Impact of Sewage Effluent Irrigation from the Water of Jalmahal Jaipur, on the Total Chlorophyll Content in Capsicum *annuum* var. annuum (Selection 5)

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Abstract

Waste Water in any form, particularly Sewage poses a threat to the growth and development and various necessary Biochemical Parameters of the Plant. Present study focuses on the Impact of Sewage Water which is untreated and partially treated on the Total Chlorophyll (mg/g) Content inCapsicum annuum var. annuum (Selection 5). Results revealed that the Chlorophyll content inside the leaves is appropriate upto the First and Second Dilution Level (Control 100% D.W., 20 %) whereas its reduction starts from the Third Dilution Level (50 %) and maximum reduction of Chlorophyll (mg/g) is observed in the Fifth Dilution level with (100%) Waste Water irrigation.

Keywords*: Sewage, Total Chlorophyll, Capsicum annuum, Waste Water Irrigation, Bio Chemical Parameters.*

Introduction

Sewage Irrigation is presently one of the widest source of irrigation water used for the purpose of irrigating fields in sake of water scarcity and prevention of the depleting drinking water resources, preferably in the water scarce areas or zones. It is a simple aspect but use of such water and in untreated or semi treated form then, it poses serious health hazards and most importantly the growth and yield of the crops which are irrigated by such type of water will get affected.Effluent irrigation has been practiced for centuries throughout the world (Shuval*et al.*, 1986; Tripathi*et al*., 2011).It provides farmers with a nutrient enriched water supply and society with a reliable and inexpensive system for wastewater treatment and disposal (Feigin*et al.*, 1991). In developing countries, there has not been much emphasis on the installation of sewage

treatment plants and all the industrial effluents are generally discharged in to the sewage system. The sewage waters are used as potential source irrigation for raising vegetables and fodder crops around the sewage disposal sites which are directly or indirectly consumed by human beings. Soil contamination by sewage and industrial effluents has affected adversely both soil health and crop productivity.Currently more than 450 cities in India generate more than 17 million cubic meters of raw sewage water per day (Bijay-Singh, 2002).The sewage water generated in India contains more than 90% water. The solid portion contains 40-50% organics, 30-40% inert materials, 10-15% bio-resistant organics and 5-8% miscellaneous substances on oven dry weight basis (Antil&Narwal, 2008).However, depending on its source, sewage sludge often contains considerable amount of toxic metals and organic toxicants. The presence of toxic metals in sewage sludges collected from different treatment plants of some cities of India has also been reported by Adhikari*et al*. (1993) and Jurwarkar*et al*. (1991). In the present study water samples were collected from the Jalmahal Water body, also known as Man Sagar Lake situated in Amber, Jaipur. It receives Sewage effluents from the nearby areas and also from the Walled city with inlet of two Nallah's, BrahmapuriNallah and the NagtalaiNallah. Including this also there is inlet of Industrial waste water from surrounding Industrial areas. So in the water body there is much quantity of Untreated and Partially Treated Sewage Water and Industrial Waste Water also. Impact of such type of water is analyzed on the *Capsicum annuum* plants var. annuum (Selection 5), by growing them inside the pots during experimental analysis conducted in the laboratory.

Material and Methodology

Water Samples were collected from the Water Body and used for studying the impact on the particular species by diluting the samples at various levels by adding distilled water inside them. Chlorophyll Content(mg/g) is measured in the Plant at various dilution levels during all the three stages viz. Pre, Peak and Post Flowering stage.

Following 5 treatment levels were prepared by diluting the water from Jalmahal , Jaipur with the Distilled water. The Plants investigated at 3 stages of their maturation at Pre, Peak and Post Flowering Stage.

Level 1: DW(control): WW (100:00)
Level 2: DW:WW (80:20)
Level 3: DW:WW (50:50)
Level 4: DW:WW (20:80)
Level 5: DW:WW (00:100)

Chlorophyll Estimation:

Samples of known fresh weight (1 gm) of leaves of individual plant species were macerated thoroughly in pestle mortar with a little sand and 80 % acetone (Acetone: Distilled Water:: 80: 20). The suspension of macerated material in acetone was centrifuged 300 rpm for 10 minutes. Supernatant solution was transferred to a volumetric flask and made up to 25 ml. The optical density of the solution was measured by Spectrophotometer at 645 and 663 nm.

Following formula is used to calculate the amount of chlorophyll a and b (Arnon 1949):

Chlorophyll a mg/l = 12.7 x A_{663}-2.69x A_{645}

Chlorophyll b mg/l = 22.9x A_{645} - 4.68 x A_{663}

Chlorophyll (a+b) mg/l = 20.20 x A_{645}+ 8.02 x A_{663}

Where

A_{663} = Absorbance at 663 nm.

A_{645}= Absorbance at 645 nm.

The amount of Chlorophyll was calculated in mg/l fresh leaves material.

Results and Discussion

Total Chlorophyll Content (mg/g)	Jalmahal Water Irrigated		
	Pre Flowering Stage	Peak Flowering Stage	Post Flowering Stage
Levels (DW:WW)			
100:00	27.12±0.23	30.39±0.22	29.01±0.23
80:20	24.89±0.21	28.96±0.21	27.93±0.20
50:50	22.34±0.20	23.25±0.24	22.84±0.20
20:80	18.82±0.19	21.35±0.21	20.34±0.20
00:100	16.61±0.24	19.10±0.21	17.81±0.23
Ch. a Content (mg/g)			
Levels (DW:WW)			
100:00	19.01±0.22	21.31±0.22	20.87±0.20
80:20	17.04±0.25	20.19±0.23	19.59±0.22
50:50	16.12±0.22	17.61±0.28	16.76±0.28
20:80	13.93±0.22	15.52±0.24	15.01±0.20
00:100	13.06±0.20	14.13±0.20	13.71±0.22
Ch. b Content (mg/g)			
Levels (DW:WW)			
100:00	8.11±0.20	9.08±0.22	8.84±0.20
80:20	7.85±0.22	8.77±0.24	8.34±0.22
50:50	6.22±0.20	5.64±0.22	6.08±0.24
20:80	4.89±0.22	5.83±0.25	5.33±0.20
00:100	3.55±0.23	4.97±0.22	4.10±0.20

Table 1: Showing the Impact of the Sewage Water of Jalmahal Jaipur, on the Total Chlorophyll (mg/g), Ch. a and Ch. b content (mg/g) in *Capsicum annuum* var. annuum (selection 5):

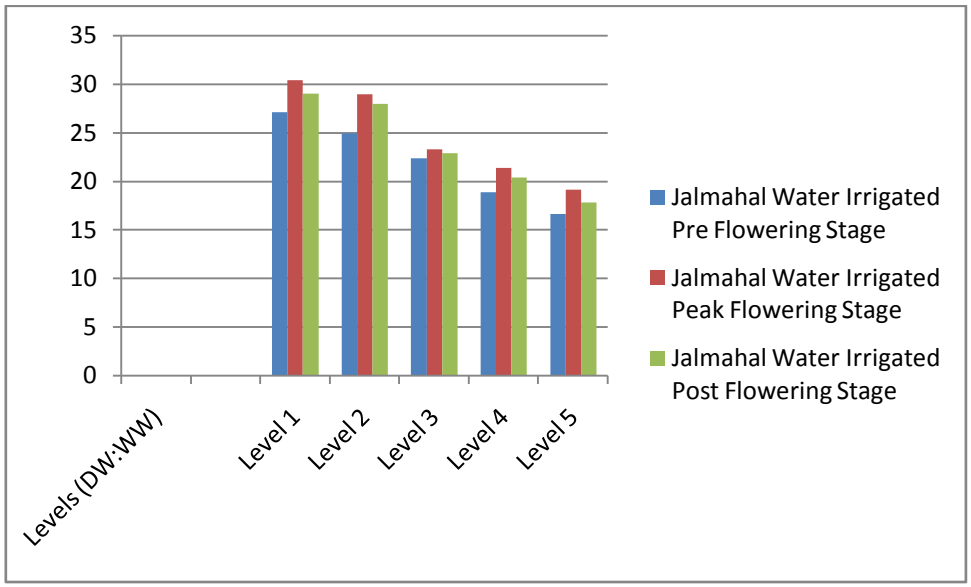

Figure1: Effect of Water of Jalmahal, Jaipur on Total Chlorophyll Content (mg/g) in *Capsicum annuum* var. annuum (Selection 5):

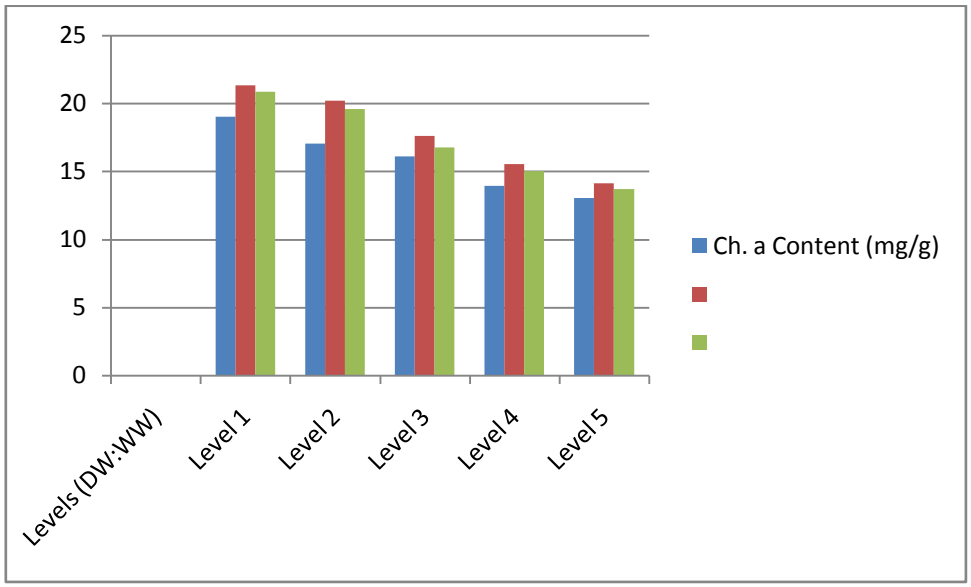

Figure2: Effect of Water of Jalmahal, Jaipur on Ch. a Content(mg/g) in *Capsicum annuum* var. annuum (Selection 5):

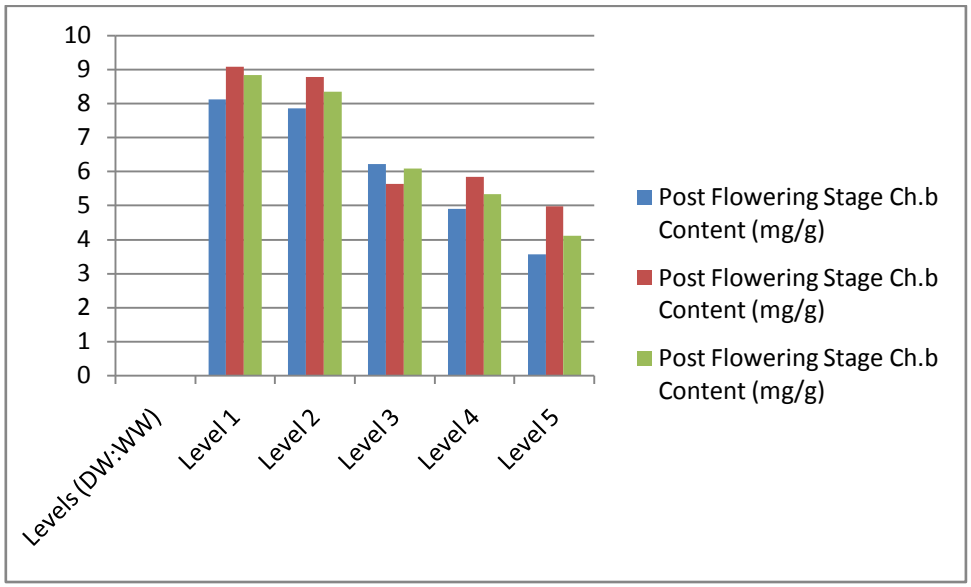

Figure3: Effect of Water of Jalmahal, Jaipur on Ch. b Content (mg/g) in *Capsicum annuum* var. annuum (Selection 5):

Total Chlorophyll Content (mg/g): The Total Chlorophyll Content in the Plants irrigated by the Water of Jalmahal in First level is 27.12, 30.39 and 29.01 mg/g at their Pre, Peak and Post Flowering Stages respectively. In Second Level it is 24.89, 28.96 and 27.93 mg/g then in Third level it is 22.34, 23.25 and 22.84 mg/g in their Pre, Peak and Post Flowering Stages respectively. In Fourth Level Total Chlorophyll Value in Pre Flowering Stage is 18.82 mg/g and 21.35mg/g, 20.34 mg/g in Peak and Post Flowering Stage respectively. Later on in the Fifth Dilution Level the Total Chlorophyll Content is 16.61, 19.10 and 17.81 mg/g in Pre, Peak and Post Flowering Stage respectively.

Ch. a (mg/g): Jalmahal have Ch. a content in their First Level is 19.01, 21.31 and 20.87 mg/g in Pre, Peak and Post Flowering Stage respectively. In Second Level it is 17.04, 20.19 and 19.59 mg/g in Pre, Peak and Post Stage respectively. Then in Third Dilution Level Ch. a value is 16.12 mg/g, 17.61 mg/g and 16.76 mg/g in Pre, Peak and Post Stage respectively while in Fourth Level it is 13.93, 15.52 and 15.01 mg/g and in Fifth Level it is 13.06, 14.13 and 13.71 mg/g in their Pre, Peak and Post Stages respectively.

Ch. b (mg/g): Plants Irrigated by the Water of Jalmahal have Ch. b content in their First Level is 8.11, 9.08 and 8.84 mg/g in Pre, Peak and Post Flowering Stage respectively. In Second Level it is 7.85, 8.77 and 8.34 mg/g in Pre, Peak and Post Stage respectively. Then in Third Dilution Level Ch. b value is 6.22 mg/g, 5.64 mg/g and 6.08 mg/g in Pre, Peak and Post Stage respectively while in Fourth Level it is 4.89, 5.83 and 5.33 mg/g and in Fifth Level it is 3.55, 4.97 and 4.10 mg/g in their Pre, Peak and Post Stages respectively.

Conclusion and Recommendations

Present study reveals that the Chlorophyll content in *Capsicum annuum* var. annuum (Selection 5), irrigated by the water of Jalmahal, Jaipur had variable Chlorophyll pattern in all the three stages at different dilution levels. It is analyzed that in all the three stages at all levels the Chlorophyll (mg/g) is greater in Peak Stage than the Pre Stage and then reduces later in the Post Flowering Stage. It has been observed that the Level of Chlorophyll get reduced as the concentration level of Sewage water increases after a certain limit. It has been observed that the level of Chlorophyll reduces mainly after the Third Dilution Level (Above 50% addition of Waste Water) and at some stages it might be fluctuating. Therefore, if we want to consume Waste Water particularly the Sewage then we have to properly treat it before consuming and have to Dilute it by the proper means prior its consumption in the agricultural practices and, there must be reduction in the practice of direct Waste Effluent inlet inside the Water Bodies.

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