

# Biological Study of Binary Complexes of La (III), Pr (III) and Nd (III) with Substituted Isoxazoline on Rice Plant

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## Abstract:

The present investigation of Binary complexes of La(III), Pr(III) and Nd(III) with 3-(2-Hydroxy-5-methyl phenyl)-5-phenyl isoxazoline – L<sub>1</sub> and 3-(2-Hydroxy-3-bromo-5-methyl phenyl)-5-phenyl isoxazoline – L<sub>2</sub> on germination, survival, seedling height on rice plant in aqueous medium at pH 5 to 7 and at constant ionic strength of 0.1 M potassium nitrate solution.

**Key words:** Binary complexes, Isoxazoline, Rice plant, pH

## Introduction:

Isoxazoline have gained prominence in synthesis chiefly because of their value as drugs in commercial use. Substituted Isoxazoline are reported as antimicrobial agent, hypolipidemic agents, antidiabetics, insecticides etc. Also substituted pyrazolines have been reported to exhibit fungicidal, anti-inflammatory, analgesic, insecticidal, antiarthritic, cerebroprotective and antidepressant activities. Apart from their biological activities, pyrazolines exhibit fluorescent and luminescent activities<sup>1,2,3</sup>.

The complexes of transition metals with bis allyl thiourea are prepared and their herbicidal and plant growth regulating activity are tested with wheat and cucumbers by Daverski et al<sup>4</sup>. Complexes of piperidine-2 carboxylic acid with some bivalent metal ions have been reported to be useful in agriculture as plant growth regulators<sup>5,6,7</sup>.

Since substituted Isoxazoline have intense biological activities and since no work is reported on the biological applications of binary complexes with them, present work is carried out with binary complexes of La(III), Pr(III) and Nd(III) with substituted Isoxazoline to study the effect of these complexes on germination, survival, seedling height etc. on Rice plants in order to make suggestion whether binary complexes with substituted Isoxazoline can be used as plant growth regulators.

## Experimental

Effect of binary complexes on germination, survival and seedling height of rice plants is studied;

### Metal Ions and Ligand Used:

For biological study the metal ions used are La(III), Pr(III) and Nd(III). The ligands used are (L<sub>1</sub>) and (L<sub>2</sub>).

The applications of complexes in general are studied by dissolving it in proper solvent at desired pH or it is formed during the reaction. The biological applications are therefore studied in aqueous medium at pH 5.0, 6.0 and 7.0 and at constant ionic strength of 0.10 M potassium nitrate solution.

### Systems (Binary complexes)

Name of system : Composition

Water or control : Distilled water 50ml.

Acid solution : 5ml KNO<sub>3</sub> (1M) + 5ml HNO<sub>3</sub> (0.1M) + 40ml distilled water.

Ligand solution : 5ml KNO<sub>3</sub> (1M) + 5ml HNO<sub>3</sub> (0.1M) + 10ml ligand + 30ml distilled water.

Metal solution : 5ml KNO<sub>3</sub> (1M) + 5ml HNO<sub>3</sub> (0.1M) + 10ml ligand + 2ml metal solution + 28ml distilled water.

Initial Volume of each composition was made 50ml by adding an appropriate amount of distilled water.

#### Soil :

The basic requirement for this experiment was soil. Fertilized soil was collected from Agricultural land. First of all stones and other materials were removed from it. It was then grinded and filtered. Two parts of this, finely powdered soil was mixed with one part of filtered pink-stone sand. This soil was then taken in three wooden trays having compartments of equal size. The soil in tray was moistened with water. In this soil sowing of seeds was done after one hour.

#### Procedure :

- 1) Healthy seeds of rice (D.R.K.) of equal size were selected. 100 seeds were soaked in water and kept in refrigerator for 4 hours. From these healthy seeds of equal size were chosen out of which 15 seeds each were immersed in distilled water, ligand solutions with La(III), Pr(III) and Nd(III) of pH 5.0 for 6 hours. The seeds soaked were taken out of each solution and washed with distilled water. The seeds were sowed in the wooden trays in the row. The experiments were carried out during 25<sup>th</sup> October 2014 to 25<sup>th</sup> December 2014. The trays were kept in sunlight for three hours during 6.30 a.m. to 9.30 a.m.
- 2) The effect of binary complexes of La(III) on the growth of rice plant at different pH (5.0, 6.0 and 7.0) the seeds being immersed in experimental solution for 6 hours.
- 3) Effect on the growth of rice plant was studied for at different pH (5.0, 6.0 and 7.0) by immersing the seeds in binary complex solution of La(III).
- 4) Effect on the growth of rice plant was studied at different pH (5.0, 6.0 and 7.0) by immersing the seeds in binary complex solution of Pr(III).

Plant growth is decided on the basis of parameters such as percentage of germination, survival, seedling height, shoot length and root length and thickness of young leaf having high values compared to control system.

#### Results and Discussion

Table 1 and 2 shows the percentage of germination, survival and seedling height. In case of growth of rice plant at pH 5.00 and 6.00 for ligand (L<sub>1</sub>). Binary complexes of metal ions under investigation can therefore, function as plant growth regulators in comparison with control system. The general order of plant growth regulators are found as

La(III)-L<sub>1</sub> > Pr(III)-L<sub>1</sub> > Nd(III)-L<sub>1</sub> > Control > L<sub>1</sub>

Since binary complexes of La(III) are found to have high plant growing tendency at different pH was found from Table 1 and 2.

Table 3 and 4 shows the percentage of germination, survival and seedling height etc. in case of growth of rice plant at pH 5.00 and 7.00 for the ligand (L<sub>2</sub>). Binary complexes of metal ions under investigation can therefore be function as plant growth regulators in comparison with control system. The general order of plant growth regulators are found as

La(III)-L<sub>2</sub> > Pr(III)-L<sub>2</sub> > Nd(III)-L<sub>2</sub> > Control > L<sub>2</sub>

Since binary complexes of Nd(III) are found to have high plant growing tendency at different pH was found from Table 3 and 4.

The percentage of germination, survival and seedling height etc. increases with increase in pH and it is observed from Table 1,2,3 and 4.

**Table -1: Effect of complexes of La(III), Pr(III) and Nd(III) with 3-(2-Hydroxy-5-methyl phenyl)-5-phenyl isoxazoline (L<sub>1</sub>) on rice seed at pH = 5.0, u = 0.1M.**

Parameters	Effect of			Effect of complexes			Total No. of seeds
	Water	Ligand	Acid	(La)	(Pr)	(Nd)	
% Germination after 8 days	52.33	45.66	65.66	39.00	12.33	39.00	20
Survival after 12 days	65.66	72.33	79.00	52.33	32.33	52.33	20
Seedling height (cm)	14.8	15.24	15.59	16.00	16.05	15.625	20
Root length (cm)	3.921	3.216	3.67	3.35	4.45	4.475	20
Shoot length (cm)	10.53	10.56	11.45	12.025	10.90	11.15	20
Root/Shoot	0.3723	0.3045	0.3205	0.2785	0.4082	0.4013	20

\*(Seed soaked in solution for 6 hour)

**Table -2: Effect of complexes of La(III), Pr(III) and Nd(III) with 3-(2-Hydroxy-5-methyl phenyl)-5-phenyl isoxazoline (L<sub>1</sub>) on rice seed at pH = 6.0, u = 0.1M.**

Parameters	Effect of			Effect of complexes			Total No. of seeds
	Water	Ligand	Acid	(La)	(Pr)	(Nd)	
% Germination after 8 days	59.00	52.33	72.33	45.66	65.66	52.33	20
Survival after 12 days	72.33	59.00	45.66	52.33	79.00	59.00	20
Seedling height (cm)	12.53	16.775	16.35	18.75	16.8	17.44	20
Root length (cm)	2.96	5.775	5.1	6.00	5.96	5.585	20
Shoot length (cm)	9.6	9.95	10.025	12.10	9.94	10.114	20
Root/Shoot	0.3083	0.5804	0.5087	0.4958	0.599	0.5522	20

\*(Seed soaked in solution for 6 hour)

**Table -3: Effect of complexes of La(III), Pr(III) and Nd(III) with 3-(2-Hydroxy-3-bromo-5-methyl phenyl)-5-phenyl isoxazoline (L<sub>2</sub>) on rice seed at pH = 5.0, u = 0.1M.**

Parameters	Effect of			Effect of complexes			Total No. of seeds
	Water	Ligand	Acid	(La)	(Pr)	(Nd)	
% Germination after 8 days	65.66	52.33	79.00	45.66	72.33	59.00	20
Survival after 12 days	72.33	59.00	85.66	52.33	85.66	72.33	20
Seedling height (cm)	16.5	19.37	17.5	16.733	18.71	18.55	20

Root length (cm)	4.2	6.62	4.475	5.333	7.566	6.816	20
Shoot length (cm)	11.5	11.828	11.675	10.45	10.20	11.00	20
Root/Shoot	0.3652	0.5596	0.3832	0.5003	0.7417	0.6196	20

\*(Seed soaked in solution for 6 hour)

**Table –4: Effect of complexes of La(III), Pr(III) and Nd(III) with 3-(2-Hydroxy-3-bromo-5-methyl phenyl)-5- phenyl isoxazoline (L<sub>2</sub>) on rice seed at pH = 7.0, u = 0.1M.**

Parameters	Effect of			Effect of complexes			Total No. of seeds
	Water	Ligand	Acid	(La)	(Pr)	(Nd)	
% Germination after 8 days	52.33	39.00	65.66	32.33	59.00	45.66	20
Survival after 1 days	65.66	52.33	79.00	45.66	72.33	59.00	20
Seedling height (cm)	14.95	15.55	15.70	18.55	16.78	15.25	20
Root length (cm)	3.95	3.52	3.72	3.70	4.73	4.85	20
Shoot length (cm)	10.75	11.32	11.65	12.72	10.45	10.95	20
Root/Shoot	0.3674	0.3109	0.3193	0.2908	0.4526	0.4429	20

\*(Seed soaked in solution for 6 hour)

### Conclusion

The experimental values given in tables shows that binary complex solution of La(III) can function as plant growth regulator in case of rice plant. System also provided that rice seeds are soaked in complex solution of pH 5.00, 6.00 and 7.00 for six hours maintaining the ionic strength of 0.1 M of potassium nitrate solution.

### References:

1. Thakare V.G., Ph.D. Thesis in Chemistry, Amravati University, Amravati, P.1 (1988).
2. Meshram U.P., Ph.D. Thesis in Chemistry, SANT GADAGE BABA Amravati University, Amravati, P.3 (2005).
3. Pande P.S., Ph.D. Thesis in Chemistry, SANT GADAGE BABA Amravati University, Amravati, P.2 (2007).
4. Vasile, V.G-, Gencher, M. and D aver ski, K., Dolk. Bolg Akad. Nauki, 32(12) 1705(1979); Chem Abstr., 92,13 (1980).
5. Adorns, C.M. and Bernays, E.A., Entamol. Exp. Appl., 23, 101(1978).
6. Thakare V.J., Ph.D. Thesis in Chemistry, SANT GADAGE BABA Amravati University, Amravati, P.170, (2007).
7. Molla Rahman Shaibur and Shingerao, J. Enviromental Botany, 67(2009).