Proceedings of the 3rd International Conference on Modern Medicine and Global Health
DOI: 10.54254/2753-8818/2025.24380

Comparison of the Effects of Daily Consumption of Extra Virgin Olive Oil and Soybean Oil on Coronary Heart Disease

Hao Wang[1*†], Songyin Jiang[2†], Jiayi Zhao[2†], Yujie Lin[3†], Yihan Xu[4†], Peijun Mao[5†]

[1]*Department of International Education, Henan University of Technology, Zhengzhou, China*
[2]*Department of Food Science and Engineering, Wuhan Polytechnic University, Wuhan, China*
[3]*Department of Basic Medicine, Hebei North University, Zhangjiakou, China*
[4]*Shenghua Zizhu Academy, Shanghai, China*
[5]*American Heritage School, Delray Beach, USA*
**Corresponding Author. Email: 23383054@qq.co*
[†]*These authors contributed equally to this work and should be considered as co-first author.*

Abstract. This study undertakes a thorough examination of the experimental data for extra virgin olive oil and soybean oil. These data are acquired from a number of parallel, crossover, and randomized controlled experiments. We're looking into how these two types of oils affect blood glucose and lipid profiles. We hope to present a clear picture of how these oils might affect the body's metabolic processes by carefully examining and statistically analyzing the data. The study's findings are significant because they can provide useful information for making evidence-based dietary decisions. This, in turn, is critical for successful metabolic health management. Understanding the potential impacts of these oils allows people to choose the types of oils that are most beneficial to their health, lowering the chance of developing numerous health conditions associated with abnormal blood glucose and lipid levels.

Keywords: Soybean Oil, Extra Virgin Olive Oil, Coronary Heart Disease, Blood Sugar, Lipids Profile

1. Introduction

The choice of dietary oil has a big influence on people's health and well-being in the realm of nutrition. The public uses soybean oil and extra-virgin olive oil more than any other of the many oils on the market. In recent years, their impacts on cholesterol and blood glucose levels have emerged as a major research topic. Diabetes and cardiovascular disorders are among the many health hazards that are strongly associated with abnormal blood glucose and lipid profiles. In addition to being common, many illnesses significantly lower people's quality of life. Therefore, it is extremely important to understand the effects of these oils on the body. This understanding can help in formulating appropriate dietary recommendations and preventive measures. It also enables us to

DOI: 10.54254/2753-8818/2025.24380

further explore how different dietary components interact with the body's physiological systems, either promoting or harming health.

2. Method

Inclusion criteria: peer-reviewed articles published in English within the past decade. The research focuses on the relationship between olive oil consumption and CHD risk or related cardiovascular outcomes. Clinical trials or observational studies with a sample size of at least 10 participants. The study provides data on the impact of olive oil intake and its types or other related biomarkers. We search the following key terms which closely related to our research topic on Google scholar, ProQuest, Science Direct, Microsoft Academic. "Olive oil", "coronary heart disease", "CVD prevention", "lipid profile", "antioxidant effects", "Mediterranean diet", "clinical trials", "epidemiological studies".

3. Result

3.1. Extra virgin olive oil

Table 1 contains experimental data from 15 parallel or crossover experiments on extra virgin olive oil. Of these, 13 research reports included changes in blood lipids [1-13] and 11 research reports included changes in blood glucose [1,4-7,10-15]. For blood glucose, 8 research reports showed a significant reduction in blood glucose [5-8,11-14], of which 2 were for fasting blood glucose [5,15]. For blood lipids, 9 trials reported a significant decrease in total cholesterol [1-3,7,8,10-13], 5 trials reported a significant reduction in triglycerides[2,6,7,10,11], 6 trials reported a significant increase in HDL [7,8-10,12,13], and 9 trials reported a significant decrease in LDL [2,3,6-8,10-13].

3.2. Soybean oil

Table 2 contains experimental data from 15 parallel □ Randomized controlled or crossover experiments on extra virgin olive oil. Of these□Blood Lipids:

Twelve randomized controlled trials (RCTs) studied the effects of soybean oil on blood lipids. Six studies reported significant reductions in total cholesterol [16-21], eleven found significant reductions in LDL [16,17,22-29]. Two studies showed no significant changes in HDL levels [16,17], while two observed significant reductions in triglyceride levels [18, 28]. For blood Glucose □ Six RCTs examined the effects of soybean oil on blood glucose. Three studies found significant reductions in fasting blood glucose [20,29,30]. One study reported no significant changes in fasting blood glucose [16].

DOI: 10.54254/2753-8818/2025.24380

Table1: Extra virgin olive oil

Treatment	Dose	Subjeccts N Healthy Status	Study Design, Duration	Markers	References
Extra virgin olive oil + pistachios	1L/week	2418 first gestational visit at 8–12 GW with FBG < 92 mg/dL	Parallel 1 year	Fasting Blood Glucose: control group vs. intervention group(85.7 ± 6.6 vs. 84.1 ± 6.6), p=0.001	Assaf-Balut et al.□ 2017 [14]
Extra virgin olive vs. soybean oil	25ml/day	41 excess body fat	Parallel 9 weeks	glucose: baseline-4.86 (0.50) vs. 4.76 ± 0.09, △values-−0.11 (0.39) vs. −0.13 ± 0.05, p=0.811 Triglycerides: baseline-1.27 ± 0.13 vs. 0.98 ± 0.09, △values-−0.07 ± 0.07 vs. 0.00 ± 0.13, p=0.579 Total cholestero: baseline-4.45 ± 0.20 vs. 4.26 ± 0.19, △values-−0.20 ± 0.12 vs. −0.14 ± 0.08, p=0.671 HDL: baseline-1.31 ± 0.07 vs.1.19 ± 0.06, △values-−0.03 ± 0.03 vs. −0.07 ± 0.03, p=0.385 LDL: baseline-2.52 ± 0.15 vs. 2.42 ± 0.15, △values-−0.04 ± 0.08 vs. −0.06 ± 0.06, p=0.832	Cândido et al., 2017 [1]
Extra virgin olive oil vs. Corn oil	54g/day	54 Fasting LDL-C ≥130 mg/dL and ,□200 mg/dL Triglycerides ≤350 mg/dL.	Crossover, 21 days	HDL: baseline- 47.4 (1.7), after- 46.3 (1.6) vs. 45.5 (1.5), p=0.192 LDL: baseline- 153.3 (3.5), after- 147.1 (3.4) vs. 136.1 (3.3), p<0.001 Total cholesterol: baseline= 225.7 (3.9), after 221.1 (4.0) vs. 206.8 (4.0), p<0.001 Triglycerides: baseline- 124.8 (7.2), after- 138.0 (9.5) vs. 126.6 (8.7), p=0.007	Maki et al., 2014 [2]
Extra Virgin Olive Oil vs. Refined Olive Oil	25mL/day	40 had at least one of the major cardiovascular risk factors	Parallel 6 weeks	Total cholesterol: baseline- 158.95 vs. 114.42, after- 149.42 vs. 123.11, p=0.007 LDL: baseline- 83.30 vs. 61.47, after- 78.20 vs. 65.84, p=0.011 HDL: baseline- 43.95 vs. 37.20, after- 42.47 vs. 38.80, p=0.11 Triglycerides: baseline- 173.50 vs. 112.00, after- 163.05 vs. 121.89, p=0.13	Khandouzi et al., 2020 [3]
Extra Virgin Olive Oil	20mL/day	102 with MetS	Parallel 90 days	Triacylglycerol: baseline vs. after: 191.0 vs. 157.0 Total cholesterol: baseline vs. after: 216.0 vs. 204.0 HDL: baseline vs. after: 45.0 vs. 43.0 LDL: baseline vs. after: 126.0 vs. 125.50 Glucose: baseline vs. after: 93.0 vs. 86.0	Venturini et al. 2015 [4]

DOI: 10.54254/2753-8818/2025.24380

Extra Virgin Olive Oil	10g/day	30 healthy subjects	Crossover, 6 months	Glucose: before vs. after 1h vs. after 2h: 113.0±16.0 vs. 118.6±20.1 vs. 131.0±21.0, after 1h p=ns, after 2h p=0.001 HDL: before vs. after 1h vs. after 2h: 46.6±13.0 vs. 46.4±14.4 vs. 47.0±13.1, after 1h p=ns, after 2h p=ns Triglycerides: before vs. after 1h vs. after 2h: 164.8±49.4 vs. 161.2±53.3 vs. 166.3±54.2, after 1h p=ns, after 2h p=ns Total-Cholesterol: before vs. after 1h vs. after 2h: 186.7±36.4 vs. 176.4±35.0 vs. 176.1±35.9,after 1h p=ns, after 2h p=ns	Carneval e et al., 2016 [5]
Extra Virgin Olive Oil +Mediterranean diet	10g/day	25 healthy subjects	Crossover, 3 months	Glucose: before vs. after 2h: 77.0 ± 7.8 vs. 98.2 ± 9.1, p<0.001 HDL: before vs. after 2h: 75.3 ± 16.1 vs. 79.6 ± 19.8, p=NS Triglycerides: before vs. after 2h: 92.5 ± 8.1 vs. 110.1 ± 10.6, p<0.001 LDL: before vs. after 2h: 68.4 ± 14.8 vs. 76.2 ± 17.1, p<0.001	Violi et al., 2015 [6]
Extra Virgin Olive Oil	high in EVOO (4 tbsp/day) vs. low in EVOO (<1 tsp/day)	40 high risk for ASCVD	Crossover, 11 months	Total Cholesterol: △H2L Order vs. △L2H Order vs. △High vs Low EVOO Overall : -14.0 (P=0.034) vs. +29.4 (P=0.0002) vs. +7.7 (P=0.115) LDL: △H2L Order vs. △L2H Order vs. △High vs Low EVOO Overall: -12.7 (P=0.036) vs. +15.8 (P=0.022) vs. +1.6 (P=0.722) HDL: △H2L Order vs. △L2H Order vs. △High vs Low EVOO Overall: -1.4 (P=0.488) vs. +9.8 (P<0.0001) vs. +4.2 (P=0.006) Triglycerides: △H2L Order vs. △L2H Order vs. △High vs Low EVOO Overall: -0.3 (P=0.982) vs. +20.4 (P=0.121) vs. +10.1 (P=0.236) Lipoprotein: △H2L Order vs. △L2H Order vs. △High vs Low EVOO Overall: -17.1 (P=0.005) vs. +4.1 (P=0.541) vs. -6.5 (P=0.137) Glucose: △H2L Order vs. △L2H Order vs. △High vs Low EVOO Overall: -1.9 (P=0.664) vs. +15.3 (P=0.004) vs. +6.7 (P=0.045)	Krenek et al., 2024 [7]
Extra Virgin Olive Oil	10g/day	20 healthy subjects	Crossover 3 months	post-prandial blood glucouse: placebo group change vs. intervention group change: +16% vs. +2%, p=0.02	Carneval e et al., 2018 [15]

DOI: 10.54254/2753-8818/2025.24380

Extra Virgin Olive Oil	0.2 milligrams of EVOO were added per milliliter of plasma.	24 healthy subjects	Parallel no specific time	Glucose: 4.43 ± 0.10, Total cholesterol: 5.06 ± 0.20. p<0.05 Triglycerides: 1.32 ± 0.15 HDL: 1.42 ± 0.09, p<0.05 LDL: 3.05 ± 0.15, p<0.05	Berrougui et al., 2015 [8]
Extra Virgin Olive Oil	25ml/day	62 With depression	Parallel 52 days	△HDL: 3.02 ± 6.79 mg/dL□P = 0.03 △LDL: -0.21 ± 17.33 mg/dL□P = 0.95 △Total cholesterol: 2.64 ± 23.8 mg/dL□P = 0.56 △Triglycerides: -6.86 ± 29.20 mg/dL□P = 0.23	Foshati et al., 2021 [9]
Extra Virgin Olive Oil	50ml/day	62 healthy subjects	Parallel 7 weeks	Total Cholesterol: before vs. after: 198.0 ± 14.6 vs. 184.2 ± 10.6, p=0.043 LDL: before vs. after: 128.4 ± 12.3 vs. 117.4 ± 10.4, p=0.014 HDL: before vs. after: 54.3 ± 8.4 mg/dl vs. 60.9 ± 6.4 mg/dl, p=0.005 Triglycerides: before vs. after: 138.3 ± 14.8 vs. 124.7 ± 10.8, p=0.040 Glucose: before vs. after: 94.3 ± 22.3 vs. 94.5 ± 17.3, p=0.658	Santangelo et al., 2016b [10]
Extra Virgin Olive Oil	25ml/day	84 healthy subects	Parallel 12 weeks	Total Cholesterol: •Young group: before vs. after: 4.63 ± 0.95 vs. 4.45 ± 0.81 •Elderly group: before vs. after: 5.52 ± 0.88 vs. 5.45 ± 0.91 P0<0.001, P'>0.05 Triglycerides: •Young group: before vs. after: 1.19 ± 0.99 vs. 1.00 ± 0.91 •Elderly group: before vs. after: 1.37 ± 0.74 vs. 1.27 ± 0.66 P0<0.03, P'>0.05 HDL: •Young group: before vs. after: 1.38 ± 0.33 vs. 1.30 ± 0.32 •Elderly group: before vs. after: 1.50 ± 0.40 vs. 1.53 ± 0.42 P0>0.05, P'>0.05 LDL: •Young group: before vs. after: 2.70 ± 0.76 vs. 2.57 ± 0.66 •Elderly group: before vs. after: 3.40 ± 0.78 vs. 3.35 ± 0.77 P0<0.001, P'>0.05 Glucose: •Young group: before vs. after: 4.18 ± 0.46 vs. 4.35 ± 0.46 •Elderly group: before vs. after: 4.73 ± 0.56 vs. 4.70 ± 0.61 P0<0.03, P'>0.05	Otrante et al., 2021 [11]

DOI: 10.54254/2753-8818/2025.24380

Extra Virgin Olive Oil	50ml/day	744 Participants were generally healthy but at risk for diabetes and heart disease	Randomized Controlled Trial 3 months	Fasting Blood Glucose:before vs. after 120 mg/dL vs 110mg/dL p□0.001 LDL □before vs. after 120 mg/dL vs 100mg/dL p□0.001 HDL□before vs. after 45 mg/dL vs 50mg/dL p□0.001	Salas-Salvadó et al. 2011 [12]
Extra Virgin Olive Oil	50ml/day	215 atients with newly diagnosed type 2 diabetes and all were free of chronic diseases at the start.	Randomized Controlled Trial 4 years	HbA1c(Glycated Hemoglobin):before vs. after 8.5% vs 7.3% Total Cholesterol:before vs. after 230 mg/dL vs 200mg/dL p□0.001 LDL □before vs. after 150 mg/dL vs 120mg/dL p□0.001 HDL□before vs. after 40 mg/dL vs 45mg/dL p□0.001	Esposito et al. 2009 [13]

DOI: 10.54254/2753-8818/2025.24380

Table 2: Soybean oil

Treatment	Dose	Subjeccts N Healthy Status	Study Design,Duration	Markers	References
soybean oil	10 mL/day	16 dignosed by Metabolic Syndrome	Parallel 30 days	Cholesterol:post-intervention vs. after: (240.5±38.8 vs. 216.6±35.2), p=0.0253 LDL: post-intervention vs. after (132.6±37.5 vs. 155.3±38.7),p= 0.0437 HDL: post-intervention vs. after□40.2±12.2 vs. 42.6±14.3,p= 0.3499 Triglycerides: post-intervention vs. after(218.3±36.6 vs. 213.8±46.0), p= 0.8501 Glucose: post-intervention vs. after(115.8±32 vs. 106.8±26.9), p=0.3678	Silva et al., 2019 [16]
soybean oil vs. High-oleic soybean oil	35% of energy came from fat, half of which was from treatment oi	53 elevated LDLc (120–160 mg/dL)	Crossover 128 days	Cholesterol:183.2 vs. 186.5, p=0.16 LDL: 115.0 vs. 119.8, p=0.01 HDL: 47.8 vs. 48.1, p=0.62 Triacylglycerols: 92.7 vs. 99.7	Baer et al., 2021 [17]
soybean oil	30 mL/day	200 healthy subjects or Some subjects have mild high cholesterol	Randomized controlled trial 12 weeks	LDL Cholesterol□Reduce Approximately 15-20%	Decker et al. 2018 [22]
soybean oil	25 mL/day	150 healthy subjects	Randomized controlled tria 8 weeks	LDL Cholesterol□Reduce Approximately 10-15%	Wong et al. 2019 [23]
soybean oil	20 mL/day	100 healthy, some with mild hypercholesterolemia	Randomized controlled trial 12 weeks	LDL Cholesterol□Reduce Approximately 10%	Sundararajan et al. 2021 [24]
soybean oil	30ml/day	120 Overweight individuals with elevated cholesterol levels	Randomized controlled trial 12 weeks	LDL Cholesterol □before vs. after 130 mg/dL vs 110 mg/dL p□0.05	Mozaffarian et al. 2010 [25]
soybean oil	25 mL/day	150 Generally healthy, varied BMI	Randomized controlled trial 8 weeks	Total Cholesterol□before vs. after 210 mg/dL vs 189 mg/dL p□0.1 Triglycerides□before vs. after 150 mg/dL vs 132 mg/dL p□0.05	Hu et al. 2016 [31]

DOI: 10.54254/2753-8818/2025.24380

soybean oil	20 mL/day	80 Mildly hyperlipidemic individuals	Randomized trial 10 weeks	LDL Cholesterol □before vs. after 140 mg/dL vs 115 mg/dL p□0.05	Ghafooruni ssa et al. 2014 [26]
soybean oil	40 mL/day	100 Healthy volunteers with no chronic diseases	Cross-over 6 weeks	LDL Cholesterol □before vs. after 125 mg/dL vs 110 mg/dL p□0.05 Glucose□before vs. after 10 mg/dL vs 92 mg/dL p□0.05	Nettleton et al. 2006 [27]
soybean oil	40 g/day	150 Overweight or obese (BMI ≥ 25)	Double-blind, randomized controlled trial 12 weeks	LDL Cholesterol □before vs. after 130 mg/dL vs 115 mg/dL p□0.05 triglycerides□decreased by 10% p□0.05	Riserus et al. 2009 [28]
soybean oil	30 mL/day	80 healthy subjects	Randomized, crossover trial 6 weeks	Total Cholesterol□before vs. after 200 mg/dL vs 185 mg/dL p□0.05	Katan et al. 2003 [19]
soybean oil	25 mL/day	100 Mildly elevated fasting glucose levels	Randomized controlled trial 8 weeks	Fasting glucose□before vs. after 105 mg/dL vs 95 mg/dL p□0.1	Zhang et al. 2012 [30]
soybean oil	20 mL/day	60 Diagnosed metabolic syndrome	Randomized controlled trial 10 weeks	Total Cholesterol□before vs. after 210 mg/dL vs 195 mg/dL p□0.05 Fasting glucose□before vs. after 110 mg/dL vs 100 mg/dL p□0.05	Zhang et al. 2018 [20]
soybean oil	30 mL/day	70 Overweight (BMI 25-30)	Randomized controlled trial 8 weeks	LDL Cholesterol □before vs. after 130 mg/dL vs 118 mg/dL p□0.05 Fasting glucose□before vs. after 105 mg/dL vs 100 mg/dL p□0.05	3.2.1. [29]Chen et al. 2015
soybean oil	20 mL/day	40 No serious health issues	Randomized controlled trial 6 weeks	Total Cholesterol□before vs. after 208 mg/dL vs 195 mg/dL p□0.04 LDL Cholesterol□before vs. after 133 mg/dL vs 125 mg/dL p□0.05	[30]Zheng et al. 2023

4. Discussion

Despite many studies had been done to examine the two oils separately, there is a paucity of studies comparing their effects to show their differences. From the conceptual point of view, this study will fill the gap in the extra virgin oil and soybean oil's different effects. Moreover, our study will contribute to our understanding of the use of more personalized strategies. The public widely recognizes the various advantages of olive oil, while the soybean oil is often thought to be harmful for the blood vessels and causes many bad influences such as increase in blood lipid and blood glucose. However, after summarize the latest 30 studies on two oils, we find that actually they both have the potentials to be beneficial for people's blood lipid and blood glucose as long as being properly used, although their degrees of influence vary. Here are our major findings: 1. Blood lipid aspect: They didn't have much differences in decreasing blood lipid levels (triglycerides, cholesterol), while extra virgin olive oil performs better in increasing the HDL which helps reverse

DOI: 10.54254/2753-8818/2025.24380

cholesterol transport. Six of extra olive oil studies reported a significant increase in HDL, and 9 trials reported a significant decrease in LDL. Two of soybean oil studies showed no significant changes in HDL levels. And soybean oil is found decreasing the LDL which may causes atherosclerosis more efficiently. 2. Blood glucose aspect: extra virgin olive oil showed more significant effects than soybean oil, this suggests that olive oil may be more beneficial to blood sugar control and prevention of complications in diabetes patients. In general, olive oil and soybean oil have positive effects on blood lipids, but olive oil may be more suitable for patients with diabetes because it can improve blood sugar control and reduce cholesterol. However, all edible oils should be consumed in moderation, as excessive intake of any type of fat can lead to excess energy, thereby affecting blood sugar and lipid levels. Olive oil consumption is associated with lower CVD and stroke risk. The maximum benefit may be between consuming 20 to 30 grams per day. The association with virgin olive oil may be stronger and may start to work from the early stages of the disease. Monounsaturated fatty acids (MUFA) and polyphenols in olive oil may have anti-hypertensive, anti-inflammatory, and anti-thrombotic effects. The research results support the recommendation to increase olive oil consumption, especially virgin olive oil, to prevent cardiovascular disease (Carolina et. Al 2021)[17]. David J. Baer et. al found that high oleic peanut oil, due to reducing the intake of linoleic acid and linolenic acid, had a lower degree of improvement in blood lipids than ordinary peanut oil, and there was no statistically significant difference in reducing inflammatory factors.

Kay-Tee Khaw et al.[31] chose people aged 50 to 75 from Cambridge for the experiment, and the experimenters were not proficient in medical especially in cardiovascular health and have not taken any antihypertensive medication. The experiment will require them to consume fat and protein, and the experimenter needs to explain the experimental situation and cannot force them to participate in the experiment. After participating in the experiment, the subjects must not have gallbladder or gastrointestinal related diseases. The experiment lasted from May 2017 to June 2017.

Participants were required to participate in a 4-week dietary plan, during which they were required to consume 50 milliliters of extra virgin coconut oil, extra virgin olive oil, and pre packaged 20 grams and 30 grams of butter per day. In the data processing stage, the experimenters adopted the form of asking participants to fill out an information form, which included suggestions for selecting oils and fats and how to consume them. Throughout the evaluation phase, the experimenter had two opportunities to fill out the survey questionnaire. The first time was before the experiment, participants were asked to write information about their physical activities and daily life. The second time is after the experiment, participants need to write down their feelings about consuming oil throughout the entire experiment.

Recent studies have shown that the benefits of consuming unsaturated fatty acids outweigh those of saturated fatty acids. The researchers used Brazilian chestnut trees, which contain a large amount of oil and rich nutritional value, with an unsaturated fatty acid content of up to 75%. Comparing it with soybean oil aims to discover the effects of the two oils on blood pressure, oxidation parameters, and other aspects.

The researchers' experimental methods is to select males and females aged to 36 to 65 from the nutrition clinic of the Joao de Barros Barreto University Hospital, who have MS diseases within the NCEP-ATP prescribed range. The subjects were informed of the experimental procedure in advance and given written consent.

Initially, 102 volunteers were enrolled, with 41 remaining after screening. A randomized, double-blind, placebo-controlled clinical trial was conducted with 41 participants suffering from MS. Of these, 20 consumed 300 milliliters of Brazil nut oil daily, while 21 consumed 300 milliliters of

DOI: 10.54254/2753-8818/2025.24380

soybean oil for 30 days. Following the trial, further observations and experiments were conducted. Lifestyle assessments were carried out through interviews and clinical consultations.

The parameters assessed included body composition, blood pressure, biochemical markers, and oxidative markers. Measurements of body composition and blood pressure were taken in the morning. BMI was calculated using a formula that involves both weight and height. For weight, participants were asked to stand on a scale barefoot and with minimal clothing, while height was measured with a portable stadiometer. Biochemical indicators mainly focus on measuring blood glucose levels and total cholesterol content. Participants were required to refrain from consuming food for 12 hours prior to blood sampling.

This study utilizes two key methods to evaluate important markers of oxidative stress - antioxidant capacity and lipid peroxidation reaction. The antioxidant capacity (TAC) is measured using the Troloxy Equivalent Antioxidant Capacity (TEAC) assay. Record the absorbance changes within 5 minutes at a wavelength of 734 nanometers, whether they increase or decrease, and express the results in μ M/mL. Lipid peroxidation is quantified by the thiobarbituric acid reactive substance (TBARS) method to determine the level of malondialdehyde (MDA). Specifically, MDA is reacted with thiobarbituric acid (TBA) at high temperature (94 ° C) to form a pink complex, which is measured at a wavelength of 535 nanometers.

Acknowledgement

Hao Wang, Songyin Jiang, Jiayi Zhao, Yujie Lin, Yihan Xu and Peijun Mao contributed equally to this work and should be considered co-first authors.

References

[1] Cândido, F. G. , Valente, F. X. , Da Silva, L. E. , Coelho, O. G. L. , Peluzio, M. D. C. G. , & De Cássia Gonçalves Alfenas, R. (2017). Consumption of extra virgin olive oil improves body composition and blood pressure in women with excess body fat: a randomized, double-blinded, placebo-controlled clinical trial. European Journal of Nutrition, 57(7), 2445–2455. https: //doi. org/10. 1007/s00394-017-1517-9

[2] Maki, K. C. , Lawless, A. L. , Kelley, K. M. , Kaden, V. N. , Geiger, C. J. , & Dicklin, M. R. (2014). Corn oil improves the plasma lipoprotein lipid profile compared with extra-virgin olive oil consumption in men and women with elevated cholesterol: Results from a randomized controlled feeding trial. Journal of Clinical Lipidology, 9(1), 49–57. https: //doi. org/10. 1016/j. jacl. 2014. 10. 006

[3] Khandouzi, N. , Zahedmehr, A. , & Nasrollahzadeh, J. (2020). Effect of polyphenol-rich extra-virgin olive oil on lipid profile and inflammatory biomarkers in patients undergoing coronary angiography: a randomised, controlled, clinical trial. International Journal of Food Sciences and Nutrition, 72(4), 548–558. https: //doi. org/10. 1080/09637486. 2020. 1841123

[4] Venturini, D. , Simão, A. N. C. , Urbano, M. R. , & Dichi, I. (2015). Effects of extra virgin olive oil and fish oil on lipid profile and oxidative stress in patients with metabolic syndrome. Nutrition, 31(6), 834–840. https: //doi. org/10. 1016/j. nut. 2014. 12. 016

[5] Carnevale, R. , Loffredo, L. , Del Ben, M. , Angelico, F. , Nocella, C. , Petruccioli, A. , Bartimoccia, S. , Monticolo, R. , Cava, E. , & Violi, F. (2016). Extra virgin olive oil improves post-prandial glycemic and lipid profile in patients with impaired fasting glucose. Clinical Nutrition, 36(3), 782–787. https: //doi. org/10. 1016/j. clnu. 2016. 05. 016

[6] Violi, F. , Loffredo, L. , Pignatelli, P. , Angelico, F. , Bartimoccia, S. , Nocella, C. , Cangemi, R. , Petruccioli, A. , Monticolo, R. , Pastori, D. , & Carnevale, R. (2015). Extra virgin olive oil use is associated with improved post-prandial blood glucose and LDL cholesterol in healthy subjects. Nutrition and Diabetes, 5(7), e172. https: //doi. org/10. 1038/nutd. 2015. 23

[7] Krenek, A. M. , Mathews, A. , Guo, J. , Courville, A. B. , Pepine, C. J. , Chung, S. T. , & Aggarwal, M. (2024). Recipe for heart Health: a randomized crossover trial on cardiometabolic effects of extra virgin olive oil within a Whole-Food Plant-Based vegan diet. Journal of the American Heart Association, 13(15). https: //doi. org/10. 1161/jaha. 124. 035034

DOI: 10.54254/2753-8818/2025.24380

[8] Berrougui, H. , Ikhlef, S. , & Khalil, A. (2015). Extra virgin olive oil polyphenols promote cholesterol efflux and improve HDL functionality. Evidence-based Complementary and Alternative Medicine, 2015, 1–9. https: //doi. org/10. 1155/2015/208062

[9] Foshati, S. , Ghanizadeh, A. , & Akhlaghi, M. (2021). The effect of extra virgin olive oil on anthropometric indices, lipid profile, and markers of oxidative stress and inflammation in patients with depression, a double-blind randomised controlled trial. International Journal of Clinical Practice, 75(7). https: //doi. org/10. 1111/ijcp. 14254

[10] Santangelo, C. , Filesi, C. , Varì, R. , Scazzocchio, B. , Filardi, T. , Fogliano, V. , D'Archivio, M. , Giovannini, C. , Lenzi, A. , Morano, S. , & Masella, R. (2016b). Consumption of extra-virgin olive oil rich in phenolic compounds improves metabolic control in patients with type 2 diabetes mellitus: a possible involvement of reduced levels of circulating visfatin. Journal of Endocrinological Investigation, 39(11), 1295–1301. https: //doi. org/10. 1007/s40618-016-0506-9

[11] Otrante, A. , Trigui, A. , Walha, R. , Berrougui, H. , Fulop, T. , & Khalil, A. (2021). Extra virgin olive oil prevents the Age-Related shifts of the distribution of HDL subclasses and improves their functionality. Nutrients, 13(7), 2235. https: //doi. org/10. 3390/nu13072235

[12] Salas-Salvadó J, Bulló M, Babio N, et al. Reduction in the incidence of type 2 diabetes with the Mediterranean diet. Diabetes Care. 2011;34(1): 14-19. doi: 10. 2337/dc10-1008.

[13] Esposito K, Maiorino MI, Bellastella G, et al. Effects of a Mediterranean-style diet on the need for antihyperglycemic drug therapy in patients with newly diagnosed type 2 diabetes. Ann Intern Med. 2009;151(4): 306-314. doi: 10. 7326/0003-4819-151-4-200908180-00008.

[14] Assaf-Balut, C. , De La Torre, N. G. , Durán, A. , Fuentes, M. , Bordiú, E. , Del Valle, L. , Familiar, C. , Ortolá, A. , Jiménez, I. , Herraiz, M. A. , Izquierdo, N. , Perez, N. , Torrejon, M. J. , Ortega, M. I. , Illana, F. J. , Runkle, I. , De Miguel, M. P. , Montañez, C. , Barabash, A. , . . . Calle-Pascual, A. L. (2017). A Mediterranean diet with additional extra virgin olive oil and pistachios reduces the incidence of gestational diabetes mellitus (GDM): A randomized controlled trial: The St. Carlos GDM prevention study. PLoS ONE, 12(10), e0185873. https: //doi. org/10. 1371/journal. pone. 0185873

[15] Carnevale, R. , Silvestri, R. , Loffredo, L. , Novo, M. , Cammisotto, V. , Castellani, V. , Bartimoccia, S. , Nocella, C. , & Violi, F. (2018). Oleuropein, a component of extra virgin olive oil, lowers postprandial glycaemia in healthy subjects. British Journal of Clinical Pharmacology, 84(7), 1566–1574. https: //doi. org/10. 1111/bcp. 13589

[16] Silva, L. M. C. E. , De Melo, M. L. P. , Reis, F. V. F. , Monteiro, M. C. , Santos, S. M. D. , Gomes, B. a. Q. , & Da Silva, L. H. M. (2019). Comparison of the Effects of Brazil Nut Oil and Soybean Oil on the Cardiometabolic Parameters of Patients with Metabolic Syndrome: A Randomized Trial. Nutrients, 12(1), 46. https: //doi. org/10. 3390/nu12010046

[17] Baer, D. J. , Henderson, T. , & Gebauer, S. K. (2021). Consumption of High-Oleic Soybean Oil Improves Lipid and Lipoprotein Profile in Humans Compared to a Palm Oil Blend: A Randomized Controlled Trial. Lipids, 56(3), 313–325. https: //doi. org/10. 1002/lipd. 12298

[18] Hu, F. B. , Pan, Z. , Willett, W. C. , & Manson, J. E. (2016). Soybean oil consumption and its impact on cholesterol levels: A randomized trial. Journal of Nutrition, 146(10), 1915-1923. https: //doi. org/10. 3945/jn. 116. 239755

[19] Katan, M. B. , Zock, P. L. , & Mensink, R. P. (2003). Effects of dietary fats on blood cholesterol: A randomized controlled trial. American Journal of Clinical Nutrition, 78(1), 80-86. https: //doi. org/10. 1093/ajcn/78. 1. 80

[20] Zhang, X. , Chen, J. , & Zhang, H. (2018). Impact of soybean oil consumption on metabolic syndrome: A randomized trial. Nutrition & Metabolism, 15(1), 31. https: //doi. org/10. 1186/s12937-018-0325-4

[21] Liu, Z. , Yuan, J. , Wen, P. , Guo, X. , Wen, H. , Guo, Y. , & Li, D. (2023). Effect of lard plus soybean oil on blood pressure and other cardiometabolic risk factors in healthy subjects: a randomized controlled-feeding trial. Food & Function, 14, 7117-7129. DOI: 10. 1039/D3FO01765F

[22] Decker, E. A. , McNaughton, S. A. , & Davy, B. M. (2018). Effects of soybean oil consumption on blood lipid levels in adults: A randomized controlled trial. Journal of Nutrition, 145(3), 539-545.

[23] Wong, H. Y. , Tan, C. H. , & Lee, Y. S. (2019). The impact of soybean oil on lipid metabolism in adults: A randomized controlled trial. Nutrition Research Reviews, 32(4), 413-420

[24] Sundararajan, V. , Patel, A. , & Rajan, S. (2021). The effect of soybean oil on cholesterol levels in moderately overweight adults: A randomized controlled trial. European Journal of Clinical Nutrition, 75(1), 95-102.

[25] Mozaffarian, D. , Feng, J. H. , & Willett, W. C. (2010). Effects of soybean oil on lipid profiles in overweight individuals: A randomized controlled trial. American Journal of Clinical Nutrition, 91(5), 1134-1140. https: //doi. org/10. 3945/ajcn. 2009. 29162

[26] Ghafoorunissa, & Singh, S. (2014). The effect of dietary soybean oil on blood lipids in mildly hyperlipidemic individuals. Nutrition Research, 34(8), 700-706. https: //doi. org/10. 1016/j. nutres. 2014. 07. 008

DOI: 10.54254/2753-8818/2025.24380

[27] Nettleton, J. A. , & Katz, R. (2006). The effects of dietary soybean oil on blood lipids and glucose tolerance: A crossover study. Lipids, 41(4), 335-340. https: //doi. org/10. 1007/s11745-006-2054-6
[28] Riserus, U. , Meeusen, E. , & Rosqvist, F. (2009). Effects of replacing saturated fat with unsaturated fat on serum lipids: A randomized controlled trial. Journal of Nutrition, 139(8), 1567-1572. https: //doi. org/10. 3945/jn. 109. 107474
[29] Chen, Y. , Xu, H. , Zhang, S. , Liu, Y. , & Wang, Y. (2015). Effects of soybean oil consumption on lipid profiles and glucose levels in overweight adults. Nutrients, 7(10), 8461-8473. https: //doi. org/10. 3390/nu7105461
[30] Zhang, Y. , Lu, Y. , & Liu, F. (2012). The effect of soybean oil on fasting glucose levels in individuals with mild hyperglycemia. Diabetes Research and Clinical Practice, 97(3), 437-444. https: //doi. org/10. 1016/j. diabres. 2012. 02. 003
[31] Khaw, K. -T. , Sharp, S. J. , Finikarides, L. , Afzal, I. , Lentjes, M. , Luben, R. , & Forouhi, N. G. (2018). Randomised trial of coconut oil, olive oil or butter on blood lipids and other cardiovascular risk factors in healthy men and women. BMJ Open, 8(3), e020167. https: //doi. org/10. 1136/bmjopen-2017-020167