

THE DETERMINATION OF HYPOLIPEMIANT ACTIVITY OF A NEW VEGETAL NATURAL FOOD SUPPLEMENT TO ANIMALS WITH INDUCED HYPERLIPEMIA

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Abstract

Scientific studies established the benefic effects of the lipids decrease using dietetically means, synthetic drugs or vegetal extracts. It was proved that the administration of vegetal food oils, containing fatty mono or polyunsaturated acids, decreases the incidence of cardiovascular, hepatic and degenerative diseases.

The present work, studied the hypolipemiant activity of a new vegetal, natural supplement having the generic name Hof.Lipomin[®]. The studies were performed on Wistar rats with Triton WR 1339 induced hyperlipemia.

The new supplement, contains the total extracts of garlic (*Allium sativum*) bulbous, leek (*Allium porrum*) sheaths and flax-seed (*Linum usitatissimum*) oil.

To determine the hypolipemiant activity we used white adult Wistar-rats, weighting 220 ± 10 g, kept in standard conditions in accordance to European demands. Hyperlipemia was induced with Triton WR 1339 at a dose of 10 mg/kg body weight i.p. Twenty hours after the hyperlipemia provocation, a dose of 50mg/200g animal of the food supplement was administrated orally. The determinations were performed simultaneously with oral administration of extracts of garlic and leek extracts in a dose of 50mg/200g animal and flax seed oil in a dose of 1mL/kg b.w.

Zocor[®] was used as a reference substance in concentration of 30 mg/kg b.w.

The control group received orally a solution of 0.9% NaCl in a dose of 10mL/kg b.w. animal. After 4 hours the animals were sacrificed under anesthesia with chloroform, the blood was collected and in the separated serum the total serum lipids, cholesterol, LDL cholesterol, HDL cholesterol, and serum triglycerides were determined, using enzymatic and colorimetric methods.

The performed studies, emphasized the fact that the food supplement Hof.Lipomin[®] as well as its components: extracts of garlic, leek and flax seed oil decrease the level of total serum lipids, total cholesterol, LDL cholesterol and serum triglycerides to animals with Triton WR 1339 induced hyperlipemia.

Rezumat

Studii științifice au stabilit efectele benefice ale scăderii lipidelor serice prin măsuri dietetice, medicamente și extracte de plante. S-a demonstrat că prin administrarea diverselor tipuri de uleiuri alimentare, care conțin acizi grași esențiali, mononesaturați sau polinesaturați, se pot trata diverse maladii. Astfel, scade tensiunea arterială, scade incidența bolilor cardiovasculare și a celor degenerative.

S-a studiat acțiunea hipolipemiantă a unui nou supliment alimentar de natură vegetală prin metoda hiperlipemiei provocate cu Triton WR 1339, la șobolan. Produsul

vegetal conține extractul total de *Allium porum*, extract total de *Allium sativum* și ulei de *Linum usitatissimum*, având denumirea generică Hof.Lipomin®.

Pentru determinarea acțiunii hipolipemiante s-au luat în lucru șobolani albi, masculi, rasa Wistar, în greutate de 220± 10g.

Hiperlipemia a fost indusă cu Triton WR 1339 în doza de 10 mg/kg corp i.p. După 20 de ore de la inducerea hiperlipemiei s-a administrat suplimentul alimentar în doza de 50 mg/200 g animal și constituienții acestuia. Ca substanță de referință s-a utilizat Zocor® în concentrație de 30 mg/kg corp administrat oral. Tratamentul s-a efectuat timp de 7 zile. Lotul martor a primit soluție de NaCl 0,9%, 10 mL/kg corp administrat oral. Animalele au fost sacrificate sub anestezie cu cloroform, s-a recoltat sângele, iar pe serul separat s-a determinat valoarea lipidelor totale serice, a colesterolului total, a LDL-colesterolului, a HDL-colesterolului și a trigliceridelor serice. Studiile efectuate au demonstrat că atât suplimentul alimentar Hof.Lipomin®, cât și componenții acestuia scad nivelul lipidelor serice totale, colesterolemiei, trigliceridelor serice și al LDL-colesterolului la animalele cu hiperlipemie provocată de Triton WR 1339.

Keywords: *Allium sativum*, *Allium porrum*, flax seed oil, hypolipemiant effect.

Introduction

The high level of the lipids, triglycerides and blood cholesterol is considered today a leading cause of cardiovascular and hepatic diseases, having a high incidence in the last years.

In this there are presented experimental studies aiming to emphasize a possible antisclerotic, hipolipemiante effect of the total garlic bulbs, the leek sheaths extracts, the flax seed oil and of the new product Hof.Lipomin®, containing the three associated extracts.

It was established that *Allium sativum* (powder of garlic bulb) emphasizes hypolipemiante and hypocholesterolemiante activity due to sinistrin, a polyfructosan able to reduce the lipids and cholesterol absorption, and to hydrolyze the lipase [6]. Garlic extracts are known for their antihypertensive and platelet antiagregant activity [5,8,12], explained by the inhibition of lipoxigenases, antioxidant activity due to selenium compounds [3] and antibacterian, antifungic, and cytostatic activity due to tioderivates [14,21].

Assessing the chemical composition of garlic and leek extracts, by HPLC, our studies emphasized the presence of allicine and alliine compounds known for their hypolipemiante and hypocholesterolemiante activity. In addition the leek (*Allium porrum*) is traditionally used in the treatment of geriatric diseases [9,14].

Obtained by cold pressing of seeds, flax (*Linum usitatissimum*) oil, contains the glycerides of linolenic (35-50%), linolic (20-25%), oleic(24%) miristic, stearic, palmitic (5-10%) acids, besides some free fatty acids.

It was proved that α linolenic acid, a polyunsaturated fatty acid emphasizes anti-inflammatory, antiplatelet antiaggregant activity, and is able to reduce the risk of cardiovascular and autoimmune diseases [3,4,16,20].

There are previous studies concerning the hipolipemiant activity of certain vegetal products [1,7,11].

To assess the hypolipemiant, hypocholesterolemiant activity of the studied extracts and of the Hof.Lipomin[®], some biochemical parameters: total serum lipids, serum triglycerides, total cholesterol, LDL and HDL cholesterol, were registered. Zocor[®], a synthetic hypolipemiant drug was used as a standard drug. The experiments were performed on animals with Triton WR 1339 induced hyperlipemia.

Materials and Methods

The total extracts of *Allium sativum* (garlic bulbs) and *Allium porrum* (leek sheaths) were obtained from plant grown in Hofigal own cultures using organic methods. The new product Hof.Lipomin as tablets was prepared by the association of the named extracts, using an original formula which makes the object of a romanian patent [17].

The active compounds contents of the extracts were presented and published in our previous studies [18]. Groups of white male Wistar rats weighing 220 ± 10 g, were used for the studies.

The animals were kept in standard conditions, fed two times a day and having access to water *ad libitum*. The experiment was in accordance to the European Council Directive 1986 (986/609 EEC) and the Romanian Government Ordinance No. 37 of February 2, 2002. Before beginning the experiment the animals were kept to fast 12 hours, and were treated with Triton WR 1399 (p-i-octylpolyoxyethylenphenol) at a dose of 10mg/kg b.w. i.p. A group of animals represents the control group and received only a 0.9% NaCl solution 10mL/kg body weight orally. After 18-20 hours after the hyperlipidemia was induced, the animals were treated orally in the following way: a group received *Allium porrum* extract 50 mg/200 g animal, another group *Allium sativum* extract 50mg/200g animal, another group flax seed oil 1mL/kg b.w. p.o. and the last group received a dose of 50mg/200g animal Hof.Lipomin[®]. As a reference substance Zocor[®] was used in a dose of 30 mg/kg b.w. animal, orally, a normal dose for human administration. The treatment was carried out for 7 days.

The animals were sacrificed under anesthesia with chloroform, the blood was collected and the serum total lipids were determined by a colorimetric method, total cholesterol by an enzymatic method, LDL and

HDL cholesterol by enzymatic-colorimetric methods and total serum triglycerides by an enzymatic method [13].

The “*t-student*” test was used for the results statistic evaluation [12,19].

Results and Discussion

The administration of Triton WR 1339 to rats brings about an increase of the serum lipids level by 39.64%, of triglycerides by 33.46% and of total cholesterol by 38.75%, comparatively to the control value (the cholesterol value for untreated animals was between 65 and 120 mg/dL. After the administration of Hof.Lipomin® the serum lipids decrease by 49.29%, against the animals having Triton induced hyperlipemia and by 29.17% against the control animals.

For the animals with Triton induced hyperlipemia, the total lipemia decreases after the administration of extracts as follows: 39.41% for leek, 47.79% for garlic, and 48.92% for flax oil (Table I).

Comparatively Zocor®, decreases the total lipid level by 53.72% against the control (Figure 1).

Serum triglycerides decrease by 48% for the new product Hof.Lipomin® by 43.44% for flax oil, by 43.07 % for the garlic extract and by 42.87% for the leek extract in Triton treated animals (Table I, Figure 2).

Table I

The hypolipidemic effect of a new Food supplement Hof.Lipomin® and of their components on the animals having induced hyperlipemia, with Triton WR 1339

Administered Products	Administered dose	Total serum lipids mg/dL			Serum triglycerides mg/dL		
		$\bar{X} \pm SD$	Effect %		$\bar{X} \pm SD$	Effect %	
			Against control	Against Triton		Against control	Against Triton
Standards	-	240.18±9.8	-	-	52.60±1.3	-	-
Triton	10 mg/kg b.w., i.p.	335.4±10.1	+39.64	-	70.2±6.9	+33.46	-
Triton + <i>Allium porrum</i> extract	50 mg/200 g animal	203.2±17.5	-15.39	-39.41	40.1±1.2	-23.76	-42.87
		p/m	0.02115	0.03821	p/m	0.01578	0.247
Triton + <i>Allium sativum</i> extract	50 mg/200 g animal, orally	175±14.2	-27.09	-47.79	40.00±3.5	-23.96	-43.07
		p/m	0.03124	0.02256	p/m	0.01258	0.04158
Triton + Flax oil	1 mL/kg b.w.	171.3±13.48	-28.67	-48.92	39.7±1.6	-24.52	-43.44
		p/m	0.02685	0.04113	p/m	0.02113	0.0384
Triton + Hof.Lipomin®	50 mg/200 g animal, orally	170±14.6	-29.17	-49.29	36.5±2.2	-30.60	-48.0
		p/m	0.02864	0.03953	p/m	0.03214	0.023
Triton + Zocor®	30 mg/kg b.w. orally	155.2±10.3	-35.28	-53.72	35.8±4.4	-31.93	-49.0
		p/m	0.01792	0.03712	p/m	0.02243	0.04168
ANOVA	F=2.17993 p<0.05				F=4.6519 p<0.05		

$\bar{X} \pm SD$ = average ± standard deviation

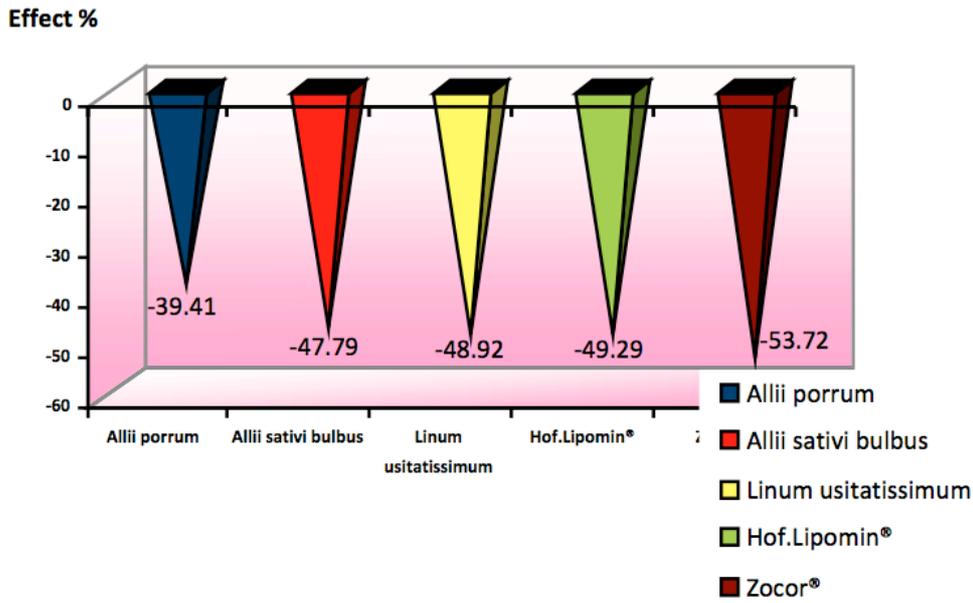


Figure 1

The effect of Hof.Lipomin® and its constituents administration on total serum lipids of the rats with Triton induced hyperlipemia

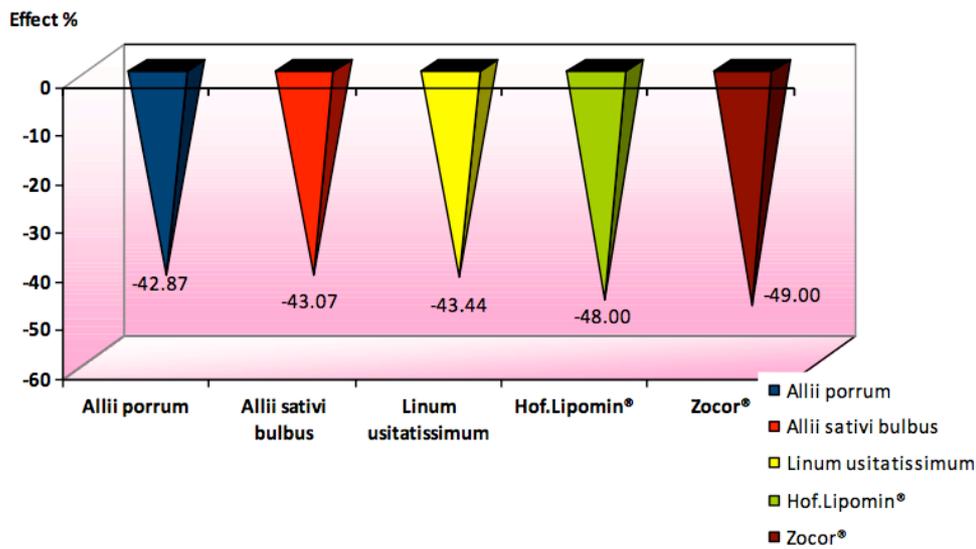


Figure 2

The effect of Hof.Lipomin® and its constituents administration on serum triglycerides of the rats with Triton induced hyperlipemia

The seric cholesterol decreases, after the administration of Hof.Lipomin[®] by 42.5%, in comparison with animals with Triton induced hyperlipemia and by 20.33% against the control (Figure 3).

Zocor[®], brings a decrease of 46.57% for Triton treated animals and 25.57% against the control.

For all extracts a diminution of total cholesterol was registered as follows: leek by 37.13%, garlic by 38.68%, flax oil by 39.65% (Table II) for the Triton treated animals.

LDL cholesterol decreases after the administration of Hof.Lipomin[®], by 43.93%, of leek extract, by 35.68% of garlic extract by 37.48%, and by flax-oil by 38.44% for the Triton treated animals (Table II, Figure 4).

Table II

The hypocholesterolemiatic effect of a new food supplement Hof.Lipomin[®] and of their components on the animals having induced hyperlipemia using Triton WR 1339

Administered Products	Administered dose	Total cholesterol mg/dL			LDL cholesterol mg/dL			HDL cholesterol mg/dL		
		\bar{X} ±SD	Effect %		\bar{X} ±SD	Effect %		\bar{X} ±SD	Effect %	
			Against control	Against Triton		Against control	Against Triton		Against control	Against Triton
Standards	-	88.5± 3.96	-	-	60.6± 7.1	-	-	31.6± 1.2	-	-
Triton	10 mg/kg b.w., i.p.	122.8 ±6.6	+38.75	-	83.5± 4.2	+37.78	-	32.3± 1.4	+2.21	-
Triton + <i>Allium porrum</i> extract	50 mg/200 g animal	77.2± 1.5	-12.76	-37.13	53.7± 5.1	-11.38	-35.68	32.5± 2.8	+2.84	-
		p < 0,05			p < 0,05			NS		
Triton + <i>Allium sativum</i> extract	50 mg/200 g animal, orally	75.3± 2.6	-14.91	-38.68	52.2± 3.1	-13.86	-37.48	33.7± 2.6	+6.64	+4.3
		p < 0,04			p < 0,03			NS		
Triton + Flax oil	1 mL/kg b.w.	74.1± 3.2	-16.27	-39.65	51.4± 4.4	-15.18	-38.44	33.9± 2.2	+7.27	+4.0
		p < 0,05			p < 0,02			NS		
Triton + Hof. Lipomin [®]	50 mg/100 g animal, orally	70.5± 4.2	-20.33	-42.58	50.2± 3.6	-17.16	-43.93	32.6± 2.3	+3.16	+10
		p < 0,02			p < 0,05			NS		
Triton + Zocor [®]	30 mg/kg b.w, orally	65.6± 3.2	-25.77	-46.57	51.2± 3.5	-15.51	-38.68	32.8± 1.5	+3.79	+0.92
		p < 0,05			p < 0,03			NS		
ANOVA		F=7.61321 p < 0.05			F=6.89153 p < 0.05			F=2.5817 p < 0.05		

\bar{X} ±SD = average ± standard deviation
N.S = statistic no significant

A statistic no significant increase of HDL cholesterol was noticed after the administration of Hof.Lipomin and its constituents, for the animals having induced hyperlipemia and also for the control (Figure 5).

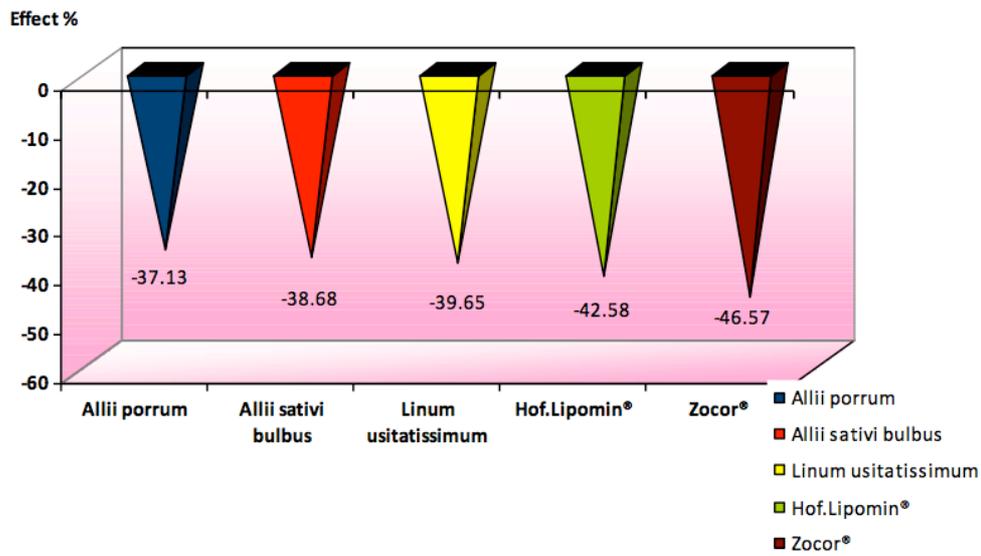


Figure 3

The effect of Hof.Lipomin® and its constituents administration on total cholesterol of the rats with Triton induced hyperlipemia

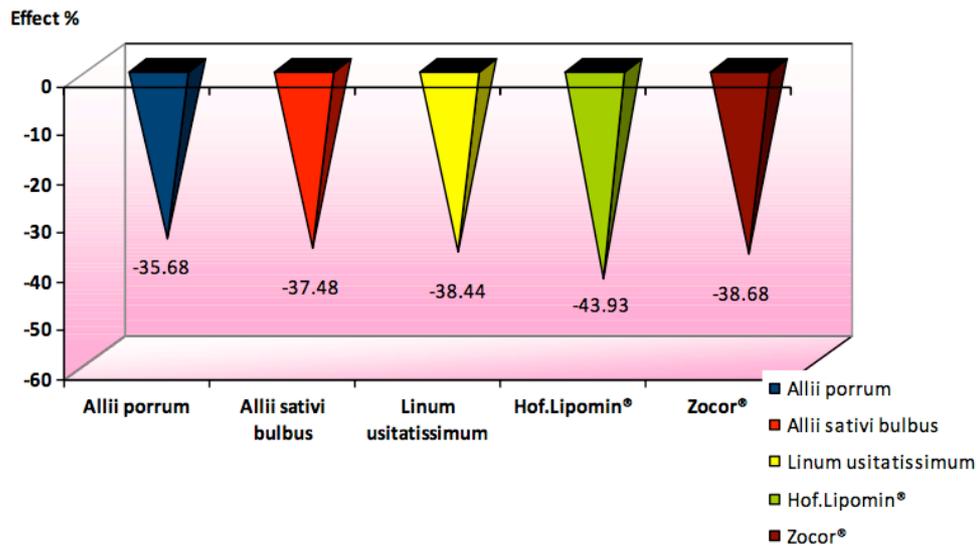


Figure 4

The effect of Hof.Lipomin® and its constituents administration on LDL cholesterol of the rats with Triton induced hyperlipemia

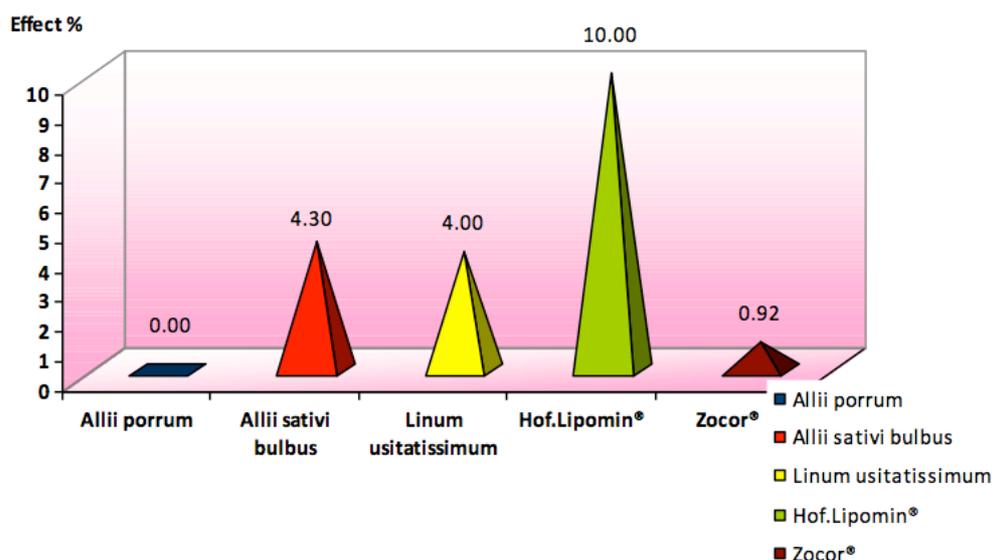


Figure 5

The effect of Hof.Lipomin® and its constituents administration on HDL cholesterol of the rats with Triton induced hyperlipemia

Conclusions

The study emphasized that the administration of the new food supplement, Hof.Lipomin®, as well as the administration of its constituents *Allium sativum*, *Allium porrum* extracts and *Linum usitatissimum* seed oil bring about a significant decrease of the total serum lipids, serum triglycerides, total cholesterol, and LDL cholesterol to animals with Triton WR 1339 induced hyperlipidemia.

The results obtained after Hof.Lipomin® administration showed the synergic effect of the three associated constituents and proved the hypolipemiant activity of the new product.

Used as reference substance Zocor® developed an hypolipemiant, hypocholesterolemiant activity comparable to the natural vegetal food supplement Hof.Lipomin®.

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