

# Physico - Chemical Assessment and Impact Determination of Chemical Fertilizers on the Quality of Water at Sapana Reservoir in District - Betul (M.P.)

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**Abstract:** *Chemical Fertilizers are used extensively in modern agriculture, in order to improve crop yield. However, nutrient leaching from agriculture soil into ground water and surface water cause a major environmental and public health concern. During present investigation, 06 water samples were collected from selected sampling stations of Sapana reservoir, District Betul (M.P.). The water samples were analyzed for physico-chemical characteristics and fertilizer residues. From the study it is concluded that, application of chemical fertilizers has severe impact on water quality. The pH of the ground water was found to be alkaline in some of the water samples. Nitrates and Phosphates concentration were to be higher than the permissible limits of WHO standards, due to leaching and surface run off of chemical fertilizers from agriculture lands. In order to overcome water pollution problems, effective management of chemical fertilizers has to be implemented.*

**Keywords:** Chemical Fertilizers, Ground water, Nitrate, Phosphate, Physico – Chemical Assessment, Sapana Reservoir

## 1. Introduction

Sapana reservoir like many others in the state was constructed for irrigation purpose and it is an important source of water supply to the wide agriculture, industrial and domestic area of District- Betul and also being used for fish culture. The dam was constructed in the year 1956 and its longitude and latitude are 77°59'05" and 21°15'15" respectively. Total length of the reservoir is 1790 Sq.m. and its catchment area is 44.75 Sq.m. The gross capacity of the reservoir is 16903 Th.cu.m. The shallow part of the reservoir gets exposed during summer session and exposed land is used for agriculture purpose where in the farmers also used huge amount of chemical fertilizers and pesticides. For the purpose of this study, 06 sampling stations were identified. The first three sampling stations were located near village Ankawari, and the next two were near village Partapur, where chemical fertilizers were extensively used and the last one was at reference sample station i.e. center of the reservoir.

## 2. Material and Methods

Water samples were collected in fresh one liter plastic containers previously washed with 1:3 HNO<sub>3</sub> in the month of Oct-2019 from surface and bottom water level. pH was determined using digital pH- meter. Conductivity was measured using digital conductivity meter. Dissolved Oxygen (DO) was determined by the Wrinkler's method with Azide modification. Biological Oxygen demand (BOD) and Chemical Oxygen Demand (COD) were determined by five days method and Potassium Dichromate Pen Reflux method. Nitrates and Phosphates were estimated by UV-Visible Spectrophotometer. Potassium was determined by using Flame Photometer.

## 3. Results and Discussion

Water quality standards and guidelines corresponding to the WHO and ISI have been compared with the mean data results under the given table1.

**pH** :- pH is largely depend on carbonates, bicarbonates and carbon dioxide. The results of pH range in between 7.2 – 7.8 indicated that the reservoir water is slightly alkaline. Desirable pH range is 7.0 – 8.5 as per WHO and ISI.

**Specific Conductance (SC)**:- Specific Conductance (SC) depends upon sulphates, chlorides, phosphates, heavy metals and total concentration of dissolved ions. The values of Specific Conductance range between 86 – 482 m. mhos/cm. The standard value of specific conductivity is 50 – 1500 m. mhos/cm.

**Dissolved Oxygen (DO)**:- DO in water is of great importance to all aquatic organism and is considered to be the factor that reflects the biological activity taking place in a water body and influences the biological changes. In the present study DO values were found in between 1.4 – 7.8 mg/l against the standard value of 6.0 mg/l.

**Biological Oxygen Demand (BOD)**:- BOD is directly linked with decomposition of dead organic matters present in the reservoir and hence the higher values of BOD can be directly correlated with pollution status and inverse relation with DO concentration. The BOD values were observed in between 1.3 – 8.1 mg/l. The permissible limit is 3.0 – 6.0 mg/l.

**Chemical Oxygen Demand (COD)** :- The range of COD was observed in between 46.1 – 62.3 mg/l, while the its permissible limit is 10.0 mg/l.

**Nitrates (NO<sub>3</sub>) and Phosphates (PO<sub>4</sub>):-** Nitrates and Phosphates are two important nutrients in the reservoir for eutrophication process. These nutrients support the fast growth of aquatic plants. In the present study, the result of nitrate was in between 52.2- 72.1mg/l and the result of

phosphates was in between 2.14 – 4.42 mg/l. This range exceeds the permissible limit.

**Potassium (K):-** Potassium ranged in between 24.6 – 44.3 mg/l. The values were observed beyond the permissible limit because excessive use of chemical fertilizers.

**Table 1:** Mean Data of Concentration of Physico - Chemical Parameters of various sampling stations of Sapana Reservoir, District- Betul (M.P.)

S.No.	Physico-Chemical Parameters	Unit	WHO Standards	Sampling Stations					
				Near Village Ankawari		Center point of the reservoir		Near Village Partapur	
				Surface	Bottom	Surface	Bottom	Surface	Bottom
1.	pH	-	7.0 - 8.5	7.8	7.4	7.3	7.2	7.6	7.4
2.	Specific Cond.	m moh/cm	50 – 1500	256	482	86	128	281	454
3.	DO	mg/l	6.0	2.8	1.4	7.8	4.2	3.0	1.6
4.	BOD	mg/l	3.0 – 6.0	8.1	4.8	3.8	1.3	7.8	5.1
5.	COD	mg/l	10.0	46.1	62.3	48.0	52.4	50.2	54.3
6.	Nitrates	mg/l	50.0	72.1	66.3	54.6	52.2	71.8	68.3
7.	Phosphates	mg/l	0.10	3.22	4.18	2.14	3.10	3.28	4.42
8.	Potassium	mg/l	12.0	42.1	39.4	32.2	24.6	44.3	41.8

#### 4. Conclusion

The present study reveals that higher availability of nutrients, both Nitrates as well as Phosphates in the water sample collected from near village Ankawari and near village Partapur of Sapana dam, which are predominantly being cultivated with chemical fertilizers such as Urea, DAP, Super Phosphate etc. The availability of the higher concentration of nutrients in the low water level due to intensive use of chemical fertilizers in the catchment area of reservoir may accelerate on the process of eutrophication. The water samples collected from reference sample i.e. center of the reservoir have comparatively low concentration of nutrients, which may be due to less availability of nutrients from the organic compost. Thus the present study recommends the use of organic fertilizer in place of chemical fertilizers which would not only improve the soil fertility but also help in reducing the enrichment of reservoir water caused of chemical fertilizers.

#### 5. Acknowledgement

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