Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2012, 4(9):4112-4114

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Effect of $HgCl_2$ on seed germination, chlorophyll and protein contents of *Arachis hypogeae* L.

K. Abraham, K. Raju, B. Suresh and T. Damodharam*

Department of Environmental Sciences, S. V. University, Tirupati - 517502.

ABSTRACT

The present work made to the effect of $HgCl_2$ on seed germination, chlorophyll and protein content of Arachis hypogeae. L. The pot culture experiment was conducted with various concentration (1, 2, 3, 4 and 5 mg/L) of $HgCl_2$. The results were showed significantly ($p > 0.05$) affected the seed germination, contents of chlorophyll a & b, total chlorophyll and protein on Arachis hypogeae .L compared to control with increasing treatment of $HgCl_2$.

Key words: $HgCl_2$, Chlorophyll, Protein, Arachis hypogeae.L , Germiantion, etc..

INTRODUCTION

Mercuric chloride is highly toxic, not only acutely but as a cumulative poison. Heavy metals make a significant contribution to environmental pollution as a result of human activities such as mining, smelting, electroplating, energy and fuel production, power transmission, intensive agriculture, sludge dumping and military operations [7]. The contamination of soil by heavy metal enhances uptake causing their accumulation in different plants organs [5,3,6]. Heavy metal presence in the atmosphere, soil and water can cause serious problems all organisms [4]. Approximately half of the atmospheric budget of vapor- phase mercury is attributed to anthropogenic sources and half of to natural sources [8]. Both gold and mercury have been located in bottom sediments and aquatic plants, aquatic lichens and dwarf birch and larch, in a river receiving effluents from a plant recovering gold from ores by mercury [10]. Crop plants grown on sludge – amended soils have shown elevated metal concentrations in tissue with occasional metal toxicity [9].

EXPERIMENTAL SECTION

Seeds of Arachis hypogeae L were collected from N.G. Rnaga Agriculture University, Tirupati, A. P. India. Seeds were washed in distilled water, immersion two minutes with 0.1 N $HgCl_2$ to remove contamination of seed coat and four times washed under the running tap water. Pot culture experiment was carried out with 10 ml concentration (1, 2, 3, 4 and 5 mg / L) of heavy metal $HgCl_2$ whereas distilled water was taken as control. The experiment was carried out in the laboratory condition. Three samples were taken from each plant after harvested for each treatment. Seeds were counted as germination percentage, estimated the chlorophyll content by according to the Arnon (1949) and protein content was determined by the Lowry et., al. (1951).

RESULTS AND DISCUSSION

The present investigation was carried out with the heavy metal mercuric chloride using different concentrations on the seed germination, chlorophyll and protein content of groundnut. The result was showed that there was clear effect of $HgCl_2$ concentration on groundnut compare to control. It was observed that significant decreased with increased concentration (4 and 5 mg/L) of $HgCl_2$ seed germination of Arachis hypogeae L. Heavy metal stress causes multiple direct and indirect effects on all physiological process of plants [11]. The chlorophyll a and b and

subsequently total chlorophyll were reduction with increasing concentrations at 4, and 5 mg/L as compare to control. It may be due to the high concentration of mercuric chloride on biological process and also on development of the plant [2]. The content of protein was also reduction with the increasing concentration at 3, 4 and 5 mg/L of $HgCl_2$ when compare to control. Alterations in the functioning and speed of enzymatic activity, like amino acid synthesis [1] and decrease in protein levels as metabolically response to water restrictions.

Table: 1 Effect of mercuric chloride on germination percentage of *Arachis hypogeae. L*

Control	1 mg/ L	2 mg/L	3 mg/ L	4 mg/ L	5 mg/ L
92.30 ± 0.78	90.30 ± 0.71	88.30 ± 0.71	88.60 ± 0.47	79.60 ± 0.64	70.30 ± 0.32

Values are arithmetic mean ±S.E of three replicates.

Table: 2 Effect of mercuric chloride on chlorophyll a of *Arachis hypogeae L*

Chlorophyll a	10^{th} day	20^{th} day	30^{th} day
control	0.278 ± 0.082	0.164 ± 0.020	0.155 ± 0.002
1 mg / L	0.251 ± 0.001	0.153 ± 0.009	0.142 ± 0.001
2 mg / L	0.238 ± 0.001	0.138 ± 0.001	0.134 ± 0.002
3 mg / L	0.230 ± 0.010	0.132 ± 0.001	0.124 ± 0.001
4 mg / L	0.224 ± 0.001	0.127 ± 0.002	0.120 ± 0.001
5 mg / L	0.193 ± 0.001	0.121 ± 0.004	0.184 ± 0.003

Values are arithmetic mean ±S.E of three replicates

Table: 3 Effect of mercuric chloride on chlorophyll b of *Arachis hypogeae L*

Chlorophyll b	10^{th} day	20^{th} day	30^{th} day
Control	0.173 ± 0.00124	0.171 ± 0.002	0.166 ± 0.003
1 mg / L	0.164 ± 0.002	0.161 ± 0.001	0.159 ± 0.002
2 mg / L	0.165 ± 0.001	0.157 ± 0.001	0.152 ± 0.001
3 mg / L	0.152 ± 0.002	0.146 ± 0.002	0.143 ± 0.001
4 mg / L	0.140 ± 0.002	0.131 ± 0.003	0.127 ± 0.003
5 mg / L	0.132 ± 0.001	0.125 ± 0.001	0.120 ± 0.001

Values are arithmetic mean ±S.E of three replicate

Table: 4 Effect of mercuric chloride on total chlorophyll of *Arachis hypogeae L*

Total Chlorophyll	10^{th} day	20^{th} day	30^{th} day
Control	0.382 ± 0.001	0.376 ± 0.002	0.362 ± 0.003
1 mg / L	0.353 ± 0.001	0.341 ± 0.001	0.335 ± 0.001
2 mg / L	0.333 ± 0.004	0.330 ± 0.001	0.324 ± 0.001
3 mg / L	0.322 ± 0.005	0.317 ± 0.003	0.312 ± .008
4 mg / L	0.287 ± 0.008	0.281 ± 0.006	0.263 ± 0.001
5 mg / L	0.193 ± 0.001	0.184 ± 0.001	0.166 ± 0.002

Values are arithmetic mean ±S.E of three replicates.

Table: 5 Effect of mercuric chloride on protein content of *Arachis hypogeae L*

Protein	10^{th} day	20^{th} day	30^{th} day
control	15.165 ± 0.008	14.253 ± 0.003	13.156 ± 0. 002
1 mg / L	14.014 ± 0.001	13.141 ± 0.001	12.029 ± 0. 001
2 mg / L	12.183 ± 0.007	11.154 ± 0.001	10.127 ± 0. 001
3 mg / L	12.132 ± 0.001	10.542 ± 0.004	9.658 ± 0. 007
4 mg / L	10.226 ± 0.006	9.982 ± 0.001	8. 761 ± 0. 002
5 mg / L	9.254 ± 0.004	8.421 ±0.003	7.215 ± 0. 001

Values are arithmetic mean ±S.E of three replicates.

CONCLUSION

The present investigation reveals that, it is an essential to estimate depredation of the seed germination, chlorophyll and protein contents of groundnut with the concentration of mercuric chloride. However this work is an important to find the photosynthesis progress in plant by the absorption of mercuric chloride. Hence it may be suggested that the plants are being affected by the mercuric chloride surrounding sources. It will reduce the percentage of nutrient in soil and leads to soil contamination.

REFERENCES

[1] M. Andrews; P. j. Lea; J.A Raven; K. Lindsey, *Annuals of Applied Biology*., **2004.** 145 (1) 25-40.
[2] Am. Ahmed; MM. Heikal; MA Shaddad, *Bull. Fac. Sci. Assiut. Univ.*, **1978**, 7, 49-56.

[3] Chaturvedi, *Emer j Agric Sci.*, **2004**, *16(2), 01-08.*
[4] P. Das; S. Samantary; G. R. Rout, *A review. Environ. Poll.*, **1997**, 18 (1), 29-36.
[5] H. Gimmler; J. Carandang; A. Boots; M. Woitke, *J. Appl Bot.*, **2002**, 76, 203-217.
[6] M.Gaspar; G. Prtter Mathe; L. Szabo; B. Orgovanyi; N. Uzinger; A. Anton, *Acta Biol Szegediensis.*, **2005**, *49(1-2), 71-72.*
[7] T.V. Nedekoska; P.M. Doran, *Minerals Engineerin.*, **2000**, 13, 549-561.
[8] J.O. Nriagu, *Nature.*, **1989**, 338, 47-49.
[9] A.L. Page, A literature review study. Pub. EPA **1974**, 670/2-74-005.
[10] T.T. Taisaev, *Dokl. Akad. Nauk. SSSR.*, **1991**, 317, 719-722.
[11] H.W. Woolhouse; O. L. Lnage; P. S.noble; C. B. Osmand; H.Ziegler (eds), III. *Encyclopedia of Plant Physiology*, (New series), Springer – Verlog, New York, **1983**, 12C: 245-300.