



## ORIGINAL ARTICLE

### **Phytoplankton Analysis in a Big Mysterious Water Body (Holi Kund) at Soron Ji (Hindu Pilgrimage), Kanshiram Nagar Uttar Pradesh (India)**

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#### ABSTRACT

*The River Ganga or Ganges has always been sacred River in India with religious and mythological significance. Since infinite years ago it was and even now it is the life line of innumerable people specially belongs to northern plains meeting all requirements associated with water. Nevertheless, during past years it has been seemingly that the River is struggling for its existence as it is becoming dirty and dirty due to untreated sewage, surface run off, industrial effluents and toxic chemicals coming as various by products being dumped in to it along the cities catchment areas. Author has selected Soron Ji a most popular sacred pilgrimage for Hindus for studying parameters in most popular sacred Holi Kund near Ganga River which flows near Soron Ji. Soron Ji itself has a big land locked water body having two major ghats like Soron Ghat and Hari ki Paudi; takes drain from River Ganga and fed by rain water but full of water all the time even if there is no rain. The present research has conducted to assess the phytoplankton congregations which lead to act as a suitable tool to assess the quality of such kund. Diversity of phytoplankton in such huge kund in Soron Ji at two sampling stations was conducted from January to December 2016. Plankton recognized in the water body mainly collected of the members of Chlorophyceae, Bacillariophyceae, and Cyanophyceae groups. The Palmer pollution index values were calculated to analyze the level of organic pollution. On the basis of quantitative and qualitative estimates 20 significant algal species were identified which can tolerate high degree of pollution. The maxima peak of phytoplankton was observed in summer season followed by winter. Summer upsurge or pulse was because of higher value of low current velocity and moderate transparency. However peaks have included all types of phytoplankton. Low phytoplankton abundance was countable at Hari ki paudi or Ganga Ji ghat or "A" ghat whereas Abundance of phytoplanktons and algal bloom was maximum at Soron Ji ghat or "B" ghat. These findings highlighted the deterioration of water quality of sacred Holi Kund.*

**Key Words:** pilgrimage, Chlorophyceae, Palmer pollution index, algal bloom

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#### INTRODUCTION

In India greater regional differences are found in the topography, ecology, climate etc. As a result of these differences the limnological resources and their morphometries are very unevenly distributed. India is blessed with vast water recourses in the form of Rivers, estuaries, lakes, natural and artificial ponds and mangrove wetlands, which are ideal for fishery and cover more than ten million hectares. Such water resources of our country if managed properly can fulfill all demands for water from human. About 70% of water in India had got polluted due to the release of domestic sewage and industrial effluents into natural water sources such as Rivers, streams, canals, ponds and lakes [1].

Apart from Indus, Ganga, had always been a symbol of India's legacy, culture and civilization, keeps in soul of Indians as it is thought it leads to human salvation. Now it is the life line of innumerable people specially belongs to northern plains meeting all requirements associated with water. Nevertheless, during past years it has been seemingly that the River is struggling for its existence as it is becoming dirty and dirty due to untreated sewage, surface run off, industrial effluents and toxic chemicals coming as various by products being dumped in to it along the town and cities catchment areas. This becomes worse when deforestation is added to list as this causes silting, floods and reduced navigational possibilities. River Ganga was known earlier for its peak value as holy fullness now is known as dirty picture for hydrosphere. Thus this study evaluates the organic polluted characters on the basis of palmer indexed phytoplankton of water at dual ghats of Soron Ji. Generally natural composition and ingredients of a River remains at equilibrium by its suo-motto action. This homogeneity gets greatly mayhem due to infiltration of wastes from various anthropogenic sources. Physico-chemical state of any River depends on natural contents of physical factors & nutrients. Therefore any seasonal, periodic (natural) and anthropogenic, environmental (artificial) alteration in water characteristics like temperature, light, wind current, turbidity, D.O., pH, alkalinity, total hardness, other chemicals nutrients and soil texture & composition, diversity and food chain of aquatic ecosystems leads to less or more deterioration of water recourses. Thus, spotting the organic pollution and to make effort to curb this environmental loss becoming important farm duties undone yet.

Algae are essential part of any aquatic ecosystem and are autotrophs meant for the primary production. [2]. They have relative a short life term, their community abundance and evenness changes swiftly with respect to the changes of limnological parameters [3]. Over herding of phytoplankton are harmful for any water body as well as for other biota. Too much algal growth and organic pollution may turn a holy water body or River into lifeless water body. Moreover, certain phytoplankton secretes toxic substances which may be lethal to other organisms. It also hauls the aesthetic value of the holy and sacred water body. Hence algal communities have been finding as indicators of water pollution [4].

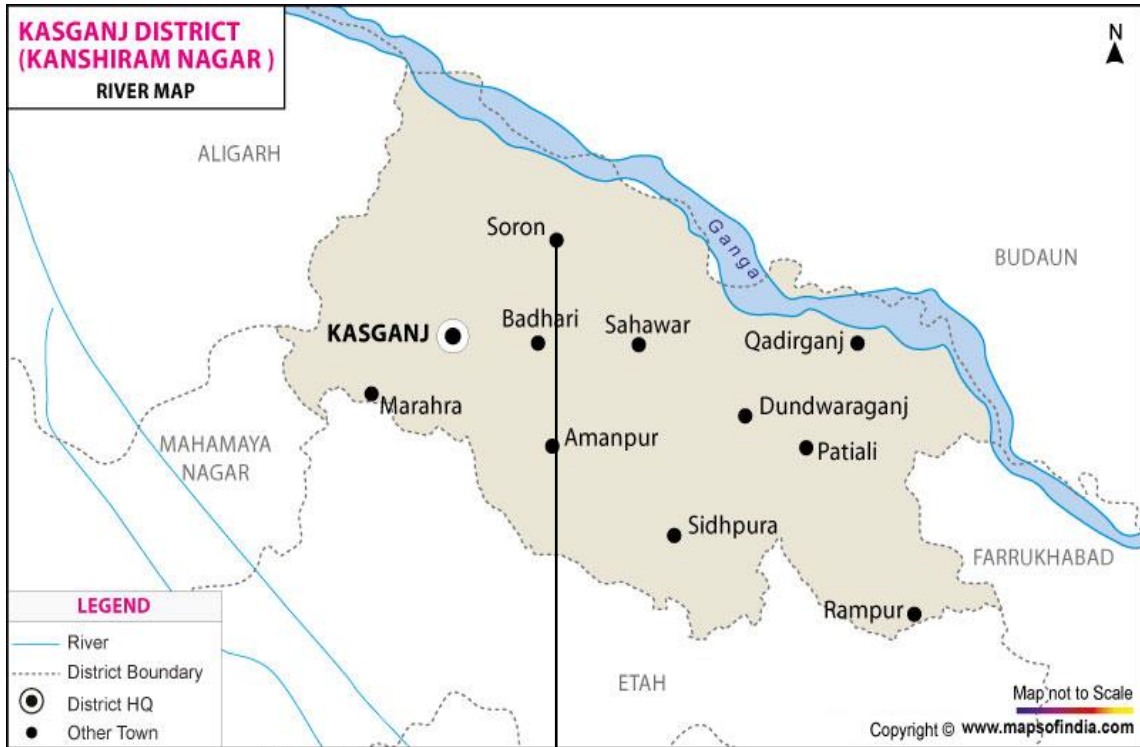
In Present limnological investigation of River Ganga is not directly undertaken but water logged as a big water body, Holi Kund is undertaken which is filled with water came from near by Ganga River which was used to flow along Soron Ji, now went away around 10 km from such town settlement to record seasonal fluctuations in phytolankton community to test the level of organic pollution. 20 genera were observed in both sites. Author used palmer value index to let know the exact level of pollution. Which genus was observed showing its presence or absence with respect to palmer numericity scale vis a vis level of organic pollution will be interfaced in present paper.

#### **STUDY AREA**

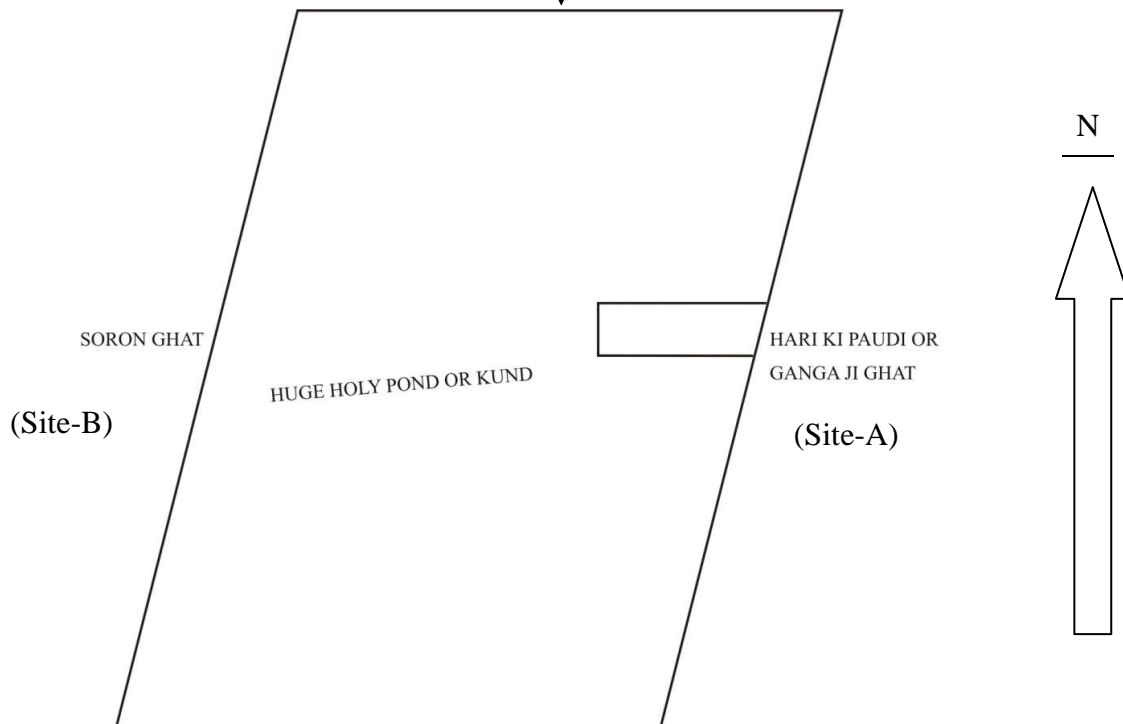
Soron is located at 27.88°N 78.75°E. it is very sacred place where Hindus get salvation after death. Once it was located on the bank of River Ganges, Soron has been shifted about 10 km from the present flowing of the River. A big holy lake (Kund) also known as Hari ki Paudi or Ganga Ji ghat located in Soron where people sink the remains in the form of burnt bones, (phool) of dead bodies. It is considered that human ash-bones are flown in this kund, they get dissolved and disappeared within 72 hrs, how it has been happening yet it is unanswerable question, a big mystery.

Soron is also referred as Shukar Kshetra. Believers travel and come over here paying prayers and offerings to the god and seek blessings. It is becoming a great pilgrimage. Devotees from Rajasthan, Madhya Pradesh, Gujarat and many parts of India visit here and darshan to different hindu gods settled in a series of temples. Soron is also believed to have been the birthsoil of narrator of Ramcharitmanas Tulsi Das. Near the Har Ki Paudi kund a very popular temple of Bajrangbali known as Laddoo Wale Balaji (child form of lord Hanuman having sweets). Shree Varaha Bhagwan's temple is also situated here.

Hindu mythological story tells that devil Hiranyaksh confiscated the earth and hide it in very deep area of Soron. God Vishnu turned incarnation of Varaha, having snout like shukar dug out that area by his nails and killed the demon and re kept the earth to its original place.



(Courtesy: India map)



**Map 1: Sketch of Studies Site**

**SAMPLING SITES**

Sampling sites were selected on the basis of human activities like taking holy and general bath, free swimming by locals, sinking the ashes of cremated bones though this was not found to make kund dirty, washing clothes by local sometimes, garbage dumping at different points on the sly. Other sources of pollution at these sites are cattle wallowing, agricultural and surface run-off especially during monsoon, offerings materials directly by devotees and from lot of temples etc. The sampling sites are given below-

1. Hari ki Paudi or Ganga Ji Ghat
2. Soron Ghat (Opposite to Hari ki Paudi)

**METHODOLOGY AND OBSERVATION**

Water samples were taken from two sampling stations of the kund every month during the course of study in year 2016. Monthly collections of phytoplanktons were made from two sampling stations with the help of planktonic net of 20 micrometer (1m) mesh size and kept preserved in 4% formalin for future use. The plankton identification was carried out with help of literatures and text books [5, 6]. The samples were also identified under the research microscope and the counting held by Lackey's drop method. Algal Generic [7] was employed to determine the organic pollution. Findings are presented in table no. 2.

**Table 1:** Palmer index values for different genera

S.No.	Genus	Reference or Index Value
1.	Microcystis	1
2.	Ankistrodesmus	2
3.	Chlamydomonas	4
4.	Chlorella	3
5.	Closterium	1
6.	Cyclotella	1
7.	Euglena	5
8.	Gomphonema	1
9.	Lepocinclis	1
10.	Melosira	1
11.	Micractinium	1
12.	Navicula	3
13.	Nitzschia	3
14.	Oscillatoria	5
15.	Pandorina	1
16.	Phacus	2
17.	Phormidium	1
18.	Secnedesmus	4
19.	Stigeoclonium	2
20.	Synedra	2
<b>Palmer Index Values</b>		<b>44</b>

**RESULT AND DISCUSSION**

Palmer [8] set up a combined rating of phytoplankton including algae, tolerating sequential organic pollution load and developed an index or scale to establish the nature of any aquatic body. In this method by studying the 20 types algae present in a water sample determination the level of organic pollution becomes possible. An organic pollution index factor from 1 to 5 has been allotted to each of the 20 types of algae which are tolerant to graded organic pollution. Most tolerant algae or much resistant or big indicator to organic pollution were allocated 5 factor. Less tolerant types algae were given a lower number. If the pollution index score comes 20 or more, representing higher

organic pollution. A score of 15-20 point to probable organic pollution Lower scores 10 - 15 usually signs of less or moderate organic pollution, but they may also happen if something is nosy with phytoplankton growth. 0-10 indicates lack of organic pollution. The genera to be considered significant if each has its concentration at least 50 cells per liter. In present samples each seen and identified genus had > 50 individuals themselves. The findings and results of water samples collected having phytoplankton from two opposite experimental stations in the area studied is given in Table 2. The seasonal variation means entire study divided in to two season summer which lasts for 8 months including rainy period and other is winter lasts for 4 months. Average numbers of phytoplankton were taken under consideration. Although many other genera belonged to different groups of phytoplankton also observed in the analyzed parameter at two locations of the Holi Kund but only those algae were estimated which were enlisted in palmer index.

**Table 2:** Palmer Pollution Index of Holi Kund at two different sites of Soron Ji in 2016

S.No.	Phytoplankton Genera	Har ki Paudi or Ganga Ji Ghat (Site -A)				Soron Ghat (Site -B)			
		Summer	Index	Winter	Index	Summer	Index	Winter	Index
1.	Microcystis	+++	1	-	0	-	0	++	1
2.	Ankistrodesmus	-	0	+	2	+	2	++	2
3.	Chlamydomonas	-	0	-	0	-	0	-	0
4.	Chlorella	++	3	+	3	+++	3	+++	3
5.	Closterium	++	1	+	1	++	1	-	0
6.	Cyclotella	++	1	+	1	+	1	-	0
7.	Euglena	-	0	-	0	-	0	-	0
8.	Gomphonema	+++	1	++	1	-	0	-	0
9.	Lepocinclis	-	0	++	1	+++	1	+++	1
10.	Melosira	+++	1	+++	1	+++	1	+++	1
11.	Micractinium	-	0	-	0	-	0	-	0
12.	Navicula	-	0	-	0	-	0	-	0
13.	Nitzschia	-	0	-	0	++	3	-	0
14.	Oscillatoria	+	5	-	0	++	5	++	5
15.	Pandorina	+++	1	++	1	+	1	-	0
16.	Phacus	-	0	-	0	-	0	++	1
17.	Phormidium	+	1	+	1	+	1	+	1
18.	Secnedesmus	-	0	-	0	+	4	-	0
19.	Stigeoclonium	-	0	-	0	-	0	-	0
20.	Synedra	+	2	-	0	+	2	++	2
<b>Palmer Pollution Index Score</b>			<b>17</b>		<b>12</b>		<b>25</b>		<b>17</b>

(+)= Common, (++) = Abundant (+++) = Dominant, (-) = Absent

Algae such as Chlorella, Scenedesmus, Nitzschia, Oscillatoria were present in the River water which indicate organic pollution [9].

Certain plankton genera are present commonly at both sites in present work named Chlorophyceae like Scenedesmus, Ankistrodesmus, Chlorella, Selenastrum, Myxophyceae like Oscillatoria with highest indexed value of 5 and microcystis and Bacillariophyceae like Synedra, Melosira, Cyclotella, Nitzschia. However chlamydomonas, euglenophyceae like Euglena was absent at both sites. The variations in these phytoplanktonic genera present in any water body is indication of the regular running of primary productivity all over the year.

Neelam *et al.* [10] investigated pollution indicator phytoplankton at five sites in Allahabad and took only two months under consideration. The richness of phytoplanktons was more in April than in March. The numericity of the genus Chlorella with index value 3 was moderate over the study. The same frequency of chlorella as observed in present study in both season corroborating with findings of Neelam *et al.* [10].

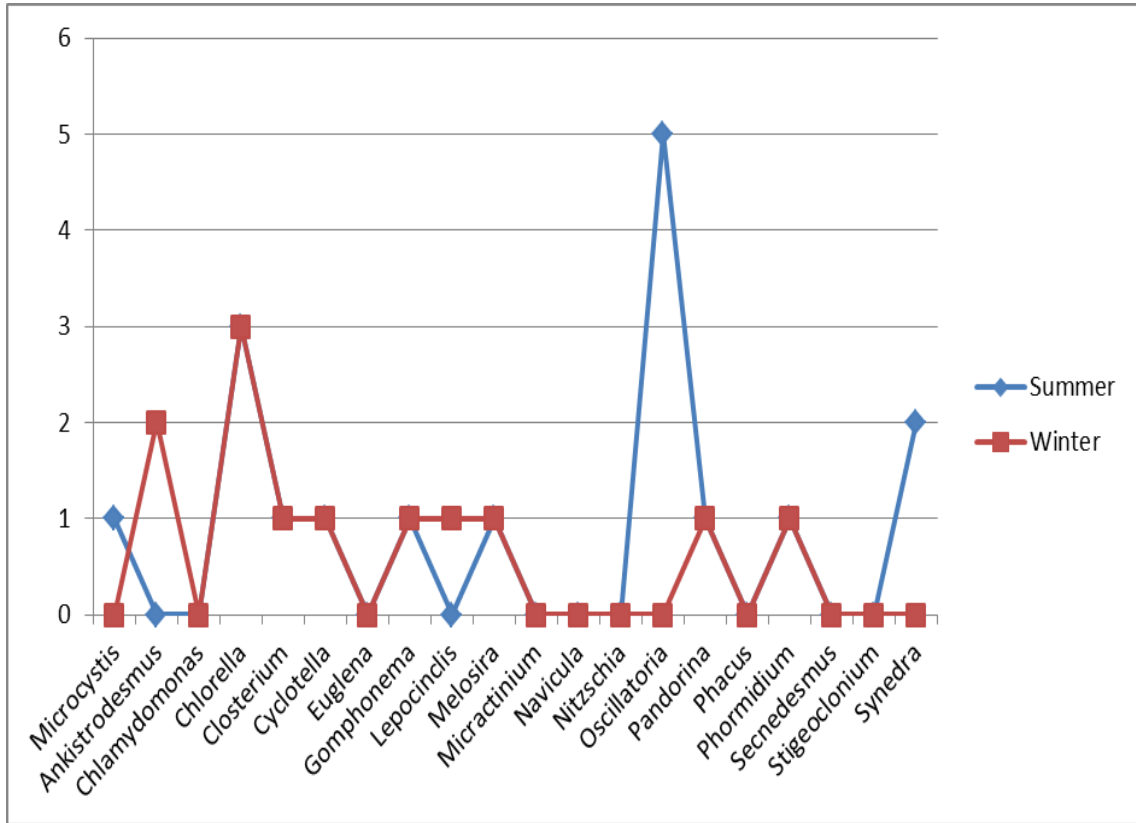


Fig. 1: Palmer index at Har ki Paudi or Ganga Ji Ghat (Site -A)

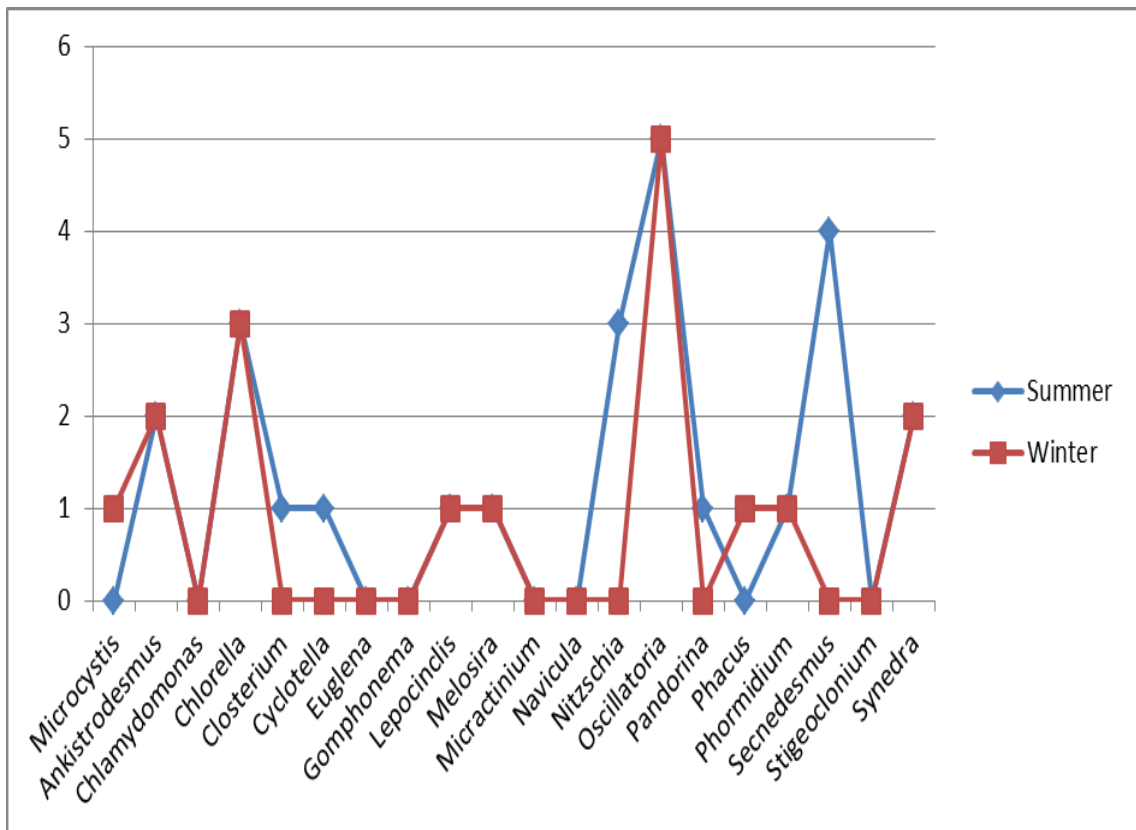
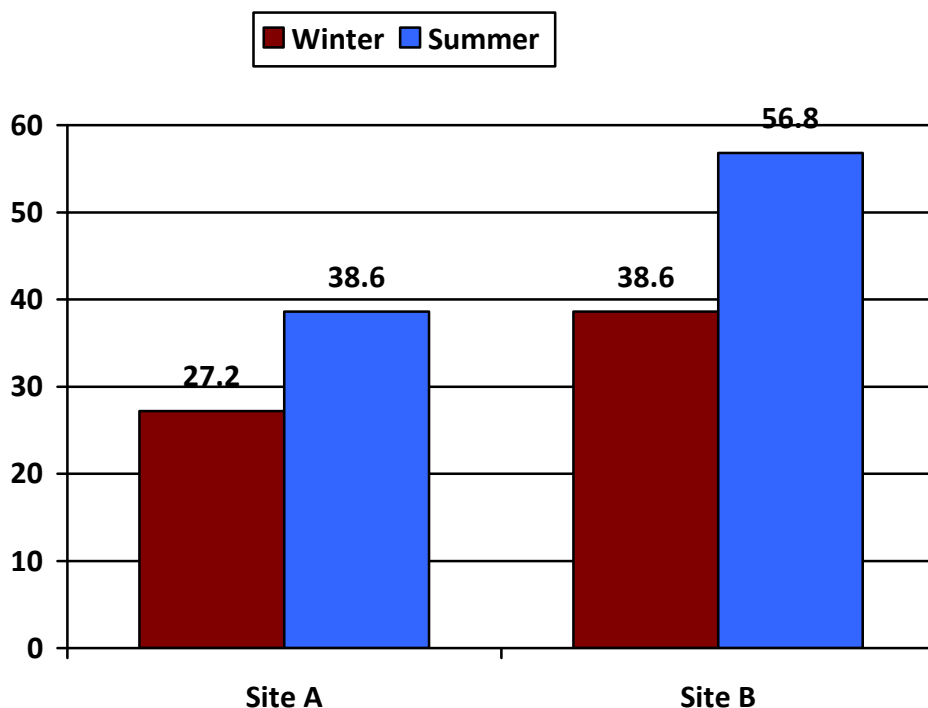


Fig. 2: Palmer index at Soron Ghat (Site -B)



**Fig. 3:** Percentage output of total palmer index at both sites

It has been prevalent at both sites in Holi Kund. Genus of *Microcystis*, *Phormidium*, *Melosira* and *Pandorina* were found throughout the study period at both sampling stations. Many of chlorophycean members formed pulse in the month of March to June. Maximum frequency as algal bloom was observed due to very low water velocity at Soron Ghat even though at this site ashes and burnt human bones for salvation purpose, a Hindu ritual after death of someone, are no immersed. While at Hari ki Paudi or Ganga Ji Ghat such activities and maximum human interventions being taken place at regular basis, inspite of this, no algal bloom was observed here. Its means that low pollution indexed genera of phytoplankton were found here. At both stations in summer higher water depth was determined causing higher organic pollution in contrast to winter season due to lower depth. Low phytoplankton diversity observed here due to fast water current, moderate temperature and high transparency of water. The latter factor generally favors algal bloom. That's why this site is considered as miracle of nature and became mystery for devotees and visitors.

Although in summer times some pollutophilic genera were not observed at both Ghats like euglenophyta, chlamydomonas genera and their species except *Phacus* species at site B in winter only. In contrast to present study same genera and species were identified and observed as indicator of higher pollution from study of Zenhom Salem *et al.* [11]. They found such species in drainage of Nile delta. They divided their study in two seasons summer and winter and took water samples from 18 stations from irrigation canals and main drains. They also observed higher Palmer index during summer as observed in present research work, because of infiltration off surface run off, bathing and washing activities and inclusions of pollutants at both sites.

David and Rajan [12] studied Palmer indexed phytoplankton in Vaigai River. They also saw common genera at various sampling stations as studied in present work done at two sites in Holi Kund. They observed higher organic pollution in pre monsoon as did in present investigation.

Final finding came out as site A in summer was found to have reference or indexed value 17/44 means 38.6% of total palmer index score and in winter 12/44 means 27.2% of

total palmer index score showing probable higher organic pollution in summer and less or moderate pollution in winter (44 is total palmer index score of 20 phytoplankton genera if all present simultaneously).

Likewise at site B in summer was found to have reference or indexed value 25/44 means 56.8% of total palmer index score showed high organic pollution and in winter 17/44 means 38.6% of total palmer index score showing probable higher organic pollution.

## CONCLUSION

From the study it is inferred that the Holi Kund receives a load of nutrients from surrounding series of temples and settlements as well as from anthropogenic and religious activities along with bathing and washing at both Ghats that headed severe contamination at Soron Ghat followed by eutrophication but such does not happen at Ganga Ji Ghat as it is considered as miracle or mystery that how this Ghat has low organic pollution based on plamer indexed algal communities. If all the necessary measures would be taken by Government and NGO together seriously can go a long way in relieving and narrowing further worsening of Holi Kund with a thought to restore its natural cleaned and healthy land locked aquatic ecosystem.

Henceforth it is advised to apply all the necessary measurement to clean up water from contamination into entire Holi Kund. Here water should not be used for drinking as it is being contaminated and odoriferous leads to adverse health effect.

## REFERENCES

1. Radhakrishnan R., Dharmaraj K., Ravithakur B.D. (2010): J. Environmental Biology, 28(1): 105.
2. Bellinger E. and Sigeo D. (2010): (Eds.), Introduction to freshwater algae, Freshwater algae: identification and use as bioindicators, John Wiley & Sons, Ltd. Inc., Chichester, 1-40.
3. Saha S.B., Bhattacharya S.B. and Choudhury A. (2000): Diversity of phytoplankton of sewage pollution brackish water tidal ecosystems, J Environ Biol., 21: 9-14.
4. Bellinger E. and Sigeo D. (2010): (Eds.), Algae as bioindicators Freshwater algae: identification and use as bioindicators, John Wiley & Sons, Ltd. Inc., Chichester, 99-136.
5. Bilgrami K.S. (1991): Biological profile of the Ganga: Bacteria and Bacteriophages. In Krishnamurti C.R., Bilgrami T.S., Das T.M., & Mathur R.P. (Eds.), The Ganga: A Scientific study (pp. 72-77). New Delhi: Northern Book Center.
6. Bilgrami K.S., Dattamunshi J.S., Siddiqui E.N. and Singh N.K. (1979): Primary productivity of phytoplankton of the River Ganges. Biological Bulletin, 1: 39-42.
7. Palmer C.M. (1968): Keys to water quality indicative organisms (South Eastern United States) Dept. of Interior, Federal Water Pollution Control Administration, Ohio, U.S.A.
8. Palmer C.M. (1969): A composite rating of algae tolerating organic pollution J. Phycol., 5, 78-82.
9. Kamat N.D. (1982). Topics in Algae, Saikripa Prakashan, New Delhi.
10. Shukla N., Gupta M.K., Chaurasia G.L., Singh S., Singh S.B., Shukla D.N., Srivastava V. and Tandon P.K. (2015): A study on phytoplankton diversity in River Ganga at Allahabad, Uttar Pradesh (India), Green Chemistry & Technology Letters, 1(1): 92-95.
11. Salem Z., Ghobara M. and El-Nahraw A.A. (2017): Spatio temporal evaluation of the surface water quality in the middle Nile Delta using Palmer's algal pollution index, Egyptian Journal of Basic and Applied Sciences. 4(3).
12. David Noel S. and Rajan M.R. (2015): Evaluation of Organic Pollution by Palmer's Algal Genus Index and Physico-chemical Analysis of Vaigai River at Madurai, India , Natural Resources and Conservation. 3(1): 7-10.