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Contents

Application of Homotopy Perturbation Method for the Large Angle period of Nonlinear Oscillator

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Abstract

The homotopy perturbation method is used to determine the period of nonlinear oscillator. The method produces the result even for large amplitude. The result is compared with others in the literature.

Keyword: homotopy perturbation method; nonlinear oscillator; period.

1.0 Introduction

The study of nonlinear oscillators is of great importance to many scientific researchers in various fields. Various methods such as variational iteration methods [2],[4-5], parameter expanding method [1] have been proposed.

The homotopy perturbation method (HPM), proposed first by He J in 1999 for solving differential and integral equations, linear and nonlinear has been the subject of extensive analytical and numerical studies. The method is a coupling of the traditional perturbation method and homotopy in topology. This method has a significant advantage in that it provides an approximate solution to a wide range of nonlinear problems in applied sciences.

In this paper, we apply HPM to obtain the frequency of nonlinear oscillator. The solution obtained is of high accuracy which is valid for the whole solution domain.

2.0. **Homotopy Perturbation Method.**

We consider a general nonlinear oscillator of the form:

$$mu''+\omega_0^2 u + kf(u,u',u'') = 0 \quad \text{.....(1)}$$

according to [7], we expand m and ω_0^2 as follows:

$$\omega_0^2 = \omega^2 + p\omega_1 + p^2\omega_2 + ... + p^n\omega_n \quad \text{.....(2).}$$

$$m = 1 + pm_1 + p^2 m_2 + ... + p^n m_n \quad \text{.....(3)}$$

Where p is a homotopy parameter, ω_i and m_i are unknown constants to be further determined.

3.0. **Mathematical Pendulum**

When friction is neglected, the differential equation governing the free oscillation of the mathematical pendulum is given by:

$$u''+\omega^2 \sin u = 0 \quad \text{.....(4)}$$

$$u(0) = A, u'(0) = 0.$$

where

u is the angle of deviation from the vertical equilibrium position.

$\omega^2 = \frac{g}{l}$; is the acceleration due to gravity and l is the length of the pendulum.

The model look simple if the approximation $\sin u \sim u$ is used, the equation (4) becomes

$$u''+\omega^2 u = 0 \quad \text{.....(5)}$$

To obtain more accurate result we modify the above equation by putting

$$\sin u \sim u - \frac{u^3}{6} \quad \text{.....(6)}$$

Substituting for equation (6) in (5) we have;

$$u''+\omega^2 u - \frac{\omega^2}{6}u^3 = 0 \quad \text{.....(7)}$$

4.0. **Application of HPM**

Equation (7) can be written in the form of equation (1) such that.

$$u''+\omega_0^2 u + ku^3 = 0, k = -\frac{\omega_0^2}{6} \quad \text{.....(8)}$$

Applying equation (2) in equation (8), we have;

$$u''+(\omega^2 + pc_1)u + pku^3 = 0 \quad \text{.....(9)}$$

The basic assumption is that:

$$u(t) = u_0 + pu_1 + p^2 u_2 + p^3 u_3 + ... + p^n u_n = 0 \quad \text{.....(10)}$$

When $p = 1$ equation (9) becomes

$$u''+(\omega^2 + c_1)u + ku^3 = 0 \quad \text{.....(11)}$$

Comparing equation (8) and (11);

$$\omega_0^2 = \omega^2 + c_1 \quad \text{.....(12)}$$

Substituting equation (10) in equation (9) and equating the coefficients of like powers of p .

$$u_0'' + \omega^2 u_0 = 0, u_0(0) = A, u'(0) = 0 \quad \text{.....(13)}$$

$$u_1'' + \omega^2 u_1 + c_1 u_0 + ku_0^3 = 0, u_0(0) = A, u'(0) = 0 \quad \text{.....(14)}$$

The solution to equation (13) is

$$u_0 = A\cos\omega t \quad \text{.....(15)}$$

Putting equation (15) in equation (14) and eliminating the secular term; we have.

$$c_1 = -\frac{3}{4}kA^2 \quad \text{.....(16).}$$

From equation (12)

$$\omega^2 = \omega_0^2 + \frac{3}{4}kA^2 \quad \text{.....(17)}$$

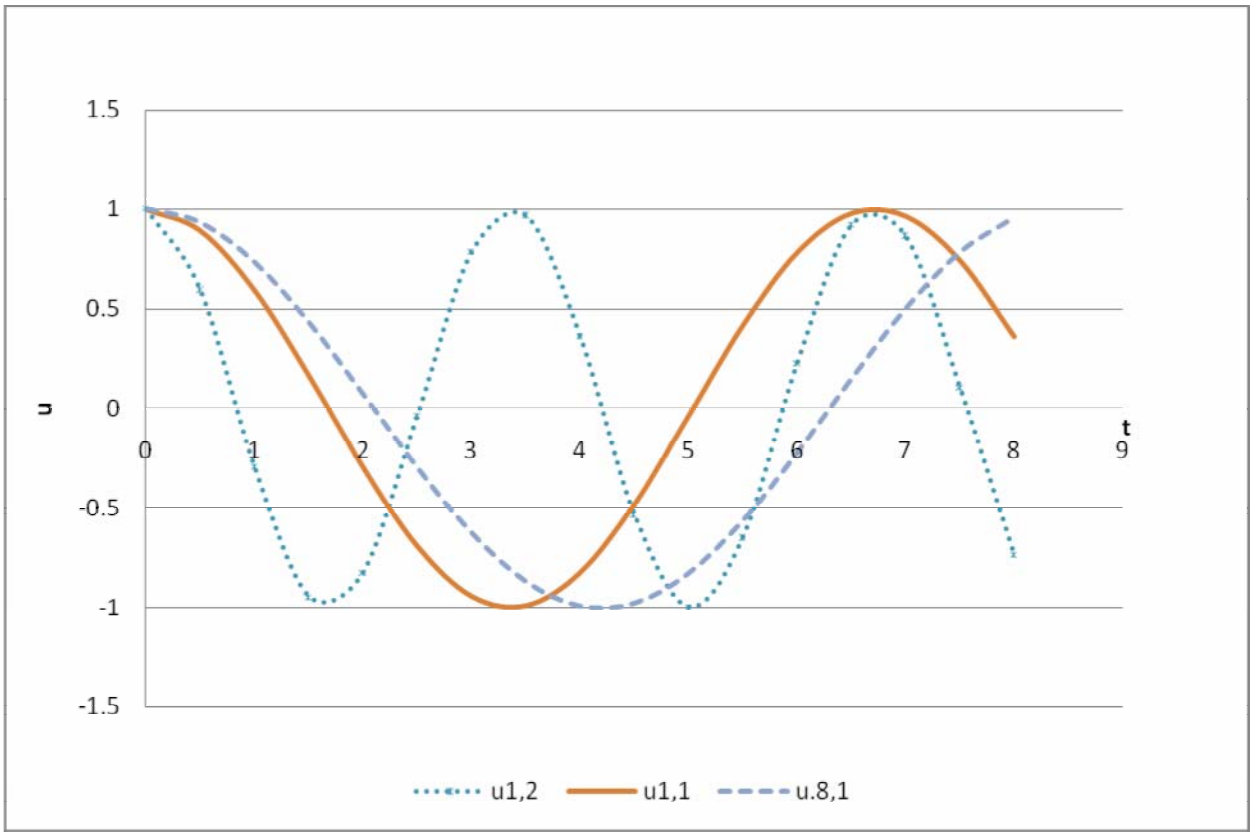
Therefore,

$$\omega^2 = \omega_0^2(1 - \frac{1}{8}A^2) \quad \text{.....(18)}$$

The period (T) is therefore:

$$T = \frac{2\pi}{\omega_0\sqrt{1 - \frac{1}{8}A^2}} \quad \text{.....(19)}$$

This compared favourably with the solution obtain in [6] and the value given in [8].



$for\ u_{0.8,1}\ \omega_0 = 0.8, A = 1,\quad for\ u_{1,1}\ \omega_0 = 1, A = 1,\quad for\ u_{1,2}\ \omega_0 = 1,\quad A = 2$

5.0. **Conclusion**

In this work, the homotopy perturbation method has been successfully applied to find the approximate solutions for the nonlinear system.

It is worth mentioning that the method is capable of reducing the volume of computational work while still maintaining high accuracy of the numerical result. This amounts to the improvement of performance of approach. This method is relatively new and may lead to some novel and innovative applications in solving linear and nonlinear problems.

The method which proved to be a powerful mathematical tool to nonlinear oscillators can be used as a searching tool for the period or frequency of various nonlinear oscillatory systems.

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Genomic DNA Extraction Methods from Wormwood Capillary (*Artemisia capillaris*) for PCR-RAPD Studies

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ABSTRACT: The protocol evaluated included the Sarkosyl Method, Kit Wizard™ Genomic DNA Purification (Promega), CTAB method, Sodium Dodecyl Sulfate (SDS Method) and Phenol-Chloroform Method. All five protocols evaluated effectively to isolate the DNA from each of the six samples and produced consistently positive results. The quality and quantity of the DNA extracted was compared using UV-spectrophotometer. It was found that the use of Sarkosyl method had good quality among others method (mean 1.4211). However, the CTAB method resulted in the most consistently positive results at the lowest concentrations (mean 795.83 ng). DNA was successfully isolated and RAPD was effectively used to study genetic similarity among *Artemisia capillaris*. [Researcher. 2009;1(1):6-15]. (ISSN: 1553-9865).

Key words: *Artemisia capillaris*, genomic DNA isolation, SDS, CTAB, Sarkosyl, RAPD.

INTRODUCTION

Artemisia capillaris is a species from class Magnoliopsida and family Asteraceae. *Artemisia capillaris* also know as wormwood or wormwood capillary in European (ShamanShop.net, 2002), Yin Chen Hao in China (ShamanShop.net, 2002; Dharmananda, 2002) and in common names are Pokok Ru Nyamuk and Pokok Daun Ru. *Artemisia capillaris* is a member of the parsley family, is a strong-smelling, fennel-like, annual plant reaching a height of about 4 feet or more. *Artemisia capillaris* leaves are alternate, basal large and petiolate, upper often subsessile to sessile, undivided or toothed-shallowly to deeply incised or lobed, palmati or pinnatipartite or pinnatisect. The Flowers is yellowish and tubular. Ray-florets: pistillate and fertile; corolla narrowly tubular, generally tapering upwards, toothed, oblique, eligulate; style exserted, 2-cleft, branches recurved, linear-filiform and terete-oblong, flattened (eFloras.org, 2006). *Artemisia capillaris* was introduced to this country from Asia (Duane and Martha, 2006; Plant for Future, 2006), America and Europe (Duane and Martha, 2006). It is in flower from August to October, and the seeds ripen from September to October for country that had seasonal (Plant for Future, 2002). It is cultivated in China, Japan, Taiwan (ShamShop.net, 2002) and some extent in this country. Small acreages of *Artemisia capillaris* have been grown successfully as a commercial crop.

About 2,000 years before *Artemisia capillaris* has been used in Chinese herbal medicine. This *Artemisia capillaris* considered to be a bitter and cooling herb, clearing "damp heat" from the liver and gall ducts and relieving fevers (Chevallier, 1996). *Artemisia capillaris* widely used in Asia to prevent and treat neonatal jaundice, also effective remedy for liver problems, works on stomach and spleen (Chevallier, 1996; Huang *et al.,* 2003; Abestmall, 2006). Modern research has confirmed that the plant has a tonic and strengthening effect upon the liver, gallbladder and digestive system (Chevallier, 1996). The studied from Hong *et al*., 2004 suggest that *Artemisia capillaries* can be a useful therapeutic agent for endotoxin-induced inflammation and injuries of the liver.

DNA extraction is a routine procedure to collect DNA for subsequent molecular or forensic analysis. Extracted genomic DNA contains nuclear and mitochondrial DNA, if DNA is extracted from plant material it will also contain chloroplast DNA. Each of these types of DNA has forensic, diagnostic and phylogenetic uses, and makes use of the polymerase chain reaction (PCR) to obtain specific information from the DNA. Purified DNA may also be used for studying DNA structure and chemistry, examining DNA-protein interactions, carrying out DNA hybridizations, and for cloning and sequencing (Jimmy and Larry, 2005). The problem of DNA extraction is still an important issue in the field of plant molecular biology. Various plants contain high levels of polysaccharides and many types of secondary metabolites affecting DNA purification (Zidani et al., 2005). According to Henry, (2001) yield and quality of DNA often varies among plant tissue types. Besides, purification of genomic DNA in plant is difficult due to co-extraction of high quantities of tannins, polyphenols and polysaccharides (Shepherd *et al*., 2002). Isolation of plant nucleic acids for use in Southen blot analysis, polymerase chain reaction (PCR) amplifications, restriction fragment length polymorphisms (RFLPs), arbitrary primed DNA amplifications

(RAPD, SSR-PCR), and genomic library construction is one of the most important and time-consuming steps (Zidani et al., 2005).

MATERIAL AND METHODS

Sample Collections.

The samples of *Artemisa capillaris* were collected from the area in Kuala Terengganu, Terengganu. 6 samples were collected randomly around this area.

Kit Wizard™ Genomic DNA Purification (Promega)

DNA from *Artemisia capillaris* leave was extracted from the samples by using Kit Wizard™ Genomic DNA Purification (Promega). About 70 mg of *Artemisia capillaris* leave were used for the extraction of the DNA. 600 µl of nuclei lysis were added to the *Artemisia capillaris* leave into 1.5 ml micro centrifuge tube. The mixture then were homogenized to get the lysat. Then the samples were incubated in the water bath at 65°C for about 15 to 20 minutes. After that, it were treated with 3.0 µl of RNase. The samples then were incubated again in water bath at 37°C for 15 to 20 minutes. Next step, the samples were left at room temperature for 5 minutes.

About 200 µl Protein Precipitation (protenase) were added in the samples and then the samples were vortex at highest maximum speed for about 20 seconds. Then the samples were centrifuged at 14,000 rpm at room temperature for 3 minutes. The supernatant that contain DNA were removed to put into a new micro centrifuge which contains 600 µl of isopropanol. The samples were centrifuged once again at 14,000 rpm at room temperature for 2 minutes. Next step is 600 µl of ethanol (70%) were added to the pellet to wash the DNA. Once again the samples were centrifuged at 14,000 rpm at room temperature for 1 minute. Then the DNA were dried at room temperature for 10 to 15 minutes. Then the DNA were resuspended with 100 µl of "DNA rehydration" for 1 hour. The DNA extraction samples were keep at -20°C to avoid DNA from degradation.

Phenol-Chloroform Method

DNA was extracted based on the Phenol-chloroform method described by Brown *et al.* (1991) with some modifications. Digestion buffer at volume of 500 µl containing (1% (w/v) Sodium Dodecyl Sulphate 0.8%, Triton X-100, 0.5 M NaCl, 0.1 M Tris-Hcl at pH 9, 0.01 M EDTA) were added into 1.5 ml microcentrifuge tube which containing 70 mg all snail body tissue and then the 40 µl of 10 % (w/v) SDS and Proteinase K (20 mg/ml solution) were added. The tube was shaken gently and was incubated at 55^0C for 1 to 2 hours. The sample was treated with 25 µl of RNase. Then, the mixture was left at room temperature for 15 to 30 minutes. The sample were treated with 500µl of phenol:chloroform:isoamyl alcohol (25:24:1) and gently the tube were vortexed to homogenize.

The sample was left at room temperature for 10 minutes before doing centrifugation at 13,000 rpm for 5 minutes. The top later is aqueous and were remove and dispersed into the new microcentrifuge tube. The step of adding phenol:chloroform:isoamyl alcohol were repeated twice. The samples were treated with 500 µl of chloroform:isoamyl alcohol (24:1) and were centrifuged at 13,000 rpm for 5 minutes. The upper aqueous layer was mixed with 1 ml of ice-cold absolute ethanol by rapid inversion of the tubes several times. Then, centrifuge at 6,000 rpm for 30 minutes and after that the precipitated DNA were collected at the bottom tubes as a white pellet. The pellet was washed with 500 µl of 70 % of ethanol and was centrifuge at 6,000 rpm for 15 minutes. The DNA was allowed to dry at room temperature. Then resuspended with 100 µl TE buffer (10 mM Tris and 1 mM EDTA, pH 8) for at least 24 hours at room temperature to fully dissolved before proceeding to the next step. This DNA extraction samples will be kept in – 20^0C to avoid DNA degradation.

CTAB Method

The genomic DNA plantlets were extracted with modified CTAB method (Doyle and Doyle, 1987). Appropriately 50 mg of *Artemisia capillaris* leave were grounded with pre-chilled mortar and pestle in liquid nitrogen. The samples were suspended in 800µl of CTAB buffer [2% (cetryltrimethylammonium bromide) CTAB, 100mM Tris pH8, 20mM EDTA, 1.4M NaCl, 2% PVP 40] and 20µl β-mercaptoethanol will be added per 10ml CTAB solution]. Subsequently, an equal volume of phenol:chloroform:isoamyl alcohol (25:24:1) were incubated at 60^oC for one hour. The mixtures were subsequently inverted 6 to 10

times to allow mixing and centrifuge at 12000rpm for 10 minutes. The aqueous phase were transferred into new tube, then 500µl of chloroform:isoamyl alcohol (24:1) were added and centrifuge again at 12000 rpm for 10 minutes. Then the supernatant were transferred into new tube and 750 µl cold isopropanol were added to precipitate the DNA. The tube were gently inverted several times until precipitation occurred, otherwise incubated at -20^{o}C for one hour or over night, then spin at 12000rpm for 12 minutes. The supernatant discarded and the pallets were washed in 500 µl 70% cold ethanol. The pallets were vacuum dry for 1 to 4 minutes and then were dissolves in 100 µl TE buffer (10 mM Tris-HCl, 1 mM EDTA, pH 8.0). The contamination of RNA will be removed by digestion with RNAase (10 µg ml^{-1}) for 30 minutes at 37^{o}C.

Sodium Dodecyl Sulphate Method

DNA were extracted based on the Sodium Dodecyl Sulphate method described by Dellaporta *et al.* (1983) with some modifications. About 70 mg leaves sample were used to extraction of DNA. About 500 µl of extraction buffer were added into 1.5 ml micro centrifuge tubes that contain samples. The mixtures were grinded with grinder until the tissue break into small pieces. Then the samples were incubated in the water bath at 65^{0}C about 1 hour. After that the mixtures were tapping the micro tube gently from time to time. The samples were treated with 2 µl of RNase A. Then, the mixtures were incubated at 37^{0}C about 30 minute. The samples were added with 170 µl of 5 M potassium acetate and were mixed gently. Next step is the samples were incubated on ice for 20 minutes.

About 600 µl chloroform:isoamyl alcohol (24:1) were added in the samples and then the samples were mixed gently. Then, the samples were centrifuged at 13, 000 rpm for 10 minute. The top layer is aqueous and were removed (600 - 700 µl) into the new 1.5 micro centrifuge tube. The samples were added with 600 µl isopropanol and were mixed gently by inverting. Then, were centrifuge at 13, 000 rpm for 15 minutes and after that the precipitated DNA were collected at the bottom tubes as pellet. The pellet were washed with 500 µl ethanol 70% and then were centrifuged at 13, 000 rpm for 2 minute. After that the DNA were air dry or leave overnight for get only the DNA. The DNA were dissolved in 100 µl dionise water or depends on the pellet size.

Sarkosyl Nitrogen Method

Fresh and healthy leafs were using and were placed them in a mortar. Then, were freeze in liquid nitrogen and the material were crush to a fine powder with a pestle. The powders were added to 3ml of DNA extraction buffer in a fresh mortar and were homogenized. Then, 1 ml phenol were added and were homogenized again. The mixed were transferred to a test tube (with cap), 2 ml phenol were added again and were centrifuged for 5 minute to separate phase. The upper aqueous phase were transferred into new tube. Then, two volume of ice-cool 95% ethanol were added to the aqueous phase for ethanol precipitated DNA and were centrifuged for 5 minutes, 12, 000 rpm. Then, the ethanol were pour from tube. Precipitated DNA were washed with ice-cool 70% ethanol. DNA were dissolve in 0.5 ml of TE and 2 µg RNAase were added. Then, were incubated at 37 ^{0}C for 15 to 30 minute. 0.25 ml phenol and 0.25 ml chloroform were added and were shaking well. Then, were centrifuged and the upper aqueous phase were transferred into new tube. Then, two volume of ice-cool 95% ethanol were added to the aqueous phase for ethanol precipitated DNA and were centrifuged for 5 minutes, 12, 000rpm. Then, the ethanol were pour from tube. Precipitated DNA were washed with ice-cool 70% ethanol. Finally, will be dissolve in 0.2 to 0.5 ml of TE.

Agarose Gel Electrophoresis

An aliquot of 10 µl of genomic DNA from each sample was mixed with 2.5 µl of loading dye. Then the mixture was separated by agarose gel electrophoresis through 1.0 % of agarose gel in 1.0 X TBE (10 mM Tris, 1mM EDTA pH 8.0). After that the electrophoresis gel were started at 55 volts for 1 to 2 hours. Next the gel was stained with ehidium bromide (EtBr) for 20 to 30 minutes and then was washed with distilled water for 5 to 10 minutes. Then the gel were done photographing with Image Master VDS.

Measurement of DNA Purity and Quality

The genomic DNA extracted was measured using a UV- spectrophotometer at 260 nm and 280 nm. The purity of DNA was determined by calculating the ratio of absorbance at 260 nm to that of 280 nm.

The average value of pure preparations of DNA and RNA is between 1.8 and 2.0 respectively (Sambrook *et al.,* 1989). The DNA concentration was determined by the formula:

DNA concentration = OD_{260} × 50 µg/ml × dilution factor (Linacero *et al.,* 1998).

Screening of PCR

Operon 10 mers Kit A were used in this study. 20 RAPD primers from Kit A (with 60% - 70% G-C) content were screened from a single individual. Primers that have the basic of sharpness, clarity of the profile and the existence of polymorphism were chosen for further study (D'Amato and Corach, 1997). The amplification were programmed at 45 cycles for 30 seconds of denaturation at 94°C, 30 seconds of annealing temperature at 36°C, 1 minutes of primers extension at 72°C and final extension of 2 minutes at 72°C.

RESULTS

Extraction of DNA

The Genomic DNA was successfully extracted and observed to have impurity. Sarkosyl method had a good result, the purity of DNA (gel) is high and clear banding pattern was obtained in this study. The DNA banding patterns were shown in Figure 1.

Purity and Quantity of DNA

The DNA purity of *Artemisia capillaris* with Sarkosyl Method was ranged from 1.3114 to 1.4655, Kit Wizard™ Genomic DNA Purification (Promega) 1.1429 to 1.1593, CTAB Method 1.3097 to 1.5652, SDS Method 1.3828 to 1.7388 and Phenol-Chloroform Method 0.9823 to 1.0382. The range was estimated quantitatively from the ratio between the reading of absorbancy at 260nm and 280nm ($OD_{260}/_{280}$) in UV-Spectophotometer. Quantity of DNA with Sarkosyl Method was calculated ranged from 106.25 to 1567.5µg/mL, Kit Wizard™ Genomic DNA Purification (Promega) ranged from 1182.5 to 2420µg/mL, CTAB Method ranged from 360 to 1268.75µg/mL, SDS Method ranged from 550 to 1350µg/mL and Phenol-Chloroform Method ranged from 2687.5 to 4798.75µg/mL. The values of the DNA purity and quantity are shown in Table 1.

Screening of RAPD Primers

Twenty primers from the Operon 10 mers (Operon Kit A) (OPA 01 to OPA 20) with 60% – 70% GC content were used during the screening of the RAPD primers. The banding patterns which were clear and reproducible bands selected. Photograph showing the RAPD electrophoresis profiles are presented in Figures 2. Out of these, only thirteen of the primers that showed polymorphisms. Number of bands generated by each primer varies, ranging from 0 to 8. Primer OPA 18 formed the highest band number (8). There were 56 fragments generated by these primers (OPA 01 – OPA 20). The sizes of bands were ranged from 250 bp to 1750 bp.

Table 1: Observed density (OD) of DNA purity and quantity of DNA for Genomic DNA extracted (Sarkosyl Method (S1-S6), Kit Wizard™ Genomic DNA Purification (Promega) (K1-K6), CTAB Method (C1-C6), SDS Method (D1-D6) and Phenol-Chloroform Method (P1-P6)).

Sample	OD 260			OD 280			Qualification ratio (Quality)	DNA C (Quantity)(ng)
	1	2	Mean	1	2	Mean		
S1	0.043	0.042	0.0425	0.029	0.029	0.0290	1.4655	106.25
S2	0.627	0.627	0.6270	0.443	0.444	0.4435	1.4138	1567.50
S3	0.452	0.452	0.4520	0.309	0.311	0.3100	1.4581	1130.00
S4	0.359	0.390	0.3895	0.268	0.270	0.2690	1.4480	973.75
S5	0.440	0.438	0.4390	0.307	0.307	0.3070	1.4300	1097.50
S6	0.478	0.478	0.4780	0.365	0.364	0.3645	1.3114	1195.00
K1	0.473	0.473	0.4730	0.408	0.408	0.4080	1.1593	1182.50
K2	0.619	0.619	0.6190	0.537	0.537	0.5370	1.1527	1547.50
K3	0.968	0.968	0.9680	0.848	0.847	0.8475	1.1429	2420.00
K4	0.960	0.961	0.9605	0.835	0.836	0.8355	1.1496	2401.25
K5	0.823	0.823	0.8230	0.714	0.714	0.7140	1.1527	2057.50
K6	0.542	0.541	0.5415	0.466	0.466	0.4660	1.1620	1353.75
C1	0.144	0.144	0.1440	0.092	0.092	0.0920	1.5652	360.00
C2	0.276	0.276	0.2760	0.204	0.203	0.2035	1.3563	690.00
C3	0.507	0.508	0.5075	0.387	0.388	0.3875	1.3097	1268.75
C4	0.272	0.273	0.2725	0.194	0.195	0.1945	1.4010	681.25
C5	0.366	0.366	0.3660	0.262	0.262	0.2620	1.3969	915.00
C6	0.344	0.344	0.3440	0.253	0.253	0.2530	1.3597	860.00
D1	0.352	0.353	0.3525	0.211	0.211	0.2110	1.6706	881.25
D2	0.220	0.220	0.2200	0.130	0.130	0.1300	1.6923	550.00
D3	0.233	0.233	0.2330	0.134	0.134	0.1340	1.7388	582.50
D4	0.316	0.317	0.3165	0.195	0.195	0.1950	1.6231	791.25
D5	0.262	0.263	0.2625	0.164	0.165	0.1 645	1.5957	656.25
D6	0.539	0.514	0.5400	0.390	0.391	0.3095	1.3828	1350.00
P1	1.880	1.880	1.8800	1.904	1.904	1.9040	0.9874	4700.00
P2	1.577	1.577	1.5770	1.519	1.519	1.5190	1.0382	3942.50
P3	1.075	1.075	1.0750	1.062	1.062	1.0620	1.0122	2687.50
P4	1.904	1.909	1.9065	1.931	1.931	1.9310	0.9873	4766.25
P5	1.909	1.913	1.9110	1.931	1.936	1.9335	0.9884	4777.50
P6	1.922	1.917	1.9195	1.954	1.954	1.9540	0.9823	4798.75

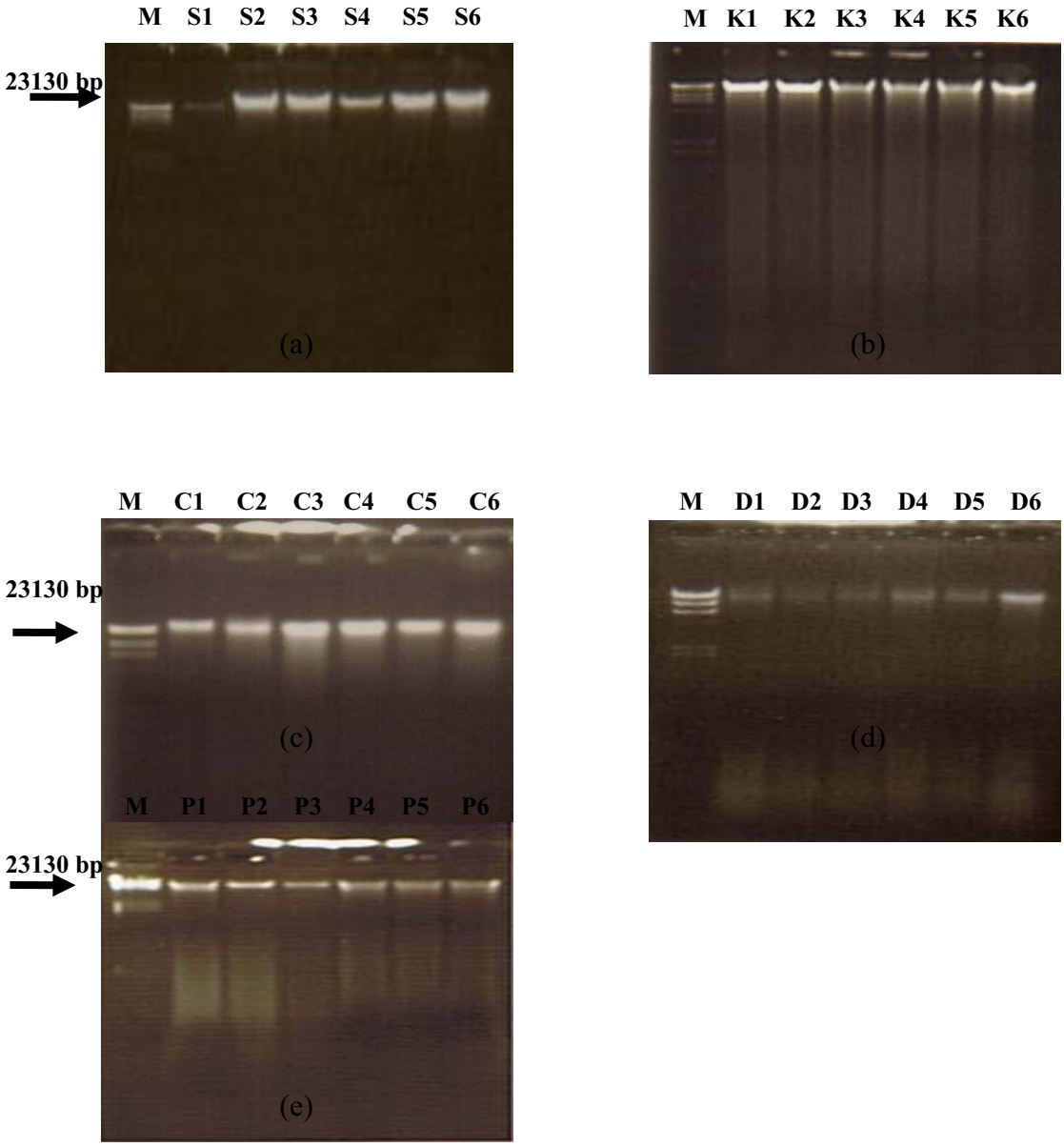

Figure 1: Genomic DNA extracted by Sarkosyl Method (a), Kit Wizard™ Genomic DNA Purification (Promega) (b), CTAB Method (c), SDS Method (d) and Phenol-Chloroform Method (e) on 1.0% agarose gel and stained with 1 µg/mL ethidium bromide (EtBr), λ DNA/Hind III marker (lane M) and samples of *Artemisia capillaris* (lane S1 to S6 (a), lane K1 to K6 (b), lane C1 to C6 (c), lane D1 to D6 (d) and lane P1 to P6 (e)).

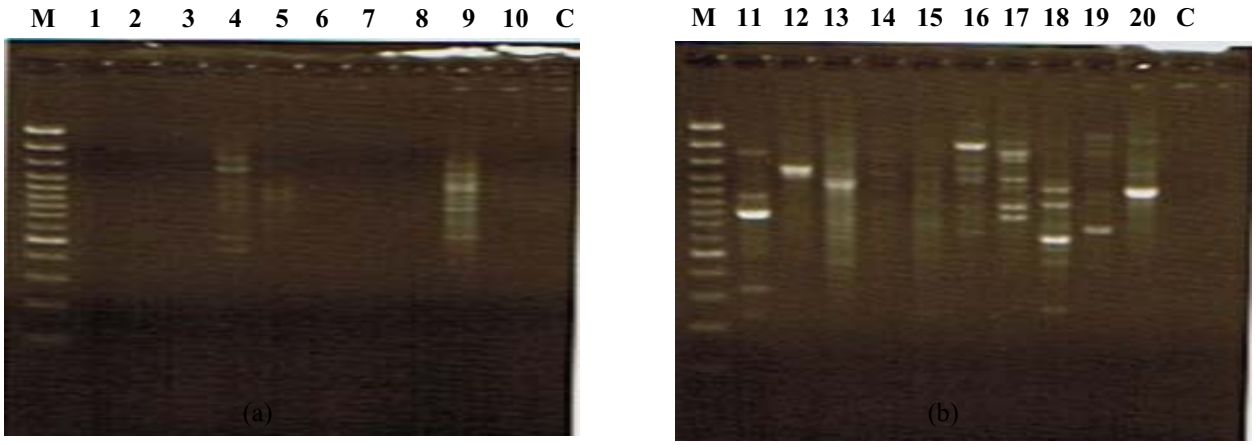

Figure 2: RAPD banding patterns for screening of 1st base primers, (a) OPA 01 to OPA 10 (lane 1 to 10), (b) OPA 11 to OPA 20 (lane 11 to 20), (Lane M is a marker 100bp ladder plus, Lane C is a control).

DISCUSSION

Extraction DNA from samples is the first step for all molecular marker type. DNA can be extract either from fresh, lyophilized, preserved or dried samples but for obtaining good quality DNA fresh material is recommended (Semagn *et al*., 2006). There are difficult to get plant DNA free from contaminating proteins and polysaccharides. Different methods need for different plants that contain divers secondary compounds that interfere with the extraction (Croy *et al*., 1993).

The DNA genomic extracted (Figure 1) from method Kit Wizard™ Genomic DNA Purification (Promega), CTAB Method, Sodium Dodecyl Sulfate (SDS Method) and Phenol-Chloroform Method had high of impurity. Sarkosyl method got clean DNA compare other methods. According to Croy *et al*., 1993, most the plants cells had very tough cell wall and make used vigorous method to breaking the cell. The excessive force make the degradation very high molecular weight molecules thought the shearing.

Agarose gel really use for check whether the DNA is degraded or not. Spectrophotometer measures the intensity of absorbance of DNA solution at 260 nm wavelength, and also indicates the presence of protein contaminants but it does not tell the condition of the DNA which is degraded or not (Semagn *et al*., 2006). The quality of the DNA by Sarkosyl Method was better than others methods. The Sodium Dodecyl Sulfate (SDS Method) had good quality but got poor results for gel electrophoresis and had contamination with RNA. So the best result was Sarkosyl Method that had no contamination by protein or polysaccharides and also good in quality. Kit Wizard™ Genomic DNA Purification (Promega), CTAB Method and Phenol-Chloroform Method got poor quality of DNA. The best quality is between 1.8 – 2.0 (Sambrook *et al.,* 1989). None of the methods gave such high values, the range between 0.9823 – 1.7388. The ratio of 1.3144 – 1.4655 by method Sarkosyl Method was used to RAPD analysis (Table 1).

Plants contain three types of DNA like nuclear, mitochondrial and chloroplast DNA (Rudi et al., 1997). All preparation methods for extraction involve the removal of the cell wall and nuclear membrane around the DNA, cell wall debris, proteins, lipid or RNA. Removal of membranes lipids is facilitated by using detergents such as sodium dodecyl sulphate (SDS), Cetyltrimethylammonium bromide (CTAB), mixed alkyl trimethyl-ammonium bromide (MTAB) (Segman *et al*., 2006) and Sarkosyl (Rudi *et al*., 1997).

DNA should be protected from endogenous nucleases and EDTA complexes magnesium ions were included in the extraction buffer that is a necessary cofactor for most nucleases (Rudi *et al*., 1997; Segman *et al*., 2006). DNA extracts often contain a large amount of RNA, proteins, polysaccharides, tannins and pigments. RNAs are removed using RNA degrading enzyme called RNase A in all method we used. For proteins remover, proteinase-K are using in Phenol-Chloroform Method, Sarkosyl in Sarkosyl Method, Protein Precipitation Solution in Kit Wizard™ Genomic DNA Purification (Promega). Phenol also used as removable for proteins. Polysaccharide more difficult to remove, NaCl, together with CTAB is known to remove polysaccharides (Murray and Thompson, 1980; Rudi *et al*., 1997; Paterson *et al*., 1993). Some protocols replace NaCl by KCl (Thompson and Henry, 1995). According to Fang et al., 1992, polysaccharides remain dissolved in ethanol. Chloroform also used for remove polysaccharides.

The separation by centrifuged when DNA with other compounds such as lipids, proteins, carbohydrates, and/or phenols. The DNA precipitated in salt solution with sodium acetate for Phenol-Chloroform Methods, isopropanol for Kit Wizard™ Genomic DNA Purification (Promega), SDS method and CTAB method, and ethanol for Sarkosyl Method. Plant that had high polyphenolic content, can used phenol that work together with SDS to extract it (Puchooa, 2004). But, SDS-phenol tends to produce low yields of DNA (Rezaian and Krake, 1987).

RAPD is one of the genetic marker studies that had been used in genetic study. RAPD technique had been used in genetic study for wheat (Devos and Gale, 1992) and also had used for filogenetic relations for padi species (Ishii, 1996). Chosen suitable primers is very important process for PCR-RAPD to get clear and good band. Twenty primers had been used and amplification showed differences banding pattern (Figure 2). From twenty primers, the best primer was primer OPA 18, because produced clear and sharp banding pattern. Differences primers produces differences fragment pattern. These happened because every primer contents G + C and difference base sequences (parenrengi, 2000). Results showed good PCR-RAPD for DNA extraction from Sarkosyl Method (Figure 2). Similarly, quantity and purity of extracted genomic DNA also plays crucial role for analysis of molecular diversity and optimization of different parameters for PCR (Weeden *et al*., 1992; Staub *et al*., 1996).

CONCLUSION

Sarkosyl Method are the best extraction for *Atemisia capillaris* according to concentration of the extracted DNA from gel electrophoresis (DNA yield and purity) and spectrophotometer (DNA quantity) compare the others method. The screening of primers from DNA extraction (Sarkosyl Method) showed OPA 04, OPA 09, OPA 11, OPA 16, OPA 17, OPA 18, OPA 19 and OPA 20 are suitable primers to use in genetic studies for *Artemisia capillaris*. Based on screening results, Sarkosyl Method is suitable to use in PCR-RAPD studies.

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Urinary Schistosomiasis And Concomitant Bacteriuria In The Federal Capital Territory Abuja Nigeria

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ABSTRACT: Urinary schistosomiasis and concomitant bacteriuria was investigated in the Federal Capital Territory (FCT) Abuja. Single urine samples collected from subjects aged 5 years and above between 1000 hours and 1400 hours were examined for the presence of *S. haematobium* eggs using centrifugation technique and for bacteriuria by standard bacteriological methods. A total of 1,150 subjects comprised of 667 males and 483 females were studied from the 6 Area Councils of the FCT. Overall, 360 (31.3%) had the eggs of *S. haematobium* in their urine while 289 (80.3%) of the 360 who had eggs of *S. haematobium* in their urine, had bacterial growth. Prevalence of bacteriuria in urinary schistosomiasis ranged from 74-86% with no significant difference in the distribution of the prevalence of the co-infection in the 6 area councils surveyed (P=0.125). The distribution of bacteria colony count in relation to different ova intensity was significantly different (P<0.001) and assumed a weak positive linear relationship (r=0.2). There was no significant difference in the results of the methods used to investigate for bacteriuria (P=0.05). The bacteria isolated included: *klebsiella species, Escherichia coli, Enterococci species, Staphylococcus aureus, Staphylococcus saprophyticus, Salmonella species, Proteus species, and Pseudomonas species. Eshericha coli* occurred more frequently (70%) than the rest of the bacteria species isolated. The antimicrobial susceptibility pattern of isolates revealed varying percentage susceptibilities by all isolates. This study clearly suggests that bacteriuria is a potent complication in the management of urinary schistosomiasis. Therefore the complimentary incorporation of antibacterial therapy appear essential. [Researcher. 2009;1(1):16-24]. (ISSN: 1553-9865).

Keywords: Schistosomiasis, Concomitant Bacteriuria , Prevalence, Susceptibility,

INTRODUCTION

Urinary tract disease is a specific trait of infection with *Schistosoma haematobium* which affects in a diffuse manner the entire genitourinary tract (King, 2001; Pereira *et al*., 1997). Bacteria infections are often recurrent and important complications of the inactive stage of urinary schistosomiasis which may be instrumental in precipitating renal failure (Farid, 1993). In schistosomiasis of the urinary bladder, secondary bacterial infections are common and in men can involve the seminal vesicles, spermatic cord, and to a lesser extent, the prostate. In women, infection can involve the cervix and fallopian tubes and can cause infertility. Mostafa *et al*., (1999) opined that it seems possible that agricultural workers and others who are regularly exposed to contaminated water are occasionally simultaneously infected with both the schistosome parasite and pathogenic bacteria. The risk factor of agricultural practices the major occupation of indigenous residents of the Federal Capital Territory (FCT) Abuja, Nigeria is capable of breeding urinary schistosomiasis and concomitant bacteriuria. In the light of the relative high level of schistosomal and bacteria infection, active assessment and reporting of bacteriuria in urinary schistosomiasis and the complementary incorporation of antibacterial therapy to the integrated morbidity control approach to urinary schistosomiasis deserves emphasis. This study examined the terminal urine sample of individuals with or without signs of urinary disturbance and infection for evidence of urinary schistosomiasis as well as evaluated associated bacteriological burden and susceptibility pattern of bacteria isolated.

MATERIALS AND METHODS

The study included 1,150 subjects both males and females between the ages of 5-50 years recruited directly through surveillance out-reaches to district/village schools and health related institutions. Informed consent of adult subjects was obtained, while consent to obtain specimen from ‘minors’/pupils was obtained through parents/guardian and the Education department of the Ministry of the Federation Capital Territory (MFCT) Abuja.

The urine samples were collected between 1000 hours and 1400 hours and were examined for colour, naked eye haematuria, turbidity and these observations were noted. Ten millilitres of urine were transferred aseptically into centrifuge tube and centrifuged for 5 minutes at 5000 rpm (Anosike *et al*., 2001). After discarding the supernatant the entire sediment was transferred to a slide covered with cover glass examined for red blood cells, pus cells (pyuria) and counting of eggs of *S. haematobium*. Using the 10x objective with the condenser iris closed sufficiently to give good contrast, the entire sediment preparation was examined systematically and ova count reported per 10ml of urine (Chessbrough, 1981; Richards *et al.,* 1984).

The remainder of urine samples positive for *S. haematobium* ova were homogenized by inverting the container severally and 0.002 ml of the urine inoculated and spread on Cysteine lactose electrolyte deficient medium (CLED-BIOTEC, UK)and blood agar (Blood agar base-BIOTEC, UK). Afterwards 10ul of the homogenized uncentrifuged urine were applied unto a glass slide allowed to dry without spreading at ambient temperature and stained by Grams method. Using 100x objective the slide was examined for bacteria per oil immersion field (Celso *et al.,* 1998).

The uncentrifuged urine samples were diluted 1:20 (20 ul of urine + 380 ul of Turks solution - 2% Acetic acid tinged with gentian violet).This is to destroy the red blood cells and stain the white blood cell nuclei. The dilutions were transferred to Neubauer haemocytometer chamber. The chamber was examined using 10x objective and 4 squares counted applying the margin rule for including and excluding cell lying on the peripherial lines to quantify pyuria (Campbell *et al.,* 2002). Reagent strip urinalysis was performed using L-Combur reagent strip (Boehringer Mannhein).

The culture plates were examined after 24 hours of incubation for bacterial growth and colony count. Bacteria growth less than 10^5 organisms per ml produced less than 30 colony forming units per ml of urine (Chessbrough, 2000).Bacteria isolates were identified and characterized using methods prescribed by Cowan and Steel,1974; Chessbrough,2000 and Graham and Galloway, 2001. Susceptibility testing of all pathogenic baceteria were performed using the standard disc diffusion method according to British Society for Antimicrobial Chemotherapy (Andrew, 2001).

Statistically Analysis

The data analysis was done using X^2 (chi-square) test to determine significant relationships between variable and coefficient of correlation for test of linearity of relationship.

RESULTS

The overall prevalence of urinary schistosomiasis was 31.1% (95% CI 26.2 – 36.4) in the Federal Capital Territory Abuja and ranged between 25 – 36.3% in the six area councils surveyed. Prevalence followed the typical age group pattern for urinary schistosomiasis attaining a peak 78.4% in subjects 10 – 14 years age, decreasing to 47.6% in subjects ≥ 50 years and lower in subjects within 20 – 39 year. Prevalence of urinary schistosomiasis was higher at all ages in males ranging between 0 – 42.1% and in females 0 – 36.3% (Table1). *S. haematobium* infection prevalence had a statistical significant difference between males and females at different age groups (x^2=48; P<0.001).

In all, of the 360 subjects that had ova in their urine, 275 was positive for uncentrifuged gram microscopy, 305 was positive for pyuria (WBC) count, 330 was positive for leucocytes esterase, 350 was positive for protein, 336 was positive for erythrocytes (urinary blood), 240 was positive for nitrite (Table 2). Overall, 289 samples from subjects had bacteria growth of varying count. 261 (90.3%) samples had overt significant bacteriuria ($\geq 10^5$cfu/ml) in both males and females. Between males and females, there was a statistical significant difference in bacteria colony count in urinary schistosomiasis (x^2=9.9; P=0.025).

Bacteriuria in urinary schistosomiasis in F.C.T. had a prevalence of 80.3% ranging between 74 to 86% in the six area councils of F.C.T. surveyed. Bacteriuria and urinary schistosomiasis co-infection had no statistical significant difference (x^2=9.8; P=0.125).The distribution of bacteria colony count (cfu/ml) according to different ova intensity i.e. egg/10 ml of urine (Table 2); had a weak positive linear relationship (r=0.2). Albeit, there was a significant difference between bacteria colony count and different ova intensity in urinary schistosomiasis (x^2=39.0; P<0.001). The statistical analysis of results from culture and non – culture methods (enhanced microscopic urinalysis and reagent strip tests) for investigating bacteriuria are shown in Table 4. There is no significant difference in percentage positive results of culture and a combination of the non-culture methods for investigating bacteriuria (x^2=5.9; P=0.05). Various bacteria

species were isolated with *Escherichia coli* occurring more frequent than the rest in males (Table 4). Notwithstanding, there was no significant difference in the bacterial isolates between males and females (x^2=7.5; P=0.65)

Antimicrobial susceptibility pattern of bacteria isolates are shown in Table 8. All the isolates had susceptibility in varying percentage to Ofloxacin Ciprofloxacin, Gentamicin and Cefuroxime in order of percentage effectiveness respectively. However all the isolates except 3 were susceptible to Nitofurantion, 2 species of the isolates *(Proteus species and Pseudomonas species)* were not susceptible to Co-trimoxazole while 1 species was not susceptible to Co-amoxiclav.

Table 1: Distribution of the prevalence of S. haematobium infection in FCT according to age and sex; statistical test of significance between make and female

AGE GROUP (YEARS)			**MALE**			**FEMALE**		
	TOTAL NUMBER EXAMINED	NUMBER INFECTED	NUMBER EXAMINED	% INFECTED	NUMBER INFECTED	NUMBER EXAMINED	% INFECTED	
5 – 9	213	93	30	32.3	120	21	16.7	
10 – 14	557	378	159	42.1	179	65	36.3	
15 – 19	200	90	30	33.3	110	27	24.5	
20 – 24	50	38	5	13.2	12	2	16.7	
25 – 29	29	19	3	15.8	10	1	10	
30 – 34	34	13	2	15.8	21	3	14.3	
35 – 39	22	12	1	8.3	10	2	20	
40 – 44	20	8	3	37.5	12	1	8.3	
45 – 49	15	9	2	22.2	6	1	16.7	
>50	10	7	1	14.3	3	1	33.3	
TOTAL	**1150**	**667**	**236**	**35.4**	**483**	**124**	**25.7**	
X^2_{cal}	*42*	X^2_{tab}	*18.25*					

Table 2: Analysis and statistical test of significance of percentage positively for culture and non culture tests for urinary schistosomiasis and bacteriuria.

NON-CULTURE TESTS			**URINE CULTURE**		
	NUMBER + VE OF 360 EXAMINED/METHOD	%	NUMBER + VE PER METHOD	%	NUMBER . -VE PER METHOD	%
UNCENTRIFUGED URINE GRAM MICROSOCOPY > 1 ORGANISM/OIL IMMERSION FIELD 12.7	**275**	76.4	**240**	87.3	**35**	
PYURIA (WBC) COUNT >1.0X10^9 6.6	**305**	85	**285**	93.4	**20**	
LEUCOCYTES ESTERASE > 25 LEU/UL 14	**330**	91.6	**284**	86	**46**	
PROTEIN > 30 MG/DL 22.9	**350**	97.2	**270**	77.1	**80**	
ERYTHROCYTES URINARY BLOOD 14.5 > 10ERY/UL	**336**	93.3	**287**	86.5	**49**	
NITRITE POSITIVE 15.8	**240**	66.7	**202**	84.2	**38**	
TOTAL		**510.20%**		**514.50%**		
X^2_{cal}	***5.5***	X^2_{tab}	***11.03***	***Pvalue***	***0.05***	

Table 3: Distribution of bacteria colony count (cfu/ml) according to different ova intensity (egg/10ml urine); Statistical test of significance and coefficient of correlation in urinary schistosomiasis.

	NUMBER OF SUBJECTS				
BACRERIA COUNT cfu/ml	0-20 (egg/10ml urine)	21-40 (egg/10ml urine)	41-50 (egg/10ml urine)	>50 (egg/10ml urine)	TOTAL
$> 10^5$	13	20	10	218	261
10^4	0	3	4	5	12
10^3	3	2	2	3	10
10^2	0	0	2	4	6
TOTAL	**16**	**25**	**18**	**230**	**289**

X^2_{cal}		***39***
X^2_{tab}		***16.92***
Pvalue	***<0.001***	
r		***0.2***

Table 4: Bacteria pathogens associated with *S.haematobium* infection and their antimicrobial susceptibility pattern.

ANTIMICROBIAL AGENT	**PERCENTAGE SUSCEPTIBILITY**							
Species	***Klebsiella coli*** n=30	***Eschericha*** n=101		***Enterococci Species*** n=27	***Staphylococcus aureus*** n=78	***Staphylococcus saprophyticus*** n=19	***Salmonella Species*** n=11	***Proteus Species*** n=9	***Pseudomonas Species*** n=14
Ciprofloxacin	*98*	89.6	67.5	74	78	68.7	95	61.7
Cephalexin	*25*	38.5	39.2	25	30	16.9	25.4	0
Cefuroxime	*65*	70	67	63	50	46.3	72.5	45
Oxfloxacin	*80.4*	90	85	82.1	80	78	95	8.6
Gentamycin	*76*	82	47	45.9	49.6	85.2	58	70.5
Co-trimoxazole	*26.4*	56	61	68	54	25	0	0
Nitrofurantion	*38.4*	85	65.1	70	64.3	0	0	0
Co-amoxiclav	*32.8*	25	41	33.5	40.2	20.4	63.2	0

DISCUSSION AND CONCLUSION

The findings in this study demonstrates that the overall estimated prevalence of urinary schistosomiasis as determined by ova in the urine was high (31.3%; 95% CI 26.2-36.4%). Recent researchers estimate prevalence of 29.4% in the Eastern Nigeria (Anosike *et al.,* 2001) and 57.4% in the West (Adeyaba and Ojeaga, 2002). The result of this study is agreeable with these reports.

This study evaluated bacteriuria in urinary schistosomiasis revealing that of the 360 subjects (31.3%) who had Ova of *S. haematobium* from 1,150 examined; 289 (80.3%) had bacteriuria by culture characterization. The percentage positive results of culture and a combination of non-culture had insignificant difference (P> 0.05). Though King (2001) noted that urinary tract disease is a specific trait of infection with *S. haematobium*; The 80.3% prevalence of bacteriuria in urinary schistosomiasis need further categorization since by the definition of Gallagher and Hemphil (2004) it may simply be taken as referring to the presence of bacteria in the urine of individuals infected with *S. haematobium* and not necessarily implying infection. This is cogent as bacteriuria and urinary schistosomiasis co-infection assessed in the study had no significant difference (P>0.05). Gallagher and Hemphil (2004) and Franz and Horl (1999) had equally noted that in general terms urinary tract infection (UTI) is infection by Pathogen along the urinary tract causing inflammation depicted by pyuria indicating significant inflammatory response to bacteriuria such as occur with infection even in asymptomatic setting. These views mentioned above explicitly suggests that bacteriuria may be significant or non- significant depending on the quantity of bacteria in the urine which imply infection and is traditionally urine culture containing $\geq 10^5$ cfu/ml. The result of our assessment of bacteriuria in urinary schistosomiasis agreeably categorized 261 (90.3%) subjects by urine culture as having significant bacteriuria ($\geq 10^5$cfu/ml) with their sex distribution being significantly different (P<0.05) . This finding in consonance to that by Rushton (1997) which suggest that it may be possible to eliminate the urine culture when enhanced microscopic urinalysis and reagent strip urinalysis are negative and clinical suspicion is low. Nonetheless, isolation of significant number of single organism on culture remains the definitive diagnosis.

The finding of lower threshold of bacteria counts (10^2-10^4 cfu/ml) and the distribution of bacteria colony count according to different ova intensity which had a weak positive linear relationship (r = 0.2) deserves critical scrutiny because bacteria colony count and different ova intensity in urinary schistosomiasis was significantly different (P<0.05).This is pertinent to obtaining the best combination of sensitivity and specificity in the diagnosis of urinary tract infection. Franz and Horl (1999) reported that the utility and consistency of the criterion ≥105 cfu/ml of clean-catch urine for the diagnosis of UTI has been validated repeatedly. Thus, Stamm and Hooton (1993) noted that in dysuric patients, an appropriate threshold value for defining significant bacteriuria is 10^2cfu/ml of a known pathogen. Considering the foregoing and that dysuria is common in both early and late urinary schistosomiasis where ova count correlate with morbidity, it might be prudent to consider these thresholds significant for the diagnosis of UTI. More so, community –based epidemiological survey of bacterial count in Egypt (Mostafa *et al*., 1999) of subjects with *S. haematobium* infection had similar low bacteria counts (10^3 cfu/ml). However, interpretation of low threshold counts as significant for diagnosis must be in the absence of mixed bacteria growth with a predominant organism typical of contamination.

Infection of the 289 (80.3%) subjects with one bacteria or the other was the trend in our study and had no significant difference (P>0.05) in bacteria isolates between males and females. The isolation of *Esherichia coli* more frequently than the rest conforms to reports of many researchers (Farid, 1993; Mostafa *et al*., 1999) about it's association with schistosome infection.

The antimicrobial susceptibility pattern of the bacteria isolates to routinely tested first line antimicrobial agents were quite diminished. There were notable pockets of resistance to all first line agents tested except for Ciprofloxacin and Cefuroxime (Table 4). This antimicrobial susceptibility results would be an invaluable premise for empirical therapy where suspicion exists but cultures are impracticable whereas enhanced microscopic urinalysis and reagent strip are positive since comparative analysis of these methods had no significant difference (P>0.05). The main goal of most initiatives to control schistosomiasis is morbidity control. The reported complications of bacteria infections in urinary schistosomiasis are odious. Clinical and pathological conditions arising there from had been enunciated (Farid, 1993; Ganem *et al.,* 1998). Hence, this research further documents and authenticate the importance of a database for continued valuation and evolution of control programmes. The complementary incorporation of antibacterial therapy to the integrated morbidity control approach of diagnosis, drugs treatment, snail control, provision of safe, adequate water supply, sanitation and health education is

advocated. More over, our results infer that urinary schistosomiasis is endemic in FCT Abuja Nigeria and deserves urgent intervention.

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The Anatomy of a Volcano, Earth Quakes, and Tsunami
June 21, 2005

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Abstract: The first reasons for earth quakes are caused by volcanic activity, like the type that occurred in Mt. Fuji- Japan, Krakatau-Indonesia, Mauna Loa-Hawaii, etc. To prevent an earthquakes locate the gas in the area of the last earthquake, and drill down into the reservoir, and release the gas. The gas can be liquefied, and sold on the open market. This article describes the anatomy of a volcano. [Researcher. 2009;1(1):25-28]. (ISSN: 1553-9865).

Keywords: anatomy; volcano; earth quakes; tsunami

I'm an expert on earth quakes, tsunamis, and volcanoes. I have been working on earthquakes, tsunamis, and volcanoes for over 15 years. I have discovered how to control earthquakes that are caused by the ignition of methane gas reservoirs to the point of preventing them from occurring. There are two causes for Earthquakes one generated by the ignition of large pockets of methane gas, and the other is generated by volcanic activity. Both types of earth quakes are caused by the build up of excessive pressure in the upper mantle, and lower, upper crust.

The first reasons for earth quakes are caused by volcanic activity, like the type that occurred in Mt. Fuji- Japan, Krakatau-Indonesia, Mauna Loa-Hawaii, etc. The earth quake that occurred during the Krakatau eruption in 1883 was, so powerful it generated strong earth quakes, which generated a tsunami, so large it killed tens of thousands of people. The pressure in the magma chamber was, so great it pushed a large area of the ocean floor upwards several yards above the surrounding area. The pressures in a volcano originate in the earth's outer core where crude oil, and it's components are combusted. The pressure in the outer core is distributed up through volcanic pathways to the volcano's magma chamber. Gases such as carbon dioxide, carbon monoxide, sulfur dioxide, hydrogen chloride gases, and high pressure, etc are all components of combusted crude oil. They are force up through the volcanic pathways to the volcano's magma chamber, where the pressure become so great it blow off the top of the mountain, where the carbon gases are ejected by the pressure. Earthquakes occur during volcanic activity, because the mountain top will not give way to the tremendous pressure easily. The pressure in the magma chamber, and volcanic pathways become, so excessive it pushes the surrounding lower, and upper crust apart, moving it laterally. Sometimes the pressure pushes the crust upwards, if this upward movement occurs in a large body of water a tide wave (tsunami) will form. Earth quakes generated by volcanoes can't be controlled. Volcanoes are the core's exhaust system. The core is the earth's engine it generate the earth's magnetic field, which protect, and sustains all life in the biosphere called earth. The higher the temperature in the core, the stronger, more violate, more wide spread, and more frequent volcanic eruptions will occur,

and the stronger earth's magnetic field.The lower the temperature in the core, the weaker, less violate, less wide spread, and less frequent volcanic eruptions will occur, and weaker earth's magnetic field will become.

The second cause for earth quakes is the ignition of underground methane gas, and/or crude oil reservoirs, like the type that occurred South America, Mexico, California, Alaska, china, Russia, and Iran, and other countries in the Middle East, etc. All these places experience earthquakes in the past, and all these places have methane gas, and/or crude oil reserves beneath the ground in the area where the earth quakes occurred. These methane gas/ crude oil reservoirs are located all around the planet. There are areas on the planet that contain underground large pockets of methane gas/ crude oil reservoirs, and don't experience earthquakes. The methane gas in these areas are undisturbed methane gas reservoirs, but most earthquakes are cause by the ignition of large pockets of underground methane gases, not volcanoes.

The methane gas is ignited by coming in contact with magma, which has seeped up from the outer core, or the methane gas/ crude oil reservoir is being over pressurized. The methane gas come in contact with the magma the gas is ignited, then it expands, and push the lower, and upper crust apart, moving it the crust laterally, sometimes the crust is pushed upwards. This upward movement can occur on the sea floor, or land. This is how faults, and tact tonic plates on the surface, and upper crust are formed. Faults, and tact tonic plates can't form on their own, and don't cause earth quakes. All hydrocarbon expands, when ignited, and nothing can withstand the pressure generated by ignited methane gas, not even an one inch thick carbon steel tank. What occurs in a methane gas earth quake is the same principal that powers the internal combustion engine. Fuel is sprayed into the engine cylinder, the sparkplug lights the fuel mixture, and the gas expands pushing the piston down. This is how the engine crank is turned. In methane gas earth quakes the expanding gas push the crust laterally, and sometimes large areas of the upper crust are pushed upwards. If this upward movement of the crust occurs in a large body of water a tide wave (tsunami) will form.

Reducing the pressures in the methane gas reservoir will weaken any future earth quake, or totally eliminate them all together. Caution, methane gas/ crude oil reservoirs are the earth's fuel systems. Some methane gas/ crude oil reservoirs can't be tampered with. The pressurized in methane gas/crude oil reservoir forces the crude oil into the outer core of the planet, where it combusted in gaseous form. This in turn sustains the high temperature in the core (the earth's engine). The higher the temperature in the core, the stronger the earth's magnetic field, which sustains all life in this bio-sphere called earth. The temperature in the core is determined by the amount of fuel (crude oil) it receives. Some of the pressurize methane gas is force back up into the crude oil reservoir to keep it pressurized. I believe the earthquake (tsunami) in the Indian Ocean that killed thousands of people a long the coast of Indian was causes by a methane gas earth quake, because the area is not known for volcanic activity.

I challenge anyone to prove my finding wrong! The other scientists have their theories, but I'm the only one that can prove his finding on earthquakes. All others findings are wrong, because tact tonic plates, and faults don't cause earth quakes, and they can't form on their own.

This is how to set off a man made earthquake (tsunami). Locate, and drill down into a large underground methane gas/ crude oil reservoir. There are large pockets of methane gas reservoirs all around this planet, including beneath the ocean floor, see figure #1. As in nature the ignition source must be large, hot and last as long as possible, so enough methane gas can be

combusted, so enough pressure can be generated in the methane reservoir to move the lower, and upper crust. This is what happens when the methane gas come in contact with magma. These methane gas/ crude oil reservoirs extend for thousands of miles down to the outer core. Once the drill head is in the methane gas reservoir activate the ignition source, and ignite the methane gas.

Once the gas is ignited the explosion (blast) is silenced by the surrounding rocks, and soil, and can't be hear on the surface. The crust can't withstand the pressure generated by the expanding gases, and is pushed laterally, and/or upwards. There are small amount of air in a methane gas reservoir. That's why in nature the magma stays in contact with the methane gas for a long periods of time in order to ignite enough gas, which will generate enough pressure to move the lower, and upper crust, and create an earthquake.

The ignition source can be achieved by igniting the gas in the drill pipe, or the head of the drill pipe can be outfitted with a heat element, that generate temperatures well above the flash point of methane gas, as with figure #1.

The explosion take place hundreds of feet beneath the surface, and the explosion (blast) is silenced by the surrounding rock, and soil. That's why the blast from the ignited methane gas can't be heard by people on the surface. The blast, and epicenter are one in the same. It's the blast (epicenter) that cause the sock wave, and it the expanding gases that causes earthquakes. The shock wave from the explosion is picked up by earth quake sensors. The sensors pinpoint where the methane gas explosion (epicenter) took place.

It is possible to drill down in the area of the epicenter of the last earthquake in the Indian ocean, where the ocean floor was push up, and ignite the methane gas, and cause another earth quake, and tsunami using the method in figure# 1. Since we know how the ocean floor will react to more pressure generated by the ignited methane gas. If a good ignition source can't be generated, it may be necessary to pump as much air into the methane gas reservoir as possible for 2-4 days with a high volume, high pressure pump, then activate your ignition source.

To prevent an earthquakes locate the gas in the area of the last earthquake, and drill down into the reservoir, and release the gas. The gas can be liquefied, and sold on the open market. Reducing the pressure within the reservoir will greatly decrease the possibility of another earthquake. My purpose is to convince you my findings on earth quakes, and global warming are correct, so I can show the world how to control, and/or stop these deadly events.

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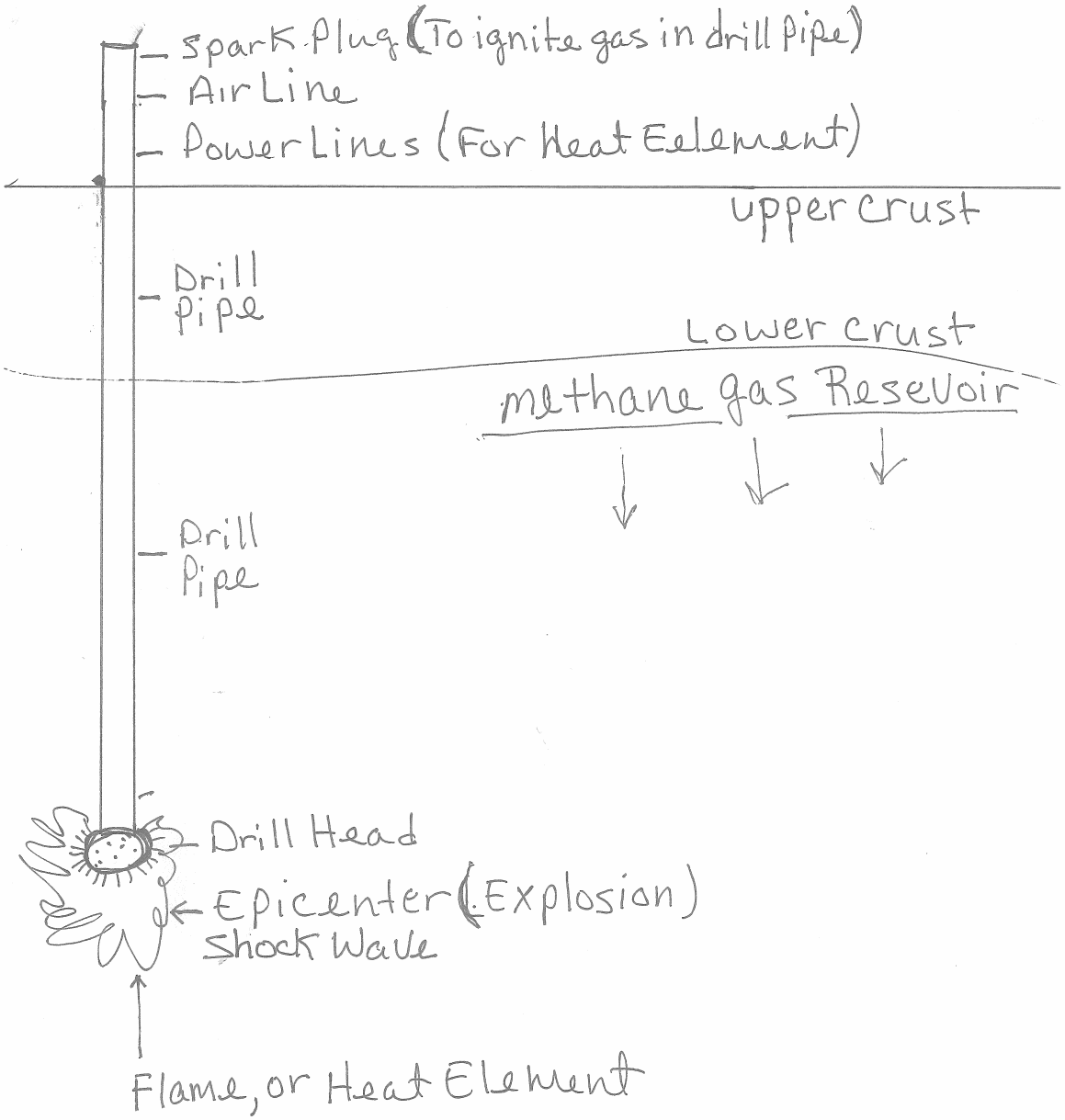

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Figure # 1

Design investigation of a magnetic hollow cathode discharge for general laboratory applications

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Abstract: We present in this work a model of design gas discharges with cold and magnetic hollow cathode, which can be useful for the experiments of sputtering and perforation of the layers solid bodies. It would use the physical principle of crossing electrical and magnetic fields so to increase the ionization way electrons and to guarantee a long maintenance of the discharge. This arrangement has potential application in a wide variety of laboratory research and development projects. [Researcher. 2009;1(1):29-31]. (ISSN: 1553-9865).

Keywords: magnetic hollow cathode, sputtering, plasma

1. Introduction

The magnetic hollow cathode (MHC) is an element for the construction of gas discharges arrangement for different purposes, which are still functional with relatively gas pressures (Boubetra, 2007), the MHC has been studied in order to improve the life-time of a discharge and of an ion source for an implanter (Tonegawa et al., 1986) and it would used for an Penning ion source (Joshua, 2008).

2. Experimental and results

It's consists of the magnetic hollow cathode, the cylindrical anode and a (anti-cathode), those simultaneous is the magnetic pole piece of the magnetic field in anode region. The potential of the anti cathode could be selected in voltage range between 200V and 1kV, concerning the anode is freely, without the ion stream would have changed considerably. The polarity of the two magnetic fields to each other had crucial influence on the shape of the plasma in the anode region. Were the fields antivalent, then arose a strong bundling of the plasma, this can be explained with the fact that the magnetic flux lines penetrate inside the used hollow cathode and to be pushed by the permanent magnet.

A strong magnetic scattering field develops directly under the cover of the hollow cathode, there takes place a strong gas reinforcement of discharge, and all electrons from this range are collected by participation of the outside field in the plasma production and transferred into anode region. Special characteristic for this field geometry is the low gas pressure; witch can be lowered up to 0,1Pa.
Against it if the two magnetic fields are positioned in series, then the plasma is transferred into the Anode region according to the cross section of the hollow cathode opening.

In the anti cathode develops an even glowing seam, for its distance becomes larger with increasing suction tension for the ions (space charge layer). In this field arrangement the spraying installation must be operated with somewhat higher gas pressures, which shows that the gas reinforcement is not so effective for this magnetic field arrangement.

In fig. 2 is to shown 200µm thick Si-disk, which was also bombarded in different times with Ar-Ions. The sample were perforated after two hours radiation, after four hours the hole diameter rose of 2mm to 4mm, from which a certain radiation not homogeny in outer zone is to be read off, with the arrangement of parallel magnetic field was tried a homogeneous demolition , however the homogeneity of the demolition was not satisfying because the deviation were over a sample diameter more than 10%, also attempts were to tested by a sample shift a diagonal cross section not very successful and only by accident one could receive an edge sharp edge at evaporated films.

The power conversion at the samples was substantial by the high ion current density of several 100mA/cm², the sample heating up played a large role with the attempts sometimes then it came also to bubbling at the surface, which resulted from current charges of the sample by to high loss rates.

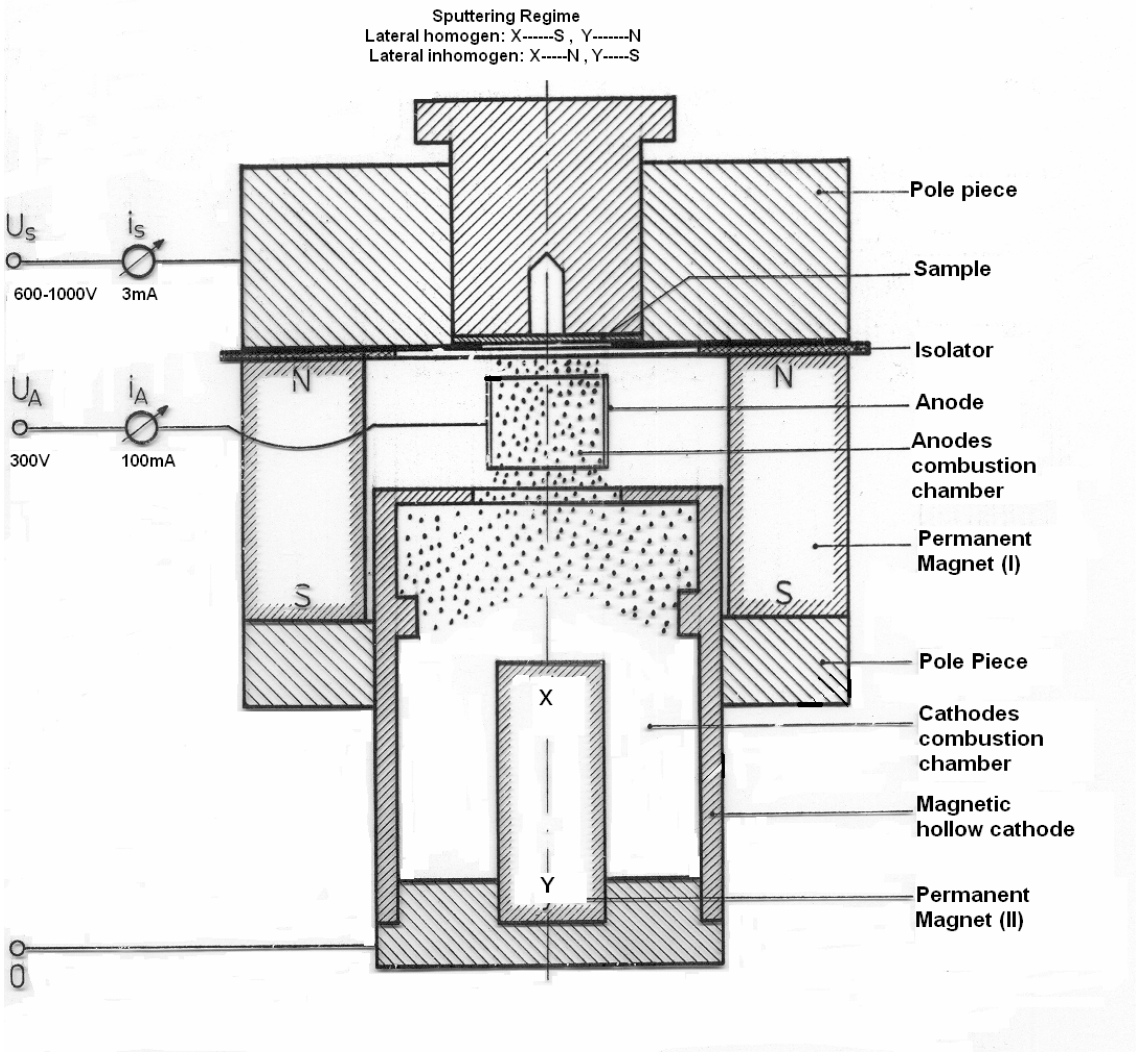

Figure 1: Sputtering arrangement with magnetic hollow cathode

The form of the plasma is determined by the polarity of the two magnetic fields to each other. If the magnetic fields of the hollow cathode and the anode region are arranged against each other for plasma focusing, then a focal spot develops on the Anticathode and/or anode. If the magnetic fields lie parallel to each other, then the plasma is transferred wide into the anode region.

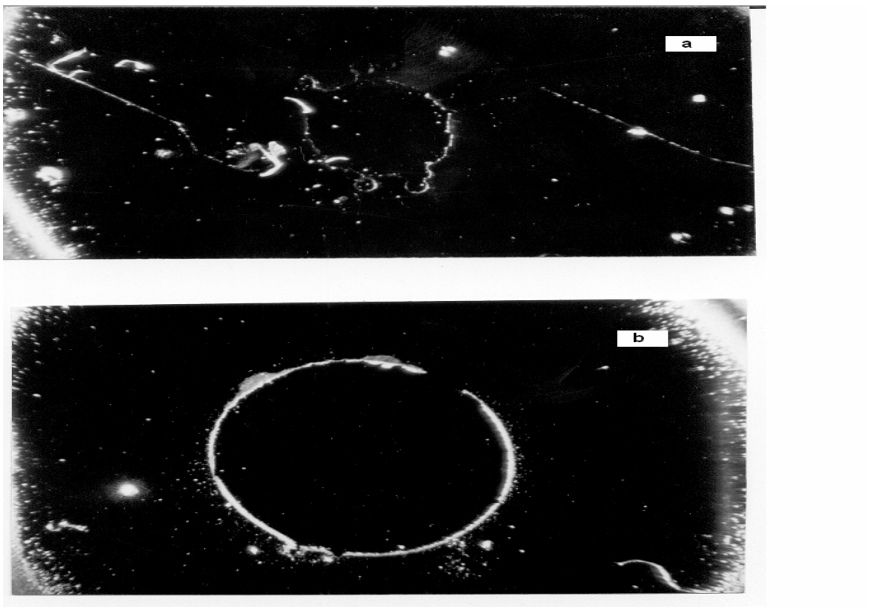

Figure.2. Photography of perforation by sputtering from 200µm thick Si samples
a) after 2h/5mA/800V - ion bombardment
b) after 4h/5mA/800V–ion bombardment

Conclusion*:*

By use this arrangement with crossed electrical and magnetic fields the gas pressure can be reduced likewise according to the extension of the ionization ways by the circulation of the electrons in the magnetic field , This leads then to a smaller gas need for the maintenance discharges and a decrease the gas load of the recipient in the vacuum installation This magnetic hollow cathode is an element with which one different ion source types can realize like Penning ion source, sheet ion source and duoplasmatron.

Acknowledgments

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A Procedural Schedule For Groundwater Flow In Porous Media

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ABSTRACT: The classical Darcy,'s law is generalized by regarding groundwater flow as a function of the hydraulic head; which is' a quantity of primary interest. This generalized law and the law of conservation of mass are then used to derive the generalized form of the groundwater flow equation. Analytical solution of this groundwater flow equation for which a fractal dimension for the flow is assumed. Equation of unsteady flow in a leaky aquifer is discussed. Prediction of groundwater flow with illustrations of contouring the water table map helps to predict the direction of flow. [Researcher. 2009;1(1):32-40]. (ISSN: 1553-9865).

Keywords: Porous media, Darcy's law, Hydraulic Head Introduction

INTRODUCTION

A problem that arises naturally in groundwater investigation is to choose an appropriate geometry for the geological system in which the flow occurs. For example, one can use a model based on unsteady state radial flow to simulate the flow in porous media with a very large pore i1uid density (Black *et aI*, 1986). This is in particular the case with the delineation of freshwater aquifer in the Coastal area of Lagos State (lkoyi, Lekki, Apapa and Victoria Island), characterized by the presence of boreholes drilled in these area that serve as the main drawdown in pumping wells. Attempts to fit in analytical solution of the groundwater flow equation with a one dimensional flow and fit a Conventional radial flow model to the observed drawdown at early times underestimates and later times over estimates[1–4].

The derivation of a generalized groundwater flow equation from the law of mass Conservation and energy balance is usually an indication that the theory is not implemented correctly or does not fit the observations. To investigate the possibility on the Lagos coastal areas. A generalized equation of groundwater flow in three-dimensional equation is expressed as[6-10]

$$\frac{\partial}{\partial x}\left(K\frac{\partial h}{\partial x}\right)+\frac{\partial}{\partial y}\left(K\frac{\partial h}{\partial y}\right)+\frac{\partial}{\partial z}\left(K\frac{\partial h}{\partial z}\right)=S_s\frac{\partial h}{\partial t} \qquad (1)$$

A fractal one-dimensional groundwater flow equation is assumed as an hypothetical case of a closed aquifer for which the flow is essentially horizontal direction and independent of y and z- axis.

$$\frac{\partial}{\partial x}\left(K\frac{\partial h}{\partial x}\right)=S_s\frac{\partial}{\partial t}$$

$$\nabla.[k\nabla h]=S_s\,\partial_1 \text{ h} \qquad (2)$$

Where S_S the specific storativity
Where K the hydraulic conductivity tensor of the aquifer
Where h(x,t) the hydraulic head with x and t the usual spatial and time coordinate
Where ∇ the gradient operator
Where ∂_1 the time derivative

The model showed that the dominant flow in these aquifers is essentially horizontal and linear and not vertical and radial as commonly assumed. However, more recent investigations (Cloot and Botha, 2006) suggest that the flow is also influenced by the geometry of the bedding parallel fractures, a feature

that Equation (3) cannot account for. It is therefore possible that equation may not be application flow in fractured rock other than a porous media[I 1- 15]

In an attempt to circumvent this problem, we introduced a conventional geometry of the aquifer, which assumed a fractal one dimensional flow. (see fig. I). Although this model has been applied with reasonable success in the analysis of the hydraulic head from borehole in the Lagos' Coastal Area[16].

As a review of the derivation of Equation (2) will show [see Bear, 1972], Darcy's Law is used as a keystone in the derivation of Equation (2)[5].

$$q(x,1) = -k\nabla h \qquad \ldots (3)$$

This law proposed by Darcy early in the 19th century, is relying on experimental results obtained from the flow of water through a one-dimensional sand column, the geometry of which differs completely from that of a fracture [17]. There is therefore a possibility that the Darcy's law not be valid for flow in fractured rock formation but is only a very crude idealization of reality. Nevertheless, the relative success achieved by (Cloot and Botha, 2006) to describe many of the properties of Karoo aquifer on the campus of the university of free State, suggests also that the basic principle underlying this law may be correct: the observed draw down is to be related to either a variation in the hydraulic conductivity of the aquifer or a change in the hydraulic head. Any new form of the law should therefore be reduced to the classical form under a more common condition. Because K is essentially determined by the permeability of the porous medium and not the flow pattern, the gradient term in Equation (3) is the most likely cause for the deviation between the observed and the theoretical drawdown observed in the Karoo formation. In this work, the possibility is further investigated for a flow symmetry form of Equation (2) by creating an artificial vertical fault that divides the aquifer into two compartments of length L, on the left and L_1 on the right. The fault gauge is sufficiently low in hydraulic conductivity that acts as a flow barrier. Thus, the left compartment is hydraulically isolated from the right compartment. Initially, the hydraulic head is h_1 in the left compartment and h_2 in the right compartment. Assume that at time $t = 0$, the fault is ruptured by an eat1hquake, so that the two compartments are now hydraulically connected. The earthquake would deform the aquifer causing changes in hydraulic head. The question we want to answer is, what happens to the hydraulic head distribution in the aquifer after the fault rupture? [19]

Therefore, when the fault ruptures, we expect groundwater to flow from compartment with higher head to compartment with lower head, in other word, flow would occur essentially in horizontal x-direction. Analytically, if we set the original length of the x-axis at the left hand boundary, then the How domain is for one-dimensional flow in a homogenous aquifer, the governing in equation (4).

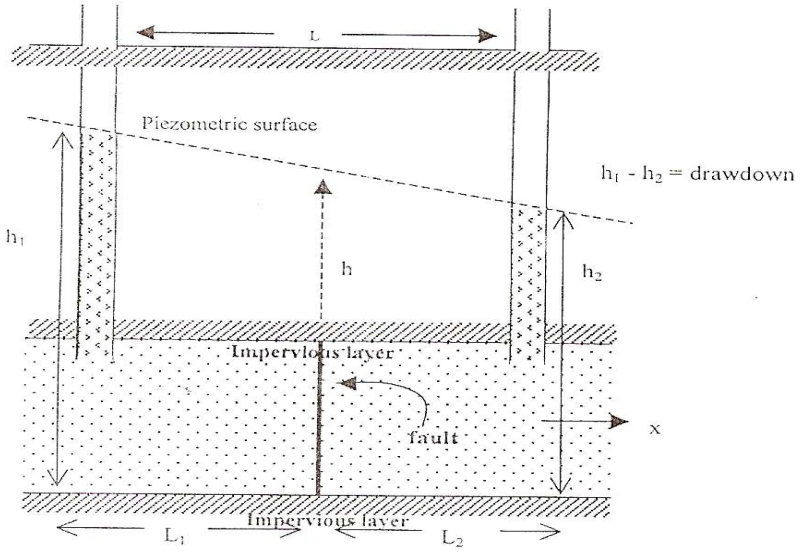

Fig. 1: Flow through a confined aquifer

The boundary condition are $\frac{\partial^2 h}{\partial x^2} = \frac{S_s}{K}\frac{\partial h}{\partial t}$ (4)

$$0 < x < L_1 + L_2$$

$$\frac{\partial h}{\partial x} = 0 \text{ at } x = 0$$

$$\frac{\partial h}{\partial x} = 0 \text{ at } x = L_1 + L_2$$

The initial conditions are

$$h(x,0) = h_1 \quad \text{for } 0 \le x \le L_1$$

$$h(x,0) = h_1 \quad \text{for } L_1 \le x \le L_1 + L_2$$

Separation of variables is employed and the solution is assumed as:

$$h(x,t) = f(x) \,.\, g(t) \qquad (5)$$

where:

$$a = \frac{S_s}{K} \text{ and } f(0) = 0 \text{ for } K_1 = \frac{n\pi}{L}$$

Using these in solution of (5), we have,

$$h(x,0) = A_0 + Cos\frac{n\pi}{L} x\lambda \frac{n^2 n^2 Kt}{S_s L^2}$$

Initial condition, we have,

$$h(x,0) = A_0 + \sum_{n=1}^{\infty} A_n Cos\frac{n\pi}{L} x\lambda \frac{n^2 n^2 Kt}{S_s L^2} \qquad (6)$$

Substitute for A_0 and A_n from Fourier integral, we have

$$A_0 = \frac{1}{L}\int_0^L f(x)dx \qquad \text{and}$$

$$A_0 = \frac{2}{L}\int_0^L f(x)\,\mathrm{Cos}\,\frac{n\,\pi}{L}dx$$

$$h(x,t) = \frac{1}{L}\int_0^L f(x)dx + \frac{2}{L}\sum_{n=1}^{\infty}\lambda\frac{n^2 n^2 Kt}{S_s L^2}\,\mathrm{Cos}\,\frac{n\,\pi x}{L}\int_0^L f(x)\,\mathrm{Cos}\,\frac{n\,\pi x}{L}dx \qquad (7)$$

Let x be a dummy variable of integration. To find the solution to the flow equation, we replace L in Equation (7) by L_1+L_2 and in addition, we replace f(x) by h(x,0) as defined. The integral inside the summation on the right hand side of equation (7) and substituting the preceding integral, we have.

$$h(x,t) = \frac{h_1 L_1 + h_2 L_2}{L_1 + L_2} + \frac{2}{L_1 + L_2}\sum_{n=1}^{\infty}\lambda\frac{n^2 n^2 Kt}{S_s L_1 + L_2} Cos\frac{n\pi x}{L_1 + L_2}\frac{(h_1 - h_2)(L_1 + L_2)}{n\pi}\,\mathrm{Sin}\,\frac{n\pi L_1}{L_2 + L_2}$$

$$h(x,t) = \frac{h_1 L_1 + h_2 L_2}{L_1 + L_2} + \frac{2(h_1 - h_2)}{\pi}\sum_{n=1}^{\infty}\frac{1}{n}\lambda\frac{n^2 n^2 Kt}{S_s (L_1 + L_2)^2} Cos\frac{n\pi x}{L_1 + L_2}\;\mathrm{Sin}\,\frac{n\pi L_1}{L_2 + L_2} \qquad \ldots.(8)$$

This solution can be expressed in dimensionless form as:

$$h_D(x_D, t_D) = L_D + \frac{2}{\pi}\sum_{n=1}^{\infty}\frac{1}{n}\lambda^{-n^2\pi^2 t_D} Cos(n\pi x_D) Sin(n\pi L_D)\ldots \qquad (9)$$

Where:

The dimensionless distance- $$x_D = \frac{x}{L_1 + L_2}$$

The dimensionless time - $$t_D = \frac{Kt}{(L_1 + L_2)^2 S_s}$$

The dimensionless - $$L_D = \frac{L_1}{L_1 + L_2}$$

One advantage of a closed form analytical solution is that it allows us to examine the behaviour of the flow system. There are several interesting features in this solution. The first term on the' right hand side is the steady state part of the solution. It gives the head in the aquifer when *t* is very large (see fig. 3). The second term on the right hand side is the transient part of the problem. Because *t* appears in the argument of the exponential function, the second term tends to zero as *t* becomes large. Furthermore, note that the second term goes to zero at a faster rate if K/Ss (hydraulic diffusivity) is large. Thus, the hydraulic diffusivity is a quantity that controls the rate of hydraulic head.

Unsteady Flow in a Leaky Aquifer

The generalized groundwater flow equation in a leaky aquifer is of the form,

$$S_s \frac{\partial h}{\partial t} = K\nabla^2 h - G \qquad (10)$$

where $G = \frac{e}{T}$, and $\mathrm{e} = \mathrm{K}^1 \frac{h_0 - h}{b^1}$ can determined form Darcy's law.

Under this condition, the above equation becomes a radial flow,

$$T\left(\frac{\partial^2 S}{\partial r^2} + \frac{1}{r}\frac{\partial S}{\partial r}\right) - S\frac{\partial}{\partial t} - q = 0$$

where

$$q = \frac{K^1}{b^1} S = \frac{S}{C} \qquad (11)$$

Using the same approach as the solution for the confined (Theis) solution, we obtained the leaky partial different equation:

$$u\left(\frac{\partial^2 S}{\partial u^2} + \frac{\partial S}{\partial u}\right) + \frac{\partial S}{\partial u} - \frac{r^2}{4uL^2} S = 0 \qquad \ldots(12)$$

and from separation of variables, we obtain an appropriate solution

$$S = \frac{Q}{4\pi T} W\left(u, \frac{r}{B}\right) \qquad \ldots(13)$$

The quantity $\frac{r}{B}$ is given by $\frac{r}{\sqrt{T/(K^1/b^1)}}$

Which holds as long as $U < 0.01$

Where W $\left(u, \frac{r}{B}\right)$ is dimensionless form from a logarithm plot chart.

The plot of S = *hi - h;* versus *t* at various observation wells, since drawdown is the hydraulic heads measured the level of the water table in wells relative to the piezometric surface (see fig. I). The change in water table in the pumping well or in observation well nearby is referred to as drawdown (see fig. 5).

APPLICATION

Set of drawdown data was analyzed in order to validate the new method. The examples were obtained from borehole drilled along the coastal area of Lagos State. The boreholes belong to companies

operating along the coastal area. The examples were to illustrate the application using equations developed in this case.

Example 1

A well is located in an aquifer with a conductivity of 15 meters per day and a storativity of 0.005. The aquifer is 20 meters thick and is pumped at a rate of 2725 cubic meters per day. What is the drawdown at a distance of 7 meters from the well after one day of pumping?

- Hydraulic conductivity = 15 metres per day
- Storativity = 0.005
- Aquifer thickness = 20 metres
- Pumping rate = 2,725 cubic metres per day
- Distance from the well = 7 metres

T=Kb = m/day x 20m = 300 m^2/day

$$u = \frac{r^2 S}{4Tt} = \frac{(7m)^2 \times 0.005}{4 \times 300 m^2 / day \times 1 day} = 0.0002$$

From the table of W(u) and u, if u = 2 x10^{-4}, w(u) = 7.94:

$$h_1 - h_2 = \frac{Q}{4\pi T} W(u) = \frac{2727 m^3 / day \times 7.94}{4 \times \pi \times 300 m^2 / day} = 5.73 m$$

The draw is 5.73 meters after one day.

Example 2

A well in a confined aquifer was pumped at a rate of 220 gallons per minute for about 8 hours. The aquifer was 18 feet thick. Time drawdown data for an observation well 824 feet away are given in table 2. Find T, K, and S.

W(u) = 1

I/u = 1

$h_1 - h_2$

$t/r^2 = 6.06 \times 10^{-6}$

Radial Diameter d = 20ft

Pumping Rate = 220 gallons per day for 8 hours

Aquifer thickness = 18 feet

Transmissivity:

$$T = \frac{114.6 Q W(u)}{h_0 - h} = \frac{114.6 \times 220 \times 1.0}{2.4} = 10{,}500 \ \ galons gpd \, 1 \text{ft}$$

Hydraulic Conductivity:

$$K = \frac{T}{b} = \frac{10{,}500}{18} = 580 gpd / \text{ft}^2$$

Storativity

$$S = \frac{Tu}{2693} \times t / r^2 = \frac{10{,}500 \times 1}{2693} \times 6.06 \times 10^{-6} = 0.00002 \ldots. \quad \text{(Theis method)}$$

$$S = \frac{Q r^{1-n}}{4\pi T d} = \frac{220}{4\pi (10{,}500)(20)} = 0.000018 \quad \ldots \quad \text{(Cloot \& Botha method)}$$

$$S = \frac{Q W(u)}{4\pi T d} = \frac{220 \times 1.0}{4 \times \pi \times 10{,}500} = 0.0016 \quad \ldots. \quad \ldots.. \quad \text{(Observation)}$$

(See fig 4 & 5)

Example 3

An aquifer 10 meters thick is penetrated by a well It is overlain by a semipervious layer I meter thick with a K" of I 0^{-5} centimeter per second. There is no storage in the leaky confining layer. The aquifer

has a K of] 0.^{2} centimeter per second and an S of 0.0005. If a well pumps at 500 cubic meters per day, compute values of drawdown at I, 5, 10, 50, 100, 500, and 1000 meters. (see Table 2)

Aquifer Thickness = 10 metres
Storativity = 0.0005
Pumping rate = 500 cubic metres per day
Various depths = I, 5, 10, 50, 100,500 & 1,000 metres
r = distance to the observation wells
t = time since pumping begin
K = 10^{-2} cm/sec x 60 sec/min x 1440 min/day x 10^{-2} m/cm = 8.64 m/day
K' = 10-^{5} cm/sec x 60 sec/min x 1440 min/day x 10-^{2} m/cm= 8.64x 10^{-3} m/day
b'=-lm
b'=l0m
T = Kb = 86.4 m^2/day
B = $(Tb'/K')^{1/2}$
= (86.4 m^2/day x 1 m /8.64 x *10.*^{3}/day)$^{1/2}$
$(10^4)^{1/2}$
B = 100

$$u = \frac{r^2 s}{4Tt} = \frac{r^2 \times 0.0005}{4 \times 86.4 \times 1} = 1.44 \times 10^{-6} r^2$$

$$\frac{r}{B} = \frac{r}{100} = 10^{-2} r$$

$$h_1 - h_2 = \frac{2.6Q}{4\pi T} W\left(u, \frac{r}{B}\right) = 1.06 W\left(u, \frac{r}{B}\right)$$ (our observation) see fig. 5

As u = 1.44x 10^{-6}r^2, we can find the value of u for each r-value

4.1 Discussion of Results:

All the three examples of drawdown data show that the new method underlying this law and the observed drawdown variations in hydraulic conductivity of the aquifer is correct. Each of the analytical solution describes the response to pumping in a very idealized representation of aquifer configurations. In the real world, aquifers are heterogeneous and isotropic: They usually vary in thickness; and they certainly do not extend to infinity. Where they are bounded, it is not by straight-line boundaries that provide perfect confinement. Aquifers are created by complex geologic processes that head to irregular stratigraphy and trendouts of both aquifers and aquitards. The Predictions that can be carried out with the analytical solution presented in this paper must be viewed as best estimates. In general, hydraulic head solutions are most applicable when the unit of study is a well.

They are less applicable on a large scale, where the unit of study is an entire aquifer.

The graphical method of solution starts with the construction of reversed type curve of W(u) against I/u on logarithm paper (see fig. 4). Data from observation well located at different distances from the pumping wells were used. If there is only one observation well, then it is sufficient to plot hi - h_2 as a function of *t* (table I). .

Using "Contouring the Water Table Map", we noticed that the contours form V's with the river and its tributaries. That's because the river is a "gaining" river. It is receiving recharge from the aquifer. The contours show that ground water is moving down the sides of the valley and into the river channel. The opposite of a gaining stream is a "losing" stream. It arises when the water table at the stream channel is lower than the stream's elevation or stage, and stream water flows downward through the channel to the water table. This is very common in dryer regions of the Southwest. In the case of a losing stream, the V will point downstream, instead of upstream. (see fig. 6)

When making a water table map, it is important that your well and stream elevations are accurate. All elevations should be referenced to a standard datum, such as mean Sea level. This means that all elevations are either above or below the standard datum (e.g., 50 feet above mean sea level datum). It's also very important to measure all of the water table elevations within a short period of time, such as one day, so that you have a "snapshot" of what's going on (Adeosun *et al* 2006). Because the water table rises and falls over time, you would be more accurate if readings are made before these changes occur.

Understanding how ground water flows is important when you want to know where to drill a well or a water supply, to estimate a well's recharge area, or to predict the direction of contamination is likely to take once it reaches the water table. Water table contouring can help groundwater developer to do all these things. Hence, groundwater flow through the subsurface is the whole essence of this paper and called for further investigation.

CONCLUSION

It has been clearly demonstrated that the study of flow in porous media was recognized in detailed through the physical behaviour of subsurface water and their interactions with the solid matrix (flow of groundwater was delineated through the presence of boreholes drilled along the coastal area of Lagos State for characterizing the flow in the subsurface aquifer. The classical Darcy's law governed the flow in porous media by regarding ground water flow as a function of the hydraulic head. A complete statement of this flow problem required specifying the extent of the flow domain, the governing equation, spatial distribution of properties, for example, hydraulic conductivity and specific storativity, boundary conditions and initial conditions. Analytical solution of this flow equation for which a fractal dimension was assumed to yield a closed form solution that could be written on paper and also be examined to understand the behaviour of the flow system in a typical limited homogeneous flow domain with relatively simple geometry.

The problem of solving fluid flow through porous media has proved analytically intractable and the problem of understanding flow and storage in aquifers is very complex. It was ·recognized that flow through' such a medium is very significantly influenced by the porous media characteristics such is porosity and permeability. A limitation of this work is the estimation of permeability (hydraulic conductivity) of the medium which can not be examined and investigated without being to the field, even if examined, permeability estimation has proved to be complex and this concept has limited the free flow of fluid within the porous medium. Therefore, this work is hoped to complement the study of flow through porous media that might have been done in other parts of the world and contributes to the unveiling knowledge of the applicability of flow in porous media. Prediction of this flow shows several interesting qualitative features such as graphs and contouring of water table map, which held to predict change in drawdown in pumping well and the direction of flow. The method becomes more accurate and easy to handle with little or no variations in the observed drawdown and water table flow prediction.

NOMENCLATURE

S = Storativity
T = Transimissivity (L^2T^1)
$h_1 - h_2$ = drawdown (L)
Q =pumping rate (L^3T^1)
t = time, (time since pumping began)
r = radial distance from pumped well (L)
e = leakage rate
B = leakage factor (Lb^{-1}) = thickness of leaky layer (L)
b^l = thickness of leaky layer (L)
K^l= vertical hydraulic conductivity of leaky layer (LT^{-1})
(X, y)= rectilinear coordinator
S_s = specific storage
h = head (L)
q = specific discharge (M^3d^{-1} per m^2)
K = hydraulic conductivity of aquifer (md^{-1})
h_2, h_1 = hydraulic heads measured along flow path
L = distance between head measurements (m)
W = width of cross - sectional flow (m)
D = height of cross-sectional flow (m)
W(u)= dimensionless form from chart
G = leakage factor
U = flow velocity

Time After Pumping Started (min)	T/r^2	Drawdown (ft)
3	4.46×10^{-6}	0.3

5	7.46 X 10^{-6}	0.7
8	U8 x $l0^{-5}$	1.3
12	1.77 x 10^{-5}	2.1
20	2.95 x 10^{-5}	3.2
24	3.53 x 10^{-5}	3.6
30	4.42 x 10^{-5}	4.1
38	5.57 x 10^{-5}	4.7
47	6.94 x 10^{-5}	5.1
50	7.41 x$l0^{-5}$	5.3
60	8.85 x $l0^{-5}$	5.7
70	1.03 x 10^{-4}	6.1
80	1.18 x 10^{-4}	6.3
90	1.33 x 10^{-4}	6.7
100	1.47 X 10^{-4}	7.0
130	1.92 x 10^{-4}	7.5
160	2.36 x 10^{-4}	8.3
200	2.95 x 10^{-4}	8.5
260	3.83x$l0^{-4}$	9.2
320	4.72 x 10^{-4}	9.7
380	5.62 x 10^{-4}	10.2
500	7.35 x 10^{-4}	10.9

Table 1: drawdown Table

R	U		W
1m	1.44 x 10^{-6}	0.01	9.44
5m	3.6 x $l0^{-5}$	0.05	6.23
10 m	1.44 x 10^{-4}	0.1	4.83
50 m	3.6 x 10^{-3}	0.5	1.85
100m	1.44 x 10^{-2}	1	0.824
500 m	6 x 10^{-1}	5	0.007
1000 m	1.44	10	00001

Table 2: Field Data

From the computed values of W(u, r/u) at each observation point, the drawdown can be computed from h_0 - h = 1.06 W(u, r/b)

R	**h_1- h_2**
1m	9.44m
5m	6.23m
10 m	4.83m
50 m	1.85m
100m	0.824m
500 m	0.007m
1000 m	00001m

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Comparison of the Wehner Spots With Angle Distribution Sputtered Atoms Materials

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Abstract: The causes for the Anisotropy in the angle distribution sputtered atoms is yet extensively unexplained. Therefore experimental investigation should be carried out to this question. The ions beam was used for comparing investigation between the distributions of back steered ions and sprayed atoms. We know that the pulverization of crystals shows an anisotropic angular distribution of pulverized atoms. The appearance of these phenomena is initiated once Wehner spots are obtained by putting a receptor in front of the sample, which shows a correlation with the principal crystallographic axes. Other study shows that till now the studies and works already done are not strongly founded in the sense of the correspondence of the Wehner spots and the principal axes of the crystals. Measurements are represented in many works and during the last years detailed studies on gold crystals (111). Principally the gold atoms emissions have appeared in the directions (110) and (111) for which the intensity to energy ratio of projectile ions is modified. Emissions directions are to be maintained in addition to representation and for omitted raison directions changes have to be taken into account. After the studies of deviations in the emission direction appear during the copper crystals pulverization. The authors allocate this fact to the influence of the forces of superficial links which should generally lead to a preference of the particles emission in the normal direction to the surface. The question is who it makes that the link ratio for different crystals directions have a different response; however, it is shown that the application of an ionic beam emitter, to examine the interference of the direction emissions of the pulverized atoms with principal crystallographic axes is necessary. [Researcher. 2009;1(1):41-45]. (ISSN: 1553-9865).

Key words: Anisotropy, angular distribution, sputtering, crystallography

Experimental and Methods

The principle of the exact determination of the angle distribution sputtered atoms and the crystal direction was based up on the registration of the particle currents in the pulverisation through precipitation development on a transparent plastic foil and through photographic registration of the particle current reflected Proton arrangement shows in Fig.1. In a reason disk out of aluminium, a hole is bored in the middle to the reception of the copper-mono-crystals. Around the crystal as an axis, a cylindrical screen is mounted, that is connected with the circular disk firmly. This screen contains in the middle a hole through which the ions ray is arranged on the sample. The screen consists of a film stage, in which a transparent plastic film could be inserted to measure the angle distribution of sputtered atoms or a photographic film, with which an over energy, reflected Proton become (Protonogram) recorded.

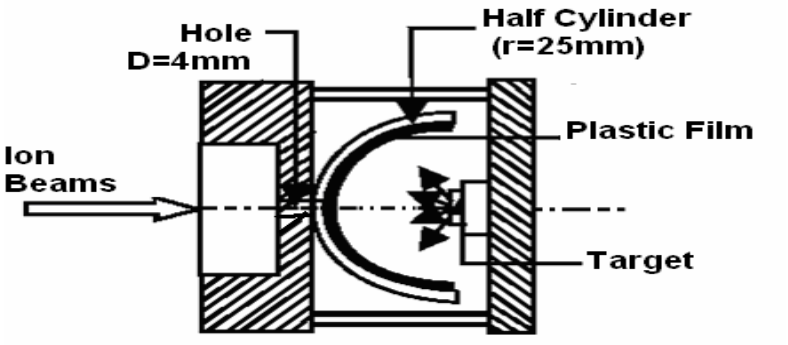

Fig. 1 : Schematic representation of radiation

Because in the two cases the disposal (arrangement) of the film support is the same with respect to the crystal, we can superpose the film and the transparent to observe that the correspondence of the emitted particles and the crystallographic axes of the sample.

Wehner Spots Apparition

To determine the angular distribution of the pulverised atoms, a transparent sheet is inserted in film carrier linked to the device in which is placed the sample (copper mono-crystal) with the wanted direction, the device being connected to the last electrode placed under the ions optics land of the beams emitter.

With a current of about 100μA, the sample is bombarded with Ne and Ar ions during 15-30 min., as a result we obtain the matter distribution on a plastic sheet and because it consists of a cylindrical arrangement, it is important to place the emission direction in the meridian plane of the device, in addition the crystal should be turned in parts around its axes until the geometry is optimal to measuring angle, this has been reached after 2-3 tests. With this arrangement and the desired image we undertake the copper crystal direction in the film carrier and this is done due to the angular distribution recording of the reflected protons.

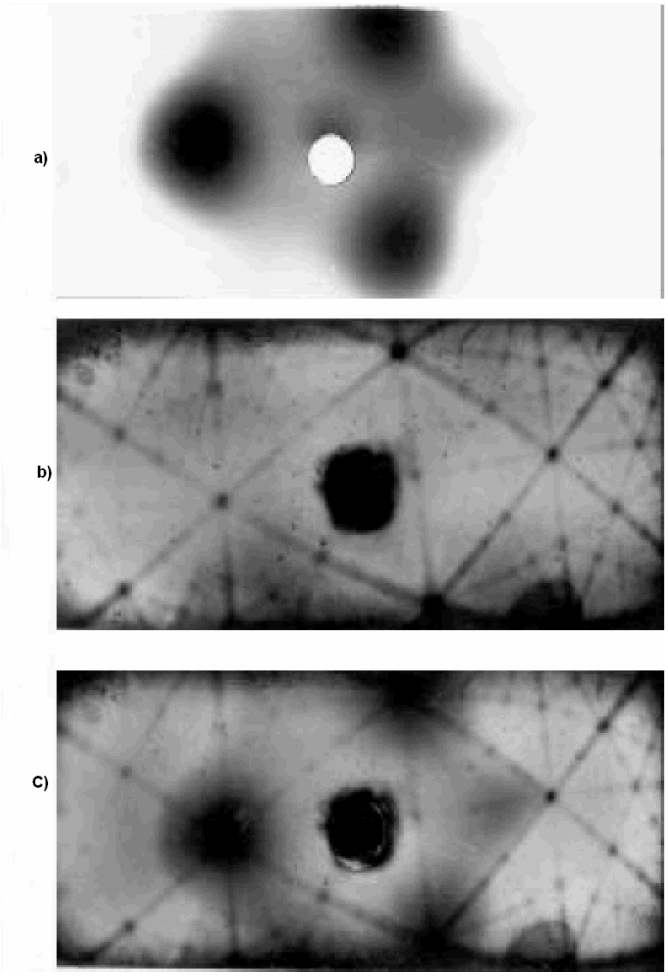

Fig. 2**:** Comparative representation of the network plane structure of a mono-crystal Cu-(111) obtained by measurements of dispersion with protons (protonogram). With the arrangement of Wehner spots, during the same angle of deviation between the surface and the axis of the crystal, a)Wehner Spots by Protonogram c) Common copy of the two photography that shows clearly the Wehner spots deviation very weak compared to the desired emission direction according to the protonogram

Determination of the Crystal Direction

We bombard the copper mono-crystal with weight and rapid particles; hence those penetrate deeply in the crystal. For protonogram photography we have taken 300kV protons with a 2μA current, an exposure time of 10s and a desensitized film, the desensitizing of the film necessitate the device installation in the dispersion room under the green light.

The protonogram is based on the reflection of the weight projectiles on the heavy atoms sample, the weight and rapid protons deeply penetrate in the mono-crystal. During a redispersion of the protons in the total angle sector around atoms network can be lighted up, a proton can be also reflected due to a collision with the atoms network in all the direction of observation, here however every atoms network is surrounded with adjacent atoms, regularly distributed and this for every adequate atom is repeated in the depth direction and the side. The protons can not be emitted by the effect protecting the adjacent atoms along their distribution direction. Even though, the protons are reflected in all the direction during the particular spreading process on the atoms network, they are however, stopped by the surrounding adjacent atoms in this direction of emission.

Because in this direction no proton is emitted, given rise on the gleam screen or on photographic film as an plane image of the network with darken films on the illuminated background plane which is produced by irregular spread protons. Because of the effect protecting adjacent atoms we call the process “Blocking Effect” or the “Shadow Effect” (Barett, 1973).

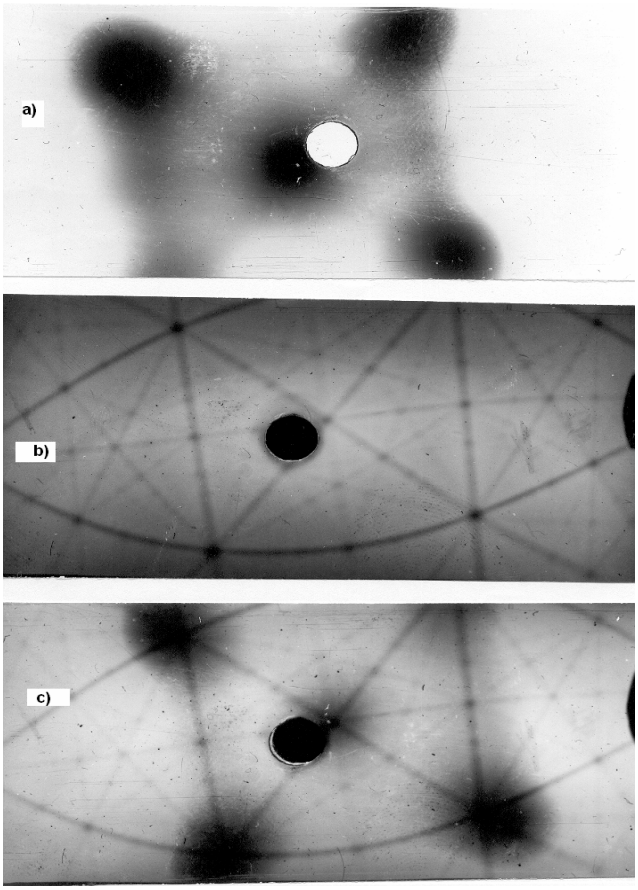

Fig. 3: Comparative representation of the network plane structure of a mono crystal Cu-(001) obtained by the dispersion measurement using protons (protonogram). With the Wehner spots arrangement, during the same angle deviation between the surface and the axis of the crystal.

a) Wehner spots.
b) Protonogram .
c) Common copy of the two photographies: Wehner spots and mono-crystal principal axis directions that correspond
well surface normals.

Discussion and Summary

As it is shown in the Fig. 3 that with direction crystals of surface (100), the emission direction and the crystallographic axes are well joined. On the other hand**,** for crystals (111) (Fig. 2) the directions correspondence with pulverisation images exist; while for the directions (100) a deviation is clearly observed with respect to (100) direction in the protonogram of around 2 mm with a radius of 25 mm of the film carrier of cylindrical form corresponds to a 20° of angle shifting. The emission direction of the normal is preferred. Similar observation are already done by the work (Niedrig et *al.,* 1987), if the cause should be the engagement energy of the surface, this should also affect the directions (100), because they passes also to the surface normal. For the other directions of the crystal also, we could observe the shifts. According to work (Robinson, 1981), overcoming the voltage barrier at the surface should cause angle enlargement at the output during the extraction of atoms relatively the normal, however the opposite shift is observed for centred crystals clear deviations of the position of Wehner spots is also observed. Consequently, it is evident to postulate to surface atoms relaxation,, this should be easily seen, because the atoms of the centred side position possess the shortest path of link compared to the atoms at the cubic corner points of the crystal network with centred fronts. If a crystal of this type is cut along the surface diagonals, these atoms arrive to the surface because they are under pressure due to their short link distances, they can be relaxed; this relaxation should be recovered on the first and the second atoms positions. Is it about the surfaces (100) or (110), the relaxations in the pulverisation image are not shifted, because the percussion direction coincide with the relaxation direction. If it is about however, more surface (111) , the relaxation direction and the percussion direction between the atoms of the first and the second position do not correspond anymore.

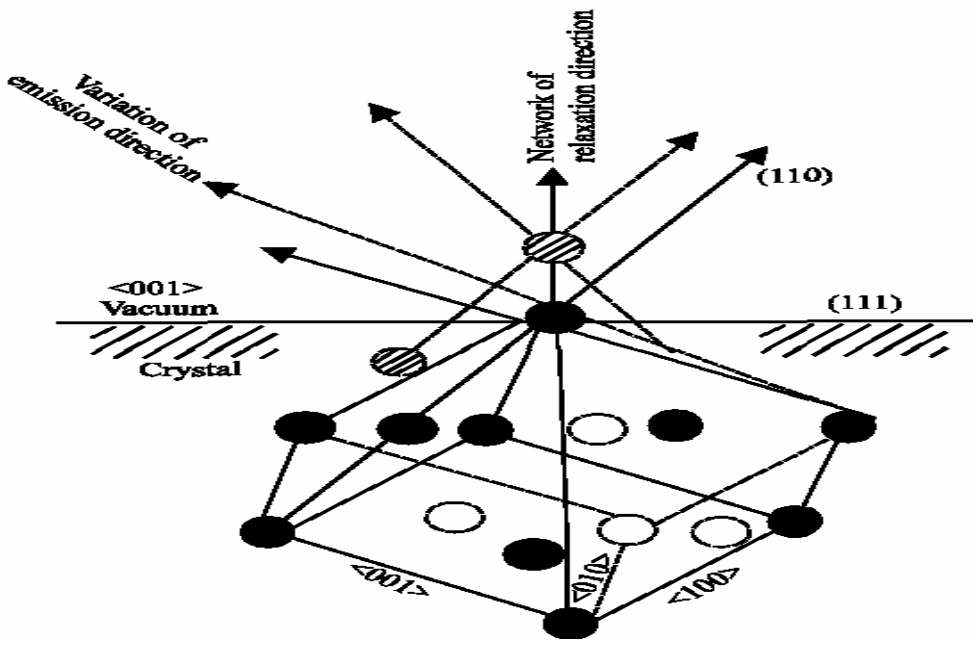

Fig. 4: Schematic representation of the process, For the relaxation of atoms vertical with respect to the surface emerges a modification in the Wehner spots situation. While for the spot (100) stills not influenced by the relaxation, It is produced for the axe (001) a change in the particles emission direction

If we evaluate quantitatively the shift on the basis of the model shown in Fig. 4**.** A relaxation of atoms on the surface, 50% of this value is calculated by the adoption of the appearance or creation of Wehner spots comes from the percussion interaction between the adjacent atoms is always a central percussion, i.e.: There exist no preferred percussion direction of second position atoms, however the atoms possess percussion energy of second position atoms in the preferred direction, which coincide with the packed and close balls directions. Hence, the oblique percussion between adjacent atoms are also possible. In this case, the network atoms are not concerned, but the percussion radius which is crucial and the ratio between the distance and the percussion radius of atoms which decide on the percussion oblique if it increases or decreases. With percussion radii which are small with respect to network gap, the oblique deviation increases concerning the central percussion, because the transferred energy of the surface atoms during the pulverisation increase in a multiple of links energy, the percussion radius can be ten times less than network distances, hence the network relaxation values are reduced from 50 to 5%. Similar values have been found (Davies et al*.,* 1975; Saris, 1982) with the measurement of Surface-Blocking-Effect, h s method is relatively expensive and necessitate very high vacuum conditions, the arrangement of the Wehner spots relaxation process is in the other hand simpler and possible under the high vacuum conditions, if we increase also the sensitivity of the measurement method with the use of a particle test, it can be possible not only to determine the metals structure, but also the arrangement arbitrary matters atoms on the surface, if it is sufficiently regular. Consequently, it appears very important also to examine very far the mono-crystals surface particles emission question and other matters, because new structural analysis methods of solid bodies' surfaces can emerge.

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Chlorophyll *a* dynamics and environmental factors in a tropical estuarine lagoon

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Abstract: The chlorophyll *a* dynamics and environmental factors of the Iyagbe lagoon, Lagos was investigated for 2 years (Oct., 2004 - Sept., 2006). The environmental indices reflected seasonal changes related to rainfall distributive pattern and tidal seawater incursion. Air temperature (26 - 34°C), surface water temperature (26 - 33°C), total dissolved solids (90 - 25,000mgl^{-1}), transparency (22 - 231cm), sulphate (20.8 - 1140mgl^{-1}), silica (0.9 - 6.0mgl^{-1}), dissolved oxygen (4 - 5.6mgl^{-1}), conductivity (110 - 40850 S/cm), salinity (0.06 - 35.1%), chloride (20.5 - 15,015mgl^{-1}), pH (6.7 - 8.42), acidity (3.8 - 44mgl^{-1}), alkalinity (15.3 - 30mgl^{-1}), total hardness (18 - 6875mgl^{-1}), calcium (10 - 720.1mgl^{-1}) and magnesium (1.4 - 900mgl^{-1}) recorded increased values in the dry than wet season. On the other hand chemical oxygen demand, biological oxygen demand, total suspended solids(18 - 2310mgl^{-1}), nitrate (3.3 - 59.8mgl^{-1}), phosphate (0.01 - 1.68mg), copper (0.001 - 0.079mgl^{-1}), zinc (0.001 - 0.015mgl^{-1}) and iron (0.06 - 1.08mgl^{-1}) recorded higher values in the wet season. Values for chlorophyll *a* were higher in the dry than wet season for the lagoon. Positive correlation coefficient was recorded between chlorophyll *a* and salinity, total dissolved solids, alkalinity, pH, conductivity total hardness, chloride, transparency, acidity, nitrate, sulphate, calcium and magnesium levels. Recorded chlorophyll *a* values places the Iyagbe lagoon between the mesotrophic and eutrophic status. It is suggested that increasing tidal influence associated with reduced rain events may have encouraged elevated salinities and created conditions for the development of more algal cells, hence higher chlorophyll *a* records. [Researcher. 2009;1(1):46-60]. (ISSN: 1553-9865).

Keywords: Physico-chemical factors, brackish, microalgae, hydroclimatic factors, Nigeria.

Introduction

Lagoons are ecologically and economically important aquatic ecosystems in South-western Nigeria. They provide natural food resources rich in protein which includes an array of fish and fisheries. They are also important in water transportation, energy generation, exploitation and exploration of some mineral resources including sand (FAO, 1969; Kirk and Lauder, 2000; Onyema *et al*., 2003, 2007; Chukwu and Nwankwo, 2004; Onyema, 2008a). Lagoons also inadvertently serve as sinks for the disposal of both domestic, municipal and industrial wastes in the region. There are nine lagoons in South-western Nigeria namely: Yewa, Ologe, Badagry, Iyagbe, Lagos, Kuramo, Epe, Lekki and Mahin lagoons from the west to the east (FAO, 1969, Webb, 1958a; Nwankwo, 2004b; Onyema, 2008).

Furthermore, chlorophyll *a* is an essential plant pigment and concentrations of it could be used to reflect algal biomass and hence, level of primary production. Chlorophyll *a* can be an effective measure of trophic status (Lee, 1999). However, elevated chlorophyll *a* concentrations often indicate poor water quality and low levels often suggest good conditions (Ogamba, *et. al*., 2004). According to Lee (1999), higher Phytoplankton biomass would directly reflect in a higher level of chlorophyll *a* in such regions. One method to determine the amount of plant materials present in a water sample is to filter out the phytoplankton, count the cells and multiply the number counted by the average mass per individual cell (Sverdrup *et al*., 2006). A less tedious method is to extract the chlorophyll from a sample of phytoplankton and determine the concentration of pigment present. Hence chlorophyll concentration can be used to estimate the total quantity of plant material or biomass (Sverdrup *et al*., 2006).

The immense ecological significance of phytoplankton diversity studies especially in relation to aquatic trophic relationships cannot be understated (Smith, 1950; Lee, 1999; Nwankwo, 1984, 2004a). Coastal areas are generally more productive than the open oceans because rivers and land run-offs supply nutrients along coasts and adjoining estuarine systems. With regard to the annual rates of global primary production and productivity, Lagos offshore falls under the high productivity category (= 300gC/m^2/yr) (Sverdrup *et al*., 2006).

Determination of primary production in the Lagos lagoon has primarily been by biomass estimation using cells number of phytoplankton (Nwankwo, 2004). With regard to chlorophyll *a* in Nigeria, there exist a report by Kadiri (1993) on the Ipkoba reservoir in Benin and another by Ogamba *et*

al., (2004) on chlorophyll *a* levels and variations in the Niger Delta region. Hence studies in Nigeria using chlorophyll *a* method are limited.

At present, there is no report on any of the nine lagoons of South-western Nigeria with regard to the chlorophyll *a* method of estimation. The aim of this study was to investigate the seasonality in chlorophyll *a* concentration and relate findings to environmental factors in the Iyagbe lagoon.

Materials and Methods

Description of Study Site

The Iyagbe lagoon (Fig 1) is located in Lagos state, Nigeria and is one of the nine lagoons in South-western Nigeria (Webb, 1958a; Nwankwo, 2004b; Onyema, 2008a). It is located between Latitude 6^0 26'N Longitude 3^0 19' E and Latitude 6^0 23'N Longitude 3^0 06' E (Webb, 1958a; Onyema, 2008a,b). It is majorly made up of the Porto-Novo and Badagry creeks. The Iyagbe lagoon is centered about the town of Iyagbe (Webb, 1958a). The lagoon is shallow at some point especially in the Badagry creek arm and is open all year round via the Lagos harbour to the sea (Webb, 1958b; Webb and Hill, 1958; Sandison, 1966; Sandison and Hill, 1966). Like all parts of South-western Nigeria, the Iyagbe lagoon is exposed to two distinct seasons namely the wet (May – October) and the dry season (November – April) (Nwankwo, 2004b; Sandison and Hill, 1966). The harmmattan, a short season of dry, dusty North-East Trade winds are experienced sometimes between November and January in the region reducing visibility and lowering temperatures (Onyema *et al.*, 2003). Dense rain forest zone vegetation preceded by littoral mangrove assemblages is the common macrofloral assemblages especially in areas with reduced anthropogenic influence. The lagoon deposits are varied, and are reflected in the pattern and type of vegetation in the region. Most of the Iyagbe lagoon area away from the Tin can Island and Apapa Ports are colonized by a recognizable riparian mangrove swamp community especially where man made structure are absent. These mangrove environments are inhabited by amphipods, polychaetes, isopods, barnacles, oysters, periwinkles, nematodes, fiddler crabs, sea cucumbers, mangrove crabs, mudskippers and shrimps among others (Sandison and Hill, 1966; Onyema, 2008b). The notable macro-floral species in the area include *Rhizophora racemosa, R. harrisoni, Avicennia germinans, Phoenix reclinata, Raphia hookeri, Elaeis guineensis, Acrotiscum aureum* and *Cocos nucifera* (Akinsoji *et al*., 2002).

Collection of samples.

Collection of water samples

Twelve sampling stations were selected to cover the lagoon area and for the collection of samples. Table 1 shows the G.P.S. location, names and number of sampling stations. Monthly surface water samples was collected for twenty-four consecutive months (October, 2004 – September, 2006) for physico-chemical characteristics analysis using 500ml plastic containers with screw caps. Collection of samples from the stations was always between 10 and 15hr each time. Water samples were collected just a few centimeters below the water surface at each of the twelve stations. The plastic containers was then labeled appropriately and transported to the laboratory immediately after collection for to further analysis. Water samples for Dissolved Oxygen was collected also in 50cl bottles and fixed on site with white and black ampoules.

Table 1: G.P.S. location and station name of sampled areas in the Iyagbe lagoon.

Station No.	Station name	G.P.S. locations
Station 1	Calabash Island	Latitude 6^{o} 25^{1}.987 N, Longitude 3^{o} 23^{1}.400 E
Station 2	Tin-can Island	Latitude 6^{o} 25^{1} .833 N, Longitude 3^{o} 21^{1} .532 E
Station 3	Ibafon	Latitude 6^{o} 25^{1} .964 N, Longitude 3^{o} 19^{1} .244 E
Station 4	Imore	Latitude 6^{o} 25^{1} .755 N, Longitude 3^{o} 19^{1} .915 E
Station 5	Ito-ogba	Latitude 6^{o} 25^{1} .409 N, Longitude 3^{o} 14^{1} .624 E
Station 6	Abule-oshun	Latitude 6^{o} 26^{1} .134 N, Longitude 3^{o} 13^{1} .224 E
Station 7	Idiagbon / Igbolobi	Latitude 6^{o} 26^{1}.214 N, Longitude 3^{o} 11^{1} .826 E
Station 8	Iyagbe	Latitude 6^{o} 25^{1} .603 N, Longitude 3^{o} 11^{1} .990 E
Station 9	Agbaja	Latitude 6^{o} 24^{1} .473 N, Longitude 3^{o} 12^{1} .744 E
Station 10	Ikare	Latitude 6^{o} 24^{1} .632 N, Longitude 3^{o} 13^{1} .705 E
Station 11	Ilashe	Latitude 6^{o} 24^{1} .676 N, Longitude 3^{o} 16^{1} .938 E
Station 12	Idimangoro	Latitude 6^{o} 24^{1} .717 N, Longitude 3^{o} 19^{1} .307 E

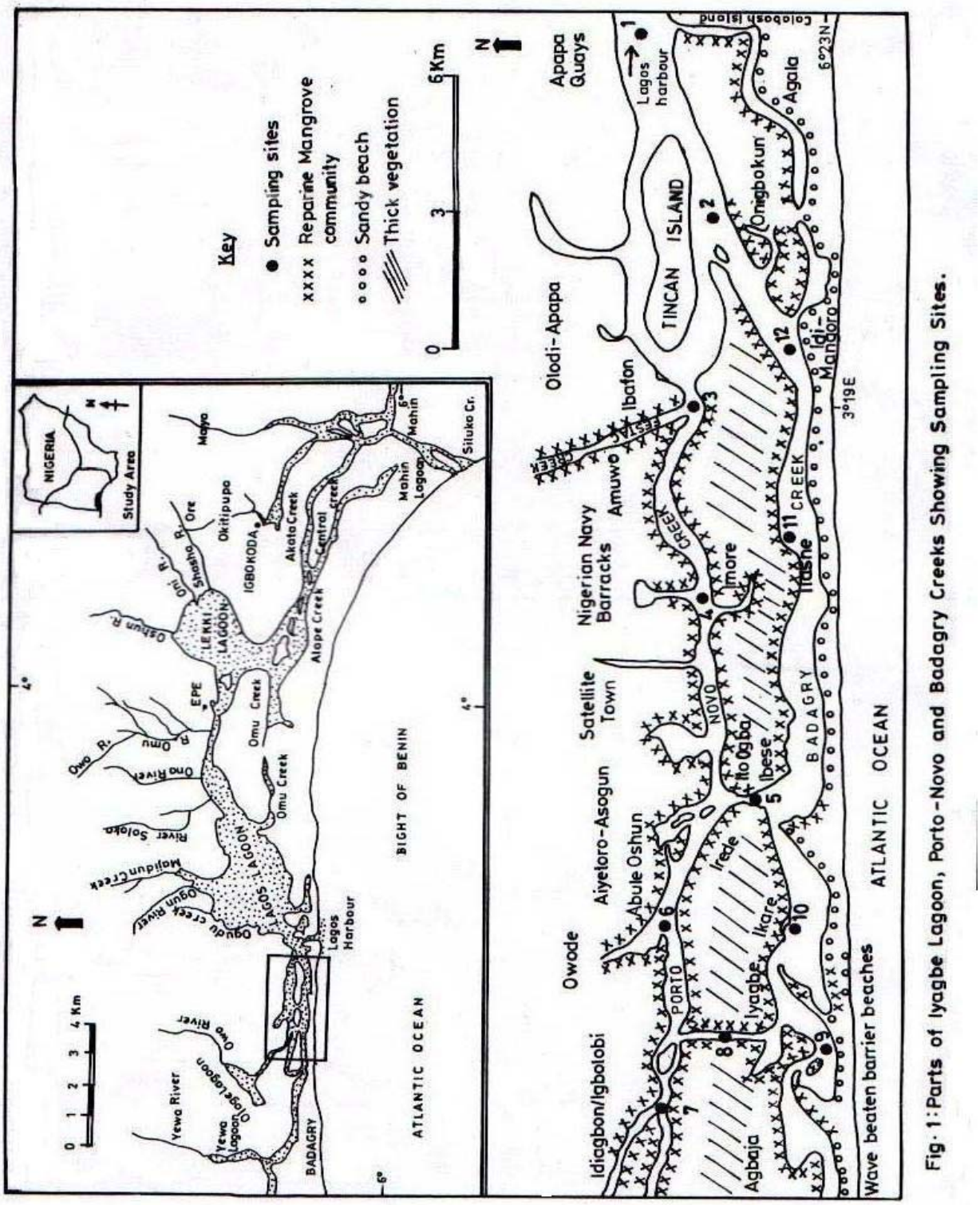

Fig. 1: Parts of Iyagbe Lagoon, Porto-Novo and Badagry Creeks Showing Sampling Sites.

Table 2: Summary of environmental factors and method/device used for their estimation.

	Parameter/ Unit	Method / Device	Reference(s)
1	Air temperature (^oC)	Mercury – in – glass thermometer	Nwankwo (1984)
2	Water temperature (^oC)	Mercury – in – glass thermometer	Onyema (2008)
3	Transparency (cm)	Secchi disc method	Onyema (2008)
4	Depth (cm)	Graduated pole	Brown (1998)
5	Rainfall (mm)	Acquired from NIMET, Oshodi, Lagos	
6	Total Dissolved Solids (mgL^{-1})	Cole Palmer TDS meter	
7	Total Suspended Solids (mgL^{-1})	Gravimetric method	APHA (1998)
8	Chloride (mgL^{-1})	Argentometric method	APHA (1998)
9	Total hardness (mgL^{-1})	Titrimetric method	APHA (1998)
10	pH	Electrometric / Cole Parmer Testr3	
11	Conductivity (µS/cm)	Philip PW9505 Conductivity meter	
12	Salinity (‰)	HANNA Instrument	APHA (1998)
13	Alkalinity (mgL^{-1})	Titration method	APHA (1998)
14	Acidity (mgL^{-1})	Titration method	APHA (1998)
15	Dissolved oxygen (mgL^{-1})	Titration method	APHA (1998)
16	Biological oxygen demand (mgL^{-1})	Incubation and Titration	APHA (1998)
17	Chemical oxygen demand (mgL^{-1})	Titration method	APHA (1998)
18	Nitrate – nitrogen (mgL^{-1})	Colorimetric method	APHA (1998)
19	Phosphate – phosphorus (mgL^{-1})	Colorimetric method	APHA (1998)
20	Sulphate (mgL^{-1})	Turbidimetric method	APHA (1998)
21	Silica (mgL^{-1})	Colorimeter (DR2010)	APHA (1998)
22	Calcium (mgL^{-1})	Titrimetric method	APHA (1998)
23	Magnesium (mgL^{-1})	Titrimetric method	APHA (1998)
24	Copper (mgL^{-1})	Atomic Absorption Spectrophotometer Perkin Elmer 5000 AAS	Perkin Elmer Application methods (2002)
25	Iron (mgL^{-1})	Atomic Absorption Spectrophotometer Perkin Elmer 5000 AAS	Perkin Elmer Application methods (2002)
26	Zinc (mgL^{-1})	Atomic Absorption Spectrophotometer Perkin Elmer 5000 AAS	Perkin Elmer Application methods (2002)
27	Chlorophyll *a* (µg/L)	Florometric method	APHA (1998)

Table 2 below presents the methods / device used in estimating the various environmental factors for this study with corresponding references.

Correlation Coefficient Values (r)

The Pearson correlation coefficient (r) (Ogeibu, 2005) for the relationship between the different environmental parameters and chlorophyll *a* were obtained using the formula:

$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{(n(\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2}}$$

Where
r = Coefficient of correlation
X and Y = Variables under consideration

Results.

The minimum and maximum values obtained for the estimates of environmental factors, their means and standard deviation are presents in Table 3. Also in Table 3 is whether each parameter recorded higher values in the wet or dry season for the two (2) years of study.

Air temperature values ranged between 26 and 34^{0}C throughout the sampling period. Whereas the lowest value estimated was 26^{0}C (September, 2006), the highest value obtained was 34^{0}C recorded in March of the same year. The lowest surface water temperature estimated was 25^{0}C (September, 2005) and the highest value obtained was 33^{0}C (May, 2005). Transparency was between 11 (March, 2006) and 280cm (December, 2004). Total dissolved solids ranged between 90 and 25000mg/L with the lowest value recorded in September, 2005 and the highest value in April, 2006. Total suspended solids values ranged between 18 (February, 2005) and 2310mg/ L (August, 2005). Rainfall volumes showed both monthly changes and varied from one year to the next. In the first year the highest rainfall volume was recorded in June 2005 (330mm) and the least was in February 2005 (8.9mm). In the second year the highest rainfall was in June 2006 (315.7mm) and the least in January 2006 (6.0mm). Recorded chloride values were between 20.5 (October, 2005) and 17710mg/L (April, 2006). Whereas the lowest value estimated for total hardness was 18mg/L (July, 2006) whereas the highest value obtained was 6875mg/L (December, 2005). Hydrogen ion concentration (pH) values ranged between 6.7 (June, 2006) and 8.42 (February, 2006) throughout the sampling period. Whereas the lowest conductivity estimated was 110µS/cm and recorded in October, 2004, the highest value obtained was 33092µS/cm recorded in April, 2006.

Salinity value ranged between 0.06 (October, 2004), and 35.1$^o/_{oo}$ (April, 2006). Alkalinity values were between 18 (August, 2006) and 311.2mg/L (February, 2005). Acidity estimates ranged between 3.8 and 60mg/L (November, 2005 and January, 2006) respectively.

Dissolved Oxygen values ranged between 4 (September, 2005) and 5.6mg/L (January, 2006) throughout the sampling period. Biological Oxygen Demand values ranged between 2 (March, 2005) and 22mg/L (September, 2006) throughout the sampling period. Chemical oxygen demand ranged between 8 (March, 2005) and 211mg/l (Feburary, 2006). Nitrate-nitrogen values werebetween 3.3 (November, 2005) and 59.8mg/L (June, 2006) whereas Phosphate-phosphorus recorded between 0.01mg/L (January, 2006) and 1.68mg/L (August, 2005). Sulphate values ranged between 20.8 (October, 2005) and 1160mg/L (January, 2006) throughout the sampling period. Silica values fell between 0.9 (August, 2005) and 6.0mg/L (September, 2006). Calcium levels were between 10mg/L in October, 2005 and 720.1mg/L in November, 2004. Magnesium estimates were between 1.4mg/L in July, 2006 and 981.1mg/L in January, 2005 and Copper values was between 0.001 (May through July 2005) and 0.09mg/L (August, 2005). Iron levels ranged between 0.06 and 1.08mg/L (October 2004). Zinc values ranged between 0.001 and 0.015mg/L (August, 2005).

Chlorophyll *a* values were between 4.2 and 55 µg/L. whereas the lowest value estimated was in June, 2005, the highest value obtained was recorded in November 2005. Chlorophyll *a* values showed a positive relationship with salinity (r = 0.21), transparency (r = 0.24), chloride (r = 0.21), total dissolved solids (r = 0.22), water temperature (r = 0.18), air temperature (r = 0.09), pH (r = 0.23), conductivity (r = 0.23), acidity (r = 0.10), alkalinity (r = 0.27), calcium (r = 0.17), magnesium (r = 0.27), nitrate (r = 0.11), chemical oxygen demand (r = 0.03), iron (r = 0.05) and sulphate (r = 0.20). A negative relationship existed between chlorophyll *a* and biological oxygen demand (r = -0.16), zinc (r = -0.02), copper (r = -0.04), total suspended solids (r = -0.07) and phosphates (r = -0.13) estimates. Table 4 shows the Seasonal variation in

Chlorophyll *a* values at the different stations in the Iyagbe lagoon from Dec., 2004 to Nov., 2006, Table 5 tabulates the Pearson correlation co-efficient matrix of environmental characteristics. Fig. 2: Seasonal variation in some environmental factors at four selected station each and chlorophyll *a* at the Iyagbe lagoon from Dec., 2004 to Nov., 2006. Stations represented were selected based on their importance as confluence points and areas exposed to possible anthropogenic stresses or not. Furthermore, Fig. 3 shows the Pearson correlation coefficient between chlorophyll *a* and environmental factors.

Table 3: A summary of the minimum, maximum and mean / standard deviation estimate values for environmental factors from the Iyagbe lagoon (December, 2004 – November, 2006).

	Parameter/ Unit	Minimum value	Maximum value	Mean value ± S.D.	Higher values reported in the ….
1	Air temperature (^oC)	26	34	30.07 ± 1.98	Dry season
2	Water temperature (^oC)	26	33	29.42 ± 1.81	Dry season
3	Transparency (cm)	22	231	102.42 ± 51.47	Dry season
4	Total Dissolved Solids (mgL^{-1})	90	25000	8467.65 ± 6641.66	Dry season
5	Total Suspended Solids (mgL^{-1})	18	2310	172.48 ± 259.01	Wet season
6	Rainfall (mm)	6	315.7	141.83 ± 116.87	Wet season
7	Chloride (mgL^{-1})	20.5	15015	6316.55 ± 24167.13	Dry season
8	Total hardness (mgL^{-1})	18	6875	2035.82 ± 1485.42	Dry season
9	pH	6.7	8.42	7.40 ± 0.28	Dry season
10	Conductivity (µS/cm)	110	40850	13208.59 ± 10418.71	Dry season
11	Salinity (‰)	0.06	35.1	14.43 ± 18.10	Dry season
12	Alkalinity (mgL^{-1})	15.3	330	74.32 ± 74.25	Dry season
13	Acidity (mgL^{-1})	3.8	44	11.80 ± 7.48	Dry season
14	Dissolved oxygen (mgL^{-1})	4	5.6	4.67 ± 0.23	Dry season
15	Biological oxygen demand (mgL^{-1})	2	22	7.15 ± 3.52	Wet season
16	Chemical oxygen demand (mgL^{-1})	8	89	30.21 ± 21.08	Wet season
17	Nitrate – nitrogen (mgL^{-1})	3.3	59.8	10.54 ± 8.37	Wet season
18	Phosphate – phosphorus (mgL^{-1})	0.01	1.68	0.26 ± 0.29	Wet season
19	Sulphate (mgL^{-1})	20.8	1140	279.71 ± 232.16	Wet season
20	Silica (mgL^{-1})	0.9	6.0	2.63 ± 0.91	Dry season
21	Calcium (mgL^{-1})	10	720.1	188.49 ± 130.05	Dry season
22	Magnesium (mgL^{-1})	1.4	900	333.36 ± 264.92	Dry season
23	Copper (mgL^{-1})	0.001	0.079	0.003 ± 0.001	Wet season
24	Iron (mgL^{-1})	0.06	1.08	0.29 ± 0.25	Wet season
25	Zinc (mgL^{-1})	0.001	0.015	0.002 ± 0.002	Wet season
26	Chlorophyll *a* (µg/L)	4.2	55	19.63 ± 7.90	Dry season

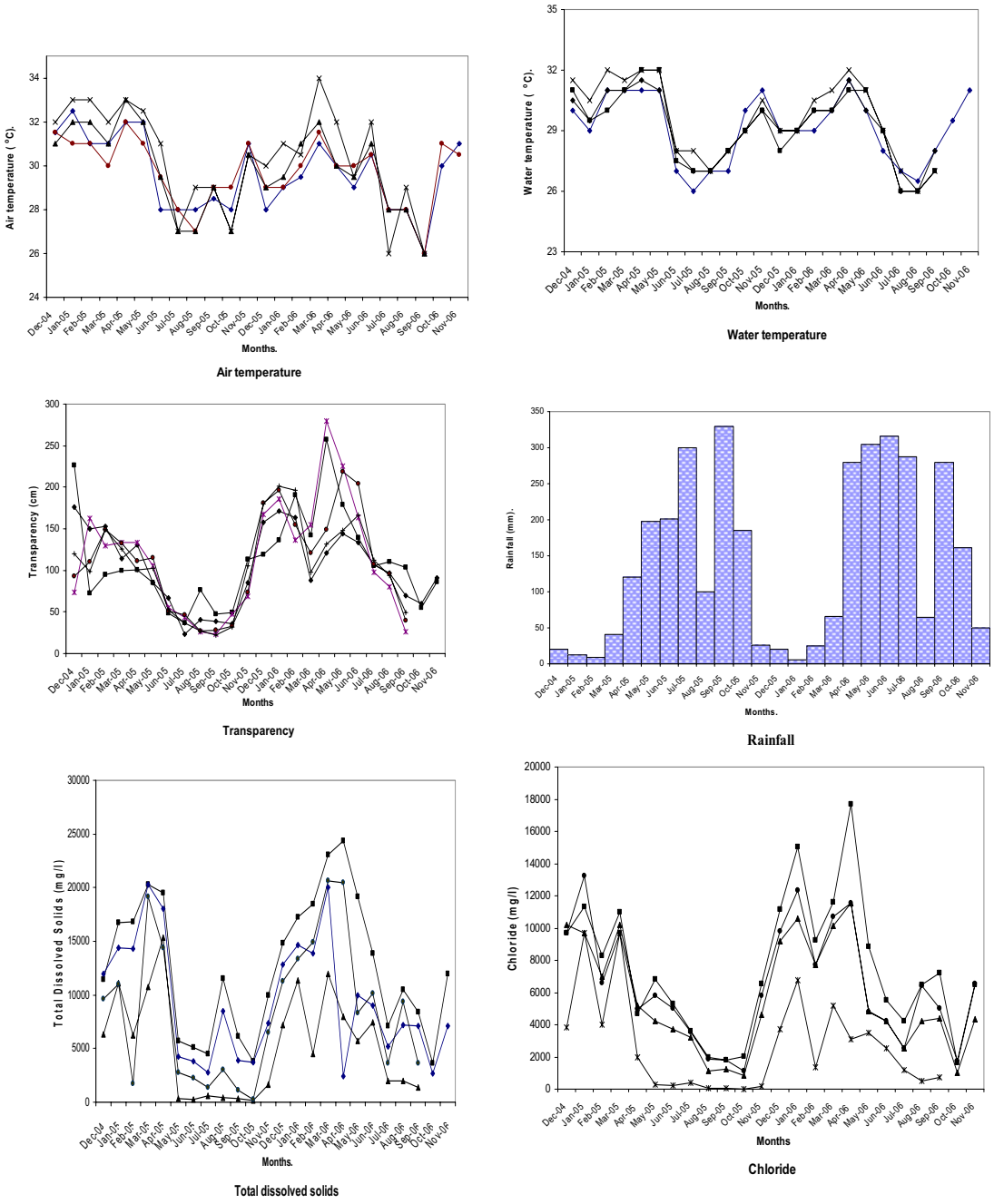

Fig. 2: Seasonal variation in some environmental factors and chlorophyll *a* at the Iyagbe lagoon from Oct., 2004 to Sept., 2006.

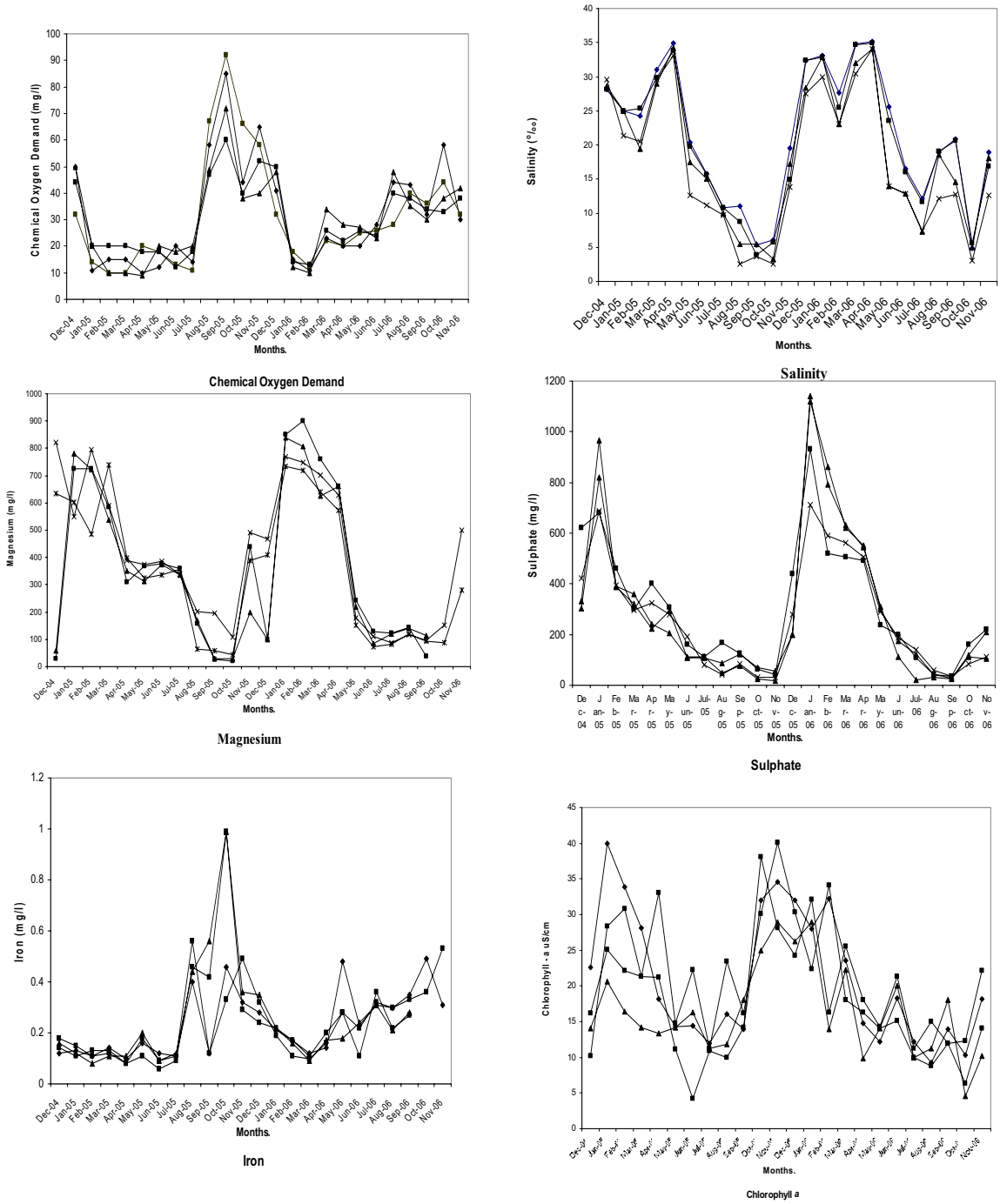

Fig. 2: Seasonal variation in some environmental factors and chlorophyll *a* at the Iyagbe lagoon from Oct., 2004 to Sept., 2006.

Fig 3: Pearson correlation coefficient between chlorophyll *a* and environmental factors.

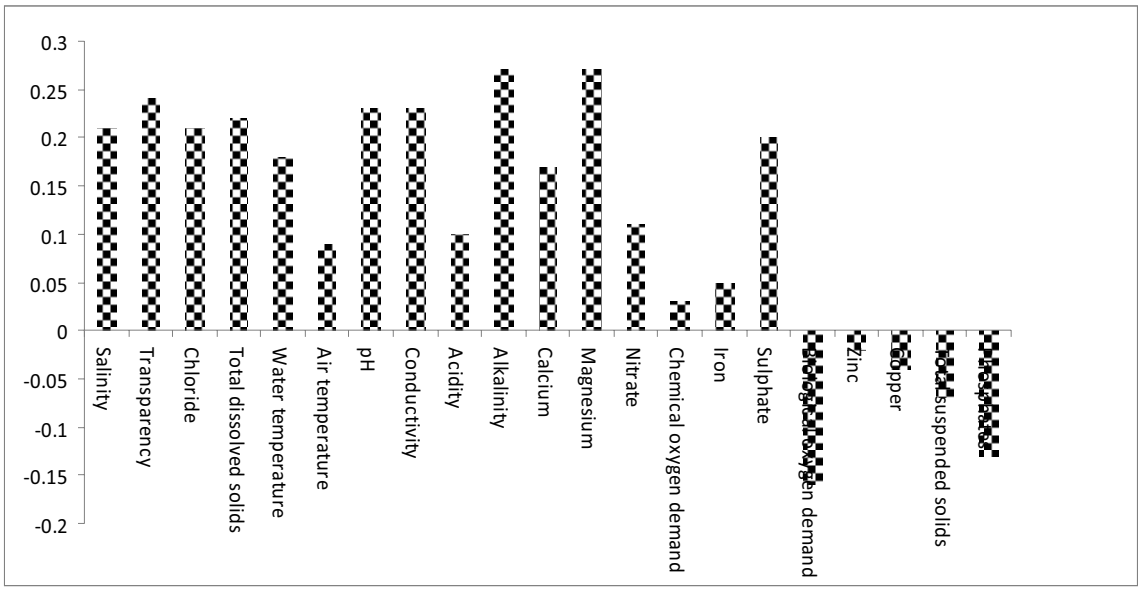

Table 4: Seasonal variation in Chlorophyll *a* values at the different stations in the Iyagbe lagoon, (Dec., 2004 – Nov., 2006).

	2004	2005														2006								
	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.
Calabash Island	22.6	40	33.9	28.1	18.2	14.3	14.4	12	16	14	32	34.6	32	28	32.2	23.6	14.8	12.2	18.3	12.2	9.3	14	10.3	18.2
Tincan Island	10.2	28.4	30.8	21.3	33.1	14.8	22.3	11.3	23.4	16.2	30.1	40.1	30.3	22.4	34.1	18	16.3	14.1	15.1	10	8.8	12	12.3	22.1
Ibafon	14.1	22.3	33.4	20.8	30	20.1	18.3	14.9	20.1	14.3	32.1	33.2	26	15.2	30.8	20.1	20.2	18.8	15.3	10.8	12.1	18	14.2	11
Imore	11.3	30.1	33.1	16.9	28.1	16.3	11.4	12.2	18.2	18.1	24	36	20.1	22	16	14.2	21.6	16.2	20	25	16.3	20	16.8	8.6
Ito-Ogba	19.2	22.4	28.6	14.8	20.1	14.1	16.3	16.4	12.6	11.3	33.2	30.8	22	18.9	14.2	22.3	25	20.1	32.3	22.6	28.1	13	14.2	11.3
Abule Oshun	18	21.3	15.1	18.3	20.6	15.2	19.2	14.4	10.7	18.3	34.1	26.1	20.3	30.2	21.3	26.1	28.1	21.6	30.6	18.4	15.2	16	11.1	10.3
Idiagbon	11.3	20.8	15.9	21.2	14.4	14.8	18.3	12.3	12.3	21.3	30.2	24.2	24.6	26.3	20.6	23.2	22.3	24.1	22.8	19.3	14.3	21	6.6	9.6
Iyagbe	12.1	21.2	20.3	15	21.3	16.3	16.2	14.2	14.1	10.2	39	50.1	22.9	24	13	28.4	33.2	23.8	22.4	10.2	12.1	16	4.9	8.3
Agbaja	14.8	22.3	16.2	18.1	16.8	14.1	14.8	18.6	10	16.3	33.3	22.6	33.6	33.4	14.2	20.1	29.3	20.6	28	16.8	16.3	11	18.2	9.4
Ikare	10.3	24.4	18.1	16.3	17.1	21.2	11.3	10.1	16	12.1	34	55	38.1	26	23	29.2	25.3	26.5	24.3	14.1	18.8	20	10	8.6
Ilashe	16.2	25.1	22.1	21.3	21.2	11.1	4.2	10.9	10	14.2	38.1	28.1	24.2	32.1	16.3	25.6	18.1	14.3	21.3	11.2	15	12	6.3	14.1
Idi-Mangoro	14.1	20.6	16.4	14.2	13.4	14.2	16.3	11.3	11.8	18.1	25	29	26.3	29	14	22.3	9.8	14.1	20	10	11.3	18	4.6	10.2

Table 5: Pearson correlation co-efficient matrix of environmental characteristics at the Iyagbe lagoon, Lagos (December, 2004 – November, 2006).

	Air temperature	Water temperature	Transparency	T.D.S.	T.S.S.	Chloride	Total hardness	pH	Conductivity	Salinity	Alkalinity	Acidity	D.O.	B.O.D.	C.O.D.	Nitrate	Phosphate	Sulphate	Silica	Calcium	Magnesium	Copper	Iron	Zinc	Chlorophyll *a*
Air temperature	1																								
Water temperature	0.77	1																							
Transparency	0.34	0.40	1																						
T.D.S.	0.35	0.39	0.54	1																					
T.S.S.	-0.18	-0.22	0.38	0.22	1																				
Chloride	0.06	0.10	0.20	0.17	-0.08	1																			
Total hardness	0.39	0.41	0.55	0.62	-0.19	0.20	1																		
pH	0.27	0.32	0.43	0.46	-0.19	0.16	0.60	1																	
Conductivity	0.40	0.44	0.57	0.96	-0.25	0.17	0.64	0.49	1																
Salinity	0.38	0.45	0.57	0.88	-0.29	0.17	0.73	0.48	0.89	1															
Alkalinity	0.34	0.26	0.41	0.28	-0.16	0.14	0.54	0.71	0.33	0.28	1														
Acidity	0.13	0.10	0.42	0.33	-0.24	0.13	0.38	0.48	0.33	0.32	0.64	1													
D. O.	-0.13	-0.07	0.19	0.18	-0.26	0.22	0.08	0.10	0.17	0.20	0.06	0.18	1												
B.O.D.	-0.39	-0.45	-0.38	-0.36	0.37	-0.14	-0.46	-0.25	-0.40	-0.45	-0.31	-0.36	-0.05	1											
C.O.D.	-0.25	-0.26	-0.18	-0.26	0.45	-0.07	-0.15	-0.09	-0.29	-0.27	-0.16	-0.26	-0.20	0.57	1										
Nitrate	-0.01	-0.04	0.25	0.18	0.20	0.22	0.27	0.33	0.15	0.18	0.34	0.45	0.14	-0.07	0.11	1									
Phosphate	-0.25	-0.24	-0.32	-0.28	0.50	-0.08	-0.31	-0.13	-0.32	-0.37	-0.26	-0.29	-0.07	0.54	0.36	0.00	1								
Sulphate	0.46	0.37	0.50	0.53	-0.18	0.15	0.60	0.56	0.55	0.57	0.67	0.58	0.16	-0.40	-0.23	0.49	-0.30	1							
Silica	-0.18	-0.14	0.12	-0.01	-0.36	-0.04	-0.19	-0.16	0.02	0.04	-0.17	0.03	0.12	0.02	-0.08	-0.24	-0.16	-0.17	1						
Calcium	0.41	0.43	0.33	0.49	-0.15	0.11	0.64	0.38	0.52	0.56	0.27	0.14	0.18	-0.35	-0.16	0.07	-0.24	0.35	-0.09	1					
Magnesium	0.45	0.43	0.46	0.64	-0.18	0.21	0.77	0.60	0.67	0.66	0.60	0.52	0.14	-0.51	-0.30	0.32	-0.34	0.70	-0.16	0.52	1				
Copper	-0.23	-0.29	-0.20	0.08	0.59	-0.04	-0.10	0.01	-0.11	-0.17	-0.04	-0.12	-0.04	0.38	0.34	0.20	0.53	-0.08	-0.31	-0.10	-0.12	1			
Iron	-0.21	-0.16	-0.35	0.44	0.11	-0.10	-0.38	-0.21	-0.47	-0.48	-0.28	-0.31	-0.08	0.43	0.22	-0.12	0.37	-0.44	-0.26	-0.33	-0.44	0.21	1		
Zinc	-0.11	-0.19	-0.27	-0.11	0.16	-0.07	-0.13	0.01	-0.14	-0.15	-0.03	-0.16	-0.02	0.46	0.24	-0.03	0.37	-0.06	-0.25	-0.09	-0.14	0.43	0.27	1	
Chlorophyll *a*	0.09	0.18	0.24	0.22	-0.07	0.12	0.33	0.23	0.23	0.21	0.27	0.10	0.09	-0.16	0.03	0.11	-0.13	0.20	-0.18	0.17	0.27	-0.04	0.05	-0.02	1

Discussion

The characteristics of environmental factors from this study shows clearly that the Iyagbe lagoon experiences environmental gradients likened to a tropical estuarine aquatic environments from year to year (Hill and Webb, 1958; Webb, 1960; Sandison and Hill, 1966; Kjerfve, 1994; Kirk and Lauder, 2000). Furthermore environmental factors of the lagoon exhibited seasonal changes that were closely related to the distributive pattern of rainfall of the region. For instance during the wet season, reduced levels for air and water temperatures, transparency, salinity, pH, total dissolved solids, conductivity, chloride, total hardness, sulphate, calcium, magnesium, acidity, total dissolved solids and alkalinity were recorded. Conversely, in the dry season the values for these parameters increased. Reduced rain events and its associated input of floodwaters from rivers, creeks, adjoining wetlands and the effect of tidal seawater incursion probably lead to this trend of environmental gradients. Reduced phytoplankton densities as reflected in chlorophyll *a* values in the wet season may be linked to the low water clarity which reduces the amount of light getting to planktonic algal component for photosynthesis. Higher chlorophyll *a* values recorded in the dry season is a pointer to improved water clarity at this time which probably allowed greater light penetration. According to Suzuki *et al*. (2002), low chlorophyll *a* values reflecting limited phytoplankton growth in an investigation of a Mexican lagoon were associated to dark water which reduced light penetration into the lagoon considerably.

Pearson correlation co-efficient showed positive correlation between chlorophyll *a* values, salinity, total dissolved solids, alkalinity, pH, conductivity, total hardness and chloride values among others. The flushing of planktonic algal forms towards the sea during the rains by flood waters and hence dilution, could also account for the low chlorophyll *a* values (phytoplankton densities) recorded at such times. The range of chlorophyll *a* values for the Iyagbe lagoon was between 12 and 55µg/l i.e between the mesotrophic and eutrophic productivity status (Suzuki *et al*., 2002, APHA, 1998). Furthermore, Ogamba *et al*., (2004) reported a chlorophyll *a* range of 0.15 – 37.4µg/l for the wet season and 0.10 and 40.28µg/l for the dry season in the Elechi creek in the Niger delta. Kadiri (1993) also reported a range of 4.20 – 35.20 mgm^{-3} for chlorophyll *a* for the Ikpoba reservoir in Benin.

Kadiri (1993) reported on the seasonal changes in the chlorophyll *a* situation of a shallow reservoir in Benin, Nigeria. Higher cloud cover situations attributed to the rainy season have been noted to impair chlorophyll *a* estimates (Kadiri, 1993) and phytoplankton biomass (Nwankwo, 1988) in some parts of the country. On the other hand, increases in insolation usually noted in the dry season likely encourage higher productivity, as recorded for this study. Furthermore, Onyema *et al*. (2003, 2007), are of the view that higher insolation, increased hydrological stability and marine situation are important encouraging factors for primary production in the Lagos lagoon. According to Kadiri (1993) seasonal fluctuation in abundance of phytoplankton is influenced by changes in the physical and chemical properties of the water which themselves can be dependent on rainfall. Similarly, sainfall and salinity are known to regulate the occurrence and distribution of biota in the Lagos lagoon and its associated creeks (Nwankwo and Onyema, 2003; Nwankwo, 2004).

Besides the ample availability of nutrients in this region, values for chlorophyll *a* were comparatively low especially in the wet season which likely indicated limited phytoplankton production. Similarly, Dissolved oxygen levels throughout the period of study were comparatively higher in the dry season than the wet season. It is possible that higher primary productivity necessarily resulted in higher chlorophyll *a* value and revealed a similar trend in dissolved oxygen values, since oxygen is a by-product of photosynthesis. It is possible to infere that chlorophyll *a* values from this study were largely determined by the trend and continuum of environmental characteristics of the lagoon which varies tidally and seasonally.

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Diversity and Distribution of Medicinal Plant Species in the Central Himalaya, India

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Abstract: In this study, we examined diversity and distribution of medicinal plant species richness between 200-5800m asl altitudes considering altitudinal gradients (200m asl altitudinal differences) in the Indian central Himalaya off which 126 were trees, 129 shrubs and 548 herbs. The total number of species, genera and families observed for herbs were maximum followed by tree and shrub species. In terms of species distribution Fabaceae and Rutaceae were found to be the most dominant family in tree species; Verbenaceae and Fabaceae in shrub species whereas in case of herb species, Asteraceae was found to be the dominant family. The total number of species including all growth forms was maximum near low altitude to mid altitude due to overlapping of climatic conditions, but further increase in altitude it decreased consistently, probably due to decrease in atmospheric temperature with increase in altitudes. [Researcher. 2009;1(1):61-73]. (ISSN: 1553-9865).

Key words: Plant species, diversity, distribution, altitude, central Himalaya

Introduction

Diversity, the variety and variability of plant and animal species are the most striking feature of life, which reflects the complexity, uniqueness, and intactness of natural ecosystems (Mohammad *et. al.,* 2000). An appropriate biodiversity management strategy should take into account the distribution patterns of species (Perring and Lovett 1999). Conservation of ecosystem and maintenance of biodiversity in central Himalaya is matter of both national and international concern.

Central Himalaya is one of the biodiversity rich states of India in terms of vegetation and flora varied altitude, topography, status of soil and climatic conditions which favors high species richness and support different forest types. Deciduous and evergreen tropical forests, subtropical, semi evergreen and sub tropical pine forest are the major forest type of this state (Champion & Seth, 1968). The wide geographical and climatic diversity provides a repository of valuable medicinal and wild edible plants of the region.

The use of the plant species of the Himalaya as medicine is known since the long time and about 1750 medicinal plants is reported from Indian Himalaya by Samant *et al.,* (1998). The unique diversity of medicinal plants in the region is manifested by the presence of a number of native (31%), endemic (15.5%) and threatened elements (14%) of total Red Data Book plant species of Indian Himalaya Region (Samant *et al.,* 1998). Plants provide food and other life supporting commodities and very important for survival of human beings and other organisms, besides they protect our environment and maintain nature. Tropical forests are major reservoir of plant diversity. Those forests inhabit a large number of trees, shrubs, herbs,

climbers, faunal, wealth and a wealth of non-timber forest products including medicinal and wild edible plants. The increased demand of medicinal plants in drug and pharmaceutical industries have caused the over exploitation of many species. Many of these are close to extinction due to over harvesting or un-skilled harvesting. Some important species that need immediate attention for conservation in India are *Aconitum, Angelica, Artemisia, Atropa, Berberis, Dectylorhiza, Thalictrum, Hedychium* etc. To maintain the ecosystem equilibrium, awareness of the sustainable utilization of these species is important and their conservation in sustainable environment is urgently needed, keeping in view the demand among the hill communities and their drugs in the global market (Samant and Dhar, 1997; Dubay *et al.,* 2004). Wide geographical and climatic diversity provides a repository of valuable medicinal and wild edible plants of this region. Therefore the present study is an effort to identify important medicinal plants in this region based on primary and secondary resources.

The objectives of the present study were (i) to find out species richness in relation to different altitudinal range (ii) to analyze the pattern plant species variation between 200 m altitudinal gradient (iii) to examine the variation in nature of plant forms in respect to altitude.

Material and Methods

The field survey was conducted in different forest sites surrounding the Nainital catchments of Kumaun region in the Central Himalaya and the information provided by the secondary resources (Samant *et al.*, 1998) and available literature (Chopra *et al.,* 1956). The study area is located between 79°23' and 79°42' E longitude and 29°20' and 29°30' N latitude between 1500m to 2600m elevations in central Himalaya. Five sites were selected in the wide elevation range along the gradient of disturbances. Several field trips were undertaken for collection of plants during different years.

The climate is monsoon temperate and annual rainfall of the area is 2668 mm/year. The mean maximum temperature varies from 13.9 (Feb) to 23.7°C (April) and the mean minimum from 4.9 (Feb) to 16.5°C (July). The monsoon strikes in this area in the middle of June to the middle of September, which sometimes extends to late September and first week of October. The bedrock belongs to the Krol formation consists predominantly of carbonate, limestone, marl and slates in the lower part and dolomites in the upper part (Valdia, 1980).

For moisture content, 50g of fresh soil was dried in an oven at 80°C temperature till constant weight (Misra, 1968). For determination of soil pH, soil extract was assessed by digital pH meter using 1:5 proportions of soil and water. Soil organic carbon was determined using the wet oxidation method (Jackson, 1958). Percentage of organic matter was obtained by multiplying the % of organic carbon by a factor of 1.724. This factor is based upon the assumption that the organic matter of soil contains 58% carbon (Misra, 1968). Nitrogen content of soil was determined by Kjel Auto Vs-KTP Nitrogen Analyzer based on a micro-Kjeldahl technique (Misra, 1968).

The vegetation analysis of each forest site was carried out by using 10, 10m × 10m quadrats placed randomly for tree layer. The number and size of the quadrats were determined by Running Mean

Method (Kershaw, 1973) and species area curve (Misra, 1968). Shrubs were sampled by using 10, 5m × 5m quadrats randomly. For the study of herbaceous vegetation, fifteen quadrats (1m × 1m) were placed on the above selected area in each of the forest/stands (hill-base, hill-slope and hill-top). Herbaceous vegetation was studied through tiller analysis. Each tiller of grasses was considered as an individual plant (Singh, 1967). In the case of creeping plant any unit of the plant having functional roots was considered as one plant. Vegetational data were analyzed following Curtis & McIntosh (1950), Species evenness (Margalef 1968), dominance (Simpson, 1949) and diversity (Shannon-Weaver, 1963) for the primary data.

Results and Discussion

Extensive survey of the locality of Central Himalayan region of Nainital area was made for the proposed study. A total of 166 species belonging to 61 family were recorded across the study sites, of which 16 were trees, 37 were shrubs and 113 were herbs (Table 1).

Percentage of sand in soil ranged from 50% to 65%. It was maximum in highly disturbed sites and reduced with decreasing disturbances. The value of silt and clay in different sites were 17.9-30% and 11-28.8% respectively. Moisture content of soil ranged from 29% to 65% and soil pH varied from 5.3 to 8.0. It was lower in the low elevation high-disturbed sites and higher in the high elevation less disturbed sites. There was no significant difference in the organic matter in high and less disturbed sites. It was comparatively higher in the oak forests towards higher elevations. The percentage value of carbon, nitrogen and organic matter in different sites were 1.2-3.4, 0.1-0.3 and 4.0-5.9, respectively. Percentage nitrogen also increased with increase in total organic matter.

Sandy loam soil is preponderance in lower elevation and clay loam in higher elevation (above 2200m asl). The pH of the soil was slightly acidic (6.65) to neutral (6.5-7), but in higher altitudes (above 2800-3000m asl) to medium (5.5-6) was strongly acidic. Organic matter content ranged from less than 1% to 4%. The soil moisture content varied from 21-43% at -3 bar water potential and 7.6-14.8% at -15bar water potential (Singh & Singh, 1987).

There was a positive relationship between shrubs and herbs diversity, and both increased with increasing disturbances. The tree, shrub and herb density were (5.1-9.5 ind/100m^2, 1.1-7.2 ind/25m^2 and 9.3- 34.7 ind/m^2 respectively. The diversity values for tree, shrub and herb species were ranged between 0.2-1.6, 1.9-3.3 and 3.2-4.0, respectively. ANOVA tests for tree, shrub and herb species (between species richness and diversity) showed significant variation at 5% level. Significant positive relations were found between moisture and density of shrubs ($P < 0.01$), and also moisture and density of herbs ($P < 0.05$). Equitability values for tree, shrub and herb species were 1.1-4.4, 12.7-19.4 and 16.7-28.8, respectively. The concentration of dominance in tree, shrub and herb species was 0.6-0.9, 0.2-0.6 and 0.08-0.6, respectively.

Based on secondary resources, a total of 777 species were found out of which a total of 126 tree species was encountered, belonging to 49 families and 52 genera. Fabaceae and Rutaceae were the most dominant family (with nine species) followed by Moraceae (with eight species), Rubiaceae (with seven species), Caesalpiniaceae (with six species), Meliaceae and Rosaceae (with five species), Anacardiaceae,

Bignoniaceae, Combretaceae, Lauraceae (with four species), Apocynaceae, Elaegnaceae, Fagaceae, Mimosaceae, Oleaceae, Pinaceae, Pistaciaceae, Sapindaceae (with three species), Burseraceae, Capparaceae, Euphorbiaceae, Mytricaceae, Pittosporaceae, Rhamnaceae, Tiliaceae (with two species), whereas the remaining 22 families were represented by one species each (Table 2).

The study showed that tree species distributed between <200-3600m asl altitude. At 200m asl altitudinal differences species ranged between 4 and 115 species, being minimum at 3400-3600 m asl and maximum at 1000-1200m asl and it declined thereafter with increasing altitude (Fig 1). A number of tree species found in the Himalaya showed varying patterns of distribution. The extension of climatic gradient enabled several species to realize their fullest range of elevational adaptability. Distributional ranges of several species were segregated along the widened altitudinal ranges (Singh & Singh, 1992).

A total of 129 shrub species was reported belonging 40 family 87 genera in which Verbenaceae and Fabaceae was the dominant family (nine species) followed by Asclepiadaceae (eight species), Apocynaceae, Berberidaceae, Caesalpiniaceae, Rosaceae (seven species), Euphorbiaceae (six species), Asparagaceae, Vitaceae (five species), Convolvulaceae, Loranthaceae, Periplocaceae, Rhamnaceae, Rutaceae, Urticaceae (three species), Celastraceae, Ericaceae, Myrsinaceae, Oleaceae, Polygonaceae, Rubiaceae, Solanaceae, Tiliaceae (two species) and 11 family represented by single species (Table 2).

Species richness of shrubs varied from <200 to 5600m asl altitudinal range. The distribution pattern of shrub species varied from 1(5400-5600m asl) to 73 (800-1200m asl) species. From 200-1200m asl, species richness increased sharply with altitude, thereafter species richness declined towards higher altitudes (Fig. 1).

Similarly, in case of herb species, a total of 548 belonging to 85 family were encountered. Asteraceae was the dominant family (with fifty-four species), followed by Lamiaceae (with thirty seven species), Poaceae (with twenty-nine species), Fabaceae, Orchidaceae(with twenty-seven species), Ranunculaceae (with twenty-two species), Apiaceae, Gentianaceae (with nineteen species), Solanaceae, Zingiberaceae Periplocaceae (with fifteen species), Scrophulariaceae, Euphorbiaceae (with thirteen species), Rubiaceae (with twelve species), Cucurbitaceae (with eleven species), Brassicaceae (with ten species), Convolvulaceae, Linaceae, Malvaceae, (with nine species), Alliaceae, Borginaceae (with eight species), Fumariaceae, Iridaceae (with six species), Acanthaceae, Geraniaceae, Violaceae, Rosaceae, Verbenaceae, Menispermaceae, Araceae (with five species), Amaranthaceae, Commelinaceae, Dioscoreaceae, Crassulaceae, Valerianaceae, Papaveraceae, (with four species), Caryophyllaceae, Chenopodiaceae, Geraniaceae, Mimosaceae, Papaveraceae, Polygonaceae (with three species), Achyranthaceae, Asclepiadaceae, Balsminaceae, Aristolochiaceae, Cannabaceae, Peperomiaceae, Leeaceae, Linaceae, Hypericaceae, Onagraceae, Hypodixaceae, Nyctaginaceae, Plumbaginaceae, Paranassiaceae, Piperaceae, Primulaceae, (with two species) whereas the remaining 26 families were represented by one species each (Table 2).

Herbs were the largest contributor of plant richness among the others forms and were distributed between <200-5800m asl. Herb richness ranged from 1 (5600-5800 m asl) and 202 (1400-1600m asl). The

herb richness declined slightly at an elevation of 2800-3000m asl; after that it increased slightly upto 3800m asl and subsequently it declines.

It is well fact that the altitude represents a complex gradient along which many environmental variables change concomitantly. However, in general, it has been suggested that an increase of 270m asl altitudes corresponds to a fall of 1ºC in mean atmospheric pressure upto 1500m asl, above which the fall is more rapid (Osmaston, 1927). Pangtey *et al*. (1991) argued the effect of monsoon is not substantially weakened at higher altitudes and also the amount of rainfall is not much different from that of the lower altitudinal range of central Himalaya.

There were pronounced effect of elevation on different edhapic factors (elevation vs. soil moisture content, elevation vs. soil pH) and total plant species richness and a positive relation between soil moisture and plant species richness of the area but there was no relationship found between soil pH and plant species richness (Kharkwal et al., 2005). On the other hand, the distribution of plant species depends mainly on the altitude and climatic variables like temperature, rainfall, which act as the sole determinant for the species richness in this region.

The pattern of proportions of family to genera, family to species and genera to species were found to be similar for primary and secondary resources (Table 3). Margalef's index for herb species in chir-pine was maximum. Shannon-Weaver index for species diversity showed a higher value for Kharsu oak forest (Table 4). Simpson index was higher for Tilonj-oak and Chir-pine than other forests indicating that few species were dominant in that forest type (Table 4). The Simpson index was higher for Tilonj-oak and Chir-pine forest as compared to other forest indicating lower stability of these forests. Whittaker value varied for all forest types.

The various parts of plant species are used for different purposes i.e. food for humans medicine, fuel, timber and multipurpose. For example, species of *Quercus* provide excellent fuel and timber, seeds of *Myrica esulenta*, rhizome of *Valeriana wallichii* and *Hedychium spicatum* etc are traded and are source of income generation in the area (Samant and Dhar, 1997). The results of the present study open new prospect of plant materials used in traditional medicine which will promote forest conservation and ecological research through surveys, development and implementation of land use plans by proper planting, afforestation, reforestation and forest rehabilitation. Such medicinal plants could also be incorporated into primary health care, as people generally feel safer with indigenous cures and also the costs of medicine would be much lesser than modern drugs.

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Table 1. A list of plants encountered in the study sites.

Species	Family	Habit
1. *Acer oblongum* Wall. ex DC.	Aceraceae	T
2. *Achyranthes aspera*	Amaranthaceae	H
3. *Achyranthes bidentata* Blume	Amaranthaceae	H
4. *Aesculus indica* (Colebr. ex Camb.) Hook.	Hippocastanaceae	T
5. *Ageratum houstonianum* Mill.	Asteraceae	H
6. *Agrimonia pilosa* Ledeb.	Rosaceae	H
7. *Ainsliaea aptera* DC.	Asteraceae	H
8. *Ainsliaea latifolia* (D. Don) Sch.-Bip.	Asteraceae	H
9. *Ajuga parviflora* Benth.	Lamiaceae	H
10. *Anaphalis busua* (Buch-Ham. ex D. Don) DC.	Asteraceae	H
11. *Anaphalis cinnamonea* Clarke	Asteraceae	H
12. *Anaphalis contorta* (D. Don) Hook. fil.	Asteraceae	H
13. *Anemone vitifolia* Buch.-Ham. ex DC.	Ranunculaceae	H
14. *Arisaema tortuosum* (Wall.) Schott	Araceae	H
15. *Artemisia nilagarica (*C.B. Clarke) Pamp.	Asteraceae	S
16. *Arthraxon prionodes* (Steud.) Dandy	Poaceae	H
17. *Arundinaria falcate* Nees	Poaceae	S
18. *Aster asperculus* (DC.) Hook. fil.	Asteraceae	H
19. *Aster thomsonii* Clarke	Asteraceae	H
20. *Athyrium foliolosum* Wall. ex Smith	Athyriaceae	H
21. *Athyrium rupicola* (Hope) C. Chr.	Athyriaceae	H
22. *Begonia picta* Smith	Begnoniaceae	H
23. *Berberis asiatica* Roxb. ex D. Don	Berberidaceae	S
24. *Bidens biternata* L.	Asteraceae	H
25. *Bidens pilosa* L.	Asteraceae	H
26. *Biota orientalis* (L.) Endl.	Cupressaceae	T
27. *Boenninghausenia albiflora* Reich. ex Meisn.	Rutaceae	S
28. *Bupleurum tenue* Buch.-Ham. ex D. Don	Apiaceae	H
29. *Campanula colorata* Wall.	Campanulaceae	H
30. *Carex cruciata* Wahlenb.	Cyperaceae	H
31. *Carex nubigena* Tilloch &Taylor	Cyperaceae	H
32. *Carpesium cernuum* L.	Asteraceae	H
33. *Carum anathifolium* Benth.	Apiaceae	H
34. *Cassia floribunda* Cav.	Caelapiniaceae	S
35. *Cassia laevigata* Willd.	Caesalpiniaceae	S
36. *Cassia mimosoides* L.	Caesalpiniaceae	H
37. *Cedrus deodara* (Roxb. ex D. Don) G. Don	Pinaceae	T
38. *Celtis tetrasperma* Roxb.	Ulmaceae	S
39. *Centella asiatica* (L.) Urban	Apiaceae	H
40. *Circaea alpina* L.	Onagraceae	H
41. *Circaea lutea* L.	Onagraceae	H
42. *Clinopodium umbrosum* (M. Bieb.) Koch	Lamiaceae	H
43. *Colquehonia coccinea* Wall.	Lamiacaea	S
44. *Commelina benghalensis* L.	Commelinaceae	H
45. *Conyza japonica* Thunb. Lessing ex DC.	Asteraceae	H
46. *Conyza stricta* Willd.	Asteraceae	H
47. *Coriaria nepalensis* Wall.	Coriariaceae	S
48. *Cornus oblonga* Wall.	Cornaceae	T
49. *Cotoneaster microphylla* Wall. ex Lindl.	Rosaceae	S
50. *Craniotome furcata* (Link) Kunze	Lamiaceae	H
51. *Crotalaria sessibiflora* L.	Fabaceae	H
52. *Cupressus torulosa* D. Don	Cupressaceae	T
53. *Cynoglossum glochidiatum* Wall. ex Benth.	Boraginaceae	H
54. *Cynoglossum lanceolatum* Forsk.	Boraginaceae	H

55. *Cyperus niveus* Retz.	Cyperaceae	H
56. *Daphne cannabina* Wall.	Thymelaeaceae	S
57. *Debregeasia longifolia* (Burm. fil.) Wedd.	Urticaceae	S
58. *Debregeasia salicifolia* (D. Don) Rendle	Urticaceae	S
59. *Desmodium multiflorus DC.*	Fabaceae	H
60. *Deutzia staminea* R.Br.	Saxifragaceae	S
61. *Dicliptera bupleuroides* Nees	Acanthaceae	H
62. *Dipsacus mites* D. Don	Dipsacaceae	H
63. *Epilobium royleanum* Haussk.	Onagraceae	H
64. *Epipactis latifoila* (L.) Alloini	Orchidaceae	H
65. *Erigeron bonariensis* L.	Asteraceae	H
66. *Erigeron annua* (L.) Pers.	Asteraceae	H
67. *Erigeron karvinskianus* DC.	Asteraceae	H
68. *Eupatorium adenophorum* Spreng.	Asteraceae	S
69. *Flemingia bracteata* (Roxb.) Wight	Fabaceae	H
70. *Flemingia involucrate* Benth.	Fabaceae	S
71. *Fragaria indica* Andrews	Rosaceae	H
72. *Fraxinus micrantha* Lingelsheim	Oleaceae	T
73. *Galinsoga ciliata* (Rafines.-Sch.) Blake	Asteraceae	H
74. *Galium aparina* L.	Rubiaceae	H
75. *Galium rotundifolium* L.	Rubiaceae	H
76. *Geranium nepalense* Sweet	Geraniaceae	H
77. *Geranium wallichianum* D. Don ex Sweet	Geraniaceae	H
78. *Gerbera gossypina* (Royle) G.Beauv.	Asteraceae	H
79. *Girardiana heterophylla* (Vahl) Decne.	Urticaceae	S
80. *Goodyera repens* (L.) R.Br.	Orchidaceae	H
81. *Habernaria latilabris* (Lindl.) Hook. fil.	Orchidaceae	H
82. *Hedychium spicatum* Buch.-Ham. ex J.E.Smith	Zingiberaceae	H
83. *Hypericum oblongifolium* Choisy	Hypericaceae	S
84. *Ilex dipyrena* Wall.	Equifoliaceae	T
85. *Indigofera heterantha* Wall. ex Brandis	Fabaceae	S
86. *Jasminum humile* L.	Oleaceae	S
87. *Justicia simplex* D. Don	Acanthaceae	H
88. *Lantana camara* L.	Verbenaceae	S
89. *Lepidium virginianum* L.	Brassicaceae	H
90. *Leucas lanata* Benth.	Lamiaceae	H
91. *Lindenbergia indica* (L.) Vatke	Scrophulariaceae	H
92. *Litsea umbrosa* Nees	Lauraceae	T
93. *Lonicera quinquelocularis* Hardw.	Caprifoliaceae	S
94. *Lychnis fimbricata* Wall. ex Benth.	Caryophyllaceae	H
95. *Lyonia ovalifolia* (Wall.) Drude	Ericaceae	T
96. *Meizotropis pellita* (Hook.fil. ex Prain) Sanjappa	Fabaceae	S
97. *Melissa fllava* Benth.	Lamiaceae	H
98. *Micromeria biflora* (Buch.-Ham.ex D. Don) Benth.	Lamiaceae	H
99. *Myrica esculenta* Buch.-Ham. ex D. Don	Myricaceae	T
100. *Myrsine Africana* L.	Myrsinaceae	S
101. *Neanotis calycina* (Wall. ex Hook.fil.) Lewis	Rubiaceae	H
102. *Nervilea crispate* (Blume) Schltr.	Orchidaceae	H
103. *Onchychium cryptogrammoides* C.Chr.	Cryptogrmmaceae	H
104. *Oplismenus compositus* (L.) P.Beauv.	Poaceae	H
105. *Origanum vulgare* L.	Lamiaceae	H
106. *Oryzopsis aequiglumis* Duthie ex Hook.fil.	Poaceae	H
107. *Oxalis corniculata* L.	Oxalidaceae	H
108. *Oxalis latifolia* BHK	Oxalidaceae	H
109. *Paris polyphylla* J.E.Smith	Liliaceae	H
110. *Pilea umbrosa* Wedd.	Urticaceae	H

111. *Pilea scripta* (Buch.-Ham.ex D. Don) Wedd.	Urticaceae	H
112. *Pimpinella acuminate* (Edgew.) Clarke	Apiaceae	H
113. *Pimpinella diversifolia* DC.	Apiaceae	H
114. *Pinus roxburghii* Sarg.	Pinaceae	T
115. *Platystemma violoides* Wall.	Gesneriaceae	H
116. *Plectranthus striatus* Benth.	Lamiaceae	H
117. *Plectranthus japonicus* (Burm.fil.) Koidz.	Lamiaceae	H
118. *Polycarpaea corymbosa* (L.) Lam.	Caryophyllaceae	H
119. *Polygonum hydropiper* L.	Polygonaceae	H
120. *Polygonum amplexicaule* D. Don	Polygonaceae	H
121. *Polygonum nepalense* Meisn.	Polygonaceae	H
122. *Potentilla nepalensis* Hook.	Rosaceae	H
123. *Pouzolzia hirta* (Blume) Hassk.	Urticaceae	H
124. *Prinsepia utilis* Royle	Rosaceae	S
125. *Pteris cretica* L.	Pteridaceae	H
126. *Pyracanthus crenulata* (D. Don) M.Roem.	Rosaceae	S
127. *Quercus floribunda* Lindl. ex Rehder	Fagaceae	T
128. *Quercus leucotrichophora* A. Camus	Fagaceae	T
129. *Quercus semecarpifolia* J.E. Smith	Fagaceae	T
130. *Randia tetrasperma* (Wall.) Hook.fil.	Rubiaceae	S
131. *Rhamnus virgata* Roxb.	Rhamnaceae	S
132. *Rhododendron arboretum* Smith	Ericaceae	T
133. *Rosa moschata* Mill. ex Herrm.	Rosaceae	S
134. *Roscoea purpurea* J. E. Smith	Zingiberaceae	H
135. *Rubus ellipticus* Smith	Rosaceae	S
136. *Rubus lasiocarpus* Smith	Rosaceae	S
137. *Rumex hastatus* D. Don	Polygonaceae	H
138. *Sanicula elata* Buch.-Ham. ex D. Don	Apiaceae	H
139. *Sarcococa hookeiana* Baill	Buxaceae	S
140. *Satyrium nepalense* D. Don	Orchidaceae	H
141. *Scutellaria angulosa* Benth.	Lamiaceae	H
142. *Sedum sinuatum* Royle ex Edgew.	Crassulaceae	H
143. *Selinum wallichianum* (DC.) Raizada & Saxena	Apiaceae	H
144. *Setaria glauca* (L.) P. Beauv.	Poaceae	H
145. *Setaria homonyma* (Steud.) Choiv.	Poaceae	H
146. *Siegesbeckia orientalis* L.	Asteraceae	H
147. *Smilax vaginata* Decne.	Smilacaceae	S
148. *Solidago virg-aurea* L.	Asteraceae	H
149. *Stachys sericea* Wall. ex Benth.	Lamiaceae	H
150. *Swertia pulchella* Buch.-Ham. ex D. Don	Gentianaceae	H
151. *Swertia ciliata* Burtt.	Gentianaceae	H
152. *Synotis rufinervis* (DC.) C. Jeffrey & Y.L.Chen	Asteraceae	H
153. *Teucrium royleanum* Wall. ex Benth.	Lamiaceae	H
154. *Thalictrum foliolosum* DC.	Ranunculaceae	H
155. *Themeda anathera* (Nees ex Steud.) Hack.	Poaceae	H
156. *Torenia cordiflora* Roxb.	Scrophulariaceae	H
157. *Torilis japonicus* (Houtt.) DC.	Apiaceae	H
158. *Urena lobata* L.	Malvaceae	H
159. *Utrica dioica* L.	Urticaceae	S
160. *Valeriana wallichii* DC.	Valerianaceae	H
161. *Viburnum continifolium* D. Don	Caprifoliaceae	S
162. *Viburnum coriaceum* Blume	Caprifoliaceae	S
163. *Viola canescens* Wall.	Violaceae	H
164. *Viola pilosa* Blume	Violaceae	H
165. *Wikstroemia canescens* Meisn.	Thymelaeaceace	S
166. *Wulfenia amherstiana* Benth.	Scrophulariaceae	H

Table 2. Family-wise contribution to genera and species

Species	Tree		Shrub		Herb	
	Genus	Species	Genus	Species	Genus	Species
Acanthaceae	-	-	1	1	1	5
Achyranthaceae	-	-	-	-	1	2
Agavaceae	-	-	1	1	-	-
Alangiaceae	1	1	-	-	-	-
Alliaceae	-	-	-	-	1	8
Amaranthaceae	-	-	-	-	2	4
Amaryllidaceae	-	-	-	-	1	1
Anacardiaceae	4	4	1	1	-	-
Annonaceae	3	3	-	-	-	-
Apiaceae	-	-	-	-	16	19
Apocynaceae	1	1	7	7	-	-
Araceae	-	-	-	-	4	5
Araliaceae	1	1	1	1	-	-
Arecaceae	3	3	-	-	-	-
Aristolochiaceae	-	-	-	-	1	1
Asclepiadaeae	-	-	6	8	2	2
Asparagaceae	-	-	3	5	-	-
Asteraceae	-	-	-	-	43	54
Athyriaceae	-	-	-	-	-	-
Balsminaceae	-	-	-	-	1	2
Berberdiaceae	-	-	2	7	-	-
Betulaceae	1	1	-	-	-	-
Bignoniaceae	3	4	-	-	-	-
Bombaceae	1	1	-	-	-	-
Borginaceae	-	-	-	-	7	8
Brassicaceae	-	-	-	-	8	10
Burseraeae	2	2	-	-	-	-
Caesalpiniaceae	3	6	3	7	1	1
Campanulaceae	-	-	-	-	-	-
Cannbaceae	-	-	-	-	2	2
Capparaceae	1	2	1	2	-	-
Caprifoliaceae	1	1	-	-	-	-
Cariaceae	-	-	-	-	1	1
Caryophyllaceae	-	-	-	-	3	3
Caryophyllaceae	-	-	-	-	3	3
Celastraceae	1	1	2	2	-	-
Chenopodiaceae	-	-	-	-	2	3
Clemaceae	-	-	-	-	1	1
Combretaceae	1	4	1	1	-	-
Commelinaceae	-	-	-	-	3	4
Convolvulaceae	-	-	2	3	7	9
Costaceae	-	-	-	-	1	1
Crassulaceae	-	-	-	-	2	4
Cryptogrammaceae	-	-	-	-	-	-
Cucurbitaceae	-	-	-	-	3	11
Cyperaceae	-	-	-	-	1	1
Dioscoreaceae	-	-	-	-	1	4
Dipsacaceae	-	-	-	-	-	-
Dipterocarpaceae	1	1	-	-	-	-
Droseraceae	-	-	-	-	1	1
Elaeagnaceae	3	3	1	1	-	-
Ephederaceae	-	-	1	1	-	-

Ericaceae	1	1	1	2	1	1
Euphorbiaceae	2	2	5	6	10	13
Fabaceae	7	9	6	9	16	27
Fagaceae	3	3	-	-	-	-
Fumariaceae	-	-	-	-	2	6
Gentianaceae	-	-	-	-	9	19
Geraniaceae	-	-	-	-	2	5
Hydrangeaceae	-	-	2	2	-	-
Hypericaceae	-	-	-	-	1	2
Hypoxidaceae	-	-	-	-	1	2
Iridaceae	-	-	-	-	3	6
Julandaceae	-	-	-	-	1	1
Lamiaceae	-	-	2	2	29	37
Lauraceae	4	4	-	-	-	-
Leeaceae	-	-	-	-	1	2
Liliaceae	-	-	-	-	12	16
Linaceae	-	-	-	-	2	2
Loranthaceae	-	-	2	3	-	-
Lythraceae	-	-	1	1	-	-
Malvaceae	1	1	3	6	8	9
Meliaceae	5	5	-	-	-	-
Menispermaceae	-	-	-	-	3	5
Mimosaceae	2	3	1	1	2	3
Molluginaceae	-	-	-	-	1	1
Moraceae	3	8	-	-	-	-
Morinaceae	-	-	-	-	1	1
Musaceae	-	-	-	-	1	1
Myricaceae	1	1	-	-	-	-
Myrsinaceae	-	-	2	2	-	-
Myrtaceae	2	2	-	-	-	-
Nelumbonaceae	-	-	-	-	1	1
Nyctaginaceae	-	-	-	-	2	2
Nymphaceae	-	-	-	-	1	1
Ochnaceae	1	1	-	-	-	-
Oleaceae	2	3	2	2	-	-
Onagraceae	-	-	-	-	2	2
Orchidaceae	-	-	-	-	12	27
Oxalidaceae	-	-	-	-	2	3
Paeoniaceae	-	-	-	-	1	1
Pandanaceae	1	1	-	-	-	-
Papaveraceae	-	-	-	-	3	4
Paranassiaceae	-	-	-	-	1	2
Pedaliaceae	-	-	-	-	1	1
Pedaliaceae	-	-	-	-	1	1
Peperomiaceae	-	-	-	-	1	2
Periplocaceae	-	-	3	3	5	15
Phytolaccaceae	-	-	-	-	1	1
Pinaceae	3	3	-	-	-	-
Piperaceae	-	-	-	-	1	6
Pistaciaceae	2	3	-	-	-	-
Pittosporaceae	1	2	-	-	-	-
Plumbaginaceae	-	-	-	-	1	2
Poaceae	-	-	-	-	24	29
Podophyllaceae	-	-	-	-	1	1
Polygonaceae	-	-	2	2	1	3
Portlaceae	-	-	-	-	1	1

Primulaceae	-	-	-	-	2	2
Punicaceae	1	1	-	-	-	-
Ranunculaceae	-	-	-	-	10	22
Rhamnaceae	1	2	2	3	-	-
Rosaceae	3	5	6	7	3	5
Rubiaceae	6	7	2	2	7	12
Rutaceae	7	9	3	3	1	1
Sapindaceae	3	3	1	1	1	1
Saxifragaceae	-	-	-	-	2	4
Scrophulariaceae	-	-	-	-	12	17
Simaroubaceae	1	1	-	-	-	-
Smilaceae	-	-	1	2	-	-
Solanaceae	-	-	2	2	7	15
Steruliaceae	1	1	-	-	-	-
Symplocaceae	1	1	-	-	-	-
Tamaricaceae	-	-	1	1	-	-
Taxaceae	1	1	-	-	-	-
Tiliaceae	1	2	2	2	-	-
Trilliaceae	-	-	-	-	1	1
Typhaceae	-	-	-	-	1	1
Ulmaceae	1	1	-	-	-	-
Urticaceae	-	-	2	3	3	5
Valerianaceae	-	-	-	-	2	3
Verbenaceae	1	1	6	9	3	5
Violaceae	-	-	-	-	2	5
Vitaceae	-	-	3	5	-	-
Zingiberaceae	-	-	-	-	6	15

Table 3. Ratios of species, genus and family

Ratio	Primary resources			Secondary resources		
	Tree	Shrub	Herb	Tree	Shrub	Herb
Genus: Species	1.14	1.09	1.30	2.42	1.48	1.56
Family: Species	1.23	1.44	3.05	2.57	3.23	6.45
Family: Genus	1.08	1.32	2.35	1.06	2.18	4.14

Table 4. Diversity indices of different forest sites

Forest	Layer	Margalef	Shannon-Weaver	Simpson	Whittaker
Chir-pine	Tree	1.85	0.22	1.83	1.5
	Shrub	16.22	2.29	0.62	2.18
	Herb	28.77	3.44	0.45	1.89
Chir-pine	Tree	1.12	0.63	0.97	1.5
	Shrub	19.44	3.27	0.62	5.26
	Herb	16.67	3.92	0.06	3.62
Banj oak	Tree	3.18	1.32	0.89	2.5
	Shrub	12.57	2.25	0.27	3.09
	Herb	22.43	3.66	0.34	2.06
Tilonj oak	Tree	3.36	0.53	3.36	1.67
	Shrub	14.41	1.99	0.32	2.5
	Herb	26.37	3.27	0.44	1.71
Kharsu oak	Tree	4.44	1.56	0.56	2.09
	Shrub	15.24	2.97	0.17	2.14
	Herb	18.87	4.00	0.08	2.12

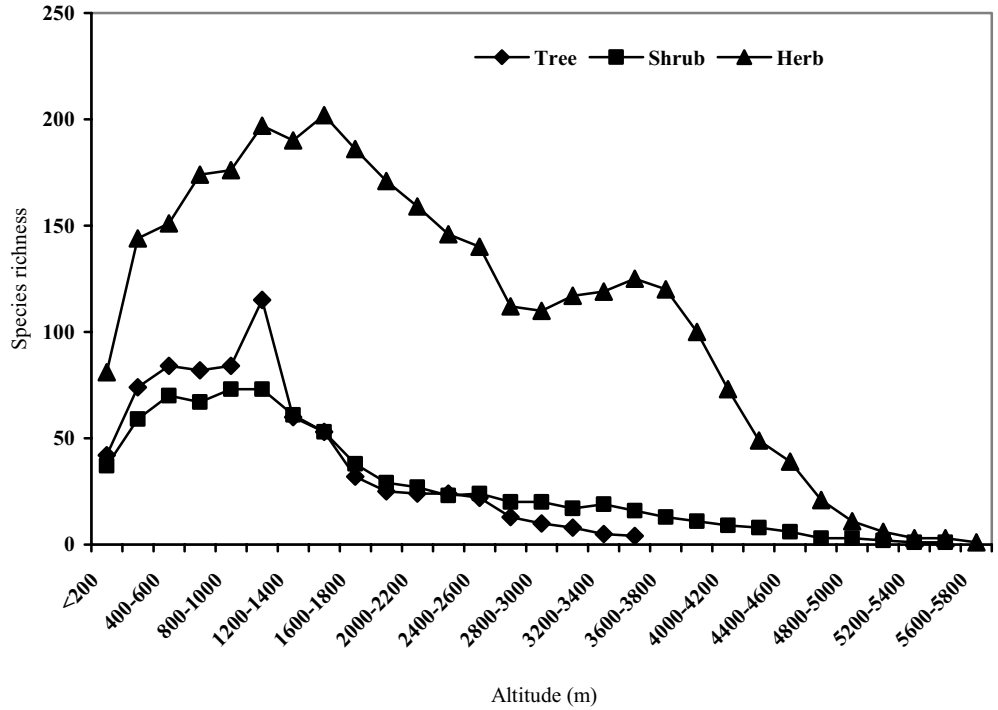

Figure 1. Total plant species richness in relation to altitude.

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Uniformly Convex Spaces

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ABSTARACT: This paper depicts the class OF Banach Spaces with normal structure and that they are generally referred to as uniformly convex spaces. A review of properties of a uniformly convex spaces is also examined with a view to show that all non-expansive mapping have a fixed point on this space. With the definition of uniformly convex spaces in mind, we also proved that some spaces are uniformly spaces. [Researcher. 2009;1(1):74-85]. (ISSN: 1553-9865).

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INTRODUCTION

The importance of Uniformly convex spaces in Applied Mathematics and Functional Analysis, it has developed into area of independent research, where several areas of Mathematics such as Homology theory, Degree theory and Differential Geometry have come to play a very significant role. [1,3,4]

Classes of Banach spaces with normal structure are those generally refer to as Uniformly convex spaces. In this paper, we review properties of the space and show that all non-expansive maps have a fixed-point on this space. [2]

Let x be a Banach Space. A Branch space x is said to be Uniformly convex if for $\varepsilon > 0$ there exist a $\partial = (\varepsilon) > 0$ such that if x, y £ x with //x//=1, //y//=1 and //x-y//$\geq \varepsilon$, then $// \frac{1}{2}(x+y) // \leq 1 - \partial$.

THEOREM (1.0)

Let x = $L_P(\mu)$ denote the space of measurable function f such that //f// are integrable, endowed with the norm.

$$// f // = (\partial x / f / \partial \mu)^{1/P}$$

Then for 1<P<+∞, the space $LP(\mu)$ is uniformly convex for the proof of the above theorem, we need the following basic lemma.

Lemma (1.0)

Let X=Lp, then for p q>0, such $\frac{1}{p} + \frac{1}{q} = 1$ and for each pair f, g £ x, the following inequalities hold.

(i) For $1<p\leq 2$

$$// \tfrac{1}{2}(f+g) // q + // \tfrac{1}{2}(f+g) // q \leq // 2^{-1}(// f // p + // g // q)$$

And

(ii) For $2 \leq p < \infty$

$$//(f+g // p + //(f-g // p \leq // 2^{-p}(// f // pp + // g // q)$$

We now apply lemma (1.0) to prove theorem (1.0)

Proof of theorem (1.0)

Choose $f_1 g \varepsilon X = Lp,$ such that $// f // \le 1, // g // \le 1$ and for any $\varepsilon > 0$, we have $// f - g // \ge \varepsilon$. Two cases arise:

Case1: $1 < p \le 2$

In this case (1.0) yield

$$// \tfrac{1}{2}(f+g) // q + // \tfrac{1}{2}(f-g) // q \le 2 - (q-1)(// f // p + // g //)^{q-1} //$$
$$\le 2 - (q-1)(2)(q-1) = 1$$

Thus, $// \tfrac{1}{2}(f+g) // q \le 1 - / \frac{f-g}{g} / q \le 1 - \frac{(\varepsilon)^q}{2}$

Or $// \tfrac{1}{2}(f+g) // \le 1 - \frac{(\varepsilon)^q}{2} //^{1/p > 0}$

So that by choosing $\delta = 1 - // \frac{(\varepsilon)}{2} //^{1/q} > 0$

We obtain $// \tfrac{1}{2}(f+g) // \le 1 - \delta$ and so $x = Lp(kp \le 2)$ is uniformly convex.

Case 2: $2 \le p < \infty$

As in Case 1, we use (ii) of Lemma (3.1.1) to show that $x = Lp(kp < \infty)$ is uniformly convex, completing the proof of the theorem.

Since Lemma (3.1.1) is also valid for 1p, $1 \le p < \infty$, the following theorem is also true.

Theorem (2.0)

For $1 \le p < \infty$, the space 1p of all infinite (real or complex) sequence, (x_1,x_2,x_3,……) such that $\sum_{i=1}^{\infty} / x_i / p < +\infty$ is uniformly convex. As a special case of theorem (1.0), we have the following.

Corollary (1.0)

Every Hibert space H is Uniformly convex. Although theorem (1.0) and (3.0) provide large classes of space which are Uniformly convex, a few well known spaces are known not to be Uniformly convex.

1. The Space λ is not Uniformly convex

To see this $\varepsilon = 1$ and choose $\pi(1,0,0,0,.....), // Y // \lambda_1 // \pi - Y // \lambda_1 = 2 > \varepsilon..$ However, $// \tfrac{1}{2}(\pi - Y // \le 1)$ and there is no $\varepsilon = 0$ such that $// \tfrac{1}{2}(X - Y // \le 1 - \delta$, showing that λ_1 is not uniformly convex.

2. The space λ_∞ is not uniformly convex

Consider $U = (1,1,0,0,0,.....,)$ and $V = (1,1,0,0,0,.....)$, Both U and V $\varepsilon \lambda_\infty$. Take $\varepsilon = 1$, then $// U // \infty = 1, // V // \infty$ and //U - V//$\infty = 2 > \varepsilon$. However, $// \tfrac{1}{2}(U - V) // = 1$ and so λ_∞ is not

uniformly convex.

3. Consider c(a,b) the space of real-valued continuous function on the compact interval (a,b) with Sup norm.

Then C (a,b) is not uniformly convex.

To see this, choose two function f(t), g(t) defined as follows:

F(t) = 1 for all $t\varepsilon(a,b)$

And

$g(t)=\frac{b-t}{b-a}$ for each $t\varepsilon(a,b)$

Take $\varepsilon=\frac{1}{2}$ clearly f(t), g(t) ε c(a, b). $// f //-// g // = 1$ and //f - g// $\Rightarrow \varepsilon$.

Also, $// \frac{1}{2}(f+g)// = 1$ and so c(a, b) is Not uniformly convex.

The following propositions are the consequences of the definition of uniform convexity.

Proposition (1.0)

Suppose x is Uniformly convex Banach space, then for any $\partial > 0, \varepsilon > 0$ arbitrary $\delta > 0$ such that $// \frac{1}{2}(x+y)// \leq \left\{1-\delta\frac{(\varepsilon)}{\partial}\right\}\partial$ Vectors x,y£x with //x// $\leq \partial$, //y// $\geq$, there exists a

Proof

Let $\varepsilon > 0$ be given and let $z_1 = x/\partial, z_2 = y/\partial$ and suppose we set $\varepsilon = \varepsilon/d$.

$// z_{\frac{1}{2}} // \leq 1$ and $//z_1 - z_2 // = \frac{1}{0} // x-y // \geq^{\varepsilon} / d = \varepsilon$

Now, by uniform convexity, we have

$= // \frac{1}{2} z_1 + z_2 // \leq 1-\delta(\varepsilon)$

$// \frac{1}{2}\partial(x+y)// \leq 1\delta\frac{(\varepsilon)}{4}$

That is

$$// \frac{1}{2}(x+y)// \leq \left\{1-\delta\frac{(\varepsilon)}{\partial}\right\}\partial$$

Which implies,

Proposition (2.0)

Let x be a uniformly convex Banach space. Then for any $\varepsilon > 0, \varepsilon > 0$ and $\partial\varepsilon(0,1)$ if x, yεX such that // x// $\leq \partial$, // x - y// $> \varepsilon$, then exist a;

$\delta = \partial\left(\varepsilon/\partial\right) > 0$ such that

$$// \alpha x + (1-\alpha)y //-2(\varepsilon)1/\partial \min\alpha, 1-\alpha)// d$$

Proof

Without loss of generality, we may take $\varepsilon\left(0, \frac{1}{2}\right)$

Now, $// \alpha x + (1-\alpha)y // = // \alpha(+y) + (1-2\alpha)// y //$

$$\leq 2\alpha // \frac{1}{2}(x+y)//+(1-2\alpha)// y // \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1.0)$$

But by proposition (1.0), we have that there exists a $\delta > 0$, such that $// \frac{1}{2}(x+y)// \leq //-\delta(\varepsilon)// \partial$

Substitute this into (1.0), to have

Since //y// $\leq \partial$ $= \left\{ \partial - 2\alpha\delta \frac{(\varepsilon)}{\partial} \partial \right\}$

$= \left(1 - 2\alpha\partial \frac{(\varepsilon)}{\partial} \partial \right)$

Put by the choice of $\alpha\varepsilon\left(0, \frac{1}{2}\right)$, have $\alpha \geq \min(\alpha, 1 - \alpha)$

Thus, we have,

$$// \alpha x + (1 - \alpha) // \leq // 1 - 2\delta \frac{(\varepsilon)}{\partial} \min(\alpha, 1 - \alpha) // \partial$$

We now discuss a characteristic of some Banach space, which is related to uniform convexity.

2.0 STRICTLY CONVEX BANACH SPACES

Definition (1.0)

A Banach space X is said to be strictly convex (or strictly rotund if for any pair of vecors x, y £ x, the equation //x + y//=//x+//y//, implies that there exists a $\lambda \geq 0$ such that $x = \lambda x \left(\text{or } y = \lambda x\right)$.

The following Lemma on uniform convexity will be useful in the sequence.

Lemma (1.0)

Let X be a uniformly convex Banach space.

If $\lambda + 0, // x - \lambda y // \geq 0$, then $// \frac{1}{2}(x + \lambda y) // \leq // x //$

Proof

Suppose $0 < // x // < // y //$. (The proof for the case $0 < // x // < // y //$ is similar).

Take $\lambda = \frac{// x //}{// y //}$ and set a = x, b = λy. The // a - b // = // x - λy // > 0,

Let $\varepsilon > 0$ such that //x - λy // $\geq \varepsilon$

Observe that,

$$// a // = //x//, // b // = \lambda // y // = \frac{// x //// y //}{// y //} = // x //$$

So by proposition (3.1.1), there exist a $\delta = \frac{\delta(\varepsilon) > 0}{// x //}$

Such that $// \frac{1}{2}(a + b) // < 1 - \frac{\partial(\varepsilon)}{// x //} // x // < // x //,$

That is $// \frac{1}{2}(x + y) // < // x //.$

Completing the proof of the lemma, we now prove the following theorem.

Theorem (1.2)

Every uniformly convex space is strictly convex

Proof

Suppose x is uniformly convex Let x, $y \varepsilon X$ be non-zero vectors such that //x+y//=//x//+//y//

We need to show that there exist $a\lambda > 0$ such that $x = \lambda y$. We consider two possible cases.

Case I: // x //=// y //

Case II: $0 < // y // < // x //$, (The other case $0 < // x // < / y //$ is treated)

Similarly,

Proof of Case I

If x=, then (II) holds with $\lambda = 1$, so, suppose $x \neq y$; then as $\frac{// x //}{// y //} = 1$ and // x+y //<2 //x // =+ // y // (Since // x // y //).

That is, // x + y // <1 // x // + //y //. Contradicting (I).

Thus, $x \neq y$ is not possible and this proves case I.

Proof of Case 2

Suppose // x=y // = // x // + // y // and that $x \neq \lambda y$. Since x is uniform convex, lemma (2.0) yields.

$$// \tfrac{1}{2}(x + \lambda y) // < // x // \quad \text{.....(1.1)}$$

For $0 < // y // < // x //$, let $\lambda = \frac{// x //}{// y //}$ $// x + y // = // x // + // y //$

And $x \neq \lambda y$

We have $\lambda(// x // + // y //) = \lambda // x + y // = // \lambda x + \lambda y - x + x //$

$$\leq // x + \lambda y // + (\lambda + 1) // x // \text{.....(1.2)}$$

That is, $\lambda(// x // + // y //) \leq // x // + \lambda // y // + \lambda // x // - // x //$

$$= \lambda(// x // + // y //) \text{.....(1.3)}$$

The inequalities (b) and (c) gives

$$\lambda(// x // + // y //) = // x + \lambda y // + (\lambda - 1) // x //$$

$$\lambda = \frac{// x //}{// y //} \tfrac{1}{2}(x + \lambda y) = // x //$$

From which we obtain (since Contracting (1.1). This completes the proof of the theorem.

Theorem (3.2.2) gives a large class of strict convex Banach spaces. However, it can be shown easily that $\lambda_1, L_1, \lambda_\infty$ and c(a,b) are NOT strictly convex. For example, to see that λ_∞ is not strictly convex.

3.0 THE MODLUS OF CONVEXITY

Definition (2.0)

Let x be a Banach space, the modulus of convexity of X is the function $\delta x : (0,2) \to (0,1)$ defined by $\delta x(\varepsilon) = Inf\left\{1 - // \tfrac{1}{2}(x + y) // : x, y \varepsilon BC(0), // x - y // \geq \varepsilon\right\}$.

We now give an important characteristic of the modulus of convexity in the following proposition.

Proposition (3.0)

The modulus of convexity of a Banach space x is a non-decreasing convex function.

Proof

The proof that $\delta x(\varepsilon)$ is non-decreasing is a trivial consequence of definition (2.0) and it is therefore omitted. To proof convexity, suppose for any two vectors U, $V \varepsilon X$, we denote by N(U,V) the set of all pairs x, ,$y \varepsilon X$ with x, $y \varepsilon B_1$ (0), such that for some real scalars α_1, B_1 we have

$$x - y = \alpha U$$

$$x + y = BV$$

That is $N(U,V) = \{(x, y) : x, y \varepsilon B_1(0) \text{ and } x - y = \alpha U, x + y = BV\}$

For $r\varepsilon(0,2)$, define

$$\delta(U,V,r) = \inf\left\{1 - \tfrac{1}{2} // x + y // \ldots\ldots\ldots, x, y\varepsilon N(U,V), // x - y // \geq r\right\} \ldots\ldots\ldots\ldots\ldots (1.4)$$

It is easy to see that $\delta(U,V,r) = 0$ for in (1.4)

$\{Since // x // = 1, \text{for all } x\varepsilon N(U,V)\}$

Moreover, of r, for given any λ_1, λ_2 in (0,2) and $\varepsilon > 0$, we can choose $(x_k y_k)\varepsilon N(U,V)$ such that $(\text{for } K = 1,2)$

$$// x_k, y_k // \geq \lambda_k \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1.5)$$

and

$$\delta(U,V,\lambda_k) + \tfrac{\varepsilon}{2} \geq 1 - \left(\tfrac{1}{2} // x_k + y_k //\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1.6)$$

The choice of (x_k, y_k) is possible because of the definition $\delta(U,V,\varepsilon)$ in (1.5) as infimum.

Now, for $\lambda x = (0,1)$

Let $x_3 = \lambda x_1 + (1-\lambda)x_2$

And $y_3 = \lambda y_1 + (1-\lambda)y_2$

We have $// x_3 // \leq \lambda // x_1 // + (1-\lambda) // \leq 1 \; Cas \; x_1, x_2 \overline{B_1(0)}$

Similarly

Also, $(x_k, y_k)\varepsilon N(U,V)$ implies that exist constants $\alpha_k, \beta_k \;\; (k = 1,2)$ such that

$$x_k - y_k = \alpha_k U$$

and $x_k - y_k = \beta_k V$

From (1.6), we have

$$\begin{aligned} x_3 - y_3 &= \lambda x_1 + (1-y)x_2 + \lambda y_1 - (1-y)y_2 \\ &= \lambda(x_1 - y_1) + (1-y)(x_2 - y_2) \\ &= \lambda\alpha_1 U + (1-y)\alpha_2 U, \qquad \text{from} \ldots\ldots\ldots\ldots\ldots (1.7) \\ &= //\lambda\alpha_1 + (1-y)\alpha_2 // U \end{aligned}$$

If we set q= $\lambda\alpha_1 + (1-\lambda)\alpha_2, q$ some real number,

We have

$$\begin{aligned} x_3 - y_3 &= \lambda x_1 + (1-y)x_2 + \lambda y_1 - (1-y)y_2 \\ &= \lambda(x_1 + y_1) + (1-\lambda)(x_2 + y_2) \\ &= \lambda\beta_1 V + (1-\lambda)\beta_2 V \qquad \ldots\ldots\ldots\ldots\ldots (1.8) \\ &= //\lambda\beta_1 + (1-\lambda)\beta_2 // V \end{aligned}$$

So that for some real number $\gamma = \lambda\beta_1 + (1-\lambda)\beta_2$

We have

$$\begin{aligned} &= \lambda\alpha_1 + (1-\lambda)\alpha_2 // U // \\ &= // \lambda\alpha_1 + (1-\lambda)\alpha_2 // U // \\ // x_3 - y_3 // \quad &= \lambda\alpha_1 // U // + (1-\lambda)\alpha_2 // U // \\ &= \lambda // \alpha_1 U // + (1-\lambda) // \alpha_2 U // \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1.9) \end{aligned}$$

So that we have

$$= \lambda\beta_1 + (1-\lambda)\beta_2 \,//\, v \,//$$

$$-//\, x_3 + y_3 \,// \quad = //\, \lambda\beta_1 + (1-\lambda)\beta_2 \,//\, v \,//$$

$$= //\, \beta_1 v + (1-\lambda)//\, \beta_2 v$$

$$= \lambda\,//\, x_1 + y_1 \,// + (1-\lambda)//\, x_2 + y_2 \,// \ldots\ldots\ldots\ldots\ldots\ldots\ldots(1.10)$$

Now making use of (3.3.9), we get

$$//\, x_3 - y_3 \,// \geq \lambda\varepsilon_1 (1-\lambda)\varepsilon_2$$

But then (1.7) and (1.8) give

$$\delta(u, v, \lambda\varepsilon_1 + (1-\lambda)\varepsilon_2) \leq 1 - \tfrac{1}{2} //\, x_3 + y_3 \,//$$

$$= 1 - \tfrac{1}{2} //\, \lambda\,//\, x_1 + y_1 \,// + (1-\lambda)//\, x_2 + y_2 \,//$$

$$= 1 - \lambda/2 //\, x_1 + y_1 \,// - \tfrac{1}{2} + (1-\lambda)//\, x_2 + y_2 \,//$$

$$= \lambda\left(1 - \tfrac{1}{2}\right)//\, x_1 + y_1 \,// + (1-\lambda)\left(1 - \tfrac{1}{2} //\, x_2 + y_2 \,//\right)$$

$$\leq \lambda(u, v, \lambda\varepsilon_1) + \tfrac{8}{2} // + (1-\lambda)//\, \delta(u, v, \lambda\varepsilon_2 + \varepsilon/2 \,//$$ .....(1.11)

From (1.0)

$$= \lambda\delta(u, v, \lambda\varepsilon_1) + (1-\lambda)\delta(u, v, \varepsilon_2) + \varepsilon/2$$

Now since ε is arbitrary, we infer that

$$= \delta(u, v, \lambda\varepsilon_1 + (1-\lambda)\varepsilon_2) \leq \lambda\delta(u, v, \varepsilon_1) + (1-\lambda)\delta(u, v, \varepsilon_2)$$

Thus, (u, v, ε) is convex. Now from the definitions of N(u, v) and δ (u, v, ε) each pair (x, y) $\varepsilon\, \overline{B}\,(0) x\, \overline{B}\,(0)$.

Belong to some N(u, v), so that we have

$\delta\, x(\varepsilon) = Inf\{\delta(u, v, \varepsilon) : U, V_\varepsilon \varepsilon X, u \neq 0, v \neq 0$ and as $\delta(u, v, \varepsilon)$ is convex, So is $\delta\, x(\varepsilon)$

For the next proposition, we need the following lemma.

Lemma (2.0)

Suppose $f : (0,2) \to (0,1)$ is non-decreasing convex function and $0 \leq u < x < y \leq 2$ then

$$\frac{f(u) - f(v)}{v - u} \leq \frac{f(v) - f(x)}{y - x}$$

Proof

We can choose $\alpha\beta_\varepsilon (0,1)$ such that

$$V = \alpha u + (1-\alpha)y \text{ and}$$

$$U = \beta v + (1-\beta)y \ldots\ldots\ldots\ldots\ldots\ldots(1.11)$$

$$\frac{f(v) - f(u)}{(v - u)} = \frac{f//\alpha u + (1-\alpha)y}{\alpha u + (1-\alpha)y - u} \quad \text{from (1.11)}$$

$$\leq \frac{\alpha f(u) + (1-\alpha) f(y) - f(u)}{\alpha u + (1-\alpha)y - u} \text{ as if is}$$

$$\frac{(1-\alpha) f(y) - (1-\alpha) f(u)}{(1-\alpha)(y - u)}$$

$$\frac{f(y) - f(u)}{y - u} = \frac{\beta(f(y) - f(u))}{\beta(y - u)}$$

$$= \frac{\beta f(y) - \beta f(u)}{y - x} \quad \text{from (1.11)}$$

$$= \frac{f(y) - \beta f(u) + \beta f(y) - f(y)}{y - x}$$

That is,

$$\frac{f(v) - f(u)}{v - u} \le \frac{f(y) - // \beta f(u)}{y - x} + (1 - \beta) + (1 - \beta) f(y) // \text{.....(1.12)}$$

But since f is convex we get from (1.11)

Hence, (1.12) leads to

$$\frac{f(v) - f(u)}{v - u} \le \frac{f(y) - f(x)}{y - x}$$

We now prove the following proposition

Proposition (3.0)

Let $f : (0,2) \to (0,1)$ be a non-decreasing convex function with f(0) = 0. Then for each x>2, f is continuous and has Lipschitz constant $(2-x)^{-1}$

Proof

As any point in the domain of f, r $\varepsilon (0,2)$, say is finite and f is non-decreasing then at each x>2, the right derivative f^{l} r(x) of f exists (See Rockfella).

Thus, for v<x<2, we have by definition f^{l} r(v+)

$$\lim_{x \to v} \frac{f(x) - f(v)}{x - v} \le \lim_{x \to v} \frac{f(2) - f(x)}{2 - x}$$ by Lemma (1.11)

$$= \frac{f(2) - f(v)}{2 - v}$$

$$= \frac{(1 - \alpha) f(y) - (1 - \alpha) f(u)}{(1 - \alpha)(y - u)}$$

$$\frac{f(y) - f(u)}{y - u} = \frac{\beta(f(y) - f(u))}{\beta(y - u)}$$

$$\frac{\beta(f(y) - \beta f(u))}{y - x}$$ from above

$$= \frac{f(y) - f(u) + f(y)}{y - x} - f(y) \text{ .....(1.13)}$$

That is,

$$\frac{f(v) - f(u)}{v - u} \le \frac{f(y) - // \beta f(u) (1 - \beta) f(y) //}{y - x} \text{.....(1.14)}$$

But since f is convex, we get from (1.12)

$$f(x) = f // \beta u + (1 - \beta) y // \le \beta f(u) + (1 - \beta) f(y) //$$

Hence, (3.3.12) leads to

$$\frac{f(v) - f(u)}{v - u} \le \frac{f(y) - f(x)}{y - x}$$

We now prove the following proposition

Proposition (4.0)

Let $f : (0,2) \to (0,1)$ be a non-decreasing convex function with f(0) = 0. Then for each x>2, f is continuous and has Lipschitz constant $(2-x)^{-1}$

That is $= f^{1}r(v) \leq \frac{f(2)-f(v)}{2-v} \leq \frac{1}{2 - v}$

Replacing v by x, we have

$= f^{1}r(v) \leq \frac{1}{2 - x}$

Now, by the mean value theorem, for all $x,y\,\varepsilon(0,2)$ we have $// f(x) - f(y)// \leq // f(\varepsilon)// x - y //$ for some $\varepsilon(x, y)$

$\leq \frac{1}{2 - x}$ //x - y// from (A)

That is $// f(x) - f(y)// \leq (2 - x)^{-1})// x - y //$

So that the function f is Lipschitz constant $(2-x)^{-1}$ on each interval (0,x).

The following proposition is also of interested

Proposition (5.0)

The Banach space x is uniformly convex if and only if $\delta x(\varepsilon) > 0$ for all $_{\varepsilon}\,\varepsilon(0,2)$

Proof

Suppose x is uniformly convex, then if $x, y\varepsilon X$ with $//x// \leq 1, //y// \leq 1$ and $//x - y// \geq \varepsilon$ we have

$// \frac{1}{2}(x + y)// \leq 1 - \delta$, for $\delta > 0$

Now , $\delta x(\varepsilon) = Inf\,(1 - //x + y//, //x - y// \geq \varepsilon, //x// \leq 1, //y// \leq 1.$

$\leq //1 - (1 - \delta)// = \delta > 0$

Let $\delta x(\varepsilon) > 0$ for $r\varepsilon(0,2)$ and choose x, $y\varepsilon x$ such that

$// x // \leq 1, //y // \leq 1$ and $//x - y // \geq \varepsilon$

By definition

$$\delta x(\varepsilon) = Inf\left\{1 - // \tfrac{1}{2}(x + y)// : x, y\varepsilon \overline{B}\,\overline{(0)} \text{ and } //x - y// \geq\right\} > 0$$

This implies that for all $x, y\varepsilon \overline{B}\,\overline{(0)}$ with

$// x - y// \geq \varepsilon, 1 - // \frac{1}{2}(x + y)\,\delta x(\varepsilon)$

This implies that there exists a $\delta > 0$ such that

$1 - // \frac{1}{2}(x + y)// \leq 1 - \delta, \delta > 0$

Which implies uniform convexity

4.0 NORMAL STRUCTURE AND REFELEXIVITY OF BANACH SPACES

In this section, we deal with some other geometric properties which are important in studying the fixed point theory of non-expansive mapping.

Let C be a bounded convex subset of a Banach spacex.

The diameter d of c is define by

D = Sup{// zi-zj //, zj, ziCA}

A point $Zo \in X$ is said to be a diameter point of C

If Sup $\{// z_0 - z // : z \in\} = d$

And a point $z^{*} \in x$ is called a non-diamental point of c

If Sup $\{// z^{*} - z // : z \in -C\} <$ Sup $\{//zi - zj// : zi, zj \in C\}$

Definition 3.0

A bounded convex subset of Banach space is said to have normal structure if for each

convex subset x of C, consisting of more than one point A, contains a non-diamental point that is there exists a $z_0 \in A$.

Such that Sup $\{// z_0 - z // : z \in C\} < \text{Sup}\{//\text{zi - zj}// : \text{zi, zj} \in \text{A}\}$

Geometrically, C is said to have normal structure if for every convex, C subset A of C there exist a ball whose radius is less than diameter of A centered at a point of A which contains A.

In the following, we exhibit large classes of spaces with normal structure.

Proposition (6.0)

Every uniformly convex set in X, containing as least two different point Z_1, Z_2. Suppose ∂ is the diameter of C and $z_0 = \frac{1}{2}(Z_1 + Z_2)$ for any $Z \in C$, proposition (1.2) given us, from

$$// z - z_1 // \leq \partial; //Z_1 - Z_2 // \leq \partial \qquad = //Z - Z_0 // \leq \frac{\{1 - \delta(// Z_1 - Z_2 //)\}}{0}$$

$$\frac{1}{2}\{(z - Z_1) + (Z - Z_2)\} = \frac{1}{2}\{(Z - Z_2)\}$$

Since $= z - z_0$

The above inequality implies that C is contained in the ball of radius, say, r, less than ∂ centered at Z_0, that is, $Z \in B(Z_0, r) \rightarrow C \subseteq B_r(Z_0)$.

Where $r = Sup\{// z_0 - z // : z \in C\}$

Proposition (7.0)

Every convex and impact subset of a Banach space normal structure.

Proof

We proof this by this contradiction that is, we shall assume that a compact convex subset of C of a Banach space X does not have normal structure. Then we shall generate a sequence, which will contradict the hypothesis of compactness.

Suppose C does not have normal structure, then we may assume that all point of C are diamental for C. let Z_0 be the diameter of C, we shall construct a sequence Z, Z_2,……. Of point of C that

$$// Z_i - Z_j // = d \quad (\text{i, j} = 1,2,.....\text{i} \neq \text{j})$$

To do this, we choose $Z_1 \in C$ arbitrary and assume that Z_2, Z_3,…….Z_n have already been chosen.

By the convexity of C

$\frac{1}{n}(Z_1 + ... + Z_n)$ is a point of C and thus by assumption, is diamental for C. by the compactness of C, the "Sup" is achieved in C so that we can find a point $Z, Z_{n+1} \in C$ such that

$$\frac{// Z_{n+1} - Z_1 + ... + Z_n //}{n} \qquad = \text{d}$$

Consequently, $//Z_{n+1} - Z_j // = \text{d}$ for j =1..,…

Which means that the sequences $/\{Z_n\}$ $n \geq 1$ has no convergent subsequence, and thus has no cluster value in C. this contradicts the compactness of C and completes the proof.

We observe that if a convex set C has normal structure, then so does every convex subset of C. in particular, if the whole space X has normal structure, then every convex subset of X has normal structure. This follows from the definition.

Some Banach space does not have the following.

Example

1. The Space X = C(0,1) with Sup norm does not have normal structure.
2. The space X = L_1 (0,2π) does not have normal structure.
3. The space X = I_1 does not have normal structure. Is called a retracting mapping.

Definition (3.4.10)

X is a retract of Y, if XCY and there exist a continuous mapping α.

Lemma (3.4.10)

Let M be a closed convex subset of a Hilbert space. If T is a non-expansive mapping of M into H, then I-T is a restriction to M of a monotone operator.

Proof

Let r be the metric retraction of H into H, for $x, y \in H$.

(I-Tr)x – (I-TR), x-y)

=//x-y//^{2} – (Trx-Try, x-y)

$\geq$ // x - y//^{2} – //Trx - Try// //x - y//

≥ 0

I-Tr is monotone

The retraction to M I – Tr is I – T

Lemma (3.4.10)**

If T is monotone and X_0 and Y_0 are normal of H such that Tx = Y_0

Proof

For any Y in H and T>0

Let $y_t = X_0 + ty_0$

With y- y_t then $(Ty_t - y_0, y) \geq 0$ so that

$(Ty_t - y_0, y) \geq (y_0 Tx_0, y)$

Let $t \to 0^+$, then $Ty_t \to Ty_0$

So that $(y_0 Tx_0, y)$

Then Y_0 = Tx

(3.4.11) Conjectures

(1) Let M be a be a convex subset of a normal linear space L let T be a non-expansive mapping on M into L, Then for 0<t<1, the mapping St = tI(1- t)T is non-expansive and the same set of fixed points is T.

If TMCM, then St <Cm

In fact, by kransnoseleki, we have the following conjectives.

(2). Consider a mapping

$T : M \to L$, Where T is non-expensive, L is a normed linear space MCL and convex, then if

$G = \frac{1}{2}(I + T)$, G is non-expansive and the exists $X^* \varepsilon M$ such that $GX^* = X^*$

Also, $X_{n+1} = \lambda_{xm} + (1 - \lambda)T_{xn}$

$\lambda \varepsilon (0,1)$ is true in a uniformly convex space.

Conclusion

We have examined in this paper project, the non-expansive mapping and the fixed point theorem. We have also been able to show that classes Banach of spaces with normal structures are examples of uniformly convex spaces. Thus, the Lp space $(1 < p < \infty)$ are classical examples of uniformly convex spaces.

Therefore, is application a non-expensive operator will have solution on these spaces.

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Expression of Heat Shock Proteins25, 60, 70 and 90 in Rat Myocardium Following Transmyocardial Laser Revascularization

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Abstract: Background: Transmyocardial laser revascularization has been shown to relieve symptomatic ischemia but laser tissue effects have potential complications. In order to define the mechanism of laser action, heat shock protein (hsp) expression was evaluated in rat hearts after Transmyocardial laser revascularization. **Methods:** Under general anesthesia, hearts were removed from 10 rats and immediately placed in oxygenated physiologic buffered solution (PBS) at 0°C. After the various treatments, hearts were homogenized and hsp25, 60, 70 and 90 were measured with Western Blotting. Group 1 (n=3) hearts were immediately homogenized; Group 2 (n=3) hearts were perfused with the PBS in a Langendorff setup for 6 h; Group 3 (n=3) hearts were lased (50 channels) using a Ho:Yag laser via a 600 m core fiber at 3 Hz and 280 mJ/pulse and perfused up to 6 h. Group 4 (n=1) rat was heated to 42°C for 15 min then recovered at 23°C for 6h prior to hsp measurement. **Results:** There was a significantly lower hsp70 expression in Group 3 and higher in Group 4 than that the control Groups 1, 2. Hsp25 and 60 were expressed in the 4 groups and there was no significant difference among the groups. There was no expression of hsp90 in any of the 4 groups. **Conclusion and Discussions:** In isolated rat hearts under stress, lasing lowered the expression of hsp70. This could be related to laser inhibition of hsp70 expression or enhancement of its degradation. Transmyocardial laser revascularization may protect myocardial cells from stress related expression of hsp. [Researcher. 2009;1(1):86-89]. (ISSN: 1553-9865).

Keywords: heat shock protein (hsp); ischemia; laser; transmyocardial; revascularization;

Abbreviations: hsp, heat shock protein; PBS, physiologic buffered solution; TMLR, transmyocardial laser revascularization

Introduction

Heat shock proteins (hsps), also called stress proteins, are a group of proteins that are present in all cells of all life forms. They are induced when a cell undergoes various types of environmental stresses like heat, cold, chemical, electricity, and hurt, etc (Katschinski, 2004). Hsps exist in cells under normal conditions, so called molecular chaperones, to help the cell's proteins folding/keeping in the right shape and place at the right time, which is essential for the proteins' function (Mogk, et al, 2004). They shuttle proteins from one compartment to another inside the cell (Welch, 1993). Hsps are also believed to play a role in the presentation of pieces of proteins (or peptides) on the cell surface to help the immune system recognize diseased cells (Papp, et al. 2003; Falkowska-Podstawka, et al. 2003). The literatures provided convincing proofs that cardiomyocytes that are subjected to hyperthermia or many other stress factors are reacting increased synthesis of hsp what guaranteed protection against further, stronger episodes of different stresses (Latchman, 2001).

Transmyocardial laser revascularization (TMLR) has been shown to relieve symptomatic ischemia but laser tissue effects have potential complications. Laser irradiation caused a significant influence in the content of inducible hsps (Yaakobi, et al, 2001). In order to define the mechanism of laser action, the expression of hsps25, 60, 70, 90 was evaluated in rat hearts after TMLR.

Material and Methods

Under general anesthesia, hearts were removed from 10 rats and immediately placed in oxygenated physiologic buffered solution (PBS) at 0°C. After the various treatments, hearts were homogenized and hsps25, 60, 70 and 90 were measured with Western Blotting. Group 1 (n=3) hearts were immediately homogenized for hsps measurements as the control-control; Group 2 (n=3) hearts were perfused with the

PBS in a Langendorff setup (Figure 1) at 34°C for 6 hours then homogenized for hsps measurements as the control (Neely, et al, 1975); Group 3 (n=3) hearts were lased 50 channels each blast using a Ho:Yag laser of 2100 nm via a 600 □m core fiber at 3 Hz and 280 mJ/pulse through the full thickness of the myocardium after 1 hour perfusion then performed as Group 2 as the laser group; Group 4 (n=1) rat was heated to 42°C for 15 min then recovered at 23°C for 6 hours then the heart was removed and hsps were measured as above.

Western Blotting method: Heart tissue was collected after Langendorff perfusion and homogenized in 3 volume of extract buffer (50 mM Tris-HCl pH 8.0, 150 mM NaCl, 0.02% sodium azide, 0.1% SDS, 0.1 mg/ml phenylmethylsulfonyl fluoride, 0.001 mg/ml aprotinin, 1% Nonidet P-40) under iced condition. The homogenized sample was centrifuged at 10,000 rpm for 10 min at 4°C and the supernatant was collected for hsps measurement. Hsps were detected by Western Blotting method with monoclonal antibodies (hsps25, 60 and 90 antibodies were obtained from Sigma, St. Louis, MO, USA; hsp70 antibody was from StressGen Biotechnologies Corp, Victoria, BC, Canada). Secondary antibody was measured by alkaline phosphotase method.

Results

Hsps25 and 60 were expressed in all 4 groups and there was no significant difference among the groups. There was a significant higher expression of hsp70 in group 4 than that of other groups and lower in group 3 than that of groups 1 and 2. There was no expression of hsp90 in any of the 4 groups. Lasing 50 channels/heart decreased hsp70 by 78% (0.87±0.10 vs. 0.19±0.03; p<0.01) (Table 1, Table 2, Figure 2).

Table 1. Heat Shock Protein 70 in Rat Hearts

	Group 1 *	Group 2 *	Group 3 **	Group 4
Relative OD_{600nm}	1	0.87±0.10	0.19±0.03	3.47

* to *: p=ns; * to **: p<0.003

Table 2. Heat Shock Proteins 25, 60, 90 in Rat Hearts

	Group 1	Group 2	Group 3	Group 4
Hsp25	++	++	++	++
Hsp60	++	++	++	++
Hsp90	-	-	-	-

p=ns among groups.

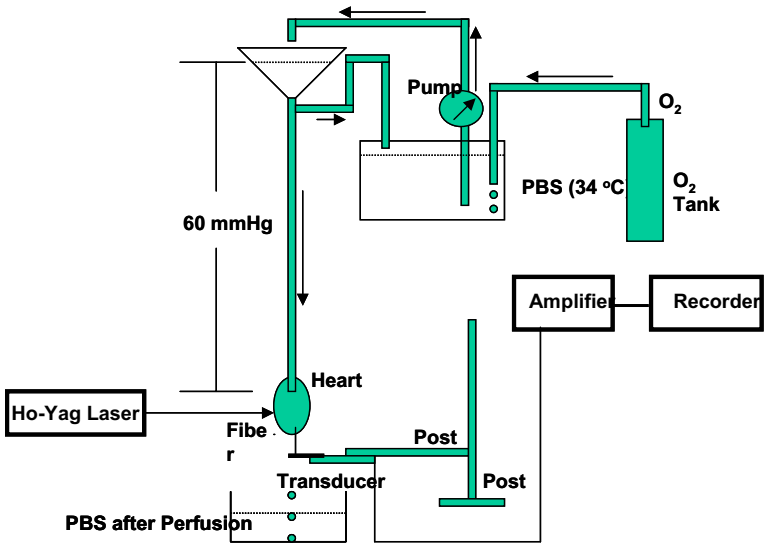

Figure 1. Langendorff Setup. Rat hearts were perfused with PBS at 34°C and lased 50 channels using a Ho:Yag laser of 2100 nm via a 600 nm core fiber at 3 Hz and 280 mJ/pulse through the full thickness of the myocardium after 1 hr perfusion.

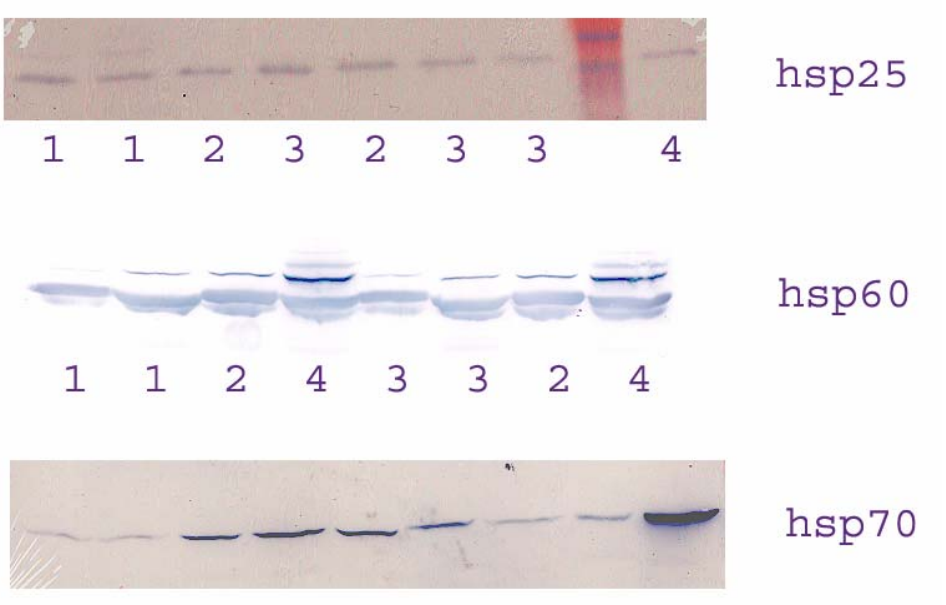

Figure 2. Heat shock proteins expressed in rat hearts measured by Western Blotting. 1: Group 1 (Control control); 2: Group 2 (Control); 3: Group 3 (Laser); 4: Group 4 (Heat 42°C).

Discussions

Hsp synthesis arises transiently as a tool to protect cellular homeostasis after exposure to heat and a wide spectrum of stressful and potentially deleterious stimuli (Delogu, et al, 2002). Isolated heart is under the severe adverse circumstances and the hsps expression will increase under the adverse condition. In this study we showed that lasing lowered the expression of hsp70. This is possibly a result of laser protect cells from injury by isolated condition. This result could be related to laser inhibition of hsp70 expression or enhancement of its degradation. The isolated rat hearts were under stress and TMLR may protect myocardial cells from stress related expression of hsp. Furthermore, lasing made holes in the rat hearts that could increase the contact of heart cells with solution, that improved the heart physical condition.

According to Garridoi's describes, hsp70 is expressed in response to a wide variety of physiological and environmental insults including anticancer chemotherapy, thus allowing the cell to survive to lethal conditions. Several mechanisms account for the cytoprotective effect of hsp70. Hsp70 is a powerful chaperones and it inhibits key effectors of the apoptotic machinery at the pre and post-mitochondrial level, and it participates in the proteasome-mediated degradation of proteins under stress conditions, thereby contributing to the so called "protein triage". In cancer cells, the expression of hsp70 is abnormally high and it may participate in oncogenesis and in resistance to chemotherapy. In rodent models, Hsp70 over-expression increases tumor growth and metastatic potential. The depletion or inhibition of hsp70 frequently reduces the size of the tumors and even can cause its complete involution. Therefore, the inhibition of hsp70 has become a novel strategy of cancer therapy (Garrido, 2006). Our results showed that there was a significant higher expression of hsp70 in group 4 than that of other groups and lower in group 3 than that of groups 1 and 2. In isolated rat hearts under stress, lasing lowered the expression of hsp70. This could be related to laser inhibition of hsp70 expression or enhancement of its degradation. Transmyocardial laser revascularization may protect myocardial cells from stress related expression of hsp.

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