

Hypocholesterolemic effect of *Cymbopogon citratus* in Rabbits.

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ABSTRACT

The current study was designed to examine the effect of an aqueous extract of *Cymbopogon citratus* leaves on the level of total serum cholesterol for normal and hypercholesterolemic rabbits. The results showed that the treatment of rabbits with an aqueous extract of *Cymbopogon citratus* leaves in concentration of 100 mg / ml and therapeutic dose of 5 ml/ kg / day via oral administration and for ten days, reduced significantly ($P < 0.05$) the total serum cholesterol (TC) level in induced hypercholesterolemic rabbits (group D) from (501.67 ± 28.81) mg/100ml to (441.59 ± 29.78) mg/100ml ,While no significant reduction was observed in the level of total serum cholesterol for treated healthy(normal) rabbits (group B) were about from (127.33 ± 9.44) mg/100ml befor treated to (130.09 ± 0.23) mg/100ml after treated with the aqueous extract for ten days.

Introduction:

Medicinal plants are source of agreat economic value . Plant herbs are naturally gifted at the synthesis of medicinal compounds, the extraction and characterization of bioactive compounds from medicinal plants have resulted in the discovery of new drugs with high therapeutic value [1]. *Cymbopogon citratus* (Lemongrass) beloged to the family gramineae is a perennial tall rass with rhizomes and densely tufted fibrous roots [2]. *Cymbopogon citratus* is a perennial Herb, commercially cultivated in Guatemala, India, China, Paraguay, Sirlanka and Pakistan[3].

Freshly cut and partially dried leaves are used medicinally and also used as lemon tea .Limited studies have demonstrated antifungal and insecticide efficacy, as well as potential anticarsinogenic activity [4]. The Medicinal value of *Cymbopogon citratus* lies in some chemical substances that produce adefinite physiological action in human body, The most important of these bioactive constituents are alkaloids, tannins, flavonoids, and phenols[5]. *Cymbopogon citratus* is used as traditional folk medicine in the treatment of nervous gastrointestinal disturbances fevers and hypertention and also afolk remedy for coughs, consumption, elephantiasis flu, gingivitis, headache leprosy, malaria, ophthalmia, pneumonia and vascular disorders[6].Studies on extract from *Cymbopogon citratus* leaves has demonstrated anti-inflammatory, vasorelaxing, diuretic and valuable

remedy in treating Ringworm as alocal application [7]. Now adays one of the most common and fatal disease in the world is acardiovascular disease. Hypercholesterolaemia is one of its reversible major risk factor and associated with an increased risk of various disorders such as coronary heart disease and stroke . These disorderses are caused by blood vessels becoming narrowed with fatty deposits,leading to reduce blood flow (or total blockage of blood flow) to vital organs,like brain.

Arthrosclerosis is caused by hardening and narrowing of arteries[8]. Factors that facilitate development of the disorders of hypercholesterolaemia include smoking, lack of proper exercise,emotional stress, diets rich in saturated fatty acid, coffee drinking, diabetes and heredity [9].

Materials and Methods :

1- Plant material :*Cymbopogon citratus* leaves were collected from one of the garden house at AL-Anbar University Camps in AL- Ramadi City, (in the morning) during March and April, 2010 and a sample of plant was identified by assistant prof. Dr. Mohammed Othman Mossa – Biology Dept. - College of Education for Pure Sciences– University of AL-Anbar.

2- Plant extraction: After cleaning, drying, garbling and powdering of plant material,100 gm. of *Cymbopogon citratus* leaves powder was added to one liter of distilled water and was mixed with blender, then left at room temperture for 24 hours

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and filtered. This process repeated several times. The filtrate was evaporated with a rotary evaporator to get the residue which was later used in preparing solution of concentration 100mg/ml.[10].

3- Laboratory Animals: Twenty male white rabbits, of (2-2.5)kg. in weight and of six months age were used. The first ten rabbits were given ordinary diet, then divided into two subgroups: (A) as negative control and (B). In the other ten rabbits hypercholesterolaemia was induced experimentally by feeding them with a high cholesterol diet (2gm/kg/day animal fat with adding 2 gm / kg / day cholesterol powder) for six weeks [11] then they divided into two subgroups: (C) as a positive control and (D). Subgroups (B) and (D) were treated daily for ten days with an aqueous extract of *Cymbopogon citratus* leaves in concentration of 100 mg / ml and an oral dose of 5 ml / kg / day, that was given orally by intragastric intubation. 4- Lipid profile test :

After 12- 14 hours of fasting, 5 ml of venous blood was drawn, then centrifuged for 10 min. at 3000 rpm for serum separation. Total cholesterol (TC) were determined by the enzymatic method [12]. Zero adjustment was made with a reagent and blank using [MSE- Spectro plus- Germany spectrophotometer] then absorbance was measured for standard and unknown at wave length of 510 nm. 5-Statistical analysis: Data were inserted and analysed by the student t-test, arithmetic mean and standard deviation were used. P- value which is less than 0.05 is considered significant.

Results and Discussion:

Nowadays, one of the most common and fatal diseases in the world is cardiovascular disease. Hypercholesterolemia is one of its reversible major risk factor. The current study was designed to examine the effect of an aqueous extract of *Cymbopogon citratus* leaves on the levels of serum total cholesterol for normal and hypercholesterolemic rabbits. Table (1) illustrated the normal (basal) values of total serum cholesterol which are determined in the beginning of the experiment for the four groups of the experiment (all rabbits) A, B, C and D were about (132.09 ± 7.36), (127.33 ± 9.44), (121.56 ± 2.23), (119.89 ± 18.01) mg/100ml respectively which are in agreement with that reported [13].

Table(2) showed the levels of total serum cholesterol in hypercholesterolemic rabbits (group C and D) were about (522.63 ± 9.44) and (501.67 ± 28.81) mg/100ml respectively which are in agreement with the previous studies [13]. The effect of aqueous extract of *Cymbopogon citratus* leaves with a concentration of 100 mg/ml and therapeutic dose of 5 ml /kg/day for ten days on the levels of total serum cholesterol for induced hypercholesterolemic rabbits (group D) was performed and the result demonstrated that the aqueous extract had lowered statistically ($P < 0.05$) the level of total serum cholesterol from (501.67 ± 28.81) mg/100ml to (441.59 ± 29.78) mg/100ml, while the aqueous extract of *Cymbopogon citratus* leaves had no effect on the levels of total serum cholesterol of treated healthy (normal) rabbits (group B), were about (127.33 ± 9.44) mg/100ml before treated to (130.09 ± 0.23) mg/100ml after treated with the aqueous extract after ten days of treatment as shown in Table (3). There is a general agreement that a high plasma cholesterol level is one of the major risk factor for cardiovascular disease. Evidence relating cholesterol to increase risk of atherosclerosis and cardiovascular disease is derived from different types of study.

One important factor is that in arterial disease there are blockages which form in the arteries known as plaques which are growths or masses of chemical product deposited in the walls of the artery. Biochemical analysis of the plaque material shows that it contains large amounts of lipids, a big portion of which is cholesterol.

The cholesterol lowering potential of the aqueous extract of *Cymbopogon citratus* leaves from (501.67 ± 28.81) mg/100ml to (441.59 ± 29.78) mg/100ml, for induced hyperlipidemic rabbits (group D) in our study may be ascribed to modification of cholesterol uptake from the intestine, conversion of cholesterol to bile acids and increasing excretion of Bile acids by the aqueous extract of *Cymbopogon citratus* leaves, quantitatively the conversion of cholesterol to bile acids (which takes place slowly in the liver) is the major pathway by which cholesterol is removed from the body [14].

Another important factor and benefit to explain the role of *Cymbopogon citratus* leaves in lowering the levels of serum total cholesterol in induced hyperlipidemic rabbits (by about 12%) is the antioxidants properties of essential oil in *Cymbopogon citratus* leaves. This might be encouraging to consider

them as a natural antioxidant in Nutraceuticals and pharmaceutical preparations. In recent years there is an increasing interest in finding antioxidant phytochemical because they can inhibit the propagation of free radical reaction, protect the human body from disease and retard lipid oxidative rancidity in food [15].

Although many elements are involved in the atherosclerosis process the oxidative modification hypothesis has been the central focus of innumerable studies. This theory claims that the oxidative modification of LDL and other lipoproteins is a central and almost obligatory element in the development of atherosclerosis [16,17]. Flavonoids, which are found abundantly in edible plants, may play a critical role in the prevention of cardiovascular disease [18], among these natural products as (C-glycosyl flavonoids) Isoorientin which is isolated from *Cymbopogon citratus* leaves. Isoorientin is an effective inhibitor of *in vitro* LDL oxidation. As oxidative damage to LDL is a key event in the formation of atherosclerosis lesions. The use of this natural antioxidant (Isoorientin in C-glycosyl flavonoids), may be beneficial to prevent or attenuate atherosclerosis [19].

There is a general agreement that a high plasma cholesterol level is one of the major risk factors for cardiovascular disease. Evidence relating cholesterol to increase risk of the atherosclerosis and cardiovascular disease is derived from different types of study. One of the important factors is that in arterial disease there are blockages which form in the arteries known as plaques which are growths or masses of chemical products deposited in the walls of the artery. Biochemical analysis of the plaque material shows that it contains large amounts of lipids, a big portion of which is cholesterol [20].

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Table (1) : The normal values of serum total cholesterol levels in all rabbits used in experiment.

Group symbol	A	B	C	D
Total serum cholesterol (mg/100ml)	(132.09 ±7.36)	(127.33 ±9.44)	(121.56 ±2.23)	(119.89±18.01)

Each value represents the mean from five rabbits ± S.D (Mean± S.D)

Table (2) : total serum cholesterol levels for induced hypercholesterolemic rabbits after induction for six weeks (group C and D).

Group symbol	C		D	
	Befor induction	After induction	Befor induction	After induction
Total serum cholesterol (mg/100ml)	(121.56 ±2.23)	(522.63 ±9.44)	(119.89 ±18.01)	(501.67 ±28.81)

Each value represents the mean from five rabbits ± S.D (Mean± S.D)

Table(3): Effect of * aqueous extract of Cymbopogon citratus leaves on cholesterol levels in normal and hypercholesterolemic rabbits.

Group symbol .	Total serum cholesterol (mg/100ml) before treated (Mean ± S.D)		Total serum cholesterol (mg/100ml)
	Before induction (norma)	After induction	
(A) Untreated healthy rabbits (negative Control)	(132.09 ± 7. 36)		after treated with 3ml distilled water for 10 days # (128.56±7.43)
(B) Treated healthy rabbits	(127. 33 ± 9.44)		after treated with aqueous extract of <i>Cymbopogon citratus</i> leaves for 10 days # (130.09±0.23)
(C) Hypercholesterolemic untreated rabbits (Positive Control)	Before induction (norma)	After induction	after treated with 3ml distilled water for 10 days the same group # (516.30±8.44)
	(121.56 ±2.23)	(522.63 ±9.44)	
(D) Hypercholesterolemic treated rabbits	Before induction (normal)	After induction	after treated with aqueous extract of <i>Cymbopogon citratus</i> leaves for 10 days \$ (441.59±29.78)
	(119.89 ±18.01)	(501.67 ±28.81)	

*: Therapeutic dose = 5 ml / kg / day and in concentration of (100mg/ ml)

#: Not significant compared with the same group before treating.

\$. significant (P < 0.05) compared with the same group(D) before treating(after induction) .

تأثير نبات حشيشة الليمون *Cymbopogon citratus* على فرط كوليسترول الدم في الأرانب

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الخلاصة :

صممت الدراسة الحالية لأختبار تأثير المستخلص المائي لأوراق نبات حشيشة الليمون *Cymbopogon citratus* في خفض مستويات الكوليسترول الكلي في الأرانب السليمة والأرانب التي أحدث بها مرض فرط الكوليسترول تجريبياً حيث أظهرت نتائج البحث ان معاملة الأرانب بالمستخلص المائي لأوراق نبات حشيشة الليمون *Cymbopogon citratus* بتركيز 100ملغم/مل وبجرعة تجريبية 5مل/كغم/يوم عن طريق التجريع الفموي لمدة عشرة ايام قد خفض معنوياً (P < 0.05) من مستوى الكوليسترول الكلي (TC) في الأرانب التي أحدث بها مرض فرط الدهون تجريبياً (مجموعة D) حيث انخفضت مستويات الكوليسترول الكلي فيها من (501.67 ±28.81) ملغم / 100مل قبل المعالجة الى (441.59±29.78) ملغم / 100مل بعد المعالجة ولم يؤثر معنوياً على مستوى الكوليسترول الكلي في الأرانب السليمة والمعالجة بالمستخلص المائي لأوراق نبات حشيشة الليمون (مجموعة B) حيث سجلت مستويات الكوليسترول الكلي فيها من (127.33 ± 9.44) ملغم / 100مل قبل المعالجة الى (130.09 ± 0.23) ملغم / 100مل بعد المعالجة بالمستخلص المائي و لمدة عشرة ايام .