Republic of Iraq
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Quarterly Refereed Journal for Natural and Engineering Sciences

Issued by
Al-`Abbas Holy Shrine
International Al-`Ameed Centre for Research and Studies

Licensed by
Ministry of Higher Education
and Scientific Research

Third Year, Sixth Volume, Issue 11 and 12
Thilhujja, 1438, September 2017

Secretariat General
of Al-'Abbas
Holy Shrine

Al-Ameed Interna-
tional center
for Research and Studies

Print ISSN: 5721 – 2312
Online ISSN: 0083 – 2313
Consignment Number in the Housebook and Iraqi
Documents: 1996, 2014
Postal Code: 56001
Mailbox: 232

Al-Abbas Holy Shrine. Al-Ameed International Centre for Research and Studies.

ALBAHIR : Quarterly Refereed Journal for Natural and Engineering Sciences \ Issued by Al-Abbas Holy Shrine Al-Ameed International Centre for Research and Studies. - Karbala, Iraq : Abbas Holy Shrine Al-Ameed International Centre for Research and Studies.—Karbala, Iraq : AL- Abbas Holy Shrine Al-Ameed International Centre for Research and Studies, 1433 hijri = 2012 -

Volume : Illustrations; 24 cm

Quarterly.-Third Year, Sixth Volume, Issue 11 and 12 (September 2017)-

ISSN : 5721-2312

Includes bibliographical references.

Text in English ; summaries in Arabic.

1. Science--Periodicals. A. title.

Q1 .A8365 2017 VOL. 6 NO. 11-12

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Most Compassionate, Mort Merciful

Edition Word

In the Name of Allah, Most Merciful, Most Gracious, thanks be upon the Creator of the universe, peace be upon the most eloquent in Arabs , the most evident , the most efficacious, the most righteous and upon his immaculate benevolent progeny

Al-Bahr journal , scientific and peer-reviewed, comes to the fore as a ground to the researchers and academics since its first publication . Today as the eleventh and twelfth edition heaves into effect to be an essential source of information in publishing the specialized research studies and cuddling the contemporary data to keep pace with the crestive development in the research fields.

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The current edition ramifies into the natural and engineering sciences to have a niche among the other journals , as such we , with the bless of Allah, grow momentum and a cynosure to all researchers, academics and readership as here comes the journal with a vesture , we do hope all the success and sapience to you all.

■ Consultation and Editaril

Master-Slave Circuit Communication by Using PC Bluetooth Based Technique

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Received Date: 4 / 4 / 2016
Accepted Date: 8 / 9 / 2016

الخلاصة

الهدف من هذا البحث هو عمل محاكاة للبلوتوث في جهاز الكمبيوتر عن طريق تصميم دائرتين (الاساسية والثانوية) والتي تعمل بصورة مماثلة لعمل جهاز بلوتوث. يصف هذاالبحث كيفية التحكم عن بعد بجهاز البلوتوث في الحاسوب عن طريق استخدام المايكروكونترولر باستخدام جهازي Bluetooth، عندما يقوم الجهاز الأول (في الدائرة الرئيسية) على سبيل المثال بارسال حرف «A» من المايكروكونترولر في hex فان جهاز البلوتوث الثاني (في الدائرة الثانوية) سيستلم الحرف «A» أيضا في hex. وفي هذه الحالة سيقوم المايكروكونترولر في الدائرة الثانية بفهم الاشارة ومعالجتها لإنجاز المهمة المطلوبة. تم استخدام المصد (CD4050B) لنقل البيانات من جهاز البلوتوث الى المتحكم الدقيق بفولتية حيث يستطيع المتحكم الدقيق التعامل معها. وتم استخدام نوعين من منظمات الفولتية، النوع الاول (L7805) هذا النوع من المنظمات يستخدم لتنظيم الفولتية المستلمة من المصدر (7) فولت الى (5) فولت مناسبة لعمل المتحكم الدقيق. النوع الثاني (LD330V) لتقليل الفولتية الى (3.3) فولت لضمان عمل جهاز البلوتوث وبعض الدايودات الضوئية.

الكلمات المفتاحية

البلوتوث، المايكروكونترولر،محطة لا سلكية.

Abstract

The aim of this research is to implement a simulation of PC Bluetooth by designing two circuits (master and slave) which will perform a task in similar way as the PC Bluetooth. The project describes how to control the wireless plant (by using Bluetooth devices).This project is consist of two Bluetooth devices: the first device (transmitter circuit) sends the character "A" for example in hex from microcontrollerand the second Bluetooth device (receiver circuit) will receive the character "A" also in hex. The microcontroller in the slave circuit will understand this character and it will perform a particular task (how to control to the plant wireless). Buffer no. (CD4050B) which used to transfer data from Bluetooth devices to Microcontroller with voltage that Microcontroller can be operated to it , (Regulators) that have two no. the first no. is (L7805) this type of regulator used to regulate voltage that received from power supply (7)V to (5)V so that Microcontrollers can be operated to it. The second regulator is (LD330V) which used to reduced voltage to (3.3)V in order to operate the Bluetooth devices, and many led to compensate the plant.

Keywords

Bluetooth, Microcontroller, wireless plant.

1. Introduction

Circumstances that we find ourselves in today in the field of microcontrollers had their beginnings in the development of technology of integrated circuits. This development has made it possible to store hundreds of thousands of transistors into one chip. That was a prerequisite for the production of microprocessors, and the first computers were made by adding external peripherals such as memory, input-output lines, timers and other. Further increasing of the volume of the package resulted in creation of integrated circuits [1].

PC Remote Control is a remote desktop application to help users to control computers and laptops via Wi-Fi and Bluetooth on mobile devices. PC remote control is supported by Windows. The Bluetooth wireless technology is set to revolutionize the way people perceive digital devices in our homes and office environment [2]. The recent developments in technology which permit the use of radio frequency (RF) technology such as Bluetooth, and radio spectrum have enabled different devices to have capabilities of communicating with each other [3]. Bluetooth is a new and developed technology enabling to connect the electronic devices such as computer, Mobile, key board, and headphone to exchange data and information without wires or cable.

1.1. Literature survey:

Wireless communication is used in many applications by using light ray in the range of infrared and this light ray is not seen by eye. The light ray is called Infrared because it has frequency smaller than frequency of red light. Infrared is used in the remote control which is called Infrared Data Association (IrDA), also it is used in many terminal devices of computer [4].

Although the device depends on infrared but it has two problems. The First problem is that, the technology uses the infrared works only in the range of the light of slight vision, this mean that, we should direct remote control to TV directly in order to control it. The second problem is that, the technology uses infrared is the one to one technique, which enable exchange infrared between two devices only, i.e., exchanging information between computer and held computer devices by infrared, but it is not able to exchange information between computer and Mobil.

The reader may be asking if the device will exchange information and data in a radio signal works at (2.45) GHZ, then what about overlapping between signals which may cause the confuse we may notice on the TV screen when overlaps with wireless signals? The problem of overlapping is solved in an intelligent method, the signal of Bluetooth is poor and its range is about 1mw if it is compared with the signal of Mobil which reach to 3w. This poor in signal make the range of Bluetooth signal effect in limit circular, and its diameter is (10) m [5].

1.2. Background:

1.2.1. Master and Slave circuits:

Bluetooth 2 Stick is an additional board which enables the microcontroller to commu-

nicate with wireless devices [6] as shown in Fig.(1) and Fig.(2).

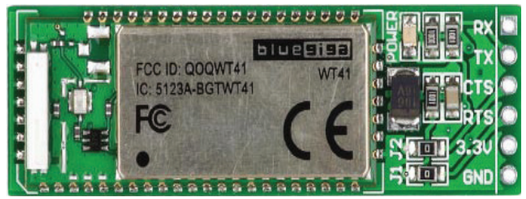

Fig. (1): External view of Bluetooth (2) Stick block diagram.

Key features: Serial UART communication, Range up to 50m and (3.3 V) DC power supply.

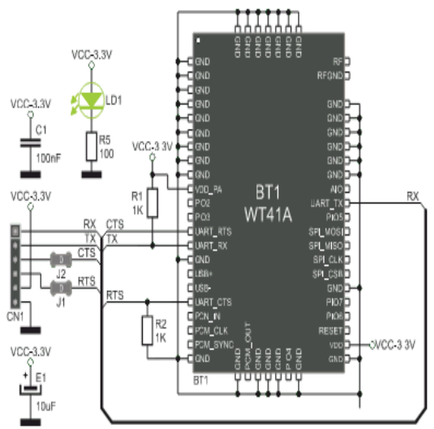

Fig. (2): Pin diagram of Bluetooth 2 Stick

1.2.2. Microcontroller:

The microcontroller consists of integrated circuits contained both processor and peripherals. That is how the first chip containing a microcomputer, or what would later be known as a microcontroller came about .There are twelve general purpose input/output (I/O) pins available. Depending on which peripherals are enabled, some or all of the pins may not be available as general purpose I/O. In general, when a peripheral is enabled,the associated pin may not be used as a general purpose I/O pin as shown in Fig. (3) [7,8].

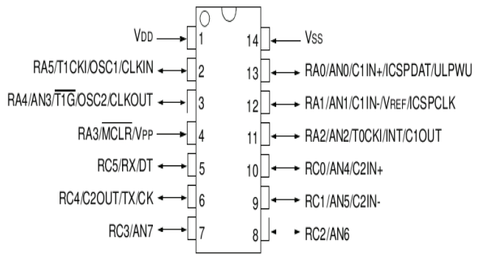

Fig. (3): External diagram for PIC16F688 with peripheral

1.2.3.Regulator

There are many type of regulator, here we uses two type of them. First is

L7805 and the second is LD330VFig.(4). [9].

Fig.(4): regulator L7805

1.2.3.1.Features for L7805

1-output current to 1.5A.

2-output voltages of 5;5.2;6;8;8.5;9;10;12; 15;18;24V.

1.2.3.2 Features for LD330V

1- Output current to 1.5A.

2-Output voltage 3.3V.

1.2.4.Description of Regulator

The L78xx series of three-terminal positive regulators is available.Several of them fixed output voltages, making it useful in a wide range ofapplications. These regulators can provide local on-card regulation,eliminating the distribution problems associated with single pointregulation. Each type employs internal current limiting, thermal shut-down- and safe area protection, making it essentially indestructible. If adequateheat sinking is provided, they can deliver over (1) A output current.Although designed primarily as fixed voltage regulators, these devices canbe used with external components to obtain adjustable voltage and Currents Fig.(5).

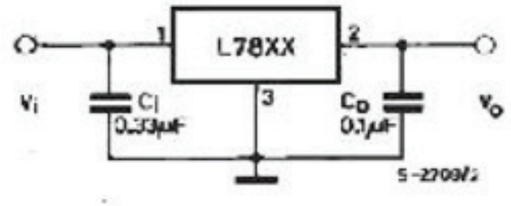

Fig.(5): application circuit

1.2.5 CMOS Hex Buffer/Converter

The CD4050B device is non-inverting hex buffers, and feature logic level conversion using only one supply voltage (VCC). The input-signal high level (VIH) can exceed the VCC supply voltage when this device is used for logic-level conversion. (VCC =5V, VOL ≤ 0.4V, and IOL ≥ 3.3mA). The CD4050B is designated to replacement for CD4010B. Because the CD4050B require only one power supply, they are preferred over the CD4010B and should be used in place of the CD4009UB and CD4010B in all inverter, current driver, or logic-level conversion applications. In this applications the CD4050B is pin compatible with the CD4010B and can be substituted for this device in existing as well as in new design. Figure blew present diagram and pin configuration for buffer fig.(6).[10]

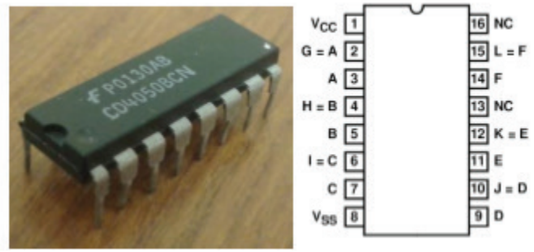

Fig.(6): block diagram and pin configuration for buffer

2. Theoretical part

2.1. Transmitter circuit (Master Circuit):

Fig.(7) illustrates a typifies transmitting circuit which contains upon (Bluetooth ,microcontroller and Buffer Voltage Amplifierwhich connect Bluetooth with microcontroller) because Bluetooth operate at (3.3)Vwhile microcontroller operate at (5)V, so Bluetooth transmit the data to the buffer in (3.3)V then the buffer transmit the same data to the microcontroller at 5V. The circuit contains a power of (7) V and voltage regulators to convert the high voltage to (5) V and (3.3)V. The green LED to show the waiting time (delay); in waiting the LED have been off. When the power switch become ON then, wait more than half minute we note that

the green LED is light. That means Bluetooth ready to receive information from switch and transmit it to the second Bluetooth. Fig.(8) illustrates a buffer for Master circuit.

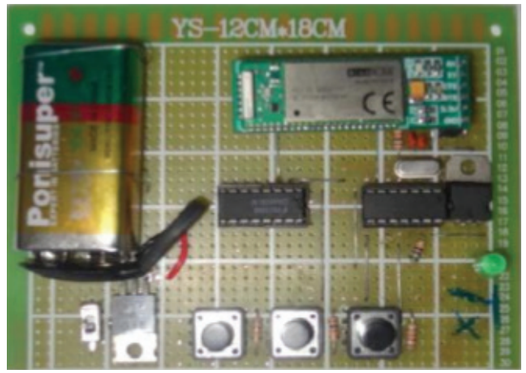

Fig. (7): Master circuit

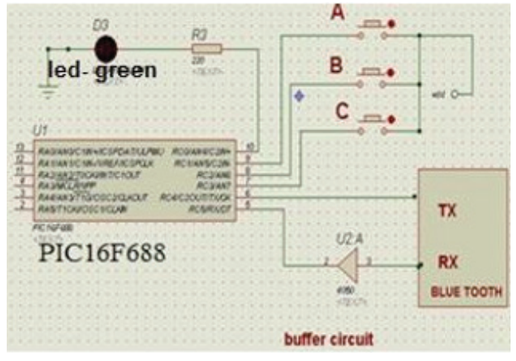

Fig. (8): Buffer for Master circuit

program Master:

```
ORG 0200
START:
CLR C
CLR PC.5
MOV C,PC.5
JHG : JNB C,JHG
SETB PA.0
LCALL DELAY ;          5 Sec.
DD: MOV C,PA.3 ;       Press SW3
JNB C,Q
SJMP Q1
Q: MOV C,PC.3 ;        Press SW2
JNB C,QM
SJMP Q2
QM: MOV C,PC.4 ;       Press SW1
JNB C,DD
SJMP Q3
;…….....……
Q1: MOV R0 ,#4
CLR C
MOV R1,#00001010b
MOV A,R1
SWAP A
PPP: RLC A
MOV PC.5,C
DJNZ R0, PPP
SJMP DD
;…….....……
Q2: MOV R0 ,#4
CLR C
MOV R1,#00001011b
MOV A,R1
SWAP A
MMM: RLC A
MOV PC.5,C
DJNZ R0,MMM
SJMP DD
;……..
Q3: MOV R0 ,#4
CLR C
MOV R1,#00001011b
MOV A,R1
SWAP A
KKK: RLC A
MOV PC.5,C
DJNZ R0,KKK
SJMP DD
;…….....……
DELAY:
MOV R2, #180d
W: MOV R3, #180d
W1: MOV R4,#142d
W2: DJNZ R4, W2
DJNZ R2,W1
DJNZ R2,W
RET
;…….....…….....
END
```

2.2. Receiver circuit (Slave Circuit):

The receiver system consist of Bluetooth (to transmit and received data), microcontroller, buffer, voltage regulator circuit (5V, 3.3V), power supply and three LED as shown in Fig. (9).

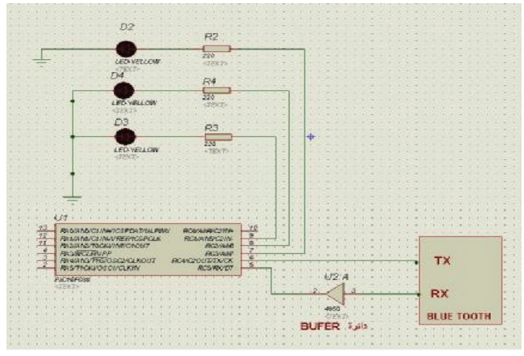

Fig. (9): Buffer for Slave circuit

The whiteLED Operates after half minute but it must find the second Bluetooth device operates in order to make connection. When the white LED operates, this mean that Bluetooth device is ready to receive data from the first device. As shown in Fig. (10).

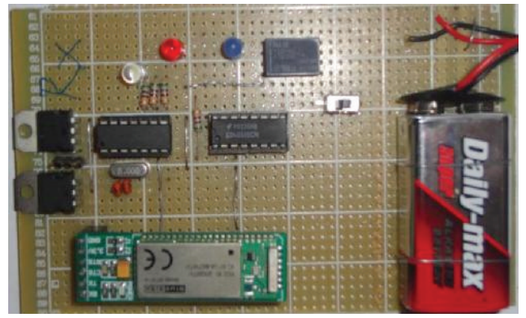

Fig. (10): Received circuit

Slave Program:

```
ORG 0200SRART:
MOV A,#00H
CLR C CLR Pc.5
MOV C,PC.5LL: JNB C,LL
SETB PA.0
MOV R0,#10d
NN: LCALL DELAY
DJNZ R0, NN ; 5 Sec.
CLR C
MOV R0,#00H
MOV A,R0
QQ: MOV C,PC.5
RLC A
CJNE A,#00001010b,MM
SJMP LM
MM: CJNE A,#00001011b,KK
SJMP LMC
KK: CJNE A,#00001100b,QQ
SJMP LMCD
LMC: SETB PA.3 ;Red Led
LCALL DELAY ;0.5 Sec.
```

```
SJMP QQ
SJMP LMCD
;……..……
LMC: SETB PA.3 ;Red Led
LCALL DELAY ;0.5 Sec.
SJMP QQ
;……..……
LMCD: CLR PA.3 ;Red Led
CLR PA.0 ;White Led
CLR PC.4 ;Blue Led
SJMP QQ
;……..……..
LM: MOV R0,#00H
MOV A,R0
CLR C
TT: SETB PC.4
MOV C,PC.5
JNB C,TT
MOV C,PC.5
RLC A
CJNE A,#00001010b,MM
SJMP LM
MM: CJNE A,#00001011B,KK
SJMP NN
GG: CJNE A,#00001100b,LM
SJMP LMCD
;……..……
NN: SETB PA.3 ; Red Led
LCALL DELAY
SETB PC.4 ; Blue Led
SJMP LM
;……..……
DELAY: ; 0.5 Sec.
MOV R2,#80d
W1: MOV R3,#80d
W2: MOV R4,#80d
W3: DJNZ R4,W3
DJNZ R3,W2
DJNZ R2,W1
RET
;……..……
END
```

3. Practical part:

The project unit operates by putting the switch of power in position ON after sure that power supply in each circuit Slave first then Master in the same time, and wait, nearly more half a minute, until the white LED is light in slave as shown in Fig. (12) and light the green LED in master. The Master circuit is shown in Fig. (11). After the amid switch goes to ON, the blue LED will operate as a step signal. Fig. (13) illustrates the blue LED.

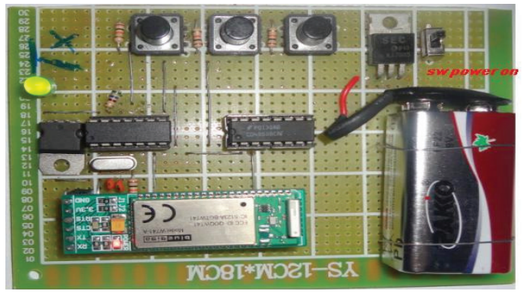

Fig. (11): Master Circuit in Operating Case

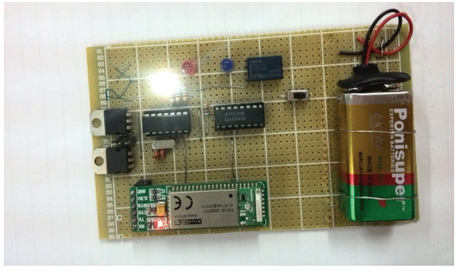

Fig. (12): Slave Circuit in Operating mode

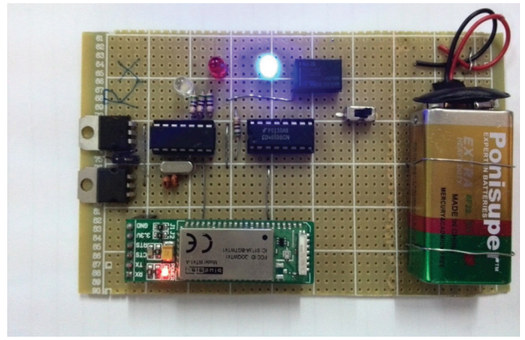

Fig. (13): Slave Circuit part 1

4. Results:

1. The y-axes in Fig. (14) refers to the input and an output voltage which is measured in volts and the x-axes refers to the time that is measured in second. The response of any signal at output is delayed after the input signal in the same point of seconds as shown in Table (1).

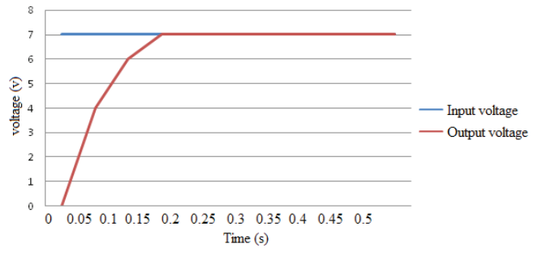

Fig. (14): Unit step response of the Slave part (1).

Table (1): Voltage values of slave circuit part (1).

A	B	C
Input Voltage (volt)	Output Voltage (volt)	Time (second)
7	0	0
7	4	0.05
7	6	0.1
7	7	0.15
7	7	0.2
7	7	0.25
7	7	0.3
7	7	0.35
7	7	0.4
7	7	0.45
7	7	0.5

When the last switch goes ON, the red LED will operate as an impulse as shown in Fig. (15).And if we press the first switch, the three leds will reset as shown in Fig. (16).

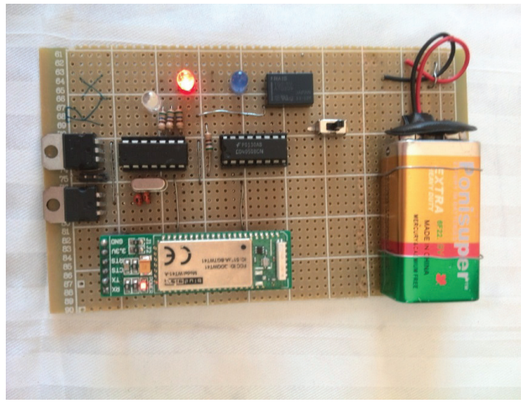

Fig.(15): Slave circuit part2

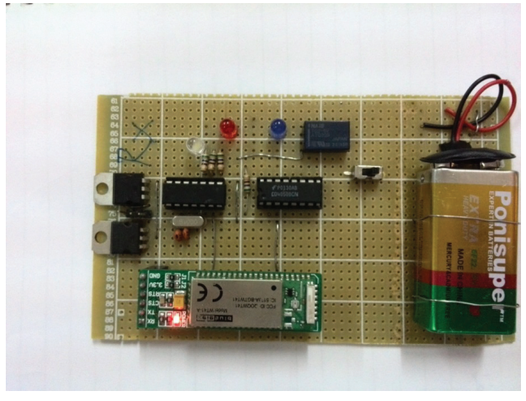

Fig.(16): Slave Circuit in Reset case

The y-axes in Fig.(17) refers to the input and output voltage which is measured in volt. And the x-axes are the time measured in second. The response values of impulse response of the Slave circuit in the same point of seconds as shown in Table (2) while the graphical representation of results is indicated in Fig. (17).

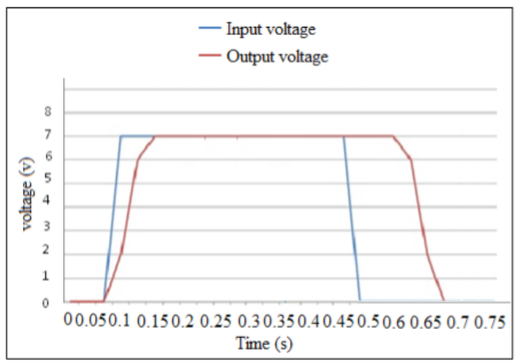

Fig. (17): Impulse response of the Slave part 2.

Table (2): Values of impulse response of the Slave circuit part2.

A	B	C
Input Voltage (volt)	Output Voltage (volt)	Time (second)
0	0	0
0	0	0.05
0	0	0.1
2	2	0.15
7	6	0.2
7	7	0.25
7	7	0.3
7	7	0.35
7	7	0.4
7	7	0.45
0	7	0.5
0	7	0.55
0	7	0.6
0	6	0.65
0	2	0.7
0	0	0.75

4. After many experiment for this project we found that the distance between the two circuits (master and slave) is about 50m in free space.

5. Discussion:

The Software and Hardware structure of the Bluetooth circuits had been introduced. Also the suitable commands where examined to show the reliability and applicability required in such system.The Software model represents a flexible, reliable and powerful way of controlling the Bluetooth circuit. Here in this project the Bluetooth circuits has been designed to control two leds. If we send the signal(character) from the master circuit by pressing one of these switches, the Slave circuit must receive the same signal(character) to implement a particular task. If the Slave circuit received any other signal(character) that is invalid in the microcontroller in the Slave circuit, the Slave circuit cannot make any operation. In future we will attempt to send data to the long distance, and use the Bluetooth device to receive data from cameras, control the fans and other devices in the refinery or factories.

6. Conclusion:

From the results obtained, we can conclude the following:

The project represents a Bluetooth circuit

examined and tested as the same as the PC Bluetooth with the suitable choices.

Enable to send data for distance exceeds (50)mand these very important to control to any plant or process in case of dangerous or other cases.

Bluetooth devices used as expedient to transform data and enable microcontroller\, when the Master circuit send particular signal so, the Bluetooth in the Slave circuit receive the signal and enable the microcontroller to perform a particular task (in this project enable led).

Impossible to send and receive data in the same time. This mean that Bluetooth operate in a Simplex Mode.

Bluetooth devices frequency is not effect with other signal (or affectability is very small) because of pokier of its signal.

LED in Slave circuit operate in (5) V, this leads to the supplied voltage must be not less than the specified voltage.

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Structural and electrical properties of CdS &CdS:Sb thin films prepared by flash evaporation technique

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Received Date: 16 / 3 / 2017
Accepted Date: 7 / 6 / 2017

الخلاصة

استخدمت سبيكة CdS لتحضير اغشية CdS واغشية CdS المشوبة بعنصر الانتيمون (CdS:Sb) Sb بنسبة وزنية (3٪) بتقنية التبخير الوميضي على ارضيات زجاجية بسمك (150) نانومتر بدرجة حرارة الغرفة.تم دراسة تاثير التشويب و درجة حرارة التلدين (373 و473) كلفن لمدة (60) دقيقة على الخواص التركيبة و الكهربائية لجميع الاغشية . قياسات الاشعة السينية اوجدت ان الاغشية (CdS , CdS:Sb) المحضرة بدرجة حرارةالغرفة والملدنة بدرجة حرارة (373) كلفن هي من النوع العشوائي و بزيادة درجة حرارة التلدين الى (473) كلفن وجد ان الغشاء CdS النقي يتحول الى طور متعدد البلورات السداسي و باتجاه نمو مفضل (002) وان الغشاء المشوب بعنصر الانتيمون CdS:Sb يتحول الى متعدد البلورات بشكل مكعب وبأتجاه نمو مفضل (111) . من خلال دراسة التوصيلية الكهربائية المستمرة تم حساب قيم طاقات التنشيط و التوصلية المستمرة أ حيث وجد ان قيم طاقات التنشيط تزداد بزيادة درجة الحرارة وتقل بأضافة عنصر الانتيمون(تقل بالتشويب) وان التوصيلية المستمرة سلكت سلوك معاكس لطاقات التنشيط. من خلال قياسات تأثير هول وجد ان حاملات الشحنة هي من النوع n-type لجميع الاغشية وان تركيز حاملات الشحنة يقل بزيادة درجة حرارة التلدين بينما التحركية تزداد . تركيز حاملات الشحنة والتحركية أزداد بعد اضافة عنصر الانتيمون الى اغشية CdS.

الكلمات المفتاحية

كبريتيد الكادميوم أ كبريتيد الكادميوم CdS المشوبة بعنصر الانتيمون Sb ، تقنية التبخير الوميضي.

Abstract

CdS alloy used to prepareCdS and CdS doped Sb (3%) (CdS:Sb) filmsby flash evaporation technique with thickness (150) nm on glass substrate at room temperature. The effect ofdoping and the annealing temperature at (373 and 473) K for (60) min on the structural and electrical propertieshas been described. The XRD studies show that theannealed film at (373) K has amorphous structure and alters to the polycrystalline at)473(K where the CdS film growth to hexagonal structure with perfect orientation (002) and CdS:Sb growth to cubic structure with perfect orientation (111). From D.C conductivity the variation of activation energies (Ea1,Ea2) and D.C conductivity at room temperature were measured.It is found that Ea2 values decreasing for doped films and increase with increasing annealing temperature (Ta) for all film. Hall Effectshows that all films are n-type, carrier's concentration decrease with increasing of annealing temperature while Hall mobility increases. Carrier'sconcentration and Hall mobility increases after adding the doped material (Sb) to the CdS films.

Keywords

CdS ,CdS:Sb , flash evaporation technique.

1. Introduction

In the last years, the world has been increment proceeding to II–VI semiconductor materials because of its wide range of technical and industrial applications especially in the optoelectronic devices: solar cells, diode, transparent electrode, photo transistor, optical sensor, etc. Cadmium sulfide (CdS) had actually yellow color, two crystal structure cubic and hexagonal phases [1]. CdS isn-type semiconductor having a direct energy band gap between 2.28-2.45 eV [2].The energy gap of CdS thin film be influenced by preparation conditions such as substrate temperature, annealing-temperature, thickness, doped, etc[3]. More techniques were used to prepared CdSfilms such as "thermal evaporation" [4], "molecular beam epitaxy (MBE)"[5], "spray pyrolysis" [6], "electro-deposition"[7], pulsed-laser deposition [8] ,"successive ionic layer adsorption and reaction (SILAR)" [9],"vacuum evaporation" [10] ,"chemical bath deposition (CBD)" [11], and sputtering [7]. The characteristic of structure, electrical and many properties of CdS thin film can be controlling that lead to wide range of band gap value.

The aim of present work is to prepared CdS and CdS doped Sb (3%) CdS:Sb films by flash evaporation technique and study the structural and electrical properties of it. The electrical properties will calculate from D.C conductivity and Hall measurement.

2. Experimental procedure

CdS powder and antimony (99.99%) Sb used to prepared CdS and CdS:Sb thin film with thickness 150 nm on glass substrate. There are several step during film prepare at first cleaned the glass slide with distilled water and use ultra-sonic and alcohol to cleaning the glass from impurity.

There are different techniques to prepare the thin film and these techniques depending on many fact or slike melting point, substrate, thickness, etc. In this research, there is used flash evaporation technical has used because the material have different melting point. Cadmium sulfide (CdS) and Cadmium sulfide were doped with antimony (CdS:Sb) with thickness (150) nm deposited on the glass substrates by the method of flash thermal vacuum evaporation (Edward E 360) using molybdenum boat under vacuum pressure(10-5) mbar as shown in fig (1). The electric current was gone through the boat step by step to avoid breaking it, the affidavit procedure begins at the vessel temperature achieved the required temperature. Every one of the samples were set up under consistent conditions (weight, substrate temperature and rate of deposited). The doping and annealing temperature (373 and 473)K was the primary parameters that control the film properties.

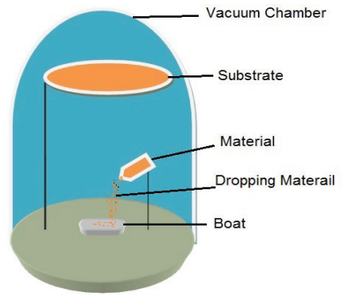

Fig. (1): Flash thermal evaporation technical

Ohmic contacts has been doneto study the electrical properties ofCdS&CdS:Sb thin films by evaporating (Aluminum) electrodes of (250) nm thickness,by means of thermal evaporation method using Balzersmodel(BL510) with pressure(10-5) mbar.Interference microscopeare used to measure the (CdS&CdS:Sb) film thicknesses .

CdS and CdS:Sb structure were studied by X-ray diffraction and compared with standard value in ASTM, and used a Philips X-ray diffractometer system which records the intensity as a function of Bragg's angle.

The D.C conductivity of the films was calculated using the electrical circuit which is consists of oven and keithly digital electrometer 616 to measure the resistance as function oftemperature.

The DC conductivity was determined from the relation [12]:

$$\sigma_{d.c.} = \frac{1}{\rho} = \frac{L}{R\,A} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

whereR :film resistance, A : cross section area of the film and L: distance between the electrodes. The activation energies have been calculated from the plot of Ln σ versus 1000/T according to the following relation[13].

$$\sigma = \sigma_o \exp(-Ea/k_B T) \quad \ldots\ldots\ldots\ldots\ldots (2)$$

Whereσo: the pre-exponential factor,kB is the Boltzman's constant,Ea: the activation energy and T: the temperature.

Hall effect measurement carried out to determine the type, mobility and the carriers concentration of CdS&CdS:Sb thin films using Hall measurement (Ecopia HMS-3000).

Hall mobility (μH) determined by using the following relation[13] :

$$\mu_H = |R_H| \cdot \sigma_{RT} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

1

Where σRT is the electrical conductivity at room temperature and RH is the Hall coefficient , while the carrier concentration (n) can be determined using the relation[13] :

$$n = \frac{1}{|R_H| .e} \quad \ldots\ldots\ldots (4)$$

Where (e) is electron charge.

3. Results and discussion

3.1. X-Ray

X-ray diffraction pattern (XRD) of CdS and CdS:Sb of thickness 150 nm for the as deposited film and annealed to (373 and 473) K are shown in Fig.(2).X-ray pattern show that theCdS and CdS:Sb films have amorphous structure for as deposited and annealed film at (373)K . CdS film was growth to hexagonal structure with perfect orientation (002) at (473)K andCdS:Sbgrowth to cubic structure with perfect orientation (111). Thisresult agreement with Mehdi H. Diwan[14] for pureCdS films .So, the addition of antimony leads to change the structure of CdS from hexagonal to cubic structure that may be due to fill the vacancy in CdS structure by Sb.

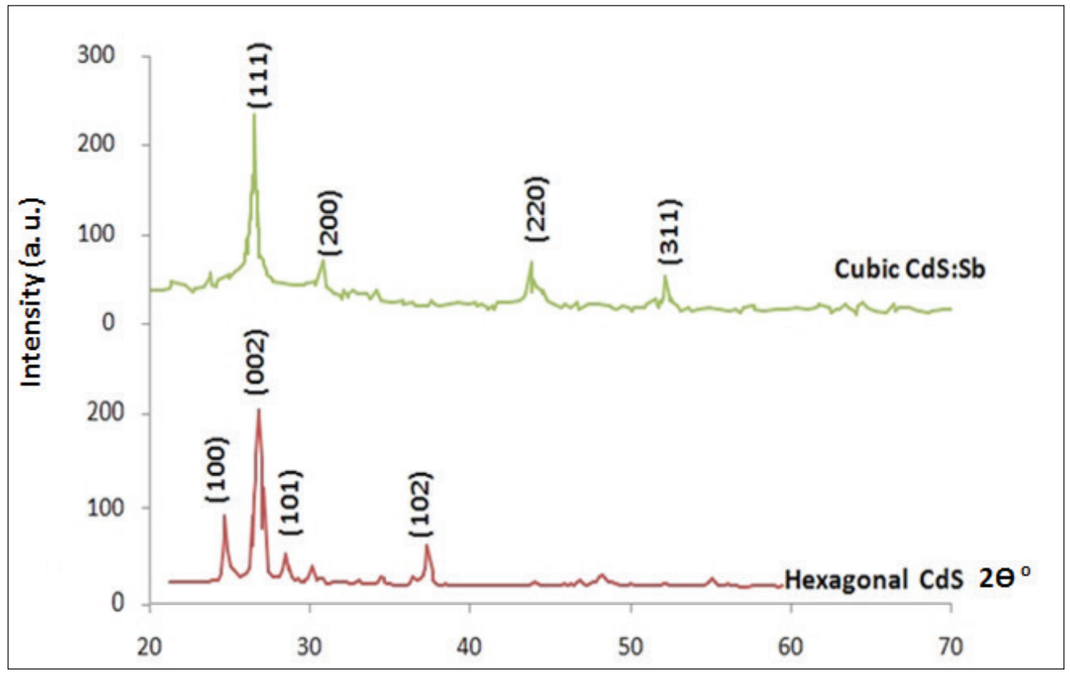

Fig. (2): XRD of annealedCdS and CdS:Sbthin films at (473)K

The experimental data of the (2θ) degree,hkl& I/I max for CdS and CdS:Sb films at (473)Kwhich compared with the standard value in ASTM are presented in Table (1).

Film	hkl	.2θ Exp	2θ standard	I/I_{max}	Crystal structure
CdS	(100)	24.809	24.807	41.6	Hexagonal
	(002)	26.508	26.507	100	
	(101)	28.186	28.182	19.5	
	(102)	36.619	36.620	24.5	
CdS:Sb	(111)	26.49	26.506	100	cubic
	(200)	30.798	30.807	29.9	
	(220)	43.786	43.96	29.4	
	(311)	52.121	52.132	22.7	

3.2. D.C Conductivity

Fig.(3) showsthe variation of lnσ as a function of 1000/T.The activation energy (Ea) and the electricalconductivity in the room temperature (σRT) for CdS&CdS:Sb films have been studied as a function of different annealing temperature Ta. The electricalconductivity show that there are two activation energies

(Ea1& Ea2),this result provesthe structure of CdS and CdS:Sb area polycrystalline thin films . The second activation (Ea2) energies increases with increasing of Ta and decrease with doped material. Table (2) show thatthe electrical conductivity(σRT)decreases with increasing of annealing temperature and increase with doped material. Nahida B. Hasan et al[15] noticed some behavior for annealing temperature effect.This comportment could be explain as follows: the annealing processes perform to rearrange the crystalline build that lead to reduction the density of state and the dangling bonds in the band gap, which leads to increasing the energy gap and activation energy.So, the carrier's concentration has been decreases and this caused a decrease in the σR.T.

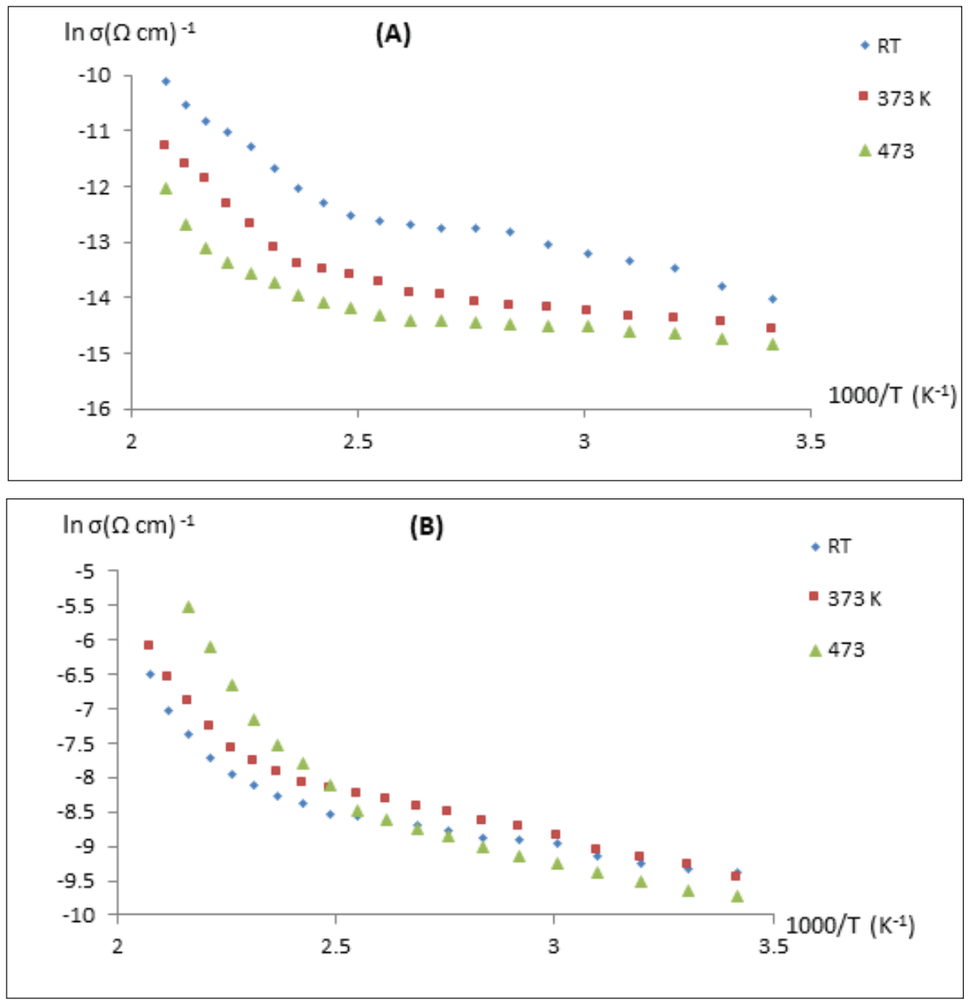

Fig.(3): The variation of Lnσvs. 1000/**T, (A) for CdS , (B) for CdS:Sb**

Table (2): shows (Ea1 , Ea2 , σRT) for CdS and CdS:Sb films

Film	T_a K	(E_{a1}(eV	(E_{a2}(eV	σ_{RT} (Ω cm) $^{-1}$
CdS	RT	0.140	0.537	8.33E-07
	373	0.079	0.637	4.90E-07
	473	0.044	0.841	3.73E-07
(CdS:Sb (3%	RT	0.085	0.504	8.59E-05
	373	0.119	0.538	8.06E-05
	473	0.125	0.582	6.19E-05

3.3. Hall effect measurement

Hall measurements show that all these films have a negative Hall coefficient (n-type charge carriers). This result are agreement with R. DEMIRa et al [1] and Y. CHEN et al[16]. Table (3)shows the data of the carrier's concentration and Hall mobility as a function of annealing temperature for CdS&CdS:Sb films. This table show that the carrier's concentration decreases with increasing of annealing temperature while Hall mobility increases. This behavior isdue to the re-arrangement process, which leads to reduce the density of state and that make the charge carrier's move freelyin the film. So, for that case the mobility is increasing.

Table (3): show the carrier's concentration and Hall mobility for CdS&CdS:Sb films

Film	T_a K	(μH (cm^2/V .S	(n (cm^3
CdS	RT	359.1	x 10^{12} 1.4903
	373	401	x 10^{11} 8.012
	473	463.5	x 10^{10} 5.62
(CdS:Sb (3%	RT	397.3	x 10^{11} 4.931
	373	473.6	x 10^{10} 7.166
	473	610.4	x 10^{10} 1.197

4. Conclusion

X-ray pattern show that the CdS and CdS:Sb films have amorphous structure for as deposited annealed film at (373)KCdS film was growth to hexagonal structure with perfect orientation (002) at (473)KCdS:Sb growth to cubic structure with perfect orientation (111)at 473. There are two activation energies (Ea1& Ea2) , Ea2 increases with increasing of Ta and decrease with doped material. Hall effectshows that all films aren-type. Carrier's concentration decrease with increasing of annealing temperature while Hall mobility increases.Carrier's concentration and Hall mobility increaseswith doped material (Sb) to the CdS films.

5. Acknowledgement

I am thankful to University of Kerbala for the financial support. I am also thankful to Professor Dr. FADHIL ISMAIL SHARRAD and Prof. Ass. Dr. Mohammed Al-Kaabi for their help. I am grateful to the staff of thin film laboratory at University of Baghdad, especially Dr. Kadhim Abdul Wahid Aadim and Dr. Issam M. Ibrahim.

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Effect of Bisphenol-A- on Some Biochemical and Hematological Parameters of Female Rats(Rattus Norvegicus)

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Received Date: 13 / 7 / 2016
Accepted Date: 2 / 9 / 2016

الخلاصة

يعد البسفينول-أ- أحد المواد المعرقلة لعمل الغدد الصم. وقد تضمنت الدراسة الحالية الكشف عن تأثير البسفينول-أ-على بعض المعايير الكيموحيوية والدموية مثل , Glucose ALT, AST وعدد خلايا الدم الحمروتركيز الهيموكلوبين في الدم وعدد خلايا الدم البيض والعدد التفريقي لخلايا الدم البيض. أربع وعشرون أنثى جرذ قسمت عشوائيا الى ثلاث مجاميع (8 حيوانات لكل مجموعة). تضمنت حيوانات المجموعة الأولى السيطرة السالبة والثانية هي مجموعة السيطرة الموجبة تناولت المحلول الملحي وزيت الذرة فمويا على التوالي، بينما أناث الجرذان للمجموعة الثالثة تناولت البسفينول-أ-المعلق بزيت الذرة (250 ملغم/ كغم من وزن الجسم) فمويا وعملت كمجموعة معاملة .أظهرت نتائج الدراسة الحالية ارتفاعا معنويا ($P\leq0.05$) في مستويات Glucose ALT وAST وعدد خلايا الدم البيض ونسبة الخلايا الدم البيض العدلة بينما هناك نقصان معنوي($P\leq0.05$) في عدد خلايا الدم الحمر وتركيز الهيموكلوبين ونسبة الخلايا الدم البيض اللمفية في المجموعة المعطية البسفينول-أ- بالمقارنة مع مجاميع السيطرة بينم هناك تغيرات غير معنوية في نسبة الخلايا الوحيدة والحمضة والقعدة من نتائج الدراسة الحالية نحن نستنتج بأن البسفينول أ يؤدي الى حدوث نتائج سلبية على المعايير الدموية والكيموحيوية. .

الكلمات المفتاحية

البسفينول-أ- ، المعايير الكيموحيوية والدموية ALT, AST ، جرذ .

Abstract

Bisphenol A (BPA) is one of the manufacturing compounds. The present study was conducted to investigate effect of BPA on some biochemical and hematological parameters such as Alanine Aminotransferase (ALT), Aspartate Aminotransferase(AST) Glucose, Red blood cells (RBCs), Hemoglobin (Hb), White blood cells (WBCs) and differential WBCs. Twenty four female rats were used and divided into three groups (8 animals for each group) randomly. Animals of first group was negative control group and second group was positive control group received normal saline and corn oil orally respectively,while female rat of third group were received BPA suspended with corn oil (250mg/kg B.W/day) orally as treatment group for 30 days . Results of the present study revealedsignificant increase ($P \leq 0.05$) in serum level of ALT, AST, Glucose, WBCs counts and percentage of neutrophil but there is significant decrease ($P \leq 0.05$) in RBCs counts, Hb concentration and percentage of lymphocyte in group administrated BPA in compared with control groups,while there are non significant changes in percentage of monocyte, eosinophil and basophilFrom the results of the present study, it was concluded thatBPA leads to occurred negative results on hematological and biochemical parameters.

Keywords

Bisphenol-A-, ALT, AST, Rat.

1. Introduction

Bisphenol A (BPA) is one of the manufacturing compounds, that interfered in production different plastic compounds and polycarbonate

and become universally used in the production of paper, food and beverage containers, consumer goods, and in many other industrial applications [1]. Recently researches showed that BPA has ability to leach out of some products, include tableware, plastic lining of cans used for food, white dental fillings sealants and polycarbonate babies' bottles. The leaching was occured by exposure of the plastic to high temperatures [2]. About 93% of urine samples in the US population contain on BPA [3]. [1] BPA found in the fluid portion of many classes of vegetables such as green beans, mushrooms, mixed vegetables, peas, corn and artichokes, which take from Cans with epoxy resin linings.ALT and AST levels were significantly increased in rats orally administrated BPA at dose 50mg/kg/B.W of for four weeks [4]. AL –Mossawi [5] reported signifigant increase in ALT and AST levels at day 90 of age of female and male offspring from mothers exposed to 250 mg/kg /BW of BPA during pre and postnatal life. [5] Reported significant increases in glucose levels of male rats exposed to 50 and 250 mg/kg/B.W. of BPA during pre and postnatal stages of their life.WBCs count significantly increased in rats exposed to (250) mg/kg/B.W. of BPA [6]. BPA is estrogen-like chemical with possible similar effects to diethylstilbestrol so, in the present pre and postnatal exposure study the decrease of RBC count which resulted in decreasing Hb concentration is thought to becaused by decrease erythropoietin production either due to estrogenic activity of BPA or decrease serum testosterone level or may be resulted from an increase indestruction of red blood cells [7].

The current study was aimed to estimate harmful effects of the exposure to BPA female rats by study the toxic effect of BPA on some biochemical andblood parameters.

2. Materials and Methods

2.1. Experimental animals

The present study was conducted at the College of Veterinary Medicine – University of Karbala. Twenty four mature female rats were purchased from care center and medicinal researches in Baghdad, Iraq. They were (14) to (16) weeks old with an average body weight (200-250) gm.

The animals were clinically healthy, kept under hygienic conditions, metal cages and glassy bottles were used to avoid exposure to BPA from old polycarbonate cages. Water and feed were givenad –libitum throughout the experimental period.

Female albino rats (24) females were divided into three main groups

(8animals of each group) as follows:

1- Negative control group: which receivedorally normal saline as a vehicle (0.5) ml/kg BW.

2- Posative control group: which receivedorally corn oil as a vehicle (0.5) ml/kg BW.

3- Treatment group: which received orally BPA at dose of (250) mg/kg B.W. /day (1/20

LD50) suspended in corn oil as high dose [8]. All treatments were given using gavage needle.

At the end of the experimental period (30) days female rats' of each group were sacrificed by placing them in a closed jar containing cotton socked with chloroform anesthesia.

Blood samples were collected by heart puncture using (5) ml disposable syringe 1 ml of blood was collected in heparinized tube for measurements of hematological parameters as soon as possible.

The rest of the blood was put in plane tubes to be centrifuged at (6000) rpm for (10) minutes to obtain serum which is then transferred to Eppendorf tubes, for the estimation of biochemical parameters. All tubes were stored at (–20) oC until analyzed.

2.2. Biochemical parameters

Serum aspartate aminotransferase(AST), alanine aminotransferase (ALT) and Glucose levels were determined by using aspecial kits (SPECTRUM AST – kit, Egypt) [9].

2.3. Hematological parameters

Red blood cells (RBCs) count,Hemoglobin (Hb),White blood cells (WBCs) count and differential WBCs countwere done by using Veterinary automated hematoanalyzer (Genex Inc., Florida USA) according to manufacturer instruction.

2.4. Statistical analysis:

The data were presented as Mean ±SE and subjected to analysis of variance by using one way analysis of variance(ANOVA) Post hoc test was used LSD to specify the significant difference among means.The SPSSProgram-was used for the analysis of data [10].

3. Results

3.1. Effect of BPA on serum levels of ALT, ASTand Glucose in Mature Female Rats

A significant($p \leq 0.05$) increase is noticed in serum AST, ALTandGlucose levels in female rats treated with BPA (250 mg/kg B.W) compared with control groups.

Table (1): Effect of BPA on serum levels of ALT, ASTand Glucose in mature female rats

parameters / Groups	ALT U/ml	AST U/ml	Glucose mg/dl
Normal saline group (Negative control group) (0.5ml/kg/B.W)	CD 47.71±1.04	C 80.28±1.01	BC 65.71±1.04
Corn oil group (Positive control group) (0.5ml/kg/B.W)	C 52.62±2.57	C 98.75±2.68	B 69.37±1.82
Bisphenol-A- group (Treated group) (mg/kg/B.W 250)	A 96.00±2.23	A 331.37±13.25	A 80.50±3.47

Values are mean ±SE

N=8

Different letters represent a significant difference at ($p \leq 0.05$).

3.2. Effect of BPA on RBCs count and Hb concentration in mature female rats

Table 2 shows that exposure to BPA (250 mg / kg B.W.) produces a significant($p \leq 0.05$) decrease in RBCs count and Hbconcentrationsin female rats compared with control groups.

Table (2): Effect of BPA on RBCs count and Hb concentrationin mature female rats

Parameters / Groups	RBC 10^6cell/ml×	Hb g/dl
Normal saline group (Negative control group) (0.5ml/kg/B.W)	A 6.73±0.19	A 13.71±O.42
Corn oil group (Positive control group) (0.5ml/kg/B.W)	B 5.76±0.21	A 13.25±O.45
Bisphenol-A- group (Treatment group) (mg/kg/B.W 250)	C 4.16±0.21	B 8.00±0.46

Values are mean ±SE

N=8

Different letters represent a significant difference at ($p \leq 0.05$).

3.3. Effect of BPA onWBC countand differential count of WBC in mature female rats

The effect of exposure to (250 mg / kg B.W.) of BPA demonstrates a significant($p \leq 0.05$) increasein WBCs count and the percentage of neutrophils, while the percentage of lymphocytes shows asignificant($p \leq 0.05$) decreaseinBPA treated of female rats when compared with the control groups Table (3). No change is observed in the percentage of monocytes, eosinophils and basophils.

Table (3): Effect of BPA(250 mg / kg B.W.)on total anddifferential leukocyte counts in mature female rats

Parameters / Groups	WBC 10^3cell/× ml	Lymphocyte %	Monocyte %	Neutro-phil %	Eosinophil %	Basophil %
Normal saline group Negative control) (group (0.5ml/kg/B.W)	B 8.15±0.16	A 89.57±0.61	A 1.50±0.21	C 6.85±0.55	A 1.64±0.17	A 0.42±0.17
Corn oil group Positive control) (group (0.5ml/kg/B.W)	B 8.27±0.22	A 89.87±0.39	A 1.37±0.18	C 7.37±0.91	A 1.12±0.24	A 0.25±0.09
Bisphenol-A- group (Treatment group) (mg/kg/B.W 250)	A 11.66±0.33	C 72.37±1.86	A 1.25±0.09	A 24.25±1.86	A 1.50±0.16	A 0.62±0.15

Values are means ± SE

N=8

Different letters represent a significant difference at (p≤0. 05).

4. Discussion

The current study showed that female rats treated with (250 mg/kg B.W) of BPA demonstrateda significant increase in AST and ALT levels compared with control groups. These results were matched with the results obtained by [4,11,12,13,14,15,16] reported that exposure to BPA lead to changes in liver result in an increase in oxidative stress that may explain the increased levels of AST and ALT. On the other hand, there was an increase in blood glucose concentration in rats exposed to BPA (250) mg/kg/day.This result matched with [17] who showed that BPA disrupt glucose homeostasis in pregnant mice.BPA affects glucose metabolism by different mechanisms such as oxidative stress, inflammation, insulin resistance and β cell dysfunction. BPAhas also been shown to cause, hyperinsulinemia and is considered a potential diabetogenic agent [18,19, 20]. The current results showed that there was a significant decrease in the RBCs count and Hb level in female rats exposed to (250) mg/kg/BW of BPA compared with control groups and these results were in agreementwith previous studies [21, 10, 4, 22, 23, 24]. [25] reported a decrease in RBCs count and Hb concentration in rats exposed to BPA at high doses, BPA may decrease the concentration of iron in the blood or lead to shorter half life for red blood cells and their degradation as a result to changing in cell membrane permeability that make red blood cells more fragile and prone to hemolysis. These result was matched with [26] who reported anemia and significant alterations in several biochemical parameters ihn raes exposed to BPA for long time .In the present study, there was an increases in WBCs count after the exposure to 250 mg/kg/BW of BPA, which may explained on the basis of the role of BPA in induction of inflammatory conditions or may be due to increase in the percentages of neutrophils. In addition the increasing number of WBCs could be due to stress that induced by BPA and stimulation of immune system. This result is in accordance with [27].

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piecewise 3-monotone approximation for 3-monotone functions in L_P-spaces for P<1

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Received Date: 4 / 6 / 2015
Accepted Date: 11 / 7 / 2016

الخلاصة

في هذا البحث قمنا بتخمين درجة التقريب 3 - رتيب على الفضاءات L_p عندما P<1.

الكلمات المفتاحية

درجة التقريب، فضاءات Lp.

Abstract

In this paper we estimate the degree of 3-monotone shape preserving approximationon L_P-spaces for <1.

Keywords

The degree of monotone, L_P-spaces.

1. Introduction

In [1] K.A.Kopotun, studied approximation of k-monotone functions, in [2] E. S. Bhaya,andR. R. Mohsin, studied approximation of 3-monotone functions by 3-monotone functions in L_p-spaces, and in [3] E.S. Bhaya, and M. S. Al-Muhjastudiedk-monotone approximation in L_p-spaces, in [4] G.A.Dzyubenko,K. A. Kopotun, and A.V.Prymark, studied Three-monotone spline approximation, in [5] A.Bondarenko , D.Leviatan, and A.Prymark, studiedpointwise estimates for 3-monotone approximation .

In this paper we introduce shape preserving approximation theorems for 3-monotone functions in L_p-spaces for <1 .

2. The auxiliary results :

Let us introduce some auxiliary lemmas that we need in our work.

2.1. Lemma

suppose f,s$\in\Delta^2_{[a,b]}\cap L_p$ [a,b]for <1 . Then either s' (b-)$\le$f[a,b]or s' (a+)$\ge$f[a,b] , satisfying

$\|f-l\|_{L_p[a,b]} \le c(p)\|f-s\|_{L_p[a,b]}$,

wheref define on[a,b] and l is linear Lagrange interpolation f at a and b

Proof:

Suppose that s' (b-) $\le$ f [a,b], and s' (a+) $\ge$ f [a,b] is symmetrical. If $x_1=\sup\{f'(x)\le f[a,b], \forall x\in(a,b)\}$, such that s' (x)$\le$s' (b-) $\le$ f [a,b], and $x_1\le x\le b$.

$\|f-l\|_{L_p[a,b]}) = l(x_1) - f(x_1)$

$=\int_{x_1}^{b}(f'(x) - l'(x))\,dx$

$\le\int_{x_1}^{b}(f'(x)-s'(x))dx$

$\le f(b) - s(b) - (f(x_1) - s(x_1))$

$\le c(p)\|f-s\|_{L_p[a,b]}$■

2.2. Lemma [6]:

Suppose that f is defined on $[a_1,b_1]$, and that s is a piecewise polynomial of degree $\le$ k - 1, which knot a and b, $a_1\le a\le b\le b_1$, such that s' (a+) $\le$ f [a,b] $\le$ s' (b-). If, s$\in\Delta_{[a,b]}^2$, then there exist a piecewise polynomial $s_1\in\Delta[a_1,b_1]2$ of degree $\le$ k - 1, with knot a and b, satisfying (1)s' (a+)$\le$$s_1$' (a+), s' (b-) $\le$ s_1' (b-).(2)s_1 (a) = f (a), s_1 (b) = f (b)

2.3. Lemma:

Let f define on $[a_0,b_0]$ and let s$\in\Delta_{[a,b]}^2\cap L_p[a,b]$ for P<1, of degree $\le$ k-1 at knots a and b, $a_0\le a\le b\le b_0$, s' (a+) $\le$ f [a,b] $\le$ s' (b-) .If f, and s are convex polynomials on $[a_0, b_0]$,then there is s' be convex a piecewise polynomial on $[a_0,b_0]$ of degree $\le$ k -1, at same knots, satisfying

(1) s' (a+) $\le$ s_1' (a+), s_1' (b-) $\le$ s' (b-)

(2)s_1 (a) = f (a), s_1 (b) = f (b)

(3)$\|f-s_1\|_{L_p[a,b]} \le c(p)\|f-s\|_{L_p[a,b]}$

(4)$\|f-s_1\|_{LP[a_0,b_0]} \le c(p)\|f-s\|_{L_p[a_0,b_0]}$

Note if [a,b]=$[a_0,b_0]$, such that s, s_1 are convex a piecewise polynomials on $[a_0,b_0]$ of degree $\le$ k-1.

Proof:

If (b)-f(a)=s(b)-s(a), let $s_1(x) = s(x) + f(a)-s(a)$, for each x $\in$ $[a_0,b_0]$. Then by Lemma 2.2 we get (1) and (2),then

$\|f-s_1\|_{L_p[a,b]} =\|f-(s(x)+f(a)-s(a))\|_{L_p[a,b]}$

$\le c(p)\|f-s\|_{L_p[a,b]}$

And

$\|f-s_1\|_{L_p[a_0,b_0]} = \|f-(s(x)+f(a)-s(a))\|_{L_p[a_0,b_0]}$

$\le c(p)\|f-s\|_{L_p[a_0,b_0]}$

Suppose f(b)-f(a)<s(b)-s(a) and this case f(b)-f(a)>s(b)-s(a) is symmetrical.

First defines$_1$ on the interval [a,b] and then extended to interval $[a_0,b_0]$if [a,b]=$[a_0,b_0]$.

Assume $s_1(x)= s(x) - s'(a+)(x-a)$, for each x $\in$ [a,b], and $f_1(x)=f(x)-s'(a+)(x-a)$, for each x $\in$ [a,b], such that $\|f_1-s_1\|_{L_p[a,b]}=\|f-s\|_{L_p[a,b]}$, then by our hypothesisf(b)-f(a)<$s_1(b)-s_1(a)$, and $s_1(b)-s_1(a)>0$. Thus set $s_1''(x)=f_1'(a)+\lambda(s_1'(x)-s_1'(a))$, for each x$\in$[a,b] and $\lambda=(f_1'(b)-f_1'(a))/(s_1'(b)-(s(a'')))$ where $0\le\lambda\le1$, note that $S''$is non decreasing and $\|s_1'(.)-s_1'(a)\|_{(LP[a,b])}=s_1'(b)-s_1'(a)$, $s_1''(a)=f_1'(a)$, $s_1''(b)=f_1'(b)$, so that s_1'' is convex in [a,b] . Hence

$\|f-s_1\|_{L_p[a,b]} = \|f_1''-s_1''\|_{L_p[a,b]}$

$=\|f_1''(.)-s_1''(.)+s_1'(a)-f_1'(a)+s_1'(.)-s_1'(a)+f_1'(a)-s_1''(.)\|_{L_p[a,b]}$

$\le c(p)\|f_1''-s_1''\|_{LP[a,b]} + \|s_1'(.)-s_1'(a)+f_1'(a)-f_1'(a)-\lambda(s_1'(.)-s_1'(a))\|_{LP[a,b]}$

$\le c(p)(\|f_1''-s_1''\|_{LP[a,b]} + \|s_1'(.)-s_1'(a)-\lambda(s_1'(b)-s_1'(a))\|_{LP[a,b]})$

$\le c(p)(\|f_1''-s_1''\|_{LP[a,b]} +(1-\lambda)\|s_1'(b)-s_1'(a)\|_{LP[a,b]}$

$\le c(p)(\|f_1''-s_1''\|_{LP[a,b]}+\|s_1'(b)-s_1'(a)-((f_1'(b)-f_1'(a))/(s_1'(b)-(s(a'')))\,(s_1'(b)-s(a))''\|_{(LP[a,b])}$

$\le c(p)\|f_1''-s_1''\|_{LP[a,b]}+c(p)\|f_1''-s_1''\|_{LP[a,b]}$

$\le c(p)\|f_1''-s_1''\|_{LP[a,b]})=c(p)\|f-s\|_{LP[a,b]}$

Further, if [a,b]$\ne[a_0,b_0]$, then extendS_1 either to right or to left or both.

Let

$$s^1(x)=\begin{cases}s(x)+f(x)-s(a) & \text{,for each } x\in[a_0,a)\\ s(x)+f(x)-s(b) & \text{,for each } x\in(b,b_0]\end{cases}$$

Then see a piecewise polynomial $s_1\in\Delta[a_0,b_0]^2$ of degree $\le$ k-1 at knots aand b.

Now

$\|f-s_1\|_{LP[b,b0]} = \|f-s(x) - (f(b) - s(b))\|_{LP[b,b0]})$

$\le c(p)\|f-s\|_{LP[b,b0]}$

and similarly

$\|f-s_1\|_{LP[a0,a]} = \|f-s(x)-(f(a)-s(a))\|_{LP[a0,a]}$

$\le c(p)\|f-s\|_{LP[a0,a]}$

Combined these with (3), we get (4) ■

2.4. Lemma:

Letf ,s$\in\Delta^2_{[a,b_0]}\cap L_p$ [a,b] , for P<1 , a<b<b_0, and s' (b-)-f[b,b_0]>0 . Then

$(s'(b-)-f[b,b_0])\,(b_0-b)\le c(p)\|f-s\|_{LP[b,b_0]}$

Symmetric, if f, s$\in\Delta^2_{[a_0,a]}\cap L_p$ [a,b] , for P<1 , a_0<a<b , and f[a_0,a]-s' (a+)$\le$c(p)$\|f-s\|_{LP[a_0,a]}$

Proof:

The proofs of the first statement ,and the second are similar, let $x_0=\sup\{x\in(b,b_0):f'(x)\le s'(b-)\}$, then

$$(s'(b-)-f[b,b_0])(b_0-b)=\int_b^{b_0}(s'(b-)-f[b,b_0])dx$$

$$=\int_b^{b_0}(s'(b-)-f'(x))dx$$

$$\le\int_b^{x_0}(s'(b-)-f'(x))dx$$

$$\le\int_b^{x_0}(s'(x)-f'(x))dx$$

$=s(x_0)-f(x_0)-(s(b)-f(b))$

$\le c(p)\|f-s\|_{LP[b,b_0]}$

where s' be no decreasing such that f' (x) $\le$ s' (b-) $\le$ s' (x), for each x$\in$(b,x_0). ■

2.5. Lemma [6]:

Leta_1 < a < b < b_1 , and f$\in\Delta^2_{[a1,b1]}$, and suppose that s$\in\Delta^2_{[a1,b1]}$is a piecewise polynomial of degree $\le$ k-1 with knots a and b , satisfying f(a)=s(a),f(b)=s(b) . Then ,there is a polynomial $s_1\in\Delta^2_{[a,b]}$of degree $\le$ k-1 , such that

(1) $s'(a+) \le s_1'(a+), s_1'(b-) \le s'(b-)$.

(2) $f[a,a_1] = k_a \le s_1'(a+), s_1'(b-) \le k_b = f[b,b_1]$.

(3) $s_1(a) = f(a), s_1(b) = f(b)$.

2.6. Lemma:

Suppose $a_0 < a < b < b_0$, and let $m=\max\{\frac{b-a}{b_0-b}, \frac{b-a}{a-a_0}\}$, and f is convex polynomial on $[a_0,b_0]$, and lets convex piecewise polynomial on $[a_0,b_0]$ of degree $\le$ k-1 , at knots a and b , we take f(a)= s(a), and f(b) =s(b). Then there exist s_1 is convex polynomial on [a,b] of degree $\le$ k-1, satisfying

(1) $s'(a+) \le s_1'(a+), s_1'(b-) \le s'(b-)$.

(2) $f[a,a_1] = k_a \le s_1'(a+), s_1'(b-) \le k_b = f[b,b_1]$.

(3) $s_1(a) = f(a), s_1(b) = f(b)$.

(4) $\|f-s_1\|_{LP[a,b]} \le c(p,m)\|f-s\|_{LP[a0,b0]}$

Proof:

Suppose that f(a)= f(b) . If S be constant on interval [a,b], put $s_1(x) = s(x)$, for each x∈[a,b] . Otherwise let s(b)=s(a) and sisconvex , such that s^' (b-)>0>s' (a+) . let

$$\lambda = \min\{\frac{k_b}{s'(b-)}, \frac{k_a}{s'(a+)}\} \ge 0.$$

If λ≥0 ,then put $s_1(x)$=s(x) , for each x∈[a,b]. Otherwise <0 , suppose that $\lambda = \frac{k_b}{s'(b-)} < 0$. Then assume $s_1(x)$=s(a)+λ(s(x)-s(a)), for each x∈[a,b] , since s_1 is convex polynomial on [a,b] of degree $\le$ k-1.We get (1) , (2) and (3) from Lemma 2.5.

Let x_1=sup{s' (x) $\le$ 0: x∈(a,b)} , and 0= s(b)-s(a)= $\int_a^b S'(x)dx$, so that

$$\|s-s_1(a)\|_{Lp[a,b]} = \int_{x_1}^{a} s'(x)dx = \int_{x_1}^{b} s'(x)dx \le (b-a)s'(b-)$$

Then by Lemma 2.4. ,

$\|s-s_1\|_{LP[a,b]} = \|s(x)-s(a)-\lambda(s(x)-s(a))\|_{LP[a,b]}$

$= (1-\lambda)\|s-s(a)\|_{LP[a,b]} \le (1-\lambda)s'(b-)(b-a)$

$= (1-\lambda)s'(b-)(b_0-b)$

$\le c(p,m)\|f-s\|_{LP[b,b0]}$

Hence

$\|f-s_1\|_{LP[a,b]} = \|f-s+s-s_1\|_{LP[a,b]} \le C(p)(\|f-s\|_{LP[a,b]} + \|f-s_1\|_{LP[a,b]})$

$\le c(p)\|f-S\|_{LP[a0,b0]}$

The proof of Lemma2.6 is complete■

2.7. Lemma [6]:

Let $a<b<b_1$, $\tilde{m} = \frac{b-a}{b_1-b}$, and $f\in\Delta^2_{[a,b_1]}$, and suppose that $s\in\Delta^2_{[a,b_1]}$is a piecewise polynomial of degree $\le$ k-1 with knot b , satisfying f(a)=s(a) and f(b)=s(b) . Then ,there is a polynomial $s_1\in\Delta^2_{[a,b]}$of degree $\le$ k-1, such that

(1) $s_1'(b-) \le s'(b-)$,

(2) $s_1'(b-) \le k_b = f[b,b_1]$,

(3) $s_1(a) = f(a), s_1(b) = f(b)$,

Symmetrically, let $a_1 < a < b$, and $f\in\Delta^2_{[a1,b]}$, and suppose that $s\in\Delta^2_{[a1,b]}$ is a piecewise polynomial of degree ≤k-1 with knot a , satisfying f(a)=s(a) and f(b)=s(b) . Then , there is a polynomial $s_1\in\Delta^2_{[a,b]}$of degree $\le$ k-1,such that

(1) $s_1'(a+) \le s'(a+)$,

(2) $f[a,a_1] = k_a \le s_1'(a+)$,

(3) $s_1(a) = f(a), s_1(b) = f(b)$,

2.8. Lemma:

Suppose $a < b < b_0$, and f be convex polynomial on $[a,b_0]$ of degree $\le$ k-1, and assume S be convex a piecewise polynomial on $[a,b_0]$ of degree $\le$ k-1 at the knot b ,put f(a)=s(a) , f(b)=s(b).Then ,there exist s_1 convex polynomial on [a,b] ,of degree $\le$ k-1, satisfying

(1)$s_1'(b-) \le s'(b-)$,

$s_1'(b-) \le k_b = f[b,b_0]$,

$s_1(a)=f(a), s_1(b) = f(b)$,

(2) $\|f-s_1\|_{LP[a,b]} \le c(p,m\hat{})\|f-s\|_{LP[a,b_0]}$

, suppose $a_0 < a < b$, $\hat{m} = \frac{b-a}{a-a_0}$, and f convex polynomial on $[a_0,b]$of degree $\le$ k-1 at knot a , we put f(a)= s(a) , f(b)=s(b) . Then , there exist s_1 convex polynomial on [a,b] of degree $\le$ k-1, satisfying

(1) $s_1'(a+) \le s'(a+)$,

$f[a,a_1] = k_a \le s_1'(a+)$,

$s_1(a) = f(a), s_1(b) = f(b)$,

(2)$\|f-s_1\|_{LP[a,b]} \le c(p,m\hat{})\|f-s\|_{LP[a0,b]}$

Proof:

We prove the first case and the second case is symmetric.

By Lemma 2.7. , we get (1).

And prove (2) by Lemma 2.6 ,

$\|f-s_1\|_{LP[a,b]} = \|f-s(a)-\lambda(s(x)-s(a))\|_{LP[a,b]}$

$\le c(p)\|f-s\|_{LP[a,b]} + c(p)\|s-f(a)\|_{LP[a,b]}$

$\le c(p,m\hat{})\|f-s\|_{LP[a,b0]}$ ■

2.9. Proposition [7]:

Letk ≥1 and r ≥ 1 , be integers such that either r ≥ 2 or 2 ≤ k+r ≤3 . Then for each f $f \in L^{(r)}_{P[-1,1]} \cap \Delta^2_{[-1,1]}$ there exist piecewise polynomials $s_1, s_2\in\Delta^2_{[-1,1]}\cap_{LP[-1,1]}$ of degree ≤ k + r-1 such that s_1 has n equidistant knots , and satisfies

$$\|f-s_1\|_{L_P[-1,1]} \le \frac{c(p,k,r)}{n^r}\omega_k(f^{(r)},\frac{1}{n};[-1,1]) \quad (1)$$

ands_2 has knots on the Chebyshev partition, and satisfies

$$\|f-s_2\|_{L_P[-1,1]} \le \frac{c(p,k,r)}{n^r}\omega^{\varphi}_k(f^{(r)},\frac{1}{n};[-1,1]) \quad (2)$$

Moreover, s_1 and s_2 interpolate f at the respective knots.

As a direct consequent of Lemma 11 in [2] ,p.167 , we get the following :

2.10. Lemma:

Assume B>1and= $\max_{0<i<j\le n}\frac{(j-i)(x_{i+1}-x_i)}{x_j-x_i}$. .Then for each step-function $g(x) = \sum_{j=1}^{n-1}\alpha_j(x-x_j)^0_+$, for each x∈[a,b], where $\alpha_i \ge 0$, there is a polygonal-line $p(x) = \sum_{j=1}^{n-1}\frac{\beta_j}{(x_{i+1}-x_i)}(x-x_j)_+$. Satisfying

$$|\beta_j| < \frac{\alpha_j}{B}, j = 1,2,3,\dots,n-1, \quad (3)$$

And

$\|g(x)-p(x)\|_{LP[a,b]} \le 8\,\mu\,A\,B$ (4)

where

A= max┬(j=1,2,…,n-1)α_j .

The following auxiliary Lemma is an improvement of Lemma introduced by D.Leviatan , and A.V.Prymark [Lemma 12 , p.167] , and it can be proved in the same way and get.

2.11. Lemma:

Given the partition $x_0<x_1<x_2<\dots<x_n$, and the sequence $\delta_1,\delta_2,\dots,\delta_{n-1}$ are nonnegative-numbers , such that

$\delta_j \le \frac{1}{(x_{j+1}-x_{j-1})^2}\Omega$, $1 \le j \le n-1$,withΩ is a positive-constant . Then there is a piecewise polynomial q of degree ≤3 ,at the knots $x_1,x_2,\dots,x_{n-1}$, such that $q\in L^{(1)}_{P[a,b]}$,

$q''(x_j+)-q''(x_j-) = -\delta_j$, j=1,2,3,…,n-1(5)

$q\in\Delta x^3_{(j-1),x_j)}\cap_{LP}(xj-1,x_j)$, j=1,2,3,…,n(6)

$\|q\|_{LP[a,b]} \le c(p,m,\mu)\Omega(7)$

wherec(p,m,μ) is constant depending on m and μ , $\mu = \max_{0<i<j\le n}\frac{(j-i)(x_{i+1}-x_i)}{x_j-x_i}$

and $= \max_{1\le j\le n-1}\{\frac{x_{j+1}-x_j}{x_j-x_{j-1}}, \frac{x_j-x_{j-1}}{x_{j+1}-x_j}\}$

2.12. Lemma [8]:

Letf $\in L_P[a,b]$, $0 < P < \infty$. Then there exist q_{k-1}a polynomial of degree $\leq k-1$, such that

$\|f-q_{k-1}\|_{Lp}[a,b] \leq c\ \omega_k (f,b-a,[a,b])_P$.

2.13. Lemma [8]:

Let Pbe a piecewise polynomial of degree $\leq k$,such that

$\|P_k^{(s)}\|_{LP[a,b]} \leq c\ k^s \|P_k\|_{LP[a,b]}$

where c is a constant and s is the order of derivative .

3. The main result

In this section we introduce our main theorems.

3.1.Theorem:

Let $\in\Delta^2_{[a,b]}\cap L_P[a,b]$, for P < 1, with the partition $x_{-1}=a=x_0 < x_1 < x_2 <\cdots< x_n= b= x_{n+1}$, and $k \geq 2$. Then for all convex piecewise polynomial S on interval [a,b] of degree $\leq$ k-1, at the knots x_j and j= 1,2,3,…,n-1, there exist s_1 is a convex a piecewise polynomial on interval [a,b] of degree $\leq$ k-1 at the knots x_j andj=1,2,3,…,n-1, satisfying

(1) $f(x_j)=s_1(x_j)$, and j= 0,1,…,n [1]

(2) $\|f-s_1\|_{LP[xj-1,xj]} \leq c(p,m)\|f-s\|_{LP[xj-2,xj+1]}$

wherec(p,m) be constant depended on p and m , and $m = \max_{1\leq j\leq n-1}\left\{\frac{x_{j+1}-x_j}{x_j-x_{j-1}}, \frac{x_j-x_{j-1}}{x_{j+1}-x_j}\right\}$

Proof :

Let

$l\_u(.)=L(.;x_{u-1}, x_u)$, u = 0,1,…,n+1. Assume A$\subset${1,2,3,…,n} is the set of each, such that $s'(x_{i-1}+) \leq l_i' \leq s'(x_i-)$. For each $\notin$A , satisfying $s_1(x)=l_i(x)$, $x\in[x_{i-1},x_i]$. By using Lemma 2.8.

$\|f-s_1\|_{LP[x_i-1,x_i]} \leq c(p)\|f-s\|_{LP[x_i-2,x_i+1]}$ (8)

So as to define s_1 on interval $[x_{i-1},x_i]$, i∈A, we first suppose 1< i < n, and use the interval $[x_{i-2},x_{i+1}]$. first Lemma 2.3 and use Lemma 2.6 ,at a= x_{i-1} and b= x_i. We achieve the existence a convex polynomial $s_1$on $[x_{i-1},x_i]$, then

$\|f-s_1\|_{LP[xi-1,xi]} \leq c(p)\|f-s\|_{LP[xi-2,xi+1]}$ (9)

and $f(x_{i-1})= s_1(x_{i-1}), f(x_i)= s_1(x_i)$

Finally, we dealwith the possible that either i=1 or i= n , and 1,n∈A . To this suppose 1∈A, and the second case n∈A is symmetrically, since $s'(a+) \leq f[a,x_1] \leq s'(x_1-)$. Then by using Lemma 2.3 we have a piecewise polynomial

$\ddot{s}_1\in\Delta^2_{[a,x_2]}$, which f interpolate with a and x_1. Since $\ddot{s}_1'(x_1-) \leq s'(x_1-)$, then

$\|f-\ddot{s}_1\|_{Lp[a,x_2]} \leq c(p)\|f-s\|_{LP[a,x_2]}$ (10)

We now using Lemma 2.8 and get $s_1\in\Delta^2_{[a,x1]}$of degree $\leq$ k-1, which f interpolate with aand x_1, since $\ddot{s}_1'(x_1-) \leq s'(x_1-)$, then

$\|f-s_1\|_{Lp[a,x_1]} \leq c(p)\|f-s\|_{LP[a,x_2]}$ (11)

so ,s_1is a convex and piecewise polynomial –function of degree $\leq$k-1 , and $s_1(x_i)= f(x_i)$, i= 0,1,2,…,n , and from (1)-(3) include

$\|f-s_1\|_{Lp[xj-1,xj]} \leq c(p,m)\|f-s\|_{LP[xj-2,xj+1]}$■

3.2. Theorem:

Let F be a 3-monotone function in $L_P[a,b]$, satisfying f (x)=F' (x), for each x∈(a,b), and take k >2 , x(-1)= a= $x_0< x_1<\cdots<x_n=b=x_{n+1}$be partition for the interval [a,b]. Also let s be convex a piecewise polynomial on[a,b] of degree $\leq$k-1 ,at knots x_j , j=1,2,…,n-1 ,then , there is a piecewise polynomial 3-monotone P in $L_P[a,b]$ of degree $\leq$ k at the same knots, satisfying

$\|F-P\|_{LP[a,b]} \leq c(p,m)\|f-s\|_{LP[x(i-2),xi+1]}$

wherec(p,m)is constant depended on p and m ,and $m= \max_{1\leq j\leq n-1}\left\{\frac{x_{j+1}-x_j}{x_j-x_{j-1}}, \frac{x_j-x_{j-1}}{x_{j+1}-x_j}\right\}$

.

Proof :

By using Theorem 3.1 ,and using Theorem 2.3 ,we have

$\|F-P\|_{LP[a,b]} \leq \|F-P\|_{LP[a,b]}+\|f-s_1\|_{LP[xj-1,xj]} \leq c(p)\|f-s\|_{LP[xi-1,xi]}+c(p)\|f-s\|_{LP[xj-2,xj+1]}$

$\leq c(p,m)\|f-s\|_{Lp[xi-2,xi+1]}$■

3.3.Theorem:

Given the integers k > 1 and > 0, such that either r >3 , or 3<k+r $\leq$ 4 , and (k,r)≠(4,0) . Then for all $\in L_P^{(r)}{}_{[-1,1]}\cap\Delta^3_{[-1,1]}$, there exist 3-monotone a piecewise polynomials S_1 and S_1 on [-1,1] of degree $\leq$ k + r-1 , such that

$\|F-S_1\|_{L_P[-1,1]} \leq \frac{c(p,k,r)}{n^r}\omega_k(F^{(r)},\frac{1}{n};[-1,1])$(12)

Where S_1 has n equal –distant knots.

And such that

$\|F-S_2\|_{L_P[-1,1]} \leq \frac{c(p,k,r)}{n^r}\omega_k^{\varphi}(F^{(r)},\frac{1}{n};[-1,1])$(13)

Where S_2 has n knot on chebyshev partition.

Proof :

We prove the first case and the second case is symmetrically.

Byusing Theorem 3.2

$\|F-P\|_{Lp}[a,b] \leq c(p,m)\|f-s\|_{Lp}[x_{i-2},x_{i+1}]$

andalso we have ,

$\|f-s_1\|_{L_P[-1,1]} \leq \frac{c(p,k,r)}{n^r}\omega_k(f^{(r)},\frac{1}{n};[-1,1])$

Hence ,

$\|F-S_1\|_{L_P[-1,1]} \leq c(p,m)\|f-s\|_{L_P[x_{i-2},x_{i+1}]}+\frac{c(p,k,r)}{n^r}\omega_k(f^{(r)},\frac{1}{n};[-1,1])$

$\leq \frac{c(p,k,r)}{n^r}\omega_k(F^{(r)},\frac{1}{n};[-1,1])$■

3.4. Theorem:

Let S be a 3-monotone a piecewise polynomial in $L_P[a,b]$, P<1, of degree $\leq$ k and k >3, at knots $x_{-1}= a= x_0< x_1< x_2<\cdots< x_n=b=x_{n+1}$. Then there exist a piecewise polynomial S_1 of degree $\leq$ k at the knots $x_{-1}=a=x_0 < x_1< x_2<\cdots< x_n= b= x_{n+1}$, such that $S_1\in\Delta^3_{[a,b]}\cap{}^{(2)}{}_{Lp[a,b]}$, for P < 1.And

$\|S-S_1\|_{LP[a,b]} \leq c(p,k,m,\mu)\omega_{k+1}(S,(x_{j+1}-x_{j-1});[x_{j-1},x_{j+1}]$ (14)

Where c(p,k,m,μ) is a constant depending on p,k,mand , and m=

$\max_{1\leq j\leq n-1}\left\{\frac{x_{j+1}-x_j}{x_j-x_{j-1}}, \frac{x_j-x_{j-1}}{x_{j+1}-x_j}\right\}$, and

$\mu = \max_{0<i<j\leq n}\frac{(j-i)(x_{i+1}-x_i)}{x_j-x_i}$(15)

Proof :

Let $\delta_j=S''(x_j+)-S''(x_j-)$, j=1,2,…,n-1. Since S be a 3-monotone function in L_P [a,b]for <1 , on interval$[x_0,x_n]$, $\delta_j \geq 0$, $1 \leq i \leq$ n-1 . By Lemma 2.12 there exist polynomial U_k of degree $\leq$ k , such that

$\|S-U_k\|_{LP[xj-1,xj+1]} \leq c(p,k)\omega_{k+1}(S,(x_{j+1}-x_{j-1});[x_{j-1},x_{j+1}])_{LP}$

This transition by Lemma2.13,

$\|U_k''-S''\|_{L_P[x_{j-1},x_{j+1}]} \leq \frac{c(p,k)}{(x_{j+1}-x_j)^2}\omega_{k+1}(S,(x_{i+1}-x_{i-1});[x_{i-1},x_{i+1}])_{Lp}$

Thus,

$\delta_j \leq \frac{c(p,m,k)}{(x_{j+1}-x_j)^2}\omega_{k+1}(S,(x_{i+1}-x_{i-1});[x_{i-1},x_{i+1}])$

Let

$\Omega=c(p,m,k)\omega_{k+1}(S,(x_{i+1}-x_{i-1});[x_{i-1},x_{i+1}])$

And by Lemma 2.11 to get the apiecewise-polynomial . The set $S_1(x)=S(x)+g(x)$, for each x∈$[x_0,x_n]$. Clearly ,apiecewise-polynomial S_1 of degree $\leq$ k at knots $x_0,x_1,\ldots,x_n$,such that

$S_1''(x_j-)=S_1''(x_j+)$, j=1,2,…,n-1,(16)

so that $S_1\in{}^{(2)}{}_{LP[a,b]}$.Also, since $S\in\Delta^3_{[x0,xn]}\cap L_P$

[a,b]for P<1, by (6) that S_1'' be nodecreasing in(x_{j-1},x_j) , $1 \le j \le n$. Combine with (16) ,and that S_1'' be non decreasing on(x_{j-1},x_j), so as to S_1 is 3-monotone function on [a,b]. At last, (14)from (7). This completes the proof■

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Evaluation of Irrigation Water Quality Statusof New Hussainiyah Canal in Karbala City, Iraq

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Received Date: 23 / 5 / 2016
Accepted Date: 22 / 8 / 2016

الخلاصة

تعتبر عملية تقييم نوعية مياه الري واحدة من اهم الامور الواجب مراعتها في ادارة المشاريع الاروائيه لما لذلك من تاثير على الواقع الزراعي والاروائي وكذلك انتاج المحاصيل. في هذا البحث تم تقييم نوعية مياه الري في قناة الحسينيه الجديده من خلال مراقبة اربع محطات على طول القناة ولمدة سنه كاملة خلال العام (2015) وفقا ل(12) متغير لتصبح عدد الاختبارات الكلية (48) اختبار. شملت الفحوصات العناصر: الموصلية الكهربائية، الرقم الهيدروجيني، الاملاح الذائبة الكلية، ايونات الصوديوم، نسبة امتصاص الصوديوم، نسبة ذوبان الصوديوم، الاملاح الكبريتية، ايونات لكالسيوم ، ايونات المغنسيوم، اايونات البوتاسيوم ، ايونات الكلوريدات، والقلوية. تتوزع المحطات المختارة ابتدا من بداية القناة وحتى نهايتها وتمت تسميتها حسب الاتي (الصلامية، الابراهيمية، القنطرة البيضاء والصافي). تم اسخدام الطريقة الكندية لتقييم نوعية مياه الري في القناة وبواقع مؤشر نوعية لكل اربعة اشهر على مدار السنه ولكل محطة. اظهرت النتائج بان مؤشر النوعية لمياه الري في القناة يقع ضمن المستوى المنصف او المقبول لمحطات الصلامية، الابراهيمية، القنطرة البيضاء، في حين كانت بين المستوى المنصف الى القريب من الحد الادنى للمتطلبات في محطة الصافي. وهذا يعني ان نوعية مياه الري في القناة لم تكن تتطابق مع الحدود المرغوب بها خلال بعض اوقات فترة الدراسة. مما تقدم في اعلاه ولاجل المحافظه على هذا المصدر المهم يجب ان تقوم الجهات المكلفة بادارة ملف المياه في محافظة كربلاء بمراقبة نوعية مياه الري وكذلك تقليل منابع التلوث من اجل المحافظه على هذا المصدر المهم .

الكلمات المفتاحية

نوعية مياه الري، قناة الحسينية الجديدة، مؤشر نوعية المياه الكندي، كربلاء، العراق.

Abstract

The assessment of irrigation water quality is a standout amongst the most critical variables that ought to be considered in irrigation projects management, because it has a huge impact on agriculture growth and production. This study has assessed the irrigation water quality status of new Hussainiyah canal in Karbala city, Iraq. Twelve water quality parameters with regard to four observing stations during the year 2015 were surveyed. The 48 samples were tested for, Electric Conductivity, pH value, Total Dissolved Solids, Sodium, Sodium Absorption Ratio, Soluble Sodium Percentage, Sulphate,Calcium, Magnesium, Potassium, Chloride and Alkalinity(EC, PH, TDS, Na, SAR, SSP, SO4, Ca, Mg, K, Cl and Alk). These stations were scattered along the new Hussainiyah canal from upstream to downstream and named as (Salamiyah, Abrahimiyah, QuntaraBedah and Safie). Canadian Water Quality Index (CWQI) technique was applied to make the assessment according to regular time variations(every four months for each station). The results indicated that the irrigation water quality of new hussainiyah canal was in fair conditions for stations, Salamiyah, Abrahimiyah and Quntara Bedah, while it was marginal to fair conditions for Safie station. Also, the conditions of the quality for irrigation water in the canal were not match the eligible levels for some times at the period of study. Regular monitoring for irrigation water quality status and reducing the pollution roots should be adopted from water resources authorities in province of Karbala to pre save that valuable artery source of water.

Keywords

irrigation water quality, new Hussainiyah canal, Canadian Water Quality Index (CWQI), Karbala city, Iraq.

1. Introduction

The status of irrigation water quality, does not get yet the significant priority from water resources authorities in many water sheds area around the world. Absence of data and monitoring about the irrigation water quality in many irrigation projects in Iraq, caused many problems in agriculture productions. This issue might be controlled by comprehension the irrigation water quality data. Water quality index (WQI) is one of simplified tools which converts the complex measurements into easy applicable number. This tool can be used as an effective way to assess the "irrigation water quality" by managers and decision makers of irrigation projects. The main idea of WQI is based on the rule of matching water quality parameters with respect to most commonly standards. Many researchers have been used the WQI to evaluate and monitor the condition of "irrigation water quality". Nabaa Hadi [1], compared the results of applications of the Canadian and Bharagava methods to evaluate irrigation water quality status in Tigris River in Amara region. The results showed that there "was no big difference between two methods and the status of quality of irrigation water was in fair state". Abdulkider [2], assessed water quality of al Husseinieh canal for irrigation purpose in Karbala city using the developed Brazilin model. It was found that "the irrigation water quality was suited to irrigate soils with light texture". Udai Jahad[3], evaluated the water quality index for irrigation in north of Hilla using the Canadian and Bharagava methods. The results of study showed "bad condition of quality at the downstream and nearly al Kifil station". Bashar AL-Sabah [4], evaluated the water quality index of Tigris River for irrigation use in southern of Iraq in Amara city and it was found "the quality of river within permissible limits". Layla Saleh,[5], assessed the irrigation water quality for al Kifil channel by Brazilin model and found "low restriction limit for soils with light texture".The main goal of this research is to evaluate the irrigation water quality of new hussainiyah canal in Karbala city with respect to (12) parameters (EC, PH, TDS, Na, SAR, SSP, SO4, Ca, Mg, K, Cl and Alk) using (CWQI) at main four stations along the canal. The research focused on evaluation the status with respect to the variation in time period for each station. Four months step was adopted to assess the quality of irrigation in the canal along the period of study.

2. Materials and Methods

2.1. Study Area

The study area is located between latitudes (N 36° 00' to 36° 19') and longitudes (E 41° 01' to 42° 85 '), Fig. (1).The new Hussainiyah canal length is about (27) Km lined with concrete and the irrigated area is close to (23) thousand hectares. During the last ten years, the maximum discharge was about (23.63) while the minimum was near (4.2.) Al Musayyib town represents the north border to the canal, while the entrance of Karbala city (Bab Baghdad) is the south border. The main

regulator of the canal is Al-Hindiah barrage with maximum design discharge nearly (50) m3/sec [6] .Generally, the climate is cold and wet in winter, while it is dry in summer. In this study, four stations were selected from upstream to downstream along the canal to assess the irrigation water quality.

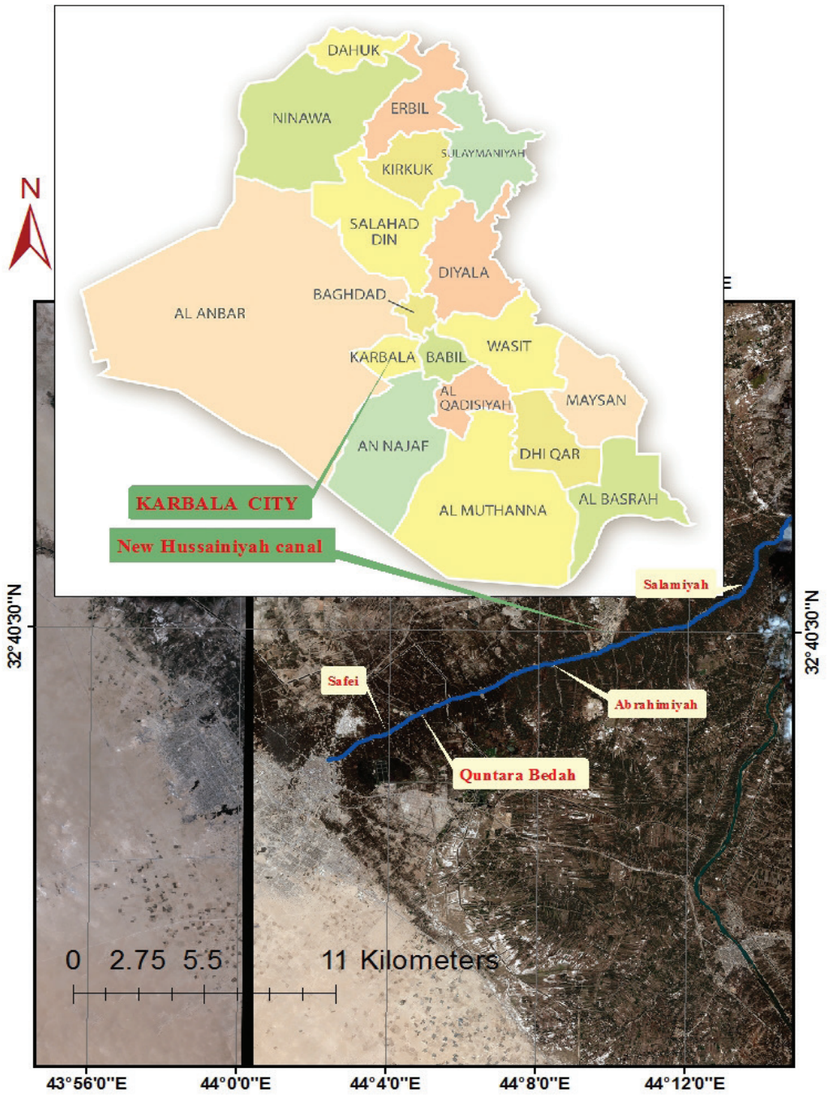

Fig.(1): Location map of the study area

Table (1): Location with respect to latitudes and longitudes for the stations.

ID	Stations	latitudes	longitudes
1	Salamiyah	06 ‘36°18	94 ‘76 42°
2	Abrahimiyah	02 ‘36°14	25 ‘93 41°
3	QuntaraBedah	76‘11 36°	25 ‘31 41°
4	Al-Safie	62 ‘10 36°	51 ‘17 41°

2.2. Testing and Analysis

The (48) water samples were collected from the four monitoring stations along new Hussainiyah canal during the period (January to December 2015). Samples were takenwith cooperation ofwater resources authorities in Karbala city.Polyethylene containers were used to collect the waterfor each stationat the area of study. Samples were analyzed for chemical and physical parameters immediately after collection at the mid-month during the morning. These parameters are (12) parameters (EC, PH, TDS, Na, SAR, SSP, SO4, Ca, Mg, K, Cl and Alk). The standard method for test water was followed to examine the samples,[7].

2.3. Application and Calculation of CWQI

The Canadian Water Quality Index model was adopted to evaluate the irrigation water quality for the area of study. The model considers a standout amongst the most ordinarily utilized procedure to evaluate water quality. The counts of list rely on upon three components with scale from 0 to 100 and need to characterize the variables and the target for water tests. The first factor called the scope (F_1), which represents the rate of variables that don’t coordinate their targets and can be computed utilizing the following equation,[8]:

$$"F_1\left(\frac{Number\ of\ failed\ parameter}{Total\ number\ of\ parameters}\right)*100" \quad \ldots\ldots\ldots 1$$

The second component named as recurrence (F_2), which represents the fizzled tests and can be characterized as the rate of individual tests that don’t meet destinations. The recurrence (F_2) can be computed utilizing the following equation, [8]:

$$"F_2\left(\frac{Number\ of\ failed\ tests}{Total\ number\ of\ tests}\right)*100" \quad \ldots\ldots\ldots 2$$

The third element called the abundance (F_3), which can be defined as the degree (outing) to which the fizzled test surpasses the rule.The computations of this component rely on upon three stages, the first and the second represent the excursions and their normalized sum (nse), which can be estimated as the following, [8]:

$$\text{“Excursions} = \left(\frac{failed\ test\ value}{guideline\ value}\right)\text{-1”} \quad \ldots\ldots\ldots 3$$

$$\text{“nse}=\left(\frac{\sum excursion}{Total\ number\ of\ tests}\right)\text{“}= \quad \ldots\ldots\ldots 4$$

At the third step can be estimated as fol-

lowing:

"$F_3=(\frac{nse}{0.01nse+001})$ "..... 5

Finally the CWQI has been calculated according to the following equation:

"CWQI= 100-$\sqrt{\frac{F_1{}^2+F_2{}^2+F_3{}^2}{1.732}}$,, ... 6

In general, theCWQIis ranged from 0 to 100. The classification of water quality based on five intervals graduated from poor to excellent. In between values of CWQI represent the intervals marginal, fair and good respectively. Table (2), shows thecategorization ofCWQI, [8].

Table (2): the classification of CWQI, [8 and 9].

Rank	CWQI	Notes
Excellent	95-100	All measurements are within the objectives" "virtually all ofthe time
Good	80-94.9	Conditions rarely depart from natural or de-" "sirable levels
Fair	65.9-79.9	Conditions sometimes depart from natural or" "desirable levels
Marginal	45-64.9	Conditions often depart from natural or desir-" "able levels
Poor	0-44.9	Conditions usually depart from natural or" "desirable levels

In this study CWQI was estimated for the selected stations according to regular time variations during the year 2015 and the evaluation was made every four months for each station. The objectives values that used in the study can be elaborated in Table (3).

Table (3):The objective values that used in estimationCWQI for stations.

Parameters	Unites	Objective Values	References
PH		6.5-8.4	[9] and [10]
Total Dissolved Solids (TDS)	(mg/l)	1225.00	[10] and [11]
Electric Conductivity (EC)	ds /m	1.85	[9] and [10]
Sodium (Na)	(mg/l)	70.00	[10] and [12]
SAR	Percentage value	9.00	[10] and [12]
SSP	Percentage value	40.00	[10] and [12]
Sulphate(SO_4)	(mg/l)	240.00	[12] and [13]
Calcium (Ca^{+2})	(mg/l)	120.00	[13]
Magnesium (Mg^{+2})	(mg/l)	40.00	[13]
Potassium (K^+)	(mg/l)	10.00	[12]
Chloride (Cl)	(mg/l)	100.00	[10] and [12]
Total alkalinity	(mg/l)	150.00	[12] and [13]

It can be obviously seen from Table (3), the most widely recognized parameters used to evaluate the irrigation water quality according maximum breaking points. This study also, considered the important factors that effect onsodicity hazard and toxicity hazard which can be represented in Sodium Absorption Ratio(SAR) and Soluble SodiumPercentage(SSP).SAR can be defined as,"ratio of the concentration of sodium to the sum of the concentration of calcium and magnesium in water", while (SSP) can be defined as "the ratio of soluble sodium concentration to the total cation concentration",[10]. Generally the high concentration sodium is unfavorable for irrigation water and plant growth, so it's necessary to deal with the restrictions for these remarkable factor. The equations (7 and 8) represent the have been used to calculate the SAR andSSPrespectively as following:

$$SAR=\frac{Na}{\sqrt{\frac{Ca^{+2}+Mg^{+2}}{2}}} \quad \text{..... 7}$$

$$SSP=\frac{Na}{Ca^{+2}+Mg^{+2}+K^{+}+Na} \quad \text{..... 8}$$

Where all the ions should be expressed in meq/L, [10].

3. Results and Discussion

The results of statistical parameters for all stations can be seen in Tables (4 to 7). It is very clear from theses results, that most of parameters are fallen near the objective limits shown in Table (3). With focusing on the other parameters results for all stations, it is obvious that parameters like [Sodium (Na), Sulphate(SO_4),, Calcium (Ca^{+2}), Magnesium(Mg^{+2}) and Chloride (Cl)] are fallen over the suggested targets. The maximum concentration founded for the parameters mentioned above was (127, 348, 128, 44 and 148) mg/l for [Sodium (Na), Sulphate , Calcium (Ca^{+2}), Magnesium(Mg^{+2}) and Chloride (Cl)] in stations Abrahimiyah, Safie, QuntaraBedah respectively. This may reflect the change in irrigation water quality index according to CWQI classification and lead to investigate the status of irrigation quality for that important branch (new Hussainiyah canal). For every four months for each station, the CWQI was estimated. These results can be found in Tables (8 to 10) which contain all effective parameters used to conclude the irrigation water status with respect to selected stations along the canal. By locking through the Table (8), which represents the status con-

cerned from (Jan-Apr), it is clearly seen that the fair status was dominated in all stations. The maximum irrigation water quality index is (72.55) in Salamiyah station, while the minimum is (66.76) with in al Safie station.Table (9), elaborates the status of irrigation water quality in the canal from (May - Aug). From the results shown in the table,the maximum irrigation water quality index is (73.97) in Salamiyah station, while the minimum is (67.10) with in al Abrahimiyah station and the fair status was dominated also. Results shown in Table (10), represent the statusconcerned from (Sep-Dec). The fair condition was obviously seen in stations: Salamiyah, Abrahimiyah and Quntara Bedah. On the other hand side, marginal status was found inal Safie station with minimum CWQI (63.44), while the maximum was found at Abrahimiyah station with CWQI (75.23) and it is very close to results obtained in in Salamiyah station.

These results lead to diagnose that al Salamiyah station was the best station according to classification of CWQI. The variation in station position along the new Hussainiyah canal and time of sampling during the year with respect to different objective parameters may cause the different in irrigation water quality status. When the results obtained have been compared with the results of Abdulkider,[2] and which classified irrigation water quality of the canal as "low to moderate restriction", it can be diagnosed that the result of this research was near to that range concluded by, [2]. But more focusing on the time step of the study and the new selected stations on the canal may give more comprehensive idea about this important index and that what the research tried to do and dealt with it. The application of CWQI on that important canal in Karbala city is very helpful to assess the state of irrigation quality. Also it is very understandable way to decision makers to get their assessment with respect to schedule plan.

Table (4):Summary of statistical parameters of Salamiyah station.

water quality parameters	unit	Mean	Max	Min	St deva
PH		8.04	8.3	7.9	0.14
Total Dissolved Solids (TDS)	(mg/l)	732	844.00	636.00	62.51
Electric Conductivity (EC)	ds /m	1.15	1.30	1.00	0.12
Sodium (Na)	(mg/l)	91.08	114.00	72.00	12.62
SAR		2.05	2.45	1.71	0.24
SSP		34.51	38.00	31.60	2.43
Sulphate(SO_4)	(mg/l)	272.71	341.00	220.00	44.69
Calcium (Ca^{+2})	(mg/l)	86.5	102.00	72.00	10.21
Magnesium (Mg^{+2})	(mg/l)	35.83	39.00	33.00	2.12
Potassium (K^{+})	(mg/l)	4.26	5.10	3.50	0.48
Chloride (Cl)	(mg/l)	116.5	142.00	101.00	11.18
Total alkalinity	(mg/l)	121.92	144.00	104.00	11.62

Table (5):Summary of statistical parameters of Abrahimiyah station.

water quality parameters	unit	Mean	Max	Min	St deva
PH		8.00	8.30	7.70	0.19
Total Dissolved Solids (TDS)	(mg/l)	759.83	922.00	656.00	79.50
Electric Conductivity (EC)	ds /m	1.19	1.34	1.01	0.10
Sodium (Na)	(mg/l)	93.25	127.00	78.00	13.97
SAR		2.09	2.70	1.73	0.28
SSP		34.78	39.70	29.40	2.87
Sulphate(SO_4)	(mg/l)	276.42	334.00	226.00	38.08
Calcium (Ca^{+2})	(mg/l)	89.67	103.00	75.00	11.55
Magnesium(Mg^{+2})	(mg/l)	34.92	40.00	30.00	2.87
Potassium (K^{+})	(mg/l)	4.30	5.40	3.60	0.46
Chloride (Cl)	(mg/l)	119.58	143.00	99.00	12.92
Total alkalinity	(mg/l)	125.08	145.00	112.00	10.53

Table (6):Summary of statistical parameters of QuntaraBedah station.

water quality parameters	**unit**	**Mean**	**Max**	**Min**	**St deva**
PH		8.03	8.20	7.80	0.14
Total Dissolved Solids (TDS)	(mg/l)	713.83	838.00	622.00	73.30
Electric Conductivity (EC)	ds /m	1.13	1.31	1.00	0.12
Sodium (Na)	(mg/l)	88.42	116.00	75.00	12.01
SAR		1.98	2.53	1.74	0.24
SSP		33.54	38.84	30.14	2.45

Sulphate(SO_4)	(mg/l)	266.5	334.00	218.00	38.28
Calcium (Ca^{+2})	(mg/l)	86.83	104.00	72.00	11.18
Magnesium(Mg^{+2})	(mg/l)	36.92	44.00	30.00	3.75
Potassium (K^{+})	(mg/l)	4.18	4.90	3.60	0.44
Chloride (Cl)	(mg/l)	118	148.00	96.00	15.10
Total alkalinity	(mg/l)	124.67	142.00	112.00	10.28

Table (7):Summary of statistical parameters of Al-Safie station.

water quality parameters	unit	Mean	Max	Min	St deva
PH		8.06	8.20	7.80	0.11
Total Dissolved Solids (TDS)	(mg/l)	747.17	882.00	642.00	75.62
Electric Conductivity (EC)	ds /m	1.18	1.38	1.00	0.14
Sodium (Na)	(mg/l)	89.08	112.00	72.00	12.64
SAR		1.97	2.40	1.50	0.28
SSP		32.97	37.86	25.31	3.60
Sulphate(SO_4)	(mg/l)	283	348.00	237.00	41.64
Calcium (Ca^{+2})	(mg/l)	94.08	128.00	77.00	14.89
Magnesium(Mg^{+2})	(mg/l)	35.83	42.00	24.00	4.86
Potassium (K^{+})	(mg/l)	4.23	5.20	3.20	0.63
Chloride (Cl)	(mg/l)	122	142.00	104.00	11.66
Total alkalinity	(mg/l)	125	144.00	108.00	12.55

Table (8): State of irrigation water quality for stations from (Jan-Apr).

Stations / Related factors	Salamiyah	Abrahimiyah	QuntaraBedah	Al-Safie
F1	25.00	25.00	33.33	33.33
F2	25.00	25.00	27.10	27.10
excursion	3.92	4.50	3.52	4.10
nse	0.08	0.09	0.073	0.09
F3	7.41	8.30	6.80	8.26
WQI (Jan-Apr)	72.55	72.40	66.95	66.76
State of irrigation water quality	Fair	Fair	Fair	Fair

Table (9): State of irrigation water quality for stations from (May - Aug).

Stations / Related factors	Salamiyah	Abrahimiyah	QuntaraBedah	Al-Safie
F1	25.00	33.33	33.33	25.00
F2	22.92	27.10	22.92	25.00
excursion	2.30	2.64	2.25	2.70
nse	0.05	0.06	0.05	0.06
F3	4.80	5.70	4.76	5.70
WQI (May - Aug)	73.97	67.10	69.10	72.80
State of irrigation water quality	Fair	Fair	Fair	Fair

Table (10): State of irrigation water quality for stations from (Sep-Dec).

Stations / Related factors	Salamiyah	Abrahimiyah	QuntaraBedah	Al-Safie
F1	25.00	25.00	33.33	41.70
F2	20.83	20.83	22.92	25.00

excursion	1.14	1.10	1.04	1.44
nse	0.02	0.02	0.02	0.03
F3	1.96	1.96	1.96	2.91
WQI (Sep-Dec)	75.22	75.23	69.23	63.44
State of irrigation water quality	Fair	Fair	Fair	Marginal

4. Conclusions:

The overall results of CWQI for stations along new Hussainiyah canal during the period of study, ranked from (63.44 to 75.23). According to these results the quality of irrigation water can be classified as marginal to fair status with clearly domination to fair state.Fair conditions were obtained for stations, Salamiyah, Abrahimiyah and Quntara Bedah, while it was marginal to fair condition for Safie station.These results lead to conclude that the quality of irrigation water was not match the desirable level during some times of the period of study. More efforts should be considered from governorate of Karabala to pre save irrigation water quality with acceptable levels along this important canal. The reduce of pollution sources and monitoring for different control points is very important steps that should be taken from irrigation water authority in Karbala city to keep that valuable source and maintain the agriculture production with in safe level.

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Vol. 6, No. 11 and 12 P. (49-61)E, 2017 Aysar Tuama Al-Awadi

Development of Simulation Model for Calculating Radiation Dose Used to Treat Lung Malignant Cells with The aid of Nanoparticles

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Received Date: 6 / 11 / 2016
Accepted Date: 16 / 1 / 2017

الخلاصة

هذه الدراسة تركز على تحسين كفاءة العلاج الاشعاعي من خلال تحسين معدل التحسس الاشعاعي(SER) .في هذه الدراسة الزيادة في معدل التحسس الاشعاعي تم بواسطة زيادة مقدار الجرعة الممتصة داخل ورم سرطان الرئة دون النسيج الصحي المحيط بالورم نتيجة وجود المواد النانوية لكل من الذهب والكادولينيوم و الفضة والتيتانيوم. وكل مادة نانوية تتفاعل مع اشعة سينية تتراوح طاقتها من (2) الى (20) ميكا الكترون فولت. و هذا بدوره انتج زيادة في معدل التحسس الاشعاعي كالتالي (10.86%) ,(12.15%), (13.03%), (13.59%) عند استخدام التيتانيوم والفضة والكادولينيوم والذهب كمواد النانوية على التوالي.

الكلمات المفتاحية

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Abstract

This theoretical study focuses on the enhancement of efficiency for radiotherapy according to increase sensitivity enhancement ratio (SER). The improvement of SER was done by increasing the amount of absorbed dose in lung cancer without the surrounding health tissue due to presence (Gold, Gadolinium, silver and titanium) nanoparticles (NPs) using x-ray with energy rangefrom (2) to (20)MeV. This causes increasing in SER percentages as follows (10.86%),(12.51%), (13.03%) and (13.59%) when using titanium, silver, gadolinium and gold as nanoparticles respectively depending on the type of nanoparticles.

Keywords

Lung cancer, nanoparticles, radiotherapy, sensitivity enhancement ratio.

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1. Introduction

The International Agency for Research on Cancer (IARC) and Global Cancer Statistics researchestogether conceder cancer as global disease spread among men and women lead death in late stage [1, 2].

According to World Health Organization - the International Agency for Research on Cancer there are (10.9) millionnew cases, the number of deaths due to cancer is (6.7) million andthere are (24.6) million people still alive with cancer. The most common cancers are lung (1.35) million, breast cancer (1.15) million, Prostate cancer (1.1) million cases, and ovary cancer (204,000)cases [3].

Cancer treatment process consists of a single stage or several stages, depending on the stage reached by the disease, the process of treatment are surgery combine with chemotherapy and radiotherapy [4].

The radiotherapy involves the use of gamma photons orx-rayphotons of high energy which can be produced from linear accelerator these are ionizing radiations lead to death or shrinking for cancer cells. Photon interaction has a high probability of injury to surrounding healthy tissue and thus appears the importance of improved radiotherapy. Improvement of radiation therapy include find a way to make a greater damage in malignant cells with less damage to healthy cells surrounding the tumor [5].

Because human tissues consisting of light elements so photons interact within tissue photoelectric effect phenomenon and Compton scattering. Interaction of electrons and photons within the malignant cells generate free radicals these free radicals leads to the destruction of malignant cells [6, 7].

When the nanoparticles size smaller than human cells, new interactions with surface and inside of the malignant tumor can present, which may improve cancer radiotherapy [8].

The nanoparticlesmaterials havewide utilization in biomedical research. They are used in diagnosing and therapy due to their individual properties like small size, high reaction in the living cells, extensive thermal constancy and nontoxic [9], thus that many of the nanoparticles materials have a high impact on radiotherapy[10].

Many researchers have studied the properties of nanoparticle materials such as gold , gadolinium ,silver and titanium elements , the possibility to apply in medical fields in order to improving therapy [11,12,13,14,15,16,17,18,19,20,21]. One of these studies was focused on the increases the number of destructive cancer cells by increasing the energy of incident radiation with a nanoparticles material [22,23].

Since the human body is made up of a large percentage of the water is about 80%, so water is the main objective of the interaction of ionizing radiation. Interaction of ionizing radiation with the water molecules in vivo interaction produces free radicals. These free radicals are the root of hydrogen and hydrogen hydroxide. The accumulation of free radicals leads to the formation of toxic hydrogen peroxide

molecule which finally destroy the tumor cell by induced of apoptosis[24]. Therefore, the greater the amount of absorption of ionizing radiation has increased the possibility of formation of toxic molecule and consequently increased the malignant cells destruction[25].

In the last few years ago the researchers injected nanoparticles metal inside cancer cellsas contrast agentsto increase absorbed dose which lead to increase radio sensitivity of cells.Injection of nanoparticles within the cancer cell leads to serious damage at the injection site without thesurrounding health tissue [26].

Nanoparticles with high atomic number effectively can interact with the high energy incident ray and leads to product electron and photonsor positron with high-energy this is called nanoparticle Enhanced x-ray Therapy NEXT[27].

This research aims to enhance lung radiotherapy by increasing SER then reduce the number dose fractions of radiotherapy therefore the side effect of radiotherapy will reduce.

This works to increase SER. SER is a relation between survival cells number after irradiation with and without nanoparticles.

2. Theoretical part:

The radiotherapy includes the use of ionizing radiation like x-ray photons of high energy products from linear accelerator these are ionizing radiations cause either death or shrinking for cancer cells but this interaction has hits to the surrounding health tissue therefore the need arises to find a way to occur more damage in malignant cells with less damage to the healthy cells surrounding the tumor [4]. x-ray interaction within the specified tissue with presence of nano-materials like titanium,silver,gadolinium and gold nano particles lead to an increase in the number of destroyed cancer cells. The high energy x-ray interaction with high atomic number nanomaterials leads to ensure the production of electron and positron inside tumor, who in turn are working to increase the ionization process within tumor [13, 14, 15, 16, 17, 18].

The computer program will apply the following equations:

1-Irradiation equation without and with-nanoparticles [28, 29, 30]:

$$N_s = N_i e^{(-(1+\frac{d}{\alpha/\beta}))} \text{.....(1)}$$

Where:

= survival cells number after irradiation. = initial cells number before irradiation [6].

/ is a factor represent radio-sensitivity(Each organ has a constant valuefor lung 3 Gy)[24].

d(Gy): is dose-per-fraction

2- Dose per fraction equation with nanoparticles[31]:

$$d(Gy) = 8.9*10^{-3}\left(\frac{\left(\mu/\rho_{Med}\right)+\left(\mu/\rho_{nano}\right)}{\mu/\rho_{air}}\right) * X \text{ .....(2)}$$

Where: $\left(\mu_{en}/\rho\right)_{Med}$ is mass energy absorption attenuation coefficient for medium. $\left(\mu_{en}/\rho\right)_{nano}$ is mass energy absorption attenuation coefficient for nanoparticles. $\left(\mu_{en}/\rho\right)_{air}$:is mass energy absorption attenuation coefficient for air.

X: The exposure in roentgen (R) unite calculated theoreticallyby following equation

$X = 1.8 \times 10^{-8} E(MeV) \left(\frac{\mu_{en}}{\rho}\right)_{air} \emptyset$ [32].

E:Photon energy in MeV, $\left(\frac{\mu_{en}}{\rho}\right)_{air}$: mass energy absorption attenuation coefficient for air in cm-2 , $\emptyset$: flounce in cm-2.

By substituting equation 2 in equation 1 produce final irradiation equation that will be used to get the results:

$$N_s = N_i e^{(-(1+\frac{8.9*10^{-3}\left(\left(\mu/\rho_{Med}\right)+\left(\mu/\rho_{nano}\right)\right)*X}{\mu/\rho\ air}/\alpha/\beta))} \text{ .....(3)}$$

Lung tissue is composite of light elements. These elements have percentage of mass as follow H(10.3), C(10.5), N(3.1), O(74.9), Na(0.2), P(0.2), S(0.3), C(l0.3) and K(0.2) so it has low cross section [33]. The increase in cross-section of the lung is by injection of nanoparticles inside lung [34,35]. It is known that cancerous tissue has vascular wider than vascular of surrounding healthy tissue tumor malignant[36]. Therefore the nanoparticles which injected inside the tumor will concentrate more than its presence in the healthy tissue and therefore the absorption of ionizing radiation dose inside the tumor will be greater due to the existence of nanoparticles. Interaction of these nanoparticles with high energy x-ray will increase the free radicals. The accumulation of free radicals product decreasing in surviving cancer cells after irradiation.

The mass energy absorption coefficient (μ/ρen) for adding nanoparticles (gadolinium, gold, silver and titanium) get from the National Institute of Standards and Technology NIST2004[37]. Computer simulation used equation of irradiation equation (3) for a lung without and with (gadolinium, gold, silver, titanium) nanoparticles that adding in lung tumor. The X-ray radiation interacts with each kind of nanoparticles with energy ranging from (2) to (20)MeV.

3. Results:

By appling the final irradiation equation equation(3) on lung without and with using-gadolinium nano particles with x-ray photons whose energy range from (2)MeV to(20) MeV we get fig. shows a decrease in the number of surviving cancer cells due to presence of gadoliniumnanoparticles and increasing energy X-rays as showen in fig.(1).

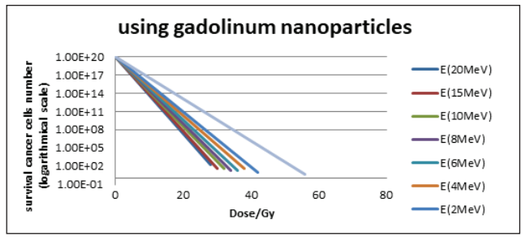

Fig.(1):This figure Shows decreasing in number of surviving cancer cells by utilization gadolinium nanoparticles and incident x-ray radiation with energy (2-20)MeV.

By loading gold nanoparticles inside lung tumor and irradiate by x-ray with energy from (2) MeVto (20) MeVproduct results as shown in fig. (2). This figure shows more decrease in number of surviving cancer cells in other words more destroy in cancer cells.

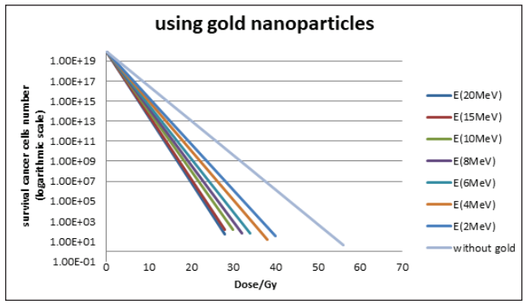

Fig.(2): this figure shows decreasing in number of surviving cancer cellsby utilization gold nanoparticles and incident x-ray radiation with energy (2-20)MeV.

Fig.(3) illustrates interaction results of silver nanoparticles injected into lung with x-ray radiation with energy (2-20)MeV.

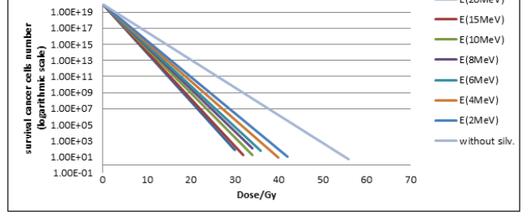

Fig.(3): this figure shows decreasing in number of surviving cancer cells by utilization silver nanoparticles and incident x-ray radiation with energy (2-20)MeV.

Last fig.(4) shows interaction of titanium nanoparticles with x-ray has energy range(2-20)MeV.

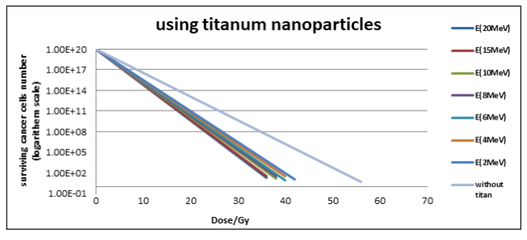

Fig.(4):This figure shows decreasing in number of surviving cancer cells by utilization titanium nanoparticles and incident x-ray radiation with energy (2-20)MeV .

4. Discussion

Fig.(1) shows that when irradiation equation (3)applied on lung malignant cells without and with gadolinium nanoparticles there is an increase in the number of cancer cells destroyed and a decreasing in number of surviving lung cancer cells as a result of the presence of gadolinium nanoparticles.

Also without and with gold, nanoparticles there were increasing in number of destroyed-malignant cells and decreasing malignant cells survivor as shown in fig.(2). Each of fig.(3) and (4) shows reduces in number of surviving lung cancer cells due to presence silver and titanium nanoparticles respectively.

These interesting results were achieved due to the existence of each of nanoparticles incancer tissue in high concentration. Nanoparticles (NPs) have the ability to increase dose deposited from high energy X-ray inside cancer tissue because of their high mass energy absorption coefficient Comparing with health tissue mass energy absorption coefficient which in turn caused breaks in DNA by generating free radicals that damage malignant cells.

By comparing the results of the number of surviving cancer cells with and without existence of nanoparticles its clear can be observed the improvement in sensitivity enhancement ratio(SER) , the results show that the SER was (10.86%) for titanium nanoparticles,(12.51%) for silver nanoparticles,(13.03%) for gadolinium nanoparticles and (13.59%) for gold nanoparticles. The largest amount of improvement was for gold nanoparticles because a gold nanoparticle has a larger absorption coefficient mass attenuation coefficient then gadolinium nanoparticles, silver nanoparticles and titanium nanoparticles respectivelyas shown in fig.(5).

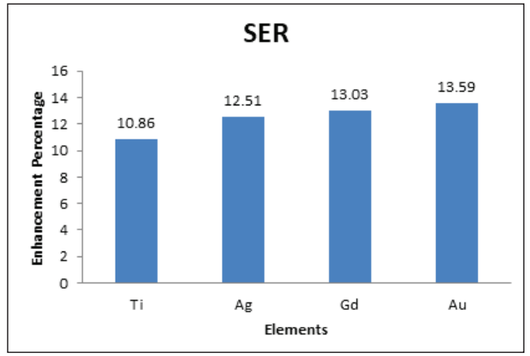

Fig.(5):this figure shows the sensitivity enhancement ratio (SER) in lung with gold nanoparticles(Au), gadolinium nanoparticles(Gd), silver nanoparticles(Ag) and titanium nanoparticles(Ti).

5. Conclusions

Theinteraction of high energy X-ray with gold, gadolinium , silver or titanium nanoparticlescan be improve the lung cancerous tumor radiotherapy by increasing in the number of destroyed malignant cells and decreasing in the number of surviving malignant cells.

The results show that the SER was(13.59%) with gold nanoparticles, (13.03%) with gadolinium nanoparticles,(12.51%)with silver nanoparticles and(10.86%)with titanium nanoparticles respectively.

6. Acknowledgements

The authors acknowledge the help of the middle Euphrates Center to cancer in the Najaf city, Iraqspecially Dr. Hyder N. Rebeea and Dr.Imad Kareem Alsaabery,kufa University –Faculty science –members of physics department to complete this research.

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Vol. 6, No. 11 and 12 P. (63-71)E, 2017 Nihad A. Saleh and Talib A. Abdul Wahid

Evaluation of Efficiency of Some Plant Extracts Against Two Bacterial Pathogens

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Received Date: 4 / 8 / 2016
Accepted Date: 30 / 12 / 2016

الخلاصة

انجزت هذه الدراسة لبحث تقييم فعالية التثبيط للمستخلص المائي والكحولي لبذور الجرجير Nasturtium officinaleوالقشور الرقيقة للرمان Punicagranatum ضد بكتريا Escherichia coli وبكتريا الـ Staphylococcus aureus والمعزولة من الانسان. تمدراسةتأثيرتراكيزمختلفة منالمستخلصاتالمائيةوالكحولية على نموالبكتريا قيدالدراسة باستخدام طريقة الانتشار. اشارتالنتائجالى عدم تاثيرالمستخلص الكحولي لبذور الج رجيرعلينموالبكتريا الخاضعةللدراسة.أمابقية المستخلصاتفقدأعطتتأثيراتمتباينة. اشارتنتائج التحليل الاحصائي للنتائج ان المستخلص المائي لقشور الرمان بتركيز (10%) و(25 %) والتي حضرت من المحلول القياسي (100 ملغم / مل) كان اكثرها معنوية في تثبيط بكتريا المكورات العنقودية (P = 0.027) و(P = 0.036) على التوالي بينما كان تركيز (75%) من المستخلص المائي لقشور الرمان اكثرها تثبيطا على بكتريا القولون.

الكلمات المفتاحية

رمان، المستخلصات المائية، بكتريا القولون، المكورات العنقودية، تثبيط البكتريا.

Abstract

This study was carried out to investigate the effectiveness of inhibition by aqueous and alcoholic extracts of watercress seeds Nasturtium officinale and thin peels of pomegranate Punicagranatum against two of human pathogens Escherichia coli and Staphylococcus aureus. The diffusion method was used for investigating the effect of different concentrations of aqueous and alcoholic extracts on the growth of bacteria, and the results showed that the alcoholic extract of the seeds of watercress did not affect the growth of bacteria under the study. The rest of the extracts have given mixed results; statistical analysis showed that the aqueous extract of the peel pomegranateconcentrations of 10% and 25%, prepared from the stock solution (100 mg. ml^{-1}), were more significantly affected the growth of St. aureus (P = 0.027 and P = 0.036), respectively. On the other hand, 75% of the aqueous extract of pomegranate peel was more significantly affected the growth of E. coli.

Keywords

pomegranate; watercress,Escherichia coli,Staphylococcus aureus, antibacterial activity.

1. Introduction

Escherichia coli, which is considered a coliform bacteria belonging to the Enterobacteriaceae family,inhabits the digestive tract of animals and humans[1].

E. coli can cause serious infectionsincludinginflammatory bowel disease, diarrhea and colitis if they escape from the digestive tract as a result of surgical operations and enter the bloodstream andtissues [2].Staphylococcus aureus is one of the bacteria that cause diseases in humans (gastroenteritis) by producing a highly heat-stable protein toxin. St. aureusis a facultative anaerobic bacteria, catalase and coagulase positiveand Gram-positive cocci[3].

Diseases caused by these pathogens are normally treated by using antibiotics. The misuse of antibiotics led to serious risks such as the increase of antibiotic resistance [4], the increasing occurrence bacterial strains with multi-drug resistance and new occurrence of strains with decreased sensitivity to antibiotics [5]. In addition, antibiotics are commonly associated with adverse effects on the host including immune suppression, allergic reactions and hypersensitivity [4]. Furthermore, commensal bacteria are also affected by antibiotics.

Serious attention has been paid towards searching for new antimicrobial substances. Therefore, significant attention has recently been paid to explore alternatives to antimicrobial drugs for the treatment of diseases from medicinal plants. A growing body of literature is available on the application of various plant extracts in different parts of the world.

Many diseases including dysentery, haemorrhage, microbial infections and respiratory pathologies have been effectively treated by the fruits of pomegranate, Punicagranatum L. [6]. Furthermore, pomegranate extracts have shown an antiviral activities against the herpes virus [7]. Although whole fruits of pomegranate have been widely investigated, thin peels of pomegranate were rarely studied.

Watercress (Nasturtium officinale) is a perennial plant belonging to the Brassicaceae family which found in clear, cold water in Europe, America and Asia [8]. Watercress is used as a herbal medicine in treatment of some diseases including oxidative stress, asthma and diabetes [9, 10]. Watercress is a high source of vitamins and pro-vitamin A, glucosinolates, folic acid, protein, iron, sulphur and calcium compounds [11].

The present study was carried out to investigate the antibacterial activity of thin peels of pomegranate Punicagranatum and watercress seeds Nasturtium officinale against two human pathogens E. coli and St. aureus.

2. Materials and methods

2.1. Plant specimens

Watercress seeds and thin peels of pomegranate were obtained from a local market and transferred to the laboratory, and ground into fine powder using an electric blender. The powder was dried in an oven at 40°C for 24 h. Then plant pellets were collected in polyethylene and stored at 4°C until extraction.

2.2. Preparation of the extract

2.2.1. Preparation of aqueous extracts

Separately, ten grams (10 g) of watercress seeds and thin peels of pomegranatewere extracted with (100) ml of hot distilled water in a conical flask (250) ml with a rubber stopper. Suspension was left in a shaking incubator (at room temperature) for (24) hours. After that, plant extracts were filtered off using several layers of sterile gauze medical pads into another clean conical flask. The plant extracts obtained were secondly filtered using sterile filter paper (Whatman no. 1) into another clean conical flask. Finally, plant extracts were then centrifuged at (3000) rpm for (10) min. Supernatants were placed in sterile Petri dishes and the extracted liquid was subjected to rotary evaporation in order to remove the liquid. After drying, the dried extracts were scraped off using a clean and sterile knife. The obtained extracts were then stored at (4) °C for antibacterial activity test. Different concentrations were prepared (7.5, 10, 25, 75 and 100%) by adding the required amount of the extract to a suitable volume of distilled water (D.W.) immediately before use.

2.3. Ethanol extraction

Ten grams (10 g) of watercress seeds and thin peels of pomegranatewere separately suspended in (100) ml of ethanol (95%) in a conical flask (250) ml and covered with a rubber stopper. After that, the same steps were used as in hot water extraction.

2.4. Bacterial isolates

Two bacterial strains were used in the study: one Gram negative, namely E. coli and one Gram positive, namely St. aureus. The tested strains were obtained from Kerbala Public Health Laboratory, Iraq.

2.5. Inoculum preparation

The inocula were prepared from stock cultures, which were maintained on nutrient agar slant at (4) °C and subcultured on to nutrient broth.

To calculate the bacterial cellsin the suspension, (0.1) ml of suspension was diluted with (0.9) ml sterile of phosphate buffered saline (PBS; pH (7.3); Oxoid, UK). This solution was then serially diluted tenfold to 10-7 with PBS and (100)µl of each dilution was spread on duplicate Nutrient Agar (Oxoid, UK) plates and incubated aerobically at (37) °C for (24) h. The colony forming units (CFU) were counted on all plates containing (30–300) CFU to determine the inoculum size to reach an inoculum of approximately log (107) CFU ml-1 to be used in assays.

3. Antibacterial activity

Antibacterial activity of the four different samples: hot water extract of watercress seeds, hot water extract of thin peels of pomegranate, ethanol extract of watercress seeds and ethanol extract of thin peels of pomegranate,were separately investigated against the studied organisms.

In vitro, antibacterial activity was then conducted by an agar-well diffusion method using (100)µl of final suspension of investigated bacteria (107 CFU ml-1) spread on Mueller-Hilton agar plates. Plates were left at room temperature for 15 minutes for adsorption and wells were cut from the agar by using a sterile tip (5 wells for different concentrations for each plant extract and one for control with sterile distilled water in each plate). Fifty µl (50) µl from each concentration were transferred to the well for each plant extract and at the same time 50 µl D.W. was transferred to a negative control well. The plates were incubated at (37) °C for (24) h. Antibacterial activity was evaluated by measuring the diameter of inhibition zone in centimeters (cm) against the invesitgated bacteria.

4. Statistical analyses

The means and standard deviations were calculated for all data and a one-way analysis of variance (ANOVA), followed by post-hoc Tukey's HSD test, were applied to test for significant differences between different concentrations in each type of plant extract and between each concentration for plant extracts. Data analysis was conducted using MiniTab statistical software version 16 (IBM, Pennsylvania, USA). The accepted level of significance was $P< 0.05$.

5. Results

5.1. Escherichia coli

All types of plant extracts except the ethanol extraction of watercress seeds showed different levels of antibacterial action against St. aureusand E. coli. Fig (1) showed that all concentrations of aqueous extract of watercress seeds displayed different levels of antibacterial action against E. coli bacteria. Although the greatest effect among all concentrations was at (25%) for which diameter of zones of inhibition was (2.2) cm, no significant differences were found between the concentrations ($P = 0.127$).

Ethanol extract of thin peels of pomegranate exhibited various antibacterial effects against E. coli; the pathogen was highly sensitive to (75%) and (100%), with diameter of inhibition zones being (2.6) and (2.9) cm, respectively. Significant differences were shown between these concentrations and the others ($P = 0.011$) Fig (2).

Fig (3) shows that all concentrations of aqueous extract ofthin peels of pomegranate exhibited different levels of antibacterial activity against E. coli. The highest effect was observed at (100) % with significant differences among other concentrations ($P = 0.002$).

5.2. Staphylococcus aureus

The ethanol extract of watercress seeds had no activity against St. aureus, unlike that shown with E. coli.

Although the highest effect of aqueous extract of watercress was for (75%), for which the diameter of zones of inhibition was (2.9) cm, other concentrations showed antibacterial activity as well. Significant differences were found

between the concentrations (P = 0.127) Fig (4)

Fig.(5)reflects the results of antibacterial activity ofethanol extract of thin peels of pomegranate against St. aureus. The highest action was for (100)mg ml-1 with significant differences among the concentrations (P = 0.002).

Fig.(6)shows that all concentrations of aqueous extract ofthin peels of pomegranate exhibited different levels of antibacterial activity against St. aureus. No significant differences were found between the concentrations (P = 0.407).

6. Discussions

Results of the current work revealed that aqueous and ethanolic extracts of two plants exhibited antibacterial activity against two bacterial pathogens. Experimental findings showed that all the extracts displayed different degrees of antimicrobial activity on the invesitgated bacteria, but the aqueous extract was more effective than the ethanolic extract for controlling the bacteria.

The ethanolic and aqueous extracts of thin peels of pomegranate displayed strong antibacterial activity on the growth of the tested pathogenic bacteria.

This work is in agreement with Dahhamet al. [12], who found that the peel extract gave highest antimicrobial activity compared to seed, juice and whole fruit of pomegranate extracts on St. aureus. In earlier research conducted by other researchers, the growth ofListeria monocytogenes,St. aureus,E. coliandYersinia enterocoliticawas inhibited by using alcohol extracts of pomegranate peels [13]. Recently, Gullonet al. [14]reported that pomegranate peel flour had antibacterial activity on Listeria monocytogenes,Listeria innocua,St. aureus, Pseudomonas aeruginosa,E. coliand-Salmonellasp. Furthermore, the current results confirmed the study of Pagliaruloet al.[15] who found thatSt. aureusandE. coli, were affected by both pomegranate aril and peel extracts. In all work mentioned, pomegranate revealed strong antibacterial activity against tested microorganisms due to their phenolic and anthocyanin content of fruits including alkaloids, tannins, phenolic compounds, flavonoids, polyphenols, sugars, fatty acids, aromatic compounds, and amino acids[16, 17].

In the current study, aqueous extract of watercress exhibited higher antibacterial activity on the growth of pathogenic bacteria tested. In agreement with the current results, acetone/dichloromethane, ethanol and aqueous extracts of twelve common medicinal plants, among them watercress, were tested against St.aureus, Bacillus subtilis, E. coli, and Ps. aeruginosa[18]. Results obtained from this study showed that watercress revealed antibacterial activity against pathogenic bacteria. In a study Bocanegra-Garcíaet al. [19] found that the watery extract of watercress displayed antibacterial activity against the microorganisms tested in that study including E. coli and St.aureus. Furthermore, in agreement with the current resultsaqueousextract of watercress has previously been reported to exhibit antibacterial activity against Mycobacterium tuberculosis [20].

Results of the current study showed that the ethanol extract of watercress exhibited no antibacterial activity in the growth of bacteria tested. These results contrast with the above-mentioned studies which indicated that all extracts of watercress including ethanolic extract revealed antibacterial activity against tested bacteria. The reason is not clear but it could be attributed to the method used to obtain the extract which affected the potency of the extract. In addition, the differences in antimicrobial activities of the plant extracts are influenced by such factors including freshness of the plant material, age of the plant used, microbial contamination, physical factors (light, water, or temperature), and incorrect preparation of the plant [21].

7. Conclusions

The results of the present study have provided evidence and confirmed previous results that watercress and pomegranates revealed an antimicrobial activity against E.coli and St. aureus. The inhibition of these bacteria by the extracts of pomegranate and watercress could become the promising plant antimicrobial agents therapeutic

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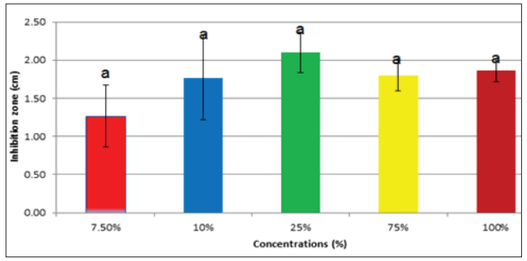

Fig (1): Antibacterial activity (diameter of zone of inhibition; cm) of various concentrations of aqueous extract of watercress seeds against E. coli. Results are presented as mean values ± SD (n = 3). No significant differences were found between the concentrations used in the present study (P = 0.127).

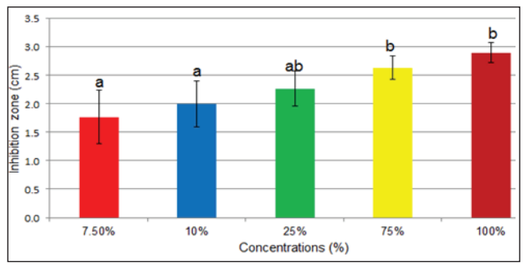

Fig (2): Antibacterial activity (diameter of zone of inhibition; cm) of various concentrations of ethanol extract of thin peels of pomegranate against E. coli. Results are presented as mean values ± SD (n = 3). Columns with different letters are significantly different (P = 0.011).

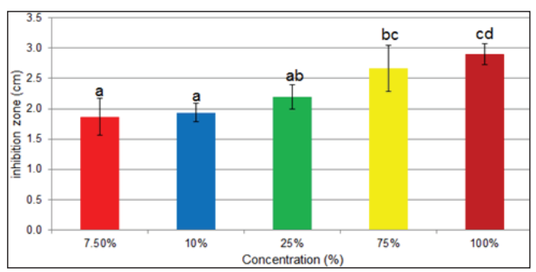

Fig (3): Antibacterial activity (diameter of zone of inhibition; cm) of various concentrations of aqueous extract of thin peels of pomegranate against E. coli. Results are presented as mean values ± SD (n = 3). Columns with different letters are significantly different (P = 0.002).

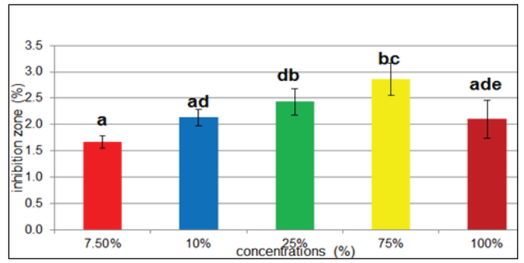

Fig (4): Antibacterial activity (diameter of zone of inhibition; cm) of various concentrations of aqueous extract of watercress seeds against St. aureus. Results are presented as mean values ± SD (n = 3). Columns with different letters are significantly different (P = 0.002).

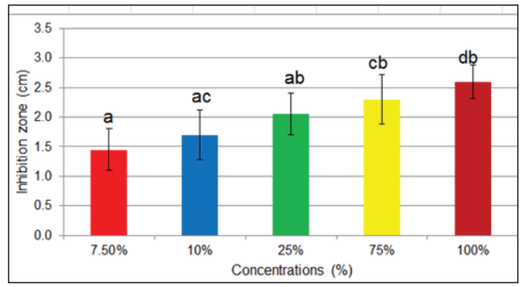

Fig (5): Antibacterial activity (diameter of zone of inhibition; cm) of various concentrations of ethanol extract of thin peels of pomegranate against St. aureus. Results are presented as mean values ± SD (n = 3). Columns with different letters are significantly different (P = 0.002).

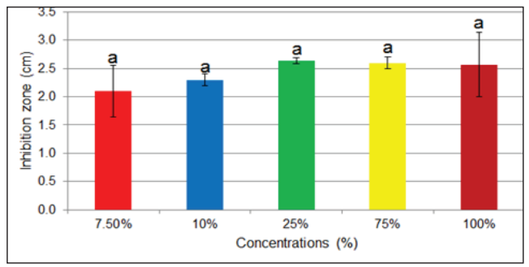

Fig (6): Antibacterial activity (diameter of zone of inhibition; cm) of various concentrations of aqueous extract of thin peels of pomegranate against E. coli. Results are presented as mean values ± SD (n = 3). No significant differences were found between the concentrations used in the present study (P = 0.407).

Co Compressible Acts

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Received Date: 4 / 4 / 2016
Accepted Date: 22 / 8 / 2016

الخلاصة

الهدف الرئيسي من البحث، وسعنا مفهوم الموديولات رديف المضغوطة، الموديولات رديف المضغوطة حرجا، الى المؤثرات رديف المضغوطة، المؤثرات رديف المضغوطة حرجا، بالتتابع، كذلك اعطينا بعض الخواص الاساسية والبراهين والامثلة. في الختام، درسنا مفهوم المؤثرات رديف المسحوبة كأعمام لمفهوم الموديولات رديف المسحوب، بالإضافة، قدمنا علاقته بالمؤثرات رديف المضغوطة.

الكلمات المفتاحية

الموديلات رديف المضغوطة، الموديلات رديف المضغوطة حرجاً، المؤثرات رديف المسحوبة، المؤثرات رديف المضغوطة.

Abstract

The goal of this paper, we expand the notion of co compressible modules, critically co compressible modules, to co compressible acts, critically co compressible acts, respectively, likewise we giveseveral of their basic properties, theorems and examples.Lastly, we studied the coretractable acts as a generalization of the concept of coretractable modules. Overtime, we introduce relation between it and co compressible acts.

Keywords

co compressible acts, critically co compressible acts, corational acts, fully corational acts, coretractable acts.

1. Introduction and Priliminaries:

Throughout this paper Swill denote a semigroup with multiplication. An element x∈S is called a left identity (a right identity) of S, if ∀ y∈S: x·y=y

(y·x=y). If x is both a left and a right identity of S, then x is called an identity of S [1]. A semigroup is a monoid; if it has an identity, for a semigroup Swe shall use the notion S^1 defined byS^1=S if it has an identity and S^1=S ∪ {1} otherwise [2]. An element x∈S is called a left zero (a right zero)of S, if ∀ y∈S:x·y=x(y·x=x)[1]. A zero element is both a left and a right zero of S, for a semigroup S we shall define S^0 byS^0=S if it has a zero element,S^0=S ∪ 0 otherwise[2].

A monoidSis said to be zero divisor free (ZDF) if for each a,b∈S,

a ≠ 0 ≠ b implies a· b ≠ 0 [3].

Let S be a monoid and A≠∅ be a set. If we have a mapping μ:A×S→Asuch that (a,s)↦as:=μ(a,s) and the following properties hold:

(a) a·1=a.(b) a(st)=(as)t for all a∈A and s,t∈S, we call A a right

S-act,or a right act over S and write A_S. A subact B of anS-actA_S is a non-empty subset of A such that bs ∈B for all b∈B,s∈Swhich is designatebyB$_S \leq A_S$.

A subact B_S of A_S is called a proper subact (designatebyB$_S$< A_S), if B≠A[4].

We call A_S a simple act if it has no proper subacts. We call A_S a θ-simple act

if A_S has no subacts other than A_S and one element subact. Let S be a monoid and A_S be an S-act, then A_S is simple if and only if A_S= aS for each0 ≠ a∈A_S[5].

A proper subact B_S of an S-actAis called maximal if for each subact C_S of A_S with $B_S \subseteq C_S \subseteq A_S$ implies either B_S=C_S or A_S=C_S [5].

An element θ∈A_S is called a zero of A_S (a fixed element, a sink) if θs=θ for all s∈S.

If A_S and B_S are right S-acts, then a mapping f:A_S→B_S is called a homomorphism of right S-acts, if f(as)= f(a)s for all a∈A and for all s∈S, theS-homomorphism f:A_S→$A_S$is called an endomorphism of A_S and the set of allendomorphism of A_S is designateby End(A_S), it is a monoid with the composition operation.

An equivalence relation ρ on A_S is called a congruence onA_S, if aρa′ implies(as) ρ (a′s) for a,a′ ∈A_S, s∈S.

Let S ρbe a congruenceonA_S, define a right multiplication on the factor set A_S /ρ={[a]_ρ,a∈A_S }by elements of S by: [a] $_\rho$ s=[as]$_\rho$for every s∈S, which is called a factor act of A_S by ρ[4]. Any homomorphism f:A_S→B_S, the kernel congruence on A_S is defined by aρa′, if and only if f(a)= f (a′).

If Bis a subact of A, the Rees congruence ρ_B is defined by:aρ_B (a)′if eithera,a′∈Bor a=a′.We denote the resulting factor act byA_S/B_S.

We say A_S is faithful, if s,t∈S, as=atfor all a∈A, it follows that s=t.

A right S-actA is called quasi-projective if for any right S-actB and any S-homomorphismsf and g from A_S to B_S with f being surjective, there exists an S-homomorphism h:A_S→A_S such that f= gh [6].

If$A_S$satisfies the ascending chain condition

for subacts, it is called, Noetherian [7]. In [8], Alex and James defined thatA_S is Noetherian if every congruence on A_S is finitely generated, and we say that a monoid S is Noetherian if it is Noetherian as anS-actover itself.

A subact B_S is large (or essential) in A_S if for any P_S and any S-homomorphism $f:A_S\to P_S$ whose restriction to B_S is one-to-one, then f is itself one-to-one [9].

A nonzero subact B of $A_S$is intersection large if for all nonzero subacts Xof A, $X\cap B\neq\theta$. This will be designateby $B_S \subseteq' A_S$ [9]. Feller and Gantos in [10] proved that every large subact of A_S is intersection large.

The singular congruence $\psi_A$on S-actA_S is a right congruence on A_S defined by $\psi=\psi(A_S)=\{(a,b)\in A_S\times A_S \mid aD\doteq bD$ for some intersection large ideal D of S$\}$. When $\psi=i_{A_S}$, we say that A_S is non-singular [11].

A right S-act A is called retractable if for any subact B_S ofA_S, $Hom(A_S, B_S)\neq\emptyset$. It is clear that for a right S-act A to be retractable it is enough that $Hom(A_S, aS) \neq \emptyset$ for each $a\in A_S$[12].

A subact B_S of A_S is called small (designate$B_S\ll A_S$) by if it satisfies one of the conditions: (1) for each S- homomorphism $f:C_S\to A_S$, if $\pi_B\circ f$ is epimorphism then f is epimorphism where $\pi_B:A_S\to A_S/B_S$ is the natural epimorphism. Or (2) $A_S=B_S\cup C_S$ implies $C_S=A_S$ for each subact C_S of A_S.

An S-act A is called hollow if every subact of A_S is small.

The purpose of this work is to introduce and investigate the concept of co compressible acts as a converted concept of co compressible modules [13]. Related properties and results are investigated. An affirmative answer to analogues problem, named Zelmanowitz problem, in the case of modules is given.

2. CO-Compressible Acts

2.1. Definition.

LetA_S be an S-act over a monoidS. A_S is co compressible if for each nonuniversal congruence ρ on A, $Hom_S(A/\rho,A)$ has at least one surjective element.That is,A_S is co compressible if and only if for all congruence $\rho\neq A\times A$ on A_S, there existsan epimorphism $\alpha:A_S/\rho\to A_S$.

2.2. Remark.

If A_S is a co compressible S-act which is not simple, then A_S must have a zero element.

Proof:

Let B_S be a proper subact of A_S, then A_S/B_S has a zero element. If $\alpha:A_S/B_S\to A_S$ is an epimorphism, then $\alpha(0')$ is a zero elementofA_S.⊛

2.3. Remark.

If A_S is not simple and has no zero we say A_S co compressible ifA_S^0 is co compressible.

2.4. Definition.

A_S is critically co compressible if it is co compressible and for proper subact B_S, $Hom_S(B,A)$ has no surjective element. That is A_S critically co compressible if and only if A_S is co compressible and

$\nexists\ \alpha:B_S\to A_S, \forall\ B_S\leq A_S$, where α is epimorphism.

2.5. Examples.

1. If A_S is a simple act, then A_S is co compressible (trivially).

2. If S=(N,·) is a monoid where N is the set of natural numbers and (·)is the usual multiplication, then $S_S$is not co compressible.

Proof:

Let S=(N,·), and the subact of $S_S$are B=2N, according to (Remark 2.3), let f:S/B→S^0 and a∈Im(f), then $a=f(\bar{x})$ for some$\bar{x}\in S/B$, this implies

$2a=f(\bar{x2})=f(0)$. If b∈Im(f)and b≠a, then $b=f(\bar{y})\to 2b=f(\bar{y2})=f(0)$. HenceIm(f) has at most one element. Hence $Hom(S/B,S^0)=\{0\}$ and ∄ epimorphism from S/B onto S^0.⊛

2.6. Remarks.

Analogous to the casein modules, it easy to prove the following statements for acts. (See [14])

1. $B_S$is a maximal subact of $A_S$if and only if A_S/B_S is θ-simple.
2. If $\alpha:A_S\to B_S$is an epimorphism and $C_S\leq B_S$then$\alpha(\alpha^{-1}(C_S))=C_S$.
3. If B_S is a proper subact of a finitely generated S-act A_S then B_S is contained in a maximal subact ofA_S.
4. Let S be a monoid and $A_S$be a Noetherian S-act then A_S is finitely generated.
5. Iff:$A_S\to B_S$ is a right S-act homomorphism then$A_S/(Ker(f))\cong Im(f)$.
6. Let B_S, $C_S\leq A_S$, then $((B_S\cup C_S))/C_S\cong BS/(B_S\cap C_S)$.

2.7. Proposition.

If A_S is co compressible S-act which is not simple, then A_S has no maximal nonzero subact.

Proof:

Assume that A_S is a co compressibleS-act, and assume that $0\neq B_S$is a maximal subact of $A_S$then A_S/B_S is a θ-simple act (by Remarks 2.6 (1)). If $\alpha:A_S/B_S\to A_S$ is an S-epimorphism, then $\alpha^{-1}(B_S)$is a subact of A_S/B_S, and hence, either $\alpha^{-1}(B_S)=A_S/B_S$, which implies $B_S=\alpha(A_S/B_S)=A_S$ (since α is onto) (by Remarks 2.6 (2)), not possible or $\alpha^{-1}(B_S)=\bar{0}$, that is $B_S=\alpha(\bar{0})=(0)\bar{}$contradicts the assumption, therefore A_S has no maximal subact.⊛

2.8. Corollary.

Any finitely generated co compressible act is simple.

Proof:

If $A_S$is not simple, then it has a proper subact say B_S and (by Remarks2.6 (3)), B_S is contained in a maximal subact which contradicts Proposition 2.7. Therefore $A_S$is simple.⊛

2.9. Corollary.

Any Noetherian co compressible act is simple.

Proof:

Since A_S is Noetherian then A_S is finitely generated (by Remarks2.6 (4)), henceA_S is simple act (by Corollary 2.8).⊛

2.10. Proposition.

A homomorphic image of a co compressible S-act is co compressible.

Proof:

Assume that $f:A_S\to A'_S$ is an epimorphism and A_S is a co compressibleS-act, let δ be a

congruence on A_S' define a relation ρ on $A_S$by

$(a,b)\in\rho\leftrightarrow(f(a),f(b))\in\delta$, then ρ is a congruence on A_S, hence there exists $\alpha:{}^{A_S}/\rho\rightarrow A_S$ epimorphism (since A_S is co compressible) which induces a $\beta:{}^{A'S}/\delta\rightarrow A_S/\rho$in this way, by$\delta f(a)\mapsto\rho a$. β is well defined since if

$\delta f(a)=\delta f(a')$then$(a,a')\in\rho$, that is $\rho a=\rho a'$. That is β is an epimorphism. Now the composition $f\circ\alpha\circ\beta$ is an epimorphism of ${}^{A_S}/\delta$ontoA_S'. Therefore$A_S'$is co compressible.⊛

At the following we give more conditions, with which a co compressible act become simple.

2.11. Proposition.

Let A_S be a co compressible actsatisfying one of the following statements:

1. $A_S$is finite.
2. There are only finite subacts inA_S.
3. $A_S$has a finitenontrivial factor,i.e. $\exists$ a congruence ρ on $A_S$such that $A_S/\rho$is finite.
4. There is a simple factor of A_S.

Then,A_S is simple act.

Proof:

1. and 2. imply that A_S has a maximal subact, consequently A_S is simple (by Proposition 2.7).

3. If $\rho$is a congruence on $A_S$such that A_S/ρ is finite factor ofA_S since A_S is co compressible thenthere exists $f:{}^{A_S}/\rho\rightarrow A_S$.Then A_S must be finite too, so $A_S$is simple by means of (1.)

4. Let ρ be a congruence on $A_S$such that $A_S/\rho$is simple since $A_S$is co compressible act then, $\exists$ $f:{}^{A_S}/\rho\rightarrow A_S$ epimorphism. Assume that $B_S$is a subact of A_S, then $f^{-1}B_S$ is a subact ofA_S /ρ, either equal to ${}^{A_S}/\rho$, then

$B_S=f^{AS}/\rho=A_S$, not possible, or$f^{-1}B_S=$, then $B_S=f(\bar{0})=0$. Therefore A_S is simple.⊛

2.12. Definition.

A_S is epiform if for each $\rho\neq A\times A$ congruence on $A_S$then each homomorphism $\alpha:A_S\rightarrow A_S/\rho$is an epimorphism.

2.13. Proposition.

Let A_S be a co compressible act, and B_S be a subact ofA_S, then the following statements are equivalent:

1. A_S is critically co compressible
2. A_S is epiform.

Proof:

1.⇛ 2.

Let $\alpha:A_S\rightarrow{}^{A_S}/\rho$ be a nonzero homomorphism, let $\ker(\alpha)=\delta$, if $Im(\alpha)=B_S/\rho'$,$\rho'=\rho\cap(B_S\times B_S)$, which is a congruence on $B_S$then ${}^{A_S}/\delta\cong{}^{B_S}/\rho'$ (by Remarks 2.6 (5)).Since A_S is co compressible then there exists $\beta:{}^{A_S}/\delta\xrightarrow{epi.}A_S$,

Consider $B_S\xrightarrow{\pi}{}^{B_S}/\rho\cong{}^{A_S}/\delta\xrightarrow{\beta}A_S$, here π is the natural mapping. Hence$B_S\rightarrow A_S$ is an epimorphism a contradiction to critically co compressible so $Im(\alpha)=A_S/\rho$ and α is an epimorphism.

2. ⇛ 1.

Assume that, A_S is co compressible, if $\alpha:B_S\rightarrow A_S$is an epimorphism then,

$A_S\cong{}^{B_S}/\ker(\alpha)$. Let $\varphi:A_S\rightarrow B_S/\ker(\alpha)$ be an isomorphism.Let

$\varphi':A_S\rightarrow A/\delta$where $\delta=\ker(\alpha)\cup\{(a,a):a\in A_S\}$, such that $\varphi'(a)=\varphi(a)$, for each $a\in A_S$ then $\varphi'$is not epimorphism a contradiction with epiform.⊛

2.14. Definition.

A subact B_S is called corational inA_S, if $\mathrm{Hom}(A_S,{}^{B_S}/\rho)=0$ for each ρ congruence on B_S.

2.15. Definition.

Let A_S be an S-act, we say that A_S is fully corational if every proper subact of A_S is corational.

The following proposition gives the relevance between epiform act and corational act,

2.16.Proposition.

Let A_S be an S-act. Then $A_S$is fully corational act if and only, if A_S is epiform.

Proof:

⇛

Assume that $0\neq\alpha:A_S\rightarrow{}^{A_S}/\rho$)is not an epimorphism

Let $\alpha':A_S\rightarrow Im(\alpha)={}^{B_S}/\rho, B_S<A_S, \alpha'\neq 0$ where$\alpha'(a)=\alpha(a)$ for each $a\in A_S$.

Then B_S is not corational hence A_S is not fully corational.

⇚

Let $\alpha:A_S\rightarrow B_S/\rho, \alpha\neq 0$ then $\alpha':A_S\rightarrow A_S/\rho$ define by

$\alpha(a)=\alpha'(a)$, it is not epimorphism.⊛

2.17. Definition.

Let A_S be an act, we call A_Sa copolyform act if for any small subact B_S of A_S, $\mathrm{Hom}(A_S,{}^{B_S}/\rho)=0$ for all congruence ρ on B_S.

It is clear that if A_S is copolyform and hollow, then it is fully corational, and thus (by Proposition 2.16) epiform.

In the following lemma, the converse will be proved,

2.18. Lemma.

If the S-act A is epiform, then it is hollow.

Proof:

Assume that A_S is epiform, and let B_S,C_S be two proper subacts of A_S such that $B_S\cup C_S=A_S$ then ${}^{A_S}/B_S\cong{}^{C_S}/(B_S\cap C_S)$ (by Remarks2.6 (6)).

$A_S\xrightarrow{\rho_B}{}^{A_S}/B_S\xrightarrow{\theta}{}^{C_S}/(B_S\cap C_S)\xrightarrow{i}{}^{A_S}/(B_S\cap C_S)$

since $i\circ\theta\circ\rho_B\neq 0$, the composition $i\circ\theta\circ\rho_B$ is not epimorphism; this contradicts the assumption that A_S is epiform, therefore A_S is hollow.

2.19. Proposition.

Any critically co compressible act A_S is hollow, and hence indecomposable.

Proof:

It is clear that A_S is epiform through (Proposition 2.13) and through (Lemma 2.18) it follows that A_S is hollow, and hence indecomposable⊛

In the rest of this section, two results about co compressible and critically co compressible acts will be added. For the first result the following two statements are needed,

2.20. Lemma.

A faithful simple finite S-act is nonsingular.

Proof:

Assume that $A_S$is faithful simple (and fi-

nite)S-act over a monoid S. Let

$\psi_{A_S}=\{(a,b)\in A\times A \mid as=bs\ \forall s$ in some intersection large ideal in S$\}$.Let$(a,b)\in\psi_{A_S}$, then there exists an intersection large ideal of S such that aI≐bI (where I≠0 since it is intersection large ideal), since A_Sis faithful then there existsx$\in A_S$,x≠0 and xI≠0. But xI is a subact of the simple act A_S,so xI=A_S=xS. But A_S is finite, impliesI=S.Now a=a·1=b·1=b, that is $\psi_{A_S}=i_{A_S}$, then A_S is nonsingular. ⊛

2.21.Lemma.

If A_S if an act and B_S is finite subact of A_S, then $A_S/(A_S\backslash B_S)S$ is finite. Since $(A_S\backslash B_S)S\supseteq A_S\backslash B_S$it follows that$|(A_S\backslash B_S)S|\geq|A_S\backslash B_S|\rightarrow|A_S/(A_S\backslash B_S)S|=|A_S\backslash(A_S\backslash B_S)S|$. Hence $|A_S\backslash(A_S\backslash B_S)S|\leq|A_S\backslash(A_S\backslash B_S)=|B_S|$.

2.22.Theorem.

A faithful co compressible act A_S over a monoid S is nonsingular in each of the following cases:

1. $A_S$is finite;
2. Sis finite;
3. There are only finite numbers of right ideals in S,
4. Thereare only finite numbers of right essential ideals in S,
5. S is a right Artinian;
6. The intersection of all essential right ideals is nontrivial.

Proof:

1. Since A_S is finite and co compressible implies A_S is simple (by Proposition 2.11), hence (by lemma 2.20), $A_S$is nonsingular.

2. Let $0\neq a\in A_S$ such that aS≠0 (A_S faithful). LetM=$A_S\backslash$aS, andN=MS, then A/N is a finite factor of A_S(by Lemma 2.21). Since $A_S$is co compressible, it is simple. Now,A_S is simple and S is finite imply that $A_S$is finite, then by (1.) it is nonsingular.

3. if S has a finite number of ideal, then it has a minimal ideal, say I, let

0≠a∈A_S such that aI≠0 ($A_S$is faithful), let M=$A_S\backslash$aI , and N=MS, then N is a maximal subact of A_S, for if L is a subact of $A_S$containing N, then it must contain an element if aI (and hence all of aI, since it is minimal), that is L=A.Then A/N is a simple factor of A_S, hence $A_S$itself is simple. Since $A_S$is simple implies A_S=aS for each 0≠a inA_S hence S is simple (since if S has a proper ideal I, then aI is a proper subact ofA_S).

Now, if$(a,b)\in\psi_{A_S}$, then aS=bS (S is the only intersection large ideal of S), then a=b, that is $\psi_{A_S}=i_{A_S}$ and A_S is nonsingular.

4. If S has a finite number of intersection large ideals, then it possess a minimal one, then we complete the proof as in (3.).

5. If S is Artinian, then it has a minimal ideal, then we proceed as in (3.).

6. In this case also we have a minimal intersection large ideal then as (4.)the proof is completed.⊛

For the second result, we recall the definition of quasi-projective act from section 1.

2.22.Proposition.

LetA_S is a critically co compressible act.A_S is simple if and only if A_S is quasi-projective.

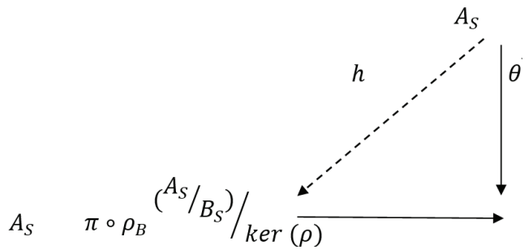
Proof:

⇒

It is clear that every simple act A_S is quasi-projective.

⇐

Let B_S be a proper subact of A_S since A_S is co compressible there existsρ:$^{A_S}/_{B_S}\rightarrow A_S$, epimorphism hence $A_S\cong((^{A_S}/_{B_S}/\ker(\rho))$. Consider the composition $A_S\xrightarrow{\rho_B}{}^{A_S}/_{B_S}\xrightarrow{\pi}\left({}^{A_S}/_{B_S}\right)/_{ker(\rho)}$, since A_S is quasi-projective∃ h:$A_S\rightarrow A_S$ such that $(\pi\circ\rho_B\circ h)=\theta$ which is isomorphism



that is h is injective, hence $A_S\cong$Im(h), then if Im(h)=As, then h itself is an isomorphism and hence $\pi\circ\rho_B$ is an isomorphism (not possible), or Im(h) is a proper subact of A_S which contradicts the assumption that A_S is critically co compressible therefore A_S has no proper subact, that is, $A_S$is simple.⊛

3. Coretractable Acts

3.1. Definition.

An S-act A is coretractable if there exists a nonzero homomorphism of every nonzero factor of $A_S$intoA_S, i.e.

∃f:$A_S/\rho\rightarrow A_S$,f≠0 ∀ ρ ≠A×A congruence on A_S .

3.2. Examples.

(1) Let S= (N,·)be a semigroup with identity, then S_S is not coretractable. (see Examples2.5 (2)).

(2)If A_S is simple, then $A_S$is coretractable (trivially).

3.3.Remark.

Every co compressible act is coretractable act.

In the next lemma, a condition, makes the converse of Remark 3.3 is correct, is given,

3.4.Lemma.

Let an act A_S be a coretractable act, if each 0≠f∈ End A_S is an epimorphism, then each nonzero element of Hom $^{A_S}/\rho,A_S$ is an epimorphism, for every congruence ρof A_S. In particular A_S is co compressible.

Proof:

Let ρ be a congruence on A_S and 0≠g:$^{A_S}/\rho\rightarrow A_S$,which exist since A_S is coretractable. A nonzero homomorphism considering υ:$A_S\rightarrow A_S/\rho$,g∘υ

is epimorphism and obviouslyg is an epimorphism. In particular A_S is co comperessible.⊛

The next theorem is generalization to proposition 2.13.

3.5. Theorem.

Let A_S be a coretractable act, then A_S is critically co compressible if and only if A_S is

epiform.

Proof:

⇛ (by Theorem 2.13).

⇚

SinceA_S is epiform implies each f∈ End $_S$ (A) is an epimorphism since

f:$A_S \to A_S$, and φ:$A_S \to {}^{A_S}/_{i_{A_S}}$) is an isomorphism φ∘f:$A_S \to {}^{A_S}/_{i_{A_S}}$) is an epimorphism, then f is epimorphism) (by Lemma 3.4),A_S is co compressible, (by Theorem 2.12), A_S is critically co compressible.⊛

3.6. Lemma.

Let A_S be an act with zero, then the next cases are equivalent:

1. Every 0≠f∈End$_S$ (A) is an epimorphism;
2. For each B_S proper subact A_S, for each h∈ Hom ($^{A_S}/_{B_S}$,A_S)is an epimorphism;
3. For each $0 \neq B_S$ proper subactA_S, Hom(A_S,B_S)=0.

Proof:

1. ⇛2.The same proof of (Lemma 3.4).

2. ⇛1. Let 0≠f ∈ End (A_S) takeB_S= 0 and define,

h:$^{A_S}/_{B_S} \to A_S$, by h($[a]_B$)=f (a) thenh is well defined and h≠0 , through (2) h is an epimorphism, it follows that f is an epimorphism also.

1. ⇛3.Ifh ∈Hom(A_S,B_S)and h≠0 then define f:$A_S \to A_S$ by f(a)=h(a) for each a∈A_S.In this case Im(f) =Im(h)=$B_S \neq A_S$ it follows that f is not epimorphism, a contradiction with(1) hence h=0.

3.⇛1. Assume 0≠f ∈End$_S$ (A) and f is not epimorphism $0 \neq B_S$=Im(f)≠A_S define h:$A_S \to B_S$ by h(a)=f (a) then h∈Hom (A_S,B_S) and h≠ 0 a contraction with (3) hence f is epimorphism.⊛

3.7. Note.

If A_S is an epiform, then the casesof (Lemma3.6)are satisfied, since each f:$A_S \to A_S$, can be writtenaccordinglyf:$A_S \to A_S$ / i_{A_S}) and hence it is an epimorphism if A_S is epiform.

3.8. Theorem.

Let A_S be an act, the nextcases are equivalent:

1. A_S is co compressible and every 0≠f∈ End$_S$ (A) is an epimorphism;
2. A_S is co compressible and End$_S$ (A) is ZDF;
3. A_S is coretractable and every 0≠ End$_S$ (A)is an epimorphism;
4. A_S is coretractable and End$_S$ (A) is ZDF.

Proof:

1. ⇛2. Since f≠0 and h≠0. f,h are epimorphisms

,then h∘fis epimorphism, henceh∘f ≠ 0.

2. ⇛ 4.It is clear that, since every co compressible act is coretractable act.

4. ⇛3. Let f:$A_S \to A_S$ be not epimorphism, then Im(f) ≠ 0 since A_S is coretractable there exists φ:$^{A_S}/_{Im(f)} \to A_S$, if π:$A_S \to A_S/Im(f)$ is the natural epimorphism, then φ∘π = h∈End$_S$ (A) it is clear that h≠0 (since π is onto and φ≠0), (h∘f) (a) = h (f(a)) = φ∘π(f(a)) = φ(0) = 0´. Now h∘f = 0, a contradiction with End$_s$ (A)is ZDF.

3. ⇛1.(by Lemma 3.4).⊛

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^{226}Ra Concentration and ^{222}RnExhalation Rate in Sediments of Euphrates River andSome ItsBranches in Thi-Qar Governorate -Southern Iraq

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Received Date: 13 / 11 / 2016
Accepted Date: 12 / 1 / 2017

الخلاصة

ان العديد من العناصر المشعة المنبعثة من الرواسب تشارك في الجرعة الاشعاعية الكلية، لذلك فان مراقبة تلوث الرواسب انتشر على مدى واسع لتتبع مصادر التلوث. في هذه الدراسة تم استخدام كواشف الاثر النووي الصلبة SSNTDs LR-115 type II للحصول على قاعدة بيانات حول تركيز ^{226}Ra و معدل انبعاث ^{222}Rn لوحدة المساحة ولوحدة الكتلة في رواسب نهر الفرات وبعض فروعه في محافظة ذي قار. هذه البيانات يمكن ان تستخدم كمرجع للدراسات المستقبلية و لتكملة الخارطة الاشعاعية لجمهورية العراق.

يتراوح تركيز ^{226}Ra في رواسب نهر الفرات وبعض فروعه في محافظة ذي قار بين Bq/kg (2.379-0.742) وبمعدل (1.498) Bq/kg، بينما يتراوح معدل انبعاث ^{222}Rn لوحدة المساحة بين mBq.m (62.52 - 200.34 - h 1.2) وبمعدل mBq.m (126.17-2.h^{-1})، ويتراوح ايضا معدل انبعاث ^{222}Rn لوحدة الكتلة بين .mBq kg^{-1} (17.97-5.61.h^{-1}) وبمعدل $mBq.kg^{-1}$ (11.3 .h^{-1}). كان تركيز ^{226}Ra ضمن الحدود الموصى بها طبقا ل OECD. وقد قورنت النتائج مع المعدل العالمي وبعض الدراسات الاخرى.

الكلمات المفتاحية

^{226}Ra ، معدل انبعاث ^{222}Rn ، الرواسب، نهر الفرات

Abstract

Many radionuclides in sediments transference are contributing to global collective doses. Therefore, monitor of the pollution in sediments was used widespread and trace pollution sources. In this study, SSNTDs LR-115 type II are used to provide database about ^{226}Ra concentration and ^{222}Rn exhalation rate in terms of area and mass in sediments of Euphrates river and Its some branches in Thi-Qar governorate. This data can be used as a reference data for future studies and it may be useful for complete radioactivity mapping for Iraq republic.

^{226}Ra concentration in sediments of Euphrates river and its some branches in Thi-Qar governorate varied between (0.742-2.379) Bq/kg with the average value is (1.498) Bq/kg, while the area exhalation rate of ^{222}Rn varied between (62.52-200.34)$mBq.m^{-2}.h^{-1}$ with the average value is (126.17) $mBq.m^{-2}.h^{-1}$, also the mass exhalation rate of ^{222}Rn varied between (5.61-17.97) $mBq.kg^{-1}.h^{-1}$ with the average value is (11.32) $mBq.kg^{-1}.h^{-1}$. ^{226}Ra concentration in this study was included the limit recommended by OECD. Also, The results compared with the average of the world and some other studies

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Keywords

^{226}Ra, ^{222}Rn Exhalation Rate, sediment, Euphrates river, SSNTDs.

1. Introduction

^{226}Raisa radioactive elementexisted in soil, rock, sand, water, animals and plants. ^{226}Rahas entered the human body fromthe soil by vegetarian food, its (like calcium) concentrated in the bones. This led to bombard the bone marrow and mutate tissue.Subsequently, ^{226}Racan causemany health hazardslike anemia, sores, bone cancer and other problems [1].$^{226}Ra$is the parent of ^{222}Rn, after decay ^{226}Ra, ^{222}Rn gas distribution in soil, rock, water and sediments [2].When the atmosphere contains^{222}Rn gas and its decay daughters, the bronchial epithelium received the big part of ionizing radiation, in addition, the extra thoracic airways and the skin may receive good dose, also low dose may receive to the kidney and bone marrow,while ^{222}Rndissolved in drinking water may effect on the stomach [3].Many radionuclides in sediments transferencearecontributing to global collective doses [4].Therefore, monitor of the pollutionin sediments was used widespread and trace pollution sources [5]. Rates of ^{222}Rn exchange from air-water and sediment-water were traced since 1965 by Broecker[6].

The aim of the present work provides database about ^{226}Ra concentration and ^{222}Rn exhalation rate in terms of area and mass in sediments of Euphrates river and Its some branches in Thi-Qar governorate southern Iraq by using SSNTDs LR-115 type II. This data can be used as a reference data for future studies and it may be useful for complete radioactivity mapping for Iraq republic.

2. Area of study

Length of Euphrates river within Thi-Qar governorate is (180 km), about (15.5%) of the total length of the river within Iraq, and the total lengths of branches in the governorate about (318 km) [7]. Euphrates river and its some branches pass through three regions consist of some of the districts like batha, Al-Nassiriah, Fudaliyah, Suq Al-Shuyukh, Aekakh, Garmat Bani Sa'aeed, Tar, Al-Fuhud, Al-Manar and Chibayish in Thi-Qar governorate as shown in Fig.(1). Approximately, the population of these districts was (968,921) people obtained by CSO [8]. WhereEuphrates river and its branches extend along the west, middle and east of Thi-Qar governorate.

3. Materials and Method

After collecting the sediment samples from the Euphrates river and Its some branches in different places in Thi-Qar governorate. The samples driedin an oven to remove moisture, then crashed and milled into a powder (14g). After that its placed at the bottom of a closed-cylindrical plastic canof diameter (4)cm as shown in Fig.(2). LR-115 type II was fixed in the mouth of the can from inside. The tracks of alpha particles recorded on the detector from ^{222}Rn decay. The detectors, fixedforthree months, thenit's removed and developed in a (NaOH)

solution of (2.5 N at 60 ±1 °C during 2 h). An ordinary microscope at a magnification of (400×) uses to number alpha (α) tracks in LR-115 type IIdetectors.

To evaluate the ^{226}Ra concentration in sediments was calculated using equation (1) [1]:

$$C_{Ra} = \frac{\rho h A}{K T_e M} \quad (1)$$

Where(tracks.cm^{-2}) is the track density due to ^{222}Rn,h (m) is the distance between the SSNTDs and the top of the sediment sample, A (m^2) is the surface area of the sediment sample, M (kg) is the mass of the sediment sample and T_e (d) is the effective exposure timedetermined by the equation (2):

T_e = t-1 / (1-) (2)

While the calibration factordetermined by theequation (3) If ($a_1 \le a \le a_\circ$) [9]:

$$K = \frac{1}{4} a \cos\theta_c \left(2 - \frac{a_1}{a} - \frac{a}{a_\circ}\right) \quad (3)$$

Where θ_c equal (40°) is the critical angle, a is the radius of the can, $a_\circ$ and $a_1$determined by the equations (4):

$a_\circ = R_\circ \cos\theta_c, R_\circ = R - R_{min}, a_1 = R_1 \cos\theta_c$ and $R_1 = R - R_{max}$ (4)

Where R equal (3.90 cm) is the alpha range of ^{222}Rn in air, R_{max}equal (3.44 cm)and R_{min} equal (0.80 cm)are the alpha (α) particle ranges in the air volume which match to the upper (E_{max}) and lower (E_{min}) energy limits respectively[10].Consequently,K=0.032 tracks. cm^{-2}.day^{-1} per Bq.m^{-3},where this calibration factor compared with [11, 12].

The ^{222}Rn exhalation rate in terms of area(E_A) and mass(E_M)from the sediments determined according to the following equations (5) and (6)[13]:

$$E_A = CV\lambda / A[t + 1/\lambda(e^{-\lambda t} - 1)] \quad (5)$$

$$E_M = CV\lambda / M[t + 1/\lambda(e^{-\lambda t} - 1)] \quad (6)$$

Where C (Bq.m^{-3}.h) is the integrated ^{222}Rn exposure from sediments, V (m^3) is the Volume of air in can, λ (h^{-1}) is the decay constant of ^{222}Rn, and t(h) is theaccumulation time exposure.

4. Results and Discussion

^{226}Ra concentration and^{222}Rnexhalation rate in terms of area and mass in the samples have been measured from Euphrates river and Its some branches in various places atThi-Qar governorate. The obtained results are summarized in Table (1), with the maximum, minimum and average valuesof thetotal.Point out that showed that Maa Al-Chibayish (samples no. 19) is branch from Gharraf canal and not Euphrates river, but some branches from Euphrates river is flowing in it.

Table(1)^{226}Ra concentration and ^{222}Rn exhalation rate in sediments of Euphrates river and its some branches in Thi-Qar governorate.

No.	*The region*	*The district*	*The name of the station*	C_{Ra} *Bq/kg*	E_A *mBq.m^{-2}.h*	E_M *mBq.kg^{-1}.h*
1	Al-Nassiriah	Batha	(Euphrates (1	0.877	73.81	6.62
2		Al-Nassiriah	Almsaffar	1.753	147.61	13.24
3			Alsaah	1.502	126.53	11.35
4			Almohia	2.379	200.34	17.97
5	Suq Al-Shuyukh	Suq Al-Shuyukh	Euphrates (2)	1.712	144.20	12.94
6		Garmat Bani Sa'aeed	Garmat Bani Sa'aeed	0.978	82.40	7.39
7			Agarmashiyah	1.979	166.74	14.96
8			Am nakhala	0.856	72.11	6.47
9		Tar	Alhaffar	1.345	113.30	10.16
10			Kheoah	2.324	195.71	17.56
11			Abu Ouane	2.079	175.10	15.71
12		Aekakh	Abu Sha'atha	1.361	114.62	10.28
13			Al rufia'a	0.742	62.52	5.61
14			Garmat Hassan	1.345	113.30	10.16
15		Fudaliyah	Am Hilan	0.856	72.11	6.47
16			Al Fadhliyah	1.345	113.30	10.16
17	Chibayish	Al-Fuhud	Barbid	2.379	200.34	17.97
18			Alla'aiossayyah	1.252	105.45	9.46
19			Maa Al-Chibayish	1.878	158.16	14.19
20		Al-Manar	Hanbat	1.502	126.53	11.35
21			Tina	1.252	105.45	9.46
22		Chibayish	Euphrates (3)	1.377	115.98	10.41
23			Abu nersi	1.502	126.53	11.35
24			AbuSobat	1.377	115.98	10.41
Total		Maximum		2.379	200.34	17.97
		Minimum		0.742	62.52	5.61
		Average		1.498	126.17	11.32
		Standard Deviation		0.482	40.61	3.64

^{226}Ra concentration in sediments of Euphrates river and some branches in Thi-Qar governorate varied between (0.742-2.379Bq/kg) with the average value is (1.498) Bq/kg, while the area exhalation rate of ^{222}Rn variedbetween (62.52-200.34) mBq.m^{-2}.h^{-1} with the average value is (126.17) mBq.m^{-2}.h^{-1}, also the mass exhalation rate of ^{222}Rn varied between (5.61-17.97) mBq.kg^{-1}.h^{-1} with the average value is (11.32) mBq.kg^{-1}.h^{-1}.

^{222}Rn exhalation rate varies from one station to another, the variation in these stations may be due to the differences in ^{226}Ra concentration and porosity of the sediments.The relation between ^{226}Ra concentration and the area exhalation rate of ^{222}Rn, and also the relation between ^{226}Ra concentration and the mass exhalation rate of ^{222}Rn are leaner one, where (R^2=1) is the squire of the correlation coefficient, these obtained in Figures (3 and 4).It is worth mentioning that the concentration of ^{226}Ra in this study was include the recommended safe (370 Bq/kg) according to OECD [14].

Whencomparing the results which obtained from sediments of Euphrates river and its branches with other studies, Obviously, these results are closed from results[15], [16] and [31] from Iraq,but itis lower than other studies especiallythe average of the world by [4], as shown in the Table(2).

Table(2): comparison of our sediments with other areas of the world

Location	*C_{Ra} (Bq/kg)*	*E_A (mBq.m^{-2}.h^{-1})*	*E_M (mBq.kg^{-1}.h^{-1})*	*Reference*
Average (Range)				
^{226}Ra concentration				
Baltic sea, Southern Baltic	(3.6-47)			[17]
China	50			[18]
Dutch	Not detected			[19]
Abano Terme, Italy	Not detected			[20]
Aegean region, Turkey	Not detected			[21]
Cauvery river,India	5.6			[22]
Vistula river, Poland	(205-415)			[23]
Danube river, Serbia	31			[24]
Cauvery river, India	84.89			[25]
Nile river, Egypt	(7-188)			[26]
Al- Hindiyah, Iraq	1.420			[16]

^{222}Rn exhalation rate				
White Oak river, USA		(2041200-4536000)		[6]
Basrah, Iraq		(20-340)		[15]
Azad Kashmir, Pakistan		(193-308)		[27]
^{226}Raconcentration and ^{222}Rn exhalation rate				
The average of the world	35	57600		[4]
Bahawalpur, Pakistan	(28-36.5)	(1560-3330)		[28]
Bulandshahr, India	14.1	600.74	23.1	[29]
Benghazi, Libyan	(1.5-23.0)	216.5	8.2	[13]
Northern Rajasthan, India	12.45(6.88-19.31)	495.32(273.80-768.04)	14.96(8.27-23.19)	[30]
Khor-Abdulla, Arabian Gulf, Basrah, Iraq	0.910(0.235-1.814)	267(69-531)	6.87(1.77-13.70)	[31]
Kassala town, Sudan	16.3(3.9-34.2)	3500(840-7350)	70(17-148)	[32]
Euphrates river, Thi-Qar, Iraq	1.498(0.742-2.379)	126.17(62.52-200.34)	11.32(5.61-17.97)	This study

5. Conclusion

Measurements of gross ^{226}Ra concentration and ^{222}Rn exhalation rate in terms of area and mass of sediments collected from Euphrates river and its some branches in Thi-Qar governorate southern Iraq were performed using SSNTDs LR-115 type II technique. The observed values of ^{226}Ra concentration in sediment samples in the present study are less than the recommended safe according to OECD. ^{226}Ra concentration and ^{222}Rn exhalation rate are much lower than the average of the world. The relation between ^{222}Rn exhalation rate in terms of area and mass to ^{226}Ra concentration obtained in figures (3 and 4) are leaner one, sofrom ^{226}Ra concentration may give a good estimate about ^{222}Rn exhalation rate and inversion. Thereby it is concluded that sediments of Euphrates river and Its some branches in Thi-Qar governorate are radiologically safe.

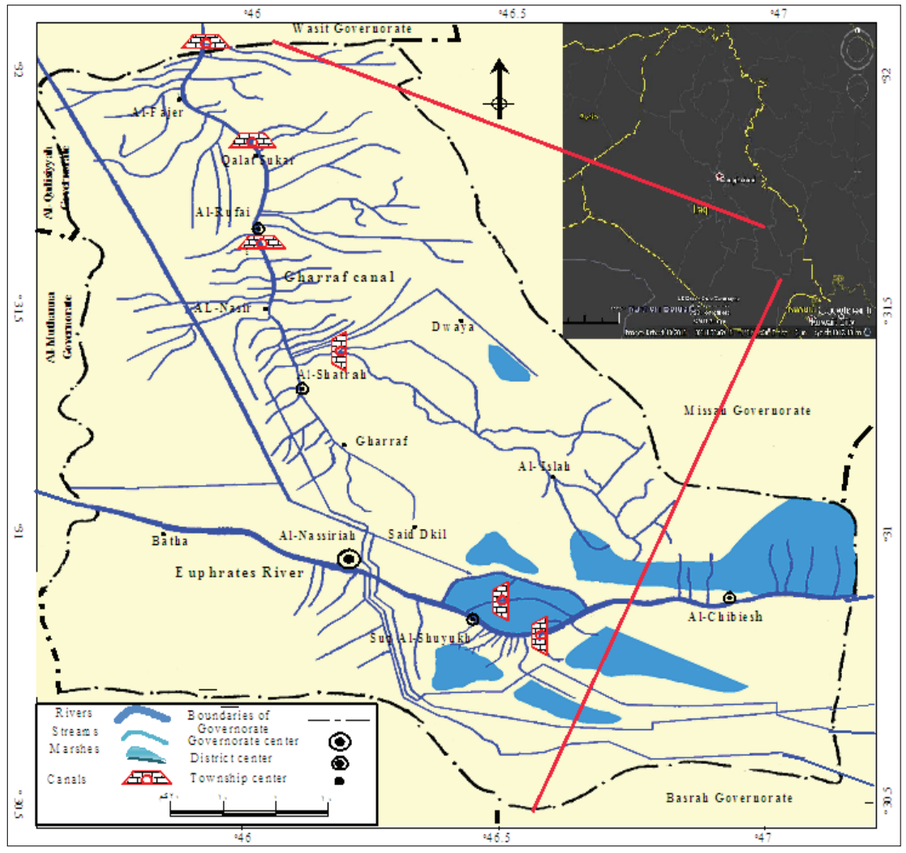

Fig.(1): surface water resources in Thi-Qar governorate including Euphrates river and its branches.

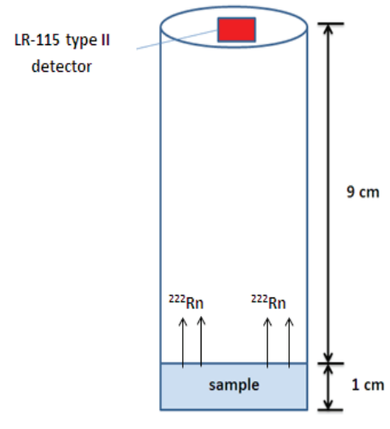

Fig.(2): shown of (LR-115 type II) film and a sediment sample in a closed cylindrical plastic can.

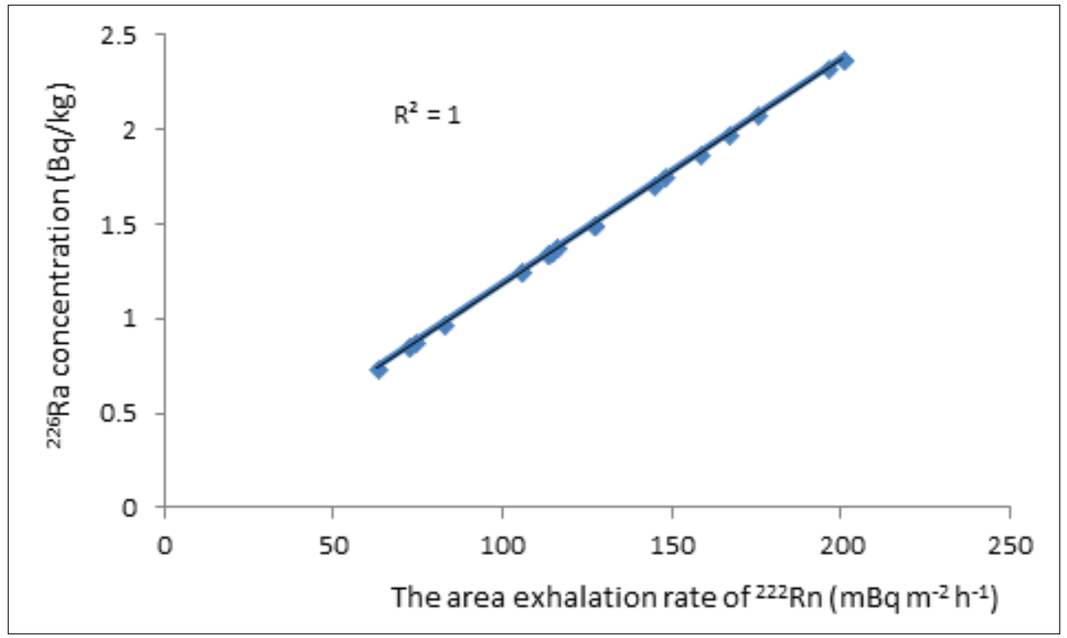

Fig.(3): show the relation between the area exhalation rate of 222Rn and 226Ra concentration

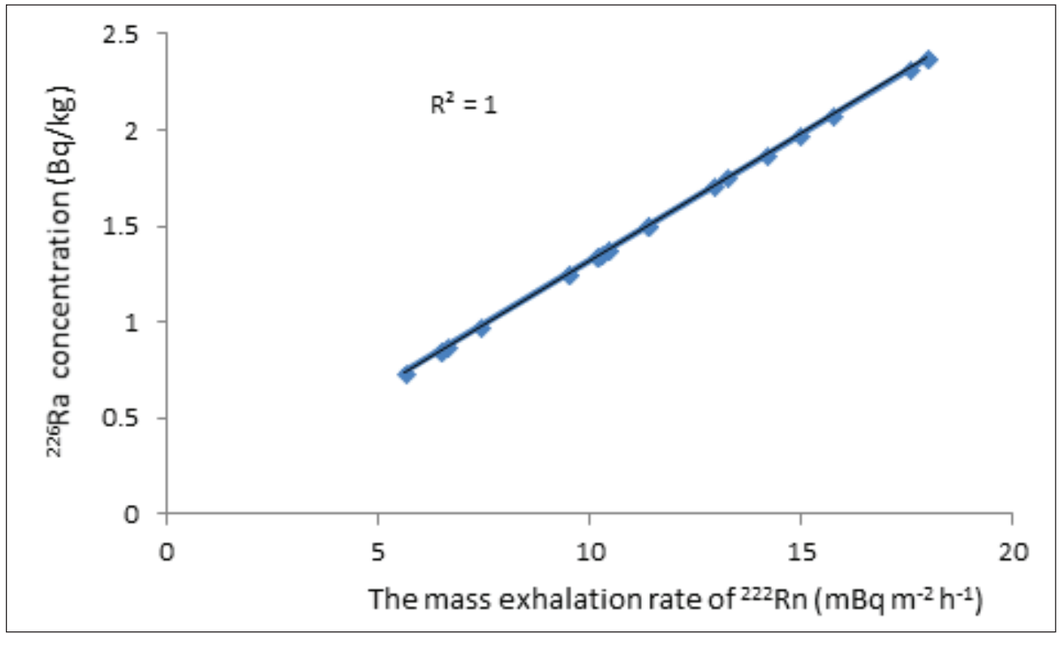

Fig.(4): show the relation between the mass exhalation rate of 222Rn and 226Ra concentration.

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Vol. 6, No. 11 and 12 P. (95-105)E, 2017 Hayder Abdulwahid Hammood

Assessment of Vitamin D Receptor Gene Expression In Type 2 Diabetic and HypertensivePatients

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Received Date: 20 / 3 / 2017
Accepted Date: 27 / 3 / 2017

الخلاصة

تعتبر مستقبلات فيتامين د والمشفر عنها من جين VDR، احدى عوامل الأستنساخ المهمة التي ترتبط وظيفتها بتنظيم قدرة الجسم على مقاومة التعرض للأمراض المناعية والألتهابات ، ويمكن ان تلعب دورا مهما في امراضية مرضي داء السكري من النوع الثاني و ارتفاع ضغط الدم . شملت الدراسة الحالية (104) شخص لغرض تحديد مستويات التضخيم للحامض النووي منقوص الأوكسجين (DNA) منهم (40) مريض بداء السكري من النوع الثاني ، و(40) مريض مصاب بأرتفاع ضغط الدم للمقارنة مع (24) شخص من الأصحاء مظهريا كمجموعة سيطرة. تمت دراسة توزيع العينات حسب العمر و الجنس و مكان السكن و تاريخ العائلة المرضي ، وتم استخدام تفاعل البلمرة المتسلسل الكمي ذو الزمن الحقيقي لغرض تعيين مستويات التضخيم لجين ال VDR في العينات المدروسة .

أظهرت النتائج وجود ترابط معنوي مهم احصائيا بين مجموعتي المرضى و مؤشرات الجنس و تاريخ العائلة لكل من داء السكري وارتفاع ضغط الدم على التوالي في حين لم تظهر النتائج اي ترابط معنوي مع مكان السكن في مجموعة مرضى السكري بينما كان هناك ترابط معنوي في مجموعة مرضى ضغط الدم المرتفع . كما اظهرت النتائج بأن قيم نقطة الشروع بتضخيم جين ال VDR لمجاميع مرضى السكري و ارتفاع ضغط الدم و مجموعة السيطرة كانت (1.22±23.5) و (1.30±24.67) و (1.94±27.41) على التوالي ، اضهرت نتائج التحليل الأحصائي وجود اختلافات عالية المعنوية لمستويات التضخيم الجيني بين مجموعتي مرضى السكري والسيطرة في حين لم تكن هناك فروقات معنوية بين مرضى ارتفاع ضغط الدم و مجموعة السيطرة ، كما اظهرت النتائج ايضا وجود فروقات احصائية معنوية بين مجموعتي مرضى السكري و ارتفاع ضغط الدم

الكلمات الفتاحية

جين ال VDR ، تفاعل البلمرة المتسلسل الكمي ذو الزمن الحقيقي، داء السكري، ارتفاع ضغط الدم.

Abstract

Vitamin D receptor (encoded by the VDR gene) is a transcription factor from the nuclear receptor subfamily. It has been reported that this gene has been participated in the regulation of susceptibility to autoimmune and inflammatory conditions, and could play a role in the pathogenesis of blood pressure and type (2) diabetes mellitus, so this study was conducted toevaluate the effect of some demographical parametersand to assess the gene expression levels of VDR gene in both type (2) diabetic and hypertensive patient groups in comparison with apparently healthy controls.A total of (104) individuals were enrolled in this study ,forty of diabetes mellitus type 2 patients, forty of blood hypertension patients and twenty four of apparently healthy individuals as a control group. The age, gender, living region and family historywere studied.Real time – quantitative polymerase chain reaction (RT-qPCR) technique was adopted to assess the amplification levels of VDR gene.

The results showed thatthere were significant associations between patients groups and gender and family history, respectively, and there was no significant association ($p \geq 0.05$) for the living region in diabetic patients.However, a significant positive association ($p \leq 0.05$) exists between living region and Diabetic condition.

RT-qPCR amplification results showed that the mean ± SD of threshold cycle (Ct) values of amplification cycles of diabetic, hypertension, and control groups were 23.5±1.22, 24.67±1.30 and27.41±1.94 respectively. The statistical analyses of quantitative amplifications revealed that there was highly significant difference ($p \leq 0.01$) between diabetic and control groups, and there were no statistically differences ($p \geq 0.05$) of hypertension patients in comparison with control group. The results also revealed significant difference ($p \leq 0.05$) between diabetic and hypertensive groups.

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Keywords

VDR gene, RT-PCR, Diabetes, Hypertension.

1. Introduction:

Type (2) diabetes mellitus (T2DM), formerly called non-insulin-dependent diabetes mellitus, obesity-related diabetes or adult-onset diabetes, is a metabolic disorder that is primarily associated with resistance to insulin hormoneand relative to deficiency of insulin and increasing the levels of blood sugars (hyperglycemia). Many genes such ashepatocyte nuclear factors,glucokinase, insulin promoter factors, and insulin receptor genes are consider a biomarker forT2DM gene abnormalities [1,2,3]. According to a global survey reported in (2004),the prevalence of diabetes has been estimated(2.8%) in (2000) and about (4.4%) in (2030), around the word.

So, the suspected number of people affected with diabetes ispredicted to increase from 171 million in (2000)to (360) million in (2030), most frequently will beT2DM. [2,4]

Vitamin D modulates the gene expression of insulin receptors,as well as insulin secretion, and exerts its activity on specific cellsby binding to the cytosolic/nuclear vitamin D receptor (VDR), which act as activation factors for transcription of many genes [3]. Vitamin D (1,25- dihydroxyvitamin D3) receptor gene is located on the long arm (q) of chromosome (12) at position (13.11), from base pairs (47,841,536) to (47,905,030), and consists of (14) exons, and has an extensive promoter region capable of generating multiple tissue-specific transcripts. [5,6,7,8]

This gene encodes the nuclear hormone receptor for vitamin D3, this receptor is important for the secondary bile lithocholic acid, and also plays critical roles in calcium homeostasis, bone development and mineralization, as well as control of cell growth and differentiation. [1,9]

The VDRgene is also serves as a good candidate gene for susceptibility to several diseases, due to regulating the renin-angiotensin system (RAS) that influencing the regulation of blood pressure. Hence molecular evaluation of VDR polymorphisms and its association with hypertension is suggested to help in the assessment of risk for the disease [10,11, 12] .Several studies have demonstrated that VDR are present in aortic endothelialand vascular smooth muscle cells [13], and also VDR polymorphisms predispose to the coronary artery diseases.[14].

The present study aimed to evaluate the effect of some demographical parameters include gender, family history andtype of living region, and to assess the gene expression levels through the quantification of amplification of VDR gene in both type (2) diabetic and hypertensive patient groups in comparison with apparently healthy controls using the accurate and reliable RT-qPCR methodology.

Materialsand Methods:

A total of (104)blood samples were studied, fortysamples from random clinically diagnosed diabetic type (2)patients(mean age 44±6.5 years) and forty samples are from hypertension patients(mean age 42±4.2 years) were involved in this study as a patients group

which were taken from Al-Hussain teaching hospital in Kerbala, Iraq. Beside the patient group, twenty foursamples from apparently healthy individuals with age matchingare served as a control group. The study conducted fromFebruary, (2015)to august, (2015). The gender, living region and family history for the disease were also studied.The official and ethical considerations were approved and provided for participant before sampling,

Blood Samples:

Two ml of peripheral blood samples were collected in EDTA anticoagulant tubes by vein puncture from all patients and controls. The collected blood samples were transmitted within (2)hours using cool box and subjected to DNA extraction and molecular analysis.

Genomic DNA purification:

Genomic DNA was purified from whole fresh blood using genomic DNA purification kit (Geneaid-South Korea), following the protocol provided by the manufacturer, DNA was quantified by the horizontal agarose gel electrophoresis and stored at (-20) Countil use.

The RT-qPCR assessment of VDR gene:

Real time- quantitative polymerase chain reaction (Rt-qPCR) was performed with the following primer sequences (forward primer: 5'-CAGAGCATGGACAGGGAGCAA-3' and reverse primer: -GCAACTCCTCATGGGCTGAGGTCTCA - 3') (1).

.Quantitative real-time PCR assays were performed in triplicate usingReal time PCR (Excecycler 96)®,BIONNER , South Korea. The Real time PCR system primer and SYBR Green master mix was used for quantitative assessment. The (25) µl of reaction volume containing(10)µl SYBR Green master mix,(1) µl of primer mixes ,(10) µl of RNase free water and (4) µl DNA template. Real-Time PCR protocol was as follows: initial denaturation by (1) cycle of (5) min at (95)°C, followed by 40 cycles of (30) sec. at (95)°C for denaturation, (40) sec. at (58)°C for annealing, (40) sec. at (72)°C for extension, and final hold at (8) °C.

Statistical analysis:

The obtained data were evaluated using Statistical Analysis System (SAS) (V 6.12, 2001) and chi- square were adopted for analysis of results, the appropriate p-values of less than (0.05) were considered as statistically significant, and value less than 0.01 was considered to be highly significant.

Results:

The study of demographical parameters (Sex, family history and living regions) revealed that (57.5%) of diabetic patients group were males and (42.5%)were females, and for hypertensive patients, (45%) of them were males and 55% were females,while for control group were (58.3%) males and (41.7%) females, (table 1), results also showed that there werestatistically significant differences($p \leq 0.05$) between males and females for both diabetic and hypertension groups.

Regarding to the family historyfor diabetic and hypertension patients, the results showed that (77.5%)of diabetic patients had positive family history in comparison with (22.5%) that had negative family history, while for hypertensive patients group the results showed that (67.5%)had positive family history and (32.5%)had negative family history, for control group , the results revealed that (25%) and (75%) had positive and negative family history respectively,and the statistical analysis revealed that there werehighly significant differences between positive and negative family history, ($p \leq 0.01$) for diabetes and ($p \leq 0.05$) for hypertension groups.

The distribution of the samples according to the living region revealed that (52.5%) of diabetic patients were live within urban regions while (47.5%)living in the rural regions, and regarding to the hypertension patients the percentages were (57.5%)and (42.5%) for urban and rural living regions respectively, while for control group , the distribution shows that (62.5%)of samples were living within urban regions in comparison with (37.5%) were live in rural regions, The results also showed no significant differences ($p \geq 0.05$) between two categories for diabetic patients while there was significant differences ($p \leq 0.05$) for living region of hypertension patients.

Table (1): The distribution of the studied groups according to the gender, family history for the diseases and living region.

Parameters*		Diabetes N(%)	HypertensionN(%)	Control
Gender	Male	23(57.5) A	18(45) B	14(58.3) A
	Female	17(42.5) B	22(55) A	10(41.7)A
Family history	Positive	31(77.5) A	27(67.5) A	6(25) B
	Negative	9(22.5) B	13(32.5) B	18(75)A
Living region	Urban	21(52.5) A	23(57.5) A	15(62.5)A
	Rural	19(47.5) A	17(42.5)B	9(37.5)B

*the similar vertical letters indicate for non- significant differences while the non- similar vertical letters indicate for significant differences within same parameter results.

The gene expression levels through the quantitative amplification of the target DNA region of VDR gene using RT-qPCRwere studied, and according to the threshold cycle (Ct) values of amplification cycles, the results revealed that the mean± SD of the Ct values for diabetic, hypertension, and control groups were (23.5±1.22, 24.67±1.30 and27.41±1.94) respectively.

The statistical analysis of the results regarding the gene expressions and threshold cycle (Ct) values of amplification revealed there were highly significant difference (P value=0.0024) between diabetic and control groups, and there were no statistically differences (P value = 0.2372) between hypertensive patients in comparison with control group. The results also revealed significant difference (P value = 0.0174) regarding Ct values between diabetes and hypertension groups Tables (2), Figs (1-3).

Table (2): The threshold cycle (Ct) values of VDR gene amplifications in diabetic, hypertensive and control groups.

Group	Threshold cycle (Ct)				
	Maximum Ct value	Minimum Ct value	mean± SD	P- value*	
Diabetes	25.37	19.42	22.5±1.22	0.0024 A	0.0174
Hypertension	27.30	23.10	25.67±1.30	0.2372 B	
Control	35.76	23.10	27.41±1.94	- - - - - B	

*the similar vertical letters indicate for non- significant differences while the non- similar vertical letters indicate for significant differences within same parameter results.

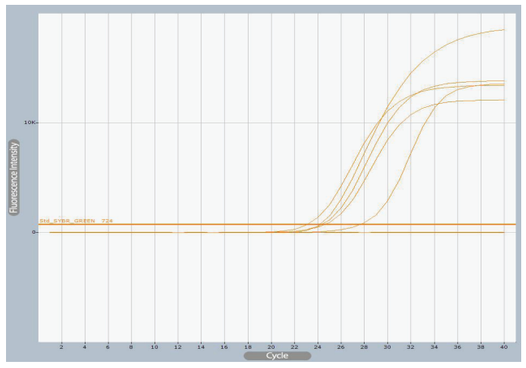

Fig. (1): RT-qPCR Amplification plot for synthesis of VDR gene in diabetic patients by Real time PCR (Excecycler 96)®,BIONNER , South Korea.

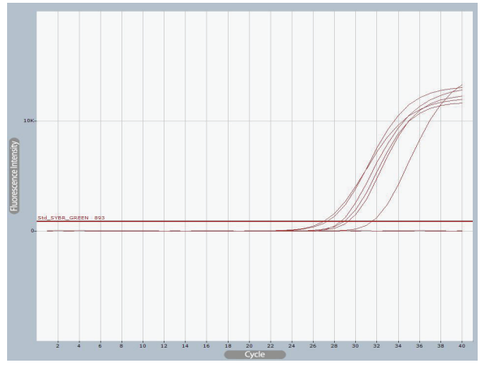

Fig. (2): RT-qPCR Amplification plot for synthesis of VDR gene in hypertensive patients by Real time PCR (Excecycler 96)®,BIONNER , South Korea.

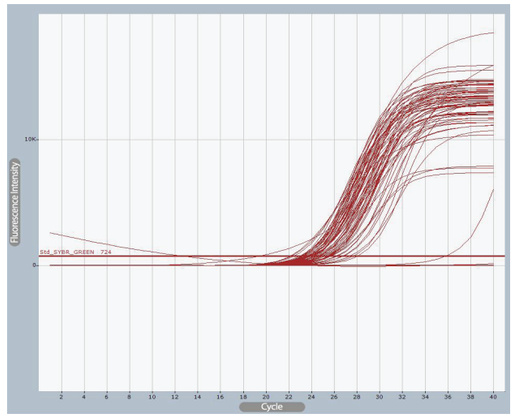

Fig. (3): RT-qPCR Amplification plot for synthesis of VDR gene in diabetic, hypertensive and control groups by Real time PCR (Excecycler 96)®, BIONNER, South Korea.

Discussion:

Diabetes and hypertension and its associated complications are part of a chronic disease global epidemic that presents a public health challenge, the study of some demographical parameters revealed(table 1) that the results of distribution of samples according to the gender were highest formale diabetic patients in comparison with female diabetic patients, and for hypertensive patients, the results revealed that the distribution for male were lower than female. While for control group the highest number of samples wasmale. Thesefindingsshowed significant differences between gender for both hypertensive and diabetic patients in comparison with control group. In diabetic, our results were agreed with the reports of Australian institute of health and welfare [15] that showed the incidence rate of diabetes regarding to the age groups which demonstrate that increasing of female gestational diabetic patients with age group range between(15-49) years old and the prevalence of diabetes type (2) will increase in males within increasing of age for (50 -75) years old. The results also compatible with other study findings that shows In the first half of the last century the prevalence of type (2) diabetes was higher among women than among men, but this trend has shifted, so more men than women are now diagnosed with type (2) diabetes. This change in the gender distribution of type (2) diabetes is mainly caused by a more sedentary lifestyle particularly among men, resulting in increased obesity [16].

The present study results were differ from Hariri et al. [17] findings on (4345) individuals, they showed (43.3%) of diabetic patients were male and (56.7%) of them were female. The present study findings revealed that the gender differences in the type (2) diabetes mellitus patients may be related to that women and men with diabetes face different challenges in the management of their condition during different hormonal and physiological condition that explain the effect of obesity and gestational period on diabetic prevalence in study samples for males in comparison with females that have mean age (44±6.5)years.

For hypertensive, the results agreed with previous study that revealed women have greater increases of cardiovascular risk than men [18].The present study were different from results reported by study used the tech-

nique of (24) hour ambulatory blood pressure monitoring shown that blood pressure is higher in men than in women at similar age groups due to presence of female hormones which may play a role in protecting females from developing hypertension [19].

Regarding the family history in diabetic patients, the present study showed that the high prevalence (77.5%) of samples have positive family history and the lowest (22.5%) were have negative ones, for hypertensive patients the results showed (67.5%)and (32.5%) were have positive and negative family history to the disease respectively in comparison with control group family history. Statistically, these results showed a significant association of family history with diabetes and hypertension. These findings support previous studies reported that family history to the disease is considered a powerful risk factor for diabetes [20, 21, 22,23,24] which suggested the potential benefit of use of family history for identification at-risk and undiagnosed individuals with diabetes and hypertensions.

In regard to living region, the present study revealed that the distribution of diabetic, hypertensive and control groups that live in urban regions were (52.5%), (57.5%) and (62.5%), in comparison with rural living regions were (47.5%), (42.5%) and (37.5%) respectively. The result of statistical analyses between patient and control groups regarding to the rural – urban living regions revealed non-significant differences for diabetic patients, these results are similar to the finding of Ogurtsovaet al. [25], both detected no significant differences of diabetes prevalence between rural and urban setting. Regarding to the hypertensive patient and control results the distribution revealed significant increasing of urban distribution of samples in comparison with rural, these results may be due to the trend of urbanization and lifestyle changes, including increasingly sedentary lifestyles, less physically demanding work and the style of nutrition.

Beside the role of vitamin D endocrine system in the calcium metabolism, it is involved in different aspects of cellular replication and differentiation in many target tissues, including the endocrine pancreas [26,27]. Now, it is clear that the VDRisimportant in the mechanism of insulin delivery and in the preservation of glucose tolerance. On the other hand, the vitamin D–VDR complex was reported as a potential controller of renin functions in human [28] and regulationof blood pressure through its effects on calcium homeostasis [29], vascular smooth muscle cell [30], and endothelial cell function [31]. Additionally, VDR may play a role in the mechanisms of inflammationand insulin sensitivity [32].

Regarding toVDR gene expression, in the present study, we examined the amplification level of VDR gene in patients suffering from the two mentioned diseases using qRT-PCR technique. We have shown that individuals with DMT2 have low threshold cycles comparing to the threshold cycles for hypertensive patients while for control group that have a highthreshold cycle values. The statistical analyses revealed significantly VDR gene expression associated withDMT2, the current results might suggests that a certain level of VDR gene expression is the determining factor in controlling of DMT2.Previous studies have shown that certain mutations and single nucleotide polymorphisms (SNPs) in the VDR gene are associated with diabetes mellitus type (2) (DMT2) and hypertension (1,4,14).

In conclusion, this study provides evidence for the interaction between VDR gene expression and DMT2. To understanding the exact mechanism of how VDR gene expression affects the outcome of DMT2, it is recommended to study the expression levels of VDR gene in sufficiently large sample size to produce results with increased precision.And many parameters are important to study including epidemiological life course, social, behavioral, genetic and environmental factors.

Acknowledgment:The authorwould like to thank Al-Hussein teaching hospital staff in holy Kerbala province,Iraq and lecturer Dr. Jawdat Noori Gaib and Assis. Lecturer Zaineb Nizar Jawad for their kind assistant and support.

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Vol. 6, No. 11 and 12 P. (107-117)E, 2017 Zuhair Mohammed Ali Jeddoaa

δ-Divisor Graphs

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Received Date: 2 / 5 / 2016
Accepted Date: 22 / 8 / 2016

الخلاصة

في هذا البحث ، قدمنا نتائج لنوع من بطاقات الرسومات البيانية ، والتي أطلقنا عليها رسم بياني δ-divisor وهو عبارة عن رسم بياني مقسّم معدّل.

الكلمات الفتاحية

بطاقات الرسومات البيانية، رسم بياني δ-divisor ، رسم بياني مقسّم معدّل.

Abstract

In this paper, we introduce results for a kind of labelings of graphs, which we named it the δ-divisor graph which is a modified divisor graph.

Keywords

labelings of graphs, δ-divisor graph, modified divisor graph

1. Introduction

G. Santhosh and G. Singh [1,4] called a graph G(V,E) with vertex set Vand edge set E a divisor graph if Vis labeled by a set of integers and for each edge uv∈E either the label assigned to u divides the label assigned to v or vice versa.Here, we studythe notion "divisor graph" in the sense thatits vertices can be labeled with distinct integers 1,2,…,|V| such that for each edge uv∈E either the label assigned to u divides the label assigned to v or vice versa and we named it δ-divisor graph. A graph which is not aδ-divisor is called a non-δ-divisor graph.

We introduce a method to calculate the number of vertices of degree 2 in the maximal δ-divisor graph of n vertices. We prove the following graphs are non-δ-divisor graphs: the $\langle S_{n_1}, S_{n_1}, S_{n_1}\rangle$is a non-δ -graph if and only if $d_l > \left\lfloor \frac{n}{3} \right\rfloor - 1$ or $n_l - \left| \frac{\left\lfloor \frac{n}{3} \right\rfloor - 1}{2} \right| + n_k + 3 > \left\lfloor \frac{n}{2} \right\rfloor$, where $n = n_1 + n_2 +$, where $n=n_1+n_2+n_3+5$, n_j ,n_k,n_l are the number of the pendant vertices of the star S_{n_i} ,i=1,2,3 where the degrees of their central vertices ared_j,d_k,$d_l$respectively, $d_j \geq d_k \geq d_l$.($G=\langle S_{n_1}, S_{n_2}, \ldots, S_{n_t}\rangle$ is the graph obtained by joining the central vertices of each star$S_{n_{m-1}}$ and the starS_m to a new vertex x_{m-1},where $2 \leq m \leq t$);P_n except P_1 ,P_2 ,P_3 ,P_4 and P_6; $G=w\ S_m$,m >1,w ≥ 4 (the union of w stars each of m vertices);and hence every graph can be embedded as an induced subgraph of a δ-divisor graph.

Any notion or definition which is not found here could be found in [1], [2].

1.1. Definition [2]

Let x be a non-negative real number .The Gauss function π(x) is defined to be the number of primes not exceeding x . i.e.,π(x)=|{p:pisprime ,p ≤ x}|.

1.2. Lemma [5]

The number of vertices of degree 1 in the maximal divisor graph is

$\pi(n) - \pi\left(\left\lfloor \frac{n}{2} \right\rfloor\right)$, where π is the Gauss's function.

2 δ-divisor graphs

2.1. Definition

A graph G(V,E)with vertex set V is said to be δ-divisor if its vertices can be labeled with distinct integers 1,2,…,|V| such that for each edge uv∈E either the label assigned to u divides the label assigned to v or vice versa. A graph which is not δ-divisor is called a non-δ-divisor graph.

2.2. Definition

A maximal δ-divisor graph of n vertices is a δ-divisor graph such that adding any new edge yields a non -δ-divisor graph.

2.3. Method

A method to calculate the number of vertices of degree 2 in the maximal δ-divisor graph of n vertices:

Explanation of method: Let the number of vertices of degree 2 in the maximal δ-divisor graph of n vertices be M(n). There are two kinds of vertices of degree 2:

Kind1. Let p_i be the prime less than or equal to $\left\lfloor \frac{n}{2} \right\rfloor$, i = 1,2,…,k, where

$k = \pi\left(\left\lfloor \frac{n}{2} \right\rfloor\right), p_j < p_{j+1}, j = 1,2,..,k-1.$ If $3p_i > n$ ... (1)

, then the vertex which is labeled by p_i has degree 2, because p_i is joined only with 1 and $2p_i$. Let $p_{k-u_1}, 0 \le u_1 \le k$, be the smallest prime number satisfying (1), then the number of vertices of degree 2 in this case isu_1+1.

Kind 2. Let $p_i \le \left\lfloor \frac{n}{2} \right\rfloor$, such that $\left\lfloor \frac{n}{2} \right\rfloor < p_i^2 \le n$, i =1,2,…,k.… (2).

It is clear that the degree of the vertices labeled by p_i^2 is 2, since $p_i^2$is joined with 1 and p_i ($2p_i^2 > n$). Let u_2 be the number of the prime numbers which are satisfying (2),$0 \le u_2 \le k$, therefore

(n)=u_1+u_2+1.

□

2.4. Example

G(V,E),|V|=n=10

Prime numbers are 2,3,5,7

Kind 1: $\pi\left(\left\lfloor \frac{10}{2} \right\rfloor\right)$=3,$p_i \le \left\lfloor \frac{10}{2} \right\rfloor$, $i.e.\, p_i \le 5$, thenthe prime satisfying condition (1) is p_3=5, then $p_3 = p_{3-0}$, therefore u_1=0.

Then the number of vertices of degree 2 in this case is u_1+1=1

Kind 2: If $5 < p_i^2 \le 10$, the only prime satisfying condition(2) is 3 , so u_2=1. Therefore ,M(n)= u_1+u_2+1= 0+1+1=2.

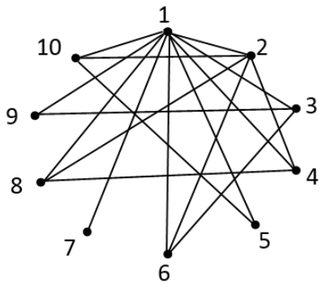

Fig. (1): Maximal δ-divisor graph of order 10

2.5.Remark

If G(V,E) is a connected graph of n vertices and degree $(v) < \pi(n) - \pi\left(\left\lfloor \frac{n}{2} \right\rfloor\right)$,

for every v∈V, then G is a non-δ-divisor graph.

Proof.By hypothesis, there is no vertex v∈G such that degree (v) $\ge \pi(n) - \pi\left(\left\lfloor \frac{n}{2} \right\rfloor\right)$, so there is at least one isolated vertex whose label is a prime number, since all $\pi(n) - \pi\left(\left\lfloor \frac{n}{2} \right\rfloor\right)$, vertices of prime labels can be joined with only the vertex of label one. Thus, we get the result.

2.6. Theorem

The pathP_n with n vertices is a non-δ-divisor graph exceptP_1 ,P_2 ,P_3 ,P_4 andP_6.

proof.

(i) It is clear thatP_1 ,P_2 ,P_3 ,P_4 andP_6 are δ-divisor graphs.

(ii) For all P_n ;n=5,or 10 or n ≥ 7,it is clear that P_5 and $P_1$0are a non- δ-divisor graphs. For allP_n ;n ≥ 7 except n=10, $\pi(n) - \pi\left(\left\lfloor \frac{n}{2} \right\rfloor\right) \ge 2$, there are at least two vertices prime numbered labels such that their labels greater than $\left\lfloor \frac{n}{2} \right\rfloor$and less than or equal to n. So we must put these vertices as pendantvertices and join them with a vertex of label one and this is impossible. Thus, we get the result.

2.7.Theorem

G=w S_m is a non-δ-divisor graph , w≥4,m>1.

Proof. Let v_i ,i=1,…,w be the central vertices of the stars.The labeling of the centers of the stars must be labeled from 1 to w, since the vertex labeled1 can be joined with any other vertex, and the vertex labeled2 can be joined with$\left\lfloor \frac{n}{2} \right\rfloor$-1 vertices, where n=w(m+1), the remainingvertices labeled 3,…,n are joined with less than $\left\lfloor \frac{n}{2} \right\rfloor$-1vertices.Now suppose that 1,2,…,r-1 be the labels of the centers ofthe stars S_m^i,i=1,2,…,r-1, and let s be the label of the center of the starS_m^r,where n ≥ s > r and r ≤ w ,s > w. The number of vertices that can be joined with the vertex labeledr is greater than or equal to the number of vertices that can be joined with the vertex labeled s since:

1) $|M_1| \ge |M_2|$, where M_1 is a set of the multiples of r other than r from r to sand M_2 is a set of the δ-divisor s of s other than s from r to s, i.e.

$M_1 = \left\{jr : 2 \le j \le \left\lfloor \frac{s}{r} \right\rfloor\right\}$ and

$M_2 = \left\{\frac{s}{k} : \frac{s}{k} is\ an integer and\ 2 \le k \le \left\lfloor \frac{s}{r} \right\rfloor\right\}$

2) From s+1 to n, the number of the multiples of r is greater than or equal tothe number of the multiples of s, since the nearest multiple of s is 2s and in this range there is at least one multiple of r. Therefore, we must label the center of the star S_m^r by label r. We continue with the same manner to other labels. So that let f(v_i)=i ,i=1,…,w.

Case 1. If w is even, then w/2 of the central vertices are labeled by even numbers, so all vertices of these stars must have even labels, and the number of these vertices is, where n is the number of vertices of G, n = $\left\lfloor \frac{n}{2} \right\rfloor$ wm + w. The other adjacent vertices with v_i would be labeled by odd numbers, but this means that one vertex of these vertices would be labeled by (2m+1)(w-1) > n, this is impossible.

2.8.Definition

Consider t of stars namely $S_{n_1}, S_{n_2}, \ldots, S_{n_t}$ then

G=$\langle S_{n_1}, S_{n_2}, \ldots, S_{n_t} \rangle$ is the graph obtained by joining the central vertices of each S_{m-1} and S_m to a new vertex $x_{m-1}$where $2 \le m \le t$.

2.9.Lemma

The graph $\langle S_{n_1}, S_{n_2}, S_{n_3} \rangle$ is a δ-divisor graph if $n_l \le \left\lfloor \frac{\left\lfloor \frac{n}{3} \right\rfloor - 1}{2} \right\rfloor$, where n=$n_1+n_2+n_3$+5, n_j, n_k, n_l are the number of the pendant vertices of the star S_{n_i},i=1,2,3 where the degrees of their central vertices are d_j ,d_k,d_l respectively, $d_j \ge d_k \ge d_l$.

Proof. Let c_i be the central vertex of S_{n_i}fori = 1,2,3. Now c_1 and c_2 are adjacent tox_1, c_2 and c_3 are adjacent to x_2. Let d_i= deg c_i, i=1,2,3, where deg c_i =n_i +1,i=1,3 and deg c_2= n_2+2. Let d_j, d_l be the maximum and the minimum numbers of the set {d_i,i=1,2,3} respectively, and the third bed$_k$. Let n_j, n_k, n_l be the number of pendant vertices of the stars where the degrees of their central vertices are d_j,d_k, d_l respectively.

We will label the central vertices of degrees d_j, d_k,d_l by the labels 1,2,3 respectively, (since any label which is greater than 3 can be joined with a number of vertices less than or equal to the number of vertices which can be joined with the vertex labeled 3).

If n_l is less than or equal to the number of the odd multiples of 3,other than 3 which is equal to $\left\lfloor \frac{\left\lfloor \frac{n}{3} \right\rfloor - 1}{2} \right\rfloor$, then we assign the odd multiples of 3,other than 3 to the pendant vertices of S_{n_l} , and the even labels to the pendant vertices of S_{n_k} and the vertices x_1 and x_2 ,the remaining labels are assigned to the vertices of S_{n_j}.Hence, the graph is a δ-divisor graph.

2.10. Example

In Fig.(2)we give labeling for:

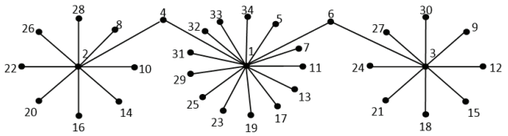

Fig. (2): (S_8,S_{13}, S_8)

2.11. Theorem

The graphs

(i) $G=\langle S_{n_1},S_{n_2}\rangle$is a δ-divisor graph if and only if $n_1\neq n_2$.

(ii) $G=\langle S_{n_1},S_{n_2}),S_{n_3}\rangle$ is a non-δ-divisor graph if and only if $d_l > \left\lfloor\frac{n}{3}\right\rfloor - 1$ or

$n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor + n_k + 3 > \left\lfloor\frac{n}{2}\right\rfloor$,where $n=n_1+n_2+n_3+5$, n_j, n_k, n_l are the number of the pendant vertices of the star S_{n_i} ,i=1,2,3 where the degrees of their central vertices are d_j ,d_k,d_l respectively, $d_j \geq d_k \geq d_l$.

Proof.(i) If $n_1 > n_2$, let $v_1^{(i)}$,$v_2^{(i)}$,…,$v_n^{(i)}$ be the pendant vertices of the starS_{n_i} and let c_i be the central vertex of S_{n_i} fori = 1,2. Now $c_1$and c_2 are adjacent tox, where x is the label of a vertex join the centers vertices of $S_{n_1}^{(1)}$ and $S_{n_2}^{(2)}$ .We define the labeling functionf:$V\langle S_{n_1}$ $S_{n_2}\rangle\rightarrow\{1,2,\ldots,n_1+n_2+3\}$as follows$f(c_1)=1$,$f(C_2)=2$,f(x)=4 , the vertices $v_1^{(2)},v_2^{(2)},\ldots,v_{n_2}^{(2)}$ will be labeled by even numbers, and the remaining labels are assigned to the vertices $v_1^{(1)},v_2^{(1)},\ldots,v_{n_1}^{(1)}$.

Conversely, If $n_1= n_2$, we have two vertices of degree n_1+1, but we have only one label "1" divides n_1+1 numbers, since the number of vertices of this graph is

$2n_1 + 3$ and $|A_i| - 2 \leq |A_2| - 2 = (\left\lfloor\frac{2n_1+3}{2}\right\rfloor-1)$

$< n_1+1$, where $A_i=\{k:k|i$ or $i|k$ $:k \leq 2n_1+3\}$,$i \geq 2$. So the graph is a non-δ-divisor graph.

(ii) Let c_i be the central vertex of S_{n_i} fori = 1,2,3. Now c_1 and c_2 are adjacent to x_1, c_2 and c_3 are adjacent to x_2. Let d_i=deg c_i, i=1,2,3, where deg c_i= n_i +1, i=1,3 and deg c_2=n_2 +2. Let d_j , d_l be the maximum and the minimum numbers of the set $\{d_i,i=1,2,3\}$ respectively, and the third bed$_k$. Let n_j, n_k, n_l be the number of pendant vertices of the stars where the degrees of their central vertices are d_j ,d_k, d_l respectively.

We will label the central vertices of degrees d_j ,d_k,d_l by the labels 1,2,3 respectively, (since any label which is greater than 3 can be joined with a number of vertices less than or equal to the number of vertices which can be joined with the vertex labeled 3).

Now if$d_l > \left\lfloor\frac{n}{3}\right\rfloor - 1$ or$n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor + n_k + 3 > \left\lfloor\frac{n}{2}\right\rfloor$, then there are two conditions:

Condition1. If $d_l > \left\lfloor\frac{n}{3}\right\rfloor - 1$, $\left\lfloor\frac{n}{3}\right\rfloor - 1$is the maximum number of labels which can be joined with the central vertex of S_{n_l}.since label 1 is used to label the central vertex of S_{n_j}. Thus G is a non- usual δ-divisor graph.

Condition 2.If $n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor + n_k + 3 > \left\lfloor\frac{n}{2}\right\rfloor$, $\left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor$is the number of odd labels which can be joined with the central vertex of S_{n_l}. If$n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor \leq 0$, then by Lemma 2.9 the graph is δ-divisor , which is a contradiction, so $n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor > 0$. Let all odd multiples of 3, other than 3 be assigned to the pendant vertices of S_{n_l}, then $n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor$is the minimum number of even labels which are assigned to the remaining pendant vertices of S_{n_l}. Therefore, we need $n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor + n_k + 3$ even labels to label the vertices of the graph,since the vertices of $S_{n_k}$and the vertices x_1 and x_2 must be even labels, hence the result.

Conversely, let G be a non- δ-divisor graph, the vertices which are joined with the central vertex of S_{n_j} can be labeled by any labels. The central vertex of $S_{n_k}$and the vertices which are joined with it need at most n_k+3 even labels and $n_k + 3 \leq \left\lfloor\frac{n}{2}\right\rfloor$, so there is no problem to label all the vertices which are joined with the central vertex of S_{n_k}. Thus, we discuss the problem that could occur when we label the adjacent vertices of the central vertex of S_{n_l} , which is labeled 3. Again if $n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor \leq 0$,then by Lemma 2.9 the graph is δ-divisor which is a contradiction. Let all odd multiples of 3, other than 3 be assigned to the pendant vertices of S_{n_l}, then we need $n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor$ even labels to label the remaining pendant vertices of S_{n_l}, so there are two cases that depend ond_l:

Case 1. If$d_l > \left\lfloor\frac{n}{3}\right\rfloor - 1$, hence the result.

Case 2. If$d_l \leq \left\lfloor\frac{n}{3}\right\rfloor - 1$ so we have n_l even labels, if $n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor + n_k + 3$

$n_l - \left\lfloor\frac{\left\lfloor\frac{n}{3}\right\rfloor-1}{2}\right\rfloor + n_k + 3 \leq \left\lfloor\frac{n}{2}\right\rfloor$, then the graph is a δ-divisor graph, which is a contradiction, hence the result.□

2.12. Corollary

$\langle S_{n_1},S_{n_2},S_3\rangle$is a non-δ-divisor graph if

(i)$n_1= n_2=n_3$

(ii)$d_j=d_k=d_l$, where d_j,d_k ,d_l are the degree of their central vertices respectively, $d_j \geq d_k \geq d_l$.

2.13. Theorem

Every graph G(n,q) can be embedded as an induced subgraph of a δ-divisor graph.

Proof .Let G(n,q) be a graph with vertex set $V(G)=\{v_1,v_2,\ldots,v_n\}$. We shall establish an embedding of G in H, where $V(H)=\{v_1,v_2,\ldots,v_n,v_{n+1},\ldots,v_2^{n-1}\}$. Let $f(v_{i+1})=2^i$,i=0,1,…,n-1, other vertices are labeled from the set $\{\{1,2,\ldots,2^{n-1}\}-2^i\}$,i=0,1,…,n-1 and join all vertices of V(H)-V(G) with a vertex of label one. It is clear that H is a δ-divisor graph and$E(H)=q+2^{n-1}-n$.

2.14.Corollary

Every bipartite graph can be embedded into a bipartite δ-divisor graph.

as an example, see Fig (3)

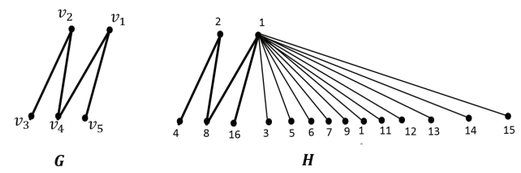

Fig. (3)

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