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RESEARCH ARTICLE

DECOMPOSITION OF PLANT'S LITTER CHANGES THE WATER CHEMISTRY OF WETLANDS IN DHEMAJI DISTRICT OF ASSAM

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ABSTRACT

This study was done for the aim to bring notice to local people about the reason of degrading wetlands and suggestion to develop this degraded wetland to get benefits. Submerged plants are the generator of oxygen in the aquatic system. Siltation being the major cause, the beel turns into unproductive areas with extensive weed cover. In controlled growth situation either naturally or by human interference aquatic plants can purify water, but if uncontrolled growth takes place they can reach the levels of pests & are frequently regarded as aquatic weeds aquatic plants can reduced DO, BOD, pH. Many terrestrial plants are also found in the ecotone region of wetlands the aquatic plants litters degrading on beel change the composition of water quality. The results are important in the context of the possible adverse impacts on aquatic life. Water sample were collected and some parameter were analyzed on spot with water analysis kit and soil samples were collected for laboratory analysis. Water and air temperature were recorded with thermometer. D.O value was as low as 2mg/l-10mg/l. Mg content was as low as 0.48mg/l-26.0mg/l. Total alkality ranges from 20mg/l-27mg/l. Soil phosphorous minimum content is found to be 0.1mg/l & highest 80mg/l which shows the unproductively of water bodies

INTRODUCTION

At, present time, due to drainage land encroachment and other exploitation beels are threatening. Most of the beels are weed infested land heavily silted aquatic and wetland plants are mostly confined to the marshes and wetland habitats. The purpose of this paper is to bring notice to local people about the reason of degrading wetlands and suggestion to develop this degraded wetland to get benefits. Wetland that provides benefits are of two categories- ecological & economical in the ecological terms wetland plants both living and debris are significant in retaining the requisite carbon and methane balance of our environment and thus maintaining green house equilibria. Therefore wetland plants having floating or emergent leaves are consider to be an important tool in reducing global rise in temperature. Submerged plants are the generator of oxygen in the aquatic system. In controlled growth situation either naturally or by human interference aquatic plants can purify water, but if uncontrolled growth takes place they can reach the levels of pests & are frequently regarded as aquatic weeds aquatic plants can reduced DO, BOD, PH and these plants are now exploited for biofiltration of organic waste water treatment system. Many terrestrial plants are also found in the ecotone region of wetlands. So far no elaborate study regarding aquatic plants litters on composition of water quality of Dhemaji District of Assam and also to report its status.

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MATERIALS AND METHODS

Study and sampling

Dhemaji district is located at 27.48N 94.58E. The maximum & minimum temperatures of the district are 39.9C &5.9C respectively. The normal annual rainfall is 2600mm to 3200mm. the district has many ponds ,tanks, river, ditches low lying water logged areas, rice field and wetlands locally known as beels which are ideals habitat for many aquatic, semi-aquatic wetlands and marshy plants. The three wetlands cover during the present investigation of Dhemaji District are Bhelamari beel, Bauli beel, and Dibong Abong beel. Bhelamari beel is a rain fed beel and has no connection with river. Most part of the beel is swampy. Biodiversity is low. Some area of the beel has free surface. Beel covered by water hyacinth and Dol grass. Local fishes are available. During winter the depth of the beel varies from 2 to 3 feet. Fringe area of the beel is encroached by people. Development activities for the beel will be beneficial for that area. Bauli beel has submerged aquatic plants present needs to be removed for fish cultivation .At present the beel is rain fed. Previously it was connected by river and now dam is built for railway construction purposes that have disrupted the

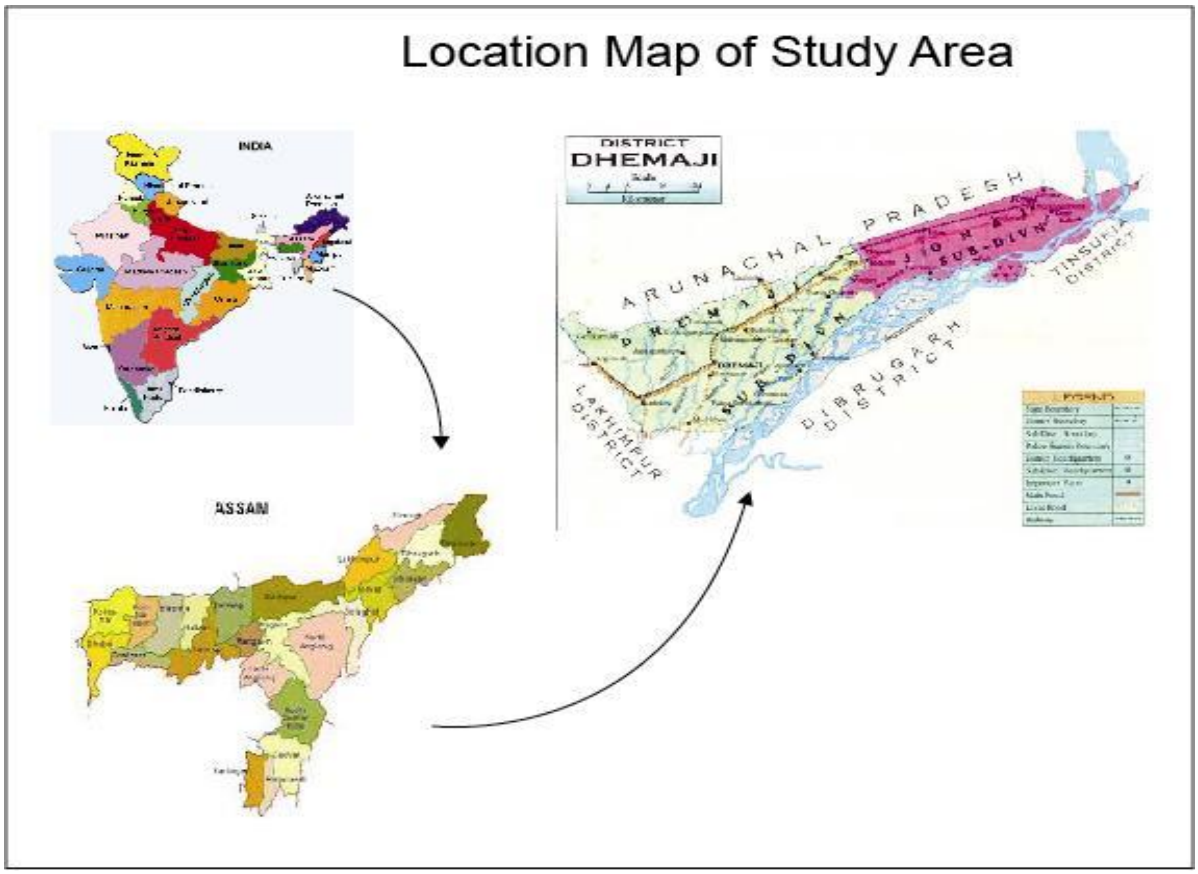
direct connection to the river. Local people use the beel for fishing purposes. Though the surface is free but because of submerged water plant the beel is unproductive one. During winter the depth of the beel varies from 5 to 6 feet. Dibong Abong beel is channel like long and narrow. There is no feeding channel. It is rain fed beel. Both sides of the beel are covered by bamboo plantation. Surface of the beel is almost free. Local people use the beel for fishing purpose. The beel has great potentiality for fish cultivation and can be taken up for development activity. During winter the depth of the beel varies from max.5 feet to min.2 feet. Flora or Vegetation study was done with the help of Random Sampling (Partial) method at various points. During our visit aquatic plants were recorded by visual identification. In doubt the sample was collected for later identification in laboratory. The submerged vegetation was done with the help of anchor ring. A list has been prepared for vegetation in and around the beels.

Alkalinity, free Carbon dioxide and Calcium were analysis with Titrimetric method. Electrical Conductivity and Total dissolved solids were recorded with water quality analyzer (modal-138). Turbidity was recorded with Nephalometer. Soil analysis: soil pH was measured by pH meter. For the above methods, APHA (American public health Association) 1998 was followed. Water and air temperature were recorded with thermometer.

RESULTS AND DISCUSSION

pH meter, Free CO2mg/l & DOmg/l

pH is generally measured on a log scale and equal to negative log10 of hydrogen ion concentration. pH=Log10 [H+] = Log10 1. Free CO2mg/l is determined with the help of Titration.



Map showing the location of the study sites of the Dhemaji District of Assam

Physico-chemical Parameters

Water sample were collected and some parameter were analyzed on spot with water analysis kit and soil samples were collected for laboratory analysis. The physico-chemical parameters that are studied include mainly DO and Biological oxygen demand (BOD) determine by Winkler's Iodometric Method. pH and Alkalinity, were determined in the laboratory with the water sample collected. pH was recorded with digital pH meter. D.O was analyzed with modified Winkler's method.

Aquatic plant life depends upon carbon dioxide and bicarbonates in water for growth. Microscopic plant life suspended in the water, phytoplankton, as well as large rooted plants, utilize carbon dioxide in the photosynthesis of plant materials; starches, sugars, oils, proteins. The carbon in all these materials comes from the carbon dioxide in water. When the oxygen concentration in waters containing organic matter is reduced, the carbon dioxide concentration rises. The rise in carbon dioxide makes it more difficult for fish to use the limited amount of oxygen present. To take on fresh oxygen,

fish must first discharge the carbon dioxide in their blood streams and this is a much slower process when there are high concentrations of carbon dioxide in the water itself.

Table 1. List of important plant species recorded in Study sites. (√ = Presnt, √√ = present in large amount, √√√= present in very large amount)

Plant Species	Dibong Abong beel	Bauli beel	Bhelamari beel
Water hyacinth	√	√√√	√√√
Ipomoea cornea	√	√	√
Enhydra fluctuans		√√√	√
Ipomoea aquatica		√	√
Eury ferox	√		
Trapa natans			√
Hydilla sps.	√	√	√
Utricularia sps.		√√√	√
Sagittaria			√
Polygonum sps.	√	√	√
Alpinia sps.			√
-dol-			√√√
Salvania sps.		√	√
Nymphaea sps.		√	
Jatiyar	√√		√
Mikania			
Cyperus sps.	√	√	√

Dissolved Oxygen (mg/L) (Winkler's Iodometric Method). The manganous Sulphate reacts with a alkali (KOH or NaOH) to form a white Precipitate if Manganous hydroxide which in the present of Oxygen, gets Oxidizes to a brown colour compound. In the strong acid medium manganic ions are reduced by iodide ions which gets converted to iodine equivalent to the original concentration of oxygen in the sample. The iodine can be totrated against thiosulphate using starch as an indicator. The DO decreases as the decomposition of the leaves in water increases with time. Thus falling leaves in water may have an adverse effect on DO and thereby affect aquatic life.

Biochemical Oxygen Demand (BOD) is the measure of the degradable organic material present in a water sample, and can be defined as the amount of oxygen required by the micro organism in stabilizing the biologically degradable organic matter under aerobic conditions. The principle of the method involves, measuring the difference of the oxygen concentration between the sample and after incubating it for 3 days at 27^0 C.

Table 2. Showing pH, Free CO2mg/l, DO mg/l & BOD mg/l water sample of the Beels

Beel	pH	Free CO2mg/l	DO mg/l	BOD mg/l
Bhelamari beel	6.7	6	1.7	740
Bauli beel	6.8	0	2.4	706
DibongAbong beel	6.6	7	3.4	716

Temperature and Hardness

The O2 and CO2 concentrations of water depend on temperature Water and air temperature were recorded with thermometer. The energy balance is dominated by radiation to and from the wetland, heat transfer from air, and evaporative losses. Transpiration was found to dominate the water loss. Water cools as it passes from inlet to outlet. The excess sensible heat is dissipated during travel through the inlet region of the wetland. For long detention times, longer than about five days, water temperature reaches a balance condition. Up to that time, sensible heat from the source water also influences evaporation and water temperature. Balance water temperatures ranged from 3.9 °C in winter to 27.2 °C in summer, while mean daily air temperatures ranged from 5.3 to 37.2 °C. Water hardness is important to fish culture and is a commonly reported aspect of water quality. Hardness is a measure of the quantity of divalent ions (for this discussion, salts with two positive charges) such as calcium, magnesium and/or iron in water. Hardness is traditionally measured by chemical titration. The hardness of a water sample is reported in milligrams per liter as calcium carbonate (mg/l $CaCO_3$).

Table 3. Showing Temperature and Hardness of water sample of the Beels

Beel	Air Temp. 0C	Water Temp. 0C	Ca mg/l	Mg mg/l	Hardnes s mg/l
Bhelamari beel	21	17	1.6	1.4	10
Bauli beel	15.5	16	22.4	6.8	84
Dibong Abong beel	14.9	15	6.4	4.6	35

Total Alkality, Electrical Conductivity, Total Dissolved Solids and Turbidity

Electrical conductivity refers to the ability of water to pass an electrical current (U.S. EPA 1997). This is affected by the concentrations of inorganic dissolved solids such as chloride, nitrate, sulphate, and phosphate anions and sodium, magnesium, calcium, iron, and aluminum cations in the water. Conductivity increases with increasing water temperature and is therefore reported as conductivity at 25oC (U.S. EPA 1997)., water with conductivity above 0.83 microSiemens per centimetre cubed (mS/cm) is not recommended for drinking water and water with conductivity above 2.5 - 4 mS/cm is problematic for irrigation. This is because at high levels of conductivity water becomes saline, which is undesirable for drinking and stressful for plants with low to medium salt tolerance. Alkalinity is a measure of the amount of acid (hydrogen ion) water can absorb (buffer) before achieving a designated pH. The problem relates to the term used to report both measures, $CaCO_3$ in mg/l. Just as with hardness, mg/l $CaCO_3$ alkalinity is a general term used to express the total quantity of base (hydrogen ion acceptors) present. If limestone is responsible for both hardness and alkalinity, these values will be similar if not identical. However, where sodium bicarbonate ($NaHCO_3$) is responsible for high alkalinity it is possible to have low hardness and low calcium. Total Dissolved Solids is a measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro-granular (colloidal sol) suspended form. The principal application of TDS is in the study of water quality for streams, rivers and lakes, although TDS is not generally considered a primary pollutant (e.g. it is not deemed to be associated with health effects) it is used as an indication of aesthetic characteristics of drinking water and as an aggregate indicator of the presence of a broad array of chemical contaminants. Primary sources for TDS in receiving waters are agricultural and residential runoff, leaching of soil contamination and point source water pollution discharge from industrial or sewage treatment plants. The most common

chemical constituents are calcium, phosphates, nitrates, sodium, potassium and chloride, which are found in nutrient runoff, general storm water runoff and runoff from snowy climates where road de-icing salts are applied. Turbidity is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air. The measurement of turbidity is a key test of water quality. Fluids can contain suspended solid matter consisting of particles of many different sizes. While some suspended material will be large enough and heavy enough to settle rapidly to the bottom of the container if a liquid sample is left to stand (the settable solids), very small particles will settle only very slowly or not at all if the sample is regularly agitated or the particles are colloidal. These small solid particles cause the liquid to appear turbid. The propensity of particles to scatter a light beam focused on them is now considered a more meaningful measure of turbidity in water. Turbidity measured this way uses an instrument called a nephelometer with the detector set up to the side of the light beam. The units of turbidity from a calibrated nephelometer are called Nephelometric Turbidity Units (NTU).

Table 4. TA, EC, TDS and Turbidity water sample of the Beels

Beel	TA mg/l	EC µS	TDS ppm	Turbidity (NTU)
Bhelamari beel	20	32.22	13.86	30
Bauli beel	20	205.2	87.6	4
Dibong Abong beel	50	104.3	43.95	50

The present investigation indicated that the beel are in poor ecological health owing to massive infestation of aquatic weeds besides other human interference. They are in advanced state of swampification. Economically, important fishes are eliminated. DO value was as low as 1.7mg/l-3.4mg/l. variation in DO value might be cause of the diurnal fluctuations caused by abundant quantity of phytoplankton and submerged weeds in the beels. Mg content was as low as 1.4mg/l-6.8mg/l. the analysis shows that Mg content is very low. These elements are necessary for chlorophyll bearing algae and plants in water. Total Alkalinity ranges from 20mg/l-50mg/l. Turbidity were high in Dibong Abong beel which was due to disturbance of water by grazing cattle. The initial experiments show that plant litters decompose in water and the pH value is acidity. pH also changes diurnally and seasonally due to variation in Photosynthetic activity, which increases the pH due to consumption of Co2 in the process. The litters decrease DO to ~2 mg/L due to decomposition for several days and therefore adversely affect the aquatic life for which a minimum DO of 5 mg/L is required.

The leaves increases B.O.D to ~740mg/L due to decomposition for several days and therefore affect the quality of water chemistry. Rise in conductivity in water due to decompose indicate addition of pollutant.

REFERENCES

A.P.H.A. 1998. Standard methods for the examination of water and wastewater (20th edition). American public health association, New York.

Adams, M.B. and Angradi, T.R. 1996. Decomposition and nutrient dynamics of hardwood leaf litter in the Fernow wholewatershed acidification experiment. Forest Ecology and Management, 83: 61–69.

Aneja K.R.1993. Experiment in Microbilogy, Plant Pathology And Tissue Culture. Wishwa Prakashan, New Delhi.

APHA-AWWA-WEF, 1992- Standard Method for the Examination of Water and waste Water (18th Edition), Washington DC.

Bagyaraj DJ. 1991. Biological interaction with VA Mycorrhizal. In: PowellCL, Bagyaraj, DJ(eds)VA Mycorrhiza. CRC Press.Inc. Boca Raton, Florida.131-154

Decomposition of tree litter is a key process of nutrient cycling in terrestrial ecosystems (Vitousek *et al.,* 1994; Aerts and de Caluwe 1997). On the forest floor, leaf litter acts as an input–output system for nutrients, serving as a Received 29 November 2004, Accepted 3 October 2005.

Maithani K., A. Arunachalam, R.S. Tripathi H.N. Pandey Influence of leaf litter quality on N mineralization in soils of subtropical humid forest regrowths. Springer-Verlag 1998.

Standard Methods For The Examination Of Water And Waste Water. 1989. 17th Edition. Edited By LENORE S.CLESCERNJ ARNOLD E.GREENBERG. R. RHODES TRUSSELL.

Tree Leaf Control on Low Flow Water Quality in a Small Virginia Stream Keith V. Slack U. S. Geological Survey, Menlo Park, Calif. 94025 Herman R. Feltz U. *S.* Geological Survey, Washington, D. C. 20242

Trivedy and Goel, 1984. Chemical and biological Method For Water Pollution Studies, Environment Pulication,Karad.

Trivedy R.C, 1995. Sampling and Analysis Of Biological Parameters Pp:1-13, Central Pollution Control Board, Delhi.

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