

Effects of Industrial Effluent on selected Nutritional Factors of *Amaranthus* Species.

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ABSTRACT: Release of industrial effluents to the open land, air and water is one of the major environmental issues facing by the whole world. Soil and environment are under tremendous pressure due to industrial expansion and discharge of effluents. The current study was based on the effect of industrial effluent on the selected nutritional factors of *Amaranthus* species. *Amaranthus* sps is a leafy vegetable with high nutritional value. For the study, nutritional factors protein, β carotene, phenol, carbohydrate, and tannin content of the plant sps was observed at different treatment concentrations of 10%, 20%, 30%, 40% and 50%. The highest amount of protein was present in the control set of *Amaranthus* sps with 0.1159mg and lowest amount is present in the 50% sample set with 0.083mg. The highest amount of β carotene was present in the 50% set with 0.0034mg and the least amount was present in the control set 0.0020mg. The highest amount of carbohydrate was present in the control with 9.860mg and the least amount was present in 50% with 1.407mg. The highest amount of phenol was present in the 50% with 0.00201mg and the least amount was observed in the control with 0.00186mg. The highest amount of tannin was present in the 50% with 0.045mg and the least amount was present in the control set with 0.022mg. As the treatment concentrations increased the amount of protein and carbohydrate decreased, but the amount of tannin, β carotene and the phenol got increased when compared with the control. So from the preliminary study it was very clear that the industrial effluent is capable to cause desirable changes in the amount of nutritional factors present in the plant.

KEYWORDS: Industrial Effluent, Nutritional Factors, Phenol, *Amaranthus* sps.

I. INTRODUCTION

Almost all the members of *Amaranthus* family are mainly used for the edible purpose. They are leafy vegetables with high nutrient value. They are very sensitive to the environmental conditions and mainly they grow in summer seasons. *Amaranthus* collectively called as amaranth is a cosmopolitan genus of annual or short-lived perennial plants. Current study is on the effect of industrial effluent on the selected nutritional factors of *Amaranthus* sps at different treatment concentrations of 10%, 20%, 30%, 40% and 50%. From the references it is very clear that, industrial effluents are capable to cause stress over plants. Robbercht. R *et al.*, 2017[6] observed that the plant treated by effluents showed desired changes in the nutrient content (increase in the phenol content indicates the reflex action of the plant to the stress). The inhibition of plant growth and crop production by toxic pollutants is a major environmental issue. Plants adapt to stress by different mechanisms, including changes in morphological and physiological and biochemical processes (Divyapriya.S *et al.*, 2014)[1]. Nagajyoti P.C *et al.*, 2008[5] also observed that as the effluent concentration increases it will negatively affect the growth and the nutritional factors in the plant body. Similar observations are obtained in the case of *Amaranthus* sps.

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II. RELATED WORKS

Divyapriya.S *et al.*, 2014[1] studied the effect of industrial effluent on the biochemical changes in the germinating seeds and he reached at the conclusion that the industrial effluents have desired effect on the biochemical activities in the plant body. Nagajyoti P.C *et al.*, 2008, Mengel *et al.*, 2001[5][9] also observed that as the effluent concentration increases it will negatively affect the growth and the nutritional factors in the plant body. Chum-xi *et al.*, 2007[12] investigated the effect of Arsenic on seed germination and physiological activities of wheat seedlings. Pal *et al.*, 2006, Masarovicova *et al.*, 1999[10][11] also observed the nutritional changes in the plant body after the influence of industrial effluents and the heavy metals present in it.

III. MATERIALS AND METHODS

Estimation of total carbohydrate

One gram of sample is added to boiling tube. Then added 10ml distilled water into it. The mixture is Grinded and filtered out. the mixture was centrifuged at 10,000rpm for 10 minutes, the supernatant was collected and make it to a known volume using distilled water. 0.1 ml of sample is make up to 1ml by distilled water. Then added 4ml anthrone reagent and kept in boiling water bath for 10 minutes. Taken OD at 620nm

Estimation of Protein

2gm of sample is grinded in phosphate buffer. Then it is filtered out by cheese cloth. Centrifuged the filtrate at 5000rpm for 10 minutes. The supernatant was collected and make it to known volume by using buffer. 1ml of solution is taken and added 1ml of 10% Trichloroacetic acid. Shaked thoroughly .Kept in freezer for 15 minutes .Centrifuged at 10,000 rpm for 10 minutes. The upper layer is removed. The pellet was dissolved in known volume of 0.1 N NaOH. 0.1 ml of aliquot is collected. Make up to 1ml by using 0.1 N NaOH .Add 5ml of reagent C .Kept it for 30 minutes .Taken the OD at 670nm.

Estimation of beta carotene

To 2gm of sample, 20ml 60% KOH is added. It is kept in darkness for 3hours. the mixture is transfered into separating funnel . It is then Washed with petroleum ether for 6 times . Ether layer is collected after each wash. Ether layer is making up to known volume. The absorbance is read at 429 nm.

Determination of Tannin

One gram of the sample was extracted using 50 % methanol. It was mixed occasionally by swirling. After 20-28 hours, the mixture was centrifuged and the supernatant was collected. One ml of the supernatant was pipette out. Vanillin hydrochloride reagent was quickly added to the reaction mixture. Absorbance was read in a spectrophotometer (UV-1800 Shimadzu) at 500 nm after 20 minutes. A blank was prepared with vanillin hydrochloride reagent alone. Result was calculated by preparing a standard graph with 20-100µg catechin using the diluted stock solution.

Determination of Phenol

One gram of the sample was reflexed it in 80% methanol for 20 minutes. It was ground thoroughly and filtrate was collected. Then the filtrate was subjected to centrifugation at 1000 rpm for 10 minutes, and the supernatant was collected. Then it was makeup to a known volume by using methanol. After that an aliquot of 0.1 ml is taken. Again it was makeup to 3 ml using methanol. Then 0.5 ml of Folin reagent is added. At last 2 ml 20% of Na₂CO₃ is added and keep in a boiling water bath for 5 minutes. Finally a white precipitate was formed. The mixture was centrifuged at 5000 rpm for 5 minutes. Absorbance was read in a spectrophotometer (UV- 1800 Shimadzu) at 650 nm after 20 minutes. A blank was prepared with Folin reagent alone.

IV. RESULTS AND DISCUSSION

The direct release of industrial effluent to the nearby water resources or open land area results in the exposure to the toxic substances. The industrial effluents are one of the major sources of toxic pollutants to the soil pollution and water pollution. The pollution or harmful pollutants present in the soil results in the morphological and physiological changes (changes to nutritional factors) to the plants. From the study it was very clear that the industrial effluents are capable to make negative impact on the morphology of the plant (growth rate, leaf production, leaf degradation etc.). The

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treatment of *Amaranthus* sps with the industrial effluent at different concentrations (10%, 20%, 30%, 40% and 50%) had made desired changes in the plant nutritional factors. The table 4 given below shows the effect of industrial effluents on selected plant nutrients.

TABLE 4: Effect of on nutritional factors at different treatment concentrations

Nutritional factors	Treatment concentrations					
	Control	10%	20%	30%	40%	50%
Protein (mg)	0.1159	0.1215	0.118	0.107	0.091	0.083
β-carotene (mg)	0.0020	0.0023	0.0024	0.0026	0.0028	0.0034
Phenol (mg)	0.00186	0.00187	0.00189	0.00193	0.00195	0.00201
Carbohydrate (mg)	9.860	8.570	8.470	7.660	6.630	1.407
Tannin (mg)	0.022	0.030	0.031	0.038	0.039	0.045

Phytochemical analysis of selected nutritional factors such as the protein, β-carotene, phenol, carbohydrate and tannin showed desired changes when compared with the control set.

The amount of protein present in the 10%, 20%, 30%, 40%, 50% and control sample set were 0.1159, 0.1215, 0.118, 0.107, 0.091 and 0.083 respectively. The amount of β-carotene present in samples set were 0.0023(10%), 0.0024(20%), 0.0026(30%), 0.0028(40%), 0.0034(50%) and 0.0020(control).

The amount of phenol present in the samples were 0.00187(10%), 0.00189(20%), 0.00193(30%), 0.00195(40%), 0.00201(50%) and 0.00186(control). The amount of carbohydrate were, 8.570 (10%), 8.470(20%), 7.660(30%) 6.630(40%), 1.407(50%) and 9.860 (control). The amount of tannin present in the samples sets were 0.030(10%), 0.031(20%), 0.038(30%), 0.039(40%), 0.045(50%) and 0.022 in control set. From the above observations the highest protein was present in the 10% and lowest amount of protein was present in the 50%. The highest amount of β-carotene was present in the 50% sample set and the least amount was present in the control. The highest amount of phenol was present in the 10% and the least amount of phenol was present in the 50%. The highest amount of carbohydrate was present in the 50% set and the highest in the control set. The amount of tannin was highest in the 50% and the least amount is present in the control set. From the above observations it is very clear that the industrial effluent were capable to cause desired changes in the amount of nutritional factors in the plant body.

Giese AC *et al.*, 1964[2] observed that one of the major molecules severely affected by stress is protein. Also he analysed the total protein content in leaf of tomato and capsicum which is treated with the industrial effluent. The results revealed that the reduction in protein content was very obvious with an increase in the concentrations of effluent, when compared to the control plants. Suresh *et al.*, 2014[8] also found that the increased concentration of effluent decreases the plant protein level. Robbercht R *et al.*, (1983)[6] said that Phenol is one of the major chemical

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constituents, providing good protection against stress injury in plants. Stafford HA *et al.*, 1965[7] observed that, the synthesis of phenol triggered only under stressful environments. Robbercht R *et al.*, 2017[6] analysed the impact of distillery effluent on the total phenol content was analysed. It was found that there was more prominent increase in the phenol content of the distillery effluent treated capsicum than that of the effluent treated *Lycopersicum esculantum*. Khan and Jain, 1995[4] observed that the plants exposed to the industrial effluents results in the reduction carbohydrate present in the plant body. Himabindu and Reddy (2005)[3], observed that the increased concentration of effluent treatment results in the increased β -carotene concentration in the plant. Likely in the present study the higher concentration of carotene is present in the 50% and the least concentration of carotene is present in the control set of sample *Amaranthus* species.

V. CONCLUSION

Almost all varieties of the *Amaranthus* sps are used for edible purpose; they are rich in nutrient content. In this study after the 5 weeks of treatment, the results showed that the highest amount of protein was present in the control set of *Amaranthus* sps with 0.1159mg and lowest amount was present in the 50% sample set with 0.083mg. The highest amount of β carotene was present in the 50% set with 0.0034mg and the least amount was present in the control set 0.0020mg. The highest amount of carbohydrate was present in the control set with 9.860mg and the least amount was present in the 50% with 1.407mg. The highest amount of phenol was present in the 50% with 0.00201mg and the least amount was observed in the control set with 0.00186mg. The highest amount of tannin was present in the 50% with 0.045mg and the least amount was present in the control set with 0.022mg. As the treatment concentration increased, the amount of protein and carbohydrate decreased, but the amount of tannin, β carotene and the phenol got increased when compared with the control. From this, it is very clear that as the treatment concentration and the duration of the treatment increases, the nutritional factors gives noticeable variations in their values. Natural resources are vital for the survival of life in earth so it is very important to conserve and protect it. Industrial effluents are one of the major pollutant source in earth. The unscientific disposal of treated or untreated effluents results in serious environmental issues such as the water, air, sound pollution etc., as the environment get polluted the associated animals and plant species also get affected. So it is very important to treat and dispose the waste water in scientific way.

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