

Study the hypolipidemic effects of Carob (*Ceratonia siliqua*) and vitamin E in albino rabbits

Sarmad Talib Abdulazeez¹, Sahib Jumaah Abdulrahman²

¹Animal production Dept., Agriculture College, Kirkuk University, Iraq.

²Biology Dept., Education College for Pure Science, Kirkuk University, Iraq.

Abstract

The current study was aimed to determining the effects of carob and vitamin E on liver functions and lipid profile in white rabbits. 20 male rabbits were used in this work, (age 5-6 month) get from local market in Kirkuk city. The rabbits were divided to the following groups (each group was content 5 male): Control group received standard diet, extract group that administrated (orally) with root extract 200mg/kg., extract group that administrated with root extract 400mg/kg., Vit. E group that administrated with vit. E 400mg/kg. Blood was drawn (cardiac puncture) monthly from each group for the duration of the study, which lasted for 5 months. the results showed significant ($P < 0.05$) decreased in the lipid profile parameters (total cholesterol, triglyceride and HDL) especially in the third month after administration of 400mg/kg carob extract group. Also, the results of current study showed significant ($P < 0.05$) decreased in the levels of liver enzymes especially in the third month after administration of 400mg/kg carob extract group. Therefore, it is concluded from the current study that carob play important as hypolipidemic effect and supports the functional aspect liver.

Keywords: Carob; vitamin E; lipid profile; hypolipidemic effect.

INTRODUCTION

The carob (*Ceratonia siliqua*) is a tree that was domesticated in the Middle East in antiquity, but is currently cultivated in many other regions of the world [1-2]. Phenolic compounds are a broad group of compounds derived from the secondary metabolism of plants, and play an important role in defense against plant pathogens and abiotic stresses [3]. These compounds possess an aromatic ring bearing one or more hydroxyl groups, and their structure may range from a simple phenol molecule to a high molecular weight composite polymer molecule. Its bioactivity (antioxidant capacity, enzyme inhibitory properties, etc.) depends on its chemical structure, in particular the number and positions of hydroxyl groups, and the nature of the substituents on aromatic [4]. Carob is an excellent source of bioactive compounds such as phenols (gallic acid, gallotannins, etc.) [5].

Carob syrup has been recorded as a good source of phenolic compounds [6], and slight differences in its phenolic content may be due to differences in the variety and origin of the raw material, as well as in production technology [7]. Carob can effectively reduce hypercholesterolemia and blood lipids in adults and children over 3 months of age. carob has great activity in resisting the increase in cholesterol in the liver and liver total lipids caused by cholesterol feeding of rats. For these reasons, foods have very good medicinal properties and can be taken long-term by children and adults without asymptomatic symptoms [8].

Address for correspondence: Sarmad Talib Abdulazeez
Animal production Dept., Agriculture College, Kirkuk University, Iraq
Email: sarmad.talib@uokirkuk.edu.iq

Access this article online

Quick Response Code:



Website:

www.pnrjournal.com

DOI:

10.47750/pnr.2022.13.04.085

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: pnrjournal@gmail.com

How to cite this article: Sarmad Talib Abdulazeez, Sahib Jumaah Abdulrahman, Study the hypolipidemic effects of Carob (*Ceratonia siliqua*) and vitamin E in albino rabbits, J PHARM NEGATIVE RESULTS 2022;13: 641-644.

Materials & methods

Animal model

20 male rabbits were used in this work, (age 5-6 month) get from local market in Kirkuk city.

Preparation of the Extract

1 kilogram of carob was mechanically crushed (mesh size 20) and extracted using cold percolation at room temperature for 72 hours with a wateralcohol combination (60 percent ethyl alcohol) [9]. In a rotary evaporator, the extract was filtered and concentrated under reduced pressure to obtain semisolid material, which was then lyophilized to generate a powder. After being dissolved in distilled water, the lyophilized powder was used.

Experimental design

20 male rabbits were used in this work and after that divided as follow (each group was content 5 male):

- A. Control group received standard diet.
- B. Extract group: administrated (orally) with root extract 200mg/kg.
- C. Extract group: administrated with root extract 400mg/kg.
- D. Vit. E group: administrated with vit. E 400mg/kg.

Blood was drawn (cardiac puncture) monthly from each group for the duration of the study, which lasted for 5 months.

Measurements

The measurements of both lipid profile and liver enzymes parameters were performed according to the method of work attached to the kit according to the manufacturer

Statistical analysis

Current data were analyzed by using program known as Minitab (statistical program). A statistical change between the groups means were analyzed using one-way analysis of variance.

Results & Discussion

Lipid profile

Table (1) show significant (P<0.05) decreased in the levels of total cholesterol In all three months of study after administration of carob extract group and vitamin E , and No significant differences were observed between carob extract group and vitamin E .

Table (1): Total cholesterol (mg/dl) in all studied groups

Period Groups	First month	Second month	Third month
Control	96.19±1.69 a	99.72±0.77 a	100.38±2.77 a

200mg/kg carob	87.14±1.98 b	85.57±2.01 b	88.23±1.57 b
400mg/kg carob	86.49±1.12 b	83.05±0.53 b	89.31±1.96 b
400mg/kg Vit. E	87.39±1.75 b	83.50±1.15 b	89.42±1.75 b

Table (2) show significant (P<0.05) decreased in the levels of Triglyceride In all three months of study after administration of carob extract group and vitamin E , and No significant differences were observed between carob extract group and vitamin E .

Table (2): Triglyceride (mg/dl) in all studied groups

Period Groups	First month	Second month	Third month
Control	127.13± 2.39 a	127.17±1.91 a	128.69±1.65 a
200mg/kg carob	118.49±3.89 b	110.70±2.86 b	116.62±2.56 b
400mg/kg carob	114.4±3.17 b	110.91±3.81 b	115.28±2.55 b
400mg/kg Vit. E	114.69±3.19 b	113.02±1.89 b	117.94±1.83 b

Table (3) show significant (P<0.05) increased in the levels of HDL In first month after administration of 400mg/kg carob and 400mg/kg Vit. E, No significant differences were observed during theadministration 200mg/kg carob . In the second and third month, the results showed significant (P<0.05) increased in the levels of HDL after administration of carob extract and 400mg/kg Vit. E

Table (3): HDL (mg/dl) in all studied groups

Period Groups	First month	Second month	Third month
Control	28.61± 0.97 b	28.32±0.79 b	30.23±0.91 c
200mg/kg carob	32.74±1.98 ab	36.58±1.32 a	36.14±1.58 b
400mg/kg carob	34.20±1.69 a	38.32±1.13 a	40.14±1.07 ab
400mg/kg Vit. E	35.81±1.68 a	38.68±1.06 a	43.64±2.46 a

Table (4) show significant (P<0.05) decreased in the levels of LDL In all three months of study after administration of carob extract group and vitamin E , and No significant differences were observed between carob extract group and vitamin E .

Table (4): LDL (mg/dl) in all studied groups

Period Groups	First month	Second month	Third month
Control	42.15±2.25 a	45.96±0.37 a	44.41±1.86 a
200mg/kg carob	30.69±3.53 b	26.84±2.60 b	28.77±1.63 b
400mg/kg carob	29.38±0.88 b	22.54±1.27 b	26.11±2.67 b
400mg/kg Vit. E	28.64±0.81 b	22.21±1.90 b	22.19±3.23 b

The present results showed the effective role of carob as a lowering cholesterol and triglyceride levels. What explains this is that carob contains a large amount of tannin, which is characterized by its effective seed and its effect as a lowering of both triglycerides and cholesterol-lowering effect [10]. The results of the current study agreed with the study of [11], which found that cholesterol, low-density lipoprotein and triglycerides were significantly ($p < 0.05$) lower in rabbits treated with carob pods compared with control. The reason was attributed to the fact that the carob plant contains a high percentage of antioxidant compounds that have a direct role in reducing lipids in the blood serum. On the other hand, vitamin E showed a protective role against hyperlipidemia in the current study. Study [12] reported decreased levels of low-density lipoprotein (LDL) in human plasma, when they administered oral vitamin E. In an in vitro experiment, [13] observed a decrease in LDL levels in mice, which dosed a concentration of 50 µl of vitamin E. Since LDL is part of cholesterol, lowering it means lowering the total cholesterol content, as observed in the current study.

Liver function

Table (5) show no significant ($P < 0.05$) differences in the levels of ALT in the first month In all groups . whereas, The result showed significant ($P < 0.05$) decreased in the ALT activity (U/L) In Second and third month after administration of 200mg/kg , 400mg/kg carob extract and 400mg/kg Vit. E .

Table (5): ALT activity (U/L) in all studied groups

Period Groups	First month	Second month	Third month
Control	28.02±1.53 a	32.34±1.16 a	28.74±1.50 a
200mg/kg carob	26.13±1.47 a	23.02±1.73 b	21.22±1.53 c
400mg/kg carob	24.50±1.60 a	20.25±1.23 b	18.80±0.94 bc

400mg/kg Vit. E	23.95±1.25 a	21.13±1.78 b	23.21±1.65 b
-----------------	-----------------	-----------------	-----------------

Table (6) show no significant ($P < 0.05$) differences in the levels of AST in the first month In all groups. whereas, The result showed significant ($P < 0.05$) decreased in the AST activity (U/L) In Second and third month after administration of 200mg/kg , 400mg/kg carob extract and 400mg/kg Vit. E .

Table (6): AST activity (U/L) in all studied groups

Period Groups	First month	Second month	Third month
Control	29.18± 2.40 a	31.55±1.30 a	29.15±1.85 a
200mg/kg carob	25.96±2.30 a	25.62±2.12 b	18.74±1.43 c
400mg/kg carob	23.96±1.90 a	22.94±1.84 b	17.28±1.52 c
400mg/kg Vit. E	26.35±1.55 a	21.87±1.36 b	24.10±0.91 b

The use of carob extract reduced the levels of liver enzymes in the current study. In a study conducted by [14], which indicated that the use of carob in white mice led to a non-significant decrease in the average level of ALT and AST compared to the control group. Also, [15] found in their recent studies that C. siliqua extract showed hepatoprotective effect and antioxidant capacity in mice against alcohol-induced hepatotoxicity. Carob seeds are an especially rich source of flavonoids such as proanthocyanidin, ellagitannin and gallotannin. These phytochemicals showed activities; Antioxidants scavenge in many diseases caused by free radical attack and play an important protective role in the liver [16-17 and this explains the results of the current study. On the other hand, regarding the role of vitamin E in reducing the effectiveness of liver enzymes. The present results are in agreement with [18] who showed that the liver is the specific metabolic organ for sulfanilamide, AST and ALT enzymes. In the extracellular fluid by liver damage caused by sulfa drugs that lead to an elevated plasma level. While in the group treated with sulfanilamide and vitamin E, there was a significant decrease in the concentrations of ALT and AST compared to the group treated with sulfanilamide due to the effect of vitamin E agreed with [19], which showed the protective effect of vitamin E against malathion that caused oxidative stress that leads to necrotic alterations in hepatocytes.

Conclusions

According to the results of current study, carob play important as hypolipidemic effect and supports the functional aspect liver.

REFERENCES

- Hillcoat, D., Lewis, G., and Vercourt, B. (1980). A new Species of *Ceratonia* (Leguminosae- Caesalpinoideae) from Arabia and the Somali Republic. *Kew Bulletin*, 35, 261-271.
- Gugliuzzo, A., Mazzeo, G., Mansour, R., Garzia, G. T., Carob pests in the Mediterranean region: bio-ecology, natural enemies and management options, *Phytoparasitica*, 2019, 47, 605–628.
- San Miguel-Chávez, R. Phenolic antioxidant capacity: A review of the state of the art. In *Phenolic Compounds—Biological Activity*; Soto-Hernandez, M., Palma-Tenango, M., Garcia-Mateos, M.d.R., Eds.; InTech: Rijeka, Croatia, 2017; pp. 59–74, ISBN 978-953-51-2959-2.
- Lawal, U.; Leong, S.W.; Shaari, K.; Ismail, I.S.; Khatib, A.; Abas, F. α -Glucosidase inhibitory and antioxidant activities of different *Ipomoea aquatica* cultivars and LC-MS/MS profiling of the active cultivar: α -glucosidase inhibitory activity of *Ipomoea aquatica* cultivars. *J. Food Biochem.* 2017, 41, e12303.
- Goulas, V.; Stylos, E.; Chatziathanasiadou, M.; Mavromoustakos, T.; Tzakos, A. functional components of carob fruit: Linking the chemical and biological space. *Int. J. Mol. Sci.* 2016, 17, 1875.
- Tounsi, L.; Karra, S.; Kechaou, H.; Kechaou, N. Processing, physico-chemical and functional properties of carob molasses and powders. *Food Meas.* 2017, 11, 1440–1448.
- Sanlı, S.; Güneşer, O.; Kılıçarslan, S.; Sanlı, N. Screening of eighteen polyphenolic compounds in different carob pekmez by green capillary electrophoresis method. *SN Appl. Sci.* 2020, 2, 576–589.
- Jenkins DJ, Jenkins AL. Nutrition principles and diabetes: a role for “lente carbohydrate”? *Diabetes Care.* 1995;18(11):1491–8.
- Herrera E, Barbas C. Vitamin E: action, metabolism and perspectives. *J Physiol Biochem.* 2001; 57:43-56.
- Silanikove, N.; Landau, S.; Or, D.; Kababya, D.; Bruckental, I. and Nitsan, Z. 2006. Analytical approach and effects of condensed tannins in carob pods (*Ceratonia siliqua*) on feed intake, digestive and metabolic responses of kids. *Livestock Science* 99:29-38.
- Abd Elhalim, S. A.; Hayat M. S.; Ibrahim A.; Wael M. A. and Sohaila T. E. (2017). Ameliorative Effect of Carob Pods Extract (*Ceratonia siliqua* L.) against Cyclophosphamide Induced Alterations in Bone Marrow and Spleen of Rats. *J. App. Pharmace. Sci.* 7 (10): 168-181.
- Dieber-Rotheneder, M.; Puhl, H.; Waeg, G.; Striegl, G. and Esterbauer, H. (1991), Effect of Oral Supplementation with D- α -Tocopherol on the Vitamin E Content of Human Low Density Lipoproteins and Resistance to Oxidation, *J. Lipid Res.*, 32, 1325-1332.
- Shige, H.; Ishikawa, T.; Suzukawa, M.; Nishiwaki, M.; Yamashita, T.; Nakajima, K.; Ito, T.; Higashi, K.; Ayaori, M.; Yonemura, A.; Nestel, P. and Nakamura, M. (1998), Vitamin E Reduces Cholesterol Esterification and Uptake of Acetylated Low Density Lipoprotein in Macrophages, *Lipids*, 33 : (12), 1169- 1174.
- Sadat S.; Shabnam M.; Alireza F.; Ghasem S.; Alireza E.; Majid G. M. and Samaneh B. (2019). Hepatotoxicity and Nephrotoxicity Evaluation of Carob Extract (*Ceratonia siliqua*) in Balb/C Mice. *J. Med. Plants*, 18(72 And S12): 267-273.
- Temiz MA, Temur A, Çelik I. Antioxidant Role and Hepatoprotective Effects of Carob (*Ceratonia siliqua* L.) Seeds against Ethanol-Induced Oxidative Stress in Rats. *Journal of Food and Nutrition Research* 2015; 3 (1): 57-61.
- Papagiannopoulos M, Wollseifen HR, Mellenthin A, Haber B, Galensa R. Identification and quantification of polyphenols in carob fruits (*Ceratonia siliqua* L.) and derived products by HPLC-UV-ESI/MS. *J Agric Food Chem* 2004; 52 (12): 3784–379.
- Lee WM. (2003) Drug-induced hepatotoxicity. *N Engl J Med.* 349(5):474–85.
- Luthria D. Significance of sample preparation in developing analytical methodologies for accurate estimation of bioactive compounds in functional foods. *Journal of the Science of Food and Agriculture* 2006; 86 (14): 2266-2272.
- Aboul-Soud MAM, Al-Othman AM, El-Desoky GE, Al-Othman ZA, Yusuf K, Ahmad J, et al. (2011) Hepatoprotective effects of vitamin E/selenium against malathion-induced injuries on the antioxidant status and apoptosis-related gene expression in rats. *J Toxicol Sci.* 36(3):285–96.