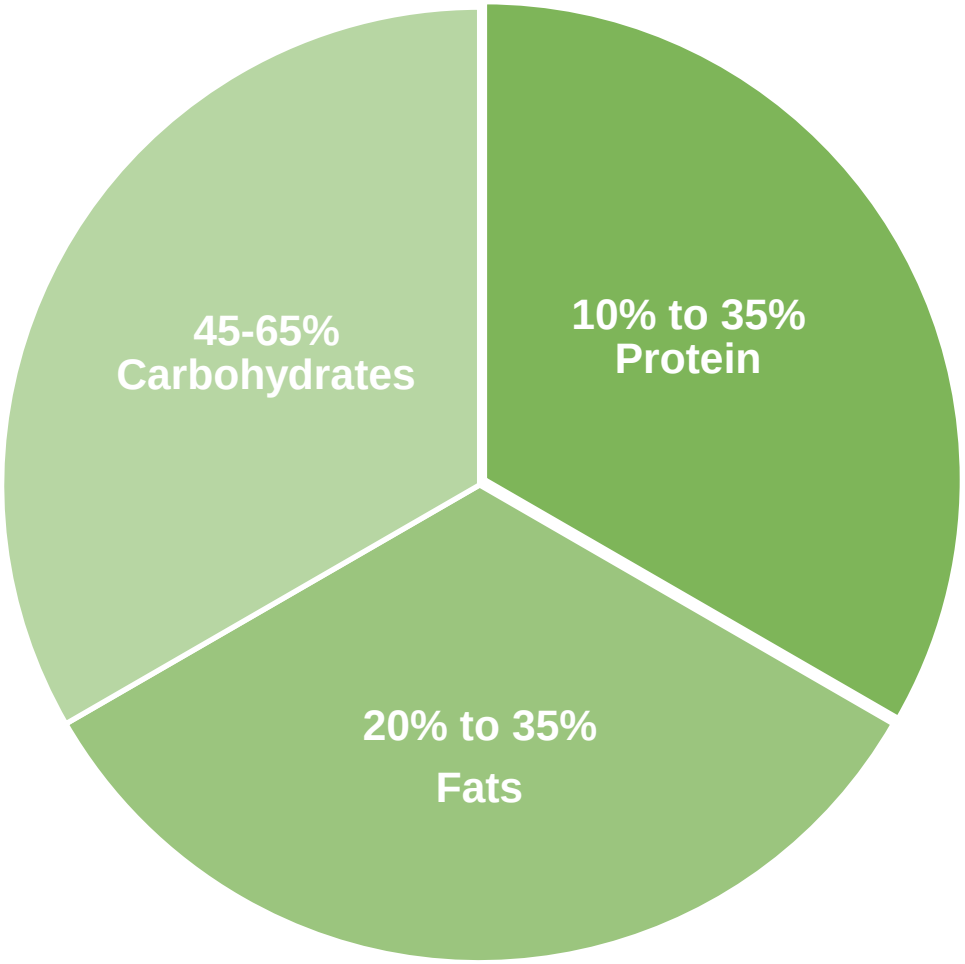
HEALTH BENEFITS OF COTTON SEED OIL

Naaznin Husein
Founder, Freedom Wellness

Fatty Acids

- Fatty acid is a fat-soluble portion of plant or animal, which is the chief constituent of lipids.
- Fatty acids play several essential roles in the homeostasis and structure of the cell and the whole human body.

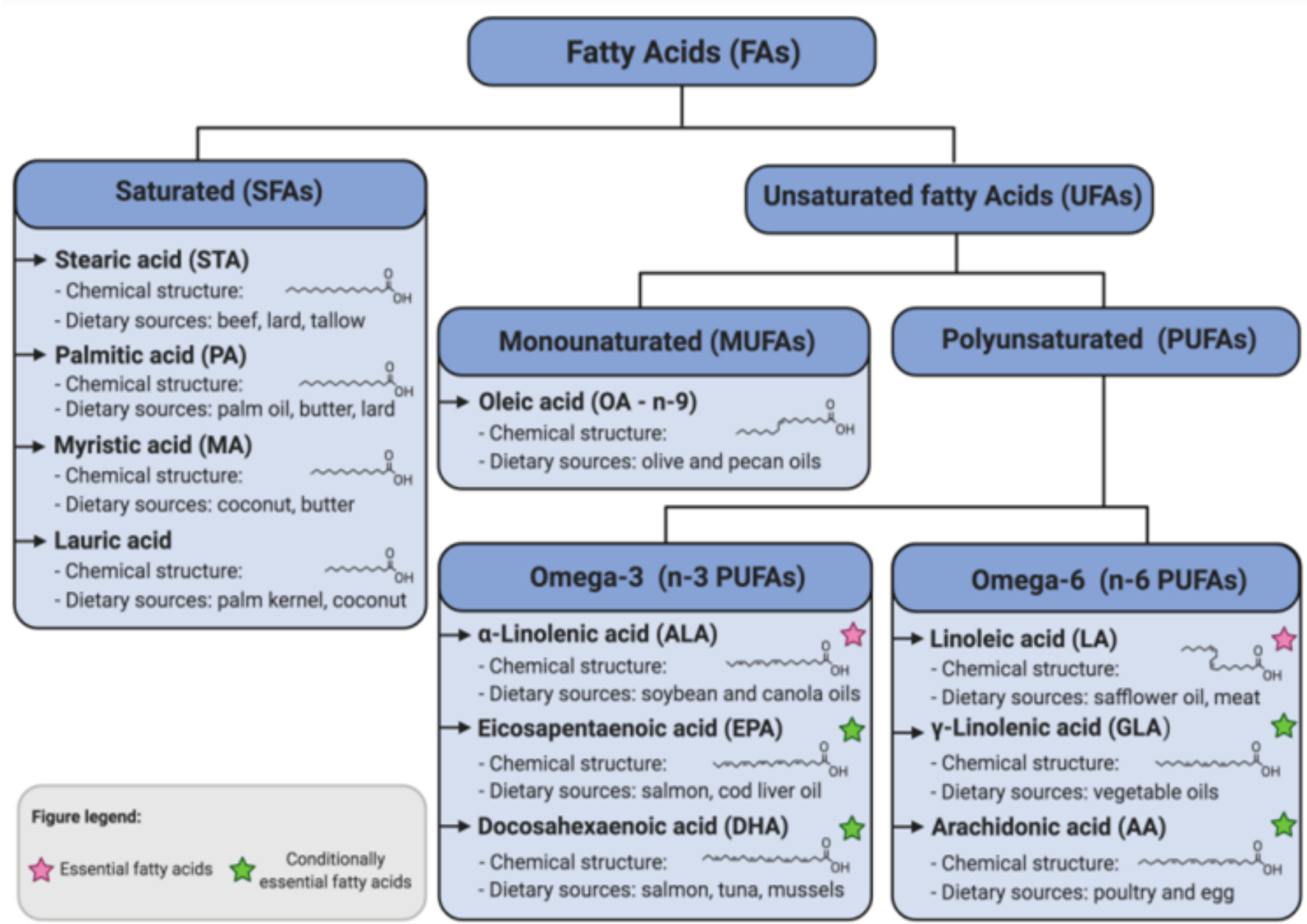
Ideal consumption of Macronutrients



57% of Fat is consumed in an Indian Household

Ryan-Harshman, M., & Aldoori, W. (2006). New dietary reference intakes for macronutrients and fibre. *Canadian family physician Medecin de famille canadien*, *52*(2), 177–179.

Classification of Fatty Acids



Radzikowska U, Rinaldi AO, Çelebi Sözener Z, Karaguzel D, Wojcik M, Cypryk K, Akdis M, Akdis CA, Sokolowska M. The influence of dietary fatty acids on immune responses. Nutrients. 2019 Dec 6;11(12):2990.

Essential Fatty Acids

The term essential fatty acids (EFA) must be provided by foods because these cannot be synthesized in the body.

Kaur N, Chugh V, Gupta AK. Essential fatty acids as functional components of foods- a review. J Food Sci Technol. 2014 Oct;51(10):2289-303. doi: 10.1007/s13197-012-0677-0. Epub 2012 Mar 21

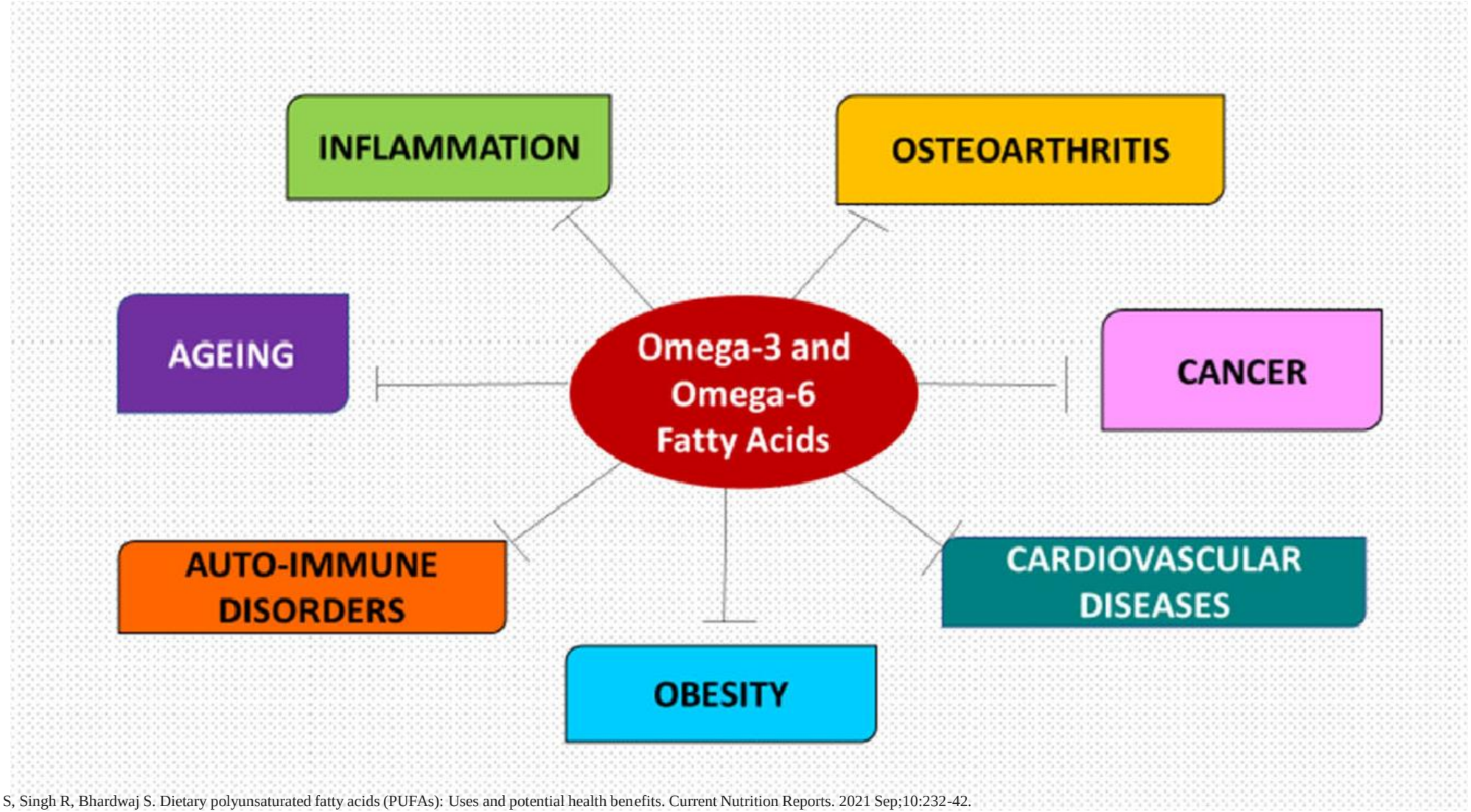
Adequate Intake (AI) for Omega-6 Fatty Acids

Life Stage	Age	Source	Males (g/day)	Females (g/day)
Infants	0-6 months	Omega-6 PUFA*	4.4	4.4
Infants	7-12 months	Omega-6 PUFA*	4.6	4.6
Children	1-3 years	LA#	7	7
Children	4-8 years	LA	10	10
Children	9-13 years	LA	12	10
Adolescents	14-18 years	LA	16	11
Adults	19-50 years	LA	17	12
Adults	51 years and older	LA	14	11
Pregnancy	all ages	LA	-	13
Breast-feeding	all ages	LA	-	13

*The various omega-6 polyunsaturated fatty acids (PUFA) present in human milk can contribute to the AI for infants. # LA, linoleic acid

Benefits of EFA

ω-3 and ω-6 fatty acids play significant roles against various disorders



Kapoor B, Kapoor D, Gautam S, Singh R, Bhardwaj S. Dietary polyunsaturated fatty acids (PUFAs): Uses and potential health benefits. Current Nutrition Reports. 2021 Sep;10:232-42.

Omega 3 (ALA, EPA, DHA)	Good Omega 6 (GLA)
Supplement Quality	
Susceptible to environmental pollution	• Herbs: susceptible to environmental pollution • Fermentation: NOT susceptible to environmental pollution
Functions	
• Anti-platelet aggregation • Vasodilation • Lowers bad lipid (LDL) • Mildly reduces inflammation	• Anti-platelet over aggregation • Vasodilation • Lowers bad lipid (LDL) and elevates good lipid (HDL) • Actively reduces inflammation • Advance elasticity and permeability of cell membrane
Therapeutic Uses	
• Improves cardiovascular health • Protects joints against inflammation • Promotes healthy skin, nails and hair • Adjunct for chemotherapy	• Improves cardiovascular health • Protects joints against inflammation • Promotes healthy skin, nails and hair • Adjunct for chemotherapy • Improves microcirculation • Relieves inflammatory responses (redness, swelling, pain, itchiness, dryness, burning sensation) • Alleviates pre-menstrual syndrome • Supports better nutrient absorption by increasing elasticity and permeability of cell membrane

Difference between Omega 3 and Omega 6 Fatty Acid

Cottonseed oil

Commonly used vegetable oil

Derived from the seeds of cotton plants

Processed, easily oxidized when exposed to high heat, light and air.

Refined to remove gossypol that works to protect the plant from insects.

Gossypol is a naturally occurring toxin in the seed's oil

Whole cotton seed contains about 15 to 20 % oil

Dr. Axe. (N.D.). Is cottonseed oil good or bad for you? What you need to know? Retrieved from https://draxe.Com/nutrition/cottonseed-oil/
Healthline. (N.D.). Cottonseed oil: benefits, side effects, and uses. Healthline. Retrieved from https://www.Healthline.Com/health/cottonseed-oil

Cottonseed oil- Gossypol

Gossypol is a phenolic compound

Acute clinical signs of gossypol poisoning include:

- Respiratory distress
- Impaired body weight gain
- Anorexia, weakness
- Apathy
- Death

Produced by pigment glands in cotton stems, leaves, seeds, and flower buds.

STUDY

Used as a contraceptive and seen as a threat to men's fertility

A 2006 study in Italy:

- **Proteinaceous diet inhibits gossypol**-induced "spermatotoxicity".
- Gossypol in cottonseed oil is not an effective contraceptive.
- If combined with most proteins, gossypol no longer causes infertility.
- Gossypol still has toxins that decrease spermatogenesis and sperm motility in men.

Review Article

Cottonseed Oil as Health Oil

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ABSTRACT

There are varieties of cooking oil and fat available today and the claims made by them are, at best, confusing. On one side are the traditional ghee, mustard oil, coconut oil, and gingelly oil. Then, there are the used-for-decades vanaspati and groundnut oil, as well as the relatively newer kinds of vegetable oil ranging from cottonseed, sunflower, safflower, corn, canola, soybean, and palm to various blends. In particular, cottonseed oil performs better than other oil as it lasts a long time and stores well by withstanding higher temperature for food items due to its high antioxidant content. For instance, chips and snacks fried in cottonseed oil may maintain a longer shelf life. It is a good option for preparing healthier foods. The purpose of this paper is to highlight the value of addition cottonseed oil in the food industry and presents an insight into other contemporary edible oil. It is important to note that buying the right oil for health has become a big deal.

ScientificWorldJournal. 2014;2014:231635. doi: 10.1155/2014/231635. Epub 2014 May 6.

Gossypol toxicity from cottonseed products

Ivana Cristina N Gadelha [1], Nayanna Brunna S Fonseca [1], Silvia Catarina S Oloris [2], Marília M Melo [3], Benito Soto-Blanco [3]

Affiliations + expand

PMID: 24895646 PMCID: PMC4033412 DOI: 10.1155/2014/231635
Free PMC article

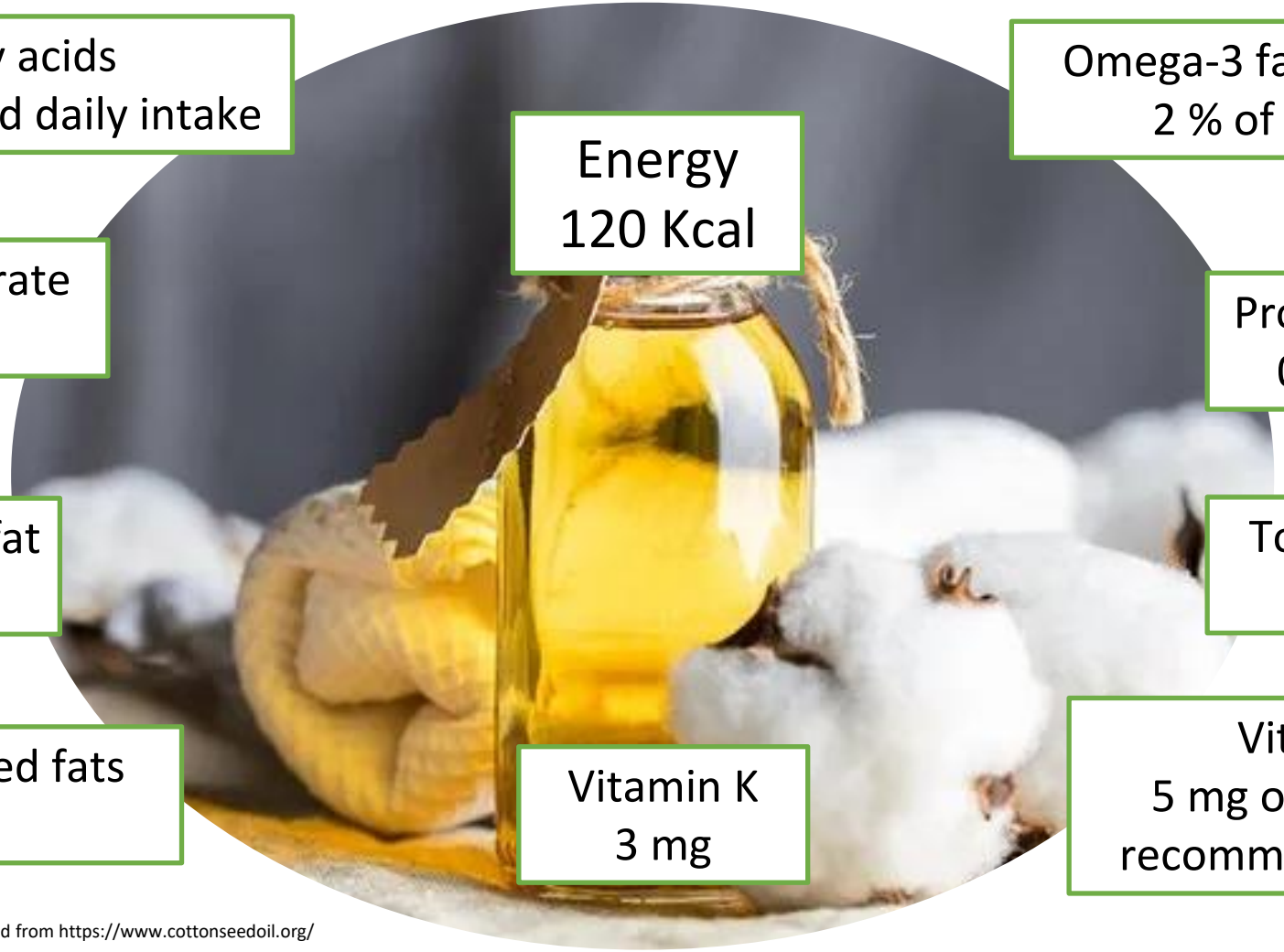
Abstract

Gossypol is a phenolic compound produced by pigment glands in cotton stems, leaves, seeds, and flower buds (Gossypium spp.). Cottonseed meal is a by-product of cotton that is used for animal feeding because it is rich in oil and proteins. However, gossypol toxicity limits cottonseed use in animal feed. High concentrations of free gossypol may be responsible for acute clinical signs of gossypol poisoning which include respiratory distress, impaired body weight gain, anorexia, weakness, apathy, and death after several days. However, the most common toxic effects is the impairment of male and female reproduction. Another important toxic effect of gossypol is its interference with immune function, reducing an animal's resistance to infections and impairing the efficiency of vaccines. Preventive procedures to limit gossypol toxicity involve treatment of the cottonseed product to reduce the concentration of free gossypol with the most common treatment being exposure to heat. However, free gossypol can be released from the bound form during digestion. Agronomic selection has produced cotton varieties devoid of glands producing gossypol, but these varieties are not normally grown because they are less productive and are more vulnerable to attacks by insects.

Cottonseed Oil as Health Oil Savanam Chandra Sekhar, 2011.
Gossypol Toxicity from Cottonseed Products, Ivana Cristina N. Gadelha, 2014.

Nutritional Facts

1 serving - 1 tbsp (15 ml)



Omega-6 fatty acids
58 % of recommended daily intake

Omega-3 fatty acids
2 % of RDA

Energy
120 Kcal

Carbohydrate
3 mg

Protein
0 g

Saturated fat
3.5 g

Total fat
14 g

Polyunsaturated fats
7 grams

Vitamin K
3 mg

Vitamin E
5 mg or 32 % daily recommended intake

Cottonseed Oil Organization. (n.d.). Home - Cottonseed Oil. Retrieved from https://www.cottonseedoil.org/

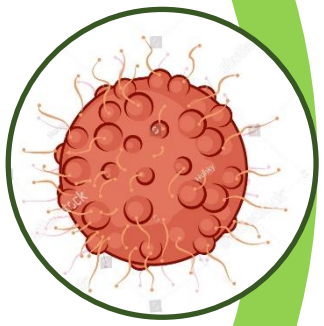
Health Benefits of Cottonseed Oil

Anticancer effect

Anticancer effect

Contains vitamin E- A potent antioxidant that helps protect cells from damage caused by free radicals.

Reduce oxidative stress and inhibits the development of cancer.



Suppress cancer cell growth that are resistant to multiple drugs.

Reduces tumor growth and slows or kills prostate cancer cell lines.

Rich in polyunsaturated fatty acids, including linoleic acid and alpha-linolenic acid.

Potential protective effects against breast cancer as gossypol retains toxicity towards cancerous cells

Riaz, T., Iqbal, M. W., Mahmood, S., et. al ,(2023). Cottonseed oil: A review of extraction techniques, physicochemical, functional, and nutritional properties. *Critical reviews in food science and nutrition*, *63*(9), 1219–1237. https://doi.org/10.1080/10408398.2021.1963206

Lowers inflammation

Mono unsaturated fatty acids

- Contains 18 percent monounsaturated fat.
- It reduces inflammation
- Significantly lower levels of inflammatory chemicals in their blood.

Omega 6 fatty acid

- Rich in omega-6 fatty acid
- Linoleic acids are precursors for the production of eicosanoids.
- Signaling molecules involved in inflammation regulation.

Lower Levels of Pro inflammatory Fats

- Used as a replacement for trans fats or saturated fats.
- The body experiences less inflammation by eliminating or reducing the intake of these unhealthy fats.

Riaz, T., Iqbal, M. W., Mahmood, S., et. al ,(2023). Cottonseed oil: A review of extraction techniques, physicochemical, functional, and nutritional properties. *Critical reviews in food science and nutrition*, *63*(9), 1219–1237. https://doi.org/10.1080/10408398.2021.196320

Wound Healing

Moisturizing properties

- High levels of linoleic acid.
- Maintains skin moisture, creating an optimal environment for wound healing.

Antioxidant activity

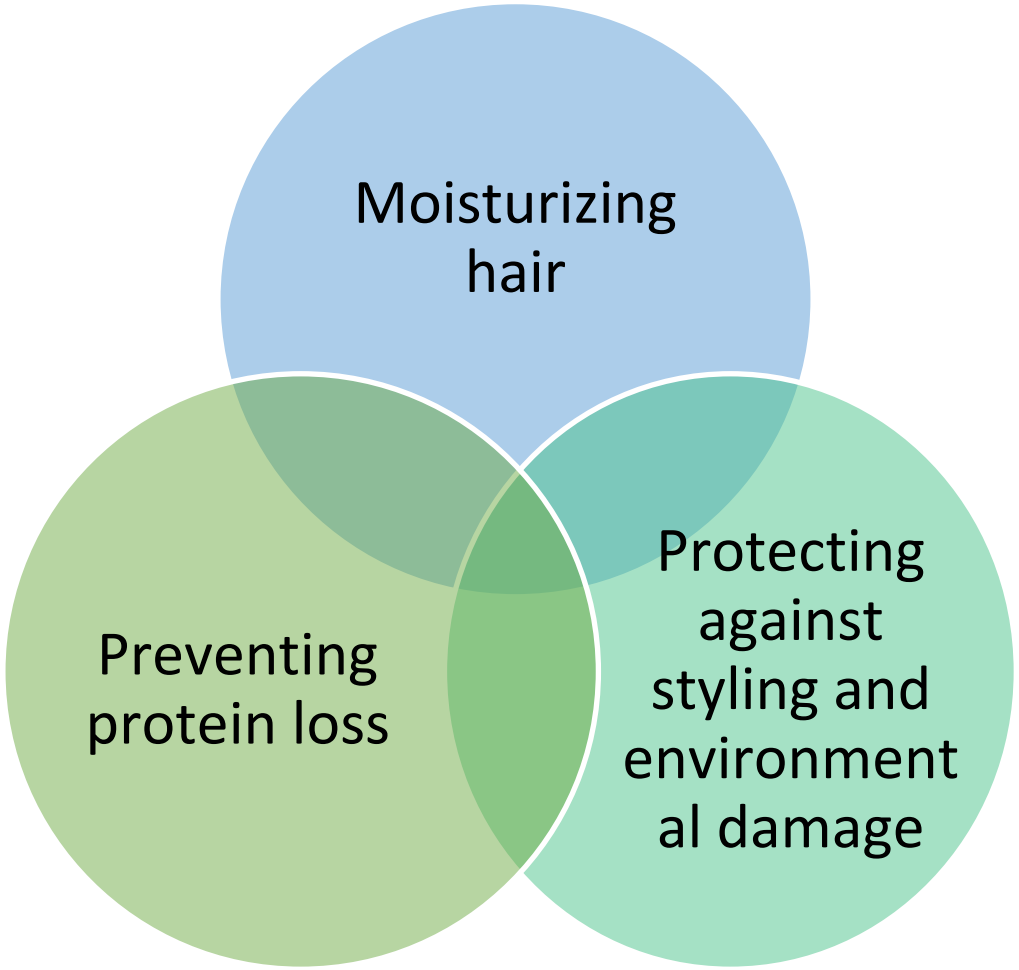
- Contains antioxidants- Vitamin E.
- neutralizes harmful free radicals, which can hinder the wound healing process.

Anti inflammatory property

- Contains natural compounds- Tocopherols and phytosterols
- Reduces inflammation is crucial for proper wound healing.

Riaz, T., Iqbal, M. W., Mahmood, S., et. al ,(2023). Cottonseed oil: A review of extraction techniques, physicochemical, functional, and nutritional properties. *Critical reviews in food science and nutrition*, *63*(9), 1219–1237. https://doi.org/10.1080/10408398.2021.196320

Hair Growth



Healthline. (n.d.). Cottonseed Oil: Benefits, Side Effects, and Uses. Healthline. https://www.healthline.com/health/cottonseed-oil#benefits

Improves Skin Health

Moisturization

- Help to hydrate and soften the skin.
- Preventing moisture loss and maintaining skin hydration.

Vitamin E content

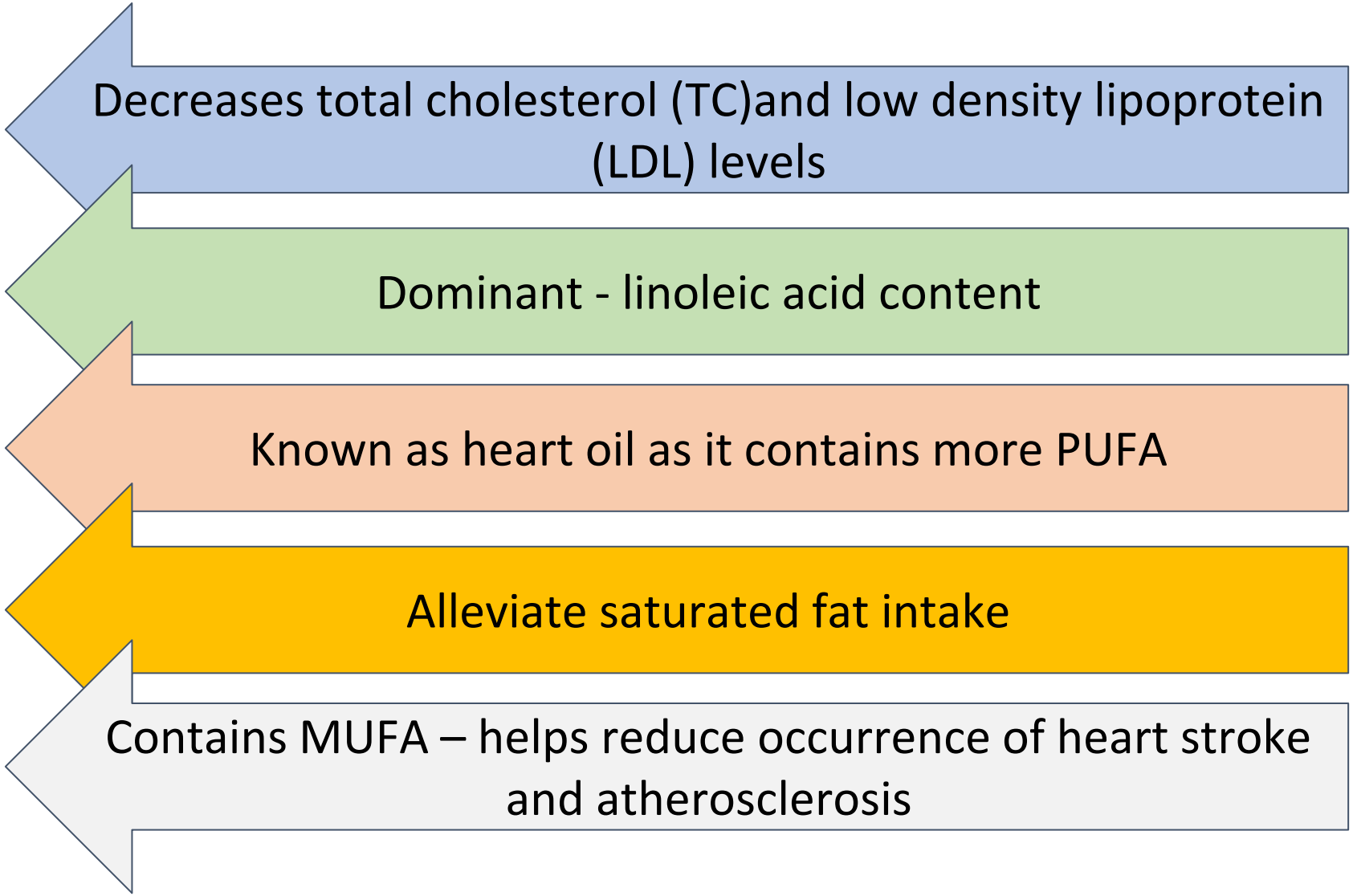
- Helps protect the skin from damage caused by free radicals.
- Reducing inflammation, promoting healing

Omega 6 fatty acid

- Particularly linoleic acid.
- Help to retain moisture, improve skin elasticity

Healthline. (n.d.). Cottonseed Oil: Benefits, Side Effects, and Uses. Healthline. https://www.healthline.com/health/cottonseed-oil#benefits

Improves Cardiovascular Diseases



Riaz, T., Iqbal, M. W., Mahmood, S., et. al ,(2023). Cottonseed oil: A review of extraction techniques, physicochemical, functional, and nutritional properties. *Critical reviews in food science and nutrition*, *63*(9), 1219–1237. https://doi.org/10.1080/10408398.2021.196320

Research Studies

A 5-day high-fat diet rich in cottonseed oil improves cholesterol profiles and triglycerides compared to olive oil in healthy men.

Method -

1. 15 normal-weight men
2. 2 controlled feeding trials (3-day lead-in diet, pre-diet visit, 5-day CSO (cottonseed oil)- or OO (olive oil)-rich diet, post-diet visit).
3. The 5-day diets (50% fat) were rich in either CSO or OO.
4. At pre- and post-diet visits, subjects consumed test meals rich in the oil that coincided with their 5-day diet, and blood draws were performed.

Results -

- **Fasting total cholesterol, low-density lipoprotein cholesterol**, and triglycerides (TG) **were lower following CSO** diet intervention.
- **High-density lipoprotein cholesterol increased** and **Postprandial TGs** were **lower** following the CSO diet intervention.

Randomized Controlled Trial > Nutr Res. 2018 Dec;60:43-53. doi: 10.1016/j.nutres.2018.09.001. Epub 2018 Sep 9.

A 5-day high-fat diet rich in cottonseed oil improves cholesterol profiles and triglycerides compared to olive oil in healthy men

Kristine R Polley [1], Natalie J Oswell [2], Ronald B Pegg [2], Chad M Paton [3], Jamie A Cooper [4]

Affiliations + expand

PMID: 30527259 DOI: 10.1016/j.nutres.2018.09.001

Abstract

Modifying dietary fat composition is important for minimizing cardiovascular disease risk. The purpose of this study was to determine the effects of a 5-day, high-fat diet rich in cottonseed oil (CSO) or olive oil (OO) on lipid profiles. Based on previous human and animal models, we hypothesized that the CSO-rich diet would lead to lower fasting and postprandial lipid levels, whereas the OO-rich diet would not significantly change lipid levels in 5 days. Fifteen normal-weight men completed a randomized crossover design with 2 controlled feeding trials (3-day lead-in diet, prediet visit, 5-day CSO- or OO-rich diet, postdiet visit). The 5-day diets (50% fat) were rich in either CSO or OO. At pre- and postdiet visits, subjects consumed test meals rich in the oil that coincided with their 5-day diet, and blood draws were performed. Fasting total cholesterol, low-density lipoprotein cholesterol, and triglycerides (TG) were lower following CSO diet intervention (total cholesterol: 148.40 ± 6.39 to 135.93 ± 6.31 mg/dL; low-density lipoprotein cholesterol: 92.20 ± 5.57 to 78.13 ± 5.60 mg/dL; TG: 80.11 ± 4.91 to 56.37 ± 5.46 mg/dL for pre- to postdiet, respectively; $P < .05$). High-density lipoprotein cholesterol increased following CSO diet intervention (46.67 ± 2.41 to 50.24 ± 2.20 mg/dL for pre- to postdiet, respectively; $P < .05$). Postprandial TGs were lower following CSO diet (area under the curve of 954.28 ± 56.90 vs

Kristine R. Polley, Natalie J. Oswell, Ronald B. Pegg, Chad M. Paton, Jamie A. Cooper, A 5-day high-fat diet rich in cottonseed oil improves cholesterol profiles and triglycerides compared to olive oil in healthy men,Nutrition Research, Volume 60, 2018, Pages 43-53, https://doi.org/10.1016/j.nutres.2018.09.001

Blood Lipid Responses to Diets Enriched with Cottonseed Oil Compared With Olive Oil in Adults with High Cholesterol in a Randomized Trial.

Method -

1. 43 men and women with hypercholesterolemia.
2. 8-week partial outpatient feeding intervention.
3. Meals and snacks (~60% of their daily energy needs, with 30% of energy needs from either CSO (n = 21) or OO (n = 22).
4. At pre- and post diet intervention visits, participants consumed a high-SFA meal.
5. fasting cholesterol profiles and postprandial blood lipids and glycemic markers were assessed over a 5-hour period.

Results -

- **Greater reductions** from **baseline to week 8 in fasting serum total cholesterol, LDL cholesterol, non-HDL cholesterol, and apoB** in CSO compared with OO and **increase HDL cholesterol**.
- **Decreases in the TC: HDL**-cholesterol ratio.

Randomized Controlled Trial > J Nutr. 2022 Sep 6;152(9):2060-2071. doi: 10.1093/jn/nxac099.

Blood Lipid Responses to Diets Enriched with Cottonseed Oil Compared With Olive Oil in Adults with High Cholesterol in a Randomized Trial

M Catherine Prater [1], Alexis R Scheurell [1], Chad M Paton [1 2], Jamie A Cooper [1]

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PMID: 35511204 PMCID: PMC9449680 DOI: 10.1093/jn/nxac099

Free PMC article

Abstract

Background: Increasing unsaturated fat intake is beneficial for cardiovascular health, but the type of unsaturated fat to recommend remains equivocal.

Objectives: We investigated the effects of an 8-week diet intervention that was rich in either cottonseed oil (CSO; PUFA rich) or olive oil (OO; MUFA rich) on blood lipids in hypercholesterolemic adults.

Methods: Forty-three men and women with hypercholesterolemia (53 ± 10 years; BMI, 27.6 ± 4.8 kg/m2) completed this randomized parallel clinical trial consisting of an 8-week partial outpatient feeding intervention. Participants were given meals and snacks accounting for ~60% of their daily energy needs, with 30% of energy needs from either CSO (n = 21) or OO (n = 22). At pre- and postdiet intervention visits, participants consumed a high-SFA meal (35% of total energy needs; 70% of energy from fat). The primary outcomes of fasting cholesterol profiles and secondary outcomes of postprandial blood lipids and glycemic markers were assessed over a 5-hour period.

M Catherine Prater et. al., Blood Lipid Responses to Diets Enriched with Cottonseed Oil Compared With Olive Oil in Adults with High Cholesterol in a Randomized Trial, The Journal of Nutrition, Volume 152, Issue 9, September 2022, Pages 2060–2071, https://doi.org/10.1093/jn/nxac099

Effects of Dietary Cottonseed Oil and Cottonseed Meal Supplementation on Liver Lipid Content, Fatty Acid Profile and Hepatic Function in Laying Hens

Method -

1. 3 × 3 factorial arrangement using **corn–soybean-meal-based** diets.
2. Diets supplemented with different levels of cottonseed oil (0%, 2%, or 4% CSO) containing CPFAs and cottonseed meal (0%, 6%, or 12% CSM) containing FG (free gossypol).

Result-

- **Overall increase in fatty acid saturation** and an **overall significant decrease** ($p < 0.05$) in **monounsaturated fatty acids** (MUFAs).

Conclusion –

- Supplementation of CSO, which contains 0.20% CPFAs, was the primary **cause of alteration in fatty acid composition** and cholesterol content in hens.

› Animals (Basel). 2021 Jan 4;11(1):78. doi: 10.3390/ani11010078.

Effects of Dietary Cottonseed Oil and Cottonseed Meal Supplementation on Liver Lipid Content, Fatty Acid Profile and Hepatic Function in Laying Hens

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PMID: 33406775 PMCID: PMC7824706 DOI: 10.3390/ani11010078

Free PMC article

Abstract

Antinutrients, such as cyclopropene fatty acids (CPFAs) and free gossypol (FG), present together in cottonseed have caused numerous adverse effects on liver health and egg quality of laying hens, which are both likely to be related to a disturbance in lipid metabolism. This experiment employed a 3 × 3 factorial arrangement using corn-soybean-meal-based diets supplemented with different levels of cottonseed oil (0%, 2%, or 4% CSO) containing CPFAs and cottonseed meal (0%, 6%, or 12% CSM) containing FG to elucidate the effects of them or their interaction on fatty acid profile, lipid content, and liver health of laying hens. An overall increase in fatty acid saturation and an overall significant decrease ($p < 0.05$) in monounsaturated fatty acids (MUFAs) were shown in the livers of hens fed diets with either 2% or 4% CSO. Meanwhile, the concentration of liver cholesterol, serum cholesterol, and serum LDL-c of hens fed a diet supplemented with a high level of CSO (4%) were noticeably increased ($p < 0.05$). Even though the supplementation of 4% CSO in diets aroused beneficial influences on liver function, a high level of CSO inclusion in laying hens' diets is not recommended due to its hypercholesterolemia effect. In conclusion, supplementation of CSO, which contains 0.20% CPFAs, was the primary cause of alteration in fatty acid composition and cholesterol content in hens, while no

Yang, A., Zhang, C., Zhang, B., Wang, Z., Zhu, L., Mu, Y., Wang, S., & Qi, D. (2021). Effects of Dietary Cottonseed Oil and Cottonseed Meal Supplementation on Liver Lipid Content, Fatty Acid Profile and Hepatic Function in Laying Hens. , 2020. Animals : an open access journal from MDPI, 11(1), 78. https://doi.org/10.3390/ani11010078

Physicochemical features, functional characteristics, and health benefits of cottonseed oil.

Aim and objective –
To demonstrate an overview of the physicochemical and functional properties of cottonseed oil to promote health benefits associated with the use of this oil.

Result and **Conclusion** - Cottonseed oil plays a role in cardiovascular diseases, anti-allergic response, anticancer activity, and antioxidant activity.

Review > Braz J Biol. 2021 Aug 9;82:e243511. doi: 10.1590/1519-6984.243511. eCollection 2021.

Physicochemical features, functional characteristics, and health benefits of cottonseed oil: a review

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PMID: 34378680 DOI: 10.1590/1519-6984.243511

Free article

Abstract

Vegetable oils have their specific physicochemical properties due to which they are playing vital role in human nutritional diet for health benefits. Cottonseed oil is obtained from various species of cotton seeds that are famous to be grown mainly for their fiber quality. The most prominently used specie is Gossypium hirsutum. It is obvious that the seeds of different variety of cotton vary as grown in diverse agroclimatic conditions with respect to oil, fats and protein contents. Cottonseed oil is routinely used for cooking and food manufacturing products. Cottonseed oil obtained after proper extraction/processing steps from crude state to refined oil in a variety of ways. Cotton crop is considered for their dual-use purpose, for fiber quality and oil production to promote health benefits in the world. Keeping in view the above facts, this review clearly demonstrated an overview about physicochemical and functional properties of cottonseed oil to promote health benefits associated with the use of this oil. The overall characteristics and all concerned health benefits of CSO will further improve their usefulness is a compact way. We have summarized a brief multi-dimensional features of CSO in all aspects up to the best of our knowledge for the end researchers who can further research in the respective aspect.

https://www.scielo.br/j/bjb/a/yQYp7FmKD5bbJzMqxm3Zs6x/

Effects of cottonseed oil (Gossypium Spp.) and cottonseed meal on estrous cycle, ovulation and histoarchitecture of female reproductive organs of adult cyclic Sprague-Dawley rats

- Regular 4-day adult cyclic female Sprague-Dawley rats
- Daily **Vaginal smears** were taken between **8-9 am**.

Group A (5 Rats each group)	experimental	**1.5mls/kg body weight of industrially extracted "refined" cottonseed oil-Sunola**
Group B	experimental	**2mls/kg body weight of finely grounded whole cottonseed powder**
Group C	control	**locally extracted "crude" cottonseed oil.**

- **Six each estrous cycles were monitored before and during the administration** of the test substances.
- Another six cycles were studied **after the withdrawal** of the test substances.
- Effects of the test substances on ovulation were also studied by administering the test substances on the morning of proestrous and counting the number of ova shed on estrous.

Result-

- **Varying degrees of variation** from the expected **2:1:1 ratio** of the number of **diestrous: proestrous: estrous** days were noticed.
- The variation was **greatest in group B animals.**
- **Ovulation was completely blocked** in animals **treated with locally extracted "crude" cottonseed oil** (Group C).

Effects of cottonseed oil (Gossypium Spp.) and cottonseed meal on estrous cycle, ovulation and histoarchitecture of female reproductive organs of adult cyclic Sprague-Dawley rats

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DOI: 10.4314/njhbs.v5i1.11568

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Section
Articles

Abstract

Experiments were conducted to determine the effects of various forms of cottonseed oil (whole Cottonseed, "Refined" industrially extracted Cottonseed oil and "Crude" locally extracted Cottonseed oil) on the Estrous cycle and Ovulation, and Histoarchitecture of female reproductive organs. Regular 4-day adult cyclic female Sprague-Dawley rats were divided into four groups; three experimental and one control of five rats each. Group A rats were fed with 1.5mls/kg body weight of industrially extracted "refined" cottonseed oil-Sunola®. Group B with 2mls/kg body weight of finely grounded whole cottonseed powder, while same number of animals in group C were fed with locally extracted "crude" cottonseed oil. Daily Vaginal smears were taken between 8-9am. Six estrous cycles were monitored before administration of the test substances, another six cycles were monitored during the periods the

Cottonseed oil alleviates ischemic stroke injury by inhibiting the inflammatory activation of microglia and astrocyte

Methods-

- Adult **male rats** with CSO for **3 weeks**.
- Measured the **neurological scores, infarction volume, neuronal injury, and brain edema, levels of pro-inflammatory cytokines, degree of microglial and astrocytic activation.**

Results-

CSO treatment significantly improved:

- **Neurological deficit**
- **Reduced infarction volume**
- **Alleviated neuronal injuries, blood-brain barrier (BBB) disruption, and brain edema.**
- Decreased the number of c3d/glial fibrillary acidic protein (gfap)-positive cells and c3d protein expression
- Increased the number of S100A10/gfap-positive cells and S100A10 protein expression.

Conclusion-

- CSO treatment alleviated ischemic stroke injury
- Reducing microglial and astrocytic activation and inflammation.
- CSO could be a **new strategy in the prevention of ischemic stroke.**

› J Neuroinflammation. 2020 Sep 11;17(1):270. doi: 10.1186/s12974-020-01946-7.

Cottonseed oil alleviates ischemic stroke injury by inhibiting the inflammatory activation of microglia and astrocyte

Min Liu [1], Zhipeng Xu [1], Long Wang [1], Lixia Zhang [2], Yi Liu [1], Jiangbei Cao [1], Qiang Fu [1], Yanhong Liu [1], Hao Li [1], Jingsheng Lou [1], Wugang Hou [3], Weidong Mi [4], Yulong Ma [5]

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PMID: 32917229 PMCID: PMC7488511 DOI: 10.1186/s12974-020-01946-7

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Abstract

Background: Ischemic stroke is the second leading cause of death globally. The narrow time window for administering effective thrombolytic therapy motivates the search for alternative prevention strategies. Microglia and astrocyte activation-mediated inflammation play a pivotal role in ischemic stroke injury. Cottonseed oil (CSO) has been shown to exert anti-inflammatory effects against peripheral tissue injury, although CSO is mostly used as a solvent for lipid-soluble drugs. However, the role of CSO in neuroprotection against stroke has not been previously reported.

Methods: We treated adult male rats with CSO (1.3 ml/kg, subcutaneous injection, once every other day for 3 weeks) and then constructed a middle cerebral artery occlusion (MCAO) model followed by 24 h of reperfusion. Then, we measured the neurological scores, infarction volume, neuronal injury, and brain edema; we also measured the levels of pro-inflammatory cytokines (IL-1β, IL-6, TNF-α), degree of microglial and astrocytic activation, protein expression levels of Toll-like receptor 4 (TLR4), nuclear factor kappa B (NF-κB), C3d and S100A10, and the presence of A1 type astrocytes and A2 type astrocytes.

Cottonseed oil alleviates ischemic stroke injury by inhibiting the inflammatory activation of microglia and astrocyte, Min Liu, Zhipeng Xu, Long Wang, 11th September, 2020.

Cottonseed Oil Protects Against Intestinal Inflammation in Dextran Sodium Sulfate-Induced Inflammatory Bowel Disease

Dietary products may protect against inflammatory bowel disease (IBD) by **forming gut microbiota structures and providing substrates for microbial metabolism.**

Aim-

To assess the efficacy of dietary oils in treating IBD, we examined the protective effects of **olive oil, coconut oil, corn oil, and cottonseed oil in a dextran sodium sulfate (DSS)-induced colitis mouse model.**

Treatment with cottonseed oil or corn oil:

- **Ameliorated the severity of DSS-induced colitis**
- **Alleviating weight loss**
- **Preventing the shortening of the intestine**
- **Reduced the expression of inflammatory cytokines (tumor necrosis factor-*α*, interleukin (il)-1*β*, IL-6, and IL-17.**
- **Reduced expression of oxidative stress markers (8-hydroxyguanosine and nitrotyrosine in colon sections).**

Conclusion-

- Cottonseed oil **protects against intestinal inflammation.**
- **Inhibited intestinal fibrosis** by **reducing the expression of *α*-smooth muscle actin** and **type i collagen**
- **Development of intestinal fibrosis** by **reducing inflammatory cytokines and oxidative stress markers.**

J Med Food. 2019 Jul;22(7):672-679. doi: 10.1089/jmf.2018.4323. Epub 2019 May 21.

Cottonseed Oil Protects Against Intestinal Inflammation in Dextran Sodium Sulfate-Induced Inflammatory Bowel Disease

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Abstract

Dietary products may protect against inflammatory bowel disease (IBD) through mechanisms such as forming gut microbiota structures and providing substrates for microbial metabolism. Recently, many studies have been conducted on diets that potentially alleviate or suppress IBD development. To assess the efficacy of dietary oils in treating IBD, we examined the protective effects of olive oil, coconut oil, corn oil, and cottonseed oil in a dextran sodium sulfate (DSS)-induced colitis mouse model. Treatment with cottonseed oil or corn oil ameliorated the severity of DSS-induced colitis, alleviating weight loss and preventing the shortening of the intestine. Moreover, cottonseed oil or corn oil treatment significantly reduced the expression of inflammatory cytokines such as tumor necrosis factor-α, interleukin (IL)-1β, IL-6, and IL-17, as well as the expression of oxidative stress markers, including 8-hydroxyguanosine and nitrotyrosine in colon sections, compared with vehicle treatment. Cottonseed oil treatment inhibited intestinal fibrosis by reducing the expression of α-smooth muscle actin and type I collagen, compared with vehicle treatment in mice with DSS-induced colitis. Cottonseed oil protects against intestinal inflammation and the development of intestinal fibrosis by reducing inflammatory cytokines and oxidative stress markers, and may therefore be useful as a dietary product with therapeutic benefits for IBD.

Refined cottonseed oil as a replacement for soybean oil in broiler diet

Method-

- 180 chickens
- One treatment was the basal diet (control)
- Four experimental diets were formulated from the basal diet by replacing SBO with refined CSO.
- At the end of week 6- blood samples were obtained from **jugular vein and the breast muscle.**

Results-

Substitution of CSO for low-level SBO had **no significant effect** on broiler performance during the starter period (week 1–3), while **50% level of CSO inclusion significantly increased** ADG and **improved FCR** during the finisher period (week 4–6). Broilers fed **100% cso diets had lower** levels of:

- **Serum total protein (TP)**
- **Albumin (ALB)**
- **Cholesterol (CHO) concentrations**
- **Serum alkaline phosphatase (AKP) activity**
- **Serum antioxidant status enhanced** by CSO.

Conclusion-

SBO could be replaced with refined CSO up to 50% in diets for broilers without adversely affecting the performance, liver functions, and breast muscle fatty acid composition of these broilers.

› Food Sci Nutr. 2019 Feb 5;7(3):1027-1034. doi: 10.1002/fsn3.933. eCollection 2019 Mar.

Refined cottonseed oil as a replacement for soybean oil in broiler diet

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PMID: 30918645 PMCID: PMC6418425 DOI: 10.1002/fsn3.933

Free PMC article

Abstract

With the shortage of common vegetable fat sources, such as soybean oil (SBO), it is urgent to find alternative oil sources for broiler producers. The objective of this study was to evaluate the potential of refined cottonseed oil (CSO) as a replacement for SBO in broiler diets. A total of 180 chickens at 1 d of age were randomly assigned to five treatments of six replicates. One treatment was the basal diet (control), and the other four experimental diets were formulated from the basal diet by replacing (w/w) 25%, 50%, 75%, and 100% of the SBO with refined CSO (only containing 0.2% cyclopropenoid fatty acids, and no free gossypol was detected). At the end of week 6, blood samples were obtained from the jugular vein and the breast muscle was aseptically isolated from two birds per replicate. The results showed that substitution of CSO for low-level SBO had no significant effect ($p > 0.05$) on broiler performance during the starter period (week 1-3), while 50% level of CSO inclusion significantly increased ($p < 0.05$) ADG and improved FCR compared with the control group during the finisher period (week 4-6). Broilers fed 100% CSO diets had lower ($p < 0.05$) levels of serum total protein (TP), albumin (ALB), cholesterol (CHO) concentrations, and serum alkaline phosphatase (AKP) activity than that of the control broilers. Furthermore, the serum antioxidant status appeared to be enhanced by CSO. Additionally, high levels of CSO (75 and 100%) significantly increased the proportions of C14:0 and C18:0 but decreased the proportions of C18:1n9t, C18:2n6c, and ∑ n-6 polyunsaturated fatty acids

NMR-based metabolomics reveals tissue metabolic responses to tetramethoxy gossypol in cottonseed oil

Results-

- Endogenous low-molecular-weight metabolites in rat liver, heart, spleen, kidney and lung tissues were profiled by ^{1}H NMR spectroscopy.
- Metabolic profiles in **liver samples were greatly changed after TMG** administration. Twenty significantly changed liver metabolites were screened out which were closely related to amino acid, glutathione, energy, and lipid metabolism.

Conclusion-

Concerning the potential chronic exposure to TMG in cottonseed oil and other cottonseed products, the cumulative **effects of dietary TMG on tissues, especially the liver, should be noted when improving the quality control standard of cottonseed oil.**

J Sci Food Agric. 2022 Oct;102(13):6169-6174. doi: 10.1002/jsfa.12115. Epub 2022 Jul 22.

NMR-based metabolomics reveals tissue metabolic responses to tetramethoxy gossypol in cottonseed oil

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Affiliations + expand

PMID: 35808803 DOI: 10.1002/jsfa.12115

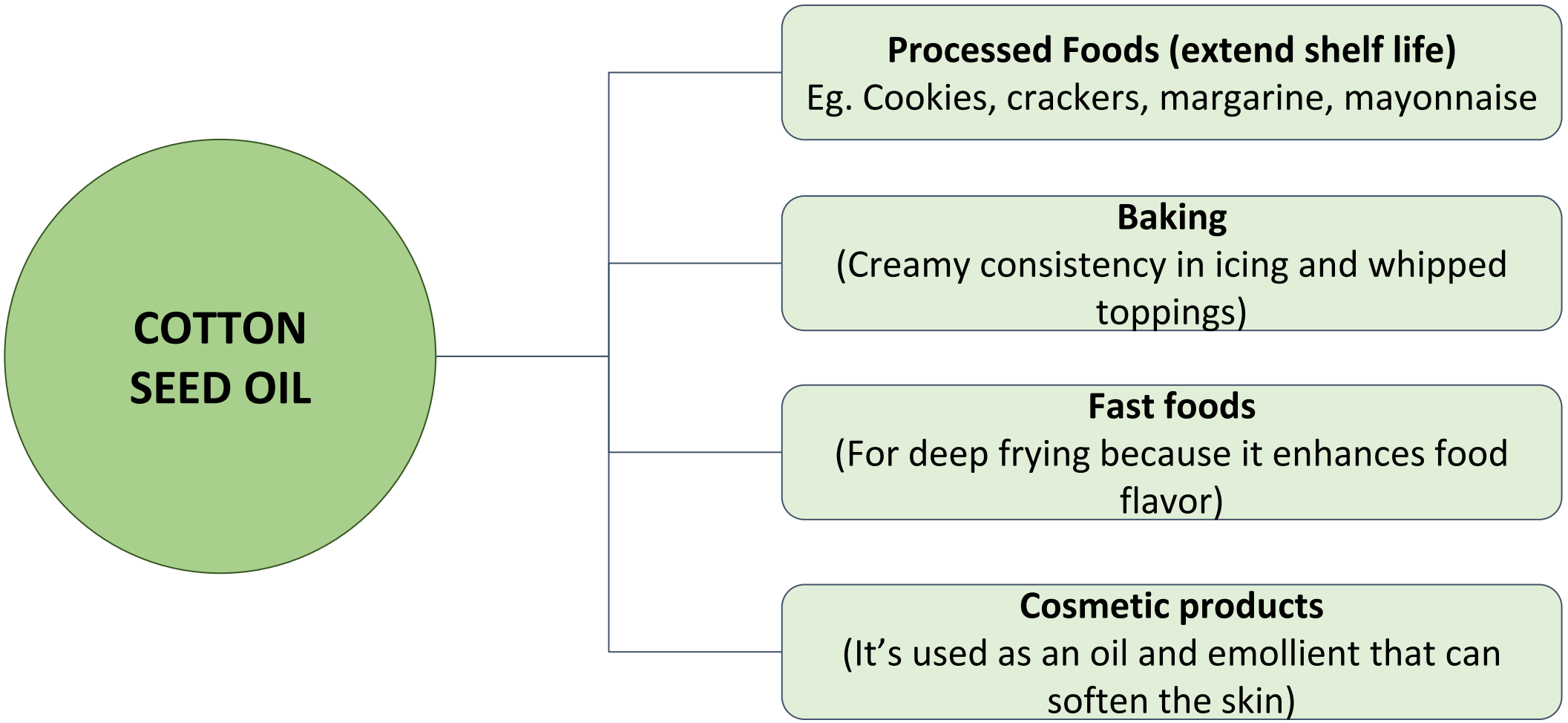
Abstract

Background: Cottonseed oil is one of the most widely consumed cooking oils because of its high nutritional benefits and relatively low price. The present study evaluated the effects of tetramethoxy gossypol (TMG), a rarely reported degradation product of free gossypol produced in crudely extracted cottonseed oil, on the metabolic responses of liver, heart, spleen, kidney and lung tissues in rats using proton nuclear magnetic resonance (^{1}H NMR) spectroscopy combined with chemometric and bioinformatics techniques.

Results: Endogenous low-molecular-weight metabolites in rat liver, heart, spleen, kidney and lung tissues were profiled by ^{1}H NMR spectroscopy. The unsupervised principal components analysis and the supervised orthogonal partial least squares discriminant analysis revealed that the metabolic profiles in liver samples were greatly changed after TMG administration. Twenty significantly changed liver metabolites were screened out and further evaluated by receiver operating characteristic curve analysis, which were closely related to amino acid, glutathione, energy and lipid metabolism.

Conclusion: Concerning the potential chronic exposure to TMG in cottonseed oil and other cottonseed products, the cumulative effects of dietary TMG on tissues, especially the liver, should be noted when improving the quality control standard of cottonseed oil.

Uses



Dr. Axe. (n.d.). Is Cottonseed Oil Good or Bad for You? What You Need to Know? Retrieved from https://draxe.com/nutrition/cottonseed-oil/
Healthline. (n.d.). Cottonseed Oil: Benefits, Side Effects, and Uses. Healthline. Retrieved from https://www.healthline.com/health/cottonseed-oil

Food Applications

Edible oil in commercial and home cooking - cooking oil, frying and baking; margarines.

Rich in Unsaturated fatty acid content, non-oily consistency, high smoke point (232.2 °C).

Deep-fat frying oil improves the shelf life of food products.

Combination of inter esterified canola oil and fully hydrogenated cottonseed oil is used to produce healthy margarine.

Provides buttery or nutty taste, mouthfeel, and storage stability to fried snack products.

Blending of cotton seed oil with palm oil is used during deep-frying of frozen French fries.

Kumar, Manoj & Zhang,et. al, (2022). Cottonseed Oil: Extraction, Characterization, Health Benefits, Safety Profile, and Application. Food Analytical Methods. 10.1007/s12161-022-02410-3.

Myths

Myth 1: Cottonseed oil is bad for Health

- Cotton seed oil is rich in antioxidants.
- Other beneficial fats such as oleic acid and linoleic acid
- Relatively healthy choice for cooking.

Myth 2: Cotton seed oil has a low smoking point

- Cottonseed oil has a high smoking point of 232°C (450°F).
- Ideal for deep-frying, sautéing, and stir-frying.

Myth 3: Cotton seed oil is used mainly for industrial products

- Cotton seed oil is used in many food products, including mayonnaise, salad dressings, bakery items, and snack foods.

Myth 4: Cottonseed oil makes Food Greasy

- Neutral-tasting oil, it won't add any greasiness to the food.

Healthline. (n.d.). Cottonseed Oil: Benefits, Side Effects, and Uses. Healthline. Retrieved from https://www.healthline.com/health/cottonseed-oil

Myths

Myth 5: Cottonseed oil is only used for cooking

- Used in many industrial applications.
- In soap making, cosmetics, and even biofuel.

Myth 6: Cottonseed oil can increase the risk of cancer

- Studies have found that cottonseed oil has no link to cancer.

Myth 7: Cottonseed oil is difficult to find

- Widely available in supermarkets, health food stores, and online.

Myth 8: Cottonseed oil is expensive

- Affordable and could save money in the long run due to its health benefits.

Healthline. (n.d.). Cottonseed Oil: Benefits, Side Effects, and Uses. Healthline. Retrieved from https://www.healthline.com/health/cottonseed-oil

Conclusion

Cotton seed oil is an excellent oil that can be used for **frying, baking, salads** and many other cooking uses.

It has a **high smoking point**, which makes it suitable for cooking at high temperatures. It also possesses a light, subtle flavor and can be used to make a variety of products like **soaps, lotions, and cosmetics**.

It is also an excellent **source of healthy fats** and is **rich in antioxidants**, which makes it a great choice for those looking to increase their intake of **heart-healthy nutrients**.

Cottonseed oil may have some **potential health benefits.** But other vegetable oils, such as olive oil and avocado oil, have considerably more evidence to back their beneficial effects.

Healthline. (n.d.). Cottonseed Oil: Benefits, Side Effects, and Uses. Healthline. Retrieved from https://www.healthline.com/health/cottonseed-oil

Way forward of Collaboration with SEA

- Creating A Nutritional awareness public campaign for consumers
- Engaging Health care Practioner’s ,DOCTORS, Nutritionist for scientific dissemination
- Creating a campaign under Eat Right Initiative with NETPROFAN members
- ARTICLES,BLOGS, VLOGS FOR MORE PUBLIC AWARENESS ON HEALTH BENEFITS OF CSO

RECEIPE FOR HAPPINESS

INGREDIENTS

- 2 heaped cup of patience
- 1 heart full of love
- 2 hands full of generosity
- 1 head full of understanding

METHOD

- Mix all the ingredients, sprinkle generosity and kindness
- Add faith and mix well.
- Add a dash of laughter, spread over a period of time
- Serve smiling to everyone you meet to spread happiness.

Thank You