



**STUDY OF PHYSICO-CHEMICAL AND BIOLOGICAL
PROPERTIES OF GANGA WATER AT MISHERPUR (HARIDWAR) AND ITS IMPACT
ON *Luffa cylindrica***

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Aim – the aim of this investigation was to determine the pollution load of river Ganga Water at Misherpur (Haridwar) and its effect on germination and plant growth .

ABSTRACT:- – An experiment was conducted at Misherpur (Haridwar) during June 2010 . For study the pollution load of Ganga , The samples were collected from Misherpur (Haridwar) The parameter adopted for knowing the pollution load of samples were Color , Odor , Temperature , D.O (Dissolve Oxygen) , B.O.D (Biochemical Oxygen Demand) , C.O.D (Chemical Oxygen Demand) , Ph , Nitrate , Nitrite , T.D.S (Total Dissolve Solids) , T.S.S (Total Suspended Solids) , Amm Nitrogen , Total Nitrogen , Alkalinity , Hardness , Chloride , R-Cl (Residual Chlorine) , Turbidity , Metal , Tc (Total Coleform), Fc (Fecal Coleform) , Abundance of fungi and presence of Phyto-planktons. The *Luffa cylindrica* was selected for observe the effect of polluted water . The seven concentrations (0% ,10% ,20% ,40% , 60% , 80% 100%) were used to see their effect on germination and growth of plant .In the result 80% concentration was found more beneficial for plant growth and germination .

Key-words- *Luffa cylindrica* , seed germination, seedling growth , Ganga water

Introduction

The Ganga is most sacred river of world and the water quality of Ganga in Haridwar is very good . But at some place the pollution load in Ganga is very high and the site from where we collected samples was one of highly polluted site of Haridwar . It is only 1.5 km away from S.T.P plant of city. Plant receives much more domestic effluent then its capacity due to this region a big amount of untreated water has been relished in river .Domestic effluent makes Ganga more and more polluted. Domestic effluent is the main cause of water pollution of river Ganga as reported by Sing A.K *et al.*, (1985) and Dubay Sujata *et al.*, (2010). The *luffa cylindrica* was selected to observe the effect of pollution on plant . The main region of selection of *luffa cylindrical* , as research crop was ,that is most growing crop in Ganga basin and it is also the most edible crop of India . The seven test solution(0% ,10% ,20% ,40% , 60% , 80% 100%) were prepared by diluting the polluted water including blank for knowing the effect of polluted water on plant . The distilled water was used as controller and blank solution

Bishnoi .S *et al.*, (1999) , Qusim M .S *et al.*,(2000) and Gupta Suman *et al.*,(2003) studied the effect of sewage water on plant growth . He also analyzed the physico-chemical and biological properties of samples.

Gupta Rudhera et al (2005) and many others Focused their study on effect of pollution on plant

MATERIALS AND METHODS:-

(a) Collection of Sample: - Water samples were collected from Misherpur(Haridwar) during 5th of June 2005 Monday 8.40 am. The water samples were collected in six B.O.D Bottles , 6 M.P.N Bottles and plastic cans. The samples were analyzed at the level of different parameters according to A.P.H.A 21st edition

(b). Method Adopted for Study physicochemical and biological

Properties:-

Sr.No.	Test	Methods
1	Odour & Colour	Detected by naked eye and smelling (at site)
2	Temperature	Detected by digital thermometer
3	Ph	Detected by digital ph meter
4	D.O	Detected by titration with sodium thio-sulphate
5	B.O.D	Detected by titration method
6	C.O.D	Detected by open reflux method
7	T.D.S	Detected by evaporation (Dry weight)
8	T.S.S	Detected by evaporation (Dry weight)
9	Amm- N2	Detected by spectrophotometer (according A.P.H.A)
10	Alkalinity	Detected by titration with H ₂ SO ₄
11	Hardness	Detected by titration with E.D.T.A
12	Chloride	Detected by titration with AgNO ₃
13	Total N ₂	Detected by T.K.N method
14	Nitrite	Detected by spectrophotometer (according A.P.H.A)
15	Nitrate	Detected by spectrophotometer (according A.P.H.A)
16	R-Cl	Detected by Ortho -Toluidine (at site)
17	Turbidity	Detected by digital turbidity meter
18	Metals	Detected by A.A.S
19	Tc, Fc -	Detected by Filter plating Technique
20	Phyto- plankton -	with the help of sedgwich rafter cell and wippel gride
21	Fungi -	Detected by using P.D.A media and preparing slide

(c) Germination experiment:-

Six test solutions (0%, 10%, 20%, 40%, 60%, 80% 100%) prepared by diluting polluted water . The distilled water was used as controller. The germination test on *Luffa cylindrica* was conducted as per I.S.T.A(International rule of seedling testing annexure Annon .1985) method . According which healthy and undamaged seed of equal size were placed in sterilized Petri dish. The seed also covered by wetted tissue paper with different concentration polluted water. The measured amounts of test solutions were added in each Petri dish.

(d) Growth experiment:- The growth experiment was carried out in plastic bags during June 2009 Haridwar . Experiment setup consisted of 10 replicate beg per treatment and ther were total seven treatments made by diluting samples with distilled water (0%,10%,20%,40%,60%,80%100%)

Plant growth and development were recorded through out the growing season through biweekly measurements. The leaf areas of third leaf of each plant were measure with the help of electronic leaf area meter at the end of one month.

RESULT AND DISCUSSION:-

Pollution Load and Water Quality of River: -

Because of high pollution load the Ganga water becomes brownish black in colure and the odor was also unpleasant. The temperature of water at this site was observed 19° C. This was 3°C more then other clean area of Haridwar.

The enhancement in water temperature was due to bio-chemical reactions which were operating in water sample by microbes. The ph of water at the site was 7.8. It was also high, the main reason behind it that the domestic effluent contain big amount of detergent .The Electric Conductivity of sample was observed 553µhs.

It was high due to presence of big amount of free ions (presence of Co2 increases Electric Conductivity). B.O.D (Bio-chemical oxygen demand) of sample was 19 Ppm. It is high due to presence of large number of micro-organism as they operate many bio-chemical reactions which require oxygen.

C.O.D (Chemical Oxygen Demand) was also high because the domestic effluents contain big amount of different chemical. D.O (Dissolve Oxygen) of sample was 4.3 Ppm . It is very low due to high pollution in Ganga water.

Alkalinity of sample was 302 Ppm. It is high due to presence of high concentration of detergent and alkaline salt in sewer water. Hardness of water sample was 250 Ppm Nitrate was 1.5 Ppm and Nitrite was 1 Ppm. T.D.S was 500 mg/L and T.S.S was 75 mg/L these value are very high due to high concentration of sludge and solavel material. R-Cl was not detected in sample . Chloride was found 16 Ppm in water sample . It was due to natural presence of NaCl in sewage water .

Turbidity of water was 250 Ppm because water sample contain big amount of sewage water , which has many soluble material in it.

Total coliform , and fecal coliform was 2.6×10^6 and 1.2×10^6 as these bacteria found in fecal matters of human being . K, Na, Mn, Fe, Zn, were found in sample but Hg, Pb, Cd, Cr were not detected in sample .

Table:-Physico -chemical Properties-

Sr	Parameters	Value
1	Colour	Brownish black
2	Odour	Unpleasant
3	PH	7.8
4	B.O.D	19
5	C.O.D	57
6	D.O	4.3
7	T.D.S	500 mg/L
8	T.S.S	75 mg/L

9	Total N2	14 Ppm
10	Amm N2	39.45 Ppm
11	Alkalinity	300 Ppm
12	Nitrate	1.5 Ppm
13	Nitrite	1 Ppm
14	R-Cl	N-D
15	Chloride	16
17	Hardness	250 Ppm
18	K	4.065 Ppm
19	Hg	B.D.L
20	Na	4.759 Ppm
21	Pb	N-D
22	Mn	.365 Ppm
23	Cd	N-D
24	Cr	N-D
25	Fe	.64759 Ppm
26	Zn	8.433Ppm

Biological properties -

The knowledge of relation ship between organism and ecological factors can be used as an Indicator of pollution level of water as Panday G. N *et al.*, (1980) had revalved the role of micro flora in the assessment of pollution level of river Ganga . The micro organism are living catalysts which operates vast number of chemical reaction in water.

Bilgrami K.S *et al.*, 1985 and Sikander .M 1987 studied the relation between microorganism and ecosystem of river Ganga. The number of microbes (Algae, Fungi, Bacteria) are increase with pollution level.

. There were large number of detected in samples as defined intable no. 2 Khana D.R *etal.*, (2010) reported that the phyto-planktons are the bio indicator of river health . The fungi show more tolerance from high concentration of pollutants reported by Blaudez *et al.*, (2000) A number fungal genera detected in water sample as describing in table-3. The natural presence of fungi in river water and domestic effluent was reported by Bilgrami K. S *et al.*, (1991) . Due to the high pollution a big No of T.C and F.C bacteria also found in samples as described in table 4. The number of T.c and F.c indicates high pollution status of water as reported by Tyagi Sing A.K *et al.*, (1985) .

Table:-2

Sr	Name of phytoplankton	N.o of Units
1	Cynophyta-	
	a. Ocillatoria	4
	b. Anabaena	2
	c. Microcystis	3
	d. Coelospaeriumum	2
2	Chlorophyta –	
	a. Hydrodictyon	3
	b. Cladophora	1
	c. Spirogyra	5
	d. Stigeoclonium	6
	e. Chlamydomonas	5
	f. Oedogonium	3
	g. Pandoria	4
	h. Eudorina	3
	i. Pediastrum	2
	j. Synura	12
	k. Scendesmus	2
	l. Chlorella	2
3	Bacillario phyta –	
	a. Navicula	10
	b. Fragillarioa	9
	c. Synedra	8
	d. Pinnularia	6
	e. Denticula	10
	f. Diatoma	7
	g. Melosoria	15
Total Units		124

Table -5

Sr	Name of Fungi	Present/ Absent
1	Achlya	+
2	Soprolegnia	+
3	Isoachelya	-
4	Aphanomyas	+
5	Dictycus	-
6	Pythisium	+
7	Mucor	+
8	Ascobolus	+
9	Olpidlopsiis	-
10	Phoma	+
11	Fusarium	+

Population of T.C and F.C –

Table - 4

Sr	T.C	F.C
1	2.6×10^6	1.2×10^6

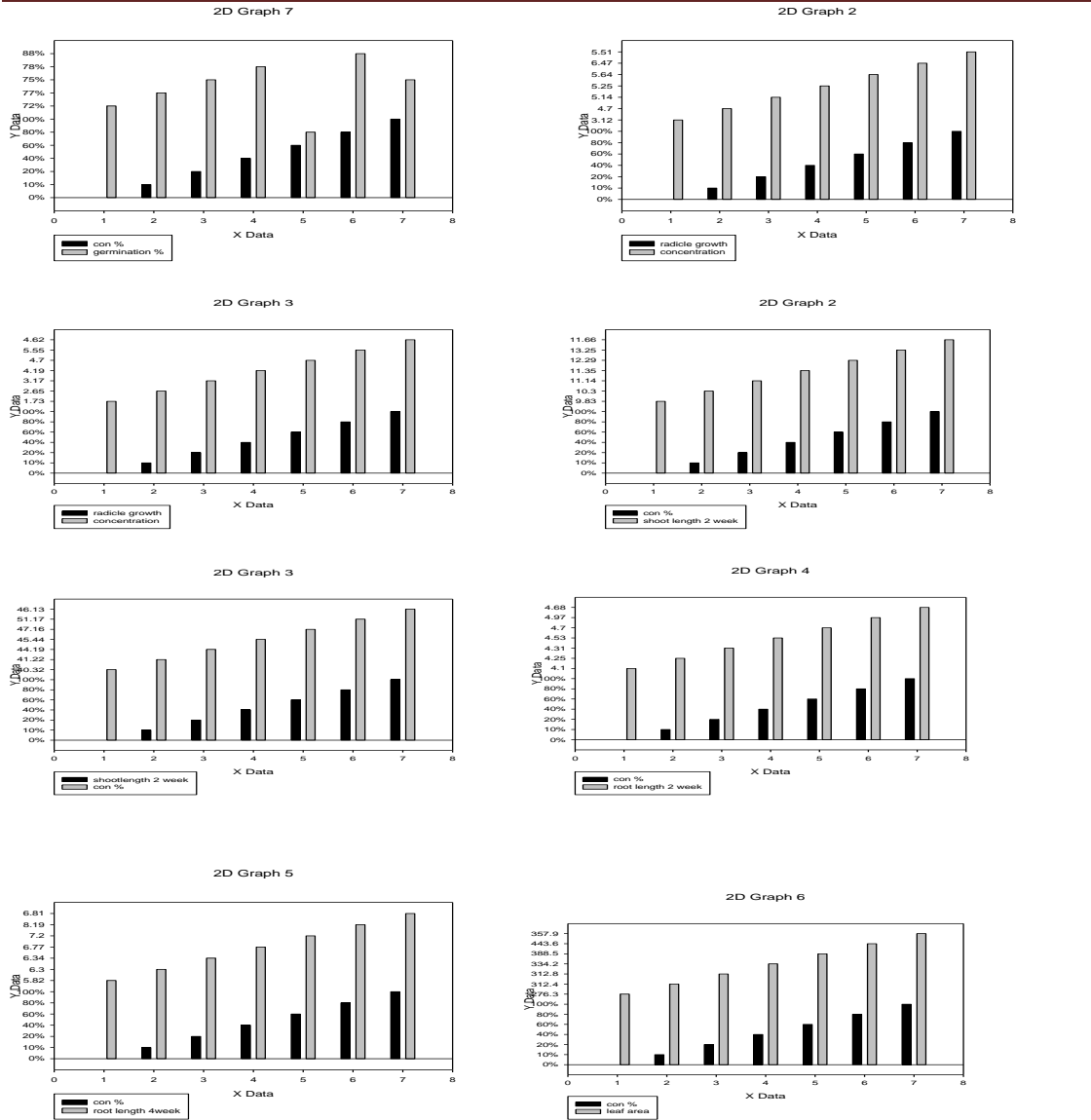
Germination and Plant Growth: -

Initially the germination percentage was increasing with the concentration of test solution. It shows maximum growth on 80% concentration of test solution. But at full strength of test solution the germination percentage suddenly got retire.

The growth of radicle and plumule significantly increase with the concentration till 80% and suddenly get degraded at 100%. The 2 week and 4 week mature plants root and shoots also followed this pattern. The leaf area (3ed leaf) of one month mature plants leaf was found maximum at 80% concentration as defining in table 5. The region behind it, the domestic effluent contains such organic substance which found more beneficial for plants at particular concentration. With these good substances effluent also has some growth inhibitor which also starts affecting the plant at particular concentration as reported by Qusim M.S *et al.*, (2000) . There 100 % was that concentration where all growth inhibitor (Microbes, Detergent and metal) show high per activation. In other hand 80% concentration of sample was found more beneficial than other concentration of samples.

Table 5

Concentration	Germination	1week		Shoot length		Root length		Leaf aria of 3ed leaf
		Radicle	Plumule	2 week	4 week	2 week	4 week	
0%	72% ±0.2	3.12 ±0.01	1.73 ±0.04	9.83±0.02	40.32 ±0.8	4.10±0.2	5.82±0.3	276.3±3.0
10%	77% ±0.3	4.70 ±0.01	2.65 ±0.01	10.30 ±0.3	41.22 ±0.9	4.25 ±0.07	6.30±0.5	312.4±2.9
20%	75% ±0.3	5.14 ±0.1	3.17 ±0.3	11.14 ±0.4	44.19 ±0.6	4.31±0.3	6.34±0.2	312.8±2.9
40%	78% ±0.3	5.25 ±0.01	4.19 ±0.01	11.35±0.3	45.44 ±0.8	4.53±0.2	6.77±0.3	334.2±3.3
60%	80% ±0.2	5.64 ±0.01	4.70 ±0.01	12.29±0.3	47.16 ±1.0	4.70±0.3	7.20±0.3	388.5±4.0
80%	88% ±0.1	6.47 ±0.01	5.55 ±0.01	13.25±0.4	51.17 ±0.7	4.97±0.3	8.19±0.2	443.6±5.3
100%	75% ±0.3	5.51 ±0.1	4.62 ±0.01	11.66±0.5	46.13 ±0.6	4.68±0.3	6.81±0.3	357.9±5.7



Conclusion :- The water quality of samples was very poor as the color of samples was brownish black . The result of this study demonstrates the germination was significantly low at full strength treatment than 80% concentration. The root length, shoot length of 2weeks and 4 weeks mature plants also follow above pattern of growth. The leaf area (3ed leaf) of plants which was treated with 80% concentration test solution was maximum. In the conclusion we can say the dilute concentration (80%) was found more beneficial than full strength



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