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Review Article

THE EFFECT OF CERTAIN HEAVY METALS ON TOTAL CHOLOROPHYLL AND CAROTENOIDS CONTENT OF CYAMOPSIS TETRAGONOLOBA CVS 936 AND 1002

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Abstract

Rapid industrialization and urbanisation practises have put water and agricultural soils in grave danger, affecting crop output around the world and raising significant questions about food security. However, some other metals like mercury (Hg), lead (Pb), arsenic (As), copper (Cu), chromium (Cr), and others are toxic even at low concentrations. The majority of heavy metals (HMs), such as zinc (Zn), nickel (Ni), copper (Cu), chromium (Cr), and others, are essential for plant metabolic pathways when present in low amounts and become toxic at higher concentrations. The HMs stress is one of the various abiotic stresses that can alter the soil's health and the ability of economic plants to use their resources. Plants that are legumes are members of the Fabaceae family, one of the largest families with 700 genera and 20,000 species. This chapter deals with the HM-initiated plant responses upon key metabolic processes such as seed germination, plant growth, photosynthetic pigments.

Keywords: Medicinal, Artemisia annua, Taxus brevifolia, Vinca rosea, Digitalis pur Chlorophyll , cartenoids , tetragonoloba , heavy metal , chlorophyll.

Introduction

MATERIALS & METHODS

Cayamopsis tetragonlobaL. seeds of two assortments, RGC 936 and RGC 1002, were guaranteed. Taub Seeds from the Durga Pura agrarian exploration Station in Jaipur were stored in glass bottles with stoppers. Following a key decision for consistent litti models of seed size and colour, the seeds were surface-disinfected using.1.0% Hgcl2 Copper sulphate, cadmium sulphide, lead nitrate, nikhil sulphate, and zinc sulphate seat absorbed refined water for two hours comprised the control after the aforementioned medications seats were eliminated and allowed to produce in Petri Plates on channel paper. For two minutes, then washed repeatedly with refined water, and after that, sold for two hours in separate arrangements of various fixation (10, 50, 100, 200, 500, and absorbed all of the aforementioned

ESTIMATION OF PIGMENTS

Total chlorophyll and total carotenoids were measured for chlorophyll A+ B. use Anand's (1949) and Kirk and Alan's (1965) methods, respectively. The ten-day-old leaves of seedlings of the Cyamopsis tetragonoloba RGC 936 & RGC 1002 types were collected independently. For each treatment, one g of leaf tissue was weighed, quickly ground, and thoroughly mixed with a few ML of 80% acetone in a mortar and pestle.After centrifuging the homogenate at 2000 rpm for one minute, 10 ML of 80% acetone were added. The amount of total chlorophyll in the clear supernatant solution was measured.

Chlorophyll

The amount of chlorophyll was determined by reading the optical density at 645 and 663 nm of the extract by spectrophotometer (Electronic Corporation of India Limited QS 5771 V) and calculated by the equation given by Aron (1949).

Total chlorophyll (A+B) = 20.2 A645+8.02 A663

mg/l and to calculate chlorophyll content on fresh weight basis, the following formula was used -

Total chlorophyll (mg/g) = (20.2 A645+8.02 A663*V)/a * 100* W

Where A645 and A663 =optical densities of the sample at 645 nm and 663 nm respectively.

A = Length of path of light in the cell (1.0 cm),

V = Volume of extract in ml.

W = Fresh weight of the sample in g.

The values of pigments were expressed in terms of mg/g fresh weight as suggested by Arnon (1949).

Carotenoids

By measuring the extract's optical density at wavelengths of 480 nm, 645 nm, and 663 nm using a spectrophotometer (Electronic Corporation of India Limited GS 570 IV), the amount of total carotenoids was computed using the Kirk and Allen (1965) equation.). According to them X g carotenoids in Y ml of solution gives extinction of E at the given wave length, then :

X = Type equation here.

480

Elem × 100

3 per the met 968

Where El = specific extinction coefficient

Indirectly AE is determined as

Ear = Increase in absorption at 480 nm due to carotenoid.

E = Extinction at 480 nm

480

E 645 = Extinction at 645 nm

E 663 = Extinction at 663 nm.

Total chlorophyll and Carotenoids Contents of two cultivars of Cyamopsis tetragonoloba L. Taub. were tabulated

.OBSERVATION

The data regarding the effect of heavy metals on total chlorophyll and carotenoid contents of the cultivars RGC936 & RGC 1002 of Cyamopsis tetragonoloba L. Tab.were tabulated.6.1 &. 6.2

Effect of Heavy Metals on Total Chlorophyll Content:

Except for Zn and Cu up to 10 and 50 ppm concentrations, when it was superior to control, Cyamopsis tetragonoloba cv .RGC 936's total chlorophyll content gradually decreased as heavy metal concentrations increased. Results were documented for the comparison of the control group to the treatments and among themselves in varying concentrations. There were no such differences found between different compounds and copies. When compared to Zn, Cu, and Ni, Cd and Pb significantly lowered the overall a 1000 ppm quantity of chlorophyll.

Effect of Heavy Metals on Carotenoid Content.

It was seen that zn.and Cu were less inhibitory to live amount Sarand10 011 allot in Ca. 0620 mel2 in Po.023 mela in 48.02, of in Harmony and Cit of New weight at 1000 ppm concentaion (Matt.52

Fig-62). At 1000 ppm focus, Disc and Pb caused the isher.dution in color content. Statistically profoundly huge outcomes were seen between control versus treatment and among different cumentations though not huge outcomes were seen among different synthetics and duplicates.

Cyamopsis tetragonoloba cv. RGC 1002 :

The data regarding the effect of heavy metals on total chlorophyll and carotenoid contents are recorded in Tables 6.3 to 6.4, Figs. 6.3 to 6.4.

(i) Effect of Heavy Metals on Total Chlorophyll Content:

The total chlorophyll content in Cyamopsis «tetragonoloba cv. RGC 1002 decreased as the concentration of heavy metals increased over time (Table 6.3, Fig. 6.3). The poisonousness of nickel, zinc, and copper to shadow content was less well-articulated than that of cadmium and lead.

In any event, when treated with Ni, Zn, and Cu, a steady reduction in shadow content was observed from 50 ppm onward. Between control and therapy, as well as between various focuses, there were incredibly stark disparities. A quantifiable analysis revealed that there were significant differences between the various synthetics. All-out chlorophyll content in the control was 0.86 mg/g new weight, and it decreased to zero (indistinguishable) un Disc and Pb, 0.33 mg/g new weight in Ni, 0.46 mg/g new weight in Zn, and 0.52 mg/g new weight in Cu.

Effect of Heavy Metals on Carotenoid Content :

A standard decline was found in carotenoid content of Cyamopsistetragonoloba cv. RGC 1002 with expanding groupings of the multitude of five weighty metals. In the control, carotenoid content was 0.25 mg/g new weight which diminished to nothing in Compact disc and Pb though 0.16 mg/g new weight in Ni and n and 0.17 mg/g new weight in Cu. Genuinely very highly critical outcomes were found between control versus treatment and among focuses. No tremendous contrasts were seen among synthetic compounds and among recreates.

OBSERVATION & RESULTS:

Role of Heavy Metals on Pigment Contents

In the leaves of higher plants, photosynthesis is managed primarily By the natural, as well as the interal factors. Chlorophylls are the most significant among inward factors which are the site of photosynthetic action. The chlorophyll contents have been utilized as a list of efficiency of regular networks and there exists a relationship between how much chlorophyll and dry matter creation. A scrutiny of the perceptions (Table 1 to 4) on colour content uncover that both complete chlorophyll and carotenoid contents diminished huge Cyamopsis tetragonoloba with the utilization of weighty metals.

In every one of the cultivars with the exception of RGC 936, Disc and Pb radically decreased color contents at 500 ppm focus at which every one of the weighty metals caused uncommon or critical decrease in the shade content of the cultivar RGC 1002 and this cultivar was additionally generally delicate to the weighty metal harmfulness in contrast with different cultivars. The cultivar RGC 936 was viewed as the most impervious to the\toxicity of weighty metals when contrasted with different cultivars. By and large, every one of the groupings of weighty metals were inhibitory to the shade contents. in Cyamopsis tetragonoloba with the exception of 10 ppm grouping of Ni, n and Cu for the chlorophyll content in every one of the four cultivars. It was clear from the perceptions that in the control, the absolute chlorophyll content in these two cultivars of Cyamopsis went from 0.97 mg/g new weight (RGC936), 0.86 mg/g new weight (RGC 1002), 0.92 mg/g showing in this way that in the control, the chlorophyll content of the two cultivars is pretty much in a similar reach. At the maximum, i.e. 1000 ppm concentration of heavy metals , it decreased in all the cultivars as given below in the following table:

C.TETRAGONOLOBA	Chlorophyll mg/g fresh weight				
	Cd	Pb	Ni	Zn	Cu
METALS					
RGC 936	0.67	0.70	0.74	0.85	0.79
RGC 1002	Nil	Nil	0.33	0.46	0.52

Showing the Effect of Heavy Metals on Total Chlorophyll Content (m8/g fresh weight) in Seedlings of Cyamopsis erragonoloba ev. RGC 936 (values are means of three)

Name of chemical	Cont.	Concentration(ppm)					
		10	50	100	200	500	1000
Cadmium Sulphate	0.97	0.85	0.84	0.82	0.77	0.72	0.67
Lead nitrate	0.97	0.92	0.89	0.87	0.83	0.76	0.70
Nickel sulphate	0.97	0.98	0.92	0.89	0.86	0.81	0.74
Zinc Sulphate	0.97	0.99	0.94	0.91	0.88	0.84	0.85
Copper Sulphate	0.97	1.2	1.2	0.98	0.97	0.86	0.79

The carotenoid content also decreased with increase in concentration except at 10 ppm concentration of Ni, n and Cu. The order of four cultivars of Cyamopsis tetragonoloba in respect of pigment contents vis-a-vis heavy metal toxicity was observed as RGC 1002 > RGC 1003 > RGC 1017 > RGC 936 (chlorophyll content), RGC 1017 > RGC 1002 > RGC 1003 > RGC 936 (cartenoid content).

Cyamopsis tetragonoloba's pigment concentration may have diminished as a result of the inhibition of various physiological activities, most notably photosynthesis. It could be brought on by disruptions in the synthesis of heavy metals may disrupt the synthesis of a protein that is a structural component of chloroplasts, which may then lead to a decrease in the pigment concentration.

Different theories have been advanced for the reduction in pigment content caused by the application of heavy metals, according to a review of the literature. According to Bohner et al. (1980), Cu decreased chlorophyll content, possibly as a result of reduced photosynthetic electron transport.Table 2 : Showing the Effect of Heavy Metals on Total carotenoid Content (mg/g fresh weight) in Seedlings of Cyamopsis tetragonoloba cv. RGC 936 (values are means of three replicates each)

Name of chemical	**Cont.**	**Concentration (ppm)**					
		10	**50**	**100**	**200**	**500**	**1000**
Cadmium sulphate	**0.37**	0.31	0.29	0.28	0.25	0.21	0.11
Lead nitrate	**0.37**	0.33	0.30	0.30	0.28	0.25	0.20
Nickel sulphate	**0.37**	0.38	0.33	0.30	0.28	0.25	0.23
Zinc sulphate	**0.37**	0.39	0.33	0.33	0.30	0.29	0.26
Copper sulphate	**0.37**	0.38	0.35	0.34	0.30	0.27	0.26

Table 3 : Showing the Effect of Heavy Metals on Chlorophyll Content (mg/g fresh weight) in Seedlings of Cyamopsis tetragonoloba cv. RGC 1002 (values are means of three replicates each)

Name of chemical	Cont.	Concentration (ppm)					
		10	50	100	200	500	1000
Cadmium sulphate	**0.86**	0.80	0.69	0.57	0.48	0.29	Nil
Lead nitrate	**0.86**	0.83	0.68	0.59	0.49	0.32	Nil
Nickel sulphate	**0.86**	0.87	0.73	0.60	0.48	0.37	0.33
Zinc sulphate	**0.86**	0.87	0.84	0.71	0.67	0.59	0.46
Copper sulphate	**0.86**	0.89	0.83	0.74	0.69	0.63	0.26

Table 4: Showing the Effect of Heavy Metals on Total Carotenoid Content (mg/g fresh weight) in Seedlings of Cyamopsis tetragonoloba cv. RGC 1002 (values are means of three replicates each)

Name of chemical	Cont.	Concentration (ppm)					
		10	50	100	200	500	1000
Cadmium sulphate	**0.25**	0.19	0.17	0.16	0.14	ND	Nil
Lead nitrate	**0.25**	0.21	0.19	0.18	0.16	0.12	Nil
Nickel sulphate	**0.25**	0.23	0.20	0.19	0.18	0.18	0.16
Zinc sulphate	**0.25**	0.25	0.23	0.19	0.17	0.16	0.16
Copper sulphate	**0.25**	0.25	0.24	0.20	0.19	0.18	0.17

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