Genotoxic Effects in Allium Cepa Exposed to Different Water Samples

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Abstract— The aim of the study is to study the effects of different Wastewater samples on Allium cepa by using chromosomal aberration test. The onion bulbs were kept in different wastewater sample along with distilled water as control. Waste water induced various types of chromosomal aberrations like Laggard/s, Vagrant/s, Chromatin bridge/s, Chromosomal break/s Stickiness, Delayed anaphase/s, Disturbed division/s and c-mitosis. The aberrations were more pronounced in pond water. No anomalies were seen at control. The test showed clastogenic effect in water samples.
Key words: Genotoxic Effects, Allium CEPA

I. INTRODUCTION

Water is an important constituent of life as it serves as an excellent solvent. It comprises 80-90% of the biomass of non-woody plants and is the central molecule in all physiological processes of plants being the major medium for transporting metabolites and nutrients. The uptake of water from the roots, through the xylem and into the rest of the plant is an essential part of a plants ability to photosynthesize. It is necessary to create cell tension, which gives plants their form and structure. But in recent years, pollution of water resources has engrossed a great attention worldwide. All kinds of waste cause adverse effects mostly on air, water and soil and in turn on the living organisms in such areas (Abrol et al., 2003). On the other hand, it is reported that the use of wastewater for the irrigation of the agricultural fields harms the mitotic division of plant and in turn wipes out the plant due to some substances contained within this water (Carita and Marin-Morales, 2008). If these plants are consumed as food, it may influence human health adversely. Therefore, the present work was planned to test the water samples collected from different localities. Allium cepa root chromosomal aberration assay was applied to test the genotoxicity of respective water samples.

II. METHODOLOGY

Water samples were collected from different localities of Phagwara region. For convenience of the study, all water samples were coded. Table 1 represents the localities different sampling sites.

S. No.	Sample Code	Sampling Location
1.	DW	Distilled Water
2.	FW	Filtered Water
3.	RW	Rural Water
4.	UW	Urban Water
5.	PW	Pond Water

Table 1: Description of different water samples

A. Genotoxic effects in Root Tip Cells of Allium CEPA

Onions were peeled off and primary roots were removed with the help of forcep without disturbing the root primordia. Onion bulbs were placed on coupling jars containing different water samples. After 24-36 hours, when 0.5 - 1cm long roots were emerged, root tips were washed thoroughly, cut and fixed in Farmer's fluid (3 : 1 :: ethanol : acetic acid glacial). Root tips were squashed in aceto-orcein stain and slides were prepared. The slides were screened under microscope to study various types of aberrations.

Fig. 1: Genotoxic Effects in Allium CEPA

B. Results

It was observed that all water samples (except distilled water) caused genotoxicity in Allium CEPA by inducing various types of chromosomal aberrations which were categorized into physiological and clastogeic aberrations. The spectrum of physiological aberrations included Laggard/s, vagrant/s, stickiness, delayed anaphase/s, Disturbed division/s and c-mitosis while that of clastgenic aberrations included chromatin bridge/s and chromosomal break/s. Stickiness was found to dominate among physiological aberrations while chromatin bridges dominated clastogenic types of aberrations (Fig. 1 and Table 2). Maximum chromosomal aberrations were induced by pond water samples which accounted for 4 % of total aberrations. The spectrum also included clastogenic aberrations. Other water samples viz., filtered water (0.65 %), rural water (0.99 %) and urban water (1.96 %) also induced chromosomal aberrations.

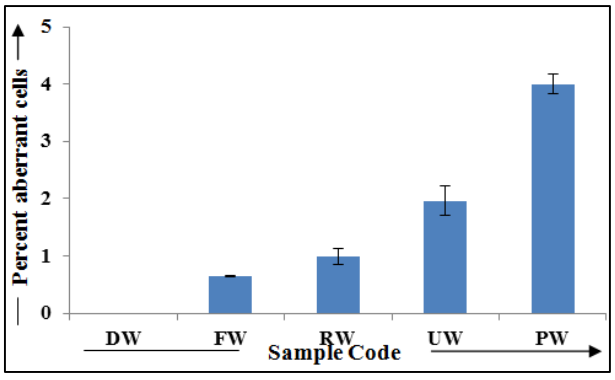

Fig. 2: Genotoxic potential (%) of different water samples

Sample Code	Total cells	Total dividing cells	Total abberant cells	Mitotic index (%)	Types of aberrations								Total % aberrant cells
					Physiological						Clastogenic		
					Lg	Vg	Cm	St	Da	Dd	Bg	Bk	
DW	1027	312	-	30.37	-	-	-	-	-	-	-	-	-
FW	1058	309	2	29.21	-	-	-	-	2	-	-	-	0.65
RW	1036	303	3	29.25	-	-	-	1	2	-	-	-	0.99
UW	1094	306	6	27.97	-	-	-	2	3	1	-	-	1.96
PW	1028	300	12	29.18	1	2	1	2	2	1	2	1	4.00

Lg-Laggard chromosome/s; Vg-Vagrant chromosome/s; Cm-C-mitosis; St-Stickiness; Da-Delayed anaphase; Dd-Disturbed division/s; Bg-Chromatin bridge/s; Bk-Chrmosomal break/s.

Table 2: Genotoxic effects in *Allium cepa* exposed to different water samples.

REFERENCES

[1] Abrol, V., Wali, P., Pareek, N., Mondal, A. K. and Jalali, V. K. (2003). Edaphic impact of sewage and industrial effluents on soil resources. Indian Journal of Environmental Protection. 23: 741-748.

[2] Carita, R. and Marin-Morales, M. A. (2008). Induction of chromosome aberrations the Allium cepa test system caused by the exposure of seeds to industrial effluent contaminated with azo dyes, Chemosphere, 72(5): 722-725.

