

Leaves of plant with treatment of following			**Total chlorophyll gm/lit**	**Chlorophyll 'a' gm/lit**	**Chlorophyll 'b' gm/lit**
1	WATER OR CONTROL	DK	0.008095	0.005641	0.002730
2	LIGAND (CPC)	DK	0.009709	0.006913	0.002991
3	COMPLEX	DK	0.007465	0.005683	0.002209
4	METAL Pr (III)	DK	0.005586	0.00402	0.001709

Table 3

Estimation of Total Nitrogen and Proteins in Leaf Powder of Dhodaka Plant.

Plant	Treatment	% Element			% Protein
		Nitrogen	Carbon	Nitrogen	
Dhodaka plant	Control	7.06	57.23	6.28	44.125
	Ligand	7.41	59.25	6.56	46.312
	Complex	7.49	59.41	6.15	46.812
	Metal	6.69	52.41	5.75	41.812

LIGAND – *Prochlorperazine Maleate* CONTROL – *Distilled Water*
COMPLEX – Pr (III)- *Prochlorperazine Maleate* METAL – Pr (III)

RESULTS AND DISCUSSION:

Germination starts when the seed shows emergence phase of growth, which, begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root and shoot independently. Therefore, root and shoot length differs. The observation table clearly indicates that average root length in *Prochlorperazine Maleate*, complex, Pr (III), at all pH increase over control for tested plant system.

Chlorophyll control / chlorophyll pigment were found affected in Dhodaka plant by the treatments. Total chlorophyll was found to be higher in the treatment of ligand. Total chlorophyll content in *Prochlorperazine Maleate* and complex is higher than in metal and control treatment in plant system.

Percentage of nitrogen and proteins were found affected in leaves of Dhodaka plant by the treatment of *Prochlorperazine Maleate*, complex and Pr (III). It is observed that percentage of nitrogen and protein are higher than that of control.

Complex > *Prochlorperazine Maleate* > H_2O > Pr (III).

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