

# Study of Physico-chemical characteristics like P<sup>H</sup> values and electrical conductivities of the river Ganga D/S at different places in Bihar (India) where their tributaries meet with it or nearby places

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## ABSTRACT

Main tributaries of Ganga are Gandak, Budhi Gandak, Ghaghra, Bagmati, Kamla-Balan, Koshi, Mahananda, Karmnasa, Son & Punpun. These tributaries contribute to the flow of Ganga in Bihar stretch and play significant role in maintaining wholesomeness (Nirmal Dhara and Aviral Dhara) of the holy river. In Bihar the covered area by the river Ganga is Down Vanarasi to Rajmahal which lies in the S-IV A segment. The Ganga water in Bihar is not suitable for drinking purposes and outdoor bathing without treatment. The P<sup>H</sup> and electrical conductivity have been observed and analysed where their tributaries meet with it or nearby places. With decrease in P<sup>H</sup> the electrical conductivity decreases.

**KEY WORDS:**Electrical conductivity, P<sup>H</sup>, salinity, physico-chemical characteristics, D/S (Down stream), TR (Tributary river), Cusec, Flow rate.

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## I. INTRODUCTION

The deterioration in physico-chemical characteristics of water<sup>1</sup> are due to mainly human activities. The contaminated or polluted water changes the P<sup>H</sup> and electrical conductivity. The water of tributaries of the river Ganga also changes the physico-chemical characteristics of water. In Bihar, Ganga traverses a distance of 445km from Chausa (Buxar) to downstream of Kahalgaon (Bhagalpur). Average flow of river Ganga during lean period (February, March and April) at the exit point of Bihar has been reported approximately 4 times (1600 cusec approximately) to that of flow of entering point (400 cusec) in Bihar<sup>2</sup>.

Conductivity measures the water's ability to conduct electricity. Common ions in water that conduct electrical current include sodium, chloride, calcium, and magnesium. Because dissolved salts and other inorganic chemicals conduct electrical current, conductivity increases as salinity increases. As conductivity is easier to measure, it is used in algorithms estimating salinity and TDS<sup>3</sup>, both of which affect water quality and aquatic life. Salinity is important in particular as it affects dissolved oxygen solubility. The higher the salinity level, the lower the dissolved oxygen concentration.

If the pH of water is too high or too low, the aquatic organisms living within it will die. pH can also affect the solubility and toxicity of chemicals and heavy metals in the water. The optimum pH levels for fish are from 6.5 to 9.0. Outside of optimum ranges, organisms can become stressed or die.

## II. EXPERIMENTAL

Values of pH and electrical conductivities are determined by the pH meter and the conductivity cell respectively at different places in Bihar state where their tributaries meet with the Ganga river or nearby places by collecting from 10 sites of the river Ganga D/S.

It is found different values of pH and electrical conductivities at different places of the main D/S of the river Ganga. The experimental data of pH and electrical conductivity are expressed in tabular form given below. (Physico-chemical characteristic of water of the river Ganga D/S at different places where the tributaries meet or nearby places)

Water sample collection date: 20 March 2019.

**Table-1**  
(P<sup>H</sup> Value)

Sl. No.	Site	$P^H$	$P^H$	Tributary	River (TR)	Flow Rate
	(For Sample Collection)	Ganga ( before meeting tributary river)	Ganga (After meeting tributary river)	$P^H$ (TR)	Name	(cusec)
1	Buxar	8.26	-----	-----	-----	400
2	Chhapra (Badalpura)	8.14	-----	-----	-----	
3	Patna (Haldi Chhapra)	8.14	7.83	7.65	Sone	
4	Sonpur	8.04	7.76	7.22	Gandak	
5	Patna (Danapur)	7.82	-----	-----	-----	
6	Patna (Gaighat)	8.08	-----	-----	-----	
7	Patna (Fatuha)	8.01	7.90	7.71	Punpun	
8	Munger	7.97	7.78	7.43	Burhi Gandak	
9	Katihar (Muradpur)	7.76	7.54	7.14	Koshi	
10	Bhagalpur (Guljar Ghat)	-----	7.74	-----	-----	1600

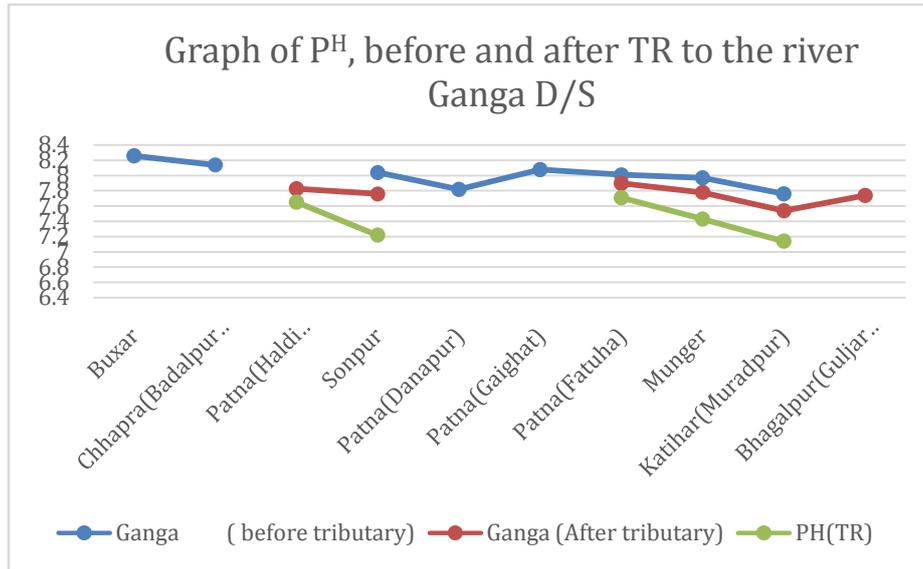
**Table-2**  
(Electrical Conductivity)

Sl. No.	Sites in the river Ganga D/S	Electrical Conductivity ( $\mu\text{mho/cm}$ )		Tributary	River (TR)	Flow Rate
	(For Sample Collection)	Ganga (before meeting river tributary)	Ganga (After meeting river tributary)	Electrical Conductivity ( $\mu\text{mho/cm}$ )	Name	(cusec)
1	Buxar	549	-----	-----	-----	400
2	Chhapra (Badalpura)	541	-----	-----	-----	
3	Patna (Haldi Chhapra)	532	492	401	Sone	
4	Sonpur	484	456	326	Gandak	
5	Patna (Danapur)	459	-----	-----	-----	
6	Patna (Gaighat)	534	-----	-----	-----	
7	Patna (Fatuha)	512	484	362	Punpun	
8	Munger	492	458	433	Burhi Gandak	
9	Katihar (Muradpur)	446	425	412	Koshi	
10	Bhagalpur (Guljar Ghat)	----	437	-----	-----	1600

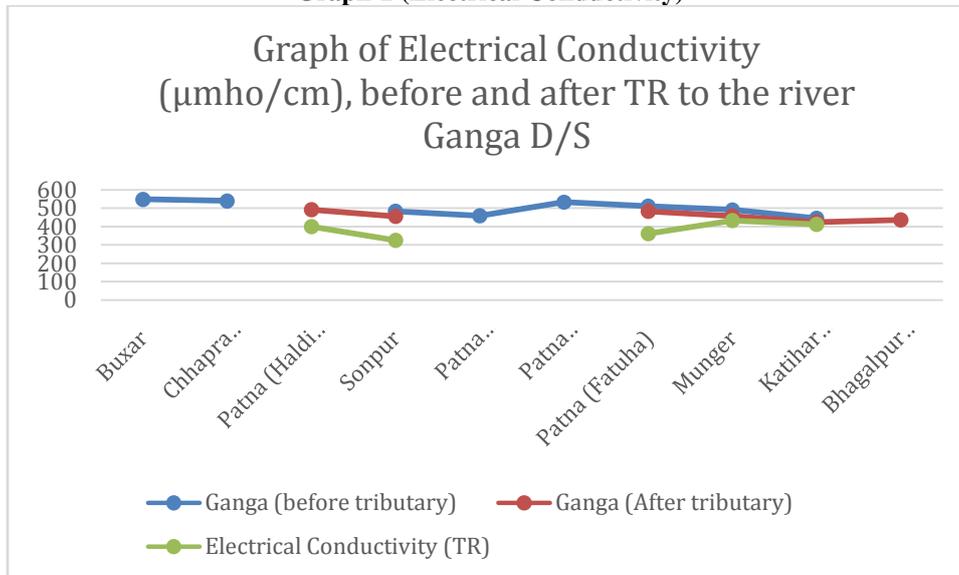
### III. RESULTS AND DISCUSSION

The above data clearly explains that the  $P^H$  before tributary is higher than the  $P^H$  of the places of the river Ganga D/S. It also explain that the nearby places of tributaries of the river Ganga D/S, which ultimately decreases the electrical conductivity of water. The  $P^H$  value of water and the electrical conductivity at different places within prescribed limit for survival of aquatic life. Their analytical studies can be visualised understand with the help of graphical representation given below:

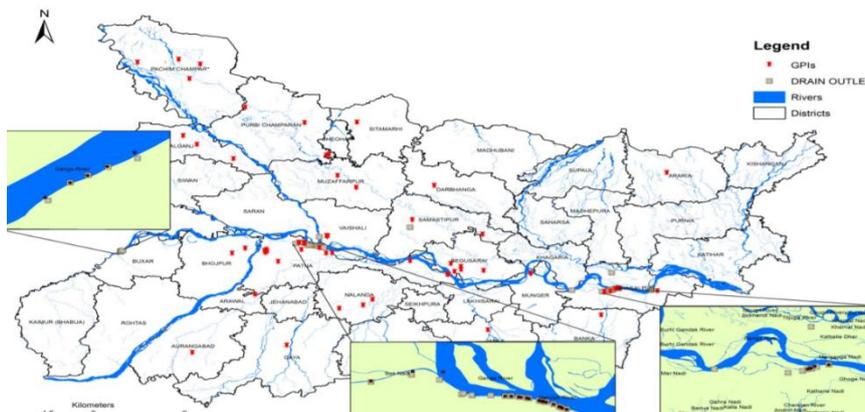
#### Graph-1 ( $P^H$ )



**Graph-2 (Electrical Conductivity)**



**Map of the river Ganga with their major tributaries in Bihar (India)**



#### **IV. CONCLUSION**

On dilution of water of the river Ganga D/S by their tributaries resulting to decrease in P<sup>H</sup> and electrical conductivity values at sample collecting site. But as a result of decrease in P<sup>H</sup> values and electrical conductivities the aquatic life remains unaffected because change is within the prescribed limit.

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