

# The Influence of Ligand and Their Complexes on Germination of Seed and Plant Growth Profile on *Chenopodium Album*

Usha S. Wasnik

Arts, Science and Commerce College, Chikhaldara Dist- Amravati (M.S.)

## Abstract

*Chenopodium album* (L.), Chandan Batwa (Bathua) is a fast-growing weedy annual plant in the genus *Chenopodium*. This weedy plant has various medicinal applications. This work investigates the usefulness of Dimethyl [1-(10-H phenothiazin-10-y1) propan-2-y1] amine (Promethazine) as an alternate fertilizer by field experiments on growing Bathua plant. Plant *Chenopodium album* were studied with the impact of heavy metal ion and their complexes on to improve the yield of plant profile. The seeds were immersed in ligands, its complexes and Nd (III) ion, to study the germination and growth pattern and certain physiological processes. Effect of Promethazine ligand, complex and metal ion solution on growth, determination of percentage of chlorophyll in the leaves of *Chenopodium album* plant system were studied. The data indicates the changes in growth pattern, chlorophyll content and increased germinations in all seed treatments was observed in the experimental plants.

**Key words:** *Chenopodium album* (L.), Promethazine

## INTRODUCTION:

*Chenopodium album* is one of the most widely distributed species of weeds in the world found in India, South Africa and Australia. The plant is commonly called Bathua and found usually in the winter season, also used as vegetable. The plant contains various phytochemicals like saponins, flavonoids, glycosides, fixed oils, gums and tannins, etc. Pharmacological studies reported that the plant possess various activities such as anticancer, hepatoprotective, antioxidant, antibacterial, anti-inflammatory, etc.

*Chenopodium album* L. (family: *Chenopodiaceae*) is herbaceous plant. The plant and their parts are useful in curing cough, anorexia, piles, dysentery and diarrhea and kills small worms<sup>1</sup>.

The plant has its medicinal property mainly in seeds and leaves. Leaves are rich in nitrogen, a considerable amount of albuminoids and potash salts<sup>2</sup>. Seeds of *Chenopodium album* includes alkaloids, Saponins, glycosides, fixed oils and tannins<sup>3</sup>.

Studies carried out in different parts of the world indicate that *C. album* is a rich source of nutrients, antioxidants and important dietary elements<sup>4</sup>.

Seed germination behavior is important for horticulture and agriculture<sup>5-6</sup>. 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. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and developing. Vegetables play an important role in human nutrition. During recent years, the interest in vegetable production has increased rapidly as a result of greater appreciation of the food value of vegetables. The findings of scientific study and their wide application in the field have enhanced this interest to a great extent among growers and consumers alike. Vegetables are a complex group of plants with diverse forms of edible parts like fruits, leaves, stem, roots, tubers, bulbs etc. They are the best sources of calories, natural vitamins, minerals, proteins, dietary fiber and are therefore essential to tackle the problem of malnutrition and improve quality of life. Vegetables are to play a significant role in supplying a balanced diet.

The information about the role of metal complexes in biological systems, their concentration and presence in different equilibria is of immense importance. Greshon et al.<sup>7-8</sup> reported that the activity of metal

chelates is considerably increased as compared to that of the free metal and the ligand alone on their complexation. The observation of antifungal and antibacterial activities of complexes show that they are more active as compared to free ligand and metal involved.<sup>9-11</sup>

The use of rare earth elements in agriculture to promote the growth of plants is well known.<sup>12-15</sup> Metal containing complexes of lactams, imidazoles and benzimidazole and their biological activity have been studied by Kukalenko et al.<sup>16</sup>

Tzortzakis N.G. et al.<sup>17</sup> studied the effect of pre-sowing treatment on seed germination by applying various organic compounds. Amani Abdel-Latif<sup>18</sup> studied the effect of methyl tert-butyl ether on growth of shoot and root elongation in Maize plant.

Since Promethazine, (Dimethyl [1-(10-H phenothiazin-10-y1) propan-2-y1] amine) has intense biological activities, antihistaminic, sedative properties and inhibits the activity of the enzymes. The current study is concerned with the process of seed germination of medicinally important Bathua plant of Chikhaldara, Amravati district, Maharashtra, India and in particular with the effect of Ligand and their Complexes on the germination process on *Chenopodium album* plant and reported the biological application of binary complexes of Nd (III), with Promethazine drug by comparison with pure ligand, metal and control solution.

Also, the percentage of chlorophyll content in the leaves of *Chenopodium album* plant are carried out at room temperature.

## EXPERIMENTAL METHODS AND MATERIAL

To determine the germination behavior of fresh seeds of *Chenopodium album* Species were collected from Aladoh, Tq. Chikhaldara, Amravati district, Maharashtra. Various seed characteristic like seed size, shape, color and weight of seed/gm would be observed. Seeds were surface-sterilized in a warm water bath to reduce the risk of fungal growth. Thereafter, seeds were chilled in cold distilled water, evenly spread on a piece of germination paper and dried overnight. The solution of Nd (III) in the form of nitrate and Dimethyl [1-(10-H phenothiazin-10-y1) propan-2-y1] amine of the concentration of 0.01 M was prepared in double distilled water. The applications of ligand, metal and complex solution is studied by dissolving it in proper solvent at different pH and at constant ionic strength of 0.01 M KNO<sub>3</sub> solution. Fertilized soil was collected from agricultural land. It was then grinding and filtered. This soil was filled in two wooden trays and tray was moistened with water. Dried seeds sowing was done in the soil after one and half hour.

## EXPERIMENTS PERFORMED

The literature survey reveals that, the organic compound affects the plant growth and yield also. 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. Various chemicals are used in agriculture as an ingredient of various fertilizers to improve the crop yield. Amongst several economical and medicinally important plants *Chenopodium album* (Bathua) is selected for study.

1. Healthy seeds of *Chenopodium album* (Bathua) were taken and soaked in 3.5 and 7.00 pH solution for about two hours. These soaked seeds were taken out of each solution and sowed in the wooden tray in a row, during winter and then the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal Nd (III), complex on percentage chlorophyll content in the leaves of *Chenopodium album* plant were studied. Chlorophyll pigments in fresh leaves were determined by spectrophotometric method.

## PARAMETERS

The important uses of Bathua (*Chenopodium album*) species in daily life is persuasive to study its response against metal ion, ligand and its complex regarding to physiological processes, particularly germination is a vital process for the growth of plants. Therefore, this plant is selected.

Plants growth is decided on the basis of parameters such as percentage of germination survival, seedling height, shoot length, root length, (root length / shoot length) and thickness of young leaf having high values compared to control system. The germination was noted after 15 days in bathua plant species. After noting

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

**Table 1**

Effect of Ligand, Metal ion and Complex on Germination. on *Chenopodium album* (Bathua)

Test System	Effect of	pH	Parameters						
			%Germination after 15 days	%Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	Width of young leaf (cm)
Chenopodium album (Bathua)	Water (Control)	3.5	77.00	83.00	7.08	4.552	9.478	0.4802	3.89
		7.0	82.00	86.00	8.56	4.656	9.698	0.4800	3.97
	Ligand	3.5	88.33	86.33	9.64	6.698	10.852	0.6172	5.87
		7.0	83.66	91.66	7.21	7.963	11.108	0.7168	5.63
	Metal	3.5	78.66	77.66	8.45	3.748	8.563	0.4376	3.96
		7.0	80.66	84.00	9.56	3.986	9.231	0.4318	4.09
	Complex	3.5	79.00	78.33	6.48	4.698	9.125	0.5148	4.12
		7.0	65.66	89.66	6.58	4.025	9.244	0.4354	4.56

**Table 2**

Estimation of Chlorophyll for *Chenopodium album* (Bathua) Plant System

S.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10 <sup>-3</sup>	Chlorophyll 'a' gm/lit.x 10 <sup>-3</sup>	Chlorophyll 'b' gm/lit.x10 <sup>-3</sup>
1	Control	Chenopodium album (Bathua)	5.986	4.014	1.568
2	Ligand		7.789	6.021	1.649
3	Metal		5.383	4.362	1.433
4	Complex		6.784	4.356	1.104

ligand

### RESULTS AND DISCUSSION:

Seed of the target species were taken to study the germination behavior under the influence pre-treatments. 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 length and length shoot independently. Therefore, root length and shoot length differs. The observation table clearly indicates that average root and shoot length in ligand Dimethyl [1-(10-H phenothiazin-10-y1) propan-2-y1] amine increased at all pH than control.

Chlorophyll pigment / chlorophyll control were found affected in *Chenopodium album* (Bathua) plant by the treatments. Total chlorophyll was found to be higher in *Chenopodium album* (Bathua). Total chlorophyll content in Dimethyl 1 [1-(10-H phenothiazin-10-y1) propan-2-y1] amine and complex are higher than in metal and control treatment in targeted plant system.

### References:

1. Bakshi DNG, Sensarma P, Pal DC. 1999. A lexicon of medicinal plants in India, Naya Prakash, Calcutta, pp. 424-25.
2. Nadkarni KM. 1982. Indian Material Medica, Bombay: Popular Prakashan Pvt. Ltd., 3<sup>rd</sup>ed, pp. 391-392.
3. Yadav P, Kumar A, Mahour K, Vihan VS. 2010. Phytochemical Analysis of Some Indiegenous Plants Potent Against Endoparasite. Journal of Advanced Laboratory Research in Biology, 1(1): 56-59
4. Afolayan J, Jimoh FO. Nutritional quality of some wild leafy vegetables in South Africa. International Journal of Food Sciences and Nutrition 2009; 60(5):424-431.
5. Vaishali S. Kohale; Advances in Horticulture Sciences Vol.2 Integrated Publications (2021)
6. Frey KJ, Takeda K,. Simultaneous selection for grain yield and protein percentage in backcross populations from *Avena sterilis* × *A. sativa* matings by using the independent culling levels procedure. TAG Theoretical and Applied Genetics. 1985; 69: 375-382. [6]
7. Gershon H., Parmegiani R. and Nicerson W. J. : Appl. Microbiol, 10, 556 (1962).
8. Gershon H. and Parmegiani R. : Appl. Microbial. 11, 62 (1963).
9. Shel A. M., Shariel E. A., Gharib A. and Ammar Y.A : J. Ind. Chem. Soc. 60, 1067 (1968).
10. Shashindharam P. and Ramchadra L. K. : J. Ind. Chem. Soc. 62, 920 (1985).
11. Sharma R.C.; Tripathi, S. P. and Sharma R.S. : Curr. Sci. 52, 410 (1983).
12. Wang G., Miao X., Li : J. Faming Zhuanli Shenqing Gongkai Shuomingshu. CN, 267, 455 Appl. 2, 5 (2000)
13. Lu K., Chang Z., Chen B., Guo D., Zheng J., Wang K. : Beijing Yi Ke Da Xue Xue Bao. 29(4), 289 (1997).
14. He Y-W., Loh C.S. : Plant Science. 159 (1), 117–124 (2000).
15. Guo B.S. : Agriculture Science and Technology Press (1998).
16. Kukalenko S. S., Bovykin B. A., Shestakova S. I., Omel'chenko A. M. : Russian Chemical Reviews. 54 (7), 676–689 (1985).
17. Tzortzakis N.G. : Hort. Sci. 9 Pragucl, 36(3), 117-175 (2009)
18. Amani Abdel-Latif : Australian Journal of Basic Appl. Sci. 2(1), 63-67 (2008)