Surface Water Treatment using *Rhasphiastylic Beninesis*

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Abstract
Rhaspiastylic barninesis roots were harvested form River Road, Abraka Delta State, Nigeria. It was sun dried and grinds mechanically; methanol extracted that used for IR spectrophotometric determination. Then used for treating surface water using 5 and 10 hours constant time. The raw samples treatment showed elevated pollution characteristic but after they were found suitable according to Standard Organization of Nigeria (SON). TS DS, SS, BOD, COD TkN, Total bacterial were reduced between 87.00 – 99.00%. The parameters were examined in accordance to Standard Method APHA from IR analysis – it contains primary esters. Therefore, it is coagulated which carry positive charges to mark it bind with negative charged participles (Pollutants, bacteria etc), it also adsorption process acting of microbes bacteria through inhibition, enzymes inhibition. Rhaspiastylic beninses is low-cost, energy consuming and green technology, water treatment for people with access to potable water.

Key words: *Rhaspiastylic Beninesis, coagulant surface water, polyelectolyte, Adsorption.*

Introduction

Rhaspiastylic beninesis (family – *Icacinaceae*) is commonly found in the rain forest zone. The stem is greenish when young and fresh but turns sandy brown when dry. It is a twining shrubs, is of the tap root system with numerous secondary root around the main 4. In Nigeria, the Bini call it "Osumadan, Kpolokolo in Ibo and Umueni" in Urhobos while Itsekiri call it "kumen" studies have indicated that *Rhaspiastylic beninensis* is a medical as well as flavouring plant. The leaves and roots are known as worm expellant, impotence treatment and the leaves for cure of convulsion, an infusion by pregnant women for strong offspring, mouth wash and lotion for sources, dried leaves are used as flavor for soups.

The exiguity of fresh water is normally trace to law rainfall but demand for water has risen for other reasons, progress and prosperity for pari-pasu with reliable water supply, owing the necessity of water to human survival and the obvious inadequacies in having water in the desired quality and quality in territorial quarters water has part of the world. There are few sources of drinking water one of them is surface water and ground water which have created drinking water crisis.[2]Water pollution is a major problem today worldwide. The major sources of pollution being leached through percolation, dumping of refuse and in-flow from other rivers air seas, domestic and industrial wastes in rivers and seas.

Majority of all the pollution do not have potable water to consume. Therefore, water

without proper treatment would cause great harm on the health of people. [3] All industries discharge their effluents directly or indirectly into surface waters without proper treatment, this effluence contains huge amount of toxic materials which make it unsafe for human consumption and irrigation or recreational purposes [3]. As population increase with the indispensible and foremost position of water in man's daily operation has left him with no option other than to recycle such water for reuse and find some new sources of drinking water. The aim of this study is to analyze the surface water quality sample of River Orle at the out skirts' of Auchi town by treatment with *Rhaspiastylic beninensis* root (RBR) powder, to find the low coast benefit and eco-friendly alternative for surface water treatment compare to costly chemical biodegradable and environmentally friendly.

Materials and Methods

Surface water was collect from Orle River situated at the outskirts of Achi town (latitude 7^{o} 04' and longitude 6o 16' E Etsako West Local Government Area of Edo State, it is over minded pattern of land used but predominantly residual and commercial activities in the core area. At present the major source of water inflow to the river is storm-water from Auchi town. Auchi and its neighborhood lacks sustainable safe or pipe borne water supplies, because of the community on this river as a sources of domestic water supply the community ensure that pollution of the river through human activities is reduced by setting vigilante groups to monitor the activities round the river.

Adsorbent Preparation (Rhaspiastylic Beninensis) Roots

High quality matured roots of *Rhaspiastylic beninensis* were harvested from River Road Abraka, Nigeria. They were separated from the stem with a knife and sundried till drying was completed. It was prepared into powder form by mortar and pestle, sieved with a molecule sieve of sized particles 250 um. This was used directly for water treatment. The water parammeter before and after treatment were analysed.

Surface Water Analysis

Water quality of surface water were analysed according to Standard Methods 5 Gab sample of surface water were collected in 20 litres plastics containers from Orle rive one daily each week for a period of seven weeks. The day and time of sampling each week were varied to account for cyclic and intermittent variation that may occur in the river.

pH was done using electrometric method using cornrows digital PH meter, turbidity with Turbidity, suspended and total dissolved solid sing solvent extraction gravimetric (drying) method, dissolved oxygen using sodium oxide modification of vinkler method, chemical oxygen demand using open reflux Redox titration Ammonia-Nitrogen using indophenols colorimetric method (UV spectrophotometer systronic salicylate colorimetric method, heaving metals using atomic absorption spectrophotometric method (Buck Model 210A, total Bacteria using Standard Method)[5].

Air dried pulverized root of about 500 g was placed in a soxhlet extract and extracted with methanol. The crude was concentrated in vacuo at 40^{o}C using a ratio vapor and used for IR spectroscopy figure 1.

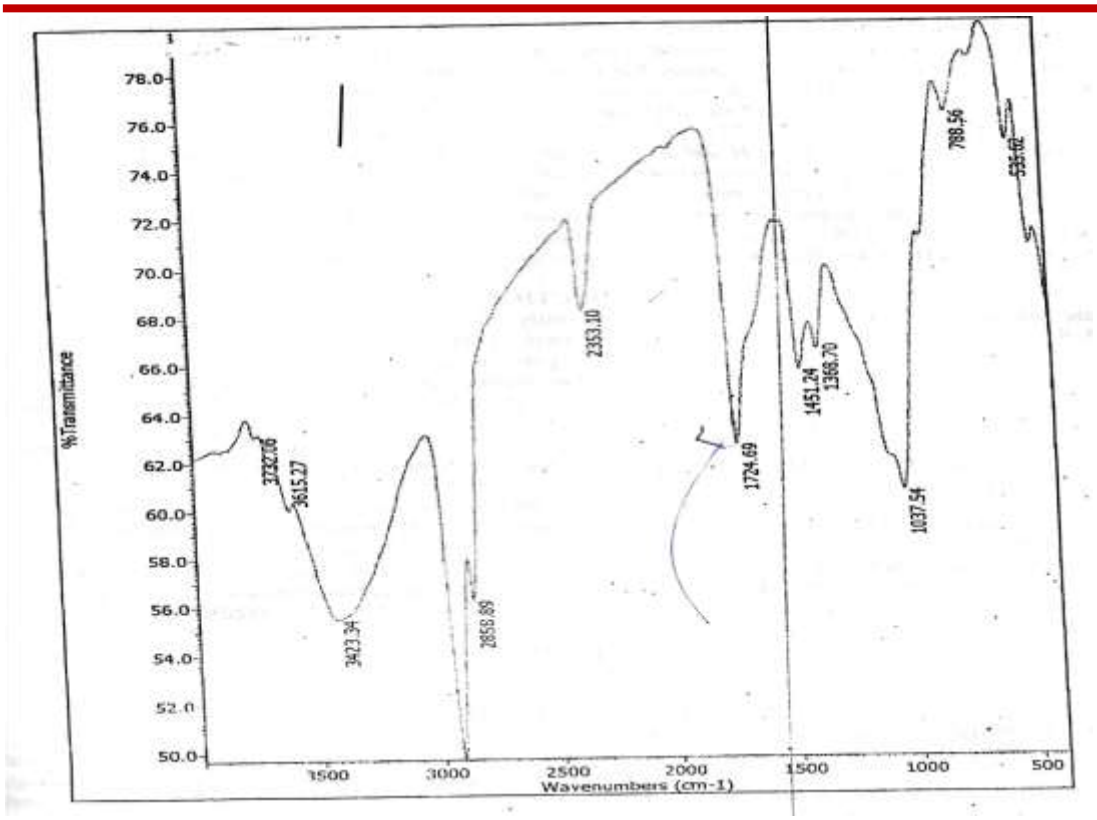

Figure 1: Roots of *Rhaspiastylic beninensis*

Result and Discussion

From the spectral in figure 1, it show signal at 3423.4cm^{-1} of (O-H str) associated with pyranose ring, hydrogen bonded, signal at 1724.69 cm^{-1} is due to a carbonyl carbon (C = O) - esters 3615.27 associated with primary amines, 1037.254cm^{-1}, for OH, COOH, – O – COOR. The prominent signals are carboxyl functional two groups, hydroxyl, Amines, alkenes, alkanes. Proteins have significant water molecules with positive charges which acts in a similar way as to charged polymers coagulants (Primary amine, alcoholic group protein groups). When roots are added to water, positively charged protein bind with negatively charged particles (anions) hydroxyl - OH, -CO, sulphide group C = S =S = S which bind with positively charged metal ions in raw water, after agitation, these particles from flocks which settles by gravity. Therefore negative charges (colloidal particles) than themselves will be absorbed on their surfaces [6].

The pH was increased from 7.20 - 7.70 making it alkaline because its presence as a coagulant is in its being a having cationic proteins present in the roots i.e. it is able to attract protons from raw water sample and donating a or some hydroxyl groups.

Since it contains an amine group, it acts as a polyelectrolyltic that is catonic in nature reducing TS, DS and SS. The Cationic polyelctrolyte or protein nature of the sample roots could be responsible for removing NO_3^- - N during precipitation mechanism[7]. The clarification of water may be due to the functional groups in the side chain amino acids of *Rhapiostylic beninosis* which aid clarification process. It could be a combination of neutralizing positive charges and negative charges of impurities and adsorption process remaining COD, BOD Turbidity in surface water. Bacterial are also remove through these mechanism because bacterial are either negatively or positively charged or neutral depending on the medium[8].

Table 1: Result of raw and treated surface waiter and SON standards.

Parameter	Raw sample	5 Hrs time	SON	10 hrs time
pH	7.40	7.70	6.50 – 9.50	7.90
Turbidity (NTU)	130.00	1.00	5	ND
TS (mg/l)	143.00	7.00	500	2.00
DS (mg/l)	18.00	6.10	-	2.00
SS (mg/l)	150.00	1.73	0	ND
DO (mg/l)	7.20	7.00	-	8.10
BOD (mg/l)	48.00	2.30	15	1.00
COD (mg/l)	108.20	4.01	15	1.0
TKN (mg/l)	16.20	2.00	-	0.12
NH_4^+ - N (mg/l)	10.10	1.20	-	0.12
NO_3 – N (mg/l)	ND	ND	-	ND
Pb (mg/l)	0.005	6	0.01	ND
Total bacterial (count/100)	$3.1X10^7$	$3.0 X 10^6$	NIL	$9 X 10^5$

ND = Not Detected

Table 2: Percentage reductions of pollution characterizes of surface water of 5 hrs and 10 hrs contact time.

Parameter	Percentage 5hrs	Reduction 10 hrs
TS	95.00	99.00
COD	96.00	98.00
BOD	95.20	95.80
TNK	87.65	93.70
Total bacteria	93.88	98.40

The percentage reduction of Total Solid present in waste water was above 90%, these are highlighted in Table 2 above. In the 10 hours contract tome method adopted in this work a general overview of the quality characteristics of effluents showed an improvement in the quality characteristics of surface water. The amount of suspended solids was undetectable and the amount of percentage reduction is not less than 90% as shown from Table 2.

In 5 hours and 10 hours contract time, the pH values became slightly alkaline high doses of *Rhapiastylis beninesis* make water alkaline [10]. Its action as coagulant is the presence of cationic proteins that are present in the root i.e the amino acids accept proteins form surface water and released hydroxyl group causing the solution to be basic [11]. As a polyelectroyte, it removes TSS, TDS because it is a natural cationic flocculent, as though forming solids which settles and form flocculants, as though forming solids which settles and form flocculants, this precipitation or reaction converts them from soluble to insoluble compounds[12].

The side chains in *Rhapiostylis beninesis* could be the main cause of remover of pollutant. This mechanism could be traced to adsorption and neutralization of the positively charged that attracts the negatively charged impurities even including bacterial (colloidal Turbidity COD, BOD in the surface water. When pH is less than 10, the root proteins are positively charged and when it is then added to water it binds the negatively charged particles in the sample [13].

Conclusion

As a natural product, *Rhaspiastylis baninesis* is believe to be a natural organic polymer since it contains pyranose ring, primary amines, hyroxyl, carboxylic, alkanes, ester, sulphids group. From this experiment, it can be concluded as a natural phytormedy for surface water treatment. It is a natural adsorbent, economic, energy friendly and eco-friendly suitable for areas where water quality is not portable.

Recommendation

Since the water still contain bacterial, it should be chlorinated to kill all bacterial. Other contact time could be experimented.

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