

GLOBAL JOURNAL

OF MEDICAL RESEARCH: B

Pharma, Drug Discovery,
Toxicology and Medicine

The Insulin Bio Intervals

Antifertility Activity

Highlights

Hepatoprotective Activities

Indian Medicinal Plants

Discovering Thoughts, Inventing Future

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The Insulin Bio Intervals

By Lutvo Kurić

Centro Universitário Feevale

Abstract - The modern science mainly treats the biochemical basis of sequencing in bio-macromolecules and processes in medicine and biochemistry. One can ask whether the language of biochemistry is the adequate scientific language to explain the phenomenon in that science. Is there maybe some other language, out of biochemistry, that determines how the biochemical processes will function and what the structure and organization of life systems will be? The research results provide some answers to these questions. They reveal to us that the process of sequencing in bio-macromolecules is conditioned and determined not only through biochemical, but also through cybernetic and information principles. Many studies have indicated that analysis of protein sequence codes and various sequence-based prediction approaches, such as predicting drug-target interaction networks (He et al., 2010), predicting functions of proteins (Hu et al., 2011; Kannan et al., 2008), analysis and prediction of the metabolic stability of proteins (Huang et al., 2010), predicting the network of substrate-enzyme-product triads (Chen et al., 2010), membrane protein type prediction (Cai and Chou, 2006; Cai et al., 2003; Cai et al., 2004), protein structural class prediction (Cai et al., 2006; Ding et al., 2007), protein secondary structure prediction (Chen et al., 2009; Ding et al., 2009b), enzyme family class prediction (Cai et al., 2005; Ding et al., 2009a; Wang et al., 2010), identifying cyclin proteins (Mohabatkar, 2010), protein subcellular location prediction (Chou and Shen, 2010a; Chou and Shen, 2010b; Kandaswamy et al., 2010; Liu et al., 2010), among many others as summarized in a recent review (Chou, 2011), can timely provide very useful information and insights for both basic research and drug design and hence are widely welcome by science community. The present study is attempted to develop a novel sequence-based method for studying insulin in hopes that it may become a useful tool in the relevant areas.

Keywords : *human insulin, algorithm, insulin model, insulin code, bio interval.*

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Lutvo Kurić

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I. INTRODUCTION

The biologic role of any given protein in essential life processes, eg, insulin, depends on the positioning of its component amino acids, and is understood by the „positioning of letters forming words“. Each of these words has its biochemical base. If this base is expressed by corresponding discrete numbers, it can be seen that any given base has its own program, along with its own unique cybernetics and information characteristics.

Indeed, the sequencing of the molecule is determined not only by distinct biochemical features, but also by cybernetic and information principles. For this reason, research in this field deals more with the quantitative rather than qualitative characteristics of genetic information and its biochemical basis. For the purposes of this paper, specific physical and chemical

factors have been selected in order to express the genetic information for insulin. Numerical values are then assigned to these factors, enabling them to be measured. In this way it is possible to determine if a connection really exists between the quantitative ratios in the process of transfer of genetic information and the qualitative appearance of the insulin molecule. To select these factors, preference is given to classical physical and chemical parameters, including the number of atoms in the relevant amino acids, their analog values, the position in these amino acids in the peptide chain, and their frequencies. There is a large number of these parameters, and each of them gives important genetic information. Going through this process, it becomes clear that there is a mathematical relationship between quantitative ratios and the qualitative appearance of the biochemical „genetic processes“ and that there is a measurement method that can be used to describe the biochemistry of insulin.

II. METHODS

The biologic role of any given protein in essential life processes, eg, insulin, depends on the positioning of its component amino acids, and is understood by the „positioning of letters forming words“. Each of these words has its biochemical base. If this base is expressed by corresponding discrete numbers, it can be seen that any given base has its own program, along with its own unique cybernetics and information characteristics. Indeed, the sequencing of the molecule is determined not only by distinct biochemical features, but also by cybernetic and information principles. For this reason, research in this field deals more with the quantitative rather than qualitative characteristics of genetic information and its biochemical basis. For the purposes of this paper, specific physical and chemical factors have been selected in order to express the genetic information for insulin. Numerical values are then assigned to these factors, enabling them to be measured. In this way it is possible to determine if a connection really exists between the quantitative ratios in the process of transfer of genetic information and the qualitative appearance of the insulin molecule. To select these factors, preference is given to classical physical and chemical parameters, including the number of atoms in the relevant amino acids, their analog values, the position in these amino acids in the peptide chain, and their frequencies. There is a large number of these parameters, and each of them gives important genetic information. Going through this

process, it becomes clear that there is a mathematical relationship between quantitative ratios and the qualitative appearance of the biochemical „genetic processes“ and that there is a measurement method that can be used to describe the biochemistry of insulin.

Insulin can be represented by two different forms, ie, a discrete form and a sequential form. In the discrete form, a molecule of insulin is represented by a set of discrete codes or a multiple dimension vector. In the sequential form, an insulin molecule is represented by a series of amino acids according to the order of their position in the **chains 1AI0**.

Therefore, the sequential form can naturally reflect all the information about the sequence order and length of an insulin molecule. The key issue is whether we can develop a different discrete method of representing an insulin molecule that will allow accommodation of partial, if not all sequence order information? Because a protein sequence is usually represented by a series of amino acids should be assigned to these codes in order to optimally convert the sequence order information into a series of numbers for the discrete form representation?

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III. EXPRESSION OF INSULIN CODE MATRIX- 1AI0

The matrix mechanism of Insulin, the evolution of biomacromolecules and, especially, the biochemical evolution of Insulin language, have been analyzed by the application of cybernetic methods, information theory and system theory, respectively. The primary structure of a molecule of Insulin is the exact specification of its atomic composition and the chemical bonds connecting those atoms.

R6 INSULIN HEXAMER (d1ai02)

The structure **1AI0** has in total **12** chains. Out of these **2** are sequence-unique

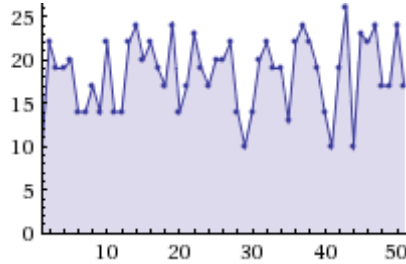
>1AI0:A	GIVEQCCTSICSLYQLENYCN
>1AI0:B	FVNQHLCGSHLVEALYLVCGERGFFYTPKT
>1AI0:C	GIVEQCCTSICSLYQLENYCN
>1AI0:D	FVNQHLCGSHLVEALYLVCGERGFFYTPKT
>1AI0:E	GIVEQCCTSICSLYQLENYCN
>1AI0:F	FVNQHLCGSHLVEALYLVCGERGFFYTPKT
>1AI0:G	GIVEQCCTSICSLYQLENYCN
>1AI0:H	FVNQHLCGSHLVEALYLVCGERGFFYTPKT
>1AI0:I	GIVEQCCTSICSLYQLENYCN
>1AI0:J	FVNQHLCGSHLVEALYLVCGERGFFYTPKT
>1AI0:K	GIVEQCCTSICSLYQLENYCN
>1AI0:L	FVNQHLCGSHLVEALYLVCGERGFFYTPKT

G	I	V	E	Q	C	C	T	S	I	C	S	L	Y	Q	L	E
10	22	19	19	20	14	14	17	14	22	14	14	22	24	20	22	19
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
N	Y	C	N	F	V	N	Q	H	I	C	G	S	H	L	V	E
17	24	14	17	23	19	17	20	20	22	14	10	14	20	22	19	19
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
A	L	Y	L	V	C	G	E	R	G	F	I	Y	T	P	K	T
13	22	24	22	19	14	10	19	26	10	23	22	24	17	17	24	17
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51

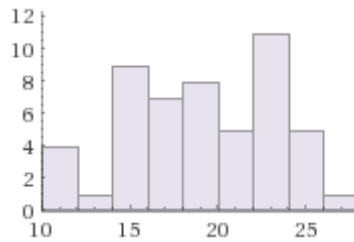
Input:

{10, 22, 19, 19, 20, 14, 14, 17, 14, 22, 14, 14, 22, 24, 20, 22, 19,
 17, 24, 14, 17, 23, 19, 17, 20, 20, 22, 14, 10, 14, 20, 22, 19, 19,
 13, 22, 24, 22, 19, 14, 10, 19, 26, 10, 23, 22, 24, 17, 17, 24, 17}

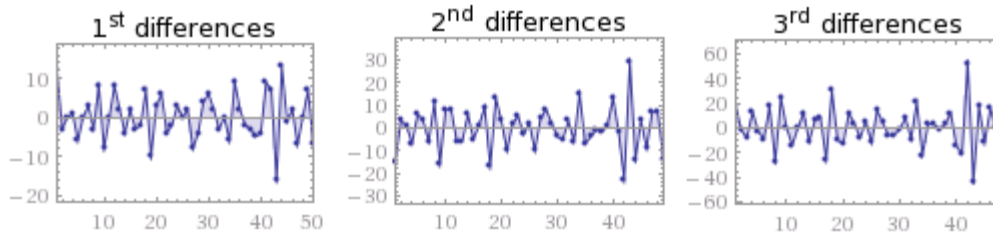
Plot:



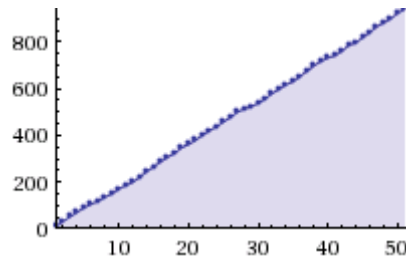
Histogram:



Differences:



Cumulative sums:



As we see, the genetic information characterized only by biochemical, or also by cyberinformation principles

Fragment 1

From 1 to 102

G	I	V	E	Q	C	C		T
10	22	19	19	20	14	14	...	17
1	2	3	4	5	6	7		102

Fragment 2

From 103 to 204

G	I	V	E	Q	C	C		T
10	22	19	19	20	14	14	...	17
103	104	105	106	107	108	109		204

Fragment 3

From 205 to 306

G	I	V	E	Q	C	C		T
10	22	19	19	20	14	14	...	17
205	206	207	208	209	210	211		306

Aforementioned aminoacids are positioned from number 1 to 306. Numbers 1, 2, 3, n... present the position of a certain aminoacid. This positioning is of the key importance for understanding of programmatic, cybernetic and information principles in this protein. The scientific key for interpretation of bio chemical processes is the same for insulin and as well as for the other proteins and other sequences in biochemistry. The first aminoacid in this example has 10 atoms, the second one 22, the third one 19, etc... Why do they have exactly this many atoms? It is because there are many codes in the molecule of insulin, analogue codes and other coded features. In fact, there is a program-cybernetic algorithm in which it is „recorded“ that the first amino acid has to have 10 atoms, the second one 22, the third one 19, etc... The first amino acid has its own

biochemistry, the second and the third one also. The conclusion here has to be that there is a concrete relationship between quantitative ratios in the process of transfer of genetic information and qualitative appearance, i.e. the characteristics of organisms.

ALGORITHM

We shall now give some mathematical evidences that will prove that in the biochemistry of insulin there really is programmatic and cybernetic algorithm in which it is „recorded“, in the language of mathematics, how the molecule will be built and what will be the quantitative characteristics of the given genetic information.

Step 1 (From 1 to 306)

$$R1 = 10; R2 = 22; R3 = 19; \dots R306 = 17;$$

$$[R1 + (R1+R2) + (R1+R2+R3) \dots + (R1+R2+R3 \dots + R306)] = S;$$

$$R1 = 10 \text{ atoms};$$

$$(R1+R2) = (10+22) = 32;$$

$$(R1+R2+R3) = (10+22+19) = 51;$$

$$(R1+R2+R3 \dots + R306) = 5640 \text{ atoms};$$

$$R1,2,3,n = \text{Number of atoms in amino acids } 1,2,3,n$$

$$[R1 + (R1+R2) + (R1+R2+R3) \dots + (R1+R2+R3 \dots + R306)] =$$

$$= (10+32+51+70 \dots + 5640) = S;$$

$$S = 863\,208;$$

Step 2 (From 306 to 1)

$$R306 = 17; R305 = 24; R304 = 17; \dots R1 = 10 \text{ atoms};$$

$$[R306 + (R306+R305) + (R306+R305+R304) \dots + (R306+R305+R304 \dots + R1)] = S1;$$

$$R306 = 17;$$

$$(R306+R305) = (17+24) = 41;$$

$$(R306+R305+R304) = (17+24+17) = 58;$$

$$(R306+R305+R304 \dots + R1) = (17+24+17 \dots + 10) = 5640;$$

R1,2,3,n = Number of atoms in amino acids 1,2,3,n

$$[R306 + (R306+R305) + (R306+R305+R304)... + (R306+R305+R304... + R1)] =$$

$$= (17+41+58+75... + 5640) = S1;$$

$$S1 = 868\,272;$$

From 1 to 102 and from 102 to 1

	G	I	V	E	Q	C	C	.	.	T	SUM
	10	22	19	19	20	14	14	.	.	17	1880
	1	2	3	4	5	6	7	.	.	102	5253
Step 1	10	32	51	70	90	104	118	.	.	1880	95976
Step 2	5640	5630	5608	5589	5570	5550	5536	.	.	3777	481184
											577160

$$(0+10) = 10; (10+22)=32; (10+22+19)=51; \text{ etc.}$$

$$(17+24+17... + 10) = 5640; (17+24+17... + 22) = 5630; \text{ etc.}$$

$$(95976 + 481184) = 577160;$$

From 103 to 204 and from 204 to 103

	G	I	V	E	Q	C	C	.	.	T	SUM
	10	22	19	19	20	14	14	.	.	17	1880
	103	104	105	106	107	108	109	.	.	204	15657
Step 1	1890	1912	1931	1950	1970	1984	1998	.	.	3760	287736
Step 2	3760	3750	3728	3709	3690	3670	3656	.	.	1897	289424
											577160

$$(287736 + 289424) = 577160;$$

From 205 to 306 and from 306 to 205

	G	I	V	E	Q	C	C	.	.	T	SUM
	10	22	19	19	20	14	14	.	.	17	1880
	205	206	207	208	209	210	211	.	.	306	26061
Step 1	3770	3792	3811	3830	3850	3864	3878	.	.	5640	479496
Step 2	1880	1870	1848	1829	1810	1790	1776	.	.	17	97664
											577160

$$(479496 + 97664) = 577160;$$

From 1 to 102		From 103 to 204		From 205 to 306
↓		↓		↓
577160		577160		577160
↘		↓		↙
		1.731.480		

$$1.731.480 = (5640+5640+5640... + 5640);$$

Number of atoms in Insulin = 5640;

Schematic representation of the bio intervals from 1 to 306 we will show in the fig.1 and 2.

In that group of chains there are three groups with 102 amino acids. Each of these three groups of amino acids has an identical number of atoms.

transfer of genetic information and the qualitative appearance of given genetic processes.

It can be concluded that there is a connection between quantitative characteristics in the process of

BIO INTERVALS – AMINO ACIDS FROM 1 TO 306

Within the digital pictures in biochemistry, the physical and chemical parameters are in a strict compliance with programmatic, cybernetic and information principles. As an example, we will here give you the mathematical gravity forces. These forces determine the positioning of aminoacids in their molecules. Each bar in the protein chain attracts only the corresponding aminoacid, and only the relevant aminoacid can be positioned at certain place in the

chain. Each peptide chain can have the exact number of aminoacids necessary to meet the strictly determined mathematical conditioning. It can have as many atoms as necessary to meet the mathematical balance of the biochemical phenomenon at certain mathematical level, etc... the digital language of biochemistry has a countless number of codes and analogue codes, as well as other information content. These pictures enable us to realize the very essence of functioning of biochemical processes.

Insulin Bio Intervals(1)

Step 1

Number of atoms	Bio intervals	Rank	Number of atoms	Bio intervals	Rank	Number of atoms	Bio intervals	Rank
199 From 1 to 12	199	78	1139 From 1 to 63	199	2016	2079 From 1 to 114	199	6555
323 From 1 to 18	124	171	1263 From 1 to 69	124	2415	2203 From 1 to 120	124	7260
361 From 1 to 20	38	210	1301 From 1 to 71	38	2556	2241 From 1 to 122	38	7503
579 From 1 to 32	218	528	1519 From 1 to 83	218	3486	2459 From 1 to 134	218	9045
617 From 1 to 34	38	595	1557 From 1 to 85	38	3655	2497 From 1 to 136	38	9316
741 From 1 to 41	124	861	1681 From 1 to 92	124	4278	2621 From 1 to 143	124	10296
940 From 1 to 51	199	1326	1880 From 1 to 102	199	5253	2820 From 1 to 153	199	11781
3760	940		10340	940		16920	940	

(199-0) = 199; (323-199) = 124; (361-323) = 38; (741-617) = 124;
 (940-741) = 199; (1139-940) = 199; (1263-1139) = 124;
 etc.

(Chain A + Chain B) = 940 atoms,
 (Chain C + Chain D) = 940 atoms,
 etc.

(3760 + 16920) = (10340 + 10340);
 10340 = (940+940+940..., + 940);

3760 = (940+940+940+940)
 10340 = (940+940+940..., + 940)
 16920 = (940+940+940..., + 940)

(2079-1139) = (1139-199);
 (2203-1263) = (1263-323);
 (2241-1301) = (1031-361);
 etc.

Correlation of bio intervals

Number of atoms	Bio intervals	Number of atoms	Bio Intervals	Number of atoms	Bio Intervals
199	199	1139	199	2079	199

$$[(199 + 2079) : 2] = 1139;$$

Number of atoms	Bio intervals	Number of atoms	Bio Intervals	Number of atoms	Bio Intervals
323	124	1263	124	2203	124

$$[(323 + 2203) : 2] = 1263;$$

Number of atoms	Bio intervals	Number of atoms	Bio Intervals	Number of atoms	Bio Intervals
361	38	1301	38	2241	38

$$[(361 + 2241) : 2] = 1301;$$

Number of atoms	Bio intervals	Number of atoms	Bio Intervals	Number of atoms	Bio Intervals
579	218	1519	218	2459	218

$$[(579 + 2459) : 2] = 1519;$$

Number of atoms	Bio intervals	Number of atoms	Bio Intervals	Number of atoms	Bio Intervals
617	38	1557	38	2497	38

$$[(617 + 2497) : 2] = 1557;$$

Number of atoms	Bio intervals	Number of atoms	Bio Intervals	Number of atoms	Bio Intervals
741	124	1681	124	2621	124

$$[(741 + 2621) : 2] = 1681;$$

Number of atoms	Bio intervals	Number of atoms	Bio Intervals	Number of atoms	Bio Intervals
940	199	1880	199	2820	199

$$[(940 + 2820) : 2] = 1880;$$

Insulin Bio Intervals(2)

Number of atoms	Bio intervals	Rank	Number of atoms	Bio intervals	Rank	Number of atoms	Bio intervals	Rank
3019 From 1 to 165	199	13695	3959 From 1 to 216	199	23436	4899 From 1 to 267	199	35778
3143 From 1 to 171	124	14706	4083 From 1 to 222	124	24753	5023 From 1 to 273	124	37401
3181 From 1 to 173	38	15051	4121 From 1 to 224	38	25200	5061 From 1 to 275	38	37950
3399 From 1 to 185	218	17205	4339 From 1 to 236	218	27966	5279 From 1 to 287	218	41328
3437 From 1 to 187	38	17578	4377 From 1 to 238	38	28441	5317 From 1 to 289	38	41905
3561 From 1 to 194	124	18915	4501 From 1 to 245	124	30135	5441 From 1 to 296	124	43956
3760 From 1 to 204	199	20910	4700 From 1 to 255	199	32640	5640 From 1 to 306	199	46971
23500	940		30080	940		36660	940	

(3019-2820) = 199; (3143-3019) = 124; (3181-3143) = 38; etc.

Schematic representation of the bio intervals from 199 to 5640 we will show in the fig.3.

Correlation of bio intervals

Number of atoms	Number of atoms	Number of atoms
3019	3959	4899

$$(3019 + 4899) = (3959 \times 2);$$

Number of atoms	Number of atoms	Number of atoms
3143	4083	5023

$$(3143 + 5023) = (4083 \times 2);$$

Number of atoms	Number of atoms	Number of atoms
3181	4121	5061

$$(3181 + 5061) = (4121 \times 2); \text{ etc.}$$

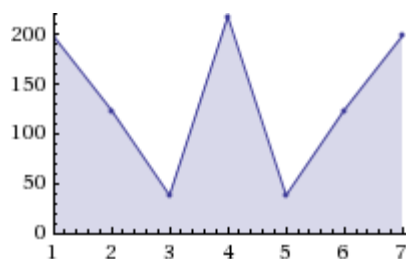
The molecule of insulin we can understand as words built from letters, i.e. aminoacids. The meaning of words is determined by positioning of letters. Each of these words has its biochemical base. If this base is expressed by corresponding discrete numbers, we find out that the base has its own program, cybernetic and information characteristics. In fact, we will find out that

the sequencing of the molecule is conditioned and determined not only by biochemical, but also by cybernetic and information principles.

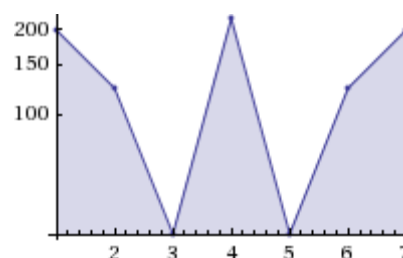
BIO INTERVALS(3)

Mathematica plaintext input:

Plot:



Long-linear plot:



```
ListLogPlot[{199, 124, 38, 218, 38, 124, 199}, Joined ->
True, Mesh -> All, Filling -> Axis]
```

BIO INTERVAL – AMINO ACIDS-FROM 306 TO 1.

Step 2

Number of atoms	Bio intervals	Rank	Number of atoms	Bio intervals	Rank	Number of atoms	Bio Intervals	Rank
199 From 306 to 297	199	3015	1139 From 306 to 246	199	16836	2079 From 306 to 195	199	28056
323 From 306 to 290	124	5066	1263 From 306 to 239	124	18530	2203 From 306 to 188	124	29393
361 From 306 to 288	38	5643	1301 From 306 to 237	38	19005	2241 From 306 to 186	38	29766
579 From 306 to 276	218	9021	1519 From 306 to 225	218	21771	2459 From 306 to 174	218	31920
617 From 306 to 274	38	9570	1557 From 306 to 223	38	22218	2497 From 306 to 172	38	32265
741 From 306 to 268	124	11193	1681 From 306 to 217	124	23535	2621 From 306 to 166	124	33276
940 From 306 to 256	199	14331	1880 From 306 to 205	199	26061	2820 From 306 to 154	199	35190
3760	940		10340	940		16920	940	

$$[(199 + 2079) : 2] = 1139; [(323 + 2203) : 2] = 1263; \text{etc.}$$

Schematic representation of the bio intervals from 306 to 1 we will show in the fig.4.

Step 2

199	199	1139	199	2079	199
323	124	1263	124	2203	124
361	38	1301	38	2241	38
579	218	1519	218	2459	218
617	38	1557	38	2497	38
741	124	1681	124	2621	124
940	199	1880	199	2820	199
3760	940	10340	940	16920	940
3019	199	3959	199	4899	199
3143	124	4083	124	5023	124
3181	38	4121	38	5061	38
3399	218	4339	218	5279	218
3437	38	4377	38	5317	38
3561	124	4501	124	5441	124
3760	199	4700	199	5640	199
23500	940	30080	940	36660	940

$$(323-199) = 124; (361-323) = 38; (579-361) = 218; \text{ etc.}$$

$$(36660 + 3760) + (30080 + 10340) + (23500 + 16920) = (940 \times Y);$$

$$Y = 43;$$

Connection:

$$(36660 \text{ and } 3760) > 36660 \ 3760 = (940 \times Y1);$$

$$(3760 \text{ and } 36660) > 3760 \ 36660 = (940 \times Y2);$$

$$(30080 \text{ and } 10340) > 30080 \ 10340 = (940 \times Y3);$$

$$(10340 \ 30080) > 10340 \ 30080 = (940 \times Y4);$$

$$(23500 \text{ and } 16920) > 23500 \ 16920 = (940 \times Y5);$$

$$(16920 \text{ and } 23500) > 16920 \ 23500 = (940 \times Y5);$$

In those examples there is an exact mathematical balance of groups of aminoacids from 1 to 102, 103 to 204, 205 to 306 and 199 to 5640.. This balance is one of important quantitative characteristics of all processes in biochemistry. How functioning of biochemistry is determined through cybernetic information principles, will be discussed further in Table 1.

BIO INTERVALS(4)

The result of the research that we have carried out clearly shows that there is a matrix code in insulin. It also shows that the coding system within the amino acidic language gives a full information, not only for the amino acid „record“, but also for its structure, configuration and its various shapes. In the following text we shall discuss the issue of the existence of the insulin code, and also the issue of coding of individual structural levels in this protein.

BIO INTERVAL (+)199

Impulse 1			Impulse 2	
G	I	V		S
10	22	19	...	14
1	2	3	...	12
10	32	51	...	199
5640	5630	5608	...	5455

$$(10+22+19... + 14) = 199;$$

BIO INTERVAL (-)199

Impulse -2			Impulse -1	
E	T	P	K	T
19	...	17	17	24
297	...	303	304	305
5460	...	5582	5599	5623
199	...	75	58	41
				17

BIO INTERVAL (+)323

Impulse 1			Impulse 3	
G	I	V	N	
10	22	19	...	
1	2	3	17	
10	32	51	323	
5640	5630	5608	5334	

BIO INTERVAL (-)323

Impulse -3		Impulse -1		
A	...	T	P	K
13	...	17	17	24
290	...	303	304	305
5330	...	5582	5599	5623
323	...	75	58	41
				17

BIO INTERVAL (+)361

Impulse 1			Impulse 4	
G	I	V	C	
10	22	19	...	
1	2	3	14	
10	32	51	361	
5640	5630	5608	5293	

BIO INTERVAL (-)361

Impulse -4		Impulse -1		
V	...	T	P	K
19	...	17	17	24
288	...	303	304	305
5298	...	5582	5599	5623
361	...	75	58	41
				17

etc.

The molecule of insulin we can understand as words built from letters, i.e. aminoacids. The meaning of words is determined by positioning of letters. Each of these words has its biochemical base. If this base is expressed by corresponding discrete numbers, we find out that the base has its own program, cybernetic and information characteristics. In fact, we will find out that the sequencing of the molecule is conditioned and determined not only by biochemical, but also by cybernetic and information principles.

BIO INTERVAL – AMINO ACIDS-FROM 1 to 306 and 306 TO 1.

Bio intervals of insulin we will show in the table 1 and table 2.

Step 1*Table 1* : Bio intervals (from 1 to 306)

199	323	361	579	617	741	940
1139	1263	1301	1519	1557	1681	1880
2079	2203	2241	2459	2497	2621	2820
3019	3143	3181	3399	3437	3561	3760
3959	4083	4121	4339	4377	4501	4700
4899	5023	5061	5279	5317	5441	5640

(1139 -199) = (2079-1139) = (3019-2079); etc.

Step 2*Table 2* : Bio intervals (from 306 to 1)

940	741	617	579	361	323	199
1880	1681	1557	1519	1301	1263	1139
2820	2621	2497	2459	2241	2203	2079
3760	3561	3437	3399	3181	3143	3019
4700	4501	4377	4339	4121	4083	3959
5640	5441	5317	5279	5061	5023	4899

(1880-940) = 2820-1880); etc.

These tables contains an overview of all bio intervals. The bio intervals show some of the quantitative characteristics of the molecule of insulin.

Schematic representation of the bio intervals we will show in the fig.5, 6 and 7.

The Insulin Bio Signal Code

We shall now give some mathematical evidences that will prove that in the biochemistry of insulin there really is programmatic and cybernetic algorithm in which it is „recorded“, in the language of mathematics, how the molecule will be built and what will be the quantitative characteristics of the given genetic information.

Signal	Signal		
+199	-5441		
S	L	Y	
14	14	22	24
11	12	13	14
185	199	221	245
5469	5455	5441	5419
(199 + 5441) = 5640;			

Signal	Signal	Signal	Signal
+323	-5317	+361	-5279
E	N	Y	C
19	17	24	14
17	18	19	20
306	323	347	361
5353	5334	5317	5293

$$(323+5317) = 5640; (361+5279) = 5640; (361-323) = (5317 - 5279)$$

Signal +579	Signal -5061	Signal +617	Signal -5023		
H	L	V	E	A	L
20	22	19	19	13	22
31	32	33	34	35	36
557	579	598	617	630	652
5103	5083	5061	5042	5023	5010

$(579+5061) = (617+5023)$ $(617-579) = (5061 - 5023)$

Signal +741	Signal -4899		
C	G	E	R
14	10	19	26
40	41	42	43
731	741	760	786
4923	4909	4899	4880

$(741 + 4899) = 5640;$

Signal +940	Signal -4700		
K	T	G	I
24	17	10	22
50	51	52	53
923	940	950	972
4741	4717	4700	4690

$(4700 + 940) = 5640;$ etc.

Aforementioned bio-codes were calculated using of corresponding groups of aminoacids. These are unions with different number of aminoacids. There are different ways and methods of selecting these unions of amino acids. We hope that science will determine which method is most efficient for this selection. Some signals have a positive, and some have negative numeric value.

IV. DISCUSSION

The results of our research show that the processes of sequencing the molecules are conditioned and arranged not only with chemical and biochemical lawfulness, but also with program, cybernetic and informational lawfulness too. At the first stage of our research we replaced nucleotides from the Amino Acid Code Matrix with numbers of the atoms in those nucleotides. Translation of the biochemical language of these amino acids into a digital language may be very useful for developing new methods of predicting protein sub-cellular localization, membrane protein type, protein structure secondary prediction or any other protein attributes. Since the concept of Chou's pseudo amino

acid composition was proposed^{1,2}, there have been many efforts to try to use various digital numbers to represent the 20 native amino acids in order to better reflect the sequence-order effects through the vehicle of pseudo amino acid composition. Some investigators used complexity measure factor³, some used the values derived from the cellular automata⁴⁻⁷, some used hydrophobic and/or hydrophilic values⁸⁻¹⁶, some were through Fourier transform^{17,18}, and some used the physicochemical distance¹⁹. The author [34-40] is devoted to provide a digital code for each of 20 native amino acids. These digital codes should more complete and better reflect the essence of each of the 20 amino acids. Therefore, it might stimulate a series of future work by using the author's digital codes to formulate the pseudo amino acid composition for predicting protein structure class [20-22], subcellular location [23, 24], membrane protein type [9, 25], enzyme family class [26, 27], GPCR type [28, 29], protease type [30], protein-protein interaction [31], metabolic pathways [32], protein quaternary structure [33], and other protein attributes. It is going to be possible to use a completely new strategy of research in genetics in the future. However, close observation of all these relationships, which are the outcomes of periodic laws (more specifically the law of binary coding), stereo-chemical and digital structure of proteins.

REFERENCES RÉFÉRENCES REFERENCIAS

1. K.C. Chou, Gene Cloning & Expression Technologies, Chapter 4 (Weinrer, P.W., and Lu, Q., Eds.), Eaton Publishing, Westborough, MA (2002), pp. 57-70.
2. K.C. Chou, Prediction of protein cellular attributes using pseudo amino acid composition PROTEINS: Structure, Function, and Genetics (Erratum: *ibid.*, 2001, Vol.44,60) 43 (2001) 246-255.
3. X. Xiao, S. Shao, Y. Ding, Z. Huang, Y. Huang, K. C. Chou, Using complexity measure factor to predict protein subcellular location, *Amino Acids* 28 (2005) 57-61.
4. X. Xiao, S. Shao, Y. Ding, Z. Huang, X. Chen, K. C. Chou, Using cellular automata to generate Image representation for biological sequences, *Amino Acids* 28 (2005) 29-35.
5. X. Xiao, S. Shao, Y. Ding, Z. Huang, X. Chen, K. C. Chou, An Application of Gene Comparative Image for Predicting the Effect on Replication Ratio by HBV Virus Gene Missense Mutation, *Journal of Theoretical Biology* 235 (2005) 555-565.
6. X. Xiao, S. H. Shao, Z. D. Huang, K. C. Chou, Using pseudo amino acid composition to predict protein structural classes: approached with complexity measure factor, *Journal of Computational Chemistry* 27 (2006) 478-482.

7. X. Xiao, S. H. Shao, Y. S. Ding, Z. D. Huang, K. C. Chou, Using cellular automata images and pseudo amino acid composition to predict protein sub-cellular location, *Amino Acids* 30 (2006) 49-54.
8. K. C. Chou, Using amphiphilic pseudo amino acid composition to predict enzyme subfamily classes, *Bioinformatics* 21 (2005) 10-19.
9. K. C. Chou, Y. D. Cai, Prediction of membrane protein types by incorporating amphipathic effects, *Journal of Chemical Information and Modeling* 45 (2005) 407-413.
10. Z. P. Feng, Prediction of the subcellular location of prokaryotic proteins based on a new representation of the amino acid composition, *Biopolymers* 58 (2001) 491-499.
11. Z. P. Feng, An overview on predicting the subcellular location of a protein, *In Silico Biol* 2 (2002) 291-303.
12. M. Wang, J. Yang, Z. J. Xu, K. C. Chou, SLLE for predicting membrane protein types, *Journal of Theoretical Biology* 232 (2005) 7-15.
13. S. Q. Wang, J. Yang, K. C. Chou, Using stacked generalization to predict membrane protein types based on pseudo amino acid composition, *Journal of Theoretical Biology*, in press (2006) doi:10.1016/j.jtbi.2006.1005.1006.
14. M. Wang, J. Yang, G. P. Liu, Z. J. Xu, K. C. Chou, Weighted-support vector machines for predicting membrane protein types based on pseudo amino acid composition, *Protein Engineering, Design and Selection* 17 (2004) 509-516.
15. S. W. Zhang, Q. Pan, H. C. Zhang, Z. C. Shao, J. Y. Shi, Prediction protein homo-oligomer types by pseudo amino acid composition: Approached with an improved feature extraction and naive Bayes feature fusion, *Amino Acids* 30 (2006) 461-468.
16. Y. Gao, S. H. Shao, X. Xiao, Y. S. Ding, Y. S. Huang, Z. D. Huang, K. C. Chou, Using pseudo amino acid composition to predict protein subcellular location: approached with Lyapunov index, Bessel function and Chebyshev filter, *Amino Acids* 28 (2005) 373-376.
17. Y. Z. Guo, M. Li, M. Lu, Z. Wen, K. Wang, G. Li, J. Wu, Classifying G protein-coupled receptors and nuclear receptors based on protein power spectrum from fast Fourier transform, *Amino Acids* 30 (2006) 397-402.
18. H. Liu, M. Wang, K. C. Chou, Low-frequency Fourier spectrum for predicting membrane protein types, *Biochem Biophys Res Commun* 336 (2005) 737-739.
19. K. C. Chou, Prediction of protein subcellular locations by incorporating quasi- sequence-order effect, *Biochemical & Biophysical Research Communications* 278 (2000) 477-483.
20. K. C. Chou, A novel approach to predicting protein structural classes in a (20-1)-D amino acid composition space, *Proteins: Structure, Function & Genetics* 21 (1995) 319-344.
21. K. C. Chou, C. T. Zhang, Predicting protein folding types by distance functions that make allowances for amino acid interactions, *Journal of Biological Chemistry* 269 (1994) 22014-22020.
22. K. C. Chou, C. T. Zhang, Review: Prediction of protein structural classes, *Critical Reviews in Biochemistry and Molecular Biology* 30 (1995) 275-349.
23. K. C. Chou, D. W. Elrod, Protein subcellular location prediction, *Protein Engineering* 12 (1999) 107-118.
24. K. C. Chou, Review: Prediction of protein structural classes and subcellular locations, *Current Protein and Peptide Science* 1 (2000) 171-208.
25. K. C. Chou, D. W. Elrod, Prediction of membrane protein types and subcellular locations, *PROTEINS: Structure, Function and Genetics* 34 (1999) 137-153.
26. K. C. Chou, D. W. Elrod, Prediction of enzyme family classes, *Journal of Proteome Research* 2 (2003) 183-190.
27. K. C. Chou, Y. D. Cai, Predicting enzyme family class in a hybridization space, *Protein Science* 13 (2004) 2857-2863.
28. K. C. Chou, D. W. Elrod, Bioinformatical analysis of G-protein-coupled receptors, *Journal of Proteome Research* 1 (2002) 429-433.
29. K. C. Chou, Prediction of G-protein-coupled receptor classes, *Journal of Proteome Research* 4 (2005) 1413-1418.
30. K. C. Chou, Y. D. Cai, Prediction of protease types in a hybridization space, *Biochem. Biophys. Res. Comm.* 339 (2006) 1015-1020.
31. K. C. Chou, Y. D. Cai, Predicting protein-protein interactions from sequences in a hybridization space, *Journal of Proteome Research* 5 (2006) 316-322.
32. K. C. Chou, Y. D. Cai, W. Z. Zhong, Predicting networking couples for metabolic pathways of Arabidopsis, *EXCLI Journal* 5 (2006) 55-65.
33. K. C. Chou, Y. D. Cai, Predicting protein quaternary structure by pseudo amino acid composition, *PROTEINS: Structure, Function, and Genetics* 53 (2003) 282-289.
34. L.Kurić, The digital language of amino acids. *Amino Acids* (2007) 653-661.
35. L.Kurić, The Atomic Genetic Code. *J. Comput Sci Biol* 2 (2009) 101-116.
36. L.Kurić, Mesure complexe des caracteristiques dynamiques de series temporelles "Journal de la Societe de statistique de Paris" - tome 127, No. 2.1986.
37. L.Kurić, The Insulin Bio Code - Zero Frequencies, *GJMR Vol. 10 Issue 1: 15 May 2010*.
38. L.Kurić, Molecular biocoding of insulin, *Advances*

and Applications in Bioinformatics and Chemistry, Jul. 2010.p.45 – 58.

39. L.Kurić, The Insulin Bio Code – Prima sequences, GJMR Vol. 1 Issue 1: 15 June 2010.
40. L.Kurić, ATOMIC HEMOGLOBIN CODE, GJMR Volume 10 Issue 2, October 2010.
41. L.Kurić, Language of Insulin Decoded:Discret code 1128, IJPBS JOURNAL, October 2010.
42. L.Kurić, „Measures of Bio Insulin Frequencies“, IJCSET (Volume 1. Issue 4. December, 2010)
43. L.Kurić, The Insulin Bio Code - Standard Deviation, International Journal of Scientific and Engineering Research (IJSER) **Nov 25, 2010** under **ISSN 2229-5518**.
44. L.Kurić, Molecular biocoding of insulin – amino acid Gly, International Journal of Scientific and Engineering Research (IJSER) - March 2011 issue.
45. L.Kurić, Algorithm and computational complexity of Insulin, International Journal of Computer Technology and Application (IJCTA) - Feb 2011 issue.
46. L.Kurić, Algorithm and computational complexity of Insulin – amino acid Asn, International Journal of Computer Technology and Application (IJCTA).

Awards

Gold medal for Bosnia and Herzegovina, in the name of your people and Bosnia and Herzegovina. Such individuals deserve recognition not only within their country of origin, but also worldwide. As such, the American Biographical Institute – a highly esteemed leader in the research of upstanding individuals around the globe – has selected you to receive one of its most internationally prominent honors, the GOLD MEDAL FOR BOSNIA AND HERZEGOVINA. –International health professional of the year 2010., -Man of the year in medicine and healthare designation for 2010.,-The international Hipocrates awards for medical achievement, -Cambridge certificate for outstanding medical achievement for 2011. – International health professional of the year 2012.-Cambridge certificate for Outstanding Medical Achievement, 2012., -ABI-Man of the year 2012. - Nomination for Great Minds of the 21st Century, a major reference directory including just 1.000 of the world's top thinkers and intellectuals. My contributions to the field of medicine and healthcare have waranted the high regard of nomination for Great Minds of the 21st Century.



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Comparative Hepatoprotective Activities of Selected Indian Medicinal Plants

By Mohammed Fazil Ahmed & A. Srinivasa Rao

Nizam Institute of Pharmacy & Research Center

Abstract - The present study deals with comparative evaluation of hepatoprotective activities of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea* L.var.capitata ethanolic leaves extracts against simvastatin induced hepatotoxicity in rats. Hepatotoxicity in rats was induced by simvastatin (20 mg/kg p.o. for 30 days) and the protective effect of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea* L.var.capitata (300 mg/kg/p.o. and 500 mg/kg/p.o.) was identified by estimating marker enzymes. Simvastatin treated rats shows significant changes in biochemical parameters i.e. increases in Serum Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT), Alanine Phosphatase (ALP), Serum bilirubin and decrease in Total proteins content, which were restored towards normalization in extracts treated rats. The results revealed that the ethanolic extracts of *Melia azedarach* Linn, and *Brassica oleracea* L.var.capitata (300 mg/kg/p.o. and 500 mg/kg/p.o.) exhibited potent hepatoprotective activity than *Catharanthus Rosea*. The hepatoprotective effect of extracts was further confirmed by histopathological studies of liver, which shows normal architecture of liver cell than compared with hepatotoxicant group. Possible mechanism for hepatoprotective activity may be due to free radical scavenging potential in extracts.

Keywords : *melia azedarach linn, catharanthus rosea and brassica oleracea L.var.capitata, hepatoprotective activity and simvastatin.*

GJMR-B Classification : NLMC Code: WB 55.A9



Strictly as per the compliance and regulations of:



Comparative Hepatoprotective Activities of Selected Indian Medicinal Plants

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Abstract - The present study deals with comparative evaluation of hepatoprotective activities of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea L.var.capitata* ethanolic leaves extracts against simvastatin induced hepatotoxicity in rats. Hepatotoxicity in rats was induced by simvastatin (20 mg/kg p.o. for 30 days) and the protective effect of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea L.var.capitata* (300 mg/kg/p.o. and 500 mg/kg/p.o.) was identified by estimating marker enzymes. Simvastatin treated rats shows significant changes in biochemical parameters i.e. increases in Serum Glutamate Pyruvate Transaminase (SGPT), Serum Glutamate Oxaloacetate Transaminase (SGOT), Alanine Phosphatase (ALP), Serum bilirubin and decrease in Total proteins content, which were restored towards normalization in extracts treated rats. The results revealed that the ethanolic extracts of *Melia azedarach* Linn, and *Brassica oleracea L.var.capitata* (300 mg/kg/p.o. and 500 mg/kg/p.o.) exhibited potent hepatoprotective activity than *Catharanthus Rosea*. The hepatoprotective effect of extracts was further confirmed by histopathological studies of liver, which shows normal architecture of liver cell than compared with hepatotoxicant group. Possible mechanism for hepatoprotective activity may be due to free radical scavenging potential in extracts.

Keywords : *melia azedarach linn*, *catharanthus rosea* and *brassica oleracea L.var.capitata*, hepatoprotective activity and simvastatin.

I. INTRODUCTION

Liver diseases remain as one of the serious health problems. It is the key organ of metabolism and excretion. It is often exposed to variety xenobiotics and therapeutic agents.¹ Conventional drugs used in the treatment of liver diseases are often inadequate. It is therefore necessary to search for alternative drugs for the treatment of liver diseases to replace the currently used drugs of doubtful efficacy and safety. More than 900 drugs have been implicated in causing liver injury² and it is the most common reason for a drug to be withdrawn from the market. Drug induced liver injury is responsible for 5% of all hospital admissions and 50% of all acute liver failures.^{3, 4}

Simvastatin hepatotoxicity is hypothesized to occur due to drug-drug interactions.^{5, 6} Simvastatin (Lipid Lowering Agent) competitively inhibits HMG-Co A

(3-hydroxy-3 methylglutaryl coenzyme A) to mevalonate. Mevalonate is also a precursor of Coenzyme Q10 (CoQ10). Thus, treatment with statins could also lower its levels. CoQ10 acts as an antioxidant, has membrane stabilising effects, and is important for cellular mitochondrial respiration, which is essential for energy production in organs.^{7, 8} Thus, simvastatin causes oxidative stress mediated hepatotoxicity by depleting antioxidant enzymes.⁹ The enzymes L- alanine aminotransferase (L-ALT), L-aspartate amino transferase (L-AST), alkaline phosphatase (ALP) and lactate dehydrogenase (LDH), are often used in assessing the integrity of the liver.¹⁰ Liver fibrosis occurs as a result of a variety of pathological factors, including viral hepatitis (especially hepatitis B and C), alcohol and drug abuse, metabolic diseases due to overload of iron or copper, autoimmunity against hepatocytes or bile duct epithelium and congenital abnormalities.¹¹

Herbal drugs play a role in the management of various liver disorders most of which speed up the natural healing processes of the liver. Numerous medicinal plants and their formulations are used for liver disorders in ethnomedical practice as well as traditional system of medicine in India. Silymarin is a flavonolignan that has been introduced fairly recently as a hepatoprotective agent. Silymarin is extracted from the seeds and fruits of *Silybum marianum* and in reality is a mixture of three structural components: Silibinin, Silydianine and Silychristine. Clinical trials have shown that Silymarin exerts hepatoprotective effects in acute viral hepatitis, poisoning by *Amanita phalloides*, ethanol, paracetamol, and carbon tetrachloride. Many studies have demonstrated the beneficial hepatoprotective effects when treatment with Silymarin.¹²

Catharanthus Rosea, which is commonly known as 'Vinca rosea' belongs to family Apocynaceae and is an important source of indole alkaloids, which are present in all plant parts. The important antineoplastic alkaloids namely Vincristine and Vinblastine are mainly present in the leaves whereas antihypertensive alkaloids such as ajmalicine, serpentine, and reserpine are reported to be present in the roots.¹³ Vincristine and Vinblastine alkaloids are used in the treatment of various types of lymphoma and leukemia.^{14, 15}

Melia azedarach, the Persian Lilac is popularly known as Maha neem tree and cultivated in all stations. It is a large evergreen tree found throughout India and very similar to Neem. Leaves have been shown to

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contain nimbinene, meliacin, quercetrin, quercetin-3-O-b-rutinoside, kaempferol-3-O-b-rutinoside, rutin and kaempferol-3-L-rhamno-D-glucoside.^{16,17} Hot methanolic extract of *Melia azedarach* leaves contain dipentadecyl ketone, glycerol 1,3-bis-undec-9-enoate 2-dodec-9-enoate and glycerol tris-tridec-9-enoate.¹⁸ The plant is traditionally used for the treatment of leprosy, inflammations, and cardiac disorders. Its fruits extracts possess ovidical¹⁹ and larvicidal activity.²⁰ The leaf extracts also possess antiviral²¹ and antifertility activity.²²

Brassica oleracea var. *capitata* (Cabbage) (Family Brassicaceae) is an excellent source of vitamin C. It also contains significant amounts of glutamine, an amino acid that has anti-inflammatory properties. Cabbage can also be included in dieting programs, as it is a low calorie food. The present study was directed to investigate the hepatoprotective activities of *Brassica oleracea* L. var. *capitata* against simvastatin induced hepatotoxicity. There are increasing evidences that increased consumption of fruits and vegetables and intake of certain non-nutrients that are present in foods reduce the risk of various pathological events such as cancer^{23,24} and cardio- and cerebro-vascular diseases.²⁵ The vegetables are rich sources of many nutrients and antioxidant vitamins. Therefore, the objectives of present study deals with comparative evaluation of hepatoprotective activities of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea* L. var. *capitata* ethanolic leaves extracts against simvastatin induced hepatotoxicity in rats.

II. MATERIALS AND METHOD

a) Plant collection and identification

The plant material of *Brassica oleracea* var. *capitata* (Cabbage) were obtained from local market, while *Melia azedarach* Linn and *Catharanthus Rosea* were obtained from Mount Opera Garden, Near Ramoji Film City, Nalgonda Dist. The plant can be identified authenticated by Department of Botany, research office (Botanist), Anwar-ul-loom College of Pharmacy, Hyderabad.

b) Extraction

The leaves of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea* L. var. *capitata* were dried under shade and powdered in a mechanical grinder. The powdered material (250gms) was extracted successively in Ethanol using Soxhlet apparatus at 55°C for 18 h. The extracts was concentrated in vacuo and kept in a vacuum dessicator for complete removal of solvent and weighed.

c) Experimental Animals

Wistar albino rats (150-200 g) of both sexes were obtained from the animal house of NIZAM INSTITUTE OF PHARMACY, Deshmukhi, Ramoji film city, Hyderabad. Before and during the experiment, rats

were fed with standard diet (Gold Moher, Lipton India Ltd). After randomization into various groups and before initiation of experiment, the rats were acclimatized for a period of 7 days under standard environmental conditions of temperature, relative humidity, and dark/light cycle. Animals described as fasting were deprived of food and water for 16 h ad libitum. All animal experiment were carried out in accordance with the guidelines of CPCSEA and study was approved by the IAEC (Institutional animal ethical committee).

d) Acute toxicity studies of extracts

Acute oral toxicity was performed as per Organization for Economic Co-operation and Development (OECD)-423 guidelines.²⁶ Three male Wistar rats weighing between 150–200 g were used for each dose. The dose levels of 5 mg, 50 mg, 500 mg, 1000 mg, 2000 mg, and 5000 mg/kg/body weight, per os were selected. The lethal dose (LD)-50 value of the extract was determined. The drug was administered orally to rats, which were fasted overnight with water ad libitum before the administration of the drug. The body weight of the rat was noted before and after treatment. The animals were observed for toxic symptoms, such as behavioral changes, loco-motion, convulsions, and mortality for 72 hours.

e) Experimental design for hepatoprotective activity²⁷

Nine groups of rats, six in each received the following treatment schedule.

- Group I : Normal control (saline)
- Group II : Simvastatin (SMT) (20mg/kg.p.o)
- Group III : Simvastatin (20mg/kg.p.o) + *Melia azedarach* leaf extract (300mg/kg, p.o)
- Group IV : Simvastatin (20mg/kg.p.o) + *Melia azedarach* leaf extract (500mg/kg, p.o)
- Group V : Simvastatin (20mg/kg.p.o) + *Catharanthus roseus* leaf extract (300mg/kg, p.o)
- Group VI : Simvastatin (20mg/kg.p.o) + *Catharanthus roseus* leaf extract (500mg/kg, p.o)
- Group VII : Simvastatin (20mg/kg.p.o) + *Brassica oleracea* L. var. *capitata* leaf extract (300mg/kg, p.o)
- Group VIII : Simvastatin (20mg/kg.p.o) + *Brassica oleracea* L. var. *capitata* leaf extract (500mg/kg, p.o)
- Group IX : Simvastatin (20mg/kg.p.o) + Silymarin (25mg/kg, p.o)

Animals were divided into nine different groups, each having 6 rats and treated accordingly. Group 1: rats fed with a normal standard diet for 30 days; Group II rats receives Simvastatin (SMT) (20mg/kg.p.o alone for 30 days); Group III and IV rats receive SMT along with *Melia azedarach* leaf extracts (300mg/kg and 500mg/kg.p.o respectively for 30days); Group V and VI rats receives SMT along with *Catharanthus roseus* leaf extract (300mg/kg and 500mg/kg p.o respectively for 30days); Group VII and VIII rats received SMT along with *Brassica oleracea* leaf extracts (300mg/kg and

500mg/kg p.o respectively for 30days) and Group IX rats receive SMT along with silymarin (20 mg/kg/p.o.for 30 days).

f) Blood Biochemistry

Blood samples were collected in glass tube from retro-orbital puncture to obtain haemolysis free clear serum for the analysis of SGOT and SGPT²⁸, ALP²⁹ and bilirubin³⁰ by standard method. Serum total protein was measured according to the method of Lowry et al, 1951.³¹

g) Histopathology

Histopathology of liver was carried out by a modified Luna (Luna LG., 1999)³². In brief, the autopsied livers were washed in normal saline and fixed in 10% formalin for 2 days followed with bovine solution for 6 h. Then the livers were paraffin embedded and 5 μ thickness microtone sections were made.³³ The sections were processed in alcohol-xylene series and stained with haematoxylin and eosin. The slides were studied under a light micro-scope for any histological damage/protection.

h) Statistical Analysis

The data are represented as mean $\pm$ S.E.M. Students't-test is used for statistical analysis of blood serum parameters and for statistical analysis of liver enzymes

L. var. capitata showed no mortality upto 2000 mg/kg. The effect of ethanol extracts of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea L. var. capitata* on serum transaminases, alkaline phosphates, bilirubin and total protein level in Simvastatin intoxicated rats are summarized in Table 1. There was a significant increase in bilirubin levels, SGPT, SGOT and ALP, in Simvastatin intoxicated group(Group II) compared to the normal control group(Group I), while the total protein levels were significantly decreased from the level of 6.46 g/dl to 3.31g/dl in Simvastatin intoxicated rats. Extracts treatment groups such as Group III to Group VIII and standard group such as Group IX (Simvastatin 20mg/kg.p.o + Silymarin 25mg/kg, p.o) showed significantly decreased the elevated serum marker enzymes when given orally and reversed the altered total protein to almost normal level (Table 1).

From the above results (Table1), it shows that ethanolic extracts of *Melia azedarach* and *Brassica oleracea L. var. Capitata* (300mg/kg, and 500mg/kg,) are more effective than *Catharanthus roseus* (300mg/kg, and 500mg/kg,) of which *Brassica oleracea L. var* (500mg/kg,) is shown to be more effective than *Melia azedarach* (500mg/kg,) in restoration of the above parameters to normal level.

III. RESULTS

The acute oral toxicity study of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea*

Table 1 : Effect of various groups on some serum chemical parameters

Groups	SGPT levels (U/L)	SGOT levels (U/L)	ALP levels (U/L)	Total bilirubin (mg/dl)	Total protein(g/dl)
Group I	34.32 $\pm$ 0.75	36.89 $\pm$ 2.30	71.45 $\pm$ 0.22	0.40 $\pm$ 0.02	6.46 $\pm$ 0.02
Group II	126.9 $\pm$ 1.50 ^{a, **}	179.95 $\pm$ 1.350 ^{a, **}	172.68 $\pm$ 0.64 ^{a, **}	1.96 $\pm$ 0.12 ^{a, **}	3.31 $\pm$ 0.08 ^{a, **}
Group III	83.2 $\pm$ 0.27 ^{b, **}	123.56 $\pm$ 0.750 ^{b, **}	133.0 $\pm$ 1.63 ^{b, **}	0.68 $\pm$ 0.08 ^{b, **}	4.08 $\pm$ 0.15 ^{b, **}
Group IV	46.6 $\pm$ 0.55 ^{b, **}	68.63 $\pm$ 0.82 ^{b, **}	98.0 $\pm$ 1.24 ^{b, **}	0.56 $\pm$ 0.01 ^{b, **}	6.12 $\pm$ 0.15 ^{b, **}
Group V	112.2 $\pm$ 0.60 ^{b, *}	168.01 $\pm$ 2.75 ^{b, *}	162.2 $\pm$ 2.42 ^{b, *}	1.42 $\pm$ 0.03 ^{b, *}	3.98 $\pm$ 0.06 ^{b, *}
Group VI	98.6 $\pm$ 2.38 ^{b, **}	142.58 $\pm$ 2.53 ^{b, **}	118.24 $\pm$ 1.88 ^{b, **}	0.99 $\pm$ 0.05 ^{b, **}	4.41 $\pm$ 0.02 ^{b, **}
Group VII	48.6 $\pm$ 1.62 ^{b, **}	70.23 $\pm$ 1.34 ^{b, **}	93.6 $\pm$ 0.53 ^{**}	0.58 $\pm$ 0.06 ^{b, **}	5.45 $\pm$ 0.08 ^{b, **}
Group VIII	38.23 $\pm$ 1.42 ^{b, **}	39.09 $\pm$ 1.60 ^{b, **}	74.3 $\pm$ 1.72 ^{***}	0.45 $\pm$ 0.04 ^{b, **}	6.24 $\pm$ 0.07 ^{b, **}
Group IX	36.98 $\pm$ 2.74 ^{b, **}	38.67 $\pm$ 1.25 ^{b, **}	72.6 $\pm$ 1.04 ^{b, **}	0.42 $\pm$ 0.02 ^{b, **}	6.50 $\pm$ 0.12 ^{b, **}

Values are mean $\pm$ SEM (n=6) one way ANOVA followed by Dunnet's't' multiple Comparison test. a - Group I vs. Group II; b – Group II vs. Group III to Group IX; Where, * represents significant at <0.05,

** represents highly significant at $p < 0.01$, and
 *** represents very significant at $p < 0.001$. All values are compared with toxicant

Histopathology of the liver of various groups:

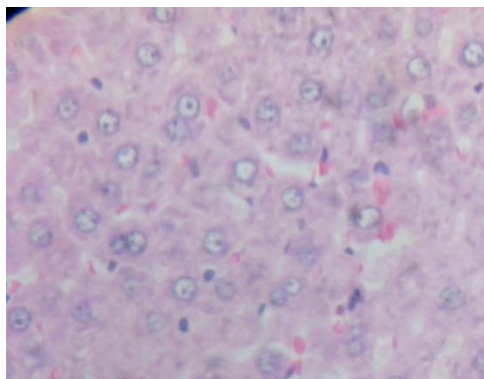


Fig. 1 : Group I

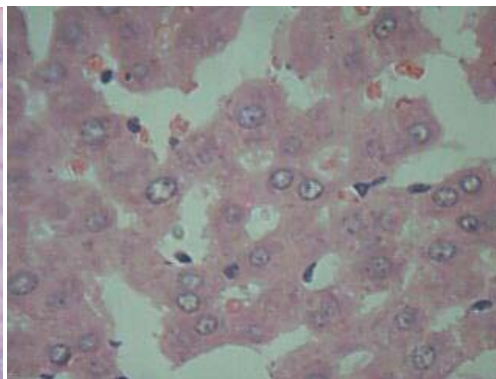


Fig. 2 : Group II

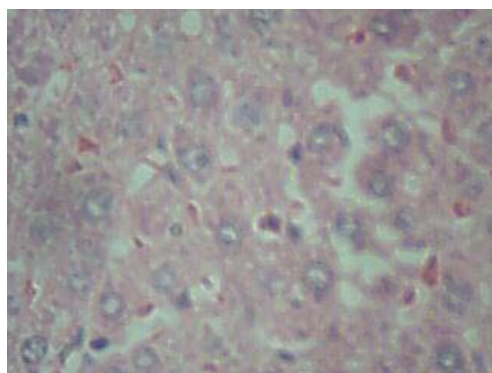


Fig. 3 : Group III

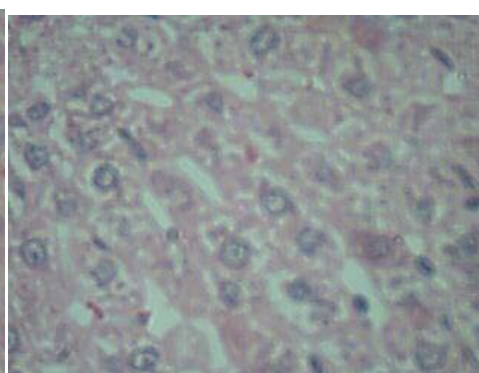


Fig. 4 : Group IV

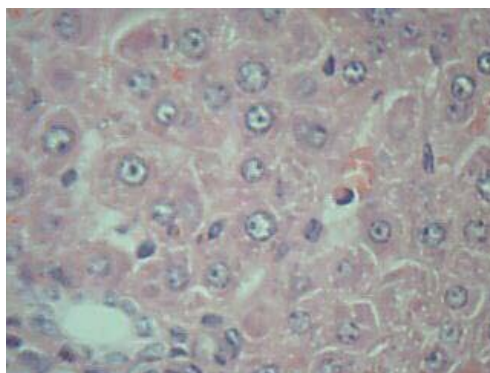


Fig. 5 : Group V

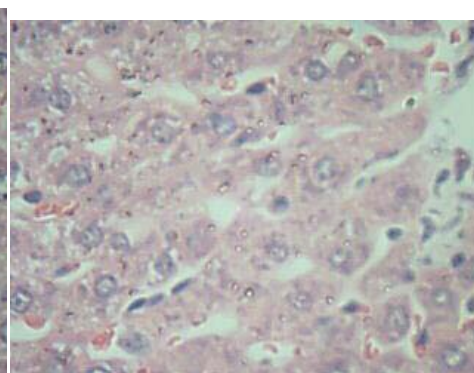


Fig. 6 : Group VI

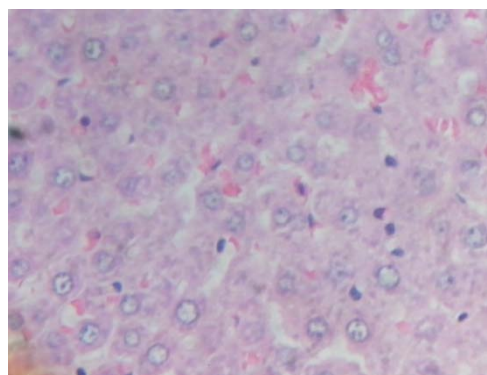


Fig. 7 : Group VII

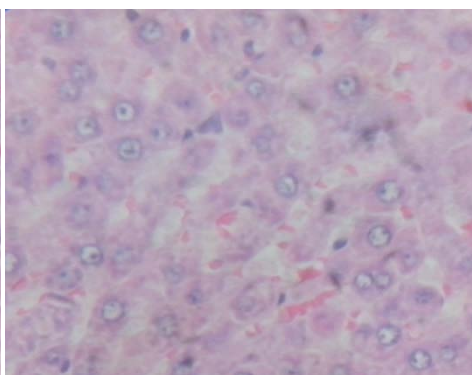


Fig. 8 : Group VIII

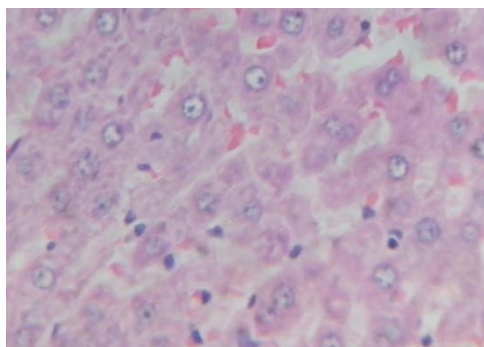


Fig. 9 : Group IX

IV. DISCUSSION

The liver is a vital organ present in vertebrates and some other animals. The liver can be injured by many chemicals and drugs.³⁴ It is reported that more than 900 drugs have been implicated in causing liver injury² and it is the most common reason for a drug to be withdrawn from the market. Drug induced liver injury is responsible for 5% of all hospital admissions and 50% of all acute liver failures.^{3, 4}. Statins are now among the most frequently prescribed medications and are currently used by about 25 million people worldwide. During hepatic damage, cellular enzyme like SGOT, SGPT, ALP and serum bilirubin present in the liver cell, leak into the serum resulting to increase in concentration.³⁵

In the previous study, it was reported that simvastatin caused oxidative stress mediated hepatotoxicity.³⁶ The most common clinical hepatic manifestation of statins is asymptomatic elevation in aminotransferases.³⁷⁻⁴⁰ Elevations to 3 times upper limit of normal occur in 1% to 3%.⁴¹

In the present study, it shows that ethanolic extracts of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea L.var.capitata* significantly decreased the elevated serum marker enzymes and reversed the altered total protein to almost normal level. *Brassica oleracea L.var.capitata*(500mg/kg,) is shown to be more effective than *Melia azedarach* (500mg/kg,) and *Catharanthus Rosea* (500mg/kg,) while *Catharanthus Rosea* shows moderate activity than other extracts. It is reported that phenols are responsible for the variation in the antioxidant activity of the plant.⁴² They exhibit antioxidant activity by inactivating lipid free radicals or preventing decomposition of hydroperoxides into free radicals.^{43, 44} Phenolic compounds are considered to be the most important antioxidative components of herbs and other plant materials.^{45, 46}

Histological changes such as fatty changes in hepatocytes (steatosis) and perivenular fibrosis were observed in simvastatin intoxicated group. Ethanolic extracts of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea L.var.capitata* (300 mg/kg and 500mg/kg, p.o) significantly prevented these histological

changes, further indicating their hepatoprotective activity. Although there is insufficient information to establish the mechanism of action of *Melia azedarach*, protection, this could be due to its antioxidant property of the phenolic compounds.

V. CONCLUSION

In conclusion, the results of present study demonstrate that *Melia azedarach* and *Brassica oleracea L.var.capitata* leaves extracts (300 mg/kg and 500mg/kg,) has potent hepatoprotective activity than *Catharanthus Rosea*, against simvastatin induced liver damage. Our study also implies that the hepatoprotective effects of *Melia azedarach* Linn, *Catharanthus Rosea* and *Brassica oleracea L.var.capitata* may be due to its antioxidant property of the phenolic compounds. Further investigation is in progress to determine the exact phytoconstituents responsible for hepatoprotective effect.

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REFERENCES RÉFÉRENCES REFERENCIAS

1. Hai Zhong Huo, Bing Wang, Yong Kang Liang, Yong Yang Bao and Yan Gu. Hepatoprotective and Antioxidant Effects of Licorice Extract against CCl₄-Induced Oxidative Damage in Rats, *Int. J. Mol. Sci.* 2011, 12.
2. Friedman, Scott E.; Grendell, James H.; McQuaid, Kenneth R. (2003). *Current diagnosis & treatment in gastroenterology*. New York: Lang Medical Books/McGraw-Hill. pp. 664–679. ISBN 0-8385-1551-7
3. Friedman, Peter F. (2006). *GI/Liver Secrets: with STUDENT CONSULT Access*. Saint Louis: C.V. Mosby. ISBN 1-56053-618-7
4. Ostapowicz G, Fontana RJ, Schiødt FV, et al. (2002). "Results of a prospective study of acute liver failure at 17 tertiary care centers in the United States". *Ann. Intern. Med.* 137 (12): 947–54. PMID 12484709.
5. Ricarte B, Guirguis A, Taylor HC, Zabriskie D. Simvastatin-amiodarone interaction resulting in rhabdomyolysis, azotemia, and possible hepatotoxicity. *Annals of Pharmacotherapy* 2006;40(4): 753–7. [PubMed: 16537817]
6. Kanathur N, Mathai MG, Byrd RP Jr, Fields CL, Roy TM. Simvastatin-diltiazem drug interaction resulting in rhabdomyolysis and hepatitis. *Tennessee Medicine* 2001;94(9):339–41. [PubMed: 11550401].

7. Frei B, Kim M, Ames B. Ubiquinol-10 is an effective lipid-soluble antioxidant at physiological concentrations. *Proc Natl Acad Sci U S A* 1990;87:4879-83 Stocker *et al.*, 1991).
8. Stocker R, Bowry VW, Frei B. Ubiquinone-10 protects low density lipoprotein more efficiently against lipid peroxidation than does alphanatocopherol. *Proc Natl Acad Sci U S A* 1991;88:1646-50.
9. Vaghasiya JD, Bhalodia YS, Manek RA, Gohil TA, Rathod SP. Oxidative stress mediated hepatotoxicity Produced by simvastatin. *Pharmacologyonline* 2008;3:495-503
10. Medhat, A., M. Shehata and S. Magder, 2002. Hepatitis C in a community in Upper Egypt: Risk factors for infection. *Am. J. Trop. Med. Hyg.*, 66: 633-638.
11. Friedman, S.L., 2000. Molecular regulation of hepatic fibrosis, an integrated cellular response to tissue injury. *J. Biol. Chem.*, 275: 2247-2250.
12. Frascini F, Demartini G, Esposti D. Pharmacology of Silymarin. *Clin Drug Inv* 2002; 22: 51-65.
13. Mishra P., Uniyal G.C., and Sharma S., Pattern of diversity for morphological and alkaloid yield related trades among the periwinkle *Catharanthus roseus* accessions collected from in and around Indian Subcontinent, *Genetic Res Crop Evol.*, 2001, 48, 273-286.
14. Farnsworth N.R., Svoboda G.H., Blomster R.N., Antiviral activity of selected *Catharanthus* alkaloids, *J Pharm. Sci.*, 1968, 57, 2174-2175.
15. Svoboda G.H., Blake D.A., The phyto-chemistry and pharmacology of *Catharanthus roseus* (L.) G. Don. Inc. In: Taylor, W.J., Farnsworth, N.R. (eds.): *The Catharanthusalkaloids*. Marcel Decker, New York, 1975, 45-84.
16. P. C. Sharma, M.B. Yelne, T. J. Dennis, Data base on Medicinal plants used in Ayurveda, (Documentation and Publication Division, Central Council for Research in Ayurveda and Siddha, New Delhi, 2001) pp. 389-406.
17. C.P. Khare, *Encyclopedia of Indian Medicinal Plants*, (Springer, Germany) pp.305- 306.
18. P. Suhag, Merra and S.B. Kalidhar. Phytochemical investigation of *Melia azedarach* leaves. *J. Med. Aromatic Plant Sci.* **25(2)**: 397-399 (2003).]
19. Corpinella MC, Miranda M, Almiron WR, Ferrayoli CG, Almedia FL, Palacios SM. In vitro pediculicidal and ovidical activity of an extract and oil from fruit of *Melia azedarach* L. *J Am Acad Dermatol* 2007; 56: 250-6.
20. Wandscheer CB, Duque JE, da silva MA, *et al.* Larvicidal action of ethanolic extracts from fruits endocarps of *Melia azedarach* and *Azadirachta indica* against the dengue mosquito *Aedes Aegypti*. *Toxicol* 2004; 44: 829-35.
21. Descalzo AM, Coto C. Inhibition of the pseudorabies virus (scis herpesviny) by an antiviral agent isolated from the leaves of melia azedarach. *Rev. Argent Microbial* 1989; 21: 133-40.
22. Choudhary DN, Singh JN, Verma SK, Singh BP. Antifertility effects of leaf extracts of some plants in male rats. *Indian J Exp Biol* 1990; 28: 714.
23. Goodwin JS, Brodwick M. *J Am Diet Assoc* 1996; 96:1027-1039.
24. Rimm EB, Ascherio A, Giovannucci E, Spiegelman D, Stampfer MJ, Willett WC. *JAMA* 1996; 275:447-451.
25. Trease GE, Evans WC, *A Text book of Pharmacognosy*, 11th edition, Bailliere Tiddall, London, 1978, 530.
26. Ecobichnon DJ. *The Basis of Toxicity Testing*. 2nd Ed. New York, NY: CRC Press; 1997.
27. Vaghasiya J, Rathod S, Bhalodia Y, Manek R, Malaviya S, Jivani N. Protective effect of polyherbal formulation on simvastatin hepatotoxicity in rats. *J Young Pharmacists* 2009;1:57-62.
28. Reitman S, Frankel S (1957). A colorimetric method for the determination of serum glutamic oxaloacetic and glutamic pyruvic transaminases. *Am. J. Clin. Pathol.*, 28: 56-63.
29. Walter K, Schutt C (1974). Acid and alkaline phosphatases in serum. In: Verlag Chemic Weinheim, In: Hans Ulrich Bergmeyer (Ed.), *Method Enzymatic Anal.* Academic Press Inc., New York, 2: 856-864.
30. Malloy HT, Evelyn KA (1937). The determination of bilirubin with the photoelectric colorimeter. *J. Biol. Chem.*, 119: 481-490.
31. Lowry OH, Rosebrough NJ, Farr AL, *et al.* Protein measurement with the folin-phenol reagent. *J Biol Chem* 1951; 193:265-275.
32. Luna LG (1999). *Manual in histology and staining method*. McGraw Hill: New York, p. 96.
33. Krajian AA (1963). Tissue cutting and staining. In: Frankel, S., Reitman, S. (Eds.), *Gradwohl's Clinical Laboratory Method and Diagnosis*. The CV. Mosby Co., Saint Louis, USA, p. 1639.
34. Leo MA, Arai M (1982). Hepatotoxicity of vitamin A and CCl₄. *Gastroenterology*, 82: 194-205.
35. Deb AC (1998). *Fundamental of Biochemistry*. 7th Ed. New Central Book Agency: Kolkata.
36. Vaghasiya JD, Bhalodia YS, Manek RA, Gohil TA, Rathod SP. Oxidative stress mediated hepatotoxicity Produced by simvastatin. *Pharmacologyonline* 2008;3:495-503.
37. Pasternal RC, Smith SC, Bairez-Merz C, Grundy SM, Cleeman JI, Lenfant C. ACC/AHA/NHLBI clinical advisory on the use and safety of statins. *Circulation* 2002;106:1024-1028.
38. *The Physician Desk Reference* 2005, 59th Edition. Montvale, NJ: Thompson HealthCare.2005.

39. Farmer JA, Torre-Amione G. Comparative tolerability of the HMG-COA reductase inhibitors. *Drug Safety* 2000;23:197-213.
40. Parra JL, Reddy KR. Hepatotoxicity of hypolipidemic drugs. *Clin Liver Dis* 2003;7:415-433.
41. Willis C. Maddrey, MD, Drug-Induced Hepatotoxicity *J Clin Gastroenterol*. Volume 39, Supp. 2, April 2005.
42. Cai Y, Luo Q, Sun M, Corke H, (2004). Antioxidant activity and phenolic compounds of 112 traditional Chinese medicinal plants associated with anticancer. *Life science*, 74: 2157-2184.
43. Pitchaon M, Suttajit M, Pongsawatmani R, (2007). Assessment of phenolic content and free radical scavenging capacity of some Thai indigenous plants. *Food Chem*, 100, 1409-1418.
44. Pokorny J, Yanishlieva N, Gordon M, (2001). Antioxidants in food, Practical Applications, Cambridge). Woodhead Publishing Limited, pp.1-3
45. Madsen HL, Nielsen BR, Bertelsen G, & Skibsted LH, (1996). Screening of antioxidative activity of spices. *Food Chemistry*, 57, 331-337.
46. Pellegrini N, Simonetti P, Gardana C, Brenna O, (2000). Brighenti activity of Vini Novelli (Young red wines). *Journal of Agriculture and Food Chemistry*, 48, 732-735.





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Medicinal Plants with Antifertility Activity-An Overview

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Abstract - Medicinal plants, is a common word which can utter in every one's mouth that are helpful in treating many diseases which can't be done by even allopathic medicine. Among those the birth control and at the same time increasing the fertility in human beings are both become major problems now a days. This review presents updated information gathered on scientifically proved medicinal plants used for anti-fertility activity. This study provides the information on botanical name, family, parts used, solvents used and their chemical constituents present in plants. In spite of rapid progress and spread of modern medicine and surgery, faith in and popularity of traditional methods has not decreased. There are a large number of studies which supports the anti-fertility effects of traditional herbal medicines. The aim of this review is to highlight the work on anti-fertility of plant origin. The present paper also involves various plant drugs and their bioactive extracts involved in anti-fertility mechanism. This article may help investigators to identify medicinal plants responsible for anti-fertility activity.

Keywords : *herbal medicines, anti-fertility plants.*

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I. INTRODUCTION

Phanobotany is the new branch which deals the medicinal plants and their activities. The applications of this field are enormous in regular life. Controlling the birth rate in India is the major problem; at the same time some parents are unable to have babies, for that they are preferring fertility centers. To cope these two types of problems now natural medicine took the time to emphasize without technical apparatus involvement the birth may control through contraception (herbal contraception) and also can have babies through natural medicine intake.

There are several other articles, journals and references which have been discussed about the antifertility and profertility individually. But this review article shows the both sections including some pharmacological activities. In 2005 G.C., world population is estimated to be 6.5 billion. This number is expected to increase by 2.5 billion over the next 45 years, 6.5 billion to 9.1 billion in 2050. Today, 95 per cent of all population growth is absorbed by the developing world and 5 per cent by the developed world. In the case of Ethiopia total population is estimated to be 74.2 million in 2005 with current growth

rate of 2.9 per cent per year. The average birth per woman is 6.14 and the contraceptive prevalence is 8.1 percent ^[1].

Moreover major population of the country lives in rural areas and those people have not approach to the modern methods of family planning. Traditional sterilization method based on herbal medicines is used to control population growth rate; including abortion at initial weeks, preventing conception or making the either member of the couple sterile. Perusal of literature revealed that enough work has been done on different medicinal aspects of plants of this area except for gynaecological disorders, abortifacient herbals and plants used to induce abortion ^[2-4].

Several plant products inhibit male and female fertility and may be developed into contraceptives. Even though, many indigenous plants have been shown to prevent the birth, only few plants have so far been investigated for anti-fertility activity. The World Health Organization (WHO) has set up a Task Force on Plant Research for fertility regulation with an objective to find new orally active non-steroidal contraceptive compounds. Various medicinal plant extracts have been tested for their anti-fertility activity both in male and female.

Some of these plants had spermicidal and altered hormone levels. It is necessary to use biologically active botanical substances or fertility-regulating agents of plant origin which are eco-friendly effects ^[5,6].

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Table 1 : List of Anti-fertility plants

Botanical name	Family	Parts used	Chemical constituents	References
<i>Abrus precatorius</i> Linn	Fabaceae	Whole plant	Alkaloids, steroids, fixed oils, anthocyanins	Abu et al ^[7]
<i>Acacia leucophloea</i> Roxb	Fabaceae	Roots	Tannins, phenols, proteins	Dheeraj ahirwar ^[8]
<i>Aegle marmelos</i> Linn	Rutaceae	Leaves	Alkaloids, terpenes, steroids	Satheesh et al ^[9]
<i>Butea monosperma</i> Lam	Fabaceae	Whole plant	Stigmasterol flavonoids, amino acids	Ashish mishra et al ^[10]
<i>Careya arborea</i> Roxb	Lecythidaceae	Roots	Phyto-estrogens, Sito-sterol	A.K.haloi et al ^[11]
<i>Cissampelos pareira</i> Linn	Manispermaceae	Whole plant	Alkaloids, chalconeflavone	Samanthajuma et al ^[12]
<i>Citrus medica</i> Linn	Rutaceae	Fruit peel	Citroflavonoids, glucosides, triterpenoids	Monica kachroo et al ^[13]
<i>Curcuma longa</i> Linn	Zingiberaceae	Rhizomes	Curcumin Flavonoids	Amit kumar ghosh et al ^[14]
<i>Dodonea viscosa</i> Linn	Sapindaceae	Whole plant	Alkaloids, phytosterols, poly phenols	R.ramya et al ^[15]
<i>Hymenocardia acida</i> Tul	Euphorbiaceae	Stem bark	Triterpenoids, glycosides	Abu et al ^[16]
<i>Madhuca indica</i> Linn	Sapotaceae	Leaves	Triterpenoids	Shivabasavaiah et al ^[17]
<i>Ocimum gratissimum</i> Linn	Caesalpiniaceae	Stems	Anthraquinones, flavanoids,	Yuvaraj et al ^[18]
<i>Plumbago rosea</i> Linn	Plumbasinaceae	Leaves	Sitosterol glycosides, tannins, fatty alcohol	Sheeja et al ^[19]
<i>Raphanus sativus</i> Linn	Brassicaceae	Roots	Raphan alkaloids	Mishra et al ^[20]
<i>Tabernaemontana divaricata</i> Linn	Apocynaceae	Flowers	Steroids, tannins Flavonoids, aminoacids	Mohd.azeemuddin nukhram et al ^[21]
<i>Trachysperm ammi</i> Linn	Umbelliferae	Fruits	Tannins, saponins, flavonoids, glycosides	Surendra kumar et al ^[22]
<i>Tragia involucrata</i> Linn	Euphorbiaceae	Aerial parts	Flavonoids, terpenoids	Chandrashekhar et al ^[23]

II. CONCLUSION

Finally, it was clear that the medicinal plants play an important role in treating various diseases. The herbal plants and their extracts have significant anti-fertility activity in animal models. This review showed that above-mentioned medicinal plants possess anti-fertility activity on dose dependent manner and can be used as an alternative for oral contraceptives which are currently in use for birth control.

REFERENCES RÉFÉRENCES REFERENCIAS

- Thakur DS, Kumar P, Kujur A, Kumar P, Kumar R. Contribution of Male Contraception in World Population. *J Pharm Sci & Res*, 2(7), 2010, 384-93.
- Dehghan MH, Martin T, Dehghanan R. Antifertility effect of Iranian neem seed alcoholic extract on epididymal sperm of mice. *Iranian Journal of Reproductive Medicine*, 3(2), 2005, 83-89.
- Gupta RS, Sharma R. A review on medicinal plants exhibiting antifertility activity in males. *Natural Product Radiance*, 5(5), 2006, 389-410.
- Hoesla CE, Saadb F, Pöppela M, Altwein JE. Reversible, Non-Barrier Male Contraception: Status and Prospects. *Eur Urol.*, 48(5), 2005, 712-22.
- Montaserti A, Pourheydar M, Khazaei M, Ghorbani R. Anti-fertility effects of *Physalis alkekengi* alcoholic extract in female rat. *Iranian Journal of Reproductive Medicine*, 5(1), 2007, 13-16.
- Mishra N, Joshi S, Tondon VL, Munjal A. Evaluation of Antifertility potential of aqueous extract of *Bougainvillea spectabilis* leaves in swiss albino mice. *Int J Pharm Sci Drug Res*, 1(1), 2009, 19-23.
- Sayeed Mohammed Abu, Hossain A.B.M, Manirul, Mondol Abdul Majid and Islam M. Antifertility studies on ethanolic extract of *Abrus precatorius* on swiss male albino mice. *International journal of pharmaceutical sciences and research*, 3(1), 2012, 288-292.
- Dheeraj Ahirwar. Anti fertility activity of *Acacia leucophloea*. *Scholars Research Library*, 3(3), 2011, 411-413.
- Satheesh Kumar B, Madhukar Rao M, Madhusudhan K, Krishna Reddy M, Prasad MSK. Isolation and evaluation of anti fertility activity of total

- alkaloids from leaves of *Aegle marmelos* in male albino rats. *International Journal of Applied Biology and Pharmaceutical Technology*, 2(3), 2011, 178-183.
10. Haloi K, Kalita E and Kalit JC. Effects of methanolic root extract of *Careya arborea* Roxb on ovarian histology of albino mice. *Nebio* 2010; 1(1), 2010, 14-17.
11. Ashish Mishra, Saket Verma, Abhinav Prasoon Mishra. A Plant Review: *Butea Monosperma* (Lam.) Kuntze. *Research Journal of Pharmaceutical Biological and Chemical Sciences*, 3(1), 2012, 700-714.
12. Samatha Jhamuna, Bhattacharya. *Cissampelos pareira*: a promising anti fertility agents. *International Journal of Research in Ayurveda and Pharmacy*, 2(2), 2011, 439-442.
13. Monica kachroo, Agrawal SS. Anti-implantation activity of different extract of the peels of *Citrus medica*, Linn. *International Journal of Pharmtech Research*, 3(1), 2011, 535-539.
14. Amit Kumar Ghosh, Anup Kumar Das, Kajal Kumar Patra. Studies on antifertility effect of rhizome of *Curcuma longa* linn. *Asian Journal of Pharmacy and Life Science*, 1(4), 2011, 349-353.
15. Ramya R, Sivasakthi R, Senthilkumar C, Anudeepa J, Santhi N and Venkata Narayanan N. Preliminary phyto chemical and anti fertility Studies on *Dodonea viscosa* Linn. *Asian Journal Res. Pharm. Sci.*, 1(3), 2011, 77-79.
16. Abu Adakole Hyacinth, Uchendu Chukwuka Nwocha. Antifertility activity of aqueous ethanolic extract of *Hymenocardia acida* stems bark in female rats. *Iranian Journal of Reproductive Medicine*, 9(3), 2011, 217-222.
17. Shivabasavaiah, Krishna Ram, Pavana H, Ramyashree T, Ramya M, and Manjunath R. Anti fertility effects of *Madhuca indica* leaves in male swiss albino rats. *Journal of Pharmacy Research*, 4(2), 2011, 323-326.
18. Sripriya S, Yuvaraj G, Nema RK, Madhan kumar V, Deecaraman M. Evaluation of antifertility activity from stem part of *Ocimum gratissimum* in acetone extracts. *International Journal of Pharmaceutical and Clinical Research*, 3(2), 2011, 41-44.
19. Sheeja E, Joshi SB, Jain DC. Anti ovulatory and estrogenic activity of *Plumbago rosea* leaves in female albino rats. *Indian Journal of Pharmacology*, 41(6), 2011, 273-277.
20. Bharat Mishra, Deshmukh AB, Anita patel, David Banji, Dharamveer. Investigation on antifertility activities of the fresh juice of *Raphanus Sativus* on experimental animals. *Pharmacology online*, 2, 2011, 430-437.
21. Mohd. Azeemuddin Mukhram, Shivakumar H, Viswanatha G.L, Rajesh S. Anti-fertility effect of flower extracts of *Tabernaemontana divaricata* in rats. *Chinese Journal of Natural Medicines*, 10(1), 2011, 0058–0062.
22. Surendra Kumar M, Rameswara Reddy, Manasa G, Vanaja P, Sirisha G, Astalakshmi N. Antifertility effect of *Trachyspermum ammi* (Linn) sprague fruits on male rats. *International Journal of Pharmaceutical & Biological Archives*, 2(2), 2011, 705-709
23. Chendrashekar joshi G, Gopal M. Anti fertility activity of hexane and ethyl acetate extracts of aerial parts of *Tragia involucrate* Linn. *Journal of pharmacology and toxicology*, 6(5), 2011, 548-553.



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