



The Effect of Different Concentrations of *Onosma Tinctoria* Plant on Blood Lipids and Atherosclerosis Index in Laboratory Rats.

Lobna Saad Mohammed Abd Elmeged

^{1a}Department of Nutrition, Faculty of Applied, AL-Baha University, Saudi Arabia

Email :lobna@bu.edu.sa . ORCID iD: 0000-0003-1527-9457

^{1b} Department of Nutrition and Food Sciences, Faculty of Home Economics, Menoufia University, Shibin el Kom, Menofia Governorate 6131567, Egypt.

Email : Lobna_lolo_2007@yahoo.com

Entsar Abushenab Rizgalla Hammad

²Department of Biology, Faculty of Science, Al-Baha University, Saudi Arabia

E-mail: hammadentsar@yahoo.com , <https://orcid.org/0009-0007-6356-1349>

Mohamed Salih

³Biology Department. Faculty of Science. AL. Baha University. Saudi Arabia

msaleh2444@gmail.com

Marwa A. Ahmed

⁴Department of Food Sciences and Nutrition, College of Sciences, University of Bisha, P.B. 551, Bisha, 61922, Saudi Arabia -Email : marwa@ub.edu.sa

Rehab A. Shehata

⁵Department of Food Science and Nutrition, College of Science, University of Bisha, Bisha 61922, Saudi Arabia, rshehata@ub.edu.sa

Abstract

Background: Herbal products, botanical products, or phytomedicines are all terms that refer to plant-based products that are utilized for the management of diseases or preserve health. Heart disease is a generic word that refers to a variety of chronic & acute medical problems that affect one or more components of the heart.

Aims of study: This research aimed to determine the effect of various concentrations of *Onosma tinctoria* plant on blood lipids and atherosclerosis index in laboratory mice.

Materials and Methods: Twenty-Four Sprague-Dawley albino mice, aged ten weeks, with a weight of 150 ± 10 , were split into four groups: the 1st was a control negative nourished on a basal diet alone, while the other three groups nourished on basal diet plus different levels of



Onosma tinctoria plant (5%,10%, 15%) for 28 days. The experiment concluded with a blood sample & biochemical examination.

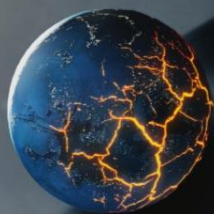
Results: F.S.VLDL-c, and Atherogenic index recorded the greatest value for 5 % *Onosma* group, whereas the lowest value in the 15%*Onosma* group after 4 weeks. But F.S.LDL-c , F.S. Cholesterol , S.GPT and S.GOT recorded the highest value in 5% group, but the lowest value was recorded 15% *Onosma* group after 4 weeks.

Conclusion: *Onosma tinctoria* may enhance vascular health and diminish the risk of cardiovascular disease by improving the lipid profile & elevating blood concentrations of antioxidants.

KEYWORDS: *Onosma tinctoria* - blood lipids - Atherosclerosis index

1- Introduction

A variety of chronic & acute medical diseases that affect one or more components of the heart are collectively referred to as heart disease (**Ossama, 2019**). Heart disease is a broad phrase that describes several conditions. Diseases of the heart are the leading cause of disability & death in countries located in the western & Middle Eastern regions. The findings of several studies suggest that nutrition & diet have significant roles in both the prevention of and the development of a wide variety of heart illness and dysfunctions. New prevention measures can be implemented and millions of lives can be saved by comprehending the intricate association between diet and illness (**Ossama, 2019**). The role of fat intake in cardiac disease is now fairly clearly recognized. The direct protective effect of particular diets or changes in diet is not as well understood; however, there are general health advantages associated with the promotion of healthy eating (**Vincent and Defoort, 2022**). There are approximately 150 species of *Onosma tinctoria* that are found all over the world. However, only about seventy-five plants have been characterized for their morphology, and fewer than ten plants have been described for their chemical ingredients & clinical potential. The phytochemical reports of this species reveal that it mostly consists of lipids, aliphatic ketones, alkaloids, naphthazarins, naphthoquinones, phenolic compounds, and flavones, with shikonins and onosmins being the most important components. (**Yildiz et al., 2020**) Alexipharmic effects, laxative properties, and anthelmintic properties are some of the traditional applications of these herbs. The plants are also utilized in the treatment of eye, blood, and urinary calculi, as well as in the treatment of pain of abdomen, bronchitis, stangury, itch, thirst, fever, lecoderma, ulcers, burns, and piles. The flowers of a variety of plants are prescribed for cardiogenic, stimulant, and body edema purposes, whereas the leaves are utilized as purgatives & for cutaneous lesions (**Sezer et al., 2021**). The blossoms of plant *O. hispidum* Wall. are utilized as a cardiac stimulant and tonic, while the roots are utilized to alleviate pain, mitigate fever, treat bites, infectious disorders, stings, and wounds.



Furthermore, it is utilized for topical treatment to address dermatological conditions (**Khajoei Nasab et al., 2020**). The leaf powder of *O. echioides* DC. is administered to kids as a purgative. Flowers are utilized as a cordial stimulant for alleviating heart palpitations & rheumatism, while roots are utilized to address infectious dermatological issues (**Çalhan and Gundogan, 2020**). *O.* species exhibit various activities attributable to the existence of phytochemicals, including pyrrolizidine alkaloids, shikonin, naphthoquinones, phenolics, and flavonoids. Scientific research has validated certain traditional uses of many species and illustrated their potential as anti-inflammatory agents, antioxidants, antibacterial agents, spasmolytic agents, wound healers, and analgesics (**Tlili et al., 2021**). Phytochemical investigations of the genus *Onosma* have identified numerous chemical compounds as principal active constituents, such as naphthaquinones (5,8-dihydroxy-2-(4-methylpent-3-enyl) naphthalene-1,4-dione), phenolics (vanillic a', ferulic a'), flavonoids (luteolin, apigenin), alkannin, & shikonines (isobutyrylshikonin, deoxyshikonin, acetylshikonin, α -methylbutyrylshikonin) (**Todorovic et al., 2021**). Recent decades have revealed various new records, pharmacological, & phytochemical research of the *Onosma* species, while two published reviews have been determined to lack integrity due to incoherent information and removal of certain biological activities of the genus *Onosma*. This article systematically reviews the traditional utilizes, pharmacological activities, clinical applications, and chemical constituents of *Onosma* species, providing a theoretical reference for further research and a comprehensive understanding of their medicinal applications based on published literature. (**Khan et al., 2021**). *O. hispidum* is conventionally utilized in the treatment of diverse hematological disorders and hypertension (**Ahmad et al., 2015**), and has been documented as possessing anti-inflammatory properties, inhibitory, and antioxidant effects. An early investigation on *O. hispidum* regarding diabetes indicated that the extract possesses a hypolipidemic influence in rabbits, while the underlying processes remain unidentified (**Hussain et al., 2017**). Moreover, *O. hispidum* is conventionally utilized in the treatment of cardiovascular ailments (**Ahmad et al., 2015**). The preliminary outcomes on *O. hispidum* prompted a pharmacological assessment of the antihypertensive and antihyperlipidemic properties of the methanolic crude extract & its fractions derived from the roots of *O. hispidum* in mice.

2) AIM OF STUDY

This goal of this research to determine the effect of various concentrations of *Onosma tinctoria* plant on blood lipids & atherosclerosis index in laboratory rats



3- MATERIALS & METHODS

Materials

- **preparation *Onosma tinctoria* plant** : has been obtained at the Jeddah KSA market, washed, dried in fifty-degree Celsius oven for 3 days, crushed & ground into a finest powdered form.
- **Experimental animals:** Twenty-four Dawley Albino rat males weighed $150\pm 10g$ were utilized.

METHODES

- **Experimental design**

Rats have been kept on basal diet for 3 day, then experimental diets for 4 weeks. They were distributed on (4) groups besides the control negative, each with comparable total body weight & have been housed separately in the wire cage - All the group of mice have been nourished the experimental diet with regard to **Campbell, (1961)**. Showed in table (a) having the following composition:

Table (a): The composition of standard (basal) diet:

Compound	Amount
Casein (protein)	15%
Corn oil	10%
Mineral mixture	4%
Vitamin mixture	1%
Corn starch	Up to 100%

- **Studied Groups:**

A. Control Group:

- Group 1: (control negative): Nourished on basal diet (casein diet).

B. Experimental diet:

- Group 2: Nourished on standard diet plus *Onosma tinctoria* plant five percent.
- Group 3: Nourished on standard standard plus *Onosma tinctoria* plant ten percent.



- Group 4: Nourished on basal diet plus *Onosma tinctoria* plant fifteen percent
- **Basal diet:**

The standard diet consisted of: Casein (fifteen percent protein), (Corn oil ten percent), (Mineral mixture four percent), (Vitamin mixture one percent) and (Corn starch up to one percent). The composition of mineral mixture with regard to Hegsted et al., (1941) & mixture of vitamin according to (Muller, 1964) showed in table (b) respectively having the following composition:

Table (b): The composition of mineral mixture:

Compound	Amount (mg)
Ca CO ₃	600
K ₂ HPO ₄	645
Ca HPO ₄ .2H ₂ O	150
Mg SO ₄ .2H ₂ O	204
Na Cl	334
Fe (C ₆ H ₅ O ₇) ₂ 6 H ₂ O	55
KI	106
Mn SO ₄ .4H ₂ O	10
Zn Cl ₂	0.5
Cu SO ₄ .5H ₂ O	0.06

According to Hegsted; et al., (1941).

Table (c): The composition of vitamin mixture:

Compound	Amount
VitA	200 (international unit)
Vit D	100 (international unit)
Vit E	10 (international unit)
Vit K	0.50 (international unit)
Thiamin	0.5 (international unit)
Riboflavin	1.0 (milligram)



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Pyridoxine	0-4 (milligram)
Calcium Pantothenic acid	4.00 (milligram)
Niacin	4.00 (milligram)
Choline Chloride	200 (milligram)
Inositol	25 (milligram)
Para - amino - benzoic a`	0.02 (milligram)
Vit B12	2.00 (milligram)
Biotin	0.02 (milligram)
Folic acid	0.02 (milligram)

According to Muller, (1964).

The composition of each experimental diet showed in table (D).

Table (d): The composition of standard diet & experimental diet:

Diets Ingredients	Negative control	<i>Onosma tinctoria</i>	<i>Onosma tinctoria</i>	<i>Onosma tinctoria</i>
Sample	-	5	10	15
Casein (gm)	15	15	15	15
Corn oil (gm)	10	10	10	10
Mineral mixture (gm)	4	4	4	4
Vitamin mixture (gm)	1	1	1	1
Corn starch	70	65	60	55
Total	100	100	100	100

- Blood Samples:**

Rats were anesthetized with diethyl ether and starved for twelve days at the conclusion of the experiment. Retro-orbital, clean, dry centrifuge tubes have been used for gathering blood



samples. To obtain a complete blood count (CBC), a sample of blood has been collected into a heparinized plastic vial and examined right away.

- **Separation of blood serum**

Animals have been sacrificed at the conclusion of the experiment, and blood samples have been taken from the retro-orbital and kept for fifteen minutes at room temperature. Following a 4000-rpm centrifugation of the samples, the serum was separated in a clean glass well, sealed, and kept at -20 degrees Celsius until analysis.

- **Biological Evaluation:**

With regard to Chapman et al. (1959), the body weight gain percentage (BWG%) & food efficiency ratio (FER) have been determined utilizing the following formulas to determine the biological assessment of the various diets:

Weight gain (g) = Final weight (g) - Initial weight (g).

BWG % = Final weight (gram) - Initial weight (gram)/ Initial weight (gram)×100.

FER = Final in body weight (gram)/ Food intake (gram).

- **Biochemical analysis:**

A- Serum:

- 1- Determination of serum glucose: Glucose has been analyzed according to **Titez (1995)**.
- 2- Determination of some hepatic Functions:
 - Determination of Serum Glutamate Pyruvat Transaminase (S. GPT): Serum GPT has been analyzed with regard to the technique of **Tietz, (1976)**.
 - Determination of Serum Glutamate Oxalate Transaminase. (S.GOT): Serum GOT has been analyzed with regard to technique defined by **Murray (1984)**.
 - Determination of Serum Alkaline Phosphates: Alkaline Phosphates has been analyzed out according to **Tietz, (1986)**. Determination of some renal Functions:
- 3- Determination of Serum Urea nitrogen: Serum Urea nitrogen has been measured with regard to described by **Schultz (1984)**. Determination of Serum Creatinine: Creatinine formed a colored complex with picrate in alkaline medium which has been determined utilizing Spectrophotometer **Patton & Crouch, (1977)**.
- 4- Determination of Serum Lipids:



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- Measurements of Serum Triglycerides (T.G.): Triglycerides Liquicolor mono has been analyzed with regard to **Koditscek (1969)**.
- measurements of Serum Total cholesterol: Cholesterol Liquicolor has been determined with regard to **Young (2001)**.
- measurements of Serum High Density Lipoprotein Cholesterol (HDL-c): Serum High Density Lipoprotein Cholesterol has been analyzed with regard to the method defined by **(Lopez, 1977)**.
- measurements of Serum Very Low-Density Lipoprotein Cholesterol (V LDL-c): Very Low-Density Lipoprotein Cholesterol (has been determined with regard to **(Lee and Nieman, 1996)**.
- measurements of Serum Low Density Lipoprotein Cholesterol (LDL—c): Serum Low Density Lipoprotein Cholesterol has been determined with regard to **(Lee and Nieman, 1996)**.

C- Important Indices for Heart:

- Atherogenic Index has been determined as TC/HDL-c with regard to the formula of Olatunji and **(Lee and Nieman, 1996)**.
- **Statistical Analysis:**

Statistical analyses were performed by Lenovo 3000N500, under Windows Microsoft Office 2010 by using Microsoft excel 2010. All obtained results were tabulated and suitable recommendation was given. **(Snedecor and Cochran, 1967)**

* significant differences ($p < 0.05$).

** high significant differences ($p < 0.01$).

*** very high significant differences ($p < 0.001$).

- **Ethical Approval**

The Science Research Ethics Committee of the Faculty of Home Economics accepted the protocol of the research #10-SREC-10-2022.

4) RESULTS & DISCUSSION

This goal of this research to determine the effect of various concentrations of *Onosma tinctoria* plant on blood lipids & atherosclerosis index in laboratory rats.



4.1) Biological effects

Body weight gain

Information in table (1) illustrate (Mean±SD) of body weight gain in 28 days among different rats nourished a basal diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant were no significant differences.

Feed Efficiency Ratio

Information observed in table (1) feed efficiency ratio (FER) study among different rats fed basal diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant. Data revealed that (Mean± SD) (0.50±0.12) for the control group, (0.51±0.02), (0.51±0.02) and (0.52±0.02) for (5%, 10% and 15%) *Onosma tinctoria* plant were not significant.

Feed intake (FI) & feed efficiency rats

Information observed in table (2) feed efficiency ratio (FER) study among different rats fed standered diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant .

Table (1): (Mean±SD) of body weight gain & Feed Efficiency Ratio in 28 days among different rats nourished a basal diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant

Groups	Body weight gain				Feed Efficiency Ratio			
	Control	5%	10%	15%	Control	5%	10%	15%
Mean	17.25	16.75	19.50	15	0.50	0.51	0.51	0.52
±SD	11.44	1:26	1	3.56	0.12	0.02	0.02	0.02
P. Value	-	0.94	0.72	0.72	-	0.91	0.89	0.82

*Significant differences (P -value under 0.05).

Table (2): Feed intake for studied group fed basal diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant

Category	Control	5%	10%	15%
Total experimental diet "g"	1830	1830	1830	1830
Residual "g"	488	483	478	473
Net food Intake g/28 day	1342	1347	1352	1357



Net intake rate/day "g"	11.97	12	12.97	12.87
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SERUM LIPIDS:

Serum very low-density lipoprotein cholesterol (milligram per deciliters)

Information in table (3) show fasting serum very low-density lipoprotein cholesterol (VLDL-c mg/dl) of different mice nourished a basal diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant. It is obvious that mean \pm SD (22 ± 4.32) for control group, (23.2 ± 2.90), (28 ± 3.65) and (25.40 ± 3.40) for (5%, 10% and 15%) of *Onosma tinctoria* plant, respectively. No significant differences could be seen for groups when compared with the control (-). Whereas the mean value of 15% *Onosma tinctoria* plant group was significant (P-value under 0.05). (Anon, (2013). VLDL is a lipoprotein synthesized via the liver. VLDL is one of the five principal categories of lipoproteins (VLDL, chylomicrons, intermediate-density lipoprotein, low-density lipoprotein, high-density lipoprotein) that facilitate the transport of cholesterol and fats in the aqueous medium of the bloodstream. VLDL is synthesized in the liver from cholesterol, apolipoproteins, & triglycerides. VLDL is transformed in the bloodstream into low-density lipoprotein. VLDL particles possess a diameter ranging from thirty to eighty nanometers. VLDL conveys endogenous substances, while chylomicrons carry exogenous (dietary) substances. VLDL conveys endogenous phospholipids, triglycerides, cholesteryl esters, and cholesterol. Within the body, it serves as the mechanism responsible for the transport of lipids. (Pan *et al.*, 2021)

Data (15) and figure (18) show fasting serum low density lipoprotein cholesterol (c milligram per deciliters) of different rats nourished basal diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant. Data investigated that mean \pm SD (127 ± 21.18) for the control group, (131 ± 18.63), (116.25 ± 24.78) and (108 ± 21.65) for (5%, 10% and 15%) *Onosma tinctoria* plant group, respectively, were significant differences when compared with the negative control.

Anon, (2013) Low-density lipoprotein is one of the five principal categories of lipoproteins, which, arranged by size from largest to smallest, include chylomicrons, very-low-density lipoprotein, intermediate-density lipoprotein (IDL), LDL, & high-density lipoprotein. These lipoproteins facilitate the transport of various lipid molecules, including cholesterol, in the aqueous environment surrounding cells & within the water-based bloodstream. Research indicates that elevated concentrations of type-B LDL particles, in contrast to type-A LDL particles, contribute to cardiovascular disease & health issues; they are commonly referred to as bad cholesterol particles, whereas HDL particles are often termed healthy cholesterol or good cholesterol particles.



Serum low density lipoprotein cholesterol (LDL-c mg/dl)

Data (3) show serum HDL-c (milligram per deciliters) of different rats nourished basal diet (negative control) compared with (5%, 10% and 15%) for *Onosma tinctoria* plant. Data revealed that mean \pm SD (41 ± 9.13) for control group, (37 ± 6.78), (33 ± 5.72) and (35 ± 9.13) for (5%, 10% and 15%) of *Onosma tinctoria* plant respectively. Data' clear that no significant difference when compared with control.

(Ahmad et al., 2015). The preliminary results on *O. hispidum* caused a pharmacological evaluation of the antihypertensive and antihyperlipidemic properties of the methanolic crude extract & its fractions derived from the roots of *O. hispidum* in rats.

Serum high density lipoprotein cholesterol (HDL-c mg/dl)

Data (3) show serum cholesterol (milligram per deciliters) of different rats nourished basal diet (negative control) compared with (5%, 10% and 15%) of *Onosma tinctoria* plant. Data revealed that mean \pm SD was (189 ± 23.47) for the control group, (194 ± 13.56), (175 ± 17.80) and (176 ± 20.26) for (5%, 10% and 15%) of *Onosma tinctoria* plant, respectively. Data for other tested diets showed no significant differences in all groups. Concentration of cholesterol in milligrams per deciliter of blood .

To assess the effect of the concentrations of cholesterol on your heart illness risk, it is essential to consider additional risk variables, including age, familial predisposition, tobacco use, and hypertension. Overall Serum cholesterol concentration: Attractive Below 200 milligrams per deciliter: If LDL, HDL, and triglyceride concentration are within desirable ranges and there are no additional risk factors for heart disease, a total blood cholesterol concentration under 200 milligrams per deciliter indicates a reasonably reduced probability of coronary heart disease. Despite a minimal risk, (Anon, 2011) it remains prudent to adhere to a heart-healthy diet, engage in regular physical activity, & prevent tobacco smoke.

Table (3): Fasting serum very low-density lipoprotein cholesterol (milligram per deciliters), serum low density lipoprotein cholesterol (milligram per deciliters) & serum high density lipoprotein cholesterol (milligram per deciliters) of different rats nourished a basal diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant

Groups	F. VLDL-c after 28 day				F. LDL-c after 28 day				F. HDL-c mg/dl after 28 day			
	Control	5%	10%	15%	Control	5%	10%	15%	Control	5%	10%	15%
Mean	22	32.6	28	25.40	127	131	116.25	108	189	194	175	176
\pm SD	4.32	2.90	3.65	4.62	21.18	18.63	24.78	21.65	23.47	13.56	17.80	20.26
P.Value	-	0.75	0.75	0.03*	-	0.40	0.40	0.12	-	0.64	0.64	0.14



*Significant differences ($P < 0.05$).

SOME LIVER FUNCTIONS:

Fasting serum alkaline phosphates (ALP, U/L).

Data (4) fasting serum alkaline phosphates (ALP, U/L) determined rats fed basal diet (negative control) compared with (5%, 10% and 15%) of *Onosma tinctoria* plant. Data investigated that mean \pm SD (199 ± 9.35), (226 ± 10.10), (125 ± 10.80) and (110 ± 18.26), for control group and (5%, 10% and 15%) of *Onosma tinctoria* plant was greater in comparison with control, elevating the concentration of experimental diet leads significant variances (p-value under 0.05)*. But the result didn't reveal any significant differences between 10% and 15% *Onosma tinctoria* plant.

Alkaline phosphatases are a category of enzymes predominantly located in the bone (isoenzyme ALP-2) liver & (isoenzyme ALP-1). Cells lining the intestines (isoenzyme ALP-3), the placenta, & the kidneys (specifically in the proximal convoluted tubules) additionally produce tiny quantities. Total quantity of alkaline phosphatases emitted from these tissues into the bloodstream. This enzyme functions optimally at an alkaline pH of 10, rendering it inactive in the bloodstream. (Jeremy, 2010).

Fasting serum glutamic oxalo acetic trans aminase (GOT, U/L).

Data in table (4) show fasting serum glutamic oxalo acetic trans aminase (GOT, U/L) determined for rats fed basal diet (negative control) compared with (5%, 10% and 15%) of *Onosma tinctoria* plant. Data revealed that mean \pm SD was (128 ± 9.09) for control group, (159 ± 12.15), (121 ± 12.27) and (129 ± 8.41) for for (5%, 10% and 15%) of *Onosma tinctoria* plant respectively. Data show significant variances (p-value under 0.05) of groups (5% and 10%) *Onosma tinctoria* plant.

Fasting serum glutamic pyruvate trans aminase (GPT, U/L)

Data (4) show fasting serum glutamic pyruvate trans aminase determined for rats fed basal diet (negative control) compared with (5%, 10% and 15%) of *Onosma tinctoria* plant. Data revealed that mean \pm SD was (41 ± 4.55) for control group, (51 ± 6.63), (45 ± 7.07), and (44 ± 4.55) for (5%, 10% and 15%) of *Onosma tinctoria* plant, respectively. Data for other tested diets showed no significant differences in all group. Cheesbrough, Monica (2005). The assessment of ALT activity is mostly conducted to examine hepatic illness. ALT levels are increasingly monitored in cases undergoing treatment with antiretroviral medications related to hepatotoxicity, including stavudine (d4T) and nevirapine (NVP). Although both ALT and AST levels increase with hepatocellular injury, ALT is more specific for identifying damage of hepatic cell.



Table (4): Fasting serum alkaline phosphates (ALP, U/L) , Fasting serum glutamic oxalo acetic trans aminase (GOT, U/L) & Fasting serum glutamic pyruvate trans aminase (GPT, U/L) determined rats nourished basal diet (negative control) compared with compared with (5%, 10% and 15%) *Onosma tinctoria* plant.

Groups	F. ALP after 28 day				F. GOT after 28 day				F. GPT after 28 day			
	Control	5%	10%	15%	Control	5%	10%	15%	Control	5%	10%	15%
Mean	199	226	125	110	128	159	121	129	41	51	45	44
±SD	9.35	10.10	10.80	18.26	9.09	12.15	12.27	8.41	4.55	6.63	7.07	4.55
P.Value	—	0.02*	0.00	0.00	—	0.051	0.05 *	0.91	—	0.14	0.14	0.29

*Significant differences (P-value under 0.05).

SOME KIDNEY FUNCTIONS:

Fasting serum creatinine (milligrams per deciliters)

The data in Table (5) present the fasting blood creatinine levels (milligrams per deciliter) of several rats subjected to a basic diet (negative control) in comparison to those receiving five percent, ten percent, and fifteen percent of *Onosma tinctoria* plant. Insignificant alterations have been found among the groups than the control group. Creatinine is a nitrogenous byproduct generated by the metabolism of creatine in skeletal muscle. Creatinine diffuses uniformly throughout the body's aqueous environment. It is extracted from the extracellular fluid via the kidney and eliminated in the urine. The excretion of creatinine is primarily renal and, in the absence of illness, is generally steady (**Cheesbrough, Monica 2005**). The measurement of serum or plasma creatinine is a crucial assessment of renal function. The measurement of plasma or serum urea is less preferred as it is not as effective an indicator of total kidney function and the progression of failure of the kidneys. The concentration of creatinine in the serum is less influenced by age, dehydration, and catabolic conditions, such as fever, sepsis, and internal hemorrhage, compared to urea levels. The concentrations of Creatinine are minimally affected by dietary variations, like a reduced protein consumption, provided this condition is not sustained.

Fasting serum urea (mg/dl)

Information in table (5) illustrate, serum urea (milligram per deciliters) of various rats nourished basal diet (negative control) compared with (5%, 10% and 15%) of *Onosma tinctoria* plant. Data clear that mean ± SD (30 ± 9.13), (33 ± 5.29), (35 ± 7.12) and (40 ± 3.74)



for (5%, 10% and 15%) of *Onosma tinctoria* plant respectively. Data illustrated insignificant variances for groups in comparison with the control. But the result was highly significant differences (P-value under 0.05) of 15% of *Onosma tinctoria* plant. (Chcesbrough, Monica 2005). Urea is the primary waste product resulting from protein catabolism. It is synthesized in the liver through the processes of the Krebs urea cycle. Amino acids undergo deamination, wherein the nitrogenous amine group is eliminated, resulting in the release of ammonia. Ammonia, a hazardous substance, is detoxified by reacting with carbon dioxide to produce urea, which enters into the blood stream and is then eliminated by the kidneys.

Table (5): Fasting serum creatinine (milligram per deciliters) and Fasting serum urea (milligram per deciliters) of different rats fed a basal diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant.

Groups	F. Creatinine after 28 day				F. Urea after 28 day			
	Control	5%	10%	15%	Control	5%	10%	15%
Mean	0.8	0.91	0.7	1.0	30	33	35	40
±SD	0.18	0.29	0.22	0.22	9.13	5.29	7.12	3.74
P.Value	-	0.60	0.60	0.30	-	0.68	0.68	0.05 *

ATHEROGENIC INDEX:

Data tabulated in table (6) show fasting atherogenic index of various mice nourished standard diet (negative control) compared with (5%, 10% and 15%) of *Onosma tinctoria* plant. Data clear that mean value ± SD was (3.14 ± 1.63) for control group, (4.66 ± 0.79), (4.24 ± 0.98) and (2.75 ± 1.09) for (5%, 10% and 15%) of *Onosma tinctoria* plant, respectively, But data observed weren't significant differences for all groups when compared with control negative.

Table (6): Fasting atherogenic index of different rats fed a basal diet (negative control) compared with (5%, 10% and 15%) *Onosma tinctoria* plant.

Groups	F. Atherogenic index after 28 day			
	Control	5%	10%	15%
Mean	3.14	4.66	4.24	2.75
±SD	1.63	0.79	0.98	1.09
P.Value	—	0.662	0.055	0.0325

*Significant differences (P-value under 0.05).



5) CONCLUSION

It could be concluded that *Onosma tinctoria* plant has the ability to enhance the condition of blood vessels & decrease the possibility of atherosclerosis through the decrease of harmful lipid profile & raising the blood antioxidant concentration.

6) RECOMMENDATIONS

1. It is recommended to utilize *Onosma tinctoria* for heart cases, especially atherosclerosis.
2. Various concentrations of *Onosma tinctoria* can help in promoting heart health.

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