Aquatic flora is a discipline that concerns the study of inland waters (both saline and Fresh) specifically lakes, ponds and river (both natural and manmade) including their biological, physical, chemical and hydrological aspects. Phytoplankton and aquatic plants are very remarkable forms of aquatic flora. They play an important role in maintaining aquatic ecosystem. Diversity of aquatic flora prevents excessive erosion and also maintains turbidity and nutrient balance in water. So many workers rushed to study aquatic ecosystems and aquatic plants from all over the world. A considerable work had been done on the phytoplankton and aquatic plants taxonomy, floristic study, biodiversity and ecological aspects in all over the world. Some of them are cited here.

Mohammed, H.A., and Daddy, F. et.al, presented “Utilization of some aquatic macrophytes in Nigerian inland water bodies: A Review”. They noted various benefits offered by aquatic plants such as aquatic plants as food, as bio fertilizer, as sources of medicine, etc.…

R. Michael Smart (1990) studied the effects of water chemistry of submersed aquatic plants. He concluded that water chemistry influences species distribution, but probably does not play a major role in limiting the peak biomass attained by submersed aquatic plants.
Kazuyuki Inubushi, Hotaka Sugii et al., (2001) observed that methane oxidation activity of aquatic weeds *Lipocarpha* sp., *Rotalaindica* and *Ludwigiaepiloboides* was higher than rice plants. Their results indicated that role of aquatic weeds in paddy soil in methane emission should not be overlooked in evaluating mitigation options for reducing methane emission from paddy fields. Dutta, S. and Naik, A. (2002) documented aquatic macrophytes of the Apalchand reserve in the Jalpaiguri district of west Bengal, in perspective of plant Biodiversity.

Korai, A.L., Sahato, G.A. *et al.*, (2008) studied “Biodiversity in relation to physicochemical properties of Keenjharlake, Thatta District, Sindh, Pakistan”. They recorded that the physicochemical properties of Keenjharlake were within tolerance limits, no excessive value was recorded, therefore the water is suitable for irrigation, for drinking if purified and for growth of aquatic fauna and flora. During their study, they have noted total 142 species of phytoplankton and 37 species of zooplankton. They also concluded that no parasitic or fungal infection was found on aquatic plants and animals during the present study. David Winship Taylor *et al.*, (2008), studied “*Scutifoliumjordanicum* Gen. ET SP. Nov. (Cabombaceae), an aquatic fossil plant from the lower Cretaceous of Jordan, and the relationships of related leaf fossils of living genera.” They have described a new species of aquatic plant *Scutifoliumjordanicum* from Albian of Jordan. The characters of leaves
suggest that *S. jordanicum* belong to the Cabombaceae lineage within Nymphaeales. They have suggested that cladistic analysis shows that *S. jordanicum* is basal to living member of the family and has unique characters not found in any living genera. They remarked that this was the oldest evidence of Cabombaceae from the old world.

Sarfaraz Khan Marwat, Khalid Usman *et. al.*, (2013) noted Monocot represented by 24 species and Dicot was with 16 species.

Daniele Paganelli and Renato Sconfietti, (2013) studied on biodiversity loss in a riverine wetland of the Ticino river (Lombardia, Northern Itly). They concluded preceded by the eradication of some specimens of *Nymphaea lutea*, would be beneficial to attempt to reintroduce the threatened aquatic species *Nymphaeaalba*, which was very abundant 24 years ago and they also suggested planning of gentle restoration of this biotope for rejuvenating the physical habitat to ensure the long term ecological functioning of the aquatic environment.

Cook, C.D.K. (1996) carried out the book “Aquatic and Wetland Plants Of India” which is a reference book and identification manual for the vascular plants found in permanent or seasonal fresh water in the subcontinent of India south of the Himalayas.

Mathew Varghese (1988) presented “Forest Flora of Dhulia district” part –I and part- II. Mandal Sudhendu, studied on pollution tolerant aquatic
plants of Lalbandh lake, West Bengal in India. They have observed 74 species out of which 48 belonged to Dicotyledons and 26 to Monocotyledons. They also noted that plants like *Wolffia*, *Lemna*, and *Spirodela* used as fish food and can grow fast in sewage effluents and also can act as a biological filter in sewage effluent. They also remarked that *Eichhornia crassipes*, *Pistia stratiotes* and *Hydrilla verticillata* can be used for removal of heavy metal pollutants from polluted water bodies without endangering the lives of other flora and fauna.

Halwe, D.R. (2004) worked on “Studies on floral diversity and productivity of the Rishi lake in relation to water quality” (Ph.D Thesis). He concluded that most of the parameters showed positive correlation and the lake was found rich in macrophytic vegetation due to high nutrient received from surface runoff water from agricultural field, human and cattle activities and sewage dumping.


Gupta Mohini (2006) worked on “Ethnobotanical and ecological studies of some medicinal plant species in Bundelkhand region (U.P)”, (Ph.D Thesis). Her study contains an information on 5 native medicinal plants of Jalaun district used by rural people to cure a number of diseases.
Patil, D.A. (2010) studied on marsh and aquatic crop weeds in Khandesh region in Maharashtra and observed 51 weedy species from rice field. Moreover, he found that Poaceae and Cyperaceae families as predominate over weed flora.

Anburaja, V. (2011) studied “Biodiversity and ecosystem functioning of mid- elevation forest of Pachmalai Hills, Tamilnadu” (Ph.D Thesis). His study was carried out around 117.5 km². He had identified total 1041 angiosperms and 4 pteridophytes belonging to 134 families among them dicot and monocot contributed 856 and 185 species respectively.


Shardendu, Sayantanet. et al., (2012) presented their research article “Luxury uptake and removal of phosphorus from the water column by representative aquatic plants and its implication for wetland management”. They have conducted their research at Kabar wetland, Bihar. In their article they have concluded that Pistia is an efficient P accumulator as compared to several other wetland species like Phragmites, Typha and so forth.
Hegde and Bhatt, (2012) worked on “Wild plant species used in Hindu festivals- A case study from UttarKannada district, Western Ghats, South India”.

Sharma and Gandhi (2012) presented “Study of aquatic biodiversity and water resources of rivers from Gujarat and Madhyapradesh states, India”. In their project they worked on rivers of Gujarat and Madhyapradesh forms the basis of an ecological assessment. They also developed tools for monitoring these environments and biotic elements.

Banik and Ajay (2012) presented “Identification and utilization of wild edible plants by the tribal of Bastar region (Chattisgarh)” and noted several wild edible plants are used in times of scarcity and famine.

Patil and Tayade (2012) presented floristic studies in Khandesh region in Maharashtra. They have presented an up to date overview of various investigations on this line in this communication which will help to future research workers in view of sustainable use of the Bioresources of the area.

Pawar and Sonawane (2012) worked on angiosperm diversity of Kas reservoir from Satara district in Maharashtra. They reported 94 plants species with 28 families and noted that dicot dominate over monocot. They also observed that enrichment of nutrient and dissolved matter in water affect the diversity of aquatic plants and water properties.
Rawat, D.S. and Satish Chandra (2014) presumed extinct *Dipcadireidii* (Asparagaceae) recollected after 127 years from Uttarakhand, India. They remarked that *Dipcadireidii* was presumed extinct species in Red Data Book of Indian plants.

The extensive survey of literatures related with plant taxonomy and ecology revealed that many floristic work have done in all over the Great Gujarat state. To understand these flora of Gujarat state the state of Great Gujarat is divided in different regions like north Gujarat, central Gujarat, south Gujarat, Saurashtra, and Kachchh region. So I tried to mention these area and the work done in these area here.

Mukteshwar, Banaskantha district, Gujarat”. Along with Patel, Patel, Parekh and Bhatt (2005) together contributed paper on “Plants of religious importance of Banaskantha district in North Gujarat”. Dabgar, P.J. (2006) presented “Contribution to the wetland flora of Dabhoi Taluka, North Gujarat”. Patel, (2009) contributed “Study of floristic and ethnobotanical aspect of angiosperms of Palanpur and Dantiwadaluka of Banaskantha district, Gujarat” (Ph.D. Thesis). Parmar and Patel, (2010) studied aquatic angiospermic plants of Patan district in north Gujarat. They also noted that Nymphaeanaouchali, Polygonumbarbatum and Scirpusarticulatum were very rare in study area. Jessica Karia (2010) worked on understanding ecology of a freshwater wetland –Thol lake of Mehsana district. Her exploration revealed that Thol wetland is inhabited by the members of families of Cyanophyceae, Chlorophyceae, Bacilliriophyceae and Chrysophyceae. She noted common rooted submerged aquatic plants in Thol wetland were Vallisneriaspiralis and Hydrillaverticillata, and Nelumbolutea in small portion of wetland, moreover she consider the bad of wetland was always found covered with the terrestrial grass Cynodondactylonand Ipomoea aquatica. She also found emergent plants Typha sp., Polygonum sp., Cyperussp. AndScirpus sp. were common which provide roosting and nesting habitat for many birds. Patel, K.C. and Patel, R.S. (2010) made their observation on tree species of Danta range forest of north Gujarat and documented 100 species with 74 genera and 38 families. Patel, Kanjariaet. al., (2010) investigated climber resources used by tribal
inhabitants of Ambaji forest of Banaskantha district and suggested that further pharmaceutical and therapeutic investigation are desired for the discovery of new herbal drugs. Raval and Patel, (2010) documented ethnomedicinal uses of some selected plants of S.V.Campus in Kadi. Patel, S.K. (2010) presented some traditional folk medicine in north Gujarat by noted 10 folk medicines. Patel, N.B.et. al.,(2010) studied the riverion vegetation of Dholwani forest range of Sabarkantha district in north Gujarat and recorded 339 plant species from the river sites. Jangid, M.S. (2011) studied “Aquatic plants of taluka Modasa, District Sabarkantha, Gujarat (India)”. He recorded 34 plant species among them 23 species belong to dicot and 17 species belong to monocot. Ant and Desai, (2011) studied spices and condiments in north Gujarat and documented total 15 plant species cultivated as spices and condiments by farmers. They also studied plant diversity in Vadali range forest in Sabarkantha district in 2012 and reported 355 plant species. Parmar, A.J. (2012) worked on “Study on aquatic flora diversity and physicochemical properties of water from selected area of Patan district, North Gujarat”. He had collected total 218 plant taxa and found approximate ratio between dicot and monocot was 2.5:1. Patel, N.K. and Parmar, A.J. together studied angiospermic plants of Patan, north Gujarat and recorded 396 plant species. Vegda, Goswamiet. al., (2012) studied on medicinal plants of Vijaynagar forest and found 180 species used folk biologically by native people. Patel, R.S. (2012) studied medicinal uses of some angiospermic plant species found
Chlorophytum comosum (Thunb.) Jacques as new record from Patan for Gujarat State. The plant was collected from Banaskantha District. Jangid, M.S. and Sharma, S.S. together have done lot of taxonomic work in Modasa Taluka during last few years. Their number of papers have been published during that period. They together worked on tree species diversity in Modasataluka in 2010 and enumerated 131 plant species. Their other efforts done such as weed plants of Modasataluka in 2011, poisonous plants of Modasataluka in 2011, climbers of Modasatalukain 2011, Jangid (2011) studied Taxo-ethnobotanical studies of angiosperms and study of angiosperms with ethnobotanical aspect of Modasa taluka in 2013. Nirmal Kumar, J.I., Soni Hiren et al., (2006) worked on Biomonitoring of selected freshwater macrophytes to assess lake trace element contamination, a case study on Nalsarovar bird sanctuary in Gujarat. They recommended that combating all kinds of pollution in lake NSBS through prevention, controlling or by applying fine treatment on drainage loads discharged in lake and well designed action plans should be developed. Soni (2007) carried out “Environmental studies of two significant wetlands of Gujarat with particular reference to eutrophication and avifauna.” Nirmal Kumar J.I., Soni Hiren et al., (2008) studied “Macrophytes in phytoremediation of heavy metal contaminated water and sediments in pariyej community reserve in Gujarat. They remarked that Pariyej
reservoir is designated as a “Wetland of International Importance”. Their results showed that greater accumulation of heavy metal was observed in *Nelumbonucifera* and poor content in *Echinochloacolonum*. They concluded that three native aquatic plants species *T.angrustata*, *E.Crassipes*and *I. aquatica* accumulated heavy metals in higher concentrations, therefore they could be used as ‘phytoremediants’ compared to other native aquatic macrophytes species. Sajis, P.R. (2012) studied “An assessment of the nutrient profile and biotic components of Mahi estuary and Vamleshwar mangrove of Gulf of Khambhat in Gujarat”.

Their study revealed that higher concentration of *Eichhorniacrassipes* from Thaltej lake and lower concentration of trace elements of *Lemnasps.* from Nikol lake.

Kachchh region falls in desert area located on northern western part of Gujarat. This region has sandy soil which show poor vegetation in comparison to the other regions of Gujarat. That is the reason that area lacks much taxonomic work, although some of the work done here is tried to be cited here. Patel, Dabgaret. *et al.*, (2010) studied some noteworthy ethno medicinal plants of western Kachchh and recommended such kind of area should be declared as ecologically sensitive and they should be conserve. Patel, Dabgaret. *et al.*, (2011) studied angiospermic flora of Kachchh district and noted total 988 angiosperm plant species in which herbs were found to be dominate over all angiosperm plants. Sorathia Kalpesh (2013) studied ethnomedicinal plants used in Anemia from Anjartaluka and recorded 33 plant species from study area for its medicinal purpose.

**REVIEW OF LITURATURE IN RELATION TO WATER ANALYSIS:**

Many workers all over the world have investigated the physico-chemical parameters of various categories of water and water ecosystem.

Lytle and Lytle (1990) examined pollutant impact upon coastal environment of Mississippi estuary in U.S., whereas in 1993 Akpan and
Offem provided data on seasonal variation in various physico-chemical parameters and proved that the main influencing factor is variable rainfall.


Zhu et. al., (2005) studied the influence of surface run-off water in contributing nutrients like sodium, potassium, silicate and carbon in river water at low reaches of Wu Jiang river in China. Wen et. al., (2008) carried out the comprehensive bimonthly field surveys of subtropical mountain river system, the Danshuei tributary, Taiwan for two years from September 2000 to June 2002 and studied the seasonal dynamics and the inter-annual variability of dissolved inorganic nitrogen (DIN; nitrate, nitrite and ammonium) and dissolved inorganic phosphorus (DIP). GulfemBakan, Hulya Boke Ozkoc et al., (2010) studied “Integrated environmental quality assessment of Kızılırmak river and its coastal environment”.


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Kadam, M.S. et. al., (2007) conducted his research to analysed water quality of Masoli reservoir in Isad village, Dist.Parbhani, Maharashtra. The results clearly indicated that water parameters were within permissible limits for surface water irrigation and suitable for pisiculture.

Kamble, S.M.et. al., (2009) presented physico chemical analysis of Ruti Dam and concluded that most of the parameters were in normal range. which indicated better quality of Dam water. Vasumathi Reddy(2009) analysed the Pakhal lake water which is mainly used agricultural purpose, drinking purposes and fish culture.

Garg, R.K.et. al., (2010) worked on trophic condition and pollution of Ramsagar reservoir of Datia district in Madhya Pradesh. The study revealed that the reservoir is under mesotrophic category and little liable
towards eutrophication, thus it requires proper maintenance and administration.

Hiremath, Yadawe et al., (2011) studied physico-chemical analysis of ground water in municipal area of Bijapur (Karnataka). They have collected water samples from 12 different sites. Their results indicated that the water of some of the sample are suitable for drinking in all seasons. They suggested that effective management, continuous monitoring of their quality parameters and uses as supplement to river water will reduce water crisis of the city.

Nafeesa Begum et al., (2011) studied physico-chemical profile and phytoplankton density and diversity in Hadadi lake in Karnataka. Their study revealed that phytoplankton composition is governed by parameters like BOD, COD, Chloride, Phosphate, Nitrate, Potassium and Total hardness. Biraris Narhar Jagannath, (2012) studied “An assessment of the quality of ground water in Dhule city of Maharastra, India” (Ph.D Thesis). He recorded that the parameters like pH, EC, TH, Cl, Ca, Mg, DO, Na and K in most of the samples were found within permissible limit. TDS of all sample were above permissible limit and TA in summer found above permissible limit prescribed by WHO.

Pagariya, S.K. (2012) analysed that water quality using physico-chemical parameters of Kolura pond in post monsoon season. He found that all parameters were within permissible limit as prescribed by WHO, ICMR
and BIS standard and concluded that water is non polluted and suitable for fisheries drinking and irrigation purposes.

Shukla and Tripathi (2012) studied River Ganga at Varanasi: The polluted purifier and conducted their study to assess the water quality and various causes of pollution in river Ganga.

Singh and Srivastava (2013) worked on “Estimation of physico-chemical properties of sewage water and their impact on selected crop plants”. They worked in Allahabad district.

Kanue, Munsi et al., (2013) worked on water chemistry of Hazratbal basin of Dal lake in Kashmir. Their data indicated that world famous Dal lake was undergoing a fast eutrophication due to pollution caused by agricultural practices in catchment area.

Indresha and Patra (2014) studied seasonal variation in the physico-chemical parameters of Kanjia lake. They have studied over a period of two years in Kanjia lake of Bhubaneswar, and reveled that as per BIS (1991) all the parameters were within desirable limit.

Dnagarsekar, A.S. and Kakde, U.B. (2014) studied of physico-chemical parameters of Mithi river water in Mumbai metropolis. They have observed that some of the parameters exceeded the limit when compare with standard BIS and CPCB and concluded river water was heavily
polluted. They suggested that continuous monitoring of river water should be done.


Nirmal Kumar and J.I. Cinioommem (2011) worked on phytoplankton composition in relation to hydro chemical properties of tropical community wetland Kanewal in Gujarat. They concluded the composition of phytoplankton is depended on different abiotic factors directly or indirectly.

Thakor, F.J. et. al., (2011) calculated water quality index (WQI) of Pariyej lake and analysed the impact of industrial waste, farming activities and human activities and proved that water is not totally safe for human consumption. Isaiah J. Nirmalkumar, Basil et. al., (2012) presented assessment of water physicochemical characteristic and statistical evaluation of Narmada estuarine in Gujarat and observed the health of estuarine ecosystem is found to be in good state for floral and faunal community thriving in the area. Soni Hiren, B., Dabhi Manisha and Thomas Sheju studied “Surface water quality assessment and conservation measures of two pond ecosystems of central Gujarat”. Their study clearly revealed the extent of aquatic pollution at both the ponds, moreover ACP
(ADIT Campus Pond) was found to be more polluted than GVP (GanaVillaga Pond) in and around new VallabhVidyanagar and impacted by anthropogenic pressures like dumping of a domestic and industrial waste. Tushar Gandhi (2012) presented a review on study of most important water quality physical parameter Dissolved Oxygen. He remarked that DO is crucial for most animals and plants in aquatic system. He noted most fishes cannot survive below 3 mg/l, moreover low DO is sign of much organic material in water. His data clearly indicated there is a need to evaluate an indicator in the cortex of specific monitoring program.

Patel, J.N. and Patel, N.K. (2012) studied physico-chemical properties of water in Amirgadhtaluka of Banaskantha District. They observed that there are significant variation in water parameters and it was found that certain parameters are exceeding the permissible limits of irrigation. Joshi and Patel (2012) studied physicochemical status of Deliyalake and Malap lake under biotic stress of Visnagar taluka in Mehsana district and concluded that both lakes were polluted because of continuous discharge of domestic sewage which leads to eutrophication. Patel, P.N., Patel, N.K. et al., (2013) studied physico-chemical analysis of water in industrial area of Banaskantha district.

A good considerable research work regarding with water analysis of water bodies or ground water have been done in special reference to Ahmedabad district and proper Ahmedabad city. This includes Verma, Chandawatet.
al., (2011) worked on seasonal variation in physico-chemical and phytoplankton analysis of Kankaria lake. They observed all physico-chemical parameters were within desirable limit and phytoplankton does not show any indication of pollution, so they concluded that the Kankaria lake is free from pollution. Solanki, Verma et al., (2011) evaluated water quality of Malav lake for physico-chemical analysis. They found that due to human activity and discharge of waste water pollute it. They also warned that if the present conditions continue for long period, Malav lake soon became ecological inactive. Solanki, Chitnis and Bhavsar (2012) presented Physico-chemical and bacterial analysis of Sabarmati river in Ahmedabad and observed that water quality becomes inferior as go from Indira bridge to Vasna barrage due to human activities, industrial waste disposal and it need treatment before use. Kotadiya, Nikesh G. (2013) studied “Seasonal variation in plankton and physicochemical properties of selected fresh water ponds of rural areas of Ahmedabad district” (Ph.D Thesis), his observations point to the significance of considering lakes and the surrounding area requiring careful management and continuous monitoring and also pointed that biological system is disturbed due to under the environmental changes, human activities and developmental activities. Kotadiya, Acharya et al., (2013) determined water quality index and suitability of a rural freshwater body in Ghuma village of district Ahmedabad. They found that their results were less than 75 (WQI level) for different season indicated that water quality was poor and not totally
safe for human consumption. Hardikar, R.S. and Acharya, C.A. (2013) presented comparative analysis of physico-chemical properties of two freshwater bodies of Ahmedabad city. Their investigation revealed that most of the parameters were within desirable limits as per BIS. They have also observed that BOD, nitrate and phosphate were quite high at Malav lake thus it is slightly polluted compare to Kankaria lake. Moreover human impact was quite high at Kankaria lake because local authorities take necessary step to minimize pollution e.g. sprinklers were set to increase aeration in water. Hardikar, R.S. and Acharya, C.A. (2013) worked on seasonal variation in physico-chemical properties of two freshwater bodies of Ahmedabad city. They studied on two lakes Vastrapur lake and Ropada lake. They have concluded most of the parameters were within desirable limits as per BIS and no sign of pollution at Vastrapur lake and BOD, Chloride and nitrate indicated polluted nature of water at Ropada lake.