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Effect of Different Concentration of Textile Waste Water on Nutritional Values of *Cicer Arietinum* Var. Rsg 896 L

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Abstract: ***Nitrogen is building block element for plants. Cicer arietinum is leguminous plant and form nodules and it is found in rhizobium association. In Cicer arietinum, rhizobium fix atmospheric nitrogen for the plant but due the presence of higher amount of heavy metal, the amount of nitrogen continuously decreases. The waste water of Amanishah nallah, Sanganer contain large number of heavy metals as the textile and dyeing printing industries are discharging their waste water directly into Amanishah nallah and these industries use dye, printing agents which have Cr, Cd, Pb, Cu in their solution. In this study, different level of this waste water were used in pots of Cicer arietinum and it was found that at each succeeding level, the amount of carbohydrate, nitrogen and protein get reduced due to the toxicity of heavy metal present in waste water. At pre stage, the concentration of carbohydrate , nitrogen and protein varies from 139 to 310 mg/g, 0.130 to 0.648% and 0.815 to 4.053% respectively, at peak stage from 376 to 782 mg/g, 0.150 to 0.799% and 0.939 to 5.495% respectively and at post stage from 302 to 615 mg/g, 0.159 to 0.799 % and 0.997 to 4.995% respectively.***

Keywords: Waste Water, Printing Industry, Cicer arietinum, Nutritional value, Amanishah Nallah

1. Introduction

Use of industrial effluents and sewage sludge on agriculture land has become a common practice in India as a result of which these toxic metals can be transferred and concentrated into the plant tissues from the soil. These metals have damaging effects on plants themselves and become a health hazards to man and animals. Above certain concentration and over narrow range, the heavy metals turn into toxins (Babich *et al* 1982). Some heavy metals at low doses are essential micronutrients for plants but in higher doses, they may cause metabolic disorder and growth inhibition for most of the plant species (Fernandes and Henrique 1991 and Claire *et al*. 1991)

Chickpea (*Cicer arietinum*) is the 3rd most widely grown grain legume in the world after bean and soyabean (Karadavut and Genc 2012). The Mediterranean origin of the crop imparts special significance to chickpea in the agriculture of this area, where it has multiple functions in the tradition farming systems. Besides being an important source of human and animal food, the crop also plays an important role in the maintenance of soil fertility, particularly in the dry and rain fed area. In addition, it is also widely used as green manure. Chickpea seeds contain about 20.65 proteins, 61.2% Carbohydrate and 2.25 fats (Soltani *et al*. 2006).

Among various nutritional requirement for production, Nitrogen is known to be an essential element for plant growth and development. Along with this nitrogen deficiency also show adverse effects on morphology and phenology of the crop plant. The level of carbohydrate in all the plant reflects all the general physiology of the growth and development at the plant. (S. S. Phuleri. 2012)

2. Material and Methods

The seeds of *Cicer arietinum* var. RSG 896 L. Were obtained from Agriculture Research centre, Rajasthan Agriculture University of Bikaner located in Durgapura, Jaipur, Rajasthan. Earthen pots (with a diameter of 12 inch) were used for conducting pot experiment for the test plant *species Cicer arietinum var. RSG 896*. The seeds were surface sterilized with dilute solution hypo chloride to prevent any fungal contamination. The sand was thoroughly washed with water and then treated with 2% sodium hypo chloride and dried. The seeds were sown in earthen pots containing equal quantities of soil and each pot were treated with different treatment levels of waste water of Amanishah nallah, Sanganer, Jaipur. Following 6 treatment levels were prepared by diluting waste water with distilled water:

1st level (DW : WW) : 100:0	4th level (DW: WW): 40: 60
2nd level (DW: WW): 80:20	5th level (DW: WW): 20:80
3rd level (DW: WW): 60:40	6th level (DW: WW): 0: 100

The plants were investigated at 3 stages of their maturation at pre stage, peak stage and post stage. Carbohydrate content was estimated by Anthrone method (Hedge and Hofreiter, 1962) and Protein content was estimated by microkjeldhal's method (Allen, 1931).

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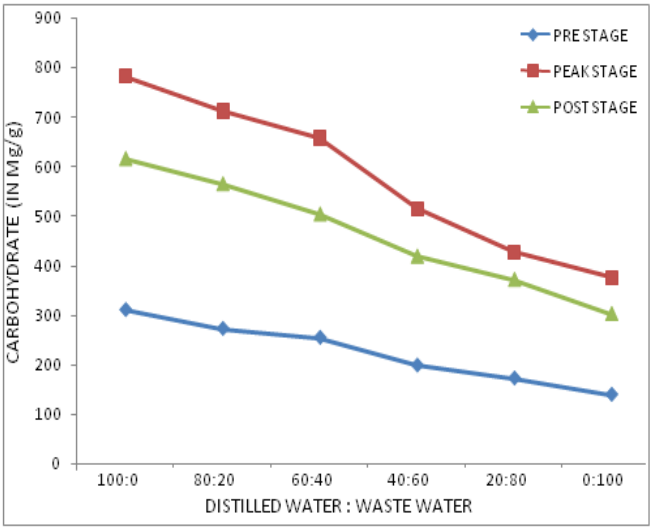
Table 1: Effect of Textile Waste Water of Amanishah Nallah on *Carbohydrate Content In Cicer Arietinum (In mg/g)*

S. No.	Concentration (Distilled Water : Waste Water)	Pre	Peak	Post
1.	100 : 0	310.00 ± 1.581	782.10 ± 1.696	615.15 ± 1.946
2.	80 : 20	272.23 ± 1.608 (12.25)	712.35 ± 1.524 (8.95)	564.23 ± 1.755 (8.29)
3.	60 : 40	254.40 ± 1.694 (18.06)	657.70 ± 1.502 (15.98)	503.40 ± 1.677 (18.21)
4.	40 : 60	198.10 ± 1.497 (36.12)	514.20 ± 1.686 (34.27)	418.00 ± 1.580 (32.03)
5.	20 : 80	172.60 ± 1.611 (44.51)	426.09 ± 1.729 (45.52)	371.60 ± 1.502 (39.67)
6.	0 : 100	139.20 ± 1.593 (55.16)	376.00 ± 1.595 (51.91)	302.20 ± 1.658 (50.89±)

Mean ± S.D.
Values in parenthesis are % reduction

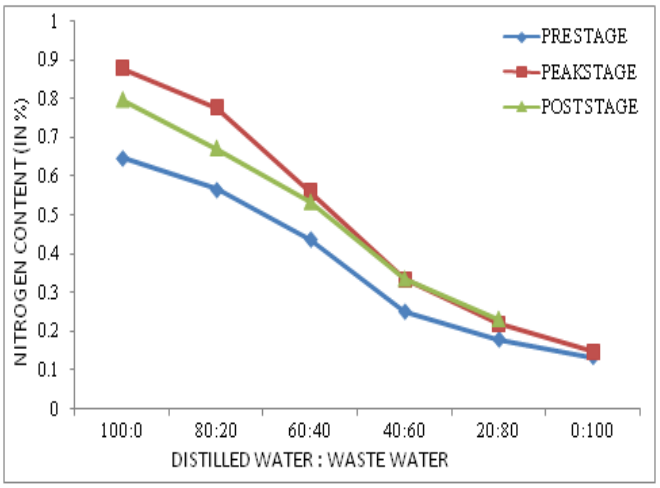


Graph 1: Showing the reduction in carbohydrate content at each successive level of waste water

Table 2: Effect of Textile Waste Water Of Amanishah Nallah On Nitrogen Content In Cicer Arietinum (In %)

S. No.	Concentration (Distilled Water Waste Water)	Pre	Peak	Post
1.	100 : 0	0.648 ± 0.025	0.879 ± 0.030	0.799 ± 0.022
2.	80 : 20	0.566 ± 0.027 (12.54)	0.778 ± 0.026 (11.44)	0.674 ± 0.025 (15.63)
3.	60 : 40	0.438 ± 0.024 (32.39)	0.561 ± 0.025 (36.06)	0.535 ± 0.025 (32.99)
4.	40 : 20	0.251 ± 0.023 (61.25)	0.335 ± 0.024 (61.84)	0.336 ± 0.024 (57.87)
5.	20 : 80	0.179 ± 0.023 (72.27)	0.222 ± 0.026 (74.71)	0.232 ± 0.026 (70.91)
6.	0 : 100	0.134 ± 0.024 (79.86)	0.150 ± 0.026 (82.90)	0.159 ± 0.025 (79.52)

Mean ± S.D.
Values in parenthesis are % reduction

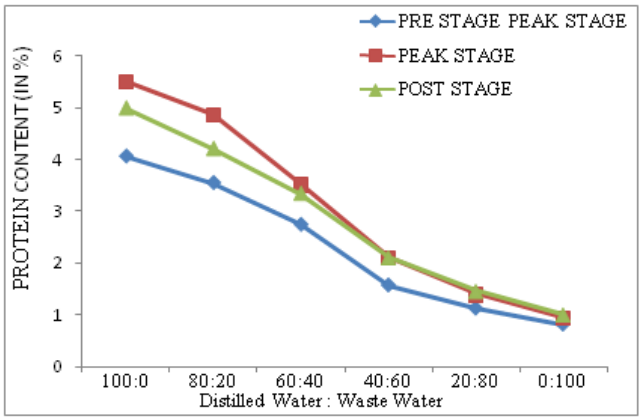


Graph 2: Showing the reduction in Nitrogen content at each successive level of waste water

Table 3: Effect of Textile Waste Water of Amanishah Nallah on Protein Content in Cicer Arietinum (In %)

S. No.	Concentration (Distilled Water : Waste Water)	PRE	PEAK	POST
1.	100 : 0	4.053 ± 0.158	5.495 ± 0.193	4.995 ± 0.141
2.	80 : 20	3.542 ± 0.169 (12.60)	4.865 ± 0.163 (11.46)	4.213 ± 0.157 (15.65)
3.	60 : 40	2.738 ± 0.152 (32.44)	3.512 ± 0.162 (36.08)	3.346 ± 0.159 (33.01)
4.	40 : 60	1.569 ± 0.148 (61.28)	2.096 ± 0.151 (61.85)	2.103 ± 0.150 (57.89)
5.	20 : 80	1.123 ± 0.149 (72.29)	1.389 ± 0.163 (74.72)	1.452 ± 0.167 (70.93)
6.	0 : 100	0.815 ± 0.153 (79.89)	0.939 ± 0.165 (82.91)	0.997 ± 0.162 (80.04)

Mean ± S.D.
Values in parenthesis are % reduction



Graph 3: Showing the reduction in Protein content at each successive level of waste water

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Pre Stage

Figure 1: Decreasing growth of *Cicer arietinum* at pre stage due to the effect of waste water

Peak Stage

Figure 2: Decreasing growth of *Cicer arietinum* at peak stage due to the effect of waste water

Post Stage

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Figure 3 & 4: Decreasing growth of *Cicer arietinum* at post stage due to the effect of waste water

3. Results

Results show that in *Cicer arietinum* at pre stage, the concentration of carbohydrate, nitrogen and protein varies from 139 to 310 mg/g, 0.130 to 0.648% and 0.815 to 4.053% respectively, at peak stage from 376 to 782 mg/g, 0.150 to 0.799% and 0.939 to 5.495% respectively and at post stage from 302 to 615 mg/g, 0.159 to 0.799 % and 0.997 to 4.995% respectively. In Carbohydrate, the maximum reduction among all level was 18% at pre stage, 19% reduction at peak stage and 14 % at post stage. In nitrogen and protein content, the maximum reduction with 29% was found at pre stage, 25 % reduction at peak stage and at post stage both. The maximum reduction was found at 60% concentration of waste water in all contents and after this concentration, the nutritional values decrease continuously.

4. Discussion

Figures and readings show that at each succeeding level of wastewater containing heavy metals, the concentration of carbohydrate, nitrogen and protein is decreasing respectively. Results reveal that up to 40% concentration of waste water , there is a slight decrease in nitrogen, protein and carbohydrate content of plant and plant is giving positive response towards the wastewater concentration because little amount of metals are required as a micronutrients for the healthy growth and development of the plant so the 40 % concentration of wastewater can be taken as a acceptable nutritional level for the plant growth but at 60% concentration of waste water there is a drastic change in the concentration of carbohydrate, nitrogen and protein content of *Cicer arietinum*. At the 60 % concentration of waste water and ahead plant is losing its nutritional value rapidly. so results proves that plants require a minimum amount of heavy metal for their growth but when its amount exceeds, it degrade the quality and nutritional value of plant which is not good for the plant growth.(Prasad, R and Roy, B. K. 2001; Sharma, B.K. and Habib, I. 1995) also showed the same results.

5. Recommendations

After a certain limit, the use of Textile waste water reduces the nutritional value of crop plant and act as a growth resistant to the plant. So, it is recommended that the use of sewage and textile waste water for growing vegetables should be minimized and before using it for agricultural purpose, waste water should be checked in order to reduce the biomagnifications via food chain. This study will help the policy makers, Technocrats and Researchers to know maximum limit of using waste water for agriculture and to find its safe use.

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