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Research Article

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Efficacy of lead on germination growth & morphological studies of Horse Gram (*Dolichos biflorus* Linn)

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ABSTRACT

The present investigation has been carried to find out the different concentration of lead on seed germination , seedling growth, fresh weight and dry weight three varieties of Horse gram (Dolichos biflorus Linn) seedlings. The horse gram seeds were procured from Tamil nadu Agricultural university (TNAU) Coimbatore. Three varieties of horse gram used for this experiment. Various concentration of lead acetate solutions were prepared (5,10,25,50,75,100,250,500 and 1000 ppm)by using distilled water. All the morphological growth parameters of the 9th day seedlings showed decreasing trend with the increasing of lead concentration.The seedlings under 500 and1000 ppm were totally leathal.The percentage of phytotoxicity values were directly proportional to the lead concentrations. From the morphological growth parameters among these three varieties of horse gram, only two varieties (co-1 and P-2) selected .However the higher concentration of lead treatment showed the minimum growth of p-2.So, it can be concluded that the variety Co-1 of horse gram was found to be a tolerant variety can be cultivated in the soils contaminated with lead. This will prevent the extent of damage caused by lead on growth of horse gram to certain extent.

Key words: Lead acetate, germination, seedling growth, horse gram, fresh weight, dry weight.

INTRODUCTION

The term heavy metal refers to all metals and metalloids with the exception of alkali and alkaline earth elements having a density more than five times higher than that of water. The metal pollutant released in to the environment due to increased industrialization, mining, smelting, and combustion of fuel, transportation, power generating plants and from the use of pesticides. Higher concentration of heavy metal present n the soil will inhibit the crop improvement. The heavy metal adversely affects the metabolic processes in plants by interfering with photosynthetic and respiratory activity.

EXPERIMENTAL SECTION

This work has been carried out in laboratory condition to find the effect of different concentration(5, 10, 25, 50, 75, 100, 250, 500 and 1000 ppm.) of lead acetate on seeds germinations, growth, fresh weight and dry weight .

Metal solution:
1 gm of lead acetate was dissolved in 1000ml of distilled water (1000 ppm). The various concentrations of lead acetate solutions were prepared from standard solution using distilled water. The prepared solutions were more important for germination studies.

PARAMETERS VARIFIED EXPERIMENTALLY

Seed germination:
The seeds co-1,p-1 and p-2 were surface sterilized with 0.1 % mercuric chloride solution to avoid the surface contamination. And then the seeds were washed with tap water .all the germination experiments were performed in 9 cm diameter petriplates with a single filter paper –placed in it. The control seeds were treated with distilled water. The emergence of radical was taken as the criterion for germination. The germination was recorded for every 24 hours and continued till the 9 th day and total germination percentage was calculated.

Germination percentage was calculated by using the formula

$$\textit{Germination percentage} = \frac{number\ of\ seed\ germinated}{total\ number\ of\ seeds} \text{ x}100$$

Fresh weight:
The seedlings were separated in to root and shoot. They rolled in a blotting paper to remove water, after that each seedling fresh weights were taken using single pan balance.

Dry weight:
The seedlings were kept in hot air oven at 80°C for 24 hours. Then their dry weight was weighed and recorded with the help of an electronic single pan balance.

RESULTS AND DISCUSSION

In the present investigation , changes in seed germination, growth and morphological studies have been done under lead stress.

Laboratory studies:
Germination percentage of horse gram (Dolichos biflorus linn.) varieties under lead stress are presented in table 1.The highest percentage of horse gram (co-1,100.00;P-1,98 &P-2,96) were recorded at control level. The lowest germination percentage of horse gram (co-1,49;P-1,44 &P-2,40 were recorded at 250 ppm in lead concentration.

Root length and shoot length. The highest root length of horse gram Co-1,9.8; P-1,9.2 &P-2,8.7 were recorded and the shoot level Co-1,13.10;P-1,12.80& P-2,11.34 were obtained at control level.

Table:1 Effect of lead on seed germination percentage of horse gram (*Dolichos biflorus* LINN)

Lead concentration (ppm)	Varieties		
	Co-1	P-1	P-2
control	100	98	96
5	95	93	90
10	89	85	81
25	81	76	72
50	72	67	62
75	67	61	56
100	59	53	49
250	49	44	40

Fresh weight and dry weight of the seedlings are expressed in the above table. The results were indicated that the highest fresh weight was observed in control level of horse gram Co-1,2.680;p-1, 2.581& P-2,2.575. the lowest fresh weight of horse gram Co-1,1.510;P-1, 1.298 &P-2 ,1.214 were observed at 250 ppm concentration. The highest dry weight was observed in control level of horse gram Co-1,0.980;P-1,0.956&P-2,0.932.the lowest dry weight of horse gram Co-1,0.556;P-1,0.505 &P-2,0.452 were recorded at 250 ppm concentration of lead.

Table 2. Changes in seedlings root length and shoot length(Cm/plant)of three varieties of horse gram (*Dolichos biflorus* Linn*)*.irrigated with various concentration of lead.

Lead concentration (ppm)	Varieties			Varieties		
	Root length(cm/plant)			Shoot length(cm/plant)		
	Co-1	P-1	P-2	co-1	P-1	P-2
Control	9.8	9.2	8.7	13.10	12.80	11.34
5	9.5	8.8	8.2	12.05	11.20	9.86
10	8.8	8.0	7.4	11.58	10.09	8.92
25	8.4	7.8	7.1	10.05	9.61	7.94
50	7.9	7.2	6.7	9.88	8.97	7.54
75	6.6	6.0	5.6	8.86	7.91	6.52
100	5.7	4.7	4.2	8.12	7.41	6.05
250	4.9	4.1	3.8	7.25	7.00	5.87

Table 3.Effect of lead on fresh weight and dry weight (mg/g/plant) of horse gram (*Dolichos biflorus* Linn)seedlings.

Lead concentration (ppm)	Fresh weight(mg/g/plant)			Dry weight(mg/g/plant)		
	Varieties			Varieties		
	Co-1	P-1	P-2	co-1	P-1	P-2
Control	2.680	2.581	2.575	0.980	0.956	0.932
5	2.610	2.463	2.429	0.942	0.912	0.875
10	2.527	2.426	2.390	0.896	0.861	0.798
25	2.389	2.259	2.205	0.852	0.803	0.721
50	2.348	2.218	2.114	0.771	0.755	0.684
75	2.098	2.002	1.921	0.718	0.704	0.659
100	1.724	1.511	1.371	0.668	0.643	0.617
250	1.510	1.298	1.214	0.556	0.597	0.536

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